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Rights-based management in the transboundary fisheries of the Western and Central Pacific Ocean

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Abstract

Open access fisheries represent a classic common pool resources problem, in which individual incentives produce a “race to fish” at the expense of other current and future users. Fisheries economists view such problems as one of externalities, transaction costs and poorly defined property rights.

However, fisheries managers and policymakers are tasked with more than simply managing the rate of extraction of the stock. They must design instruments and set policies capable of achieving multiple biological, ecological, economic and social objectives in a dynamic and uncertain environment. These objectives often conflict with each other such that they cannot be achieved simultaneously.

Holistic management frameworks, such as ecosystems approaches to fisheries, can be employed to set management objectives, evaluate management options and determine responses to changes in biological and ecological factors to ensure the sustainable use of the stock. Fisheries managers have before them an array of management instruments with which to implement ecosystems approaches.

Rights-based management (RBM) approaches grounded in property rights theory have been shown to be capable of dealing with the central common pool resource problem and have become increasingly common in domestic fisheries. However, their ability to address more complex biological, ecological and social objectives is less certain. The *robust separation* of management instruments, including transferable property rights, assigned appropriately to each objective has been put forward as a framework to support the achievement of multiple objectives for the management of common pool resources. Such an approach is designed to support a *robust management system* – one that is capable of withstanding changes over time without affecting the fundamental structure of the management system.

Transboundary fisheries, such as fisheries for highly migratory species, magnify these challenges. Their management requires cooperation between States with competing interests to agree on compatible, precautionary measures across the geographic range of the stocks, without the aid of a centralised decision maker to arbitrate between those interests. The tuna fisheries of the Western and Central Pacific Ocean (WCPO) – the largest in the world – exemplify these challenges. While international law provides a basis for RBM, ecosystems approaches, cooperation, compatibility and precaution, there has been limited research into the application of RBM in transboundary fisheries.

This thesis aims to contribute to a deeper understanding of how RBM can be applied to highly migratory fish stocks by examining the extent to which the institutional framework in the WCPO provides a basis for well-defined property rights. It draws on extensive property rights scholarship and the robust separation framework to develop an analytical framework for the

evaluation of management instruments that seek to limit catches, fishing effort or fishing capacity, and allocate shares in those limits to participating States and Territories.

The results are discussed with a view to identifying reforms to strengthen the definition of property rights in the WCPO. The study demonstrates that the methodical analysis of property rights can be employed to identify key reforms to support a robust management system that can aid the achievement of multiple objectives in the presence of dynamism and uncertainty.

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Certification

I, Kamal Yosuf Azmi, declare that this thesis submitted in fulfilment of the requirements for the conferral of the degree of Doctor of Philosophy, from the University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged. This document has not been submitted for qualifications at any other academic institution.

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Kamal Yosuf Azmi

17 November 2021

List of Abbreviations and Acronyms

BET	bigeye tuna
CBD	Convention on Biological Diversity
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
CCM	members, participating territories and cooperating non-members
CNM	cooperating non-member
CPUE	catch per unit of effort
DWFN	distant water fishing nation
EDF	Environmental Defence Fund
EEZ	exclusive economic zone
EPO	eastern Pacific Ocean
EU	European Union
FAD	fish aggregating device
FAO	Food and Agriculture Organisation of the United Nations
FFA	Pacific Islands Forum Fisheries Agency
IATTC	Inter-American Tropical Tuna Commission
ITE	individual transferable effort
ITQ	individual transferable quota
IUU	illegal, unreported and unregulated (fishing)
LRP	limit reference point
MCS	monitoring, control and surveillance
MEY	maximum economic yield
MHLC	Multilateral High Level Conference
MPA	marine protected area
MSE	management strategy evaluation
MSY	maximum sustainable yield
nm	nautical mile
PAE	party allowable effort
PIC	Pacific island country
PICTs	Pacific island countries and territories
PNA	Parties to the Nauru Agreement
RBM	rights-based management
RFMO	regional fisheries management organisation
SB	spawning biomass
$SB_{F=0}$	spawning biomass in the absence of fishing
SIDS	small island developing State(s)
SIDSTs	small island developing States and Territories
SKJ	skipjack
SPA	South Pacific albacore
TAC	total allowable catch
TAE	total allowable effort
TRP	target reference point
UNCED	United Nations Conference on the Environment and Development
UNFCCC	United Nations Framework Convention on Climate Change
UNFSA	United National Fish Stocks Agreement

USD	United States Dollar
VDS	vessel day scheme
WCPF Convention	Convention for the Conservation of Highly Migratory Species in the Western and Central Pacific Ocean
WCPFC	Western and Central Pacific Fisheries Commission
WCPFC-CA	Western and Central Pacific Fisheries Commission Convention Area
WCPO	western and central Pacific Ocean
YFT	yellowfin tuna

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1 Introduction

1.1 Introduction

Sustainably managing the world's fisheries resources exemplifies the idea of a wicked problem[1], that is, one that is difficult to define, has no obvious solution, and requires continuous action to address it[2] [3]. Multiple stakeholders will view a problem differently, and therefore prioritise different objectives. Some may emphasise the maximisation of catches or profit, while others seek to conserve stocks and preserve the health of the wider ecosystem. The pursuit of one objective very likely means that other objectives are not achievable[4]. Even within the single objective of ensuring sustainable catches, stakeholders compete for a share of the available resource. Each has their own justification for what they perceive to be a fair share that, in aggregate, may undermine the ability of the stock to renew itself. All of this takes place in a context in which fish populations, environmental parameters, ecological interactions, technology, costs, market prices and preferences, and human behaviour are all to varying degrees uncertain, unpredictable, ever-changing and, at worst, unknowable.

The fisheries manager is thus faced with the task of choosing between the pursuit of an array of conflicting objectives advocated by numerous competing stakeholders in order to solve an indefinable, dynamic problem for which no single solution exists.

Wicked problems for which the cost of addressing the issue increases over time, where those actors best able to deal with it have the least incentive to do so, and where institutional frameworks to deal with the problem are not present, have come to be regarded as "super wicked problems"[5]. Ecosystems that straddle jurisdictional boundaries, such as those between the exclusive economic zones (EEZs) of more than one coastal State or between one or more EEZ and the high seas, exemplify these three exacerbating factors[6].

Transboundary fish stocks, such as tuna and billfish species, which straddle, or move across, maritime jurisdictional boundaries, are subject to multiple regulatory regimes designed and enforced by independent sovereign entities, each of which is already dealing with the complexities of a single

[1] Jentoft, S. and R. Chuenpagdee (2009). "Fisheries and coastal governance as a wicked problem." Marine Policy **33**(4): 553-560.
[2] Rittel, H. W. J. and M. M. Webber (1973). "Dilemmas in a general theory of planning." Policy Sciences **4**(2): 155-169.
[3] On the use of the term "wicked problem" in academic literature, see Ruhl, J. B. and J. Salzman (2020). "Symposium: Governing Wicked Problems: Introduction " Vanderbilt Law Review **73**(6): 1562-1583.
[4] Hilborn, R. (2007). "Defining success in fisheries and conflicts in objectives." Marine Policy **31**(2): 153-158.
[5] Lazarus, R., J. (2009). "Super Wicked Problems and Climate Change: Restraining the Present to Liberate the Future." Cornell Law Review **94**(5). pp1159-61.
[6] See the example of the Hatton-Rockall plateau in the northeast Atlantic in Johnson, D. E., C. Barrio Froján, F. Neat, D. Van Oevelen, D. Stirling, M. J. Gubbins and J. M. Roberts (2019). "Rockall and Hatton: Resolving a Super Wicked Marine Governance Problem in the High Seas of the Northeast Atlantic Ocean." Frontiers in Marine Science **6**: 1153-1233.

jurisdiction. Transboundary fisheries and single jurisdiction fisheries share the first of the exacerbating factors of a super wicked problem – the temporal problem of cost. The longer a stock is overfished the more difficult, and costly, it will be to rebuild. On the second factor, those with an ability to solve the problem – those with greater wealth and resources, or those who have contributed most to the problem – are arguably no more likely to have a greater incentive to do so than in a single jurisdiction fishery. The presence of single decision-making authority in a domestic fishery at least increases the likelihood that a resolution may be arbitrated between competing interests. Transboundary stocks, however, rely on cooperation and agreement between States, without resort to a single decision maker. Individual States lack the incentive to act, even when they can, and there is little that others can do about it[7].

1.2 Status of the world's highly migratory fish stocks

As demand for fish has risen over recent decades, the challenge of managing them sustainably has also increased. In its most recent *State of the World's Fisheries and Aquaculture* Report[8], the Food and Agriculture Organisation of the United Nations (FAO) has estimated that, in 2017, 65.8% of all marine fish stocks were fished within or at biologically sustainable levels, having fallen from 90% in 1974. It also estimated that, of these stocks, the vast majority (59.6%) were considered "maximally sustainably fished" – that is, stocks at or close to the level capable of producing the maximum sustainable yield (MSY) – while just 6.2% were regarded as "underfished"[9]. The proportion of stocks that are fished at biologically unsustainable levels (previously referred to as "overfished") has seen corresponding increases over the same period – from 10% in 1974 to 34.2% in 2017.

The trend towards increasingly overfished stocks has been associated with increasing industrialisation of fishing since the Second World War, characterised by serial depletions and the ever-outward expansion of distant water fishing activities, notably by Spain and, more recently, China[10]. Some stocks

[7] Munro, G. (2008). "Game theory and the development of resource management policy: the case of international fisheries." Environment and Development Economics **14**(01): 7-27.
[8] FAO (2020). The State of World Fisheries and Aquaculture 2020. Rome, The Food and Agriculture Organisation of the United Nations (FAO)**:** 224pp. p47.
[9] The FAO defines the following terms: "In The State of World Fisheries and Aquaculture, fish stocks are classified into two categories: Fished within biologically sustainable levels: stocks with abundance at or above the level associated with maximum sustainable yield (MSY); Fished at biologically unsustainable levels: stocks less abundant than the level needed to produce MSY…Stocks are also characterized in three more traditional categories, to give more information about the production potential of a fish stock in relation to its current status: Overfished: having abundance lower than the level that can produce MSY; Maximally sustainably fished: having abundance at or close to the level of MSY; Underfished: abundance above the level corresponding to MSY In previous editions the category "maximally sustainably fished" was labelled "fully fished". That term was often misinterpreted and has been modified for greater conceptual clarity". FAO (2018). The State of the World Fisheries and Aquaculture 2018. Rome, The Food and Agriculture Organisation of the United Nations (FAO)**:** 227pp. p39 Box 2.
[10] Pauly, D. (2018). "A vision for marine fisheries in a global blue economy." Marine Policy **87**: 371-374.

have managed to recover through deliberate restrictions on fishing[11] and the application of a variety of management tools[12].

Seven tuna species[13] represent some of the most fished, economically valuable and internationally traded fish species. The FAO estimates that skipjack tuna and yellowfin tuna account for approximately 4% and 2% respectively of marine capture fisheries production, with the former behind only anchoveta and Alaskan pollock[14]. Tunas and billfish species accounted for around 9% of international fish trade in 2018[15].

Global catches of four key tuna species – albacore, bigeye, skipjack and yellowfin – represent 65% of global catches of all tuna and tuna-like species[16], two-thirds of which are taken in the Pacific Ocean[17]. Global catches of these four species have more than tripled since 1974, although catches have been reasonably steady since 2012[18].

Tuna stocks, which the FAO notes are generally well-assessed, currently exhibit a similar status to fish stocks overall – in 2017, 66.6% of tuna stocks were fished sustainably and 33.3% of stocks were not. However, the status of tuna stocks varies between tuna regions, with particular concerns for yellowfin in the Atlantic[19] and Indian[20] Oceans, bigeye in the Atlantic Ocean[21], and Pacific bluefin in the north Pacific[22], the most recent assessments of which have indicated they are being overfished and subjected

[11] Melnychuk, M. C., H. Kurota, P. Mace, M. Pons, C. Minto, G. C. Osio, O. P. Jensen, C. L. Moor, A. M. Parma, L. R. Little, D. Hively, C. E. Askbrook, N. Baker, R. O. Amoroso, T. A. Branch, C. M. Anderson, C. S. Szuwalski, J. K. Baum, T. McClanahan, Y. Ye, A. Ligas, J. Bensbai, G. G. Thompson, J. DeVore, A. Magnusson, B. Bogstad, E. Wort, J. Rice and R. Hilborn (2021). "Identifying management actions that promote sustainable fisheries." Nature Sustainability **4**: 440-449.

[12] Worm, B., R. Hilborn, J. K. Baum, T. A. Branch, J. S. Collie, C. Costello, M. J. Fogarty, E. A. Fulton, J. A. Hutchings, S. Jennings, O. P. Jensen, H. K. Lotze, P. M. Mace, T. R. McClanahan, C. Minto, S. R. Palumbi, A. M. Parma, D. Ricard, A. A. Rosenberg, R. Watson and D. Zeller (2009). "Rebuilding global fisheries." Science **325**(5940): 578-585. p583.

[13] These seven commercially important tuna species are: albacore (*Thunnus alalunga*); bigeye (*Thunnus obesus*); skipjack (*Katsuwonus pelamis*); yellowfin tuna (*Thunnus albacares*); and three species of bluefin tuna (*Thunnus thynnus, Thunnus maccoyii and Thunnus orientalis*). FAO (2020). The State of World Fisheries and Aquaculture 2020. Rome, The Food and Agriculture Organisation of the United Nations (FAO)**:** 224pp. p49.

[14] Ibid. p14 Table 3.

[15] Ibid. p84 Figure 33.

[16] FAO reports that total catches of tuna and tuna-like species were 7.9 million tonnes in 2018 SPC reports that catches of these four species amounted to 5.2 million tonnes globally. See ibid. p12; and SPC (2019). Western and Central Fisheries Commission Tuna Fishery Yearbook 2018. Pohnpei, WCPFC**:** 149pp. p141 Table 98

[17] Western and Central Pacific: 54%; Eastern Pacific: 13%; Atlantic: 11%; Indian Ocean: 23% See SPC (2019). Western and Central Fisheries Commission Tuna Fishery Yearbook 2018. Pohnpei, WCPFC**:** 149pp. p142 Table 99.

[18] Catches have moved within a range from 4.7 million tonnes in 2012 to a record of 5.2 million tonnes in 2018. See ibid. p142 Table 99.

[19] ICCAT (2019). Stock assessment: yellowfin tuna summary. Stock Assessments and Executive Summaries.

[20] IOTC (2018). Status of the Indian Ocean yellowfin tuna (YFT: Thunnus albacares) resource: executive summary. Status summary for species of tuna and tuna-like species under the IOTC mandate, as well as other species impacted by IOTC fisheries. Port Louis.

[21] ICCAT (2018). Stock assessment: bigeye tuna summary. Stock Assessments and Executive Summaries.

[22] IATTC (2019). Status of the tuna and billfish stocks in 2018 No.20. Stock Status Reports. La Jolla. **No. 20**.

to overfishing. A positive assessment of skipjack in the Indian Ocean is tempered by a 38% probability that they are both overfished and subjected to overfishing[23], and similarly for albacore in the Mediterranean (35.7% probability that it is being both overfished and subjected to overfishing)[24]. Poor data availability[25] has hampered assessments of albacore, bigeye, skipjack and yellowfin stocks in the Eastern Pacific[26], albacore in the Mediterranean[27] and bluefin in the Western Atlantic[28].

1.3 Threats to highly migratory fish stocks

While environmental change, including through the impacts of climate change, is expected to become increasingly significant[29], overfishing is clearly the most obvious proximate cause of pelagic stock depletions globally[30]. Stocks have a finite capacity to replenish themselves but the capacity of industrial fishing to exploit stocks appears for the most part to be far greater. Possible explanations of what causes overfishing and other associated impacts, however, are many, and these vary depending on the context.

The multitude of objectives in a fishery suggests that explanations for overfishing of target stocks and the impacts of fishing on ecosystems are therefore likely to be far more complex than simply a failure to limit access to, or catches of, target stocks. For example, the right to exploit a fishery may be limited to a defined group of users but the amount of fishing undertaken by each user might not[31] [32]. And governments, often under pressure from particular stakeholders, may take actions aimed at achieving a social objective, such as maximising employment in the short to medium term, but which may

[23] IOTC (2017). Status of the Indian Ocean skipjack tuna (SKJ: Katsuwonus pelamis) resource: executive summary. Status summary for species of tuna and tuna-like species under the IOTC mandate, as well as other species impacted by IOTC fisheries. Port Louis.
[24] ICCAT (2016/2017). Stock assessment: albacore summary. Stock Assessments and Executive Summaries.
[25] See Pauly, D., R. Hilborn and T. A. Branch (2013). "Does Catch Reflect Abundance?" Nature **494**(21 February): 303-306.
[26] IATTC (2019). Status of the tuna and billfish stocks in 2018 No.20. Stock Status Reports. La Jolla. **No. 20**.
[27] ICCAT (2016/2017). Stock assessment: albacore summary. Stock Assessments and Executive Summaries.
[28] ICCAT (2017). Stock assessment: bluefin tuna summary. Stock Assessments and Executive Summaries.
[29] Lam, V. W. Y., E. H. Allison, J. D. Bell, J. Blythe, W. W. L. Cheung, T. L. Frölicher, M. A. Gasalla and U. R. Sumaila (2020). "Climate change, tropical fisheries and prospects for sustainable development." Nature Reviews Earth & Environment **1**: 440–454.
[30] Worm, B., R. Hilborn, J. K. Baum, T. A. Branch, J. S. Collie, C. Costello, M. J. Fogarty, E. A. Fulton, J. A. Hutchings, S. Jennings, O. P. Jensen, H. K. Lotze, P. M. Mace, T. R. McClanahan, C. Minto, S. R. Palumbi, A. M. Parma, D. Ricard, A. A. Rosenberg, R. Watson and D. Zeller (2009). "Rebuilding global fisheries." Science **325**(5940): 578-585.
[31] A fishery that can exclude some potential fishers, for example, the fish in a coastal state's exclusive economic zone, could be described as a *club good*. Despite a degree of excludability, club goods are rivalrous (consumption causes congestion or diminishes the amount of stock available to others) and therefore may still share some of the challenges of a common pool resource. Libecap, G. D. (1986). "Property rights in economic history: Implications for research." Explorations in Economic History **23**: 227-252.p235.
[32] See for example Holzer, J. (2015). "Property Rights and Choice: The Case of the Fishery." American Journal of Agricultural Economics **97**(4): 1175-1191. p1183.

encourage excessive fishing to the long-term detriment of the stock and of the welfare of those dependent on it[33].

Such pressure often leads to fleet overcapacity, which in turn leads to overfishing[34]. Actors with an interest in a fishery tend to stimulate political pressure to maintain those interests, often through subsidies[35], which in turn have resulted in further substantial overcapacity[36] in global fishing fleets[37] [38]. The cycle is a vicious one, in which subsidised fishing capacity continues to increase in the face of ever-dwindling stocks and increasing costs[39] [40].

Overfishing can also be the unintended consequence of fisheries governance and management arrangements that are designed to reduce overfishing but fail to do so effectively. This could be due to weaknesses in the design of governance and management arrangements[41] that create perverse incentives for fishers (and fishery managers), or a failure to regulate fisheries at all.

Alternatively, it may be due simply to a failure to effectively enforce fisheries regulations, regardless of what those regulations might be. Effective monitoring, control and surveillance (MCS) and

[33] See for example the Canadian Atlantic cod fishery documented in Kurlansky, M. (1999). Cod: A Biography of the Fish that Changed the World. London, Vintage. Pp182-3.

[34] See for example: Grafton, R. Q., R. Arnason, T. Bjørndal, D. Campbell, H. F. Campbell, C. W. Clark, R. Connor, D. P. Dupont, R. Hannesson, R. Hilborn, J. E. Kirkley, T. Kompas, D. E. Lane, G. R. Munro, S. Pascoe, D. Squires, S. I. Steinshamn, B. R. Turris and Q. Weninger (2006). "Incentive-based approaches to sustainable fisheries." Canadian Journal of Fisheries and Aquatic Sciences **63**(3): 699-710. p700.

[35] Larkin, P. A. (1977). "An epitaph for the concept of maximum sustainable yield." Transactions of the American Fisheries Society **106**(1): 1-11. p6.

[36] The FAO makes a distinction between effort and capacity. While both can be the subject of input controls, capacity is "closely related to the fishing mortality a fishing fleet could generate if the entire fleet were to fish full time" and effort refers to the "actual amount of fishing activity". Garcia, S. M., A. Zerbi, C. Aliaume, T. Do Chi and G. Lasserre (2003). The Ecosystems Approach to Fisheries: Issues, terminology, principles, institutional foundations, implementation and outlook. FAO Fisheries Technical Paper. Rome, Food and Agriculture Organisation of the United Nations. **443:** 71. p33.

[37] Sumaila, U. R., V. Lam, F. Le Manach, W. Swartz and D. Pauly (2016). "Global fisheries subsidies: An updated estimate." Marine Policy **69**: 189-193.

[38] Bell et al estimate that global fishing capacity nearly tripled from 1950 to 2012 but has levelled off since 2010. Fishing effort, however, has continued to increase, driven by growth (in both effort and capacity) in Asia and South America, and in developing countries. They estimate that global fishing capacity needs to be reduced by 43 to 50 percent. Bell, J. D., R. A. Watson and Y. Ye (2016). "Global fishing capacity and fishing effort from 1950 to 2012." Fish and Fisheries **18**(3): 495-505. pp8-12.

[39] See for example the description of the changing fortunes of the Spanish distant water fleets in the Twentieth Century in Sinde Cantorna, A. I., I. D. CastrillÓn and A. G. Canto (2007). "Spain's Fisheries Sector: From the Birth of Modern Fishing through to the Decade of the Seventies." Ocean Development & International Law **38**(4): 359-374. pp364-70.

[40] See also Stobutzki et al, who note the heavy overcapacity in South and Southeast Asia in both coastal and industrial fisheries, which has in turn driven political pressure to allow harvest rates greater than MSY or MEY. Stobutzki, I. C., G. T. Silvestre and L. R. Garces (2006). "Key issues in coastal fisheries in South and Southeast Asia, outcomes of a regional initiative." Fisheries Research **78**(2-3): 109-118. p114.

[41] According to Charles, "Governance deals with the processes and principles by which decisions are made – in whatever sector, institution or organization is of interest – and concerns such aspects as the values underlying decision making, the principles of 'good governance' (such as transparency and accountability) and the options available for engagement and participation of stakeholders in decision making". Charles, A. T. (2013). "Fisheries Management and Governance: Forces of Change and Inertia." Ocean Yearbook **27**: 249-266. p257.

enforcement measures to ensure compliance are expensive, complex undertakings for even the most well-resourced States[42]. This is particularly so for small, developing coastal States with large maritime jurisdictions[43]. Poor monitoring by fisheries authorities, and poor reporting by fishers mean fisheries managers have an incomplete picture of the amount of fishing activity taking place, its impact on stocks and ecosystems, and the level of compliance with regulations. Flag States also may find it difficult to monitor vessels flying their flag if they fish beyond waters under the flag State's jurisdiction. Flag States, particularly those with open registries, may not be inclined to monitor their vessels closely.

The preceding two paragraphs have essentially described what has commonly become known as illegal, unreported and unregulated (IUU) fishing[44]. In the absence of effective MCS and enforcement, illegal fishing could allow fishing pressure to increase above sustainable levels. By its nature, IUU fishing is difficult to quantify but the most widely cited estimate puts IUU fishing at around 11-19% of reported catches, representing 10-26 million tonnes of fish valued at US$10-23 billion[45]. Certainly, it is difficult to know whether fish stocks are healthy, or to manage them effectively, when those fisheries are data-poor and subject to high levels of uncertainty[46].

That many proximate causes of overfishing and marine ecosystem damage often result from incentives created by governance arrangements has led some to argue that the ultimate causes stem from some form of a "failure of fisheries governance"[47]. Governance arrangements are often adopted in response to ecological, economic and social factors within an inherently political context. As noted earlier, those factors are not static. Fish stocks and marine ecosystems are dynamic, responding to natural fluctuations in the environment, and to human activity, which in turn responds to changes in biological conditions of the stock, market conditions and costs, and socio-cultural preferences, and to the institutions and incentives created by the governance system.

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[42] See for example the challenges described by US Coast Guard Rear Admiral Matthew Bell in Bladen, S. (2020). "International collaboration and information sharing are key to detecting suspicious vessels and achieving well-managed fisheries." Global Fishing Watch: Blog https://globalfishingwatch.org/impacts/gfw-assists-us-coast-guard-patrol-in-pacific/ Accessed 11 December 2020.

[43] See the example of Pacific island countries in Bergin, A., D. Brewster and A. Bachhawat (2019). Ocean Horizons: Strengthening maritime security in Indo-Pacific island states. ASPI Special Report. Barton, Australian Institute of Strategic Studies**:** 56pp. pp17-20.

[44] For generally accepted definitions of illegal, unreported and unregulated fishing, see FAO (2001). International Plan of Action to Prevent, Deter, and Eliminate Illegal, Unreported and Unregulated Fishing. Rome, FAO. Article II(3).

[45] Agnew, D. J., J. Pearce, G. Pramod, T. Peatman, R. Watson, J. R. Beddington and T. J. Pitcher (2009). "Estimating the worldwide extent of illegal fishing." PLoS One **4**(2): e4570.

[46] Hilborn, R., R. O. Amoroso, C. M. Anderson, J. K. Baum, T. A. Branch, C. Costello, C. L. de Moor, A. Faraj, D. Hively, O. P. Jensen, H. Kurota, L. R. Little, P. Mace, T. McClanahan, M. C. Melnychuk, C. Minto, G. C. Osio, A. M. Parma, M. Pons, S. Segurado, C. S. Szuwalski, J. R. Wilson and Y. Ye (2020). "Effective fisheries management instrumental in improving fish stock status." Proc Natl Acad Sci U S A **117**(4): 2218-2224.

[47] World Bank and FAO (2008). The Sunken Billions: The Economic Justification for Fisheries Reform. Washington, World Bank and the Food and Agriculture Organisation of the United Nations**:** 86. p39.

Fisheries thus represent a social-ecological system, that is, a system defined by the interaction between ecological systems and human systems[48]. Ecological and human systems cannot be regarded as independent of each other but in fact influence and interact with each other over time and space.

1.4 Property rights-based management instruments

Among the instruments available to fisheries managers, rights-based instruments, grounded in the theory of property rights, have gained significant attention, through both theoretical research and practice. Proponents contend that they harness individual incentives to achieve broader social objectives by restraining catches and maximising economic returns, thus avoiding the "tragedy of the commons"[49]. Critics argue that they have little to contribute in terms of broader ecological outcomes and can have dramatic social impacts on vulnerable communities that have previously relied upon stocks that are henceforth privatised to the highest bidder. Over time, practice has seen increased nuance in the application of property-rights-based approaches to more appropriately match the assignment of rights to preserve equity between heterogenous groups[50]. Each management instrument has advantages and disadvantages and no single instrument is capable of addressing the myriad conflicting objectives[51].

In this study, I will argue that well-defined property rights have an important role to play in effective fisheries management as part of a broader suite of instruments designed to address social-ecological complexity. Rights-based management (RBM) is far more common in domestic fisheries than in transboundary fisheries. However, there is a strong desire in some regions to establish a strong RBM system for transboundary fisheries, notably in the western and central Pacific Ocean (WCPO). This study aims to build an understanding of the extent to which the governance framework for the fisheries of the WCPO comprises "well-defined" property rights with a view to proposing reforms that would enhance the governance of the tuna fisheries of the WCPO and in transboundary fisheries more broadly.

[48] Ostrom, E. (2009). "A general framework for analysing sustainability of social-ecological systems." Science **325**(5939): 419-422.
[49] Hardin, G. (1968). "The Tragedy of the Commons." Ibid. **162**(3859): 1243-1248.
[50] Charles, A. T. (2013). "Fisheries Management and Governance: Forces of Change and Inertia." Ocean Yearbook **27**: 249-266. p260.
[51] Young, M. D. and J. C. McColl (2002). Robust Separation: A Search for a Generic Framework to Simplify Registration and Trading of Interests in Natural Resources, Commonwealth Scientific and Industrial Research Organisation**:** 1-48.

1.5 The fisheries for highly migratory species in the WCPO

1.5.1 Introduction

The Western and Central Pacific Ocean (WCPO) is the largest tuna region in the world, accounting for 56 percent of the global tuna catch by volume[52], and is also home to important fisheries for several species of billfish, including marlins and swordfish.

The main tuna species targeted in the WCPO are albacore (*thunnus alalunga*), bigeye (*thunnus obesus*), skipjack (*katsuwonus pelamis*) and yellowfin (*thunnus albacares*). They are targeted by a variety of gear types, including purse seine, longline, pole and line, and troll, as well as other gear types associated with artisanal and other small scale fisheries. Much smaller catches are recorded for Pacific bluefin (*thunnus orientalis*), which are a northern stock. Billfish species targeted in the region include black marlin (*makaira indica*), blue marlin (*makaira nigricans*), striped marlin (*tetrapturus audax*) and swordfish (*xiphias gladius*)[53].

In addition to its global importance, the WCPO is a highly complex fisheries region. Fleets from a variety of distant water fishing nations (DWFNs) and coastal States harvest substantial catches of multiple interacting species using multiple gear types throughout the region, including on the high seas and in the waters of several small island developing States and Territories (SIDSTs).

In 2000 interested coastal States and fishing States agreed to form the Western and Central Pacific Fisheries Commission (WCPFC) through which its members, participating territories and cooperating non-members (collectively "CCMs") could fulfil their duty under the UN Fish Stocks Agreement (UNFSA)[54] to cooperate for the conservation and management of highly migratory fish stocks in the WCPO[55].

[52] Brouwer, S. L., G. Pilling, J. Hampton, P. Williams and S. McKechnie (2016). The Western and Central Pacific Tuna Fishery: 2015 Overview and Status of Stocks Noumea, New Caledonia, Secretariat of the Pacific Community. **Tuna Fisheries Assessment Report No. 16:** 46. P1.

[53] SPC (2016). Tuna Fishery Yearbook 2015. Pohnpei, Federated States of Micronesia Western and Central Pacific Fisheries Commission 143pp. p1.

[54] Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UNFSA), United Nations, Treaty Series Vol. 2167.

[55] The WCPFC was established by the Convention on the Conservation of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (WCPF Convention). Agreed on 5 September 2000, Honolulu. Entered into force on 19 June 2004. **40 International Legal Materials 278 2001**. Negotiated and adopted by the Multilateral High Level Conference on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific (MHLC). MHLC (2000). Final Act of the Multilateral High-Level Conference on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Multilateral High-Level Conference on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific, Honolulu. 30 August to 5 September 2000, WCPFC.

Compared to other multispecies tuna regional fisheries management organisations (RFMOs)[56], the WCPFC has allocated to CCMs a high proportion of the stocks for which it has a mandate[57]. The mostly SIDST members of the Pacific Islands Forum Fisheries Agency (FFA) form a bloc within the WCPFC representing their interests in Commission negotiations[58]. Eight FFA members are also Parties to the Nauru Agreement (PNA)[59].

In this section I argue that the WCPO provides a valuable case study for rights-based management in complex transboundary fisheries by highlighting some important features of the region in addition to its global importance described above. The features include the importance of tuna stocks to the region itself, particularly to Pacific island economies and communities; the impact of recent developments in RBM in the region; and the region's political commitment to rights-based approaches to the management of its tuna stocks.

1.5.2 Significance of WCPO fisheries to Pacific island economies and communities

Fisheries have a multifaceted role in Pacific island countries (PICs) and their communities. Fisheries and the marine environment have a strong association with cultural identify in the Pacific[60]. Coastal communities in Pacific SIDS are also heavily reliant on marine living resources for food and nutrition security and livelihoods[61]. However, "modern" diets, growing populations and urbanisation are together presenting a significant public health challenge to many PICs[62]. Based on an estimated optimal fish

[56] The other multispecies tuna RFMOs are the Inter-American Tropical Tuna Commission (IATTC), the International Commission for the Conservation of Atlantic Tuna (ICCAT), and the Indian Ocean Tuna Commission (IUOTC). Only the Commission for the Conservation of Southern Bluefin Tuna (CCSBT) has a mandate for a single tuna species.

[57] Seto, K., G. R. Galland, A. McDonald, A. Abolhassani, K. Azmi, H. Sinan, T. Timmiss, M. Bailey and Q. Hanich (2021). "Resource allocation in transboundary tuna fisheries: A global analysis." Ambio **50**(1): 242-259.

[58] See further, Chapter Five section 5.2.

[59] PNA (1982). Nauru Agreement Concerning the Cooperation in the Management of Fisheries of Common Interest. Agreed 11 February 1982. Entered into force 2 December 1982. Amended May 2010, Office of the Parties to the Nauru Agreement.

[60] Tuilaepa, L. S. M. (2017). "Remarks by Hon. Tuilaepa Lupesoliai Sailele Malielegaoi Prime Minister of the Independent State of Samoa at the High-Level Pacific Regional Side event by PIFS on Our Values and identity as stewards of the world's largest oceanic continent, the Blue Pacific, 5 June, New York." Retrieved 28 April, 2020, from http://www.forumsec.org/remarks-by-hon-tuilaepa-lupesoliai-sailele-malielegaoi-prime-minister-of-the-independent-state-of-samoa-at-the-high-level-pacific-regional-side-event-by-pifs-on-our-values-and-identity-as-stewards/.

[61] Charlton, K. E., Russell, J., Gorman, E., Hanich, Q., Delisle, A., Campbell, B. and Bell, J. (2016). Fish, Food Security and health in Pacific Island Countries and territories: A Systematic Literature Review. BMC Public Health 16: 235. DOI: 10.1186/s12889-016-2953-9.

[62] FSM, Kiribati, RMI and PNG did not meet MDG Target 1C (halve, between 1990 and 2015, the proportion of people who suffer from hunger), and Nauru and Vanuatu had mixed results. These countries have a high incidence of underweight children and malnutrition. Countries that did achieve the target were troubled by increasing prevalence of overweight children and obesity, linked to higher incidence of non-communicable diseases (NCDs). PIFS (2015). 2015 Pacific Regional MDGs Tracking Report. Pacific Islands Forum Secretariat. p21 Available at http://www.forumsec.org/resources/uploads/embeds/file/2015%20Pacific%20Regional%20MDGs%20Tracking%20Report.pdf. Accessed on 4 May 2016.

consumption of 35-42kg per capita pa[63], Bell et al have estimated that, by 2030, PICs will require an additional 115,000 tonnes of fish to achieve a good level of nutrition[64].

Increasing pressure on reef fisheries, including the threat of climate change[65], means communities will likely depend more heavily on tuna in the future. Tunas are available to coastal fishers directly, including through the use of nearshore fish aggregating devices (FADs)[66]. Bell et al. also note that catches of small individual tuna by industrial fleets are often sold into local markets and have the potential to play a greater role in the diets of urban communities[67]. Canned tuna produced by domestic processing facilities is already an important source of protein for many Pacific communities[68].

Fisheries also provide livelihoods and employment for Pacific islanders and their communities. Fisheries are estimated to directly support over 22,000 jobs in Pacific island members of the FFA in the areas of processing, crewing and fisheries management [69].

While Pacific island communities' association with the ocean and marine resources has been an enduring feature of the region, one of the most profound changes in more recent times has been the increase in the economic returns to PICs from offshore fisheries. While some PICs, particularly those in Melanesia, are able to rely on industries such as oil and gas[70], minerals[71], forestry[72] and tourism[73], most have been, and continue to be, heavily reliant on aid, remittances and public sector activity[74].

[63] This is based on WHO guidelines on protein consumption and an assumption that 40-50 percent of protein intake in PICs is supplied by fish. See Bell et al 2015 "Diversifying the use of tuna to improve food security and public health in Pacific Island countries and territories." Marine Policy. 2015; 51: 584–91.

[64] Bell, J. D., V. Allain, E. H. Allison, S. Andréfouët, N. L. Andrew, M. J. Batty, M. Blanc, J. M. Dambacher, J. Hampton, Q. Hanich, S. Harley, A. Lorrain, M. McCoy, N. McTurk, S. Nicol, G. Pilling, D. Point, M. K. Sharp, P. Vivili and P. Williams (2015). "Diversifying the use of tuna to improve food security and public health in Pacific Island countries and territories." Marine Policy **51**: 584-591.

[65] Bell, J. D., A. Ganachaud, P. C. Gehrke, S. P. Griffiths, A. J. Hobday, O. Hoegh-Guldberg, J. E. Johnson, R. Le Borgne, P. Lehodey, J. M. Lough, R. J. Matear, T. D. Pickering, M. S. Pratchett, A. S. Gupta, I. Senina and M. Waycott (2013). "Mixed responses of tropical Pacific fisheries and aquaculture to climate change." Nature Climate Change: 9.

[66] Bell, J. D., V. Allain, E. H. Allison, S. Andréfouët, N. L. Andrew, M. J. Batty, M. Blanc, J. M. Dambacher, J. Hampton, Q. Hanich, S. Harley, A. Lorrain, M. McCoy, N. McTurk, S. Nicol, G. Pilling, D. Point, M. K. Sharp, P. Vivili and P. Williams (2015). "Diversifying the use of tuna to improve food security and public health in Pacific Island countries and territories." Marine Policy **51**: 584-591.

[67] Ibid.

[68] Bell, J. D., M. K. Sharp, E. Havice, M. Batty, K. E. Charlton, J. Russell, W. Adams, K. Azmi, A. Romeo, C. C. C. Wabnitz, N. L. Andrew, L. Rodwell, S. Gu'urau and R. Gillett (2019). "Realising the food security benefits of canned fish for Pacific Island countries." Ibid. **100**: 183-191.

[69] FFA and SPC. (2019). "Future of Fisheries: Tuna fishery report card 2019." Retrieved 28 April, 2020, from https://www.ffa.int/node/1569.

[70] PNG is the only PIC to have significant oil and gas resources.

[71] For example, PNG, Solomon Islands, New Caledonia.

[72] PNG, Solomon Islands.

[73] Fiji, Vanuatu, as well as some Polynesian countries (notably Samoa, Tonga) and Micronesia (particularly Palau). See World Bank (2017). Pacific Possible: Long-term Economic Opportunities and Challenges for Pacific Island Countries. Washington, DC, World Bank**:** 130pp. p25.

[74] Ibid. pp13-4.

Tropical and subtropical tuna stocks, however, represent a substantial resource of common interest to all PICs.

Fisheries now account for a substantial portion of economic activity and government revenue in Pacific island coastal States and territories. Foreign fishing access fees account for 68 per cent of gross domestic product (GDP) in Kiribati[75], 15 percent in Federated States of Micronesia[76], and 14 per cent in Tuvalu[77]. Foreign fishing access fees also account for a substantial portion of government revenue in many PICs. Twenty-two PICs and territories earned around $350 million from fees paid by foreign fishing fleets for access to their EEZs in 2014[78]. As Figure 1.1 below illustrates, access fees accounted for over 10 percent of government revenues in seven of them. Kiribati notably earned 75 per cent of its government revenue from access fees. Fish-related exports are also the highest value primary export commodity for 10 PICs[79].

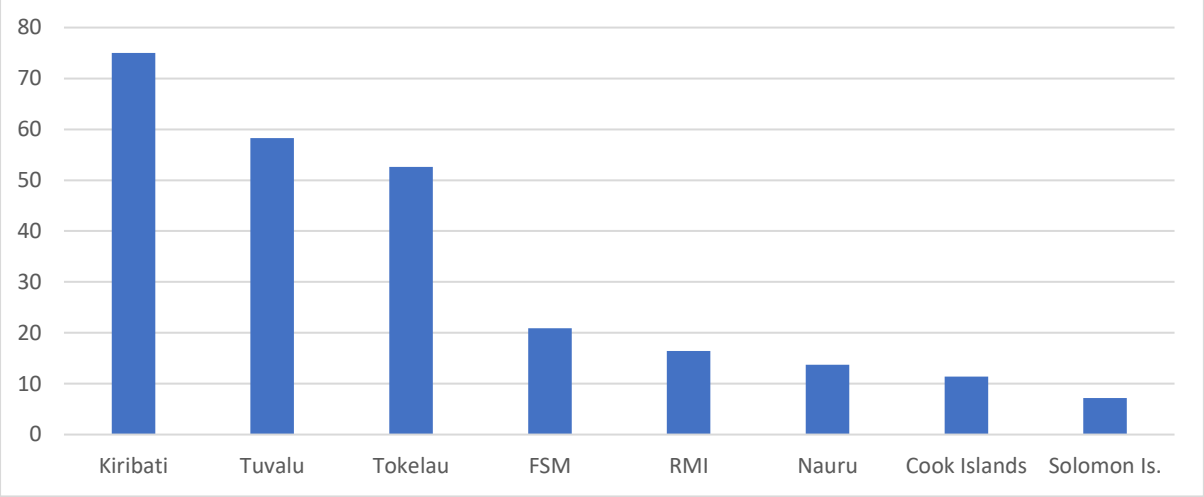

Figure 1.1 Foreign fishing access fees as a percentage of Pacific island coastal States' government revenue (2014)[80]

A significant risk to these economic benefits is the predicted shift in the distribution of tuna stocks over coming decades due to climate change. Of interest to PICs is an expected shift further eastward toward areas of the Pacific characterized by a greater proportion in the high seas and away from their EEZs[81].

[75] IMF (2015). Staff Report for the 2015 Article IV Consultation: Kiribati. Washington DC, Interational Monetary Fund. pp4-5.
[76] IMF (2015). Staff Report for the 2015 Article IV Consultation: Federated States of Micronesia. Washington DC, International Monetary Fund. p4.
[77] Note also that fish exports accounted for an additional 21.4 percent of Tuvalu's GDP in 2014. IMF (2014). Staff Report for the 2014 Article IV Consultation: Tuvalu. Washington DC, International Monetary Fund.Table 1 p17.
[78] Gillett, R. (2016). Fisheries in the Economies of Pacific Island Countries and Territories. Noumea, New Caledonia, Pacific Community: 664pp. p7.
[79] Hughes, A. A. and J. Kamea (2016). Pacific Islands Trade 2010-2014. Noumea, Secretariat of the Pacific Community. p15.
[80] Data source: Gillett, R. (2016). Fisheries in the Economies of Pacific Island Countries and Territories. Noumea, New Caledonia, Pacific Community: 664pp.
[81] Bell, J. D., A. Ganachaud, P. C. Gehrke, S. P. Griffiths, A. J. Hobday, O. Hoegh-Guldberg, J. E. Johnson, R. Le Borgne, P. Lehodey, J. M. Lough, R. J. Matear, T. D. Pickering, M. S. Pratchett, A. S. Gupta, I. Senina and M.

In addition to their global importance, WCPO tuna fisheries thus play a vital role in the economies, livelihoods and cultural identify of Pacific island countries and their communities.

1.5.3 Developments in rights-based fisheries management in the WCPO

The codification in the UN Convention on the Law of the Sea (LOSC)[82] of coastal States' sovereign rights over the resources of EEZs and the significant strengthening of coastal States' position vis a vis fishing States under UNFSA presented an unprecedented opportunity for newly independent PICs to assert property rights over highly migratory fish stocks[83] [84] and secure for their benefit a vital economic resource.

For both the biological and legal reasons discussed above, the coastal States and Territories of the WCPO and States whose vessels fish in the waters of the WCPO have established a number of cooperative mechanisms for the conservation and management of highly migratory species at the regional and sub-regional scales. The WCPFC has allocated a relatively high proportion of stocks under its management to member States and fishing entities, participating territories and cooperating non-members[85].

Arguably the most rights-like management arrangement has been developed not by the WCPFC but by a subgroup of FFA members, the Parties to the Nauru Agreement (PNA)[86]. The PNA's tropical purse seine vessel day scheme (VDS)[87] stands out as a sub-regional scale approach to fisheries management that exhibits some of the characteristics of RBM in a transboundary fishery[88] [89]. As a scheme that limits the overall level of access to the fishery and allocates that access on an exclusive basis to participant

Waycott (2013). "Mixed responses of tropical Pacific fisheries and aquaculture to climate change." Nature Climate Change: 9.

[82] United Nations Convention on the Law of the Sea (LOSC). Agreed on 10 December 1982. Entered into force on 16 November 1994, United Nations.

[83] Cartwright, I. and A. Willock (2000). Oceania's Birthright: The Role of Rights-based Management in Tuna Fisheries of the Western and Central Pacific. FAO Fisheries Technical Paper 404/1 Use of Property Rights in Fisheries Management. Proceedings of the FishRights99 Conference, Fremantle, Western Australia, 11 - 19 November 1999. R. Shotton. Rome, FAO.

[84] Aqorau, T. (2007). "Moving Towards a Rights-Based Fisheries Management Regime for Tuna Fisheries in the Western and Central Pacific Ocean." The International Journal of Marine and Coastal Law **22**(1): 125-142.

[85] Of the four multi-species tuna RFMOs, Seto et al assess that the WCPFC has allocated the highest proportion of stocks under its management. See Seto, K., G. R. Galland, A. McDonald, A. Abolhassani, K. Azmi, H. Sinan, T. Timmiss, M. Bailey and Q. Hanich (2021). "Resource allocation in transboundary tuna fisheries: A global analysis." Ambio **50**(1): 242-259.

[86] PNA (1982). Nauru Agreement Concerning the Cooperation in the Management of Fisheries of Common Interest. Agreed 11 February 1982. Entered into force 2 December 1982. Amended May 2010, Office of the Parties to the Nauru Agreement.

[87] PNA (1992). Palau Arrangement for the Management of the Western Pacific Fishery - Management Scheme (Purse Seine Vessel Day Scheme) (as amended April 2016). Signed 2 October 1992. Entered into force 1 November 1995, Office of the Parties to the Nauru Agreement.

[88] Aqorau, T. (2009). "Recent Developments in Pacific Tuna Fisheries: The Palau Arrangement and the Vessel Day Scheme." The International Journal of Marine and Coastal Law **24**(3): 557-581.

[89] Gillett, R. (2016). Fisheries in the Economies of Pacific Island Countries and Territories. Noumea, New Caledonia, Pacific Community**:** 664pp. pp495-6.

coastal States and Territories and then to vessels or fleets, the VDS possesses the rudiments of a rights-based approach to fisheries management[90].

Through the VDS, the PNA and Tokelau have secured substantial economic returns primarily through the coordinated sale to foreign purse seine fleets of access rights to their EEZs. Given the confidentiality of many bilateral access agreements, analysis of the shares of catch values going to fleets and coastal States is difficult. It is clear however, that access fees have increased rapidly and substantially since the establishment of the purse seine VDS. The benchmark price for a vessel day under the purse seine VDS has increased from USD5000 in 2007, its first year, to USD8000 in 2014[91]. Analysis by Havice in 2013 suggests rates of return to Pacific island coastal States could be as high as 13 percent of the gross value of catches, compared to six percent before the commencement of the VDS[92]. An authoritative source estimates the overall economic returns to the PNA of the purse seine VDS at USD500 million in 2019, up from USD60 million in 2010[93].

The growth of foreign exchange earnings and government revenue from the sale of foreign fishing access rights, particularly under the purse seine VDS, has demonstrated the potential for similar rights-based approaches to further increase the economic returns from WCPO fisheries and increase the share of those returns accruing to Pacific SIDSTs.

Despite the PNA's success in establishing management arrangements that draw upon rights-based approaches, many more challenges remain. For example, the purse seine VDS, and the more recently established longline VDS, only apply to the waters of PNA members and Tokelau. The World Bank has noted that since the commencement of the purse seine VDS, purse seine fishing has increased outside PNA waters[94].

The purse seine VDS, which primarily targets skipjack (SKJ) for the canned tuna market, has so far struggled to resolve issues concerning juvenile bycatch of species targeted by the tropical longline fishery – primarily bigeye tuna (BET) and yellowfin (YFT). Tropical tuna fisheries on the high seas of

[90] Aqorau, T. (2009). "Recent Developments in Pacific Tuna Fisheries: The Palau Arrangement and the Vessel Day Scheme." The International Journal of Marine and Coastal Law **24**(3): 557-581. p577.
[91] PNA (2014). Memorandum of Understanding on Minimum Benchmark Fee for a Fishing Day under the Vessel Day Scheme. Meeting of the Parties to the Palau Arrangement, Majuro, Republic of Marshall Islands, 13 June 2014, Office of the Parties to the Nauru Arrangement.
[92] Using 2013 data, Havice used Bangkok frozen SKJ price to estimate the gross value of a vessel day, that is ignoring operating costs, data for which is difficult to obtain, to in turn estimate the proportion of that gross value returned to PNA members, acknowledging that some access fees are not public. Havice, E. (2013). "Rights-based management in the Western and Central Pacific Ocean tuna fishery: Economic and environmental change under the Vessel Day Scheme." Marine Policy **42**: 259-267. p264.
[93] Aqorau, T. (2020). Fishing for Success: Lessons in Pacific Regionalism. Canberra, Department of Pacific Affairs, Australian National University**:** 155pp. p1.
[94] World Bank (2017). Pacific Possible: Long-term Economic Opportunities and Challenges for Pacific Island Countries. Washington, DC, World Bank**:** 130pp. p61.

the WCPO are largely out of reach of the PNA's regulatory framework[95]. The FFA has argued that the southern longline fishery, which primarily targets subtropical south Pacific albacore (SPA), has been subject to excess effort and poor economic performance[96]. Coastal States with an interest in SPA and other southern species[97] have attempted to restrict and possibly reduce catches by the southern longline fishery but with little success.

1.5.4 Political interest in rights-based management

While the success of the purse seine VDS has prompted the PNA more recently to establish a similar scheme for the longline fishery[98] [99], the demonstrative effect of the former has helped to build broader political interest in RBM in the Pacific[100] as a way of capturing a greater share of the value of the shared tuna resources of the region[101]. Indeed, purse seine VDS allocations are recognised by the WCPFC in its tropical tuna conservation and management measure[102].

Given their strong coastal State interests and limited capacity to fish the stocks within their own EEZs, PICs have shown a clear interest in RBM. In 2007, for example, Pacific Leaders committed to "a phased

[95] Vessels licensed to fish in PNA members' waters may not fish in two high seas areas: "A vessel shall not fish in the areas listed below during the period of validity of a licence issued by a Party: (a) the area of high seas bounded by the national waters of the Federated States of Micronesia, Indonesia, Palau and Papua New Guinea; and (b) the area of high seas bounded by the national waters of the Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Papua New Guinea, Solomon Islands and Tuvalu." PNA (2019). A Third Arrangement Implementing the Nauru Agreement Setting Forth Additional Terms and Conditions of Access to the Fisheries Zones of the Parties (Third Implementing Arrangement). Agreed 16 May 2008, as amended on 11 September 2010, 7 April 2011, and 1 May 2019). Majuro, Office of the Parties to the Nauru Agreement. para 3.

[96] WCPFC (2020). Summary Report. Sixteenth Regular Session of the Western and Central Pacific Fisheries Commission (WCPFC16), 5-11 December 2019, Port Moresby, WCPFC. paras 379-91.

[97] Key southern species in addition to albacore include yellowfin, bigeye and swordfish.

[98] PNA (2015). Palau Arrangement for the Management of the Western Pacific Tuna Fishery - Management Scheme (Longline Vessel Day Scheme), Office of the Parties to the Nauru Agreement.

[99] Pacific coastal states with an interest south Pacific albacore have also been looking at the establishment of a catch-based arrangement for that stock, however this met with some considerable difficulties in late 2017. Tokelau Arrangement for the Management of the South Pacific Albacore Fishery, Agreed 22 October 2014. Final agreed text by SC-SPTBF17. Entered into force on 14 December 2014.

[100] In 2015 "[PIF] Leaders acknowledged the current effort based management system (VDS) that has brought significant economic return to Parties to the Nauru Agreement (PNA)." PIF (2015). Forum Communique. 46th Pacific Islands Forum, 8-10 September 2015, Port Moresby, Papua New Guinea, Pacific Islands Forum Secretariat.

[101] Cartwright and Willock note that the first reference to property-rights concepts in the WCPO was by the by the Chair of the 2nd MHLC Satya Nandan. See Cartwright, I. and A. Willock (2000). Oceania's Birthright: The Role of Rights-based Management in Tuna Fisheries of the Western and Central Pacific. FAO Fisheries Technical Paper 404/1 Use of Property Rights in Fisheries Management. Proceedings of the FishRights99 Conference, Fremantle, Western Australia, 11 - 19 November 1999. R. Shotton. Rome, FAO.

[102] WCPFC (2018). Conservation and Management Meaure for Bigeye, Yellowfin and Skipjack Tuna in the Western and Central Pacific Ocean. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2018-01**.

introduction of rights-based management arrangements supported by an appropriate management and regulatory framework"[103].

In 2015, Pacific Leaders established a multi-agency Fisheries Taskforce[104] to "lead the development of a programme to increase the sustainable economic returns of fisheries, including examining a quota management system"[105]. At the same time, Pacific Leaders endorsed a *Regional Roadmap for Sustainable Fisheries*, in which "FFA members commit[ted] to vigorously assert a system of national rights, within a cooperative framework of binding limits"[106].

The FFA has also committed to rights-based management as central to maximising "long term social and economic benefit from the sustainable use of our shared offshore fishery resources"[107]. Its Strategic Plan 2014 – 2020 identified among its principles that "the FFA is committed to zonal rights based management".[108] This was reiterated in the FFA's new 2020-2025 Strategic Plan, which noted that *"*much can still be done to capitalise on the value of…[zone-based] rights and increase the economic and social benefits flowing to the people of the Pacific"[109].

The FFA defines zone-based management as "a multi-jurisdictional form of rights-based fisheries management for shared stocks that establishes total limits on catch and/or effort across participating EEZs, and then allocates shares of the total limits to each coastal State EEZ. Zone based management gives greater recognition to the rights given to coastal States under [LOSC] to conserve and manage resources in their EEZs"[110].

Finally, the PNA has, not surprisingly, made the development of property rights a priority. Its 2019-2025 Strategic Plan states that the Office of the PNA will *"*assist Parties in their renewed focus on

[103] PIF 2007. The Vava'u Declaration on Pacific Fisheries Resources "Our Fish, Our Future". Annex B to PIF (2007). Forum Communique. 38th Pacific Islands Forum Leaders' Meeting, Vava'u, Tonga, 16-17 October, Pacific Islands Forum Secretariat.
[104] The Taskforce comprises the Forum Fisheries Agency, the Parties to the Nauru Agreement and the Forum Secretariat and SPC.
[105] PIF (2015). Forum Communique. 46th Pacific Islands Forum, 8-10 September 2015, Port Moresby, Papua New Guinea, Pacific Islands Forum Secretariat. The reference specifically to a "quota management system" rather than a more general rights-based system was controversial, given the success of the VDS as an effort-based system.
[106] FFA and SPC (2015). Future of Fisheries: A Regional Roadmap for Sustainable Pacific Fisheries. Endorsed by Leaders at the 46th Pacific Islands Forum Leaders Meeting, Port Moresby, Pacific Islands Forum Fisheries Agency and the Pacific Community.
[107] FFA. (2014). "Pacific Islands Forum Fisheries Agency Strategic Plan 2014-2020." Retrieved 29 October, 2017, from http://ffa.int/system/files/FFA%20Strategic%20Plan%202014-2020%20Final.pdf. p5.
[108] Ibid. p5.
[109] FFA. (2019). "Pacific Islands Forum Fisheries Agency Strategic Plan 2020-2025." Retrieved 5 May, 2020, from https://www.ffa.int/node/1955. p9.
[110] Ibid. p9 footnote 1.

cooperating to create an enabling environment for commercial development including the establishment of property rights"[111].

This strong political commitment to RBM provides a clear mandate for Pacific fisheries policy makers to consider ways in which RBM can be developed to manage the region's tuna fisheries.

1.5.5 Conclusion

This section has set out a case for the selection of the WCPO tuna fisheries as a focus for this study. It has demonstrated that the WCPO fisheries are of global significance, accounting for the largest share of global tuna catches. They are also of regional significance, providing immense social, cultural and economic benefits already to Pacific island countries and territories and their communities. This section also argued that political leadership in the region recognises that substantial potential remains to extract greater benefits from the fisheries, while at the same time several significant management challenges, including problems arising from multiple conflicting management objectives, remain to be resolved. This has led to a strong political commitment in the Pacific to harnessing RBM to secure long-term benefits from the tuna fisheries of the WCPO for Pacific island coastal States and Territories.

1.6 Research contribution, research objective and research questions

The overarching objective of this study is to contribute to our understanding of how well-defined property rights can be incorporated into management frameworks for transboundary fisheries, using the highly migratory fish stocks of the WCPO as a case study. It will do this by responding to the following research question:

> *To what extent does the institutional framework for the conservation and management of highly migratory tuna stocks in the Western and Central Pacific Ocean provide a basis for well-defined property rights.*

This objective is based on several propositions put forward in this chapter. The first is that no single instrument can address all management objectives in a complex fishery, and that in fact each instrument may result in trade-offs between objectives. Second, a combination of instruments assigned to separate objectives could aid the optimisation of multiple objectives. Third, that transferable property rights – that is, market-based instruments – that are designed to be appropriate to the social-ecological context of the resource, can form a central component of a management system to address multiple, conflicting objectives, dynamism and uncertainty. Fourth, that market-based instruments are most effective when they are "well-defined". Fifth, that there is a basis in international law for rights-based management in transboundary fisheries but that it has had limited application beyond purely domestic arrangements for the management of national allocations of access to shared stocks.

[111] PNA (2019). PNA Strategic Plan 2019-2025. Majuro, Office of the Parties to the Nauru Agreement (PNAO): 12pp. p6.

Against this background, the study seeks to answer two preliminary questions and a reflective question focusing on policy reforms to support the central question of this study:

Preliminary questions:

1. What could a rights-based management system look like in a transboundary fishery?
2. How can the extent to which a property right is "well-defined" be assessed?

Central question:

3. To what extent does the institutional framework at a regional or subregional scale in the WCPO provide a basis for well-defined property rights for the conservation and management of WCPO tuna stocks?

Reflective question

4. What reforms could be made to strengthen rights-based approaches for the conservation and management of highly migratory species in the WCPO to deal with complexity?

The institutional framework for a transboundary fishery comprises regional, sub-regional and national components with application at regional, subregional, national and individual user scales. This study will focus on an examination of regional and subregional fisheries agreements, arrangements and instruments in the WCPO. An examination of domestic legislation would require an extensive additional analysis and is therefore beyond the scope the present study. It is noted, however, that a further study of national legislation and instruments would form an important complement to this study. A 2016 study of the extent to which national fisheries legislation of FFA members provides a basis for effective RBM at the individual user scale was conducted in 2016[112]. While it has informed the development of the analytical framework for the RBM-related aspects of the present study, it did not consider legislation of non-FFA members of the WCPFC. For the purposes of this study, the focus will be on property rights at a regional, subregional scales and national scales, not individual user scales. This means that, although a rights-based arrangement for a transboundary stock may be in place in a self-contained, purely domestic form within a particular participating State, the study is concerned only with arrangements that apply to States and between States. Notwithstanding this, some consideration will also be given to individual use rights where appropriate.

Focusing therefore at the regional and subregional scales, this study will consider fisheries for all highly migratory species and associated and dependent species for which the WCPFC has a mandate and that are of interest to members of the FFA. The focus on the interests of FFA members reflects their high

[112] Although this study has not been published, it is available from Pacific Catalyst on request. A short summary of the study can be found at https://pacificcatalyst.org/projects/.

level of dependence on those stocks and the special requirements arising from their status as predominantly small island developing States and Territories.

1.7 Thesis structure and methodology

This thesis commenced by identifying transboundary fisheries as a super-wicked problem, characterised by the interaction between complex social-ecological systems. It proposed a study into how well-defined property rights can be incorporated into management frameworks for transboundary fisheries, with a focus on the highly migratory fish stocks of the WCPO.

Chapter Two examines the nature of the transboundary fisheries problem by building a detailed picture of the generalised fisheries problem – one comprising multiple competing objectives in the presence of uncertainty and dynamism – and then transposing it to a transboundary context. It proposes a framework for dealing with complexity that could offer a robust management system for transboundary fisheries, that is, one that can withstand changes over time without undermining the fundamental structure of the management system[113]. In doing so, it reviews the limited existing literature into rights-based management of transboundary fisheries.

Each of the preliminary questions, the central research question and the reflective question are then addressed in turn, as summarised in Table 1.1 below. Chapter Three addresses the two preliminary research questions. It considers the rationale for RBM and examines conceptions of property rights employed to address common pool resource problems. It evaluates the capacity of RBM systems to deal with complexity before considering the basis in international law for the application of RBM to transboundary fisheries. It proposes a model for understanding how RBM could work in a transboundary fishery to frame the subsequent analysis. An analytical framework based on the review of property rights literature in Chapter Three is then proposed to assess the extent to which property rights are well-defined and capable of addressing social-ecological complexity.

Chapters Four and Five address the central research question of this thesis by assessing rights-based instruments for the management of transboundary stocks in the WCPO that have been adopted at the subregional and regional scales respectively. Each Chapter identifies management instruments that appear to establish a basis for RBM – that is, those that, at a minimum, set a limit on catch, effort or capacity and allocate it in some way to CCMs. In addition, they identify instruments that enable RBM either as an overarching framework agreement between States and Territories under which right-like instruments may be established, or as an operational level instrument that addresses certain elements of the analytical framework without themselves, forming a right-like instrument.

[113] Jen, E. (2003). "Stable or Robust? What's the Difference?" Santa Fe Institute Working Paper **2002**(12 069): 13.

Chapter Six draws this analysis together to respond to the reflective research question by identifying key reforms that could be adopted in the region in order to strengthen the capacity of the governance framework to address transboundary complexity. Chapter Seven concludes the study with some reflections on some of the practical challenges in implementing the proposed reforms.

Importantly, this study does not aim to solve the entire problem of transboundary fisheries. It aims to offer some insights into improvements based on a methodical examination of current management instruments. It does not directly examine the political feasibility of the proposed reforms but it is hoped that the robust system framework discussed in Chapter Two may help to disentangle some of the key points of tension in negotiations on the management of transboundary fish stocks.

Table 1.1: Summary of research objective, research questions and research strategies

Research objective	*To contribute to a deeper understanding of how rights-based management can be applied at a regional scale for highly migratory fish stocks.*			
Research question:	**1.** What could a rights-based management system look like in a transboundary fishery?	**2.** How can the extent to which a property right is "well-defined" be assessed?	**3.** To what extent does the institutional framework at a regional or subregional scale in the WCPO provide a basis for well-defined property rights for the conservation and management of WCPO tuna stocks?	**4.** What reforms could be made to strengthen rights-based approaches for the conservation and management of highly migratory species in the WCPO to deal with complexity?
Research strategy	**Chapter 3** Development of a model for rights-based management in transboundary fisheries	**Chapter 3** Development of an analytical framework for the assessment of property rights instruments	***Chapters 4 and 5*** Analysis of key regional and subregional governance instruments and conservation and management measures against property rights criteria	**Chapter 6** Identify key areas where improvements could be made to the definition of property rights in the WCPO at regional, subregional and national scales

2 The Transboundary Fisheries Problem

2.1 Introduction

In this chapter I argue that, while property rights-based management is increasingly common as a fisheries management tool in single-jurisdiction fisheries, its application in transboundary contexts has been limited. It commences in section 2.2 by framing the general fisheries problem as one that extends beyond the seemingly simple challenge of open access to a limited stock – that is, a common pool resource problem – to one characterised by a range of conflicting biological, ecological, economic, and social objectives in the presence of uncertainty and dynamism.

Section 2.3 examines the rationale for the adoption of well-defined property rights to address the bioeconomic elements of the common pool resource problem and to position property rights in a broader management framework that more fully addresses the social ecological complexity of the fisheries problem.

Section 2.4 describes the additional complexities of transboundary fisheries arising from the zonal approach of the international law of the sea to fisheries governance. It also identifies ways in which international fisheries law attempts to address some of these additional elements of complexity and some of the intrinsic challenges of the general fisheries problem.

Section 2.5 discusses a brief survey of scholarly research into property rights in transboundary fisheries. Section 2.6 concludes the chapter.

2.2 The fisheries problem

2.2.1 Introduction

Fisheries are often characterised as a classic common pool resource problem, in which users of a renewable resource are motivated to maximise their catches. The rate of extraction of the stock will likely exceed the resource's rate of replenishment. In this section I argue that the fisheries problem extends beyond this seemingly simply biological problem to one characterised by multiple competing objectives in the presence of uncertainty and dynamism.

2.2.2 Fisheries as a common pool resource problem

Fisheries are often used to illustrate the classic common pool resource problem. Fish in an open access fishery can be caught by anyone but any fish caught by one fisher cannot be caught by another – in economic terms this means the fishery is *non-exclusive* and *rivalrous*[114]. The fact that the stock of a

[114] Economists generally use two broad dimensions to describe the nature of goods. First, to what extent is the resource *rivalrous* – does one person's consumption or enjoyment of a resource, or part of it, and affect the amount available to others? Second, is the resource exclusive, that is, can others be excluded from consuming or enjoying the resource, or is there open access to the resource? This framework can be used to define whether a particular good exhibits the characteristics of a private good (both exclusive and rivalrous), public

common pool resource can be diminished is a key distinguishing feature between them and public goods[115]. All users can enjoy the non-exclusive benefit of a public good, and each user's enjoyment of those benefits does not diminish the benefits available to others, and is therefore non-rivalrous. However, consumption of the stock of a common pool resource by each individual, acting in rational self-interest, reduces the stock available to other consumers.

Hardin[116] argued that it was entirely rational for an individual to consume one more unit of a common pool resource even if this came at a cost to other potential consumers. An individual is not required to bear the cost to others of his or her consumption – that is, the cost is external to their decision-making. Because it is rational for one individual to do so, it is also rational for all individuals to do the same. Each individual therefore fears that other individuals will exploit the resource and so applies a very high discount rate to future stocks. They rush to secure as much of the resource as possible, rather than exercise self-restraint[117], to the point of the exhaustion of the stock[118] [119].

From an economic perspective, common pool resource problems are therefore essentially problems of externalities. Externalities typically arise when one person's consumption or production causes a direct harm or benefit to another individual who is not party to the transaction, and that this effect is unintentional and uncompensated[120]. In a market, the externality is not able to be internalised in the market price due to excessive transaction costs[121]. One fisher's catch reduces the availability of the stock to other fishers, driving up the cost of fishing borne by others, and driving down their likely

goods (neither exclusive nor rivalrous), a club good (exclusive but non-rivalrous) or a common pool resource (non-exclusive but rivalrous). This characterisation is discussed in most standard environmental economic texts. For example, Grafton, R. Q., V. Adamowicz, D. Dupont, H. Nelson, R. J. Hill and S. Renzetti (2004). The Economics of the Environment and Natural Resources. Malden, MA, Blackwell Publishing. pp36-8.

[115] The benefits resulting from the supply of a public good are not rivalrous – one person's enjoyment of the benefits does not diminish someone else's enjoyment. Non-exclusivity creates a *problem of supply*, whereby the supplier of the public good, for example, a fisheries governance arrangement, cannot capture all the benefits of the good and therefore lacks the incentive to supply it. See Ostrom, E. (1990). Governing the Commons: The Evolution of Institutions for Collective Action. Cambridge, UK, Cambridge University Press. p32

[116] Hardin, G. (1968). "The Tragedy of the Commons." Science **162**(3859): 1243-1248.

[117] Ostrom, E. (1990). Governing the Commons: The Evolution of Institutions for Collective Action. Cambridge, UK, Cambridge University Press. p35.

[118] The "exhaustion" of a resource may not necessarily mean the physical depletion of the stock but the reduction of the stock to the point where it is economically infeasible to exploit it further, that is, where the net benefits of exploitation are zero or negative. See further Hannesson, R. (2004). The Privatisation of the Oceans. Cambridge Mass., MIT Press. p44.

[119] It is important to note that not all commons are tragic. See further below and Chapter Three section 3.2. For an overview of conceptions of the commons problem see Rose, C. M. (2020). "Thinking about the Commons." International Journal of the Commons **14**(1): 557-566.

[120] Keohane, N. O. and S. M. Olmstead (2007). Markets and the Environment. Washington DC, Island Press. p66

[121] Demsetz, H. (1967). "Toward a theory of property rights." American Economic Review **57**(2, Papers of the Proceedings of the Seventy-ninth Annual Meeting of the American Economic Association (May 1967)): 347-359. p348.

catches. These *stock externalities* increase the social cost of fishing above the private or internal cost borne by the first individual[122] [123].

Gordon had earlier observed the phenomenon in fisheries, noting that the "race to fish" led to increased costs of fishing and reduced rents by creating incentives to invest in faster and larger boats and new technology, and by dramatically shortening fishing seasons[124]. Improved fishing technology in turn also created the illusion of abundance, by increasing catches despite falling stocks and catch per unit of fishing effort (CPUE)[125].

The relatively simple idea of stock externalities that underlies the tragedy of the commons thesis is, however, by no means inevitable. As Feeny et al.[126] and Ostrom[127] showed, there are many examples of groups of resource users that recognised, perhaps after some depletion had occurred and under particular circumstances, that some form of collective action was required. However, the externalities of human fishing activity affect not just the target fish stock and the welfare of others seeking to exploit them. For example, bycatch could affect the interests of other fishers who target those bycatch species or of people concerned to protect charismatic species. Damage to marine ecosystems could result from the impact of fishing on food webs[128], or as a direct consequence of harmful fishing methods[129]. These impacts are typically not taken into account when a fisher decides when and how to fish, and how much fish to catch, often because the impact is far removed from the user[130].

[122] Grafton, R. Q., V. Adamowicz, D. Dupont, H. Nelson, R. J. Hill and S. Renzetti (2004). The Economics of the Environment and Natural Resources. Malden, MA, Blackwell Publishing. pp45-9.
[123] Externalities can be both pecuniary – that is, those that have an effect on prices in other markets for, say, substitutes – and technological, which affect consumers or producers through non-price mechanisms. The impacts of the former are still regarded as efficient as they still reflect the preferences of individuals, but the latter do not and are therefore of concern in this discussion. See ibid. p42.
[124] Gordon, H. S. (1954). "The Economic Theory of a Common Property Resource: The Fishery." Journal of Political Economy **62**(2): 124-142. p133.
[125] Roberts, C. (2007). The Unnatural History of the Sea. Washington DC, Island Press/Shearwater Books. p170.
[126] Feeny, D., F. Berkes, B. J. McCay and J. M. Acheson (1990). "The Tragedy of the Commons Twenty-Two Years Later." Human Ecology **18**(1): 1-19.
[127] Ostrom, E. (1990). Governing the Commons: The Evolution of Institutions for Collective Action. Cambridge, UK, Cambridge University Press.
[128] Pauly, D., V. Christensen, J. Dalsgaard, R. Froese and F. Torres Jr (1998). "Fishing down marine food webs." Science **279**(5352): 860-863.
[129] On the impacts of trawling, for example, see Roberts, C. (2007). The Unnatural History of the Sea. Washington DC, Island Press/Shearwater Books. p193, 206-9.
[130] Levin, S. A., T. Xepapadeas, A.-S. Crépin, J. Norberg, A. de Zeeuw, C. Folke, T. Hughes, K. Arrow, S. Barrett, G. Daily, P. Ehrlich, N. Kautsky, K.-G. Mäler, S. Polasky, M. Troell, J. R. Vincent and B. Walker (2013). "Social-ecological systems as complex adaptive systems: modeling and policy implications." Environment and Development Economics **18**(02): 111-132. p113.

2.2.3 Multiple fisheries objectives

While the concept of maximum sustainable yield (MSY) has been evolving since the early 20th Century[131], it was not until after the Second World War, as industrialisation enabled fisheries to expand to a global scale, that it gained a firm footing as an objective in fisheries management discourse[132]. Wartime stock recovery[133] and the rapid increase in industrial-scale fishing revealed the vulnerability of fish stocks to fishing and eroded a long-held belief that the sea would always provide[134]. Fishing could, it was realised, drive stocks down to levels that could at worst cause extinctions[135], or at least reduce catchability and harvests.

As the term suggests, MSY aims to achieve the maximum possible harvest of the target stock without reducing the stock size[136]. This was based on the idea that a stock produced a surplus above that needed to sustain its population and that that surplus could be harvested. The Schaefer model depicted surplus production increasing with stock size to a maximum, after which surplus yield fell[137]. Surplus production would continue to fall until the stock reached maximum carrying capacity (that is, surplus production equalled zero). Fishing at levels that drive stocks below the point at which it could produce MSY would therefore be regarded as *biological overfishing*[138].

However, setting a limit on catches at MSY obscures a range of other objectives related to different biological attributes of the target stock. For example, as argued by Larkin, fishing at MSY was likely to alter the age structure of the spawning population with potentially devastating impacts on long term

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[131] Lugten, G. and N. Andrew (2008). "Maximum Sustainable Yield of Marine Capture Fisheries in Developing Archipelagic States - Balancing Law, Science, Politics and Practice." The International Journal of Marine and Coastal Law **23**(1): 1-37. p3.

[132] Pauly, D., V. Christensen, S. Guénette, T. J. Pitcher, U. R. Sumaila, C. J. Walters, R. Watson and D. Zeller (2002). "Towards sustainability in world fisheries." Nature **418**(8 August): 689-695.

[133] In fact, this observation holds true for the First World War as well, with respect to the North Sea fisheries. Roberts, C. (2007). The Unnatural History of the Sea. Washington DC, Island Press/Shearwater Books.pp166, 188.

[134] Ibid. pp163-70.

[135] Recruitment is generally considered to increase with spawning stock size to a maximum after which it declines due to increased cannibalistic predation on larvae and juveniles (i.e. a density-dependent relationship). At stock levels below the maximum recruitment stock level the stock is considered to be subject to depensation, whereby a small decrease in stock can lead to a significant fall in recruitment, possibly to a point at which the stock cannot recover at all (i.e. critical depensation). Grafton, R. Q., V. Adamowicz, D. Dupont, H. Nelson, R. J. Hill and S. Renzetti (2004). The Economics of the Environment and Natural Resources. Malden, MA, Blackwell Publishing. pp100-1.

[136] Ibid. p106.

[137] Schaefer's model described the same basic density-dependent relationship noted at footnote 135 above. He noted that fishing would reduce the rate of increase in a population or indeed reduce the population when fishing intensity increased above the natural rate of increase, including by accentuating any natural decrease in population (However, as Schaefer argued, as population fell, catch per unit of effort would also decrease, thus reducing catches for a given level of effort). MSY could therefore be achieved at a level of effort that equalled the natural rate of increase in surplus population at the level of population capable of maximising that surplus. Schaefer, M. B. (1954). "Some aspects of the dynamics of populations important to the management of the commercial marine fisheries." Bulletin of the Inter-American Tropical Tiuna Commission (IATTC) **1**(2): 27-56.

[138] Hannesson, R. (2004). The Privatisation of the Oceans. Cambridge Mass., MIT Press. p44.

stock abundance. Further, sub-populations over the range of a species' distribution were likely to exhibit different levels of productivity, potentially resulting in depletions of more vulnerable, geographically dispersed sub-populations[139].

In a multispecies fishery, it may be impossible to simultaneously achieve multiple single-species MSY targets due to fishing gear selection or predator-prey relationships[140]. If catches are limited by a single-species MSY for a less vulnerable target stock, more vulnerable species (or indeed subpopulations of the target stock) could be depleted well before MSY is reached[141] [142]. Conversely, setting MSY with respect to a more vulnerable species will mean that catches of less vulnerable species will fall short of potential maxima[143] [144].

The challenge of balancing impacts of fishing on multiple species introduces the question of the impacts of fishing on the wider ecosystem[145]. Fishing activity places substantial demands on global primary

[139] For example, Grewe et al have found that populations of yellowfin tuna in three studied areas of the Pacific are "genetically distinct populations" and so likely to be "reproductively isolated units", concluding that management of these stocks as a single homogeneous population needs to be reconsidered. See Grewe, P. M., P. Feutry, P. L. Hill, R. M. Gunasekera, K. M. Schaefer, D. G. Itano, D. W. Fuller, S. D. Foster and C. R. Davies (2015). "Evidence of discrete yellowfin tuna (Thunnus albacares) populations demands rethink of management for this globally important resource." Scientific Reports **5**: 16916.pp4-5.

[140] Fogarty, M. J. and K. Rose (2014). "The art of ecosystem-based fishery management." Canadian Journal of Fisheries and Aquatic Sciences **71**(3): 479-490. p481.

[141] Larkin, P. A. (1977). "An epitaph for the concept of maximum sustainable yield." Transactions of the American Fisheries Society **106**(1): 1-11. p5.

[142] This is not a theoretical proposition. As Dulvy et al have shown, the majority of marine extinctions have been caused by exploitation. Their study found that 55 percent of a dataset of 133 global, regional and local extinctions had been caused by exploitation, while an additional 37 percent (most likely local extinctions) were caused by habitat loss or degradation, usually due to damage caused by fishing gear. See the discussion in Dulvy, N., K., Y. Sadovy and J. D. Reynolds (2003). "Extinction vulnerability in marine populations." Fish and Fisheries **4**: 25-64. pp27-37.

[143] Andersen, K. H., K. Brander and L. Ravn-Jonsen (2015). "Trade-offs between objectives for ecosystem management of fisheries." Ecological Applications **25**(5): 1390-1396.

[144] For all its drawbacks, MSY nevertheless provides a useful starting point for avoiding *biological overfishing* of target species. As Pauly et al have observed, often the problem is not so much MSY per se, but the fact that other competing (social) objectives mean it is ignored altogether. Pauly, D., V. Christensen, S. Guénette, T. J. Pitcher, U. R. Sumaila, C. J. Walters, R. Watson and D. Zeller (2002). "Towards sustainability in world fisheries." Nature **418**(8 August): 689-695. pp689-90.

[145] Larkin, P. A. (1977). "An epitaph for the concept of maximum sustainable yield." Transactions of the American Fisheries Society **106**(1): 1-11. pp3-6.

production[146], with significant consequences for trophic relationships and ecosystem structures[147] [148] and on marine ecosystem services[149].

Fishing also can have a direct impact on associated and dependent species through bycatch, which MSY does not take into account[150] [151], leading to *ecosystem overfishing*[152]. The incidence of bycatch and the particular species taken as bycatch vary with gear types and fishing methods[153]. Some fishing activity can also cause damage to habitats through the impact of fishing gear, such as the removal of benthic fauna and damage to benthic habitats by bottom trawling[154].

Broader ecosystem impacts of fishing may also have social consequences. Other stakeholders may be interested in associated or dependent species either as a target species or charismatic species, or in the continuing health of ecosystems on which they depend. Indeed, as a component of the marine ecosystem, target species are also dependent on ecosystem health for their own health.

From an economic perspective, maximising catches may not achieve an optimal outcome. Gordon argued that, in an open access fishery, equilibrium would be reached not at MSY, but when individual fishers ceased to make a profit – that is, where gross revenues equalled total costs and net economic rents were zero. Equilibrium would more likely occur at a level of fishing effort greater than that

[146] Pauly and Christensen have demonstrated the significance of trophic relationships by estimating the proportion of global marine primary production required to support global marine catches, in Pauly, D. and V. Christensen (1995). "Primary production required to sustain global fisheries." Nature **374**(6519): 255-257.
[147] Pauly, D., V. Christensen, J. Dalsgaard, R. Froese and F. Torres Jr (1998). "Fishing down marine food webs." Science **279**(5352): 860-863.
[148] An excellent example of fishing down the marine food web is the ecosystems regime shift from a predator-dominated ecosystem to one dominated by jellyfish in the Black Sea due to overfishing, first of pelagic predators and second, of planktivorous fish. See Daskalov, G. M., A. N. Grishin, S. Rodionov and V. Mihneva (2007). "Trophic cascades triggered by overfishing reveal possible mechanisms of ecosystem regime shifts." Proc Natl Acad Sci U S A **104**(25): 10518-10523.
[149] Worm, B., E. B. Barbier, N. Beaumont, J. E. Duffy, C. Folke, B. S. Halpern, J. B. C. Jackson, H. K. Lotze, F. Micheli, S. R. P. Sala, K. A. Selkoe, J. J. Stachowicz and R. Watson (2006). "Impacts of biodiversity loss on ocean ecosystem services." Science **314**(5800): 787-790.
[150] Most obviously bycatch could have the same impacts on population structures and distribution of the bycatch stocks as those on the target stocks described above. Bycatch could remove species that are valuable target stocks for other fishers and so have an economic impact on those fishers' their wellbeing. Bycatch can also present a challenge to community values when it involves iconic or charismatic species such as whales, dolphins and turtles.
[151] Kempf, A., J. Mumford, P. Levontin, A. Leach, A. Hoff, K. G. Hamon, H. Bartelings, M. Vinther, M. Stäbler, J. J. Poos, S. Smout, H. Frost, S. van den Burg, C. Ulrich and A. Rindorf (2016). "The MSY concept in a multi-objective fisheries environment – Lessons from the North Sea." Marine Policy **69**: 146-158.
[152] Coll, M., S. Libralato, S. Tudela, I. Palomera and F. Pranovi (2008). "Ecosystem overfishing in the ocean." PLoS One **3**(12): e3881.
[153] See for example the different impacts by gear types employed in tuna fisheries in ISSF (2021). Status of the World Fisheries for Tuna. Washington DC. **ISSF Technical Report 2021-10**. pp109-10. My thanks to Tim Adams for drawing attention to this resource.
[154] Clark, M. R., F. Althaus, T. A. Schlacher, A. Williams, D. A. Bowden and A. A. Rowden (2016). "The impacts of deep-sea fisheries on benthic communities: a review." ICES Journal of Marine Science: Journal du Conseil **73**(suppl 1): i51-i69.

required to achieve MSY[155]. Instead, he argued that maximum net returns, or maximum economic yield (MEY), would likely be achieved at a more conservative level of effort (and catch) than at MSY[156] [157], and therefore consistent with a biological sustainability objective[158] [159]. Nevertheless, MEY remains a single species reference point and therefore subject to the same limitations as MSY in dealing with multispecies catches, non-target bycatch and ecological complexity[160] [161] [162].

As an aggregate measure of economic returns, MEY also does not address the distribution of those returns in the present (*intragenerational equity*). Many different stakeholders may feel they have a legitimate interest in obtaining an equitable share of the benefits of the fishery, whether in the form of profits to be made from fishing, as a share of catches or access to fishing opportunities. Coastal and indigenous communities have cultural, livelihoods and food security interests in fisheries[163] that may conflict with those of commercial fishers. Some actors may derive other benefits from the social-ecological system of which the fishery is a part. For example, recreational fishers may target species that are bycatch in commercial fisheries[164] or seek access to a share of a commercially fished stock for

[155] This phenomenon can be explained by the idea that as long as new fishers could expect positive net revenues by entering the fishery, or existing fishers could increase profits by expanding their effort, total fishing effort would increase until net revenues (rents) dissipated. Gordon, H. S. (1954). "The Economic Theory of a Common Property Resource: The Fishery." Journal of Political Economy **62**(2): 124-142.

[156] Gordon's rationale was that rents would be maximised if effort were limited at the point at which the difference between gross returns and total cost was maximised. Assuming that costs increased in a linear fashion with effort, and catch returns essentially tracked catches (that is, the inverted U-shaped curve of Schaefer's model), MEY would occur at a level of effort below MSY. Ibid.

[157] Gordon's assumption that scarcity reduces net returns from fishing due to increasing costs per unit of catch may not hold in all cases. Dulvy et al, for example, have argued that rents may not diminish if the target species' value *increases* with scarcity. See Dulvy, N., K., Y. Sadovy and J. D. Reynolds (2003). "Extinction vulnerability in marine populations." Fish and Fisheries **4**: 25-64. pp44-6

[158] It is worth noting also that a catch-related objective may be to maximise protein for human consumption, but as Anderson et al and Voss et al have noted, the value of the catch depends on the value of the species caught. The same biomass can be obtained through catches of less valuable species. Andersen, K. H., K. Brander and L. Ravn-Jonsen (2015). "Trade-offs between objectives for ecosystem management of fisheries." Ecological Applications **25**(5): 1390-1396.

[159] Hilborn, R. (2007). "Defining success in fisheries and conflicts in objectives." Marine Policy **31**(2): 153-158.

[160] Larson, D. M., B. W. House and J. M. Terry (1996). "Towards Efficient Bycatch Management in Multispecies Fisheries: A Nonparametric Approach." Marine Resource Economics **11**: 181-201.

[161] Boyce, J. R. (1996). "An Economic Analysis of the Fisheries Bycatch Problem." Journal of Environmental Economics and Management **31**: 314-336.

[162] Dulvy et al argue that even if economic exhaustion could prevent biological exhaustion of a target stock, there is considerable evidence that this does not necessarily hold for bycatch species. In much the same way that more vulnerable bycatch species could become depleted when fishing at a target reference point of MSY for a relatively resilient target species, they could also become biologically exhausted before it is no longer economic catch the target species. See Dulvy, N., K., Y. Sadovy and J. D. Reynolds (2003). "Extinction vulnerability in marine populations." Fish and Fisheries **4**: 25-64. pp44-6

[163] See for example Charlton, K. E., J. Russell, E. Gorman, Q. Hanich, A. Delisle, B. Campbell and J. Bell (2016). "Fish, food security and health in Pacific Island countries and territories: a systematic literature review." BMC Public Health **16**(1): 285.

[164] Pikitch, E. K., C. Santora, E. Babcock, A. Bakun, R. Bonfil, D. O. Conover, P. Dayton, P. Doukakis, D. Fluharty, B. Heneman, E. D. Houde, J. S. Link, P. A. Livingston, M. Mangel, M. K. McAllister, J. G. Pope and K. J. Sainsbury (2004). "Ecosystem based fishery management." Science **305**(5682): 346-347. p346

the satisfaction of catching that species in the wild. Tourism operators benefit from the attractiveness of healthy ecosystems. Questions of equity also include a temporal dimension – the benefits sought may be enjoyed now or by future generations[165]. Overfishing today reduces the availability of the stock for future fishers, harming *intergenerational equity*.

While it is not surprising that the fair, just or equitable distribution of returns has been described as "the most pervasive and troublesome objective" of fisheries management[166], achieving that objective could strengthen the legitimacy of decisions and the level of compliance with, and effectiveness of, management arrangements resulting from those decisions[167] [168]. However, achieving a desired equitable distribution of benefits may reduce the total economic returns because it may mean that less efficient users are permitted to enter the fishery. An equitable distribution of benefits may also undermine the sustainability of the stock. Governments understandably seek to assist poor coastal communities to overcome food and livelihoods insecurity by, say, subsidising coastal fisheries or simply not imposing limits on fishing[169], but this can exacerbate rather than solve the problem[170]. In other cases, the level of equity has tended to be considered after other management decisions have been made or is simply the result, intended or otherwise, of decisions about a much narrower set of goals [171].

The fisheries problem thus becomes difficult to define because different stakeholders prioritise different, conflicting objectives and those objectives likely conflict with each other. Each places a different value on different attributes of the social-ecological system, and these shape their objectives. One person may define the problem as a biological one in which the aim is to maximise catches, while others may view it as a broader ecological problem. While for some, the aim will be to maximise economic returns to the entire fishery, many want to maximise the returns *to themselves* and thus secure a "fair share" of

[165] Boyle, A. and D. Freestone (1999). Introduction. International Law and Sustainable Development: Past Achievements and Future Challenges. A. Boyle and D. Freestone. Oxford, Oxford University Press: 1-18. p12

[166] Crutchfield, J. A. (1973). "Economic and Political Objectives in Fishery Management." Transactions of the American Fisheries Society **102**(2): 481-491. p483.

[167] Halpern, B. S., C. J. Klein, C. J. Brown, M. Beger, H. S. Grantham, S. Mangubhai, M. Ruckelshaus, V. J. Tulloch, M. Watts, C. White and H. P. Possingham (2013). "Achieving the triple bottom line in the face of inherent trade-offs among social equity, economic return, and conservation." Proceedings of the National Academy of Sciences **110**(15): 6229-6234. p6229.

[168] Voss, R., M. F. Quaas, J. O. Schmidt, O. Tahvonen, M. Lindegren and C. Mollmann (2014). "Assessing social--ecological trade-offs to advance ecosystem-based fisheries management." PLoS One **9**(9): e107811. p1.

[169] Stobutzki et al note that overcapacity in industrial and coastal fleets in South and Southeast Asia drives political pressure to allow harvest rates greater than MSY or MEY. In this case the problem is not so much MSY per se but the fact that competing objectives mean it is ignored altogether. Indeed, a common criticism of MSY is that it is too often not implemented. Stobutzki, I. C., G. T. Silvestre and L. R. Garces (2006). "Key issues in coastal fisheries in South and Southeast Asia, outcomes of a regional initiative." Fisheries Research **78**(2-3): 109-118. p114.

[170] Larkin, P. A. (1977). "An epitaph for the concept of maximum sustainable yield." Transactions of the American Fisheries Society **106**(1): 1-11. p6.

[171] Halpern, B. S., C. J. Klein, C. J. Brown, M. Beger, H. S. Grantham, S. Mangubhai, M. Ruckelshaus, V. J. Tulloch, M. Watts, C. White and H. P. Possingham (2013). "Achieving the triple bottom line in the face of inherent trade-offs among social equity, economic return, and conservation." Proceedings of the National Academy of Sciences **110**(15): 6229-6234. p6229.

those returns. And there will be little agreement on what fair is. Success will therefore mean quite different things to different people[172]. The solution to such problems is therefore as unattainable as a definition of the problem – hence a wicked problem.

2.2.4 Uncertainty and dynamism

The fisheries problem is further exacerbated by uncertainty and dynamism. Each element of the social-ecological system is likely to change over time and may be difficult to measure at any point in time or predict into the future. Stock assessments must handle substantial levels of uncertainty based on proxies such as catch rates[173] [174], making MSY difficult to determine and necessitating changes to estimates of MSY over time[175].

A range of environmental factors such as seasonal sea temperature variations, wind stress and long-term impacts of climate change have been shown to have an impact on stock levels and the location of stocks through their impact on the abundance and availability of prey[176] [177] [178]. The biological and ecological complexity of the resource is therefore impossible to reduce to its component factors[179], and even if data were available, some have argued, it may not contribute to our understanding of the system and how to manage it[180].

Fishing activity is itself subject to uncertainty. Theoretical models can predict rational fisher behaviour in response to market and regulatory incentives. In practice, however economic factors such as market prices, consumer tastes, cost structures and labour conditions are difficult to forecast. While fisher

[172] Hilborn, R. (2007). "Defining success in fisheries and conflicts in objectives." Marine Policy **31**(2): 153-158.
[173] Cochrane, K. L., D. S. Butterworth, J. A. A. De Oliveira and B. A. Roel (1998). "Management procedures in a Fishery based on highly variable stocks and with conflicting objectives: experiences in the South African pelagic fishery." Reviews in Fish Biology and Fisheries **8**(2): 177-214. p201.
[174] Understanding of a stock's dynamics typically lags behind exploitation of it. Ludwig, D., R. Hilborn and C. J. Walters (1993). "Uncertainty, resource exploitation and conservation: lessons from history." Science **260**(5104): 17-18.
[175] Pilling, G. M., L. T. Kell, T. Hutton, P. J. Bromley, A. N. Tidd and L. J. Bolle (2008). "Can economic and biological management objectives be achieved by the use of MSY-based reference points? A North Sea plaice (Pleuronectes platessa) and sole (Solea solea) case study." ICES Journal of Marine Science **65**(6): 1069-1080.
[176] On windstress and climate change see Cushing, D. H. (1995). "The long-term relationship between zooplankton and fish." Ibid. **52**(3-4): 611-626.
[177] On sea surface temperatures and climate change see Lehodey, P., M. Bertignac, J. Hampton, A. Lewis and J. Picaut (1997). "El nino southern oscillation and tuna in the western Pacific." Nature **389**(6652): 715-718.
[178] Also on the impact of sea surface temperatures and climate change on global latitudinal species richness, see Chaudhary, C., A. J. Richardson, D. S. Schoeman and M. J. Costello (2021). "Global warming is causing a more pronounced dip in marine species richness around the equator." Proceedings of the National Academy of Sciences **118**(15).
[179] Ludwig, D., R. Hilborn and C. J. Walters (1993). "Uncertainty, resource exploitation and conservation: lessons from history." Science **260**(5104): 17-18.
[180] "[T]he idea that we can "data-collect" our way to the ecosystem approach, or an [integrated ecosystem assessment], must be recognized as a fallacy". Dickey-Collas, M. (2014). "Why the complex nature of integrated ecosystem assessments requires aflexible and adaptive approach." ICES Journal of Marine Science **71**(5): 1174-1182. p1175.

responses to changes in those factors may be predictable, such predictions rely on often fallible assumptions[181].

Similarly, while regulatory measures may deliver the desired response from some fishers, at least in the short term, innovations to work around regulations such as gear prohibitions have been shown to be difficult foresee, but often logical in hindsight[182]. The actual amount of fishing will also be difficult to estimate in the presence of IUU fishing which can further confound stock assessments and drive inappropriate investment and regulatory decisions[183].

The foregoing discussion, while far from complete, is intended to give a sense of some of the key sources of uncertainty in the fishery. While scientific and economic research has improved our understanding of many of these uncertainties, it is as likely to reveal new areas of uncertainty[184]. Dickey-Collas summed up the biological and ecological enigma of fisheries by declaring that "there is no such thing as a marine ecosystem in equilibrium" and that "[y]ou will never fully understand the system in which you operate, and it will always change"[185]. When human interaction is taken into account, the same could be said for the entire social-ecological system in which fishing occurs.

2.2.5 Conclusion

This Section couched the underlying biological problem of the fishery as an example of common pool resource problem and stock externalities. However, fisheries problems were shown to extend beyond the simple common pool resource problem because they face a range of conflicting biological, ecological, economic, and social objectives as well as uncertainty and dynamism. Framed as such, the generalised fisheries problem exhibits the characteristics of a social-ecological system.

Such complexity is confounding even in a single jurisdiction, where a single decision-maker has authority to determine a set of trade-offs between the objectives of different stakeholders. In a transboundary fishery, however, no such single authority exists.

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[181] Holland, D. S. and G. E. Herrera (2009). "Uncertainty in the management of fisheries: Contradictory implications and a new approach." Marine Resource Economics **24**(3): 289-299.

[182] Townsend, R. E. (1990). "Entry Rrestriction in the Fishery: A Survey of the Evidence." Land Economics **66**(4): 360-378. particularly p362.

[183] See for example Watson, R. and D. Pauly (2001). "Systematic distortions in world fisheries catch trends." Nature **414**: 534-536.

[184] As Crutchfield has noted, the speed of exploitation often precludes fisheries policy makers from enjoying the luxury of comprehensive scientific research and modelling. Crutchfield, J. A. (1973). "Economic and Political Objectives in Fishery Management." Transactions of the American Fisheries Society **102**(2): 481-491. p487

[185] Dickey-Collas, M. (2014). "Why the complex nature of integrated ecosystem assessments requires aflexible and adaptive approach." ICES Journal of Marine Science **71**(5): 1174-1182. p1176.

2.3 Responding to social-ecological complexity

2.3.1 Introduction

This section turns to the question of responding to complex social-ecological problem of the fishery. It first considers holistic approaches to addressing complexity and the emergence of ecosystems approaches. It then describes the array of management instruments available to fisheries managers before focusing in particular on the economic rationale for dealing with the underlying common pool resource problem.

2.3.2 Holistic approaches to dealing with complexity

Complexity in fisheries, manifested in multiple often conflicting objectives, points clearly to a need for integrated approaches to fisheries management. The concept of *optimum sustainable yield (OSY)* has evolved from a narrow focus on the maximisation of food supply from marine products[186] [187] to a form of MSY modified by economic, social and environmental factors[188]. Roedel defined OSY as "a deliberate melding of biological, economic, social and political values designed to produce the maximum benefit to society from stocks that are sought for human use, taking into account the effect of harvesting on dependent or associated species"[189].

Larkin countered that Roedel's definition of OSY was "an eclectic mishmash that was all things to all people" and that it could be used to justify any political position[190]. But he also conceded that OSY pointed to the future by recognising species interaction and implying a deliberate process of decision-making[191]. This has since been echoed by calls for "a more holistic view of management objectives" aided by the explicit definition and prioritisation of objectives[192]. Nevertheless, variations on single

[186] Article 2 of the Convention on Fishing and Conservation of the Living Resources of the High Seas. Agreed on 29 April 1958, Geneva. Entered into force on 20 March 1966. UN Treaty Series. **559 (8164)**.
[187] For example, in the 1970s, the International Council for the Exploration of the Sea (ICES) recommended that the EEC 1976 Common Fisheries Policy adopt OSY as its objective in place of MSY. The aim was to provide a buffer against environmental fluctuations as a way of stabilising catches and further reducing the risk of depletion. Discussed in Cunningham 1980 Cunningham, S. (1980). "EEC fisheries management: A critique of Common Fisheries Policy objectives." Marine Policy **4**(3): 229-235. p231.
[188] Lugten, G. and N. Andrew (2008). "Maximum Sustainable Yield of Marine Capture Fisheries in Developing Archipelagic States - Balancing Law, Science, Politics and Practice." The International Journal of Marine and Coastal Law **23**(1): 1-37. p4.
[189] This quote is from Philip Roedel's summary of the American Fisheries Society's 1975 Symposium on Optimum Sustainable Yield, cited in Larkin, P. A. (1977). "An epitaph for the concept of maximum sustainable yield." Transactions of the American Fisheries Society **106**(1): 1-11. p8.
[190] Ibid. p8.
[191] Ibid.
[192] Pilling, G. M., L. T. Kell, T. Hutton, P. J. Bromley, A. N. Tidd and L. J. Bolle (2008). "Can economic and biological management objectives be achieved by the use of MSY-based reference points? A North Sea plaice (Pleuronectes platessa) and sole (Solea solea) case study." ICES Journal of Marine Science **65**(6): 1069-1080. p1078.

species reference points are still seen as having some utility in meeting multiple objectives[193]. Such approaches recall Hilborn's "pretty good yield" concept, which proposed that objectives could be broadly achieved without maximising any particular one[194].

The broader economic, social and environmental concerns of OSY were central to the emergence in the 1970s[195] [196] and 1980s[197] of the more enduring concept of *sustainable development*. It received formal recognition by the international community at the 1992 *United Nations Conference on Environment and Development* (UNCED) in Rio de Janeiro. The latter's *Rio Declaration*[198] stated that "[t]he right to development must be fulfilled so as to equitably meet developmental and environmental needs of present and future generations"[199], and "that environmental protection shall constitute an integral part of the development process"[200]. The signatories also called for a precautionary approach[201] to be "widely applied by States according to their capabilities" in order to protect the environment[202] [203].

[193] Kempf, A., J. Mumford, P. Levontin, A. Leach, A. Hoff, K. G. Hamon, H. Bartelings, M. Vinther, M. Stäbler, J. J. Poos, S. Smout, H. Frost, S. van den Burg, C. Ulrich and A. Rindorf (2016). "The MSY concept in a multi-objective fisheries environment – Lessons from the North Sea." Marine Policy **69**: 146-158.
[194] Hilborn, R. (2010). "Pretty Good Yield and exploited fishes." Ibid. **34**(1): 193-196.
[195] Declaration of the United Nations Conference on the Human Environment. Report of the United Nations Conference on the Human Environment, Stockholm 5-16 June 1972. **A/Conf.48conf/14/Rev1**.
[196] Hey points to foundations for sustainable development in Principles 8 and 9 which state, respectively that "Economic and social development is essential for ensuring a favourable living and working environment for man and for creating conditions on earth that are necessary for the improvement of the quality of life"; and "Environmental deficiencies generated by the conditions of under-development and natural disasters pose grave problems and can best be remedied by accelerated development through the transfer of substantial quantities of financial and technological assistance as a supplement to the domestic effort of the developing countries and such timely assistance as may be required". Hey, E. (2016). Advanced Introduction to International Environmental Law. Cheltenham, UK, Edward Elgar. p65.
[197] The report defined sustainable development as ensuring humanity "meets the needs of the present without compromising the ability of future generations to meet their own needs". Brundtland, G. H. and WCED (1987). Our Common Future: Report of the World Commission on Environment and Development**:** 300. para 27
[198] UN (1992). Rio Declaration on Environment and Development (Rio Declaration). Report of the United Nations Conference on Environment and Development, 3-14 June 1992, A/CONF.151/26 (Vol. I) Annex I. Rio de Janeiro, United Nations.
[199] Ibid. Principle 3.
[200] Ibid. Principle 4.
[201] The precautionary approach is considered "the flagship value of environmental law" by Lugten, G. and N. Andrew (2008). "Maximum Sustainable Yield of Marine Capture Fisheries in Developing Archipelagic States - Balancing Law, Science, Politics and Practice." The International Journal of Marine and Coastal Law **23**(1): 1-37. p8.
[202] UN (1992). Rio Declaration on Environment and Development (Rio Declaration). Report of the United Nations Conference on Environment and Development, 3-14 June 1992, A/CONF.151/26 (Vol. I) Annex I. Rio de Janeiro, United Nations. Principle 15.
[203] See also Agenda 21, also adopted at UNCED, in particular Chapter 17 (para 1) which called for "…new approaches to marine and coastal area management and development, at the national, subregional, regional and global levels, approaches that are integrated in content and are precautionary and anticipatory in ambit…", and Chapter 39 (para 2), which further committed States to review and develop international environmental law in order "…to promote the integration of environment and development policies through effective international agreements or instruments taking into account both universal principles and the particular and differentiated needs and concerns of all countries". UNCED (1992). Agenda 21. United Nations Conference on Environment and Development, Rio de Janeiro, Brazil, 3 to 14 June, United Nations.

Sustainable development still retains the sense that it aims to be all things to all people. While it lacks the character of a legal principle[204], it has had a considerable influence on the development of international environmental (including fisheries) law and reflects the parallel emergence of integrated approaches to natural resource management[205]. The Rio Conference thus set the stage for significant developments in integrated approaches to fisheries management[206], particularly those falling under the broad heading of ecosystems approaches[207].

Ecosystem approaches represent a comprehensive attempt to apply the elements of sustainable development to marine ecosystem management and fisheries management. A variety of terms are used[208], including the ecosystems approach, ecosystems-based fisheries management (EBFM), ecosystem-based management (EBM) and ecosystems approaches to fisheries (EAF)[209] [210].

It is not the intention of this thesis to evaluate the different forms of ecosystems approaches. While the various definitions have slightly different emphases,[211] they share the fundamental underpinnings of an integrated approach to marine resource management.[212] Both EAF and EBFM aim to bring together the approaches of ecosystem management and fisheries management, both of which have evolved to recognise that the needs of people and ecosystems need to be balanced, and that conflict between stakeholders and objectives must be dealt with equitably.[213] While for the purposes of this thesis the

[204] While *sustainable development* contains many norm-like features, for example, "as an element of the process of judicial reasoning", according to Lowe it lacks a "fundamentally norm-creating character" that would render it a justiciable principle in international law. See Lowe, V. (1999). Sustainable Development and Unsustainable Arguments. International Law and Sustainable Development: Past Achievments and Future Challenges. A. Boyle and D. Freestone. Oxford, Oxford University Press**:** 19-37. p31.
[205] Ibid. pp36-7.
[206] See the Preface of FAO (1995). Code of Conduct for Responsible Fisheries (Code of Conduct). Adopted on 31 October 1995 at the twenty-eighth session of the FAO Conference by Resolution 4/95. Food and Agriculture Organisation of the United Nations. Rome. ppxi-xiii.
[207] Charles, A. T. (2013). "Fisheries Management and Governance: Forces of Change and Inertia." Ocean Yearbook **27**: 249-266. p253-4.
[208] Garcia, S. M., A. Zerbi, C. Aliaume, T. Do Chi and G. Lasserre (2003). The ecosystem approach to fisheries. Issues, terminology, principles, institutional foundations, implementation and outlook. FAO Fisheries Technical Paper. Rome, Food and Agriculture Organisation of the United Nations. **443:** 71. pp5-7.
[209] For a helpful typology with which to distinguish between these terms, see Link, J. S. and H. I. Browman (2014). "Integrating what? Levels of marine ecosystem-based assessment and management." ICES Journal of Marine Science **71**(5): 1170-1173.p1170-1 and Table 1.
[210] See also the discussion on terminology and "alphabet soup" in Link, J. S. (2010). Ecosystem-Based Fisheries Management: Confronting Tradeoffs. Cambridge, UK, Cambridge University Press.pp20-6 and Table 2.1
[211] Patrick, W. S. and J. S. Link (2015). "Hidden in plain sight: Using optimum yield as a policy framework to operationalize ecosystem-based fisheries management." Marine Policy **62**: 74-81. p75.
[212] Garcia, S. M., A. Zerbi, C. Aliaume, T. Do Chi and G. Lasserre (2003). The ecosystem approach to fisheries. Issues, terminology, principles, institutional foundations, implementation and outlook. FAO Fisheries Technical Paper. Rome, Food and Agriculture Organisation of the United Nations. **443:** 71.p7.
[213] Ibid.pp47-9.

terms could be used interchangeably, for the most part EAF will be used as it is the preferred approach of FAO members.[214] Other terms will be used where they are the focus of cited research.

Clearly, the EAF and its related approaches inherently recognise complexity in ways that MSY cannot[215]. It recognises the need to address multiple objectives across human and natural systems and permit trade-offs between them[216]. EAF also attempts to deal with uncertainty by incorporating the precautionary approach[217].

Patrick and Link[218] suggest that current definitions of optimum yield (OY) in the US[219] had, by the mid-1990s, evolved to the point that it was almost identical to ecosystem-based management. They suggest an ecosystem level limit on harvests could be set at a level (OY) that promotes resilience to ecosystem overfishing and argue that while this would mean a significant drop in catches, catch value would likely increase [220] . Quantitative and qualitative ecological and economic trade-off analysis (through management strategy evaluations – MSEs)[221] would then be undertaken across species, taking account of social factors[222], to inform decisions on operational level objectives. MSEs would not produce a single optimal solution but permit alternative strategies (and hence trade-offs) to be evaluated[223].

[214] EAF was adopted in 2002 by the FAO Technical Consultation on Ecosystem-based Fisheries Management held in Reykjavik from 16 to 19 September 2002. See Garcia, S. M., A. Zerbi, C. Aliaume, T. Do Chi and G. Lasserre ibid.The Ecosystems Approach to Fisheries: Issues, terminology, principles, institutional foundations, implementation and outlook. p6.

[215] Andersen, K. H., K. Brander and L. Ravn-Jonsen (2015). "Trade-offs between objectives for ecosystem management of fisheries." Ecological Applications **25**(5): 1390-1396.p1391.

[216] Link, J. S. (2010). Ecosystem-Based Fisheries Management: Confronting Tradeoffs. Cambridge, UK, Cambridge University Press. p158.

[217] Garcia, S. M., A. Zerbi, C. Aliaume, T. Do Chi and G. Lasserre (2003). The ecosystem approach to fisheries. Issues, terminology, principles, institutional foundations, implementation and outlook. FAO Fisheries Technical Paper. Rome, Food and Agriculture Organisation of the United Nations. **443:** 71.pp24, 25, 36-7.

[218] Patrick, W. S. and J. S. Link (2015). "Hidden in plain sight: Using optimum yield as a policy framework to operationalize ecosystem-based fisheries management." Marine Policy **62**: 74-81.pp74-7.

[219] This specifically refers to the Magnuson-Stevens Fishery Conservation and Management Act Public Law 94-265 (16 USC 1802) as amended at 11 October 1996, which defines optimum yield as "the amount of fish which (A) will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems; (B) is prescribed as such on the basis of the maximum sustainable yield from the fishery, as reduced by any relevant economic, social, or ecological factor; and (C) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the maximum sustainable yield in such fishery" (section 3(28)). Available at http://www.nmfs.noaa.gov/sfa/magact/mag1.html#s3. Accessed on 9 September 2016.

[220] Patrick, W. S. and J. S. Link (2015). "Hidden in plain sight: Using optimum yield as a policy framework to operationalize ecosystem-based fisheries management." Marine Policy **62**: 74-81. pp78-79.

[221] Holland, D. S. and G. E. Herrera (2009). "Uncertainty in the management of fisheries: Contradictory implications and a new approach." Marine Resource Economics **24**(3): 289-299.pp294-7.

[222] While this is often a stated aim of EAF, Charles has observed that ecosystems approaches have not consistently taken social factors into account. Charles, A. T. (2013). "Fisheries Management and Governance: Forces of Change and Inertia." Ocean Yearbook **27**: 249-266. pp254-5.

[223] Link, J. S. (2010). Ecosystem-Based Fisheries Management: Confronting Tradeoffs. Cambridge, UK, Cambridge University Press.

Fishery ecosystem plans would specify performance monitoring, control rules and actions to be taken to achieve operational-level objectives[224] [225].

This description amounts to a harvest strategy approach[226], which has been developed specifically to operationalise the EAF. Harvest strategies provide a consistent set of rules and actions to be taken in response to a fishery's performance against its objectives. They comprise explicit operational objectives, indicators against which to measure performance against objective, target reference points, hard and soft limit reference points, predetermined harvest control rules to ensure the fishery avoids LRPs and moves toward TRPs, and specific management decisions that define whether current catches or effort are consistent with objectives.

Whether ecosystem approaches can be operationalised continues to be debated[227] [228]. There is no doubt that implementing EAF/EBFM is a complex undertaking[229], perhaps too complex[230] [231]. While some of these challenges to implementing EAF are perennial and possibly independent of the fisheries management regime[232], Patrick and Link have argued that many of the main obstacles have been addressed[233]. For example, although EAF ideally requires a large amount of data to permit the establishment of a wide range of performance indicators for multiple ecosystem objectives, data gaps are inevitable. Proponents of EAF argue that it is an adaptive approach, which can be as complex as

[224] Ibid. p166.
[225] See also Sainsbury, K. (2000). "Design of operational management strategies for achieving fishery ecosystem objectives." ICES Journal of Marine Science **57**(3): 731-741.
[226] FAO. (2011-2019, Updated 27 May 2011). "EAF-Net. Planning and Implementation Tools - Harvest Strategies and Control Rules." EAF Toolbox Retrieved 12 February, 2019, from http://www.fao.org/fishery/.
[227] Link cites at least six reasons for this, including: lack of data; limited resources; concerns that EAF will be used as an excuse not to provide clear single species advice; scientific disagreements about the relative importance of lower trophic levels; concerns that EAF itself will add to complexity; and perceived inability to actually implement EAF. [cited from Link 2002b in] Link, J. S. (2010). Ecosystem-Based Fisheries Management: Confronting Tradeoffs. Cambridge, UK, Cambridge University Press. p32.
[228] See also Patrick, W. S. and J. S. Link (2015). "Myths that Continue to Impede Progress in Ecosystem-Based Fisheries Management." Fisheries **40**(4): 155-160.
[229] Fogarty, M. J. and K. Rose (2014). "The art of ecosystem-based fishery management." Canadian Journal of Fisheries and Aquatic Sciences **71**(3): 479-490. p479.
[230] Froese, R., A. Stern-Pirlot, H. Winker and D. Gascuel (2008). "Size matters: How single-species management can contribute to ecosystem-based fisheries management." Fisheries Research **92**(2-3): 231-241.
[231] Jennings has summarised the situation well: "In general, the EAF has led to major changes in management objectives but modest changes in the capacity of managers to meet them. Attempts to meet the objectives of EAF are hindered by many of the same factors that kept single-species fishery management from meeting objectives, notably lack of good governance, inappropriate incentives, high demand for limited resources, poverty and lack of alternatives, complexity and lack of knowledge, and interactions of the fishery sector with other sectors and the environment." Jennings, S. (2009). "The role of MPAs in environmental management." ICES Journal of Marine Science **66**(1): 16-21. p17.
[232] Valdimarsson and Metzner ask, "if we are failing to achieve the basic requirement of encouraging fishers to leave enough fish in the water for future sustainable harvests, how can we hope that an even more sophisticated system will work?". Valdimarsson, G. and R. Metzner (2005). "Aligning incentives for a successful ecosystem approach to fisheries management." Marine Ecology Progress Series **300**: 286-291. p287.
[233] Patrick, W. S. and J. S. Link (2015). "Myths that Continue to Impede Progress in Ecosystem-Based Fisheries Management." Fisheries **40**(4): 155-160. p156.

one designs it, and can work within data limitations[234] [235]. Of course, managers must also weigh the costs and benefits of obtaining more data – indeed overly complex models may in fact add little to understanding of the system[236]. Dickey-Collas emphasised that ecosystems approaches call for a precautionary approach to setting targets and limits in the face of data limitations and uncertainty, and ideally place an onus on the proponents of fishing to demonstrate that it will not cause ecological damage[237].

For all these considerations, a fisheries manager must select appropriate instruments to achieve the objectives of an EAF management regime. Some argue that existing fisheries management institutions – particularly those that focus on single species – are outdated[238]. The FAO, which strongly supports the EAF, has also noted that existing institutions fall short of what is required to meet the challenge of implementing it[239]. Those who argue that EAF can be implemented point to the need to accept the inevitability of uncertainty and incomplete data and models [240] [241], and that existing fisheries management tools are capable of implementing the EAF[242]. The next section considers the array of instruments available to a fisheries manager.

[234] Ibid.p157.

[235] See also Murawski's arguments against what he calls common myths about ecosystems approaches: Myth#4 that "[t]here is insufficient information for any area currently available to answer all the ecosystem questions necessary to support [ecosystems approaches to marine management"; and myth #8 that "[a] complex model of species interactions among all components of an ecosystem is necessary to guide EAM", in Murawski, S. A. (2007). "Ten myths concerning ecosystem approaches to marine resource management." Marine Policy **31**(6): 681-690. pp684, 686.

[236] Fogarty, M. J. and K. Rose (2014). "The art of ecosystem-based fishery management." Canadian Journal of Fisheries and Aquatic Sciences **71**(3): 479-490. p481.

[237] Pikitch, E. K., C. Santora, E. Babcock, A. Bakun, R. Bonfil, D. O. Conover, P. Dayton, P. Doukakis, D. Fluharty, B. Heneman, E. D. Houde, J. S. Link, P. A. Livingston, M. Mangel, M. K. McAllister, J. G. Pope and K. J. Sainsbury (2004). "Ecosystem based fishery management." Science **305**(5682): 346-347. p347.

[238] Edwards, S. F. (2003). "Property rights to multi-attribute fishery resources." Ecological Economics **44**(2-3): 309-323. p310.

[239] FAO (2014). The State of World Fisheries and Aquaculture 2014: Opportunities and Challenges. Rome, The Food and Agriculture Organisation of the United Nations (FAO)**:** 243pp. p137.

[240] Pikitch et al note that the availability of moderate amounts of data may in fact warrant the use of "single species management with the addition of precautionary set-asides for unknown ecosystem components". Pikitch, E. K., C. Santora, E. Babcock, A. Bakun, R. Bonfil, D. O. Conover, P. Dayton, P. Doukakis, D. Fluharty, B. Heneman, E. D. Houde, J. S. Link, P. A. Livingston, M. Mangel, M. K. McAllister, J. G. Pope and K. J. Sainsbury (2004). "Ecosystem based fishery management." Science **305**(5682): 346-347.

[241] Murawski, S. A. (2007). "Ten myths concerning ecosystem approaches to marine resource management." Marine Policy **31**(6): 681-690.

[242] Link, J. S. (2010). Ecosystem-Based Fisheries Management: Confronting Tradeoffs. Cambridge, UK, Cambridge University Press. Table 11.3 p152.

2.3.3 An array of instruments

One way of understanding these different characteristics is by considering whether the instrument is defined in terms of outputs or inputs and whether they are qualitative or quantitative[243].

Quantitative instruments based on outputs specify how much (weight, number) of a particular species may be caught, including non-target species. In some fisheries, each fisher is permitted to catch a limited quantity of fish, such as a bag limit applied in many recreational fisheries. In larger commercial fisheries, output controls typically start with a total allowable catch (TAC) for the fishery. The TAC is set by a central authority and fishers may then be permitted to enter the fishery until the TAC is reached. This type of open access fishery is often referred to as an "Olympic fishery" and suffers the disadvantages of the "race to fish" discussed in subsection 2.2.2. Alternatively, fishers may be assigned the right to catch a share of the TAC in the form of a catch share. As will be seen in this chapter, exclusive catch shares possess some of the basic characteristics of property rights. Qualitative output controls could also specify the age, size, sex and stage of maturity of fish that may be caught.

Other instruments aim to control outputs indirectly by permitting, prohibiting or mandating certain types of fishing inputs. Input controls thus seek to determine who may fish and how, when or where fishing activity may take place, or how much fishing activity may take place.

Qualitative input controls may seek to prohibit or mandate certain types of gear to achieve certain biological or ecological objectives[244] [245]. Input controls may also target other technical factors such as vessel size, vessel capacity, engine size or power permitted to be deployed in a fishery.

Qualitative inputs could also arguably be defined temporally and spatially, that is, by specifying when and where fishing may or may not take place. Seasonal and/or spatial closures may be employed to protect spawning stocks, to permit target stocks to recover from the impacts of fishing or, in combination with output controls, to maintain a desired spatial distribution of a stock. For example, CCAMLR has set TACs for its krill fisheries for regions and subregions within its convention area. In effect, CCAMLR divides its krill TAC into spatially defined sub-TACs[246]. Spatial closures, such as

[243] This Chapter uses Morison's typology to distinguish between output controls and input controls. Morison, A. K. (2004). "Input and output controls in fisheries management: a plea for more consistency in terminology." Fisheries Management and Ecology **11**(6): 411-413.

[244] For example, turtle excluders may be mandated in trawl fisheries to minimise bycatch of sea turtles FAO (2004). Report of the Expert Consultation on Interactions between Sea Turtles and Fisheries within an Ecosystem Context. Rome, Italy, 9-12 March 2004. Rome, Food and Agriculture Organisation of the UN. **FAO Fisheries Report. No. 738:** 37pp.

[245] Other effective technical measures include those for seabirds, sharks and marine mammals. See Gilman, E. L. (2011). "Bycatch governance and best practice mitigation technology in global tuna fisheries." Marine Policy **35**(5): 590-609. pp592-3.

[246] For instance, Antarctic krill fisheries are subdivided into regions and sub-regions, each with their own TAC. See: CCAMLR Conservation Measure 51-01 (2010) Precautionary catch limitations on *Euphausia superba* in Statistical Subareas 48.1, 48.2, 48.3 and 48.4; CCAMLR Conservation Measure 51-02 (2008) Precautionary catch limitation on *Euphausia superba* in Statistical Division 58.4.1; CCAMLR Conservation Measure 51-03

various types of marine protected areas[247] (MPAs) typically aim to advance ecological objectives by promoting conservation of ecologically significant species, biodiversity and habitats[248] [249]. They may also aim to support sustainable fishing by protecting a portion of biomass, spawning grounds, nursery habitats and foraging grounds, and increase available stocks through spillovers [250].

Input-based quantitative instruments may seek to limit the amount of fishing effort deployed in a fishery. Effort is a term that incorporates a wide range of factors, including the number of vessels with access to a fishery (e.g. limited entry or licence limitations[251]) and the amount of time (e.g. number of days) vessels are permitted to fish[252]. Effort limits may also include a range of quantitative limits on gear used, such as the number of hooks that may be deployed or the number of sets permitted[253]. The maximum possible effort that can be deployed may also be constrained by limiting fishing capacity, which represents a maximum possible fishing effort that could be deployed[254] [255].

Like a TAC, shares in a total allowable level of effort (TAE) can be assigned to individual fishers in a property right-like instrument as individual effort quotas. Squires et al. note that, effort quotas provide

(2008) Precautionary catch limitation on *Euphausia superba* in Statistical Division 58.4.2. All available at https://www.ccamlr.org/en/document/conservation-and-management/schedule-conservation-measures-force-2019/20. Accessed on 6 February 2020.

[247] Also referred to as no-take zones and marine reserves.

[248] Roberts, C., J. A. Bohnsack, F. Gell, J. P. Hawkins and R. Goodridge (2001). "Effects of marine reserves on adjacent fisheries." Science **294**(5548): 1920-1923. p1921.

[249] Halpern, B. S. (2003). "The impact of marine reserves: do reserves work and does reserve size matter?" Ecological Applications **13**(1 Supplement): S117-S137.

[250] Russ, G., A. C. Alcala, A. P. Maypa, H. P. Calumpong and A. T. White (2004). "Marine reserve benefits local fisheries." Ibid. **14**(2): 597-606. p597.

[251] See Townsend, R. E. (1990). "Entry Rrestriction in the Fishery: A Survey of the Evidence." Land Economics **66**(4): 360-378.

[252] Squires, D., M. Maunder, R. Allen, P. Andersen, K. Astorkiza, D. Butterworth, G. Caballero, R. Clarke, H. Ellefsen, P. Guillotreau, J. Hampton, R. Hannesson, E. Havice, M. Helvey, S. Herrick Jr, K. Hoydal, V. Maharaj, R. Metzner, I. Mosqueira, A. Parma, I. Prieto-Bowen, V. Restrepo, S. F. Sidique, S. I. Steinsham, E. Thunberg, I. del Valle and N. Vestergaard (2017). "Effort rights-based management." Fish and Fisheries **18**(3): 440-465. p443

[253] Ibid. Table 1 pp444-6.

[254] The FAO makes a distinction between effort and capacity. While both can be the subject of input controls, capacity is "closely related to the fishing mortality a fishing fleet could generate if the entire fleet were to fish full time" and effort refers to the "actual amount of fishing activity". Garcia, S. M., A. Zerbi, C. Aliaume, T. Do Chi and G. Lasserre (2003). The Ecosystems Approach to Fisheries: Issues, terminology, principles, institutional foundations, implementation and outlook. FAO Fisheries Technical Paper. Rome, Food and Agriculture Organisation of the United Nations. **443:** 71. p33.

[255] See for example the discussion of policies to limit European fleet capacity in Seto, K. (2017). West Africa & the New European Common Fisheries Policy: Impacts and Implications. Ocean Law and Policy: 20 Years Under UNCLOS. C. Espósito, J. Kraska, H. N. Schneiber and M.-S. Kwon. Leiden, Boston, Brill Nijhoff. pp74-7.

an automatic feedback to limit total catch – as biomass fluctuates, the ease with which fish can be caught (catchability) is expected to vary correspondingly[256] [257].

A significant challenge, however, is that effort controls typically do not account for all inputs[258], giving fishers a perverse incentive to substitute regulated inputs with unregulated inputs[259] [260] in what has become known as "effort creep". This leads to a regulatory "cat-and-mouse" game between fisheries managers and fishers[261] [262] [263]. The management costs of developing new policies, costs to industry of participating in each new policy change and the cost of obsolete capacity resulting from each policy change also need to be considered[264]. The primary incentive for individual vessels in an effort-controlled fishery thus remains to maximise catches and revenues, while increasing inputs (and therefore costs) in order to do so[265] [266].

If measures to limit effort are successful, including by overcoming effort creep, it is reasonable to expect that catches of all species, whether target species or bycatch will be reduced. As the FAO noted, effort limitations could be particularly useful in multispecies fisheries[267]. While this may have positive flow-ons for ecosystems, reductions in effort in multispecies fisheries are unable to maximise catches or returns from all species simultaneously (see subsection 2.2.3 above). Most researchers stress that, in

[256] Squires, D., M. Maunder, R. Allen, P. Andersen, K. Astorkiza, D. Butterworth, G. Caballero, R. Clarke, H. Ellefsen, P. Guillotreau, J. Hampton, R. Hannesson, E. Havice, M. Helvey, S. Herrick Jr, K. Hoydal, V. Maharaj, R. Metzner, I. Mosqueira, A. Parma, I. Prieto-Bowen, V. Restrepo, S. F. Sidique, S. I. Steinsham, E. Thunberg, I. del Valle and N. Vestergaard (2017). "Effort rights-based management." Fish and Fisheries **18**(3): 440-465. p454.
[257] Shepherd, J. G. (2003). "Fishing effort control: could it work under the common fisheries policy?" Fisheries Research **63**(2): 149-153. p149-50.
[258] Squires, D., M. Maunder, R. Allen, P. Andersen, K. Astorkiza, D. Butterworth, G. Caballero, R. Clarke, H. Ellefsen, P. Guillotreau, J. Hampton, R. Hannesson, E. Havice, M. Helvey, S. Herrick Jr, K. Hoydal, V. Maharaj, R. Metzner, I. Mosqueira, A. Parma, I. Prieto-Bowen, V. Restrepo, S. F. Sidique, S. I. Steinsham, E. Thunberg, I. del Valle and N. Vestergaard (2017). "Effort rights-based management." Fish and Fisheries **18**(3): 440-465. p447-9.
[259] Hannesson, R. (2004). The Privatisation of the Oceans. Cambridge Mass., MIT Press. p60-3.
[260] Pascoe, S. and L. Coglan (2002). "The contribution of unmeasurable inputs to fisheries production: an analysis of technical efficiency of fishing vessels in the English Channel." American Journal of Agricultural Economics **84**(3): 585-597.
[261] Fujita, R. and K. Bonzon (2005). "Rights-based Fisheries Management: An Environmentalist Perspective." Reviews in Fish Biology and Fisheries **15**(3): 309-312. p310.
[262] USCOP (2004). An Ocean Blueprint for the 21st Century. Final Report. Washington DC, US Commission on Ocean Policy. p233.
[263] See also Kompas, T. and P. Gooday (2007). "The Failure of 'Command and Control' in Fisheries Management: Lesson from Australia." International Journal of Global Environmental Issues **7**(2/3): 174-190. p181.
[264] Ibid. p185.
[265] Kompas, T., T. N. Che and R. Q. Grafton (2004). "Technical efficiency effects of input controls: evidence from Australia's banana prawn fishery." Applied Economics **36**(15): 1631-1641.
[266] Squires, D., M. Maunder, R. Allen, P. Andersen, K. Astorkiza, D. Butterworth, G. Caballero, R. Clarke, H. Ellefsen, P. Guillotreau, J. Hampton, R. Hannesson, E. Havice, M. Helvey, S. Herrick Jr, K. Hoydal, V. Maharaj, R. Metzner, I. Mosqueira, A. Parma, I. Prieto-Bowen, V. Restrepo, S. F. Sidique, S. I. Steinsham, E. Thunberg, I. del Valle and N. Vestergaard (2017). "Effort rights-based management." Fish and Fisheries **18**(3): 440-465.
[267] Garcia, S. M., A. Zerbi, C. Aliaume, T. Do Chi and G. Lasserre (2003). The ecosystem approach to fisheries. Issues, terminology, principles, institutional foundations, implementation and outlook. FAO Fisheries Technical Paper. Rome, Food and Agriculture Organisation of the United Nations. **443:** 71.

any given situation, the potential gains and losses need to be estimated before dismissing effort controls, and that such controls may in fact be the only politically or feasible options available[268]. For example, squid fisheries have traditionally been managed by effort controls due to the rapid life cycle of squid and the weak relationship between biomass and recruitment[269].

Management instruments may also be regarded as either influencing behaviour or controlling behaviour. For example, taxes, may be adopted to decrease incentives to undertake certain behaviours that create negative externalities, while subsidies can increase incentives to produce positive externalities. Buybacks in effect pay individuals to exit the fishery and reduce fishing capacity. All three instruments aim to influence behaviour by influencing the cost or benefits of certain behaviour without prohibiting or mandating those behaviours. Pigou advocated the introduction of institutions that required a firm whose production caused negative externalities, say, pollution, to internalise that cost through government intervention[270]. This could be achieved through a tax or compensation equal to the value of the externality.

Taxes and their counterpart, subsidies, thus aim to influence behaviour through the cost of consumption or production rather than controlling behaviour. The ultimate decision about how to respond to those incentives are left to the individual. Taxes may be levied on inputs or outputs to deter a negative externality or in an attempt to reduce the quantity of fish caught through the application of a royalty[271] or landing tax[272]. While economic theory suggests that subsidies could be used to encourage the supply of public goods (i.e. goods with positive externalities)[273], other, harmful, subsidies have been heavily criticised as promoting overcapacity and overfishing[274].

Whether instruments aim to influence or control behaviour also aids the distinction between market-based instruments and command-and-control instruments. The former comprise transferable property rights and emphasise decentralised decision-making and reliance on individual incentives to achieve

[268] Anderson, L. G. (1985). "Potential Economic Benefits from Gear Restrictions and License Limitation in Fisheries Regulation." Land Economics **61**(4): 409-418. p417.
[269] Aguilera, S. E. (2018). "Measuring squid fishery governance efficacy: A social-ecological system analysis." International Journal of the Commons **12**(2). p24.
[270] On Pigou's (1920) Economics of Welfare, see Keohane, N. O. and S. M. Olmstead (2007). Markets and the Environment. Washington DC, Island Press.p126; and on Pigouvian taxes on pollutants see Grafton, R. Q., V. Adamowicz, D. Dupont, H. Nelson, R. J. Hill and S. Renzetti (2004). The Economics of the Environment and Natural Resources. Malden, MA, Blackwell Publishing. p69.
[271] See Scott's discussion of the practical hurdles and limited success in implementing fishing royalties in Scott, A. (2000). Introducing Property in Fishery Management: FAO Fisheries Technical Paper 404/1: Use of Property Rights in Fisheries Management. Proceedings of the FishRights99 Conference. R. Shotton. Fremantle, Western Australia, FAO**:** 1-13.
[272] Hannesson, R. (1991). "From common fish to rights based fishing: fisheries management and the evolution of exusive rights to fish." Eurpoean Economic Review **35**(2-3): 397-407. p402.
[273] Public goods supported by "good subsidies" include research and MCS activities that support the sustainable management of the fishery. See Squires, D., R. Clarke and V. Chan (2014). "Subsidies, public goods, and external benefits in fisheries." Marine Policy **45**: 222-227.
[274] See Chapter One section 1.1.

fisheries management objectives. "Command-and-control" rules, on the other hand, centralise decision-making and achieve cooperation by coercion rather than harnessing individual incentives[275]. Kompas and Gooday define command and control rules as those "that focus on input restrictions and total catch limits"[276]. It is important, however, to distinguish between qualitative input restrictions, which prohibit or mandate certain inputs, and many quantitative individual input restrictions, which act in a property right-like manner, such as forms of individual transferable effort (ITEs). Furthermore, in addition to total catch limits, qualitative output controls described above would also qualify as command-and-control rules. Steelman and Wallace's distinction between command and control and property rights-based instruments is perhaps more useful – the former distinguished by state-based regulatory institutions, the latter by incentives[277] derived from the secure, exclusive enjoyment of future benefits flowing from an asset[278].

As an externally imposed means of management, command-and-control instruments can lack legitimacy among stakeholders, manifesting in perverse incentives to get around regulations and opportunities for regulatory capture by particular interests[279]. However, command-and-control may be appropriate in some circumstances when compared to rights-based approaches. For example, where there has been no history of individual or common property rights in a resource, command and control approaches may be more readily accepted by those with an interest in the resource[280]. Steelman and Wallace have also observed that some form of command-and-control rules may be more effective than individual or common property rights where fishers have high discount rates, which would nullify fishers' long term interest in the sustainability of the fishery that one would expect from secure property rights[281].

Many scholars have argued that the root cause of common pool resource problems can often be traced back to the incomplete definition of property rights[282] [283]. Such arguments posit that open access equates

[275] Steelman, T. A. and R. L. Wallace (2001). "Property Rights and Property Wrongs: Why Context Matters in Fisheries Management." Policy Sciences **34**: 357-379. p359.
[276] Kompas, T. and P. Gooday (2007). "The Failure of 'Command and Control' in Fisheries Management: Lesson from Australia." International Journal of Global Environmental Issues **7**(2/3): 174-190. p175.
[277] Steelman, T. A. and R. L. Wallace (2001). "Property Rights and Property Wrongs: Why Context Matters in Fisheries Management." Policy Sciences **34**: 357-379. p359.
[278] Grafton, R. Q., V. Adamowicz, D. Dupont, H. Nelson, R. J. Hill and S. Renzetti (2004). The Economics of the Environment and Natural Resources. Malden, MA, Blackwell Publishing. p36.
[279] Steelman, T. A. and R. L. Wallace (2001). "Property Rights and Property Wrongs: Why Context Matters in Fisheries Management." Policy Sciences **34**: 357-379.pp359, 361-2.
[280] Ibid. p372.
[281] Ibid. p373.
[282] Libecap, G. D. (2009). "The tragedy of the commons: property rights and markets as solutions to resource and environmental problems." Australian Journal of Agricultural and Resource Economics **53**(1): 129-144. p129.
[283] Although others, such as Scott, have observed that understanding its characteristics rather than completeness is a better way of evaluating a right. See Scott, A. (2000). Introducing Property in Fishery Management: FAO Fisheries Technical Paper 404/1: Use of Property Rights in Fisheries Management. Proceedings of the FishRights99 Conference. R. Shotton. Fremantle, Western Australia, FAO**:** 1-13. Section 4.1.

to the absence of an owner of any type[284]. If a limited number of users held exclusive rights to appropriate a limited share of the resource, they would have an incentive to husband the resource to ensure its long-term sustainability[285]. However, it is arguable that property rights systems, whether defined in terms of inputs or outputs, exhibit the characteristics of both decentralised decision-making of influencing instruments and centralised decision-making of command-and-control instruments. For example, a TAC or TAE would ordinarily be set centrally but decisions about when, where and how to exercise the right to a share of the TAC or TAE are made by individual fishers[286].

As noted above, market-based instruments fall into the broader category of property rights[287], and are distinguished by their transferability of those rights between users[288]. Decisions to transfer market-based instruments are devolved to individuals and therefore aim to influence decisions based on individual actors' preferences for when and how to fish.

In summary, fisheries management instruments can be described using a number of dimensions. They may be specified as quantitative limits or qualitative rules, they may be defined as controls on inputs or outputs, and depending on the locus of decision-making, they may be command-and-control instruments that direct or prohibit actions, or instruments that provide incentives to achieve similar goals, typified by taxes and subsidies and property rights-based instruments (Figure 2.1). Each type of instrument has different advantages and disadvantages and their selection will be influenced by the social-ecological context in which they are to be applied. Undoubtedly, one instrument will never be sufficient to achieve all the objectives of fisheries management. Instead, as section 2.3.5 below argues, a suite of instruments is likely to make sense. First, however, the next section examines the evolution of rights-based approaches to addressing common pool resource problems.

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[284] See for example Runolfsson: "Overfishing and other inefficient fishing practices have nothing to do with the nature of the resource, the characteristics of fishermen, or the localities in which fish are found. Rather, inefficiencies are the direct result of the definition and enforcement of property rights in fisheries. Fisheries are troubled by overfishing because they are not privately owned. Fishermen only own what they catch. *The government, which is to say, everyone and therefore no one, owns the stock* of fish from which the catch is taken." (emphasis added). Runolfsson, B. (1997). "Fencing the oceans: a rights-based approach to privatizing fisheries." Regulation **20**: 57-62. p57.

[285] Ibid.

[286] See for example the description of the centralised elements of the application of the European Union Common Fisheries Policy at a national scale in Spain in Caballero-Miguez, G., M. M. Varela-Lafuente and M. Dolores Garza-Gil (2014). "Institutional change, fishing rights and governance mechanisms: The dynamics of the Spanish 300 fleet on the Grand Sole fishing grounds." Marine Policy **44**: 465-472. pp469-70.

[287] Useful examples are summarised in Keohane, N. O. and S. M. Olmstead (2007). Markets and the Environment. Washington DC, Island Press. pp182-206; and
Libecap, G. D. (2009). "The tragedy of the commons: property rights and markets as solutions to resource and environmental problems." Australian Journal of Agricultural and Resource Economics **53**(1): 129-144.

[288] As will be seen in Chapter Three, property rights may be referred to as "use rights" or "privileges" in order to avoid concerns that the term "property" could be construed as granting ownership over the asset, which is otherwise regarded as public or common property, or conferring inalienability in relation to the right. See for example the use of the term "privilege" rather than "right" in the US. USCOP (2004). An Ocean Blueprint for the 21st Century. Final Report. Washington DC, US Commission on Ocean Policy. p289, Box 19.1.

Influence behaviour	Individual effort limits Subsidies & buybacks	Individual catch limits Taxes
Control behaviour	Temporal and spatial controls Gear restrictions	Catch limits Bycatch bans
	Inputs	**Outputs**

Figure 2.1: A simple typology of fisheries management instruments
Figure 2.1 illustrates a simplified typology of four broad types of fisheries management instrument. Each instrument is categorised as defined by either input controls or output controls (horizontal axis) and whether they aim to control behaviour or influence behaviour (vertical axis). Each box contains examples of each of the four types of instrument.

2.3.4 Addressing the common pool resources problem

As discussed in the previous section, common pool resource problems are, from an economic perspective, essentially problems of externalities. Externalities arise when one person's consumption or production affects another individual who is not party to the transaction. Together private costs and "external" costs are the social cost of the transaction. An "external" cost is not able to be "internalised" in the price paid for a good or the cost of producing it due to excessive transaction costs[289]. This leads to the over-consumption of goods that produce external costs and the underproduction of goods that cause external benefits. In fisheries, externalities are manifested in overfishing, the dissipation of rents and environmental damage.

Recalling Gordon's observation that individual fishers in an open access fishery would likely lead to overfishing and the dissipation of rents (subsection 2.2.2), either total effort or total catches must be limited to both preserve stocks and maximise rents. Noting similar experiences in US oil fields and the English commons, Gordon concluded that rents could be protected "only by methods which make them private property or public (government) property, in either case subject to a unified directing power"[290].

However, Gordon's model did not take into account the dynamic nature of incentives. Scott argued that Gordon had neglected to consider the present value of the impact of fishing today on the cost of fishing in the future. Scott suggested that a sole owner with secure future rights, aiming to maximise returns

[289] Demsetz, H. (1967). "Toward a theory of property rights." American Economic Review **57**(2, Papers of the Proceedings of the Seventy-ninth Annual Meeting of the American Economic Association (May 1967)): 347-359. p348.
[290] Gordon, H. S. (1954). "The Economic Theory of a Common Property Resource: The Fishery." Journal of Political Economy **62**(2): 124-142. p135.

from the fishery in the long run, would internalise stock externalities and approximate the social optimum[291]. Long term certainty of property rights in the fishery would thus provide incentives to consider the discounted future value of the fishery in making decisions about catches in the current season[292].

Townsend argued that the "theoretical yardstick" of sole ownership is, in reality, unachievable due to the presence of multiple stakeholders with competing interests[293]. Although a fishery may have some degree of exclusiveness, for example, by virtue of an EEZ or traditional rights in a coastal fishery, it is possible that there is still competition for the resource between those fishers with access. In such a limited user open access scenario, depletion of the stock may, in the absence of adequate institutions within the group, occur for the same reasons as in the open access case[294].

Section 2.3.3 above noted the Pigouvian solution to tax negative externalities and subsidise positive ones. Coase challenged this orthodoxy, arguing that such arrangements might not always result in a socially optimal outcome[295]. Using several stylised and real world examples, Coase argued that Pigou's approach ignored the fact that most situations were reciprocal[296]. Rather than levying a charge on the firm that caused the externality, persons or firms affected by the damage could also take action to reduce the impact of the externality on them. They could, for example, move away from the affected area, take their own measures to reduce the impact or pay the producer to reduce production and therefore the externality. Importantly, he argued that the parties could achieve an optimal outcome by negotiating a solution without the need for government intervention[297]. Such a decentralised or market-based approach directly challenged both the Pigouvian approach and more traditional regulatory or command-and-control approaches to resolving externality problems[298].

What has since become known as *Coase Theorem* holds that individuals can trade property rights to achieve an efficient allocation of resources. Holders of property rights can sell them if someone else places a higher value on them, eventually exhausting all potential gains from such trades until an efficient outcome is achieved. In this way, property rights could, paradoxically, maximise social welfare through the pursuit of individual interests[299]. Such a market is said to be *Pareto efficient* if no one can be made better off without making someone else worse off. A refinement to this proposition is that, if

[291] Scott, A. (1955). "The Fishery: The Objectives of Sole Ownership." Ibid. **63**: 116-124.
[292] Ibid. p122.
[293] Townsend, R. E. (1998). "Beyond ITQs: Property Rights as a Management Tool." Fisheries Research **37**: 203-210. p205.
[294] See Squires, D. (2010). Chapter 3. Property and Use Rights in Fisheries. Conservation and Management of Transnational Tuna Fisheries. R. L. Allen, J. Joseph and D. Squires. Ames, IA, Wiley-Blackwell**:** 39-64, ibid. p40
[295] Coase, R. N. (1960). "The Problem of Social Cost." Journal of Law and Economics **3**: 1-44. p16.
[296] Ibid. p2.
[297] Ibid.
[298] Grafton, R. Q., V. Adamowicz, D. Dupont, H. Nelson, R. J. Hill and S. Renzetti (2004). The Economics of the Environment and Natural Resources. Malden, MA, Blackwell Publishing. p44.
[299] Hannesson, R. (2004). The Privatisation of the Oceans. Cambridge Mass., MIT Press. p9.

the aggregate gains to beneficiaries are sufficient to compensate the aggregate losses suffered by others (losers) even if the compensation is not paid, then a *potential Pareto improvement* is still possible and the trade should take place[300].

Central to Coase's proposition was that bargaining would deliver an efficient outcome under strict conditions – that is, that there were no transaction costs, participants did not engage in strategic behaviour and had access to full information, and the initial allocation of rights did not affect participants' marginal valuation of those rights[301] In reality, these conditions may be difficult to achieve. For example, the interests of existing property rights holders and the question of compensation to individuals in pursuit of potential society-wide Pareto improvements suggest that initial allocations and the expected distribution after bargaining are in fact very relevant[302].

Dahlman later observed[303] that one of Coase's key insights was the importance of transaction costs and imperfect information which led to externalities, rather than the externalities themselves[304]. Because externalities could never be completely eliminated, whatever outcome was achieved represented a constrained but attainable optimum[305]. In more complex resources it would likely be costly to reflect the value of all attributes of the resource, rendering the associated property rights incomplete[306]. Coase Theorem implies therefore that, once all gains through trade have been exhausted, there may still be a case for government intervention to address transaction costs and incomplete information whether through regulation or Pigouvian taxes[307].

Nevertheless, Coase Theorem's main insight, that bargaining could improve the efficiency of the allocation of resources, both relied upon well-defined property rights, and supported the adoption of well-defined property rights to address common pool resource problems. Demsetz[308] drew together these streams of thought in an economic theory of property rights. He proposed that positive and

[300] Grafton, R. Q., V. Adamowicz, D. Dupont, H. Nelson, R. J. Hill and S. Renzetti (2004). The Economics of the Environment and Natural Resources. Malden, MA, Blackwell Publishing.
[301] Coase, R. N. (1960). "The Problem of Social Cost." Journal of Law and Economics **3**: 1-44.
[302] Keohane, N. O. and S. M. Olmstead (2007). Markets and the Environment. Washington DC, Island Press. p127.
[303] Dahlman, C. J. (1979). "The Problem of Externality." The Journal of Law and Economics **22**: 141-162.p158.
[304] Dahlman also noted that Coase neglected to make a clear distinction between pecuniary and technological externalities, which, he observed, was "so central to Pigovian tax rules". Ibid. at p159.
[305] Ibid. p153.
[306] Cheung, S. N. S. (1970). "The Structure of a Contract and Theory of Non-exclusive Rresource." Journal of Law and Economics **13**: 49-70. pp51-3.
[307] Dahlman, C. J. (1979). "The Problem of Externality." The Journal of Law and Economics **22**: 141-162. p160-1.
[308] Demsetz, H. (1967). "Toward a theory of property rights." American Economic Review **57**(2, Papers of the Proceedings of the Seventy-ninth Annual Meeting of the American Economic Association (May 1967)): 347-359.

negative externalities could be internalised through the proper design and exchange of property rights, thus achieving a socially optimal level of production[309].

Apart from achieving an efficient outcome, property rights provide several practical advantages that enhance their value as an economic instrument. They can help to avoid disputes over output (and therefore the diversion of resources to protect that output), and minimise risk by facilitating insurance and risk-sharing[310]. Similarly, when a person possesses a durable thing, property rights create incentives to maintain and improve that thing, to the extent that the present value of the future benefits of maintaining or improving it exceed the cost of doing so[311]. The right to transfer an asset would also enhance incentives to maintain and improve it, and transfer it in the future at a greater value than it otherwise might have had[312].

The contributions of Gordon, Coase, Hardin, Demsetz and Dahlman revealed the importance of the presence of institutions and their design. Collectively they point to the need to limit rights to access the resource, ensure that long term impacts are taken into account by making them durable, maximise efficiency by allowing them to be transferred, and protect their exclusivity. The property rights perspective has therefore come to understand common pool resource problems as resulting from incompletely defined property rights[313] rather than simply the inherent characteristics of the resource[314]. This is not to discount the latter, which represents a large portion of the sources of complexity discussed earlier in this chapter. The many attributes of a resource represent different values to different stakeholders and thus presents a challenge to instrument designers to capture as many of those values as possible as rents, rather than see them dissipate[315]. A more accurate observation, therefore, might be that common pool resource problems are likely to arise where institutions are defined in ways that do

[309] A stylised example of how property rights can create an incentive to work or produce a socially optimal output can be seen in Shavell, S. (2004). Foundations of Economic Analysis of Law. Cambridge, Massachusetts, The Belknap Press of Harvard University Press. pp11-16. Shavell also notes that when a worker is not able to retain property rights in their output, an undersupply or oversupply of work may result due, for example, to a fear that their output may be taken from them.
[310] Ibid. pp20-1.
[311] Scott, A. (1955). "The Fishery: The Objectives of Sole Ownership." Journal of Political Economy **63**(2): 116-124. p121.
[312] Shavell, S. (2004). Foundations of Economic Analysis of Law. Cambridge, Massachusetts, The Belknap Press of Harvard University Press. pp17-9. Individuals will usually place a lower value on future benefits compared to short term benefits. Future benefits can be discounted at a rate influenced by a range of factors discussed in Ostrom, E. (1990). Governing the Commons: The Evolution of Institutions for Collective Action. Cambridge, UK, Cambridge University Press. pp34-5.
[313] Libecap, G. D. (2009). "The tragedy of the commons: property rights and markets as solutions to resource and environmental problems." Australian Journal of Agricultural and Resource Economics **53**(1): 129-144.
[314] Keohane, N. O. and S. M. Olmstead (2007). Markets and the Environment. Washington DC, Island Press.p71.
[315] Edwards, S. F. (2003). "Property rights to multi-attribute fishery resources." Ecological Economics **44**(2-3): 309-323. p311.

not match "the biogeophysical scale of the resource either in time or space"[316] [317] [318] [319]. Clearly, both design and context matter.

2.3.5 Property rights in a robust system

While property rights may be able to reconcile the biological problem and the economic problem by harnessing individual incentives to influence human behaviour, they do not address the entirety of the complex social-ecological system. The ecological and social dimensions of the fisheries problem remain at the periphery of traditional property rights theory. This section considers how rights-based instruments can complement other instruments in addressing various aspects of complexity in the fishery, based on Young and McColl's *robust separation* framework[320].

Young and McColl argued that a robust management system – one that can withstand small changes and remain close to its original equilibrium, or remain structurally stable in response to small changes in, for example, the external parameters of the system[321] – should comprise separate management instruments assigned to separate objectives. Central to a robust system, they argued, was the Tinbergen Principle: that there should be at least as many policy instruments as there are "goals or important dimensions to the problem" and that a shortage of instruments requires trade-offs between goals[322] [323].

Tinbergen observed that a larger number of instruments, while likely to lead to greater complexity, could make it easier to take account of special circumstances and redistribute the costs of policy measures to alleviate extraordinary hardship. Gains in efficiency were also possible through the

[316] This quote is from Cash, D. W., W. Adger, F. Berkes, P. Garden, L. Lebel, P. Olsson, L. Pritchard, and O. Young. 2006. "Scale and cross-scale dynamics: governance and information in a multilevel world." Ecology and Society 11(2):8. p4, [online] URL: http://www.ecologyandsociety.org/vol11/iss2/art8/., cited in Yandle, T. (2007). "Understanding the Consequences of Property Rights Mismatches: a Case Study of New Zealand's Marine Resources." Ecology and Society **12**(2): 27-41.

[317] See also in relation to water-related property rights: Young, M. D. and J. C. McColl (2009). "Double trouble: the importance of accounting for and defining water entitlements consistent with hydrological realities*." Australian Journal of Agricultural and Resource Economics **53**(1): 19-35.

[318] See also the discussion in Ostrom, E. (1990). Governing the Commons: The Evolution of Institutions for Collective Action. Cambridge, UK, Cambridge University Press. pp22-3.

[319] See further, Libecap, G. D. (1986). "Property rights in economic history: Implications for research." Explorations in Economic History **23**: 227-252.

[320] Young, M. D. and J. C. McColl (2002). Robust Separation: A Search for a Generic Framework to Simplify Registration and Trading of Interests in Natural Resources, Commonwealth Scientific and Industrial Research Organisation**:** 1-48.

[321] Jen, E. (2003). "Stable or Robust? What's the Difference?" Santa Fe Institute Working Paper **2002**(12 069): 13. p3.

[322] Young, M. D. and J. C. McColl (2002). Robust Separation: A Search for a Generic Framework to Simplify Registration and Trading of Interests in Natural Resources, Commonwealth Scientific and Industrial Research Organisation**:** 1-48. p25.

[323] Young, M. D. and J. C. McColl (2005). "Defining Tradeable Water Entitlements and Allocations - A Robust System." Canadian Water Resources Journal **30**(1): 65-72. p66.

employment of multiple instruments because adjustments to each instrument need only be small and therefore reduce incentives to not comply with any regulations set by those instruments[324].

Young and McColl also drew on Coase Theorem, the key aspect of which was the importance of designing a suite of instruments such that trade-offs in the system could be achieved with minimum transaction costs, and optimise outcomes over time[325]. Separate, tradable where possible, and appropriately assigned instruments thus established what Young and McColl called the "robust separation" of market-based instruments, reflecting unbundled interests or values in the resource[326]. Where interests and therefore objectives were not separated, they argued, a problem in the system could result in the renegotiation of the entire system, creating "an opportunity…to reopen old agendas"[327]. Robust separation therefore provided an alternative to the intuitively appealing notion of integration[328].

Young and McColl identified three system objectives: economic efficiency; environmental sustainability; and distributive or social equity. Importantly, a robust system needs to reconcile system-wide objectives with those of individual users[329] [330]. Young and McColl therefore proposed a generalised framework comprising a minimum of six separate instruments to achieve each objective at individual and total system levels. This framework is illustrated in Table 2.1 below, adapted from a water resources management context to a generalised framework which could be employed in other settings such as emissions trading schemes, forestry[331], and fisheries[332].

[324] Tinbergen, J. (1952). On the Theory of Economic Policy. Amsterdam, North-Holland Publishing Company.
[325] Young, M. D. and J. C. McColl (2005). "Defining Tradeable Water Entitlements and Allocations - A Robust System." Canadian Water Resources Journal **30**(1): 65-72.
[326] Young, M. D. and J. C. McColl (2002). Robust Separation: A Search for a Generic Framework to Simplify Registration and Trading of Interests in Natural Resources, Commonwealth Scientific and Industrial Research Organisation**:** 1-48.
[327] Young, M. D. and J. C. McColl (2003). "Robust reform: The Case for a New Water Entitlements System for Australia." Australian Economic Review **36**(2): 225-234. p229.
[328] Ibid. p229.
[329] Recall that Levin et al argue that the aggregate (or macroscopic) properties of a system result from interactions at lower levels, not attempts to optimise the whole. Levin, S. A., T. Xepapadeas, A.-S. Crépin, J. Norberg, A. de Zeeuw, C. Folke, T. Hughes, K. Arrow, S. Barrett, G. Daily, P. Ehrlich, N. Kautsky, K.-G. Mäler, S. Polasky, M. Troell, J. R. Vincent and B. Walker (2013). "Social-ecological systems as complex adaptive systems: modeling and policy implications." Environment and Development Economics **18**(02): 111-132. p114.
[330] For a further discussion of system level and user level elements of a resource allocations scheme in a water allocation context, see OECD (2015). Water Resources Allocation: Sharing Risks and Opportunities. OECD Studies on Water. Paris, Organisation for Economic Cooperation adn Development (OECD)**:** 1-141.pp44-9.
[331] Young, M. D. and J. C. McColl (2005). "Defining Tradeable Water Entitlements and Allocations - A Robust System." Canadian Water Resources Journal **30**(1): 65-72. p72.
[332] Notably by Townsend, R. E., J. McColl and M. D. Young (2006). "Design principles for individual transferable quotas." Marine Policy **30**(2): 131-141.

Table 2.1: Robust separation of instruments assigned to objectives

	Policy Objective		
Scale	**Distributive Equity**	**Economic Efficiency**	**Externality Management**
Total System	Allocation Plans	Trading protocols	Resource Plans
Individual User	Entitlements*	Access allocations**	Use licences, setting out conditions of use

* A percentage of the total resource in perpetuity
** A seasonal or annual volumetric allocation based on the entitlement[333]

According to this framework, distributive equity is achieved through entitlements at the user level – that is, long term shares in the resource[334]. Young and McColl argued that in the presence of unavoidable uncertainty, a robust system should define entitlements as proportional shares of the aggregate available stock, rather than absolute quantities, thus enabling the aggregate extraction to vary with the size of the available stock. At the total system scale, allocation plans determine how available stocks – in a fishery, the total allowable catch – would be measured and allocated to individual users.

Economic efficiency would be achieved at the individual level through periodic allocations, the size of which would be determined on a pro rata basis in accordance with entitlements held and the aggregate available stock for that period. Allocations here represent a volumetric unit of the stock distributed periodically, perhaps annually or seasonally, and in a fishery would be the equivalent of an ITQ or ITE[335]. They would be tradable in a market governed at the system level by trading protocols that maximised efficiency, that is, minimised transaction costs. Entitlements would also be tradable.

As tradable instruments, Young and McColl argued that entitlements and allocations should have strong qualities of property rights[336], secured under legislation and through a transparent, centrally administered register. However, the term property rights created a presumption that entitlements were "compensable" property and guaranteed a certain volume of water. Instead, Young and McColl suggested focusing on the clear specification and assignment of risk in the resource. This means, for

[333] Young, M. D. and J. C. McColl (2005). "Defining Tradeable Water Entitlements and Allocations - A Robust System." Canadian Water Resources Journal **30**(1): 65-72.Table 1 p68.
[334] Young, M. D. and J. C. McColl (2002). Robust Separation: A Search for a Generic Framework to Simplify Registration and Trading of Interests in Natural Resources, Commonwealth Scientific and Industrial Research Organisation**:** 1-48. p27.
[335] Townsend et al suggest also that Individual transferable effort, or individual transferable input, could be substituted for ITQs if they were demonstrably more efficient. Townsend, R. E., J. McColl and M. D. Young (2006). "Design principles for individual transferable quotas." Marine Policy **30**(2): 131-141. p139.
[336] Young and McColl specified that property rights in the proposed system should address universality (which appears to relate to duration and the comprehensive coverage of the resource under: long term, non-extinguishable entitlements; short term allocations; and use licences); flexibility; exclusivity; quality of title; transferability; and divisibility. These dimensions are discussed further in Chapter Three. See Young, M. D. and J. C. McColl (2002). Robust Separation: A Search for a Generic Framework to Simplify Registration and Trading of Interests in Natural Resources, Commonwealth Scientific and Industrial Research Organisation**:** 1-48. pp41-2.

example, that while entitlements should ideally be mortgageable, any third party interests in the entitlement should be entered in the register[337].

Any externalities not captured by markets for entitlements and allocations would be dealt with by separate instruments[338]. Young and McColl stipulated that, while entitlements and allocations gave a right to use water they did not grant permission to take water. Instead, use licences could set out the conditions under which water could be taken and any obligations that the user has towards third parties[339]. This recognised that impacts on third parties arise due to the use of the resource, not holding an entitlement or allocation[340]. Standards and conditions should be assumed to change over time, either by specifying that altered conditions will be automatically triggered when certain thresholds are met or by imposing a cost on a third party until a management plan is put in place to address changed conditions[341]. Some externalities may be addressed by a separate tradable instrument. Examples in the context of water resources management is salinity credits[342] [343], and channel capacity shares[344]. Use licences, allocation plans and resource plans would need to be regularly reviewed in a way that was fair and efficient, and minimised uncertainty so as not to discourage investment[345].

Robust separation has obvious appeal to the fishery, which provided some of the foundational ideas for robust separation (e.g. the development of ITQs)[346]. Indeed, Young had proposed a similar approach in relation to reforms in the New South Wales (NSW) fisheries in the 1990s[347]. A later, more generalised paper on fisheries by Townsend, McColl and Young sought to advance understanding of how ITQs could be designed to reduce transaction costs by unbundling attributes of the resource and through institutional design.

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[337] Ibid. p36.
[338] Young, M. D. and J. C. McColl (2005). "Defining Tradeable Water Entitlements and Allocations - A Robust System." Canadian Water Resources Journal **30**(1): 65-72. p72.
[339] Young, M. D. and J. C. McColl (2002). Robust Separation: A Search for a Generic Framework to Simplify Registration and Trading of Interests in Natural Resources, Commonwealth Scientific and Industrial Research Organisation**:** 1-48. pp39-40.
[340] Ibid. p39.
[341] Ibid. p40.
[342] Ibid. p39.
[343] See also the argument for market in salinity credits in the Australian water resources management context in Young, M. D. and J. C. McColl (2003). "Robust reform: The Case for a New Water Entitlements System for Australia." Australian Economic Review **36**(2): 225-234. p228.
[344] Young, M. D. and J. C. McColl (2002). Robust Separation: A Search for a Generic Framework to Simplify Registration and Trading of Interests in Natural Resources, Commonwealth Scientific and Industrial Research Organisation**:** 1-48. p44.
[345] Young, M. D. and J. C. McColl (2005). "Defining Tradeable Water Entitlements and Allocations - A Robust System." Canadian Water Resources Journal **30**(1): 65-72.p71.
[346] A number of references to equivalent issues in fisheries appear in Young, M. D. and J. C. McColl (2002). Robust Separation: A Search for a Generic Framework to Simplify Registration and Trading of Interests in Natural Resources, Commonwealth Scientific and Industrial Research Organisation**:** 1-48.
[347] Young, M. D. (1999). "The Design of Fishing-Right Systems: the NSW Experience." Ecological Economics **31**: 305-316.

First, and at its simplest, they argued that an ITQ[348] should be defined as a permanent entitlement to a share of the TAC for target stocks. The TAC would be varied in accordance with stock assessments. Subquotas could be set for seasons or specific areas or individual sizes. Bycatch quotas could be set for important bycatch species. Ownership and any encumbrances would be made clear in a central registry, further reducing transaction costs relating to transfers.

Townsend et al. noted that defining entitlements as a share would spread risk. Where entitlements were defined by catch volume, a central authority – the fishery manager or government agency – would need to trade annual allocations to adjust the TAC, which places all the risk on the central authority[349].

Second, annual quota allocations against ITQs should be determined on the basis of the TAC for the current year (or fishing season) and the size of the entitlement share held. Allocations would be transferable to maximise economic value. Transferability would also allow short term and long term adjustments to fleet capacity. An important implementation issue is whether allocations can be carried forward or brought forward between periods. Allowances for carry overs would reduce uncertainty and allow catches to better match market conditions[350].

Third, as ITQs are not able to deal with all externalities, licences to fish would likely still be required in order to place conditions on fishing activity. These could include individual size limits, mesh size and other gear limitations, as well as spatial and temporal restrictions. These externalities are not directly related to the volume of fish caught so should be separated from the entitlements and allocations for target stocks[351].

Townsend et al.'s proposal did not address objectives at different scales but it can be assumed that at the system level scale, Young and McColl's proposed resource management plans (environmental objectives), trading protocols (economic objectives) and allocation plans (social objectives) would be an integral part of the management system. This is certainly the case in New Zealand's quota management system, which very closely resembles robust separation in action[352].

2.3.6 Conclusion

This section traced the emergence of holistic approaches to addressing social-ecological complexity, most notably ecosystems approaches to fisheries. It argued that the theoretical rationale for property

[348] Townsend et al suggest also that Individual transferable effort, or individual transferable input, could be substituted for ITQs if they were demonstrably more efficient. Townsend, R. E., J. McColl and M. D. Young (2006). "Design principles for individual transferable quotas." Marine Policy **30**(2): 131-141. p139.
[349] See for example the experience in New Zealand which forced a change from volumetric ITQs to ITQs defined as shares in a variable TAC. Stewart, J. and J. Leaver (2015). "Efficiency of the New Zealand annual catch entitlement market." Ibid. **55**: 11-22. pp11-2.
[350] Townsend, R. E., J. McColl and M. D. Young (2006). "Design principles for individual transferable quotas." Ibid. **30**(2): 131-141. pp133-4.
[351] Ibid. p134-5.
[352] Ibid. p138-9.

rights as a solution to common pool resources problems does not fully address social-ecological complexity and that property rights must therefore be part of a broader governance framework. The robust separation of instruments matched to environmental, economic and social objective was offered as a framework in which to situate rights-based instruments in such a framework.

2.4 The transboundary fisheries problem

2.4.1 Introduction

So far this chapter has considered the generalised fisheries problem. This section turns to the problem of transboundary fisheries. By definition, the range of a transboundary stock extends across maritime boundaries, and to varying degrees those stocks *move* across boundaries, influenced by a range of environmental factors, including changes in sea temperatures, currents and the abundance of prey. The common pool resource problem is thus extended to an international scale. Transboundary stocks include straddling stocks[353], highly migratory species[354], some marine mammals[355], anadromous species[356] and catadromous species[357]. The international legal regime governing transboundary stocks comprises a range of international and regional agreements, chief of which are the 1982 Convention on the Law of the Sea (LOSC)[358] and the 1995 UN Fish Stocks Agreement (UNFSA)[359]. While LOSC delivered the vast majority of the world's fisheries to the jurisdictions of coastal States, the zonal approach that it established adds further complexity to the management of those stocks. It also arguably embeds multiple fisheries management objectives and the inherent conflicts between them.

International fisheries law aims to address some of these challenges by recognising the various interests in transboundary fisheries through: requirements for cooperation between interested States; the

[353] While the term straddling stocks does not appear in LOSC, it is a term generally accepted as referring to those covered by Article 63, that is, the same stocks or stocks of associated species occurring in more than one EEZ or in both an EEZ and in areas adjacent to and beyond the EEZ.
[354] A list of highly migratory species is contained in United Nations Convention on the Law of the Sea (LOSC). Agreed on 10 December 1982. Entered into force on 16 November 1994, United Nations. Annex I.
[355] The provisions in LOSC Article 65 relating to marine mammals are limited to requiring States to cooperate in their conservation, recognising the role of other international organisations and adding no further obligations beyond those already contained in Part V. Through Article 120, Article 65 also applies to marine mammals on the high seas.
[356] LOSC Article 66 contains provisions relating to anadromous species (that is, species that migrate up rivers to spawn), giving primary interest and responsibility to the States in whose rivers the stocks originate (Article 66(1)). The State of origin is required to consult and cooperate with other States fishing for those stocks (Article 66(2), (3) and (5)) and with States through whose EEZ such stocks migrate (Article 66(4)).
[357] LOSC Article 67(2) restricts fishing for catadromous species (that is, species that migrate down rivers to spawn in the ocean) to the landward side of the outer limits of EEZs and in accordance with other provisions in LOSC relating to fishing on EEZs, and requires that coastal States to whose EEZs catadromous species migrate, shall agree on the "rational management of the species" (Article 67(3)).
[358] United Nations Convention on the Law of the Sea (LOSC). Agreed on 10 December 1982. Entered into force on 16 November 1994, United Nations.
[359] Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UNFSA), United Nations, Treaty Series Vol. 2167.

compatibility of rules applying in different jurisdictions; and by providing a basis for ecosystems approaches to fisheries.

This section first briefly introduces the historical context of maritime jurisdictions. It then examines the zonal approach of the international law of the sea, noting the key differences in rights and responsibilities of States in each zone, and briefly considers some of its implications for the governance of transboundary fish stocks, with an emphasis on highly migratory stocks. It then highlights the presence of multiple objectives set out in LOSC for two key zones – the exclusive economic zone and the high seas. Finally, the section outlines how international fisheries law attempts to deal with these implications with reference to UNFSA[360] and the FAO *Code of Conduct for Responsible Fisheries*[361].

2.4.2 Historical developments

One of the most enduring principles of the international law of the sea has been the freedom of the high seas, and with it the freedom to exploit the resources therein – including fisheries[362] [363]. Since Dutch scholar Hugo Grotius sought, through his 16th Century work *Mare Liberum*, to overcome the closed seas of the Spanish and Portuguese empires[364], the freedom of the high seas has remained a key principle of maritime law. However, as States have realised that unrestrained freedoms could be detrimental to their own interests, greater assertion of coastal State jurisdiction and interests has both steadily eroded the extent of the high seas and increasingly qualified the freedoms of the remaining areas of the high seas.

In 1635, Selden challenged the notion of unrestrained freedom by asserting Britain's dominion over the waters around the British Isles but it was not until 67 years later that the idea of a three mile limit – the distance of a cannon shot – was proposed as an outer limit to maritime sovereignty[365].

[360] Ibid.
[361] FAO (1995). Code of Conduct for Responsible Fisheries (Code of Conduct). Adopted on 31 October 1995 at the twenty-eighth session of the FAO Conference by Resolution 4/95. Food and Agriculture Organisation of the United Nations. Rome.
[362] Hey, E. (1989). The Regime for the Exploitation of Transboundary Marine Fisheries Resources. Dordrecht, Boston, London, Martinus Nijhoff Publishers.. pp5-11. See also Hannesson, R. (1991). "From common fish to rights based fishing: fisheries management and the evolution of exusive rights to fish." Eurpoean Economic Review **35**(2-3): 397-407.
[363] See also Borg, S. (2012). Conservation on the High Seas: Harmonizing International Regimes for the Sustainable Use of Living Resources. Cheltenham UK, Northampton, USA, Edward Elgar. pp96-101.
[364] The 1494 Treaty of Tordesillas, given effect by papal bull, effectively divided the seas into Spanish and Portuguese realms. See Paine, L. (2013). The Sea and Civilisation: A Maritime History of the World. New York, Alfed A. Knopf. p397.
[365] Rothwell, D. R. and T. Stephens (2016). The International Law of the Sea. Oxford, Bloomsbury. Pp62-3. On debate in the 17th Century see also Paine, L. (2013). The Sea and Civilisation: A Maritime History of the World. New York, Alfed A. Knopf. pp444-7.

The 1882 North Seas Fisheries Convention was likely the first treaty between fishing States to attempt to regulate high seas fishing[366], and reflected the growing recognition of coastal States' rights over the waters within three nautical miles of the low water mark. The Behring Sea (Fur Seal) Arbitration a few years later established, among other things, that the freedom of fishing beyond the three mile limit should be qualified by the need not to undermine others' enjoyment of the same right, and that it was possible to constrain the freedom of fishing on the high seas in order to conserve marine resources there as long as participants willingly consented to those constraints[367]. Importantly, the 1882 Convention and the Behring Sea Arbitration set out some important measures that remain key instruments of transboundary (and domestic) fisheries management today, including licensing arrangements, spatial and temporal closures, information exchange and vessel identification[368].

As competition for fisheries resources increased following the Second World War, several coastal States asserted jurisdiction (including in relation to fishing) over territorial waters extending up to 12 nautical miles from their coasts[369]. While coastal States' jurisdiction over fisheries exploitation and regulation in their territorial seas was codified in the 1958 *Convention on the Territorial Sea and Contiguous Zone*[370], it left undetermined the outer limit of the zone.

Freedom of fishing on the high seas, and thus exclusive flag State jurisdiction, was preserved in the 1958 *Convention on the High Seas*[371] with a concomitant obligation in the 1958 *Convention on Fishing and the Conservation of Living Resources of the High Seas*[372] requiring States fishing the same stocks to cooperate on their conservation. This suite of conventions therefore provided little basis for the assertion of coastal State jurisdiction over fish stocks beyond those clearly restricted to inshore areas. As fishing began to industrialise, the 1958 Conventions provided little protection for offshore fish stocks, many of which suffered the consequences of open access.

However, as early as the mid-1940s some coastal States started to claim, at first controversially, jurisdictional rights to fish in waters up to 200 nautical miles from their coasts. By the 1970s, such

[366] This refers to the International Convention for regulating the policing of the North Sea fisheries outside territorial waters (the North Seas Fisheries Convention). Agreed 6 May 1882 between the United Kingdom, Denmark Germany, Netherlands, Belgium and France. Entered into force 18 May 1884, terminated 26 September 1976. Borg notes, the Convention "established progressive measures to address depletion of stocks harvested on the high seas" beyond a three nautical mile territorial limit. See Borg, S. (2012). Conservation on the High Seas: Harmonizing International Regimes for the Sustainable Use of Living Resources. Cheltenham UK, Northampton, USA, Edward Elgar. p96.

[367] See ibid. p97-8.

[368] Ibid. p97.

[369] See for example the gradual extension of maritime claims by Iceland, documented in Kurlansky, M. (1999). Cod: A Biography of the Fish that Changed the World. London, Vintage. pp158-73.

[370] Convention on the Territorial Sea and Contiguous Zone. Agreed on 29 April 1958, Gevena. Entered into force on 10 September 1964. UN Treaty Series. **516 (7477)**.

[371] Convention on the High Seas. Agreed on 29 April 1958, Geneva. Entered into Force on 30 September 1962. UN Treaty Series. **450(6465)**.

[372] Convention on Fishing and Conservation of the Living Resources of the High Seas. Agreed on 29 April 1958, Geneva. Entered into force on 20 March 1966. UN Treaty Series. **559 (8164)**.

claims had become widespread, culminating in the codification of the 200nm exclusive economic zone (EEZ) in the 1982 *Convention on the Law of the Sea* (LOSC)[373]. LOSC established an international legal basis for coastal States' sovereign rights over, among other things, the living resources of their EEZs[374], and sovereignty over their territorial seas and internal and archipelagic waters and the fisheries within them[375], while largely preserving freedom of fishing in areas beyond national jurisdiction[376].

Reflecting on these developments, legal scholars became increasingly concerned that international law conflated territorial rules with those governing the use of the living and non-living resources of the sea. Johnston argued in 1965 that "different uses of the seas involve different problems and considerations that are sufficiently distinct to require separate treatment"[377]. Further, the "traditional regimes of the high seas and the territorial sea – especially the territorial sea – are impediments to clear thinking and feasible suggestions by those concerned with rationalising the use of the oceans"[378]. LOSC thus established a zonal approach to oceans governance that juxtaposes freedom of fishing on the high seas with coastal State jurisdiction in EEZs and sovereign waters.

2.4.3 The Zonal Approach of the Law of the Sea

This subsection outlines the basis for each type of maritime zone and the broad rights and responsibilities of States within each.

Internal Waters, Territorial Sea and Archipelagic Waters

Three maritime zones can be regarded as part of the sovereign territory of a coastal State. First, LOSC Article 2 provides that a coastal State's sovereignty extends over its internal waters, (that is, waters landward of baselines[379] determined in accordance with Articles 5 and 7). Second, an archipelagic State[380] enjoys sovereignty over its archipelagic waters[381], that is, waters landward of baselines drawn in accordance with Article 47. Third, LOSC confirmed that a coastal State's territorial sea extends up to 12 nautical miles seaward from baselines[382].

A coastal State's sovereignty therefore extends over the living resources located in its territorial sea, internal waters and, in the case of archipelagic States, archipelagic waters. The coastal State also has

[373] United Nations Convention on the Law of the Sea (LOSC). Agreed on 10 December 1982. Entered into force on 16 November 1994, United Nations. Articles 55 & 57.
[374] LOSC Article 56(1)(a).
[375] LOSC Article 2(1).
[376] LOSC Article 87(1)(e).
[377] Johnston, D. M. (1987). The International Law of Fisheries. New Haven/Dordrecht, New Haven Press/Martinus Nijhoff Publishers. Pxvi.
[378] Ibid. p463.
[379] LOSC Article 8.
[380] Defined in LOSC Article 46.
[381] LOSC Article 49.
[382] LOSC Articles 3 and 4, and with respect to archipelagic States, Article 48.

sovereignty over highly migratory stocks as they pass through those waters[383]. In addition, Article 33(1) permits coastal States to exercise necessary controls to prevent and punish any "infringement of its customs, fiscal, immigration or sanitary laws and regulations within its territory or territorial sea" in a contiguous zone[384] extending 24 nautical miles from the same baselines used to determine the territorial sea.

Without prejudice to its sovereignty over its archipelagic waters[385], Article 51(1) obliges archipelagic States to "recognise the traditional fishing rights and other legitimate activities of the immediately adjacent neighbouring States in certain areas falling within archipelagic waters" and that this may be "regulated by bilateral agreements". This appears to be the only substantive limit on an archipelagic State's sovereignty over its archipelagic waters[386].

Sovereignty confers substantial powers on coastal States. While all ships have a right of innocent passage[387] through another State's territorial sea[388] and archipelagic waters[389], they are not permitted to load or unload "any commodity…contrary to the customs, fiscal or sanitary laws and regulations of the coastal State"[390], or conduct any fishing activities[391]. Coastal States are also permitted to adopt laws consistent with LOSC and other rules of international law in relation to, inter alia, "the conservation of marine living resources of the sea"[392]; "the prevention of infringement of the fisheries laws and regulations of the coastal State"[393]; and "the preservation of the environment of the coastal State…"[394]. Beyond these provisions, LOSC is silent on the rights and obligations of States within sovereign waters in relation to fisheries[395], suggesting that coastal States have largely unfettered rights to regulate for the

[383] Hey, E. (1989). The Regime for the Exploitation of Transboundary Marine Fisheries Resources. Dordrecht, Boston, London, Martinus Nijhoff Publishers. p46.
[384] With respect to archipelagic States, LOSC Article 48 states that "The breadth of the territorial sea, the contiguous zone, the exclusive economic zone and the continental shelf shall be measured from archipelagic baselines drawn in accordance with article 47".
[385] LOSC Article 49.
[386] Johnston, D. M. (1987). The International Law of Fisheries: A Post-Classical Review and Assessment. The International Law of Fisheries. New Haven/Dordrecht, New Haven Press/Martinus Nijhoff Publishers**:** XXV-LXXX. pLVI.
[387] In accordance with Articles 18 (Meaning of passage) and 19 (Meaning of innocent passage).
[388] LOSC Article 17.
[389] LOSC Article 52.
[390] LOSC Article 19(2)(g).
[391] LOSC Article 19(2)(i).
[392] LOSC Article 21(1)(d).
[393] LOSC Article 21(1)(e).
[394] LOSC Article 21(1)(f).
[395] Tsamenyi, M. and Q. Hanich (2012). "Fisheries Jurisdiction under the Law of the Sea Convention: Rights and Obligations in Maritime Zones under the Sovereignty of Coastal States." The International Journal of Marine and Coastal Law **27**(4): 783-793. p784.

management and conservation of fisheries, including transboundary stocks[396], within maritime zones that are subject to their sovereignty.

Exclusive economic zone

Perhaps the most significant jurisdictional innovation of LOSC was the establishment under Part V of exclusive economic zones (EEZs) beyond and adjacent to coastal States' territorial seas[397] in an area extending up to 200 nautical miles from baselines[398].

The development of the concept of the EEZ since the 1950s[399] reflects "the seminal idea" of the special interests of coastal States on the conservation of the living resources of what was at the time the high seas adjacent to their territorial seas[400]. This idea, although hotly contested by fishing States in favour of freedom of fishing on the high seas[401], was an important influence on the language of 1958 Geneva Convention on Fishing and Conservation of the Living Resources of the High Sea[402], discussed in the previous section.

Variations on the 1958 provisions eventually appeared in LOSC, thanks in part to the persistence of Latin American States, which viewed the 1958 Convention's limitations on coastal States' special interests as excessive[403].

LOSC Part V [404] contains a number of provisions relating to the conservation and utilisation of marine living resources within coastal States' EEZs. LOSC Article 56(1)(a) grants sovereign rights, rather than sovereignty, to a coastal State over the living and non-living resources in its EEZ[405]. Coastal States may,

[396] Hey, E. (1989). The Regime for the Exploitation of Transboundary Marine Fisheries Resources. Dordrecht, Boston, London, Martinus Nijhoff Publishers. p46.
[397] LOSC Article 55.
[398] LOSC Article 57.
[399] A coastal State's right to establish an EEZ is generally regarded as having its genesis the International Technical Conference on the Conservation of the Living Resources of the Sea, held in Rome in 1955. UN (1955). Report of the Technical Conference on the Conservation of the Living Resources of the Sea, Rome.
[400] Nelson, D. (1999). The Development of the Legal Regime of High Seas Fisheries. International Law and Sustainable Development: Past Achievements and Future Challenges. A. Boyle and D. Freestone. Oxford, Oxford University Press**:** 113-134. pp117.
[401] Ibid. p116.
[402] In particular Article 6. Convention on Fishing and Conservation of the Living Resources of the High Seas. Agreed on 29 April 1958, Geneva. Entered into force on 20 March 1966. UN Treaty Series. **559 (8164)**.
[403] Nelson, D. (1999). The Development of the Legal Regime of High Seas Fisheries. International Law and Sustainable Development: Past Achievements and Future Challenges. A. Boyle and D. Freestone. Oxford, Oxford University Press**:** 113-134. p118.
[404] LOSC Part V covers Articles 55 to 75.
[405] LOSC Article 56: "(1) In the [EEZ], the coastal State has sovereign rights for the purpose of exploring and exploiting, conserving and managing the natural resources, whether living or non-living, of the waters superjacent to the seabed and of the seabed and its subsoil, and with regard to other activities for the economic exploitation and exploration of the zone, such as the production of energy from the water, currents and winds".

under Article 73(1), take certain types of actions[406] to ensure compliance with any laws or regulations it may impose in pursuit of these rights.[407] Further, the coastal State has, according to Article 56(1)(b), jurisdiction under the Convention with regard to, inter alia, "(iii) the protection and preservation of the marine environment".

The nationals of other States who fish in a coastal State's EEZ must comply with the conservation and management measures (CMMs) and laws and regulations of the coastal State, in accordance with Article 62(4), which contains a substantial non-exhaustive list of issues on which a coastal State may adopt CMMs, and other laws and regulations, including relating to licensing, quotas, species, seasons, gear, fees and enforcement. This is tempered slightly by a requirement that coastal States adopt CMMs, taking into account the best scientific evidence available, to avoid overexploitation of living resources in their EEZ[408].

Coastal States also have the right under Article 61(1) to "determine the allowable catch of the living resources in its [EEZ]" and "promote the objective of optimum utilisation of the living resources" in their EEZs (Article 62(1)). Coastal States are required to determine their capacity to harvest stocks and where that capacity is insufficient to harvest the total allowable catch shall give other States access to the surplus (Article 62(2)). Given the coastal State has the right to determine both the total allowable catch and its capacity to catch it, the provisions place considerable power in the hands of coastal States to control access to fisheries in their EEZs[409] [410].

Continental shelf

A coastal State enjoys sovereign rights to explore and exploit the natural resources of the continental shelf[411], specifically the non-living resources of the seabed and subsoil and sedentary species[412] [413]. In

[406] Including the right to "…take such measures, including boarding, inspection, arrest and judicial proceedings, as may be necessary to ensure compliance with the laws and regulations adopted by it…" in pursuit of its rights under Article 56(1)(a).
[407] Subject to the conditions in LOSC Article 73 (2), (3) and (4).
[408] LOSC Article 61(2).
[409] Hey argues that these provisions in LOSC, including those relating to dispute settlement (Article 297(3)), do not establish a right of other states to participate in the fisheries of a coastal state's EEZ. Hey, E. (1989). The Regime for the Exploitation of Transboundary Marine Fisheries Resources. Dordrecht, Boston, London, Martinus Nijhoff Publishers. Pp47-8.
[410] Should it give other States access to the living resources of its EEZ, a coastal State must "take into account all relevant factors, including, inter alia, the significance of the living resources of the area to the economy of the coastal State concerned and its other national interests, the provisions of Articles 69 and 70, the requirements of developing States in the subregion or region in harvesting part of the surplus and the need to minimize economic dislocation in States whose nationals have habitually fished in the zone or which have made substantial efforts in research and identification of stocks" (LOSC Article 62(3)).
[411] LOSC Article 77(1).
[412] LOSC Article 77(4).
[413] The case of the invasive but economically valuable snow crab in the Barents Sea illustrates some of the implications of the species' definition as a sedentary species and the assertion by Norway and Russia over extended continental shelves in the Barents Loophole, which is otherwise regarded as a high seas pockets. See

terms of marine living resources, the delimitation of the continental shelf[414], has therefore had an influence only on sedentary species beyond the 200nm limit, not on species in the superjacent waters[415], which are covered by provisions relating to the high seas.

High seas

The high seas comprise all those parts of the sea beyond the EEZ, territorial sea, internal waters or archipelagic waters[416]. In contrast to the exclusive rights enjoyed by coastal States in their EEZs, the freedom of fishing on the high seas was preserved for all States by Article 86(1)(e). No State may subject any area of the high seas to its sovereignty[417], leaving flag State jurisdiction as the only substantive source of control over activities on the high seas. A flag State is required to "effectively exercise its jurisdiction and control in administrative, technical and social matters over vessels flying their flag"[418] and to take measures for their nationals for the conservation of living resources of the high seas[419].

A fishing State's freedom of fishing on the high seas is not absolute. As noted above, the requirement that States consider each other's interests was established in the Behring (Fur Seals) Case in 1893 and confirmed by the Icelandic Fisheries Cases in the mid-1970s[420]. LOSC codifies this qualification on the freedom of fishing by requiring that the freedom of fishing "be exercised…with due regard for the interests of other States in their exercise of the freedom of the high seas…"[421]. "Due regard" is similar to good neighbourliness or the concept of reasonable use[422], which suggests that one State's exercise of

the discussion in Kaiser, B. A., M. Kourantidou and L. Fernandez (2018). "A case for the commons: The Snow Crab in the Barents." Journal of Environmental Management **210**: 338-348.

[414] LOSC Article 76(1): The continental shelf of a coastal State comprises the seabed and subsoil of the submarine areas that extend beyond its territorial sea throughout the natural prolongation of its land territory to the outer edge of the continental margin, or to a distance of 200 nautical miles from the baselines…where the outer edge of the continental margin does not extend up to that distance", subject to the limits contained in Article 76(3)-(7) and Article 83 on the delimitation of the continental shelf between States with opposite or adjacent coasts.

[415] LOSC Article 78(1).

[416] LOSC Article 86.

[417] LOSC Article 89.

[418] LOSC Article 94(1).

[419] LOSC Article 117.

[420] Fisheries Jurisdiciton (United Kingdom v. Iceland), Merits, Judgment. ICJ Reports, International Court of Justice. **1974:** 3. para 79(4); Fisheries Jurisdiction (Federal Republic of Germany v. Iceland), Merits, Judgment. ICJ Reports, International Court of Justice. **1974:** 175. para 77(4).

[421] LOSC Article 87(2).

[422] Borg, S. (2012). Conservation on the High Seas: Harmonizing International Regimes for the Sustainable Use of Living Resources. Cheltenham UK, Northampton, USA, Edward Elgar. p35.

its rights should not impinge upon the same right of other States[423] [424] and that one State's interests are not subordinate to another's[425].

In addition, the freedom of fishing on the high seas is subject to States' treaty obligations[426], "the rights and duties as well as the interests of coastal States provided for, inter alia, in article 63, paragraph 2, and articles 64 to 67"[427] as well as the remaining provisions of Part VII Section 2[428]. States fishing on the high seas are also required implicitly[429] to determine an allowable catch, and to adopt conservation measures for the living resources in the high seas that, inter alia, are designed to "maintain or restore populations of harvested species at levels which can produce the maximum sustainable yield" subject to economic and environmental qualifications.[430]

2.4.4 Implications of the zonal approach for transboundary fisheries governance

Prior to its entry into force, some scholars assessed that LOSC had effectively resolved the problem of unrestricted fishing on the high seas because the establishment of EEZs gave coastal States jurisdictional rights over 90% of commercial marine fish stocks[431] [432]. Although LOSC[433] represented a major break from classical[434] and neo-classical[435] traditions of international law, its zonal framework arguably did little to address these criticisms. As McDougall noted, LOSC "protects the two extremes

[423] Ibid. pp30-3.
[424] Johnston, D. M. (1987). The International Law of Fisheries. New Haven/Dordrecht, New Haven Press/Martinus Nijhoff Publishers. pp303-17.
[425] See Nelson, D. (1999). The Development of the Legal Regime of High Seas Fisheries. International Law and Sustainable Development: Past Achievements and Future Challenges. A. Boyle and D. Freestone. Oxford, Oxford University Press**:** 113-134. p123.
[426] LOSC Article 116(a).
[427] LOSC Article 116(b).
[428] That is, LOSC Articles 117 to 120, in accordance with Article 116(c).
[429] The duty is implicit because the provision in LOSC Article 119(1) starts "In determining the allowable catch and establishing any other conservation measures for living resources in the high seas, State shall…".
[430] LOSC Article 119(1)(a).
[431] Hey, E. (1989). The Regime for the Exploitation of Transboundary Marine Fisheries Resources. Dordrecht, Boston, London, Martinus Nijhoff Publishers. p1.
[432] Recent analysis estimates that the high seas account for just 4.2% of global marine capture fisheries by volume. Schiller, L., M. Bailey, J. Jacquet and E. Sala (2018). "High seas fisheries play a negligible role in addressing global food security." Science Advances **14**(8).
[433] United Nations Convention on the Law of the Sea (LOSC). Agreed on 10 December 1982. Entered into force on 16 November 1994, United Nations.
[434] According to Johnston, classical approaches to international law "consisted of the virtues of clarity, consistency, certainty, balance, simplicity, uniformity, and rationality" and valued "equality and reciprocity": Johnston, D. M. (1987). The International Law of Fisheries: A Post-Classical Review and Assessment. The International Law of Fisheries. New Haven/Dordrecht, New Haven Press/Martinus Nijhoff Publishers**:** XXV-LXXX. pXXVII.
[435] In the years between and following the two World Wars, neoclassicism emerged with the essence of classicism largely intact "tempered by a growing awareness of the need for international law to serve purposes of global diplomacy and bureaucracy" and the growing role (in the form of the International Law Commission), of "private, but publicly endorsed, scholars…exposed to the vagaries of the political arena": ibid. pXXVII.

of exclusive monopoly for coastal States in some areas and of arbitrary unorganised inclusive access for all States in other areas…" and creates "irrational geographic compartmentalisations…"[436].

Despite many shortcomings, Johnston viewed LOSC as a "masterpiece of clever compromises"[437] in the post-classical era of international law[438] and "a spectacular triumph for participatory democracy in the world community"[439]. Most significantly, the establishment of the 200nm exclusive economic zone reflected an attempt to balance the desire of distant water fishing States to preserve the freedom of fishing on one hand and attempts by coastal States to extend territorial sea provisions to their EEZs[440].

Those compromises – manifested mainly in the zonal framework of LOSC – add considerably to the complexity of offshore fisheries but reflect what was likely to be the best possible outcome given the diversity of interests and the level of support for LOSC[441]. First, and most obviously, the mobility of stocks between zones means that harvests in one zone could reduce the potential harvests in other zones. Migratory stocks harvested in one zone are rivalrous with respect to the interests of other States seeking to harvest the same stocks in another zone. The ability of one State's actions to affect the interests of another was a significant preoccupation of coastal States when coastal State jurisdiction was restricted to their territorial waters. LOSC thus arguably shifted the locus of disputes between coastal States and DWFNs from the margins of the territorial sea to areas of the high seas adjacent to EEZs[442] [443].

Second, rules applying in each zone are likely to be different and possibly inconsistent with each other. LOSC firmly places the duty to establish CMMs on individual fishing and coastal States, presenting the very real likelihood that each State will produce its own CMMs. This presents the very real risk that such rules will be inconsistent with each other. Fisheries governance arrangements must therefore be able to reconcile the different rights and responsibilities under international law pertaining to

[436] McDougall, M. S. Ibid. Foreword. D. M. Johnston**:** vii-xi. Pvii.
[437] Johnston, D. M. Ibid.The International Law of Fisheries: A Post-Classical Review and Assessment**:** XXV-LXXX. pXXX.
[438] See further ibid. ppXXIX-XXXII.
[439] A key element of this post-classical Convention context was the emergence and participation in the process of many newly independent and developing states. Ibid. pXXX-XXXI.
[440] Johnston, D. M. (1987). The International Law of Fisheries. New Haven/Dordrecht, New Haven Press/Martinus Nijhoff Publishers. ppLVI-LVII.
[441] As at 1 July 2019 168 states had ratified or acceded to LOSC. UN DOALOS. (2020, 12 February 2020). "Status of the United Nations Convention on the Law of the Sea, the Agreement relating to the Implementation of Part XI of the Convention and the Agreement for the Implementation of the Provisions of the Convention relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, as at 31 July 2019." Retrieved 19 April, 2021, from https://www.un.org/Depts/los/reference_files/UNCLOS%20Status%20table_ENG.pdf.
[442] See the conflicts described in Miles, E. L. and W. L. Burke (1989). "Pressures on the United Nations convention on the law of the sea of 1982 arising from new fisheries conflicts: The problem of straddling stocks." Ocean Development & International Law **20**(4): 343-357.
[443] Nelson, D. (1999). The Development of the Legal Regime of High Seas Fisheries. International Law and Sustainable Development: Past Achievements and Future Challenges. A. Boyle and D. Freestone. Oxford, Oxford University Press**:** 113-134. p119.

transboundary stocks in each maritime zone if those rights and responsibilities are to support the effective management and conservation of the entire stock[444].

Third, multiple zones, means multiple States and therefore multiple diverse interests, adding further complexity to the already diverse interests within each jurisdiction. The most obvious aspect of this diversity is simply the rivalrous claims to transboundary stocks. As noted above, the establishment of EEZs was expected to deliver substantial benefits to coastal States at the expense of DWFNs' pre-LOSC freedom to fish on the high seas[445]. While that expectation has largely been borne out, it is conceivable that strong regulations within in an EEZ could push fishing effort onto the high seas or to a less-well governed EEZ.

A further aspect of diversity relates to the different levels of development or dependence on the fisheries of interested States. Developing coastal States, and their coastal communities, are particularly vulnerable to the effects of overfishing[446]. Their governments often lack the resources to secure an equitable share of the returns from their fisheries[447] but their populations are often more dependent on fisheries resources for livelihoods and food and nutrition security than those in developed countries[448].

Developing States may also be fishing states. In 2012, developing States accounted for around 60 percent of global fish exports by live weight and 54 percent by value[449]. Perhaps more importantly, capture fisheries employ around 40 million people, 90 percent of whom are engaged in small scale fishing[450]. The sustainable development discourse, particularly since the late 1980s, has increasingly

[444] See also "Matching Jurisdictional and EAF Boundaries" in Garcia, S. M., A. Zerbi, C. Aliaume, T. Do Chi and G. Lasserre (2003). The ecosystem approach to fisheries. Issues, terminology, principles, institutional foundations, implementation and outlook. FAO Fisheries Technical Paper. Rome, Food and Agriculture Organisation of the United Nations. **443:** 71. pp38-9.

[445] Hanich, Q., C. Schofield and P. Cozens (2009). Oceans of Opportunity? The Limits of Maritime Claims in the Western and Central Pacific. Navigating Pacific Fisheries: Legal and Policy Trends in the Implementation of International Fisheries Instruments in the Western and Central Pacific Region. Q. Hanich and M. Tsamenyi. Wollongong, Ocean Publications, Australian National Centre for Ocean Resources and Security (ANCORS), University of Wollongong**:** 21-50.

[446] Allison, E. H., B. D. Ratner, B. Åsgård, R. Willmann, R. Pomeroy and J. Kurien (2012). "Rights-based fisheries governance: from fishing rights to human rights." Fish and Fisheries **13**(1): 14-29.

[447] FAO and OECD (2015). Fishing for Development. FAO Fisheries and Aquaculture Proceedings No.36. Rome, Food and Agriculture Organisation of the United Nations (FAO); Organisation for Economic Cooperation and Development (OECD)**:** 1-59. pp20-1.

[448] See for example Charlton, K. E., J. Russell, E. Gorman, Q. Hanich, A. Delisle, B. Campbell and J. Bell (2016). "Fish, food security and health in Pacific Island countries and territories: a systematic literature review." BMC Public Health **16**(1): 285.

[449] FAO (2014). The State of World Fisheries and Aquaculture 2014: Opportunities and Challenges. Rome, The Food and Agriculture Organisation of the United Nations (FAO)**:** 243pp. p8.

[450] FAO and OECD (2015). Fishing for Development. FAO Fisheries and Aquaculture Proceedings No.36. Rome, Food and Agriculture Organisation of the United Nations (FAO); Organisation for Economic Cooperation and Development (OECD)**:** 1-59. p8.

recognised the particular interests of developing countries in the management of shared natural resources[451] [452].

In addition, LOSC contains particular provisions in relation to the rights of landlocked States and geographically disadvantaged States[453] "to participate, on an equitable basis, in the exploitation of an appropriate part of the surplus of the marine living resources" of coastal States' EEZs (Articles 69(1) and 70(1) respectively), subject to the conditions of the remainder of Articles 69 and 70[454].

A fourth and related factor is the absence of a single agent in which authority is vested to reconcile different rules and interests or to decide and impose fisheries management rules itself. States must agree on rules and, as a general principle of international law, cannot be bound by rules without their consent[455]. In a domestic context, a national government typically must balance the interests of its constituents but ultimately the government and parliament have authority to adopt rules that may not be supported by all constituents but nevertheless bind them[456].

In summary, LOSC establishes a zonal framework for the governance of the seas and allocates jurisdictional rights to each zone, including in relation to fisheries. An important question is whether the allocation of jurisdictional rights is a proxy for access to stocks. In the EEZ, this is likely to be the case but only to the extent that harvests in one EEZ do not affect the harvests of the same stock in an adjacent EEZ. On the high seas, this will only be the case if each fishing State's catches do not adversely affect the catches of other interested States, whether they are States fishing on the high seas or the fisheries interests of coastal States in adjacent EEZs.

[451] Azmi, K., R. Davis, Q. Hanich and A. Vrahnos (2016). "Defining a disproportionate burden in transboundary fisheries: Lessons from international law." Marine Policy **70**: 164-173.
[452] See further subsection 2.2.3 above.
[453] Defined in Article 70(2) as "coastal States, including States bordering enclosed or semi-enclosed seas, whose geographical situation makes them dependent upon the exploitation of the living resources of the exclusive economic zones of other States in the subregion or region for adequate supplies of fish for the nutritional purposes of their populations or parts thereof, and coastal States which can claim no exclusive economic zones of their own".
[454] In accordance with Article 71, Articles 69 and 70 do not apply when a coastal State's "economy is overwhelmingly dependent on the exploitation of the living resources" of its EEZ.
[455] International rules are adopted by agreement between states and can only be binding on states that consent to be bound. Borg, S. (2012). Conservation on the High Seas: Harmonizing International Regimes for the Sustainable Use of Living Resources. Cheltenham UK, Northampton, USA, Edward Elgar. pp5-6.
[456] States with federal structures, such as Australia, Canada and the United States, arguably face similar challenges of multiple jurisdictions. However, it is argued that, as domestic fisheries managed under federal jurisdictions are still under the interests of a single state, the degree of complexity is far lower than in international transboundary fisheries. That said, the federal structure of a state may be relevant in international fisheries governance in some instances, adding further complexity. See for example the management of Pacific Salmon stocks by Canada and the US discussed in Bailey, M., G. Ishimura, R. Paisley and U. R. Sumaila (2013). "Moving beyond catch in allocation approaches for internationally shared fish stocks." Marine Policy **40**: 124-136. p126.

2.4.5 Multiple objectives in international fisheries law

In establishing a State's rights, responsibilities and prohibitions, international fisheries law also embeds a diverse range of biological, ecological, economic and social objectives. This subsection aims to identify the apparent management objectives for transboundary fisheries – specifically straddling stocks and highly migratory stocks in exclusive economic zones (EEZs) and the high seas – based on a review of the UN Convention on the Law of the Sea (LOSC)[457] and the UN Fish Stocks Agreement[458].

Despite the many criticisms of MSY[459] [460] [461], the maintenance of stocks at, or restoration of stocks to, levels capable of producing MSY is an explicit biological objective of the management of fisheries within EEZs[462] and on the high seas[463] under LOSC. Within its biological scope, MSY is qualified by the need to take into account fishing patterns and the interdependence of stocks. But these are not the only qualifications and as such, MSY is merely a starting point for the identification of management objectives. Indeed, its character has evolved through the development of hard and soft law instruments over time such that it bears little resemblance to its original biological focus[464].

In relation to EEZs, coastal States are required to take measures to ensure "the maintenance of the living resources in the exclusive economic zone is not endangered by over-exploitation"[465]. Measures for target species, however, are to "be designed to maintain or restore populations of harvested species at levels which can produce the maximum sustainable yield, as qualified by relevant environmental and economic factors, including the economic needs of coastal fishing communities and the special requirements of developing States, and taking into account fishing patterns, the interdependence of stocks and any generally recommended international minimum standards, whether subregional,

[457] United Nations Convention on the Law of the Sea (LOSC). International Legal Materials 1982; 21: 1261 (1982). Opened for signature 10 December 1982. Entered into force 16 November 1994; Montego Bay, Jamaica.
[458] Agreement for the Implementation of the Provisions of the United Nations Convention of the Law of the Sea 10 December 1982, Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UNFSA). International Legal Materials 1995; 34: 1542. Opened for signature 4 August 1995. Entered into force on 11 December 2001. New York.
[459] Hey, E. (2012). "The Persistence of a Concept: Maximum Sustainable Yield." The International Journal of Marine and Coastal Law **27**(4): 763-771.
[460] Kompas, T. (2005). "Fisheries Management: Economic Efficiency and the Concept of Maximum Economic Yield." Australian Commodities **12**(1): 152-160.
[461] Larkin, P. A. (1977). "An epitaph for the concept of maximum sustainable yield." Transactions of the American Fisheries Society **106**(1): 1-11.
[462] LOSC Article 61(3).
[463] LOSC Article 119(1)(a).
[464] Lugten, G. and N. Andrew (2008). "Maximum Sustainable Yield of Marine Capture Fisheries in Developing Archipelagic States - Balancing Law, Science, Politics and Practice." The International Journal of Marine and Coastal Law **23**(1): 1-37. p2.
[465] LOSC Article 61(2): "The coastal State, taking into account the best scientific evidence available to it, shall ensure through proper conservation and management measures that the maintenance of the living resources in the exclusive economic zone is not endangered by over-exploitation. As appropriate, the coastal State and competent international organizations, whether subregional, regional or global, shall cooperate to this end."

regional or global"[466]. LOSC provides little assistance in the interpretation of the "environmental and economic factors" that qualify MSY[467]. Coastal States must only "take into consideration" the effect of fishing on associated or dependent species "with a view to maintaining or restoring populations of such associated or dependent species above levels at which their reproduction may become seriously threatened"[468].

Article 62(1), however, requires coastal States to "promote the objective of optimum utilization of the living resources in the exclusive economic zone without prejudice to article 61"[469]. Freestone notes that "optimum utilisation" is effectively defined by the qualified formulation of MSY in Article 61(3) and that this is framed as an obligatory objective[470].

The reference to "economic factors" opens the possibility that MSY could be adjusted to reflect MEY but there is no suggestion in LOSC that MEY would be an obligatory management objective. "Economic factors" is only elaborated upon by the reference to "the special requirements of developing States" for both the high seas and EEZs and the "economic needs of coastal communities" in EEZs. Both have the character of a social objective, which suggests that economic factors could include either economic (rent maximisation) or social (rent distribution) objectives.

While the optimisation of harvests at a qualified level of MSY is an objective in EEZs, conservation appears to be the primary objective on the high seas in LOSC[471]. Article 117 provides the most convincing evidence of this proposition, requiring all States "to take…measures for their respective nationals as may be necessary for the conservation of the living resources of the high seas". The qualifications on MSY for the high seas in Article 119(1)(a) are identical to those applying to EEZs, apart from the quite reasonable absence of the reference to "the economic needs of coastal fishing communities" that appears in Article 61(3)[472]. However, there is no equivalent requirement to "promote

[466] LOSC Article 61(3): "Such measures shall also be designed to maintain or restore populations of harvested species at levels which can produce the maximum sustainable yield, as qualified by relevant environmental and economic factors, including the economic needs of coastal fishing communities and the special requirements of developing States, and taking into account fishing patterns, the interdependence of stocks and any generally recommended international minimum standards, whether subregional, regional or global."
[467] Following Brown's characterisation – Brown, E.B. (1994). The International Law of the Sea. Dartmouth. Cited in Freestone, D. (1999). International Fisheries Law Since Rio: The Continued Rise of the Precautionary Principle. International Law and Sustainable Development: Past Achievements and Future Challenges. A. Boyle and D. Freestone. Oxford, Oxford University Press: 135-165. P147.
[468] LOSC Article 61(4): "In taking such measures the coastal State shall take into consideration the effects on species associated with or dependent upon harvested species with a view to maintaining or restoring populations of such associated or dependent species above levels at which their reproduction may become seriously threatened."
[469] LOSC Article 62(1).
[470] Freestone, D. (1999). International Fisheries Law Since Rio: The Continued Rise of the Precautionary Principle. International Law and Sustainable Development: Past Achievements and Future Challenges. A. Boyle and D. Freestone. Oxford, Oxford University Press: 135-165. p147.
[471] Ibid. p147.
[472] LOSC Article 119(1)"In determining the allowable catch and establishing other conservation measures for the living resources in the high seas, States shall: (a) take measures which are designed, on the best scientific

optimum the utilisation of living resources" of the high seas. Freestone argues that the duty in Article 119 to maintain or restore stocks to levels capable of producing a qualified MSY allows for the *potential* to harvest stocks at such levels but not an obligation to do so[473].

Ecological objectives for the high seas are set out in Article 119(1)(b), which uses the same language[474] as Article 61(4) does for EEZs. These provisions are backed by a general obligation in LOSC Part XXII to protect and preserve the environment[475] [476] [477].

In relation to stocks that straddle more than one EEZ, coastal States are not set any particular objective in addition to those that apply generally to stocks within an EEZ[478], other than to seek to agree with each other on measures to ensure their conservation and development[479]. Other than the reference in its preamble[480], LOSC does not contain any provisions requiring equity to be applied in such cases[481] but

evidence available to the States concerned, to maintain or restore populations of harvested species at levels which can produce the maximum sustainable yield, as qualified by relevant environmental and economic factors, including the special requirements of developing States, and taking into account fishing patterns, the interdependence of stocks and any generally recommended international minimum standards, whether subregional, regional or global".

[473] Freestone, D. (1999). International Fisheries Law Since Rio: The Continued Rise of the Precautionary Principle. International Law and Sustainable Development: Past Achievements and Future Challenges. A. Boyle and D. Freestone. Oxford, Oxford University Press**:** 135-165. p147.

[474] LOSC Article 119(1): "In determining the allowable catch and establishing other conservation measures for the living resources in the high seas, States shall (b) take into consideration the effects on species associated with or dependent upon harvested species with a view to maintaining or restoring populations of such associated or dependent species above levels at which their reproduction may become seriously threatened." See also ibid. p147. Note that the benchmark for the conservation of associated and dependent species is quite different from that for target species.

[475] LOSC Part XXII Article 192: "States have the obligation to protect and preserve the marine environment; and Article 193: "States have the sovereign right to exploit their natural resources pursuant to their environmental policies and in accordance with their duty to protect and preserve the marine environment".

[476] See the discussion on various interpretations of Part XII, from a narrow focus on marine pollution to one that more broadly includes other harmful impacts of human activities, including fishing, in Borg, S. (2012). Conservation on the High Seas: Harmonizing International Regimes for the Sustainable Use of Living Resources. Cheltenham UK, Northampton, USA, Edward Elgar. p103.

[477] See also Freestone, D. (1999). International Fisheries Law Since Rio: The Continued Rise of the Precautionary Principle. International Law and Sustainable Development: Past Achievements and Future Challenges. A. Boyle and D. Freestone. Oxford, Oxford University Press**:** 135-165. pp148-9.

[478] LOSC Article 63(1) applies "without prejudice to the other provisions of this Part".

[479] LOSC Article 63(1): "Where the same stock or stocks of associated species occur within the exclusive economic zones of two or more coastal States, these States shall seek, either directly or through appropriate subregional or regional organizations, to agree upon the measures necessary to coordinate and ensure the conservation and development of such stocks without prejudice to the other provisions of this Part."

[480] LOSC Preamble: "Recognizing the desirability of establishing through this Convention, with due regard for the sovereignty of all States, a legal order for the seas and oceans which will facilitate international communication, and will promote the peaceful uses of the seas and oceans, the equitable and efficient utilization of their resources, the conservation of their living resources, and the study, protection and preservation of the marine environment".

[481] A useful comparison is the 1997 *International Watercourses Convention*, of which Article 5 refers to the "equitable and reasonable utilisation" of shared watercourses. Convention on the Law of the Non-navigational Uses of International Watercourses. Adopted by the UN General Assembly as an Annex to UNGA Res. 51/229, New York, 21 May 1997. Entered into force 17 August 2014.

it appears reasonable to suggest that any allocation of access to the shared stock between relevant coastal States should be equitable,[482] in the absence of any other clear formula or principles.

Similarly, no harvest-related benchmark is offered for stocks that occur in both an EEZ and adjacent high seas areas, beyond a requirement that the coastal State and fishing States are to seek to agree on measures for their conservation in the adjacent high seas area[483] [484]. Here the objective is restricted to ensuring the conservation of the stock on the high seas, rather than the conservation *and development* of stocks within multiple EEZs[485]. However, Borg has argued that, in a post-UNCED world, "conservation" has come to embody "sustainable use" rather than "non-use"[486].

LOSC does set an explicit benchmark for highly migratory species by reiterating the objective of their optimum utilisation and conservation throughout their range and by also applying the remainder of Part V to those stocks[487]. Although there is no specific reference to equitable access to, or reasonable use of, highly migratory stocks, States have existing obligation in customary law to "pay due regard to the interests of other States in the conservation and equitable exploitation of…[high seas] resources"[488].

Notwithstanding the vague nature of the qualifications on MSY in LOSC, those qualifications have evolved to reflect an increasing recognition of the complexity of fisheries and the inadequacy of

[482] LOSC does not refer to "equity" or "equitable" in relation to access to shared fish stocks, other than in cases where LOSC "does not attribute rights or jurisdiction to the coastal State or to other States within the exclusive economic zone" (Article 59) or in relation to the delimitation of maritime boundaries between states with opposite or adjacent coasts (Article 74).

[483] LOSC Article 63(2): "Where the same stock or stocks of associated species occur both within the exclusive economic zone and in an area beyond and adjacent to the zone, the coastal State and the States fishing for such stocks in the adjacent area shall seek, either directly or through appropriate subregional or regional organizations, to agree upon the measures necessary for the conservation of these stocks in the adjacent area."

[484] The obligation to cooperate is further developed in UNFSA Article 8. While Article 8 does not include a duty to agree on measures, Article 7(2) requires that such cooperation be "for the purpose of achieving *compatible measures* in respect of…[straddling stocks and highly migratory stocks]…stocks" (emphasis added). UNFSA is discussed further below in this subsection and in subsection 1.4.6.

[485] Hey, E. (1989). The Regime for the Exploitation of Transboundary Marine Fisheries Resources. Dordrecht, Boston, London, Martinus Nijhoff Publishers. p54.

[486] Borg, S. (2012). Conservation on the High Seas: Harmonizing International Regimes for the Sustainable Use of Living Resources. Cheltenham UK, Northampton, USA, Edward Elgar. p15, and, in relation to "sustainable use" in the Convention on Biological Diversity, p108.

[487] LOSC Article 64(1): "The coastal State and other States whose nationals fish in the region for the highly migratory species listed in Annex I shall cooperate directly or through appropriate international organizations with a view to ensuring conservation and promoting the objective of optimum utilization of such species throughout the region, both within and beyond the exclusive economic zone. In regions for which no appropriate international organization exists, the coastal State and other States whose nationals harvest these species in the region shall cooperate to establish such an organization and participate in its work."

[488] Fisheries Jurisdiciton (United Kingdom v. Iceland), Merits, Judgment. ICJ Reports, International Court of Justice. **1974:** 3. para 77; Fisheries Jurisdiction (Federal Republic of Germany v. Iceland), Merits, Judgment. ICJ Reports, International Court of Justice. **1974:** 175. para 74.

traditional formulations of MSY[489]. A greater emphasis on integrated approaches and *sustainable development* can be seen in post-UNCED instruments[490], particularly UNFSA. Near identical language to that in LOSC Articles 119(1)(a), 61(3) and 62(1) can be found in UNFSA Article 5, which requires States "to conserve and manage straddling fish stocks and highly migratory fish stocks" both on the high seas and in areas within national jurisdiction[491] by "(a) adopt[ing] measures to ensure long-term sustainability of straddling fish stocks and highly migratory fish stocks…" and "(b) ensur[ing] that such measures are designed to maintain or restore stocks at levels capable of producing maximum sustainable yield, as qualified by relevant environmental and economic factors…".

However, the simple shift from "harvested species" in LOSC[492] to "marine species" in Agenda 21[493] signalled an important change in focus from target stocks to wider ecosystem health[494]. UNFSA thus called on States not simply to take into consideration the impacts of fishing on associated and dependent species[495] but to "*adopt*, where necessary, conservation and management measures for species belonging to the *same ecosystem* or associated with or dependent upon the target stocks, with a view to maintaining or restoring populations of such species above levels at which their reproduction may become seriously threatened"[496] (emphasis added). The benchmark objectives nevertheless remained to avoid allowing populations to fall to levels that would seriously threaten their reproduction.

Lugten and Andrew argue that UNFSA represented a major shift away from single target species fisheries management to "the holistic approach of using the concept of the entire ecosystem as the starting point" for the management of straddling stocks and highly migratory stocks. Further, in adopting the precautionary approach[497], UNFSA characterises MSY as a "minimum standard for

[489] Lugten, G. and N. Andrew (2008). "Maximum Sustainable Yield of Marine Capture Fisheries in Developing Archipelagic States - Balancing Law, Science, Politics and Practice." The International Journal of Marine and Coastal Law **23**(1): 1-37.

[490] While *sustainable development* contained many norm-like features, for example, "as an element of the process of judicial reasoning", according to Lowe it lacked a "fundamentally norm-creating character" that would render it a justiciable principle in international law. See Lowe, V. (1999). Sustainable Development and Unsustainable Arguments. International Law and Sustainable Development: Past Achievments and Future Challenges. A. Boyle and D. Freestone. Oxford, Oxford University Press**:** 19-37. p31.

[491] UNFSA Article 5 applies to both the high seas, in accordance with Article 3(1), and EEZs, in accordance with Article 3(2) and removes the distinction between straddling stocks and highly migratory stocks throughout.

[492] LOSC Articles 119(1)(a) and 61(3).

[493] Agenda 21 para 17.7: "Coastal States, with the support of international organizations, upon request, should undertake measures to *maintain biological diversity and productivity of marine species and habitats* under national jurisdiction. Inter alia, these measures might include: surveys of marine biodiversity, inventories of endangered species and critical coastal and marine habitats; establishment and management of protected areas; and support of scientific research and dissemination of its results" (emphasis added).

[494] Lugten, G. and N. Andrew (2008). "Maximum Sustainable Yield of Marine Capture Fisheries in Developing Archipelagic States - Balancing Law, Science, Politics and Practice." The International Journal of Marine and Coastal Law **23**(1): 1-37. p9.

[495] LOSC Articles 119(1)(b) and 61(4).

[496] UNFSA Article 5(e).

[497] UNFSA Articles 5(c) and 6.

reference points"[498] [499], and therefore as a limit reference point rather than a target reference point[500] [501]. Others have emphasised the unprecedented prominence given to environmental concerns in their own right in UNFSA.[502] For example, Article 5(g) requires coastal States and fishing States to "protect biodiversity in the marine environment".

As in the case of LOSC, MEY would find some support in the economic qualifications on MSY in UNFSA. While this remains discretionary, an objective of MEY would be consistent with the characterisation of MSY as an upper limit rather than a target[503]. UNFSA also retains the characterisation of "economic factors" as social objectives by including the special requirements of developing States in relation to straddling and highly migratory fish stocks[504].

However, UNFSA develops equity considerations more fully than LOSC, reflecting the themes of UNCED[505]. It includes a new obligation to provide assistance to developing States[506] and obliges States to "give full recognition to the special requirements of developing States in relation to straddling stocks and highly migratory stocks and the development of fisheries for such stocks"[507].

The special requirements of developing States are elaborated in UNFSA Article 24(2) as including:

> "(a) the vulnerability of developing States which are dependent on the exploitation of living marine resources, including for meeting the nutritional requirements of their populations or parts thereof;

[498] UNFSA Annex II Article 7.
[499] Lugten, G. and N. Andrew (2008). "Maximum Sustainable Yield of Marine Capture Fisheries in Developing Archipelagic States - Balancing Law, Science, Politics and Practice." The International Journal of Marine and Coastal Law **23**(1): 1-37. p11.
[500] Supported by Nelson, D. (1999). The Development of the Legal Regime of High Seas Fisheries. International Law and Sustainable Development: Past Achievements and Future Challenges. A. Boyle and D. Freestone. Oxford, Oxford University Press**:** 113-134. pp126-7.
[501] It also worth noting, however, that LOSC Article Articles 119(1)(a) and 61(3) arguably do not mandate MSY as a target but rather require that measures be taken "to maintain or restore populations of harvested species at levels which *can* produce the maximum sustainable yield" (emphasis added). See Caddy, J. F. and R. C. Griffiths (1995). Living marine resources and their sustainable development: some environmental and institutional perspectives. Rome, Food and Agriculture Organisation of the United Nations.
[502] For example, Freestone points to the focus on the protection of marine ecosystem integrity and biodiversity in the Preamble to UNFSA and in Article 5. Freestone, D. (1999). International Fisheries Law Since Rio: The Continued Rise of the Precautionary Principle. International Law and Sustainable Development: Past Achievements and Future Challenges. A. Boyle and D. Freestone. Oxford, Oxford University Press**:** 135-165. pp155-7.
[503] See subsection 2.2.2.
[504] UNFSA Article 5(b).
[505] See subsection 2.3.2.
[506] See UNFSA Articles 25 and 26 on forms of cooperation and assistance.
[507] UNFSA Article 24(1).

(b) the need to avoid adverse impacts on, and ensure access to fisheries by, subsistence, small-scale and artisanal fishers [508] and women fishworkers, as well as indigenous people in developing States, particularly small island developing States; and

(c) the need to ensure that [conservation and management measures] do not result in transferring, directly or indirectly, a disproportionate burden of conservation action onto developing States."

These provisions give international legal recognition to several types of interests within developing countries, not just developing countries as a whole, in the design of CMMs in an effort to achieve some level of equity in the distribution of the benefits of transboundary fisheries. Those interests extend to food security, employment and livelihoods, cultural uses and gender equity. How these special requirements translate into measurable objectives is not clear. For example, Article 24(2)(c) is a clear reflection of the UNCED theme of *common but differentiated responsibility* [509] and the use of proportionality to assist the determination of an equitable outcome[510]. This provision provides probably the strongest indication that equitable principles should be applied in the design of CMMs that allocate access to stocks between developing and developed States, within the bounds of the rights and jurisdictions established in LOSC. Exactly what constitutes a "disproportionate burden" remains elusive, although the application of the concept of proportionality in other areas of international law may suggest a way forward[511].

Following the discussion above, optimum utilisation retains its presence as an integrated objective defined by MSY, qualified by a largely open-ended range of biological, ecological, economic and social considerations from which objectives may be inferred. Little guidance is provided on the relative importance of each interest or objective and how these should be weighed in achieving the optimum utilisation of stocks.

2.4.6 Responding to transboundary complexity

In this section I argue that international fisheries law attempts to address, or at least mitigate, some of the complexities of transboundary fisheries. These relate to cooperation, compatibility, precaution and ecosystems approaches.

Cooperation

[508] The interests of artisanal and subsistence fishers are also noted in UNFSA Article 5(i).
[509] Rio Declaration Principle 7: "States shall cooperate in a spirit of global partnership to conserve, protect and restore the health and integrity of the Earth's ecosystem. In view of the different contributions to global environmental degradation, States have *common but differentiated responsibilities*. The developed countries acknowledge the responsibility that they bear in the international pursuit to sustainable development in view of the pressures their societies place on the global environment and of the technologies and financial resources they command" (emphasis added).
[510] Azmi, K., R. Davis, Q. Hanich and A. Vrahnos (2016). "Defining a disproportionate burden in transboundary fisheries: Lessons from international law." Marine Policy **70**: 164-173.p166.
[511] Ibid.

As noted in the previous section, in the absence of a single decision-making authority, cooperation is essential where the interests of multiple States conflict. The duty to cooperate to reduce the risk of adverse effects borne by one State as a result of the actions of another within its jurisdiction is well-established in customary international law[512]. LOSC and UNFSA also place a clear obligation on States to cooperate in relation to the conservation and management of transboundary marine living resources.

LOSC Part V obliges States to cooperate directly or through appropriate international organisations in the conservation and management of transboundary stocks, whether target stocks or stocks of associated species. Its provisions include cooperation between adjacent coastal States[513], between coastal States and States whose vessels fish on adjacent high seas areas[514] and between coastal States and States fishing for highly migratory species "throughout the region, both within and beyond the exclusive economic zone"[515]. Article 64(1) further adds a requirement that fishing and coastal States cooperate to establish and participate in an appropriate international organisation.

Additionally, LOSC Part VII Section 2 requires States fishing on the high seas to cooperate in relation to high seas marine living resources. Article 117 requires States to take measures for the conservation of high seas marine living resources[516], and Article 118 requires that they enter into negotiations with a view to their conservation[517].

None of the provisions in LOSC require that such cooperation result in an agreement. For example, international jurisprudence [518] suggests that negotiations under Part V must be substantive and conducted "with a view to arriving at an agreement"[519], but not necessarily conclusive[520]. Neither State

[512] See Molenaar, E. J. (2000). "The Concept of "Real Interest" and Other Aspects of Cooperation through Regional Fisheries Management Mechanisms." The International Journal of Marine and Coastal Law **15**(4): 475-531. p481

[513] LOSC Article 63(1).

[514] LOSC Article 63(2).

[515] LOSC Article 64.

[516] LOSC Article 117: "All States have the duty to take, or to cooperate with other States in taking, such measures for their respective nationals as may be necessary for the conservation of the living resources of the high seas". Note that Article 117 does not contain a specific obligation to cooperate.

[517] In contrast to Article 117, LOSC Article 118 contains an obligation to cooperate but it is not necessary that that cooperation result in the agreement of conservation measures: "States shall cooperate with each other in the conservation and management of living resources in the areas of the high seas. States whose nationals exploit identical living resources, or different living resources in the same area, shall enter into negotiations with a view to taking the measures necessary for the conservation of the living resources concerned."

[518] ICJ (1969). North Sea Continental Shelf Cases (Federal Republic of Germany/Denmark; Federal Republic of Germany/Netherlands). ILM, International Court of Justice. **8:** 340. para 85(2).

[519] Nelson, D. (1999). The Development of the Legal Regime of High Seas Fisheries. International Law and Sustainable Development: Past Achievements and Future Challenges. A. Boyle and D. Freestone. Oxford, Oxford University Press**:** 113-134. p121.

[520] See the discussion of LOSC Article 283(1), which states that "[w]hen a dispute arises between States Parties concerning the interpretation or application of this Convention, the parties to the dispute shall proceed expeditiously to an exchange of views regarding its settlement by negotiation or other peaceful means", in Molenaar, E. J. (2000). "The Concept of "Real Interest" and Other Aspects of Cooperation through Regional Fisheries Management Mechanisms." The International Journal of Marine and Coastal Law **15**(4): 475-531. p483.

may act unilaterally without at least attempting in good faith[521] [522] to secure agreement on measures to conserve and develop the relevant stock.

UNFSA was adopted in 1995 following UNCED and reflecting more clearly its themes of sustainable development and recognising that LOSC was inadequate to the task of addressing transboundary fisheries. UNFSA's provisions relate to both straddling stocks and highly migratory stocks and reiterate the obligation to cooperate in relation to straddling fish stocks[523] and highly migratory fish stocks[524] in two important ways. First, such cooperation shall occur "either directly or through appropriate subregional or regional fisheries management organizations or arrangements"[525] (collectively known hereafter as regional fisheries management mechanisms or RFMOs)[526].

UNFSA Article 8(3) requires that, where such RFMOs exist, coastal and fishing States are obliged to either join them or agree to apply CMMs established by them. Article 8(5) states that, where an RFMO does not exist, States should cooperate to establish one. The role of RFMOs is further cemented by Article 8(4), which states that only States that are members of RFMOs or agree to apply CMMs established by them may have access to the fisheries to which those CMMs apply[527]. While the duty to cooperate is clearly binding on Parties to UNFSA, it has been argued that the duty to cooperate in LOSC may be sufficient to bind States that are not party to UNFSA[528].

Importantly, UNFSA explicitly acknowledges the rights of States with a "real interest" to become members of RFMOs and that the terms of their participation not be applied in manner which discriminates against them.[529] While "real interest" is not defined in UNFSA, "States fishing for stocks on the high seas and relevant coastal States"[530] clearly have a real interest by virtue of the act of fishing

[521] ICJ (1969). North Sea Continental Shelf Cases (Federal Republic of Germany/Denmark; Federal Republic of Germany/Netherlands). ILM, International Court of Justice. **8:** 340. Para 85.
[522] See also the brief discussion in Nelson, D. (1999). The Development of the Legal Regime of High Seas Fisheries. International Law and Sustainable Development: Past Achievements and Future Challenges. A. Boyle and D. Freestone. Oxford, Oxford University Press**:** 113-134. p121.
[523] UNFSA Article 7(1)(a).
[524] UNFSA Article 7(1)(b).
[525] UNFSA Article 8(1).
[526] For simplicity, this study will refer to such regional fisheries management mechanisms – whether organisations of arrangements – as regional fisheries management organisations or the acronym "RFMO".
[527] See also UNFSA Article 8(6), which requires that States proposing actions that "would have a significant effect on [existing] conservation and management measures" to consult with other members of or participants in the relevant RFMO.
[528] Henriksen, T. (2009). "Revisiting the Freedom of Fishing and Legal Obligations on States Not Party to Regional Fisheries Management Organizations." Ocean Development & International Law **40**(1): 80-96. p91.
[529] UNFSA Article 8(3): "States having a real interest in the fisheries concerned may become members of such organization or participants in such arrangement. The terms of participation in such organization or arrangement shall not preclude such States from membership or participation; nor shall they be applied in a manner which discriminates against any State or group of States having a real interest in the fisheries concerned."
[530] UNFSA Article 8(3).

or the presence of exploited stocks in waters under their jurisdiction. It is also implicit in the duty to cooperate by participating in RFMOs in Article 8(3).

Molenaar[531] contends that if the above provisions amounted to an exhaustive definition of "real interest" then the "real interest" provisions of UNFSA would be superfluous. States that might claim a "real interest" could include those that are not currently fishing in relevant waters but wish to. Existing RFMO members will be tempted to resist new entrants with prospective fishing interests but may conclude that they are better off having them "inside the tent" than outside[532]. Article 8(4) provides some scope for new entrants to establish their interests by agreeing to comply with measures adopted by an RFMO without becoming a member or participant in it (often termed "cooperating non-members")[533].

Compatibility

A further important aspect of cooperation relates to reconciling the mismatch between the zonal approach of LOSC and the behaviour of transboundary fish stocks. This mismatch introduces the risk that inconsistent rules will be adopted for the same stocks by different coastal States with respect to fishing in their waters, and by fishing States with respect to vessels flying their flag on the high seas. UNFSA Article 7(2) requires that CMMs for the high seas and areas under national jurisdiction be compatible and that States must cooperate in order to achieve this.

Tensions emerged in the negotiations leading up to UNFSA between the respective interests of coastal States and States fishing on the high seas regarding the superiority or otherwise of measures applying to areas under national jurisdiction vis a vis measures applying to the high seas[534]. The former appear to have some priority over the latter through Article 7(2)(a), which requires that CMMs applying to the high seas not undermine the effectiveness of CMMs established by coastal States under LOSC Article 61 for the same stocks. Among the other factors to be taken into account in meeting the compatibility requirement are "the respective dependence of the coastal States and the States fishing on the high seas on the stocks concerned"[535] and the need to "ensure that such measures do not result in harmful impact on the living marine resources as a whole".[536] The use of "areas under national

[531] Molenaar assesses that the common arguments against new entrants are weak. See Molenaar, E. J. (2000). "The Concept of "Real Interest" and Other Aspects of Cooperation through Regional Fisheries Management Mechanisms." The International Journal of Marine and Coastal Law **15**(4): 475-531. pp497-9.
[532] For a full discussion of the issues see ibid. pp497-501.
[533] UNFSA Article 8(4): "Only those States which are members of such an organization or participants in such an arrangement, or which agree to apply the conservation and management measures established by such organization or arrangement, shall have access to the fishery resources to which those measures apply."
[534] Nelson, D. (1999). The Development of the Legal Regime of High Seas Fisheries. International Law and Sustainable Development: Past Achievements and Future Challenges. A. Boyle and D. Freestone. Oxford, Oxford University Press**:** 113-134. p130-1.
[535] UNFSA Article 7(2)(e).
[536] UNFSA Article 7(2)(f). Nelson notes this introduces consideration of "the interest of the international community in the protection of the marine environment". Nelson, D. (1999). The Development of the Legal Regime of High Seas Fisheries. International Law and Sustainable Development: Past Achievements and Future Challenges. A. Boyle and D. Freestone. Oxford, Oxford University Press**:** 113-134. p130.

jurisdiction" in Article 7(2) rather than "EEZs", creates some ambiguity as to whether this provision applies to sovereign waters as well. Tsamenyi and Hanich make the case that, on balance, these provisions[537] should be interpreted as referring to the high seas and EEZs only[538].

Precaution

An important concept that emerged from UNCED was the application of precaution. The *precautionary principle* and its weaker cousin, the *precautionary approach*, have emerged in international environmental law as a way of dealing with scientific uncertainty. Debate through the 1990s as to the status of the precautionary principle in international law[539] appears to have settled, at least for now, on it assuming the role of an international legal principle but not a rule of international law. Freestone argues that State practice in both international and domestic planes provides substantial evidence that the precautionary principle has attained the status of a principle of customary international law[540] [541] [542].

It is the incorporation of uncertainty that distinguishes the precautionary principle from the preventative principle,[543] which requires States to take all reasonable measures to prevent *known or foreseeable* harm.[544] However, as Freestone notes, the *precautionary approach* bears a close resemblance to the preventative principle, while at the other extreme, *the precautionary principle* could place the burden of proof on the proponent of an activity to demonstrate that no harm will be caused. He concludes that

[537] See also UNFSA Article 3(1): "Unless otherwise provided, this Agreement applies to the conservation and management of straddling fish stocks and highly migratory fish stocks beyond areas under national jurisdiction, except that articles 6 and 7 apply also to the conservation and management of such stocks within areas under national jurisdiction, subject to the different legal regimes that apply within areas under national jurisdiction and in areas beyond national jurisdiction as provided for in the Convention."

[538] This is in part on the basis that the provisions should be read in the context of LOSC Articles 63(2) and 64, which establish the obligation to cooperate in the management of straddling fish stocks and highly migratory fish species both within and beyond the EEZ, not in sovereign waters. See the more comprehensive legal analysis in Tsamenyi, M. and Q. Hanich (2012). "Fisheries Jurisdiction under the Law of the Sea Convention: Rights and Obligations in Maritime Zones under the Sovereignty of Coastal States." The International Journal of Marine and Coastal Law **27**(4): 783-793. p790.

[539] See Hewison, G. J. (1996). "The Precautionary Approach to Fisheries Management: an environmental perspective." International Journal of Marine and Coastal Law **11**(3). p315.

[540] Freestone, D. (1999). International Fisheries Law Since Rio: The Continued Rise of the Precautionary Principle. International Law and Sustainable Development: Past Achievements and Future Challenges. A. Boyle and D. Freestone. Oxford, Oxford University Press**:** 135-165. pp136-7.

[541] Ibid.

[542] This position is supported more recently by Hey, at least in relation to the high seas. Hey, E. (2016). Advanced Introduction to International Environmental Law. Cheltenham, UK, Edward Elgar.

[543] Rio Declaration Principle 2.

[544] Hey, E. (2016). Advanced Introduction to International Environmental Law. Cheltenham, UK, Edward Elgar. p71.

the reality is likely to be somewhere in between, pointing to ambiguities in the meaning of underlying concepts such as "significant harm" or "significant risk"[545] [546].

LOSC Part VII Section 2 contains a range of environmental obligations in relation to the marine living resources of the high seas, which Freestone argues constitute some "essential elements of a precautionary approach"[547]. Indeed, precaution featured in various forms in a range of pollution instruments in the 1980s and 1990s and was applied in substance to driftnet fishing on the high seas in UN General Assembly resolutions[548] [549]. At UNCED in 1992 a broad international consensus formed in support of the concept, albeit in its weaker form[550] [551], and lay the basis for its appearance in the convention on biological diversity (CBD), the UN Framework Convention on Climate Change (UNFCCC) and UNFSA[552]. Principle 15 of Agenda 21 stated that: "In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."

[545] Freestone, D. (1999). International Fisheries Law Since Rio: The Continued Rise of the Precautionary Principle. International Law and Sustainable Development: Past Achievements and Future Challenges. A. Boyle and D. Freestone. Oxford, Oxford University Press**:** 135-165.

[546] For a discussion of the debate regarding the relative legal significance of the precautionary principle and the precautionary approach, and the absence of a clear delineation between these and other formulations of precaution, see Hewison, G. J. (1996). "The Precautionary Approach to Fisheries Management: an environmental perspective." International Journal of Marine and Coastal Law **11**(3).pp313-4.

[547] Freestone points to the obligations in Article 117, supported by Article 119(1)a) and (b), and the absence of the same requirement to promote the objective of optimal utilisation to which coastal States were subject in their EEZs. Freestone, D. (1999). International Fisheries Law Since Rio: The Continued Rise of the Precautionary Principle. International Law and Sustainable Development: Past Achievements and Future Challenges. A. Boyle and D. Freestone. Oxford, Oxford University Press**:** 135-165. pp141, 146-9.

[548] UNGA (1991). Resolution on large-scale pelagic driftnet fishing and its impact on the living marine resources of the world's oceans and seas. . 10 February. United Nations General Assembly (UNGA). Adopted in New York on 20 Dec. 1991, A/46/PV.79, United Nations. **A/RES/46/215**. The resolution does not mention precaution but imposes a moratorium on driftnet fishing unless it could be demonstrated that they did not cause an "undesirable impact on resources". See FAO (1994). The Precautionary Approach to Fisheries with Reference to Straddling Fish Stocks and Highly Migratory Fish Stocks. UN Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks. New York 14-31 March 1994, United Nations. **A/Conf.164/INF/8**. paras82-91.

[549] For an outline of the evolution of the precaution principle in international law, see Hewison, G. J. (1996). "The Precautionary Approach to Fisheries Management: an environmental perspective." International Journal of Marine and Coastal Law **11**(3). pp303-4.

[550] Principle 15 of Agenda 21 stated that: "In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation." UN (1992). Rio Declaration on Environment and Development (Rio Declaration). Report of the United Nations Conference on Environment and Development, 3-14 June 1992, A/CONF.151/26 (Vol. I) Annex I. Rio de Janeiro, United Nations.

[551] Recall also that Agenda 21 para 17.1 called for, inter alia, "…approaches that are integrated in content and are precautionary and anticipatory in ambit…". See Section 3.2 above.

[552] Agenda 21 para 17.50 called for an intergovernmental conference to implement the provisions of LOSC on straddling fish stocks and highly migratory fish stocks.

Precaution was nevertheless a controversial aspect of negotiations on the text of UNFSA[553]. States fishing on the high seas – including Japan, Korea, Russia and Norway – were particularly concerned about the consequences of its inclusion in negotiating texts. Their concerns included the perceived shifting of the burden of proof onto fishing nations[554] and the possibility that fishing may be halted if they could not be shown to be sustainable[555]. The FAO also expressed concern about the potential socio-economic impacts of a precautionary approach[556] [557].

Ultimately a text was agreed that included the first explicit reference to precaution in a fisheries treaty.[558] UNFSA Article 6 calls on States to "apply the precautionary approach widely"[559] and to "be more cautious when information is uncertain, unreliable and inadequate."[560] Article 6(2) reiterated the Rio Declaration imperative that "[t]he absence of adequate scientific information shall not be used as a reason for postponing or failing to take conservation and management measures"[561].

UNFSA also established obligations to develop and share the "best scientific information available"[562] and, on the basis of that information, and in accordance with Articles 6(3)(b) and 6(4), apply guidelines set out in Annex II of UNFSA to "determine…stock-specific reference points and the action to be taken if they are exceeded"[563]. New and exploratory fisheries were to be managed through cautious CMMs

[553] In fact, as Freestone notes, the proposal to hold a conference at all was highly controversial. Para 17.50 of Agenda 21 was one of the last paragraphs to be agreed and ultimately led to the negotiation of UNFSA. See Freestone, D. (1999). International Fisheries Law Since Rio: The Continued Rise of the Precautionary Principle. International Law and Sustainable Development: Past Achievements and Future Challenges. A. Boyle and D. Freestone. Oxford, Oxford University Press**:** 135-165. p143.

[554] Hewison, G. J. (1996). "The Precautionary Approach to Fisheries Management: an environmental perspective." International Journal of Marine and Coastal Law **11**(3).pp309.

[555] Freestone, D. (1999). International Fisheries Law Since Rio: The Continued Rise of the Precautionary Principle. International Law and Sustainable Development: Past Achievements and Future Challenges. A. Boyle and D. Freestone. Oxford, Oxford University Press**:** 135-165. p153-4.

[556] In its paper to the UN Conference, the FAO stated that "In the absence of explicit reference to social and economic costs to fisheries, the concept of precaution could lead to imbalance in favour of non-fishery uses and future generations." FAO (1994). The Precautionary Approach to Fisheries with Reference to Straddling Fish Stocks and Highly Migratory Fish Stocks. UN Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks. New York 14-31 March 1994, United Nations. **A/Conf.164/INF/8**. p9 para 34.

[557] See also Hewison, G. J. (1996). "The Precautionary Approach to Fisheries Management: an environmental perspective." International Journal of Marine and Coastal Law **11**(3). pp308-11.

[558] Note also the parallel development of the precautionary approach in the non-binding Code of Conduct for Responsible Fisheries. See Lugten, G. and N. Andrew (2008). "Maximum Sustainable Yield of Marine Capture Fisheries in Developing Archipelagic States - Balancing Law, Science, Politics and Practice." The International Journal of Marine and Coastal Law **23**(1): 1-37. pp9-10.

[559] UNFSA Article 6(1).

[560] UNFSA Article 6(2).

[561] UN (1992). Rio Declaration on Environment and Development (Rio Declaration). Report of the United Nations Conference on Environment and Development, 3-14 June 1992, A/CONF.151/26 (Vol. I) Annex I. Rio de Janeiro, United Nations.

[562] UNFSA Article 6(3)(a).

[563] UNFSA Article 6(3)(b). Further, UNFSA Article 6(5) contained provisions for enhanced monitoring of target stocks and non-target or associated or dependent species whose status was of concern.

which "shall remain in force until there are sufficient data to allow assessment of the impact of the fisheries on the long-term sustainability of the stocks…"[564].

Thus the formulation of precaution in UNFSA is far weaker – a precautionary approach – than the precautionary principle, reflecting political negotiations of the time. It does not reverse the burden of proof, nor does it require moratoria on fishing where scientific information is not available[565]. The FAO's influence is significant in drawing together an acceptable formulation for precaution. It argued that the precautionary principle was an inflexible concept that may be employed to halt fishing on the high seas in favour of conservation, whereas a precautionary approach required a balance between social, economic and environmental outcomes[566] [567].

Nevertheless, these provisions and the guidelines in Annex II constitute a shift in approaches to management and conservation from reacting to crises once they have occurred, toward more active preventative approaches. Critical to this shift are the procedures set out in Annex II for setting precautionary limits and for the imposition of measures to be taken when those limits are approached or exceeded. Importantly for the management of a complex adaptive system, the precautionary approach allows for proactive adjustments to measures to maintain a balance between economic, social, biological and environmental objectives. The challenge to operationalise these procedures, however, falls largely to the instruments and policies employed in a particular context – that is, within RFMOs and their members/participants[568].

Ecosystems approaches

Finally, binding and non-binding international legal instruments give some support for the argument that the ecosystems approach to fisheries (EAF) has some basis in international law. While EAF does

[564] UNFSA Article 6(6).

[565] In relation to the absence of a shift in the burden of proof in favour of conservation, Freestone cites the avoidance of the word "evidence" (LOSC Articles 61(2) and 119(1)(a) use the term "best scientific *evidence* available") in UNFSA Articles 6(2) ("*adequate scientific information*") and 6(3)(b) ("best scientific *information* available") (emphases added). Freestone, D. (1999). International Fisheries Law Since Rio: The Continued Rise of the Precautionary Principle. International Law and Sustainable Development: Past Achievements and Future Challenges. A. Boyle and D. Freestone. Oxford, Oxford University Press**:** 135-165. P158-9.

[566] FAO (1994). The Precautionary Approach to Fisheries with Reference to Straddling Fish Stocks and Highly Migratory Fish Stocks. UN Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks. New York 14-31 March 1994, United Nations. **A/Conf.164/INF/8**. pp7-10.

[567] See also Hewison, G. J. (1996). "The Precautionary Approach to Fisheries Management: an environmental perspective." International Journal of Marine and Coastal Law **11**(3). P314.

[568] Freestone, D. (1999). International Fisheries Law Since Rio: The Continued Rise of the Precautionary Principle. International Law and Sustainable Development: Past Achievements and Future Challenges. A. Boyle and D. Freestone. Oxford, Oxford University Press**:** 135-165. p161.

not appear in LOSC or UNFSA, some of the underlying concepts of the EAF do[569] [570]. The EAF finds considerable implicit support in the FAO's 1995 *Code of Conduct for Responsible Fisheries*[571]. The FAO Code of Conduct contains a comprehensive set of provisions relating to ecosystems[572] and the environment[573], biodiversity and associated and interdependent species[574], the impact of fishing activities (including pollution)[575], gear impacts and ghost fishing[576], and bycatch and discards[577]), and integrated coastal management[578]. Garcia et al have argued that these provisions, "when considered together, provide a good basis for EAF", covering "practically all of its aspects"[579].

Although the Code of Conduct is voluntary, some of its provisions are legally binding[580] as they are contained in instruments such as LOSC, UNFSA and the FAO Compliance Agreement[581]. Given the support for the Code of Conduct – it was endorsed by consensus among all FAO members – there is also a strong argument that even its non-binding provisions qualify as "generally recommended international minimum standards"[582] and are therefore required by LOSC and UNFSA to be taken into account in the formulation of conservation and management measures.

[569] Lugten and Andrew, for example, conclude that the qualified interpretation of MSY in UNFSA amounts to "one of the clearest legal endorsements yet" of the ecosystems approach to fisheries. Lugten, G. and N. Andrew (2008). "Maximum Sustainable Yield of Marine Capture Fisheries in Developing Archipelagic States - Balancing Law, Science, Politics and Practice." The International Journal of Marine and Coastal Law **23**(1): 1-37. p11.

[570] For counterarguments, see Hey, E. (2012). "The Persistence of a Concept: Maximum Sustainable Yield." Ibid. **27**(4): 763-771. pp765, 768.

[571] FAO (1995). Code of Conduct for Responsible Fisheries (Code of Conduct). Adopted on 31 October 1995 at the twenty-eighth session of the FAO Conference by Resolution 4/95. Food and Agriculture Organisation of the United Nations. Rome.

[572] For example, Code of Conduct Article 6.1: "States and users of aquatic resource should conserve aquatic ecosystems".

[573] For example, among its objectives the Code of Conduct aims to "to promote protection of living aquatic resources and their environments and coastal areas" (Article 2(g)). Further, according to Article 8.4.1: "States should ensure that fishing is conducted with due regard to….the protection of the environment…".

[574] For example, Code of Conduct Article 6.2: "…Management measures should not only ensure the conservation of target species but also of species belonging to the same ecosystem or associated with or dependent upon the target species."

[575] For example, Code of Conduct Article 8.7, which refers to the binding provisions of the 1973 International Convention for the Prevention of Pollution from Ships (MARPOL).

[576] For example, Code of Conduct Article 8.4.6 on gear loss and ghost fishing.

[577] For example, Code of Conduct Article 8.4 on Fishing operations, particularly 8.4.5 on reducing discards, 8.4.2 on destructive fishing practices, 8.4.7 habitat disturbance, and 8.4.8 on "[r]esearch on the environmental and social impacts of fishing gear…".

[578] For example, Code of Conduct Article 10 on "Integration of fisheries into coastal area management".

[579] Garcia, S. M., A. Zerbi, C. Aliaume, T. Do Chi and G. Lasserre (2003). The ecosystem approach to fisheries. Issues, terminology, principles, institutional foundations, implementation and outlook. FAO Fisheries Technical Paper. Rome, Food and Agriculture Organisation of the United Nations. **443:** 71. p19.

[580] Code of Conduct Article 1.1.

[581] Agreement to Promote Compliance with International Conservation Measures by Fishing Vessels on the High Seas, 1993. Forms a part of the Code of Conduct through FAO Conference resolution 15/93 para 3.

[582] See LOSC Articles 61(3)(b) and 119(1)(a), and UNFSA Article 5(b), which require that conservation and management measures take into account "generally recommended international minimum standards".

2.4.7 Conclusion

This section has identified at least four challenges arising from the zonal framework of LOSC that add to the inherent complexity of fisheries governance. First, the geographic range of many stocks crosses different types maritime zones in which States have different rights and responsibilities. Second, in crossing multiple jurisdictional boundaries, such stocks are likely to be subject to different rules, some of which may be inconsistent with each other. Third, individual States are likely to have competing interests in the same stocks or stocks of associated or dependent species and, beyond simple competition for a resource, the nature each State's interests may be qualitatively different. Finally, LOSC does not establish a single authority to reconcile conflicting interests and rules but rather requires cooperation with a view to adopting compatible measures applying to the full geographic range of the stock, including across different maritime zones.

The section outlined how international fisheries law attempts to address this additional complexity, through requirements to cooperate and adopt compatible conservation and management measures across different jurisdictional zones. While incomplete, these requirements nevertheless lay a foundation for the negotiation of compatible measures in a structured forum with comprehensive participation. It noted also that binding and non-binding international legal instruments provide a sound basis for a precautionary approach and the adoption of ecosystems approaches in transboundary fisheries.

These developments, while welcome, do not reduce the transboundary fisheries problem to that of a single jurisdiction fishery. The remaining gaps in the institutional framework for transboundary fisheries governance – such as the requirement for cooperation in the absence of a single decision maker – and the inherent complexity of multiple conflicting objectives and the misalignment between individual incentives and the broader social good common pool resources problem squarely places the transboundary fisheries problem in the realm of a super wicked problem.

2.5 Research into transboundary rights-based management

While much has been written on the characteristics of well-defined property rights and the challenges of governing highly migratory fish stocks, little has been written on the application of those characteristics in a transboundary context. The Environmental Defense Fund's (EDF) database of rights-based management programs is one of the most comprehensive but contains no transboundary examples [583]. Nevertheless, EDF acknowledges several examples of international fisheries management

[583] The EDF is a large US-based environmental non-profit organisation with a strong program of support to individual countries to develop and strengthen rights-based management approaches to fisheries. EDF claims that its Fisheries Solutions Center database is the "only comprehensive online database of rights-based management programs". EDF. (2020). "Fisheries Solutions Center Database." Retrieved 20 July, 2020, from http://fisherysolutionscenter.edf.org/database.

regimes under which national catch limits are allocated to each participating State and managed by independent domestic rights-based management programs[584].

Hannesson [585] has contemplated the opportunities and challenges in establishing rights-based management on the high seas – a critical element of a property rights-regime for highly migratory stocks. He concluded that the main obstacle to establishing property rights in high seas stocks was "the weak enforcement regime"[586].

Allen et al. have compiled one of the most concerted attempts to examine property rights in a transboundary fisheries[587], with particularly relevant contributions from Squires, Allen et al., Serdy and Alcock. Squires set out a clear examination of property rights characteristics – exclusivity, divisibility, transferability, duration, quality of title and flexibility – but their methodical application to transnational contexts is left to others[588].

Alcock[589] took up this challenge with respect to exclusivity and transferability, as well as two others: enforcement and allocation. Enforceability and allocation are critical features of a rights regime and may be reflected in rules that govern rights rather than as characteristics of the rights themselves. For example, enforceability would certainly enhance the security of a right, although it is surely an essential element of any type of management regime, whether rights-based or otherwise. The allocation of shares in a TAC or TAE are the mechanism through which such shares may be made exclusive. Further, an equitable allocation of shares is more likely to bolster the legitimacy of a rights-based system in the eyes of participants, and indeed an important mechanism by which an equitable outcome is achieved.

Allen et al[590] argue that strengthening the security and durability of rights can enhance transboundary fisheries outcomes. Supporting Alcock, they added that such arrangements must be underpinned by strong enforcement. Serdy's[591] examination of the legal basis for the transferability of transboundary rights-based fisheries management was premised on the establishment of secure property rights. He notes that IATTC members in effect transfer well capacity limits when changing the flag of the vessel

[584] Kelso, K. (2020). Personal communication: EDF FSC Database: Transboundary Rights-based Management Programs. K. Azmi, Fisheries Solutions Centre, Environmental Defense Fund.
[585] Hannesson, R. (2011). "Rights based fishing on the high seas: Is it possible?" Marine Policy **35**(5): 667-674.
[586] Ibid. p671.
[587] Allen, R. L., J. Joseph and D. Squires, Eds. (2010). Conservation and Management of Transnational Tuna Fisheries. Ames, IA, Wiley-Blackwell.
[588] Squires, D. (2010). Chapter 3. Property and Use Rights in Fisheries. Conservation and Management of Transnational Tuna Fisheries. R. L. Allen, J. Joseph and D. Squires. Ames, IA, Wiley-Blackwell**:** 39-64.
[589] Alcock, F. Ibid.Chapter 15. Prospects for Use Rights in Tuna Regional Fisheries Management Organisations. R. Allen, J. Joseph and D. Squires**:** 251-268.
[590] Allen, R. L., W. Bayliff, J. Joseph and D. Squires (2010). Chapter 4. Rights-based Management in Transnational Tuna Fisheries. Conservation and Management of Transnational Tuna Fisheries R. L. Allen, J. Joseph and D. Squires. Ames, IA, Wiley-Blackwell**:** pp65-86.
[591] Serdy, A. (2010). Chapter 6. International Fisheries Law and the Transferability of Quota: Principles and Precedents. Conservation and Management of Transnational Tuna Fisheries. R. Allen, J. Joseph and D. Squires. Ames, IA, Wiley-Blackwell**:** pp99-126.

on the vessel register but that this is an "administrative afterthought" rather than a deliberate financial transaction. Serdy also noted the importance of transferability to enabling new entrants to purchase capacity limits[592].

In addition to the IATTC, Serdy found several examples of transferable quotas in other RFMOs, which suggest the presence of a rudimentary form of property rights in each. These include the International Baltic Sea Fisheries Commission (IBFSC), the International Commission for the Conservation of Atlantic Tunas (ICCAT)[593], the North East Atlantic Fisheries Commission (NEAFC) and a brief reference to squid quota transfers in NAFO[594].

Allen et al.[595] offer a range of options for rights-based instruments for a transboundary fishery. These include familiar instruments, including limited entry, fishing capacity limits, catch limits and effort limits. It appears therefore that any arrangement whereby entry is restricted to a transboundary fishery and a cap on at least one parameter is distributed to authorised participants may form the basis of a rights-based management scheme. The employment of closed regional vessel registers by IATTC and CCSBT are notable starting points, as well as the former's dolphin mortality limit[596].

Seto et al have recently identified the extent to which tuna stocks have been allocated to tuna RFMOs members[597], providing a useful starting point for the identification of rights-based schemes but not on the quality or completeness of the definition of any rights that they may create. Of the multispecies tuna

[592] Ibid. p111-3.

[593] Sumaila and Huang suggest that ICCAT's limited powers to address fishing by non-contracting partners significantly undermines the exclusivity of contracting partners' Mediterranean bluefin tuna allocations. See Sumaila, U. R. and L. Huang (2012). "Managing Bluefin Tuna in the Mediterranean Sea." Marine Policy **36**(2): 502-511. pp507-8. This is presumably not the case for Parties UNFSA who are obliged to comply with an applicable RFMO's measures whether they are members of not. Indeed, Borg argues that an obligation to comply likely extends beyond Parties to UNFSA – notably through a flag states' duty to ensure its nationals "safeguard the rights and duties of coastal states". See Borg, S. (2012). Conservation on the High Seas: Harmonizing International Regimes for the Sustainable Use of Living Resources. Cheltenham UK, Northampton, USA, Edward Elgar. p67.

[594] Serdy, A. (2010). Chapter 6. International Fisheries Law and the Transferability of Quota: Principles and Precedents. Conservation and Management of Transnational Tuna Fisheries. R. Allen, J. Joseph and D. Squires. Ames, IA, Wiley-Blackwell**:** pp99-126. Borg arrived at similar findings for NEAFC, NAFO and ICCAT but her review was focused on the implementation of the duty cooperate in several RFMOs rather than allocations or rights-based management. Borg, S. (2012). Conservation on the High Seas: Harmonizing International Regimes for the Sustainable Use of Living Resources. Cheltenham UK, Northampton, USA, Edward Elgar. pp66-72.

[595] Allen, R. L., W. Bayliff, J. Joseph and D. Squires (2010). Chapter 4. Rights-based Management in Transnational Tuna Fisheries. Conservation and Management of Transnational Tuna Fisheries R. L. Allen, J. Joseph and D. Squires. Ames, IA, Wiley-Blackwell**:** pp65-86.

[596] Allen et al note an IATTC dolphin mortality limit sets a limit on purse seine sets on yellowfin associated with dolphins and allocates shares in the limit to individual vessel limits. See ibid. p66.

[597] Seto, K., G. R. Galland, A. McDonald, A. Abolhassani, K. Azmi, H. Sinan, T. Timmiss, M. Bailey and Q. Hanich (2021). "Resource allocation in transboundary tuna fisheries: A global analysis." Ambio **50**(1): 242-259.

RFMOs[598], they found that the WCPFC has allocated the highest proportion of stocks for which it has a mandate, including for EEZs and the high seas[599].

The purse seine vessel day scheme (VDS) of the Parties to the Nauru Agreement (PNA) in the Western and Central Pacific tropical purse seine fishery has received considerable attention and is arguably one of the most developed transboundary rights-like arrangements. It provides a vivid illustration of coastal States asserting their sovereign rights to the fish stocks of their EEZs as opposed to a continuation of flag State allocations to DWFNs that had previously fished for those stocks[600]. Yeeting et al.[601], Tamate[602] and Aqorau[603] make important contributions on the allocation of effort limits under the VDS. Havice has examined the rationale for adopting the VDS as a rights-based arrangement and noted the likely benefits of transferability of vessel days between VDS participants[604].

While the allocation of shares in a limit signal the possibility that those allocations might form the basis of property rights, they do not guarantee that those property rights will be strong. The political challenges of securing agreement among RFMO members has been well-documented by Squires[605], Bailey et al[606], Hanich and Ota[607] and Hanich[608] among others. But little research has been conducted into whether those allocations form strong property rights-like instruments and how well-defined those property rights are.

[598] The Commission for the Conservation of Southern Bluefin Tuna (CCSBT) has of the single stock under its management and has allocated 100% of the stock.
[599] See for example the tropical longline catch limits in WCPFC (2018). Conservation and Management Meaure for Bigeye, Yellowfin and Skipjack Tuna in the Western and Central Pacific Ocean. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2018-01**. para 39.
[600] Aqorau, T. (2009). "Recent Developments in Pacific Tuna Fisheries: The Palau Arrangement and the Vessel Day Scheme." The International Journal of Marine and Coastal Law **24**(3): 557-581.
[601] Yeeting, A. D., S. R. Bush, V. Ram-Bidesi and M. Bailey (2016). "Implications of new economic policy instruments for tuna management in the Western and Central Pacific." Marine Policy **63**: 45-52. p49 contains the only reference to “property rights”.
[602] Tamate, J. M. M. M. (2013). Balancing the scales: the experience of the Parties to the Nauru Agreement. Doctor of Philosophy thesis, University of Wollongong.
[603] Aqorau, T. (2009). "Recent Developments in Pacific Tuna Fisheries: The Palau Arrangement and the Vessel Day Scheme." The International Journal of Marine and Coastal Law **24**(3): 557-581.
[604] Havice, E. (2013). "Rights-based management in the Western and Central Pacific Ocean tuna fishery: Economic and environmental change under the Vessel Day Scheme." Marine Policy **42**: 259-267.
[605] Squires, D. (2010). Chapter 3. Property and Use Rights in Fisheries. Conservation and Management of Transnational Tuna Fisheries. R. L. Allen, J. Joseph and D. Squires. Ames, IA, Wiley-Blackwell**:** 39-64. p58
[606] Bailey, M., G. Ishimura, R. Paisley and U. R. Sumaila (2013). "Moving beyond catch in allocation approaches for internationally shared fish stocks." Marine Policy **40**: 124-136.
[607] Hanich, Q. and Y. Ota (2013). "Moving Beyond Rights-Based Management: A Transparent Approach to Distributing the Conservation Burden and Benefit in Tuna Fisheries." The International Journal of Marine and Coastal Law **28**(1): 135-170.
[608] Hanich, Q., B. Campbell, M. Bailey and E. Molenaar (2015). "Research into fisheries equity and fairness—addressing conservation burden concerns in transboundary fisheries." Marine Policy **51**: 302-304.

2.6 Conclusion

This chapter commenced by noting the increasing pressure on global fisheries, including those targeting transboundary stocks, largely due to fishing beyond biologically sustainable limits. While there are many possible explanations for overfishing, section 2.2 observed that, at its most basic, a fishery represents a typical common pool resource problem – that is, one to which access is open and in which individual incentives encourage an unsustainable race to fish. However, fisheries problem as extend beyond the simple common pool resource problem because they are faced with a range of conflicting biological, ecological, economic, and social objectives as well as uncertainty and dynamism.

Fisheries can be described in terms of biological characteristics such as biomass, age structure and spatial distribution. They also represent a component of a wider ecosystem with which they interact. The ecosystem contains other living organisms and habitats, and provides ecosystem services on which humans and other living organisms are dependent, including global energy transfer, climate modulation, carbon sequestration and transport. It may also provide access to other resources or services, including oil and minerals extraction and energy generation, which may interact with fishing activity. Target fish stocks also represent economic and social opportunities through potential catches and therefore opportunities to earn income, obtain food or gain employment.

All of these attributes represent potential values in which various stakeholders may have an interest. Each component of the system can have an impact on the quality and abundance of other attributes. These interests and objectives thus interact with, and influence each other, and may be in conflict[609].

Section 2.3 noted that economic theory supports the establishment of well-defined property rights to address the bioeconomic elements of the common pool resource problem. A securely held right to use or take a portion of a limited harvest was likely to more closely align individual incentives with social objectives to avoid the tragedy of the commons. Rights-based approaches to solving the biological common pool resource problem fall short of the more holistic approaches to social-ecological complexity, such as ecosystems approaches to fisheries. A framework for a robust management system – one that can withstand and adapt to change over time without altering the fundamental structure of the system – was offered in which RBM could be incorporated as part of a suite of instruments designed to tackle multiple objectives.

Section 2.4 argued that the social-ecological complexity of the general fisheries problem is magnified in transboundary fisheries due to the presence of multiple jurisdictions and legal regimes and the

[609] FAO. (1984). "Report of the FAO Conference on Fisheries Management and Development." Retrieved 1 November, 2018, from https://books.google.com.au/books?printsec=frontcover&vid=LCCN85116676&redir_esc=y#v=onepage&q&f=false. See para 8(iii) of the Strategy for Fisheries Management and Development, p13.

absence of a single decision maker. It found that international fisheries law attempts to address this additional complexity by requiring that interested States cooperate with a view to adopting compatible measures across different jurisdictional zones, as well providing a basis for the application of precautionary approach and ecosystems approaches to fisheries.

Section 2.5 observed that, while rudimentary elements of property rights exist in some transboundary fisheries, little research has been conducted into how well-defined those rights are. The Western and Central Pacific Ocean is a globally significant transboundary fisheries region in which initial steps have been taken to implement rights-based management regimes for key stocks. It is this gap in the literature that this thesis aims to address.

3 Rights-based management in transboundary fisheries

3.1 Introduction

In a natural resources context, rights-based management (RBM) usually refers to a management system characterised by some form of exclusive right to access, use or take a resource. In offshore commercial fisheries, RBM typically refers to a system of individual rights to expend a certain amount of effort in a fishery or to catch a certain quantity of fish.

Such an interpretation is grounded in property rights theory[610], which views the benefits of rights as restricted to those who hold them, to the exclusion of those who do not[611]. Rights represent particular actions that are the product of rules[612]. Rules may relate directly to the right, such as a rule permitting an action that is embodied in a right, or a rule protecting that right by, say, prohibiting actions by others that may impinge upon the right. Bromley accordingly defines a right as "a capacity to call upon the collective to stand behind one's claim to a benefit stream" and the possession of property as "control of a benefit stream"[613]. A similar definition offered by Devlin et al. regards property rights as "essentially…the rights of economic agents to the benefits that flow from assets"[614]. Together, rights and rules are the building blocks of an RBM system.

Exclusive rights may be held by an individual or a group. Rights-based management can refer to the operation of customary rights relating to an inshore area, sometimes referred to as customary marine tenure. While a customary marine tenure arrangement may incorporate individual rights, they are often associated with forms of common property – that is, possession of rights by a defined group, such as a community[615] [616]. The sense of exclusion remains – collective rights are enjoyed by the members of the group but not by non-members.

The notion that a rightholder enjoys certain benefits does not necessarily imply a sense of exclusion. The term "rights" can also be applied to non-exclusive contexts. A human rights perspective interprets

[610] Demsetz, H. (1967). "Toward a theory of property rights." American Economic Review **57**(2, Papers of the Proceedings of the Seventy-ninth Annual Meeting of the American Economic Association (May 1967)): 347-359.
[611] Grafton, R. Q., V. Adamowicz, D. Dupont, H. Nelson, R. J. Hill and S. Renzetti (2004). The Economics of the Environment and Natural Resources. Malden, MA, Blackwell Publishing. p16.
[612] Schlager, E. and E. Ostrom (1992). "Property Rights Regimes and Natural Resources: A Conceptual Analysis." Land Economics **68**(3): 249-262. p250.
[613] Bromley, D. M. (1991). Environment and Economy: Property Rights and Public Policy. Oxford and Cambridge, Basil Blackwell Inc. p15.
[614] Devlin, R. A., R. Q. Grafton and D. Rowlands (1998). "Rights and wrongs - a property rights perspective on Russia market reforms." The Antitrust Bulletin **Spring**(1): 275-296. p277.
[615] Christy, F. T. (2000). Common Property Rights: An Alternative to ITQs. FAO Fisheries Technical Paper 404/1: Use of Property Rights in Fisheries Management. Proceedings of the FishRights99 Conference Fremantle, Australia, 11-19 November 1999, Food and Agriculture Organisation of the United Nations.
[616] Ciriacy-Wantrup, S. V. and R. C. Bishop (1975). "Common Property as a Concept in Natural Resources Policy." Natural Resources Journal **15**(4): 713-727.

rights as universal[617] in much the same way that open access fishing represents a universally held right to fish[618]. The property rights and human rights perspectives can therefore appear to be in conflict with each other. Rights conceived as property rights emphasise exclusion, which may in fact violate the human rights of people who are dependent on fisheries for their food, livelihoods and cultural needs[619].

Some researchers have aimed to reconcile the two perspectives by emphasising the individual nature of human rights as being consistent with a neo-liberal agenda that is often associated with the property rights perspective[620] [621] [622]. This individualistic perspective contrasts with the collective approach of customary marine tenure described above[623]. Huppert suggested avoiding the term "individual property rights" in favour of "various forms of rules, privileges, duties, individual quotas and permits"[624] [625]. Some forms of property rights may protect human rights by recognising the right of members of a particular group to appropriate a resource, to the exclusion of non-members, as in the case of customary marine tenure described above[626]. A human rights-based approach underlies much of the FAO's *Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication*[627].

It is not the purpose of this study to fully examine the relative merits of the human rights and property rights perspectives, but it is important to make a clear distinction between them and acknowledge the

[617] Allison, E. H., B. D. Ratner, B. Åsgård, R. Willmann, R. Pomeroy and J. Kurien (2012). "Rights-based fisheries governance: from fishing rights to human rights." Fish and Fisheries **13**(1): 14-29.
[618] Huppert, D. D. (2005). "An Overview of Fishing Rights." Reviews in Fish Biology and Fisheries **15**(3): 201-215. p205.
[619] Ratner, B. D., B. Åsgård and E. H. Allison (2014). "Fishing for justice: Human rights, development, and fisheries sector reform." Global Environmental Change **27**: 120-130.
[620] See for example the discussion in Song, A. M. (2015). "Human dignity: A fundamental guiding value for a human rights approach to fisheries?" Marine Policy **61**: 164-170. pp164-6.
[621] But as Ratner et al argue, adequately defining property rights is often insufficient to address many of the factors leading to unsustainable fishing, particularly in small scale fisheries Ratner, B. D., B. Åsgård and E. H. Allison (2014). "Fishing for justice: Human rights, development, and fisheries sector reform." Global Environmental Change **27**: 120-130. p122.
[622] Human insecurity – relating to, say, food security, education, health and violence – undermine a community's incentive to manage resources sustainably, and thus undermine the effectiveness of natural resource governance systems, including property rights systems Allison, E. H., B. D. Ratner, B. Åsgård, R. Willmann, R. Pomeroy and J. Kurien (2012). "Rights-based fisheries governance: from fishing rights to human rights." Fish and Fisheries **13**(1): 14-29.
[623] Ruddle, K. and A. Davis (2013). "Human rights and neo-liberalism in small-scale fisheries: Conjoined priorities and processes." Marine Policy **39**: 87-93.
[624] Huppert, D. D. (2005). "An Overview of Fishing Rights." Reviews in Fish Biology and Fisheries **15**(3): 201-215.
[625] Ibid. p205.
[626] See for example Foley, P. and C. Mather (2018). "Ocean grabbing, terraqueous territoriality and social development." Territory, Politics, Governance **7**(3): 297-315.
[627] FAO (2015). Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security. Rome, Food and Agriculture Organisation of the United Nations**:** 34pp. p1.

value of the human rights perspective when addressing fisheries governance challenges[628]. This study focuses on approaches that are grounded in the property rights perspective.

The purpose of this chapter is to respond to the two preliminary research question:

What could a rights-based management system look like in a transboundary fishery?

How can the extent to which a property right is "well-defined" be assessed?

It defines an analytical framework to guide the analysis of fisheries management instruments in WCPO fisheries for highly migratory fish stocks based on the property rights literature and proposes a model for how RBM could operate in a transboundary fishery. Section 3.2 examines the different ways in which rights-based management instruments can be characterised, including the basic nature of the right, ownership of the right, conceptualisations of rights as a bundle of operational and collective choice rights, and design characteristics of well-defined rights. It concludes with a review of examples of rights-based instruments employed in fisheries.

Section 3.3 expands on Chapter Two by considering the capacity of property rights to address complexity and identifies ways in which property rights systems can be designed to accommodate, either directly or indirectly, multiple objectives, uncertainty and dynamism. Section 3.4 then briefly examines the basis in international law for an RBM system for transboundary fisheries. Section 3.5 applies the preceding review to propose a model of rights-based management in a transboundary fishery.

Section 3.6 draws together the discussion in this chapter to propose an analytical framework for the assessment of the extent to which management instruments in a transboundary fishery represent well-defined property rights. Section 3.7. concludes the chapter.

3.2 Rights-based management instruments

3.2.1 Introduction

This section examines the different ways in which property rights can be characterised. It first considers how the fundamental nature of the right and its ownership can determine how the right operates in practice. It then considers how property rights can be understood as a bundle of operational and collective choice rights, giving different actors powers to make decisions on different matters pertaining to the resource. This is followed by a review of the different dimensions of a "well-defined property right". The section concludes by reviewing some examples of common RBM instruments employed in fisheries.

[628] Charles also identifies a third type of rights-based management – management rights. These are discussed further in subsection 3.2.3 below. Charles, A. T. (2013). "Fisheries Management and Governance: Forces of Change and Inertia." Ocean Yearbook **27**: 249-266. p258.

3.2.2 The nature and ownership of rights

As a right to the flow of benefits from an asset[629], property rights can refer to rights arising from the ownership of a thing – *ownership rights* – or rights to use a thing – *use rights (usufructary rights)*[630]. Squires used the term *property rights* to describe rights that relate to the ownership of the resource itself[631], but the term can lead to misunderstandings[632]. Like water and air, fish are a fugitive resource. Their mobility makes it difficult to claim ownership over a particular fish in a river or in the sea as recognised in law. Common law jurisdictions, for example, do not regard wild fish in the oceans capable of being owned until they are caught, and that any assertion of ownership by the State is likely to be incomplete[633]. A use right, however, does not define ownership over the resource but of the right to use the resources in some way[634].

That said, use rights themselves may possess some of the qualities of property – that is, an asset that holds value, primarily because it is held exclusively. In the analogy of real property, *ownership* of, say, a house is distinct from the right to *possess* it in the form of a lease. The latter confers use rights and therefore may create value in the right without requiring the possessor to own the house[635] [636].

Arguments against the "privatisation" of fisheries[637] may therefore be misleading when the rights are sold or transferred to "private interests"[638]. Privatisation could be construed as a permanent change of ownership of the resource from public or community-ownership (either State-owned or common

[629] Section 3.1 above.

[630] In common law jurisdictions usufructuary rights developed from Roman law, which considered things such as water, light and air as *res communes*, and thus property belonging "to no person, but the use to all" (Lord Chief Justice Tindal in Liggins v Inge (1831) 7 Bing. 682; 131 ER 263), cited in Gardner, A. W., R. H. Bartlett and J. Gray (2009). Water Resources Law. Sydney, LexisNexis Butterworth. p152.

[631] Squires, D. (2010). Chapter 3. Property and Use Rights in Fisheries. Conservation and Management of Transnational Tuna Fisheries. R. L. Allen, J. Joseph and D. Squires. Ames, IA, Wiley-Blackwell**:** 39-64. p42

[632] The use of the term "property' still does not refer to the thing but the legal relationship the rightholder has with the thing. See for example the expression given to this principle in Yanner v Eaton. Commonwealth Law Reports, High Court of Australia. **201:** 351. pp365-6.

[633] Gullett gives the example of Australian states' assertion of ownership in fisheries legislation which they may not be entitled to do under Commonwealth law. See Gullett, W. L. (2008). Fisheries Law in Australia. Australia, LexisNexis Butterworths. pp60, 65.

[634] Charles, A. T. (2009). Rights-Based Fisheries Management: The Role of Use Rights in Managing Access and Harvesting. A Fishery Manager's Guidebook: FAO Fisheries Technical Paper 424. K. L. Cochrane and S. M. Garcia. Rome, The Food and Agriculture Organisation of the United Nations and Wiley-Blackwell**:** 253-282. p255.

[635] See the discussion on the meaning of *ownership of a property right* in Bromley, D. W. (2016). "Rights-based fisheries and contested claims of ownership: Some necessary clarifications." Marine Policy **72**: 231-236.

[636] The legal basis for property rights in the domestic plane is discussed in section 3.4 below.

[637] See for example Ørebech, P. (2005). "What Restoration Schemes Can Do? Or, Getting It Right Without Fisheries Transferable Quotas." Ocean Development & International Law **36**(2): 159-178.

[638] Hannesson, for example, appears to wave a red flag in the title of his book when in fact it predominantly focuses on use rights as an approach to fisheries management, rather than privatising ownership of the stock. Hannesson, R. (2004). The Privatisation of the Oceans. Cambridge Mass., MIT Press.

property) to private, commercial interests[639]. The establishment of use rights does not change the ownership of the resource but merely allows the holder of a use right to do something with it[640]. A central unifying authority, akin to the sole owner suggested by Scott[641], would in fact be vested with the authority to assign use rights on behalf of a community or the public[642]. Such rights may be assigned to a user for a limited period or under conditions that some form of compensation is paid to the State in recognition of the benefits enjoyed by the holder of a right to use an otherwise public resource[643].

Ownership can take four broad forms: unowned property; State or public property; private (ie: individual) property; and common property. Unowned property, or "non-property", signals that no owner can be identified, and is synonymous with open access[644]. Solutions to common pool resource problems were, until the late 1980s, seen as a choice between public property and private property regulated and allocated by government[645], while common property had more often been equated to unowned property[646].

In some common property contexts, appropriate institutions might not emerge[647], producing a limited user, open access scenario discussed in Chapter Two. Without further constraints, individual members of the group would still attempt to maximise their direct benefits without considering the impact on other community members or the future cost to the community of such actions[648]. However, property rights systems have appeared in many communities without the intervention of an external actor to

[639] Foley, P. and C. Mather (2018). "Ocean grabbing, terraqueous territoriality and social development." Territory, Politics, Governance **7**(3): 297-315. p298.
[640] Bromley, D. W. (2016). "Rights-based fisheries and contested claims of ownership: Some necessary clarifications." Marine Policy **72**: 231-236.
[641] Scott, A. (1955). "The Fishery: The Objectives of Sole Ownership." Journal of Political Economy **63**(2): 116-124. See Chapter Two subsection 2.3.4.
[642] See further subsection 3.2.3 below.
[643] See Costello, C. J. and D. Kaffine (2008). "Natural resource use with limited-tenure property rights." Journal of Environmental Economics and Management **55**(1): 20-36.
[644] Charles, A. T. (2009). Rights-Based Fisheries Management: The Role of Use Rights in Managing Access and Harvesting. A Fishery Manager's Guidebook: FAO Fisheries Technical Paper 424. K. L. Cochrane and S. M. Garcia. Rome, The Food and Agriculture Organisation of the United Nations and Wiley-Blackwell**:** 253-282. pp253-4.
[645] Ibid.
[646] Christy argued that the term "common property" denotes a level of access to the resource not who the owners are. Common property in his definition suffers the open access problem of the commons and is therefore distinct from, say, community property. This thesis, however, uses the term common property to refer to joint ownership by an identifiable group that is not the state or a corporation. See Christy, F. T. (1982). Territorial use rights in marine fisheries: FAO Fisheries Technical Paper 227. Rome, Food and Agriculture Organisation of the United Nations**:** 10.
[647] Squires observes that open access and common property can be either unregulated or regulated – see Squires, D. (2010). Chapter 3. Property and Use Rights in Fisheries. Conservation and Management of Transnational Tuna Fisheries. R. L. Allen, J. Joseph and D. Squires. Ames, IA, Wiley-Blackwell**:** 39-64.pp40-2
[648] Demsetz, H. (1967). "Toward a theory of property rights." American Economic Review **57**(2, Papers of the Proceedings of the Seventy-ninth Annual Meeting of the American Economic Association (May 1967)): 347-359. p354.

overcome individual self-interest and successfully deal with common pool resource problems[649] [650] [651] [652] [653], contrary to orthodox public goods theory[654] [655].

Certainly, the cost of internalising externalities would likely increase as the number of stakeholders increases. Property rights systems would also be more likely to emerge in situations in which the resource was: perceived as valuable and therefore attracted more demand for those rights; relatively sedentary; and easy to husband (that is, inexpensive to capture the benefits of maintaining the resource)[656]. But as Ostrom observed, there was no adequate theoretical explanation for how individuals, in the absence of an external actor, overcame self-interest in order to cooperate[657]. After examining several common pool resource case studies Ostrom concluded that, while the size and stability of the group were relevant factors[658], individual users of a common pool resource will be more likely to cooperate if most of them:

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[649] Feeny et al (1990) note that, despite Hardin's predictions, there are plenty of examples of emergence of rules to protect the commons. Private, state and communal property rights can all play a role in natural resource management and a more complete theory of the commons should include institutional arrangements and cultural factors. See Feeny, D., F. Berkes, B. J. McCay and J. M. Acheson (1990). "The Tragedy of the Commons Twenty-Two Years Later." Human Ecology **18**(1): 1-19.

[650] Ostrom, E. (1990). Governing the Commons: The Evolution of Institutions for Collective Action. Cambridge, UK, Cambridge University Press. p40.

[651] See also for example the emergence of land property rights among indigenous peoples in Labrador in the 17th Century following the emergence of a commercial fur seal trade, which led in turn to a sharp increase in their harvest and a classic open access common pool resource problem. Here the benefits of cooperation and the establishment of property rights was seen as beneficial both by the group and by enough individuals in the group. (See Leacock, Eleanor "The Montagnes 'Hunting Territory' and the Fur Trade." American Anthropologist **56** (5) Part 2 Memoir No.78, cited in Demsetz, H. (1967). "Toward a theory of property rights." American Economic Review **57**(2, Papers of the Proceedings of the Seventy-ninth Annual Meeting of the American Economic Association (May 1967)): 347-359. p351.

[652] Shavell points to the appearance of ideas relating to property rights and their potential to benefit society in early Greek and Roman writings, and work of Locke, Hobbes, Hume, Blackstone and Bentham. See Shavell, S. (2004). Foundations of Economic Analysis of Law. Cambridge, Massachusetts, The Belknap Press of Harvard University Press. pp22-3 footnote 13.

[653] The English enclosures and Scottish clearances are among the more well-known examples of the establishment of property rights with profound consequences for those economies and societies. See the discussion in Hannesson, R. (2004). The Privatisation of the Oceans. Cambridge Mass., MIT Press.pp14-23.

[654] If individuals could free ride on the supply of a non-excludable good, their individual interests would suggest that they would find no advantage in supplying or contributing to the provision of the public good, even if the gains to be made by cooperating were greater than individuals acting on their own. Olson, M. (1965). The Logic of Collective Action: Public Goods and the Theory of Groups. Cambridge Mass. and London, Harvard University Press. p15, 34-5.

[655] Demsetz, H. (1967). "Toward a theory of property rights." American Economic Review **57**(2, Papers of the Proceedings of the Seventy-ninth Annual Meeting of the American Economic Association (May 1967)): 347-359. p350.

[656] Ibid. p354.

[657] Ostrom, E. (1990). Governing the Commons: The Evolution of Institutions for Collective Action. Cambridge, UK, Cambridge University Press. p40.

[658] Olson had earlier concluded that small, homogenous groups were more likely to cooperate because their individual share of the returns from collective action (a public good) were greater than in a larger group. Heterogeneity, however, provided incentives to the smaller members of the group to free ride on the actions of larger members, for whom cooperation provided greater individual returns. Olson, M. (1965). The Logic of

- believe that they will be harmed by not cooperating;
- believe that they will be affected in similar ways by the new arrangements;
- have low discount rates;
- face "relatively low information, transformation, and enforcement costs"; and
- "share generalised norms of reciprocity and trust…"[659].

Thus some level of homogeneity within the group is necessary for success. Where those factors are satisfied, the likelihood of cooperation leading to the establishment and maintenance of a property rights system is greatly improved. The system that evolves may be one of individual private property rights or common property[660].

Whether property rights are established through cooperation within a community or through the action of a central authority, strategic behaviour by participants could reasonably be expected[661]. These efforts may be aimed, for example, at maximising compensation, influencing the design of a property rights regime and anticipating the basis on which initial allocations of rights are to be determined. Some actors may use strategies to minimise the costs imposed by an anticipated property rights regime, including by resisting the entire proposition[662]. Given the presence of many diverse interests, the development of property rights is therefore often "an evolutionary process" that delivers a far from ideal solution but one which nevertheless works, due in large part to the fact that it has the support of a sufficient number of stakeholders[663]. There is a tension, therefore, between the idea of participation and legitimacy on one hand, and the suggestion that it may be better to implement a property rights regime quickly, to minimise strategic positioning and capture of the process by interest groups[664].

The distribution of costs and benefits, and the political context, therefore matter. Because the political economy of each situation will be unique, the level of stakeholder support and the exact design of institutions will vary widely such that communities with similar resource endowments may exploit and

Collective Action: Public Goods and the Theory of Groups. Cambridge Mass. and London, Harvard University Press. pp21-36.

[659] Ostrom, E. (1990). Governing the Commons: The Evolution of Institutions for Collective Action. Cambridge, UK, Cambridge University Press. p211.

[660] Ciriacy-Wantrup and Bishop define common property as "a distribution of property rights in resources in which a number of owners are co-equal in their rights to *use* the resource" (emphasis added, p714 and footnote 4), and that "[t]his means that their rights are not lost through non-use…[and]…does not mean that the co-equal owners are necessarily equal with respect to the quantities (or other specification) of the resource each uses over a period of time" (p715). Ciriacy-Wantrup, S. V. and R. C. Bishop (1975). "Common Property as a Concept in Natural Resources Policy." Natural Resources Journal **15**(4): 713-727.p714-5

[661] Libecap, G. D. (1986). "Property rights in economic history: Implications for research." Explorations in Economic History **23**: 227-252. p228.

[662] Hannesson, R. (2004). The Privatisation of the Oceans. Cambridge Mass., MIT Press. p54

[663] Ibid. p6.

[664] Ibid. pp171-2.

manage those resources quite differently, with important consequences for the economic performance of those societies[665].

Chapter Two demonstrated that management approaches based on transferable private property rights have a theoretical advantage over other systems in terms of economic efficiency. This discussion has shown that they may not always be appropriate. Common property is likely to suit relatively small, homogenous groups with high levels of mutual trust. Such circumstances are more likely in a coastal fishery managed by a small community than in a large, diverse industrial commercial fishery, such as offshore tuna fisheries, where economic objectives are central[666].

3.2.3 Operational and collective choice rights

An important contribution to understanding of property rights is the notion of property as a bundle of rights rather than a single instrument[667]. Ostrom and Schlager[668] argued that, in common pool resource contexts, the right to do something comprises a bundle of five rights, each of which may be exercised by different classes of person. The right of *access* permits a right-holder to enter and enjoy the resource without reducing the quantity available. The right of *withdrawal*, on the other hand, permits harvest of units of the resource. These two *operational-level* rights can be exercised by an individual who logically must possess a right of *access* to be able to exercise a right of *withdrawal*.

The remaining rights are regarded as *collective-choice* rights, which give the holder authority to not just exercise access and withdrawal rights but also define them. The right of *management* gives authority to regulate access to, and withdrawal of, the resource, and the right to make improvements to it. A fisheries authority or community decision-making body exercising rights of *management* is able to determine aspects of *withdrawal*, such as the quantity of fish a person may take, where and when they may fish and how they may fish. The holder of a right of *exclusion* is able to determine who has *access* and *withdrawal* rights and whether and how those rights may be transferred to others. Finally, the right of *alienation* permits the right-holder to transfer *management* and *exclusion* rights to others[669].

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[665] Libecap, G. D. (1986). "Property rights in economic history: Implications for research." Explorations in Economic History **23**: 227-252. p234.

[666] See the application of Ostrom's principles in the south Pacific albacore fishery in Abolhassani, A. (2015). Canning Complexity: An Institutional Analysis of the Management System for South Pacific Albacore Tuna. Undergraduate Honors Thesis, Arizona State University.

[667] Shavell, S. (2004). Foundations of Economic Analysis of Law. Cambridge, Massachusetts, The Belknap Press of Harvard University Press. p10.

[668] Ostrom, E. and E. Schlager (1996). The Formation of Property Rights. Rights to Nature: Ecological, Economic, Cultural, and Political Principles of Institutions for the Environment. S. S. Hanna, C. Folke, K.-G. Mäler and Ä. T. E. Jansson. Washington DC, Island Press: pp127-156. pp130-4.

[669] Ibid. pp131-2.

This framework helps us to understand the structure of rights in common pool resources, such as fisheries, and who may possess and exercise each type of right[670]. The rights of *access* and *withdrawal* could be held by domestic and foreign commercial fishers, recreational fisheries, and/or artisanal and subsistence fishers. The collective-choice rights of *management*, *exclusion* and *alienation* could be held, for example, by a fisheries authority on behalf of the State, a cooperative, a community decision-making body in an area over which the community has some form of tenure, or even an individual resource owner[671]. In a formal legal environment, a government would typically possess *alienation* rights in relation to commercial fisheries, and may also exercise such rights in relation to community decision-making bodies by recognising, through legislation, their *management* and *exclusion* rights.

3.2.4 Property rights design characteristics

Subsection 3.2.2 above described how different forms of resource ownership can influence incentives and individual behaviour, and ultimately resource use outcomes. Nested within an ownership regime, the design of use rights can also have a significant influence on incentives.

Several researchers have identified a number of common dimensions or characteristics of property rights. Scott[672], for example, identified four key characteristics of a property right: *exclusivity*, *quality of title*, *duration* and *transferability*, and acknowledged that other characteristics may also be measured – such as *flexibility*, *divisibility* and *enforceability*. Devlin and Grafton's[673] framework incorporated six of those characteristics – *enforceability* is arguably an element of their definition of *security*. The following considers each of the six characteristics, drawing on the definitions proposed by these and other researchers[674].

[670] See for example the application of this framework in an analysis of New Zealand's fisheries management system in Yandle, T. (2007). "Understanding the Consequences of Property Rights Mismatches: a Case Study of New Zealand's Marine Resources." Ecology and Society **12**(2): 27-41.

[671] See examples in Ostrom, E. and E. Schlager (1996). The Formation of Property Rights. Rights to Nature: Ecological, Economic, Cultural, and Political Principles of Institutions for the Environment. S. S. Hanna, C. Folke, K.-G. Mäler and Ä. T. E. Jansson. Washington DC, Island Press**:** pp127-156. p138.

[672] See 4.1 *Measurement of rights* and 4.2 *A short survey of characteristics* in Scott, A. (2000). Introducing Property in Fishery Management: FAO Fisheries Technical Paper 404/1: Use of Property Rights in Fisheries Management. Proceedings of the FishRights99 Conference. R. Shotton. Fremantle, Western Australia, FAO**:** 1-13.

[673] Devlin and Grafton identify a sixth, flexibility. Devlin, R. A. and Grafton, R. Q. (1998). Economic Rights and Environmental Wrongs: Property Rights for the Common Good. Edward Elgar, Cheltenham. Cited in Grafton, R. Q., V. Adamowicz, D. Dupont, H. Nelson, R. J. Hill and S. Renzetti (2004). The Economics of the Environment and Natural Resources. Malden, MA, Blackwell Publishing. pp38-9.

[674] An additional researcher is Squires, D. (2010). Chapter 3. Property and Use Rights in Fisheries. Conservation and Management of Transnational Tuna Fisheries. R. L. Allen, J. Joseph and D. Squires. Ames, IA, Wiley-Blackwell**:** 39-64.

First and most importantly[675], *exclusivity* determines the extent to which the right holder can exclude others from enjoying the benefits of the right, or as Scott puts it, the freedom from interference[676]. *Exclusivity* confers value on the right because the right is, in economic terms, rivalrous and therefore establishes scarcity.

Second, *quality of title* determines the level of *security* with which the holder of the right has over that right, thus reflecting the certainty with which a rightholder's title will be recognised by others and protected by the law. Scott notes that quality of title has historically been determined by custom and that this has evolved in many societies into a formal legal protection, often including the registration of title[677]. Title is rarely absolute. Governments may forcibly resume property on certain conditions, typically determined by legislation. *Security* will also be influenced by the extent to which regulations may be changed and affect the nature, and therefore the value, of the title[678]

Third, *transferability*, is the extent to which the holder of the right is able to transfer the right to another rightholder. Transferable property rights are often referred to as market-based instruments, which embody the efficient ideal of a Coasean bargain[679]. The absence of exclusivity obviates the need to transfer rights, as anyone may obtain a right. If a rightholder decides they no longer wish to exercise the right they can transfer it to someone who does and potentially receive compensation in return. Or they may be able to obtain a higher value from it by selling it to someone (a more efficient user, perhaps) than by exercising it themselves. Transfers may be permanent, thus offering a way of capitalising the value of the flow of future benefits, or temporary, as in the case of leases.

Fourth, *duration* denotes the temporal limits of the right – that is, when and for how long the holder may exercise the right[680]. A longer *duration* implies greater certainty in the right to enjoy a future stream of benefits, and quite likely a lower discount rate, and therefore a greater present value and a stronger interest in the future state of the stock. As Hanna notes, long *duration* of title provides incentives to

[675] Ibid. p43.
[676] Scott, A. (2000). Introducing Property in Fishery Management: FAO Fisheries Technical Paper 404/1: Use of Property Rights in Fisheries Management. Proceedings of the FishRights99 Conference. R. Shotton. Fremantle, Western Australia, FAO**:** 1-13. 4.2.
[677] Ibid. 4.2.
[678] Sykes, D. R. (2010). Chapter 7: Can Rights Put it Right? Industry Initiatives to Resolve Overcapacity Issues: Observations from a Boat Deck and a Manager's Desk. Conservation and Management of Transnational Tuna Fisheries. R. Allen, J. Joseph and D. Squires. Ames, Iowa, Wiley-Blackwell**:** 127-135. p127-8.
[679] See Chapter Two subsection 2.3.4.
[680] On the first five dimensions, see also Squires, D. (2010). Chapter 3. Property and Use Rights in Fisheries. Conservation and Management of Transnational Tuna Fisheries. R. L. Allen, J. Joseph and D. Squires. Ames, IA, Wiley-Blackwell**:** 39-64. p43.

invest in resource stewardship and in information that reduces other sources of uncertainty[681]. This is consistent with Scott's argument supporting the benefits of sole ownership[682].

Fifth, *divisibility* describes the extent to which a resource or the flow of benefits from it can be divided into smaller units and exercised or transferred. Squires argued that if these first five dimensions are fully specified then private interests are more likely to coincide with society-wide interests – that is, externalities will be minimised such that internal costs and benefits align more closely with social benefits and costs[683].

A final dimension, *flexibility*[684], describes the extent to which the right is adaptable to changing economic, social and ecological conditions[685]. Given the importance of *security* in a rightholder's title, *flexibility* must be applied in a predictable manner in response to otherwise unpredictable exogenous factors.

Together the strength of each dimension influences how well-defined a property right is, its value as an asset, the nature and strength of the incentives that it creates, and the extent to which externalities are taken into account. A highly exclusive right that is secure and held permanently, but able to be transferred to someone who can derive greater value from it, either as a whole or in part, will command higher value than one that is less exclusive, vulnerable to resumption or alteration, short-lived, and not transferable. High levels of flexibility may increase uncertainty in important aspects of the right and so reduce its value. But flexibility also enables key parameters to be altered to meet the conditions of any given time. Rigidity in, say, quantitative rights to extract a resource may lead to overexploitation and reduced economic returns when the available stock declines due to exogenous factors. Rights that have a higher degree of certainty in the way that any flexibility will be applied are therefore more likely to provide both adaptive capacity and certainty.

3.2.5 Rights-based instruments in fisheries

Individual fishing rights can be defined as the right to catch a certain quantity of fish based on a share of a total allowable catch (TAC), or units of effort based on a share of total allowable effort (TAE) for

[681] Hanna, S., S. (1999). "Strengthening Governance of Ocean Fishery Resources." Ecological Economics **31**: 275-286. p281.
[682] Scott, A. (1955). "The Fishery: The Objectives of Sole Ownership." Journal of Political Economy **63**(2): 116-124.
[683] Squires, D. (2010). Chapter 3. Property and Use Rights in Fisheries. Conservation and Management of Transnational Tuna Fisheries. R. L. Allen, J. Joseph and D. Squires. Ames, IA, Wiley-Blackwell**:** 39-64. p44.
[684] Devlin, R. A. and R. Q. Grafton (1998). Economic Rights and Environmental Wrongs: Property Rights for the Common Good. Cheltenham, Edward Elgar. Cited in Grafton, R. Q., V. Adamowicz, D. Dupont, H. Nelson, R. J. Hill and S. Renzetti (2004). The Economics of the Environment and Natural Resources. Malden, MA, Blackwell Publishing. pp38-9.
[685] Squires, D. (2010). Chapter 3. Property and Use Rights in Fisheries. Conservation and Management of Transnational Tuna Fisheries. R. L. Allen, J. Joseph and D. Squires. Ames, IA, Wiley-Blackwell**:** 39-64. p44.

the fishery[686]. Exclusive use rights such as these imply a division of responsibilities between governments and fishers, in which the former, as "the guardians of the viability and productivity of fish stocks…", asserts management rights by setting the TAC or TAE[687] and rights of exclusion by assigning access and withdrawal rights to the latter[688].

Where rights are transferable between users[689] they may be referred to as individual transferable quotas (ITQs) when defined as a portion of a TAC or individual transferable effort (ITEs) when defined as a portion of a TAE. Other names are used to refer to individual rights, including the generic term catch shares, individual vessel quotas (IVQs), individual fishing quotas (IFQs), vessel days and licence limitations. The terms "ITQ" and "ITE" clearly convey the understanding that rights are transferable and vested in an individual user. ITQ and ITE will be used in this study to refer to all individual and transferable rights to harvest an amount of catch or use an amount of effort in a fishery, unless specific examples use a particular term.

While both catch-based and effort-based approaches are amenable to individual property rights[690], the weaknesses of input controls as a proxy for output has prompted an increasing focus on instruments to control catches directly[691]. Access to an ITQ-managed fishery is limited to ITQ holders and, if the TAC is a firm limit, new entrants must buy ITQs from existing ITQ holders in order to fish. ITQs have been

[686] Hannesson, R. (2004). The Privatisation of the Oceans. Cambridge Mass., MIT Press. p4, 54.
[687] Ibid. p55.
[688] See subsection 3.2.3 above.
[689] Scott, A. (2000). Introducing Property in Fishery Management: FAO Fisheries Technical Paper 404/1: Use of Property Rights in Fisheries Management. Proceedings of the FishRights99 Conference. R. Shotton. Fremantle, Western Australia, FAO**:** 1-13. Section 3.2.
[690] On the circumstances which may lend themselves to ITEs rather than ITQs, see Grafton, R. Q. and A. McIlgorm (2009). "Ex ante evaluation of the costs and benefits of individual transferable quotas: A case-study of seven Australian commonwealth fisheries." Marine Policy **33**(4): 714-719.
[691] Grafton, R. Q., D. Squires and J. E. Kirkley (1996). "Private Property Rights and Crises in World Fisheries: Turning the Tide?" Contemporary Economic Policy **14**(4): 90-99.

implemented with varying degrees of success in New Zealand[692] [693], Iceland[694], Australia[695], Canada[696], Chile[697], Norway[698], Spain[699], the United States[700] and South Africa[701] [702].

Customary marine tenure[703] and territorial use rights in fisheries (TURFs)[704] are examples of common property that link spatial rights to use rights. Spatial measures such as TURFs are more likely to be effective in relation to sedentary species or fish that inhabit a defined area, and therefore may well translate into ownership of resources[705]. Such common property approaches specify who may have access to a geographic area – usually members of a community, with quantitative withdrawals regulated by community rules or norms[706]. As Christy has observed, TURFs appear to work well when embedded within existing community institutions, which helps to minimise the cost of establishing and maintaining (i.e. enforcing) them[707]. As such, TURFs are distinct from open access because they control access, and in doing so, are more likely to increase the net economic returns from the fishery.

[692] Yandle, T. (2007). "Understanding the Consequences of Property Rights Mismatches: a Case Study of New Zealand's Marine Resources." Ecology and Society **12**(2): 27-41.
[693] Hersoug, B. (2018). "“After all these years” – New Zealand's quota management system at the crossroads." Marine Policy **92**: 101-110.
[694] Arnason, R. (2005). "Property Rights in Fisheries: Iceland’s Experience with ITQs." Reviews in Fish Biology and Fisheries **15**(3): 243-264.
[695] Grafton, R. Q. and A. McIlgorm (2009). "Ex ante evaluation of the costs and benefits of individual transferable quotas: A case-study of seven Australian commonwealth fisheries." Marine Policy **33**(4): 714-719.
[696] Grafton, R. Q. (1996). "Experiences with Individual Transferable Quotas: An Overview." Canadian Journal of Economics **XXIX**(Special Issue): S135-S138.
[697] Bernal, P., A., D. Oliva, B. Aliaga and C. Morales (1999). "New regulations in Chilean Fisheries and Aquaculture: ITQs and Territorial Users Rights." Ocean & Coastal Management **42**(2-4): 119-142.
[698] Hannesson, R. (2004). The Privatisation of the Oceans. Cambridge Mass., MIT Press.
[699] See for example Caballero-Miguez, G., M. M. Varela-Lafuente and M. Dolores Garza-Gil (2014). "Institutional change, fishing rights and governance mechanisms: The dynamics of the Spanish 300 fleet on the Grand Sole fishing grounds." Marine Policy **44**: 465-472.
[700] See Steelman, T. A. and R. L. Wallace (2001). "Property Rights and Property Wrongs: Why Context Matters in Fisheries Management." Policy Sciences **34**: 357-379.P359 and endnote 3.
[701] Grafton, R. Q., D. Squires and J. E. Kirkley (1996). "Private Property Rights and Crises in World Fisheries: Turning the Tide?" Contemporary Economic Policy **14**(4): 90-99.
[702] See also Bertolotti, M. I., F. Baltar, P. Gualdoni, A. Pagani and L. Rotta (2016). "Individual transferable quotas in Argentina: Policy and performance." Marine Policy **71**: 132-137.
[703] Cinner, J. E., X. Basurto, P. Fidelman, J. Kuange, R. Lahari and A. Mukminin (2012). "Institutional designs of customary fisheries management arrangements in Indonesia, Papua New Guinea, and Mexico." Ibid. **36**(1): 278-285.
[704] Christy, F. T. (1982). Territorial use rights in marine fisheries: FAO Fisheries Technical Paper 227. Rome, Food and Agriculture Organisation of the United Nations**:** 10.
[705] Hannesson, R. (2004). The Privatisation of the Oceans. Cambridge Mass., MIT Press. p63.
[706] Charles, A. T. (2009). Rights-Based Fisheries Management: The Role of Use Rights in Managing Access and Harvesting. A Fishery Manager's Guidebook: FAO Fisheries Technical Paper 424. K. L. Cochrane and S. M. Garcia. Rome, The Food and Agriculture Organisation of the United Nations and Wiley-Blackwell**:** 253-282. p255, 264.
[707] Christy, F. T. (1982). Territorial use rights in marine fisheries: FAO Fisheries Technical Paper 227. Rome, Food and Agriculture Organisation of the United Nations**:** 10. p264.

Aswani[708] noted that customary rights share many of the fundamental characteristics of property rights. Customary rights can be *exclusive* in cases where a community may exercise the collective choice right of *exclusion* – that is, it can exercise a collective choice right of *management* to decide who may have operational rights of *access* and *withdrawal*[709]. Rights will be limited if communities can restrict the amount of fishing or harvests. And they may be *secure* when they are monitored and enforced by customary norms and institutions, including credible penalties for non-compliance[710], or by the formal legal system[711]. They will also be *durable* if the community holds rights in perpetuity and are typically *transferable* to future generations.

3.2.6 Conclusion

This section has described how property rights can be understood in a number of different ways. Property rights in common pool resources are typically defined as use rights, which represent a right to take or use an exclusive share of a resource, rather than ownership of the resource itself. While such rights may pertain to access and withdrawal of the resource, they may also represent the right to manage and exclude access to the resource and determine who may manage and exclude access. Different individuals or groups may possess and exercise each of these rights as part of rights-based management system.

The quality of a property right can be measured against a number of dimensions. Critically, they should represent an *exclusive* share of a *limited* pool and held with a sufficient degree of *security* to incentivise the rightholder to consider exercising the right in the future rather than immediately. Rights may also be *transferable* to permit them to be allocated to the most efficient user, and *flexible* in a predictable way to adapt to uncertainty over time. Well-defined property rights are those in which these dimensions are strong. Examples of property rights in fisheries were provided.

3.3 Complexity and transferable property rights

3.3.1 Introduction

The central argument supporting property rights is that exclusive possession of a secure right to enjoy the benefits flowing from a portion of a resource shifts individual incentives toward convergence with social benefits[712]. This section evaluates the ability of transferable rights-based instruments (or market-based instruments) to deal with various aspects of complexity, with empirical examples. It briefly

[708] See the discussion in Aswani, S. (2005). "Customary Sea Tenure in Oceania as a Case of Rights-based Fishery Management: Does it Work?" Reviews in Fish Biology and Fisheries **15**(3): 285-307. pp287-90.
[709] Such decisions could include the assignment of exclusive rights to individual members of the community, or they could grant freedoms to all members of the community that non-members do not enjoy.
[710] Ostrom, E. (1990). Governing the Commons: The Evolution of Institutions for Collective Action. Cambridge, UK, Cambridge University Press.
[711] The formal legal system may also override or extinguish customary rights.
[712] Chapter Two subsection 2.3.4.

addresses the capacity of property rights to address multiple attributes in a resource and evaluates the capacity of market-based instruments to address complexities related to biological, ecological, economic and social objectives, and in doing so, their adaptive capacity to address uncertainty and dynamism.

3.3.2 Property rights and multiple resource attributes

This subsection extends the idea of a bundle rights to aid understanding of how rights can apply to the management of multiple attributes of the resource. Chapter Two noted that resource stocks may have multiple attributes and therefore represent multiple values to different users. A single property right, and therefore its value, however, often captures multiple attributes or only some of the attributes of the resource[713]. Either may compromise objectives related to each attribute.

In the marine sphere, multiple attributes reflect competing uses of the resource or space, such as commercial, subsistence and recreational fisheries, conservation and tourism, oil drilling and shipping[714]. Within a fisheries context, separate biological attributes can include multiple target species, non-target bycatch, spatial distribution and stock age profiles. An ITE that is specified as a right to use a particular gear type could affect multiple target and non-target species and damage habitats. A right to catch a particular quantity of a particular species similarly does not, on its own, take into account impacts on bycatch species and habitats. In both cases, externalities, or spillovers, emerge, affecting those other attributes and imposing a cost on those stakeholders with an interest in them[715].

These examples evoke the notion of bundled rights – that is, that a single right bundles together multiple attributes and may therefore be poorly defined. Edwards argues that rights could be unbundled and assigned to each attribute[716]. Rights could then be traded-off against each other in a series of decentralised Coasean bargains rather than "optimised" by a centralised decision maker.

The benefits of unbundling may not outweigh the costs. Where the costs of negotiation and enforcement exceed the known cost of the externalities, a fisheries authority may decide to regulate using command

[713] Cheung, S. N. S. (1970). "The Structure of a Contract and Theory of Non-exclusive Rresource." Journal of Law and Economics **13**: 49-70. p51.
[714] Edwards, S. F. (2003). "Property rights to multi-attribute fishery resources." Ecological Economics **44**(2-3): 309-323.
[715] Cheung refers to stipulations in a contract. "It has become increasingly clear to me that the mushrooming of alleged "externalities" is attributable to either (I) the absence of the right to contract, (2) the presence of a contract but with incomplete stipulations, or (3) the presence of stipulations that are somehow inconsistent with some marginal equalities." Cheung, S. N. S. (1970). "The Structure of a Contract and Theory of Non-exclusive Rresource." Journal of Law and Economics **13**: 49-70. p51.
[716] Edwards, S. F. (2003). "Property rights to multi-attribute fishery resources." Ecological Economics **44**(2-3): 309-323. p312.

and control instruments. And where a high level of complexity leads to high transaction costs, authorities may bundle property rights to reflect joint attributes[717].

Transferability, flexibility and unbundling underlie the discussion in the next subsection on the capacity of rights-based instruments to address multiple objectives arising from multiple attributes in the fishery.

3.3.3 Property rights and multiple objectives

This section examines the capacity of property rights to cope with multiple objectives, and where relevant, uncertainty and dynamism.

Biological objectives

Chapter Two set out the fundamental biological and economic arguments for property rights as a solution to common pool resource problems. This subsection identifies some of the key theoretical advantages of individual property rights, primarily ITQs, over open access and limited user open access in addressing biological objectives[718] [719].

First, as access is limited to ITQ holders, fishers no longer need to "race to fish" before the TAC is met, as happens in an open access environment[720]. As an output-defined instrument, ITQs act as both a catch control and an effort control. Assuming the TAC is set appropriately, effort is aligned perfectly with the TAC rather than based on an estimate of how much effort is required to meet the TAC.

Second, the race to fish in open access fisheries leads to very short, intense seasons, where the market is swamped with fish in a short period, driving down prices and curtailing supply for the rest of the year[721]. Under an ITQ regime, and in the absence of a race to fish, fishers are likely to make less risky decisions about when to fish (e.g. by avoiding unsafe weather)[722] and maximise returns by responding to market prices[723]. The catch is likely to be more evenly spread throughout the season and fishers are likely to land better quality fish and sell their catch at higher prices than under open access conditions[724].

[717] Ibid. p312.
[718] Grafton, R. Q., D. Squires and J. E. Kirkley (1996). "Private Property Rights and Crises in World Fisheries: Turning the Tide?" Contemporary Economic Policy **14**(4): 90-99.
[719] Libecap, G. D. (2009). "The tragedy of the commons: property rights and markets as solutions to resource and environmental problems." Australian Journal of Agricultural and Resource Economics **53**(1): 129-144.
[720] Chapter Two subsection 2.3.4.
[721] Chapter Two subsection 2.3.4.
[722] Pfeiffer, L. and T. Gratz (2016). "The effect of rights-based fisheries management on risk taking and fishing safety." Proc Natl Acad Sci U S A **113**(10): 2615-2620.
[723] Huppert, D. D. (2005). "An Overview of Fishing Rights." Reviews in Fish Biology and Fisheries **15**(3): 201-215. p205.
[724] For example, fishers in the British Columbia halibut fishery enjoyed increased revenues following the introduction of individual vessel quotas in 1991. See Grafton, R. Q., D. Squires and K. J. Fox (2000). "Private Property and Economic Efficiency: A Study of a Common-Pool Resource." Journal of Law and Economics **XLIII**: 679-713. pp704-5.

Third, fishers holding secure, durable ITQs have an interest in the long-term productivity of the stock and are more likely to take into account the discounted future value of the stock when making decisions about short term fishing activity[725]. This acts as an incentive to conserve the stock[726].

Fourth, as noted in the previous subsection, property rights can be unbundled to match each attribute and related objective. Beyond the stock-wide population and reproductive capacity, property rights could be assigned to different biological attributes of a stock, such as the age classes and spatial distribution of stocks and temporal characteristics[727] [728]. TACs and ITQs often apply to the stock as a whole, without differentiating sub-stocks on the basis of such characteristics[729]. Edwards[730] suggested that, if transaction costs can be minimised, separate ownership of rights corresponding to each attribute could contribute to the value of each attribute by permitting negotiations and encouraging mutual enforcement between the interested parties to manage externalities. Similarly, Arnason suggests setting TACs for each sub-stock or size category, with corresponding ITQs, could provide a tool to manage these attributes, noting that this will be more complex and more expensive to monitor[731].

Unbundling is likely to be more effective where technology and/or preferences are specialised enough to warrant the creation of separate rights[732]. Similarly, it is likely to be simpler to match unbundled output-based controls to each attribute compared to effort -based controls unless effort is defined by the use of very selective gear. An ITE that is specified as a right to use a particular gear type could affect multiple target and non-target species.

To illustrate, New Zealand's Quota Management System (QMS) sets catch quotas for 98 species[733] [734]. Catch compositions can be reconciled with quotas through intra-seasonal, post-catch transfers of

[725] Scott, A. (1955). "The Fishery: The Objectives of Sole Ownership." Journal of Political Economy **63**(2): 116-124.
[726] Libecap, G. D. (2009). "The tragedy of the commons: property rights and markets as solutions to resource and environmental problems." Australian Journal of Agricultural and Resource Economics **53**(1): 129-144. p134.
[727] Edwards, S. F. (2003). "Property rights to multi-attribute fishery resources." Ecological Economics **44**(2-3): 309-323.
[728] See also Yandle, T. (2007). "Understanding the Consequences of Property Rights Mismatches: a Case Study of New Zealand's Marine Resources." Ecology and Society **12**(2): 27-41.
[729] Arnason, R. (2012). "Property Rights in Fisheries: How Much Can Individual Transferable Quotas Accomplish?" Review of Environmental Economics and Policy **6**(2): 217-236.p227.
[730] Edwards, S. F. (2003). "Property rights to multi-attribute fishery resources." Ecological Economics **44**(2-3): 309-323. P312.
[731] Arnason, R. (2012). "Property Rights in Fisheries: How Much Can Individual Transferable Quotas Accomplish?" Review of Environmental Economics and Policy **6**(2): 217-236. p227-8.
[732] Edwards, S. F. (2003). "Property rights to multi-attribute fishery resources." Ecological Economics **44**(2-3): 309-323. p312.
[733] MPI. (2020, 16 November 2020). "Fish Quota Management System." Retrieved 13 January, 2021, from https://www.mpi.govt.nz/legal/legal-overviews-legislation-standards/fisheries-legislation/quota-management-system/.
[734] For annual quotas for each species see Fisheries New Zealand and Tini A Tangaroa. (2020). "Fisheries Infosite: Species." Retrieved 13 January, 2021, from https://fs.fish.govt.nz/Page.aspx?pk=6&tk=97.

quota[735] [736]. The QMS also controls spatial distribution by unbundling spatial attributes of the stock into Quota Management Areas[737]. CCAMLR sets similar spatial catch limits for certain species in each of its statistical areas or divisions[738] [739].

A further area for potential conflict may be between the biological and economic objectives of fishers on one hand and stock conservation objectives on the other. Conservation of target stocks can be considered a value, typically represented by environmental groups' interest in the future existence of the stock but also by fishers concerned for future catches. In this sense, MSY or MEY are entirely compatible with such a conservation objective. Again, it is the TAC that achieves the conservation objective rather than the ITQ regime. However, where a property right provides sufficient security of future access, fishers are likely to be motivated to seek a more conservative (ie: profit maximising) TAC than if there is less certainty about the future value of those rights[740].

However, should environmental objectives require a further increase in the unharvested portion of the stock, the most obvious solution would be to reduce the TAC further, in effect allocating a portion of the original TAC to "the environment"[741]. A similar example exists in relation to water resources management regimes in which allocations of "environmental water" are set aside from extractive allocations[742]. This amounts to a form of unbundling of extractive attributes and environmental (biological) attributes of the resource.

A market-based alternative to a set-aside could be to allow an entity, such as a central authority or a conservation group, to purchase rights in the market from existing rightholders. Arnason[743] has modelled the possibility of purchases on behalf of the environment and suggests that, unlike trading rights between commercial and recreational fishers, permitting conservationists to purchase ITQs from fishers may result in a sub-optimal allocation of ITQs between extraction and conservation. Arnason

[735] Edwards, S. F. (2003). "Property rights to multi-attribute fishery resources." Ecological Economics **44**(2-3): 309-323. p317.
[736] Stewart, J. and J. Leaver (2015). "Efficiency of the New Zealand annual catch entitlement market." Marine Policy **55**: 11-22.
[737] Fisheries Act 1996. New Zealand. **1996 No.88**. s.24.
[738] See the map of CCAMLR Convention Area at https://www.ccamlr.org/en/system/files/CCAMLR-Convention-Area-Map.pdf. Retrieved on 17 June 2020.
[739] For example, catches of all toothfish species (Dissostichus spp) are limited in the entire CCMLAR convention area under CM41-01(2019). However, a CM41-02(2019) separately limits catches of Patagonian toothfish (*dissostichus eleginoides*) in statistical area 48.3, and three sperate management areas within that area.
[740] Nowlis, J. and A. A. Van Benthem (2012). "Do Property Rights lead to Sustainable Catches." Marine Resource Economics **27**: 89-105.
[741] An environmental objective here relates to the quantity of water or fish that are not extracted from the system – i.e. conservation of the stock as an environmental objective – rather than a broader ecological objective.
[742] See Ancev, T. (2015). "The role of the commonwealth environmental water holder in annual water allocation markets." Australian Journal of Agricultural and Resource Economics **59**(1): 133-153.
[743] Arnason, R. (2009). "Conflicting Uses of Marine Resources: Can ITQs promote an efficient solution?" Ibid. **53**: 145-174.

explains that conservationists will likely offer too low a price for ITQs because they will not take into account the positive externalities of their purchase (a public good) enjoyed by other conservationists. The reverse is also true – fishers will not take into account the positive externalities of selling ITQs to conservationists[744] and so will demand too high a price to sell their ITQs to conservationists[745]. This will most likely result in a level of conservation that is lower than conservationists' preferences but could nevertheless be an improvement in the level of conservation[746].

Instead, Arnason suggests that two categories of ITQs could be established – conservation ITQs and fishing ITQs – and traded separately[747]. The former would be traded between fishers and conservationists acting as two groups (thus internalising the previously noted externalities within each group[748]) to achieve an optimal allocation of harvesting and conservation rights through a Coasean bargaining process[749]. The latter would be traded between fishers only, establishing separate market prices for each[750] [751]. There is a clear parallel here with Edwards' unbundling proposition.

In the presence of uncertainty in relation to stock size, such trades in ITQs could conceivably be employed by a central authority to make adjustments to the TAC in response to new information on stock abundance while compensating users who choose to sell their rights. Again, water resources management provides a helpful analogy, where a central authority has acted on behalf of the environment to buy back (or sell back) allocations to adjust for seasonal variations in water availability[752]. This would allow intra- and inter-seasonal adjustments to be made as stock assessments are revised, and where overall effort requires adjustment.

Alternatively, in line with the robust separation model, individual allocations could be defined in terms of a fixed proportion of the TAC/TAE rather than volumetric. This would allow the TAC/TAE to be adjusted as required, with automatic adjustments to individual allocations in accordance with the

[744] Arnason argues that the negative externality impose on other fishers is addressed by the ITQ system. Ibid. p156.
[745] Ibid. pp156-8.
[746] Ibid. p159.
[747] Note that this is similar to the set-aside mentioned above.
[748] Arnason, R. (2009). "Conflicting Uses of Marine Resources: Can ITQs promote an efficient solution?" Australian Journal of Agricultural and Resource Economics **53**: 145-174.p162.
[749] Coase, R. N. (1960). "The Problem of Social Cost." Journal of Law and Economics **3**: 1-44.
[750] Arnason, R. (2009). "Conflicting Uses of Marine Resources: Can ITQs promote an efficient solution?" Australian Journal of Agricultural and Resource Economics **53**: 145-174. p160.
[751] Experience in New Zealand suggests that conservationists and recreational fishers may in fact prefer to exert influence through political processes rather than seek property rights. See Yandle, T. (2007). "Understanding the Consequences of Property Rights Mismatches: a Case Study of New Zealand's Marine Resources." Ecology and Society **12**(2): 27-41.
[752] Wheeler, S., H. Bjornlund and A. Loch (2014). Water Trading in Australia: Tracing Its Development and Impact Over the Past Three Decades. Water Markets for the 21st Century: What Have We Learned? K. W. Easter and Q. Huang. Dordrecht, Springer. **11:** 179-202. p192.

percentage share of the TAC/TAE held by each individual user. This possibility is discussed further in relation to social objectives below.

Economic objectives

Chapter Two made the case that transferability of property rights is expected to lead to net economic gains through improvements in allocative efficiency and technical efficiency by permitting transfers to more efficient users[753]. In practice economic gains accrue through a variety of mechanisms, aided by the definition of rights in terms of outputs rather than inputs. Technical efficiency is likely to improve where ITQ holders have an incentive to reduce costs and maximise net returns, and so optimise investments in vessels, gear and skills accordingly[754]. Under open access, fishers have an incentive to overcapitalise to increase fishing power in the race to fish[755]. Conversely, ITQs allow technological improvements to *contribute* to improvements in efficiency without undermining biological sustainability[756]. For example, the influence of captain and crew skill can be harnessed by ITQs by ensuring that quota is allocated to the most efficient vessels whereas they would be expected to undermine the effectiveness of input controls[757]. ITQs can also provide advantages over effort-based controls in multigear fisheries, in which effort is difficult to define[758]. A further efficiency gain from ITQs arises from the removal of the competition between fishers and regulators observed under input control regimes[759].

The reallocation of resources through transfers can also help to manage fleet overcapacity, by encouraging inefficient vessels to leave the fishery by selling their rights[760]. Capital and labour departing the industry would be expected to be deployed elsewhere in the economy while profitability of the remaining industry would be expected to increase[761]. For example, modelling by Weninger predicted a substantial reduction in vessels in the US surf clam and ocean quahog fishery following a

[753] Chapter Two subsection 2.3.4.
[754] Arnason, R. (2012). "Property Rights in Fisheries: How Much Can Individual Transferable Quotas Accomplish?" Review of Environmental Economics and Policy **6**(2): 217-236. p224.
[755] Gordon, H. S. (1954). "The Economic Theory of a Common Property Resource: The Fishery." Journal of Political Economy **62**(2): 124-142. pp133-4.
[756] Kompas, T. and P. Gooday (2007). "The Failure of 'Command and Control' in Fisheries Management: Lesson from Australia." International Journal of Global Environmental Issues **7**(2/3): 174-190.p186.
[757] Pascoe, S. and L. Coglan (2002). "The contribution of unmeasurable inputs to fisheries production: an analysis of technical efficiency of fishing vessels in the English Channel." American Journal of Agricultural Economics **84**(3): 585-597. p595.
[758] Squires, D., M. Maunder, R. Allen, P. Andersen, K. Astorkiza, D. Butterworth, G. Caballero, R. Clarke, H. Ellefsen, P. Guillotreau, J. Hampton, R. Hannesson, E. Havice, M. Helvey, S. Herrick Jr, K. Hoydal, V. Maharaj, R. Metzner, I. Mosqueira, A. Parma, I. Prieto-Bowen, V. Restrepo, S. F. Sidique, S. I. Steinsham, E. Thunberg, I. del Valle and N. Vestergaard (2017). "Effort rights-based management." Fish and Fisheries **18**(3): 440-465. p16.
[759] See Chapter Two subsection 2.3.3.
[760] See Chapter Two Subsection 2.3.4.
[761] The social consequences of this type of structural change are discussed below (*Social objectives*).

transition from limited entry regime to ITQs, leading to harvest cost savings of around US$11-12 million[762].

However, the assumption that vessels will depart the industry, rather than move to another fishery should be treated with caution[763]. Similarly, the suggestion that workers exiting the industry will be redeployed elsewhere in the economy assumes that workers are mobile in terms of geography, skills and social networks.

ITQs have produced a number of successes and many useful lessons for their design. The introduction of an ITQ system into the Australian southern bluefin tuna fishery – a long-lived, relatively stable single species fishery – led to a 70 percent reduction in vessel numbers, increased catch rates and reduced costs per tonne. Fishers also targeted larger, more valuable species and profitability grew strongly[764].

A study of early changes in the South Atlantic Wreckfish fishery made similar, albeit tentative, findings that technical efficiency had increased, excess vessels were leaving the fishery and fishers were responding to conservation incentives (reflected in reduced calls for increased TAC)[765]. Iceland's pelagic and demersal fisheries have experienced significant reductions in effort and a rapid increase in the value of the market price of ITQs[766].

Kompas and Che's study of the multispecies, multigear Australian southeast trawl fishery estimated that the efficiency gains and cost reductions associated with the introduction of ITQs and enhanced quota trade were considerable. Cost reductions arose from both transfers from high cost to low cost fishers and lease trades to fishers who exceeded their quota[767].

The positive impacts seen in these anecdotal cases are borne out by more systematic assessments. Costello et al[768] compared the performance of 11,135 fisheries, and found that the proportion of those fisheries that employed ITQs that had collapsed[769] was half that experienced by those that did not. A

[762] Weninger, Q. (1998). "Assessing Efficiency Gains from Individual Transferable Quotas: An Application to Mid-Atlantic Surf Clam and Ocean Quahog Fishery." American Journal of Agricultural Economics **80**: 750-764.
[763] Barkin and de Sombre call this the "balloon problem". See Barkin, J. S. and E. R. DeSombre (2013). Saving Global Fisheries: Reducing Fishing Capacity to Promote Sustainability. Cambridge, MA, MIT Press. pp50-62
[764] Geen, G. and M. Nayar (1988). "Individual transferable quotas in the Southern bluefin tuna fishery: An economic appraisal." Marine Resource Economics **5**(4): 365-387.
[765] Gauvin, J. R., J. M. Ward and E. E. Burgess (1994). "Description and Evaluation of the Wreckfish (Polyprion Americanus) Fishery under Individual Transferable Quotas." Ibid. **9**: 99-118.
[766] Arnason, R. (2005). "Property Rights in Fisheries: Iceland's Experience with ITQs." Reviews in Fish Biology and Fisheries **15**(3): 243-264.
[767] Kompas, T. and T. N. Che (2005). "Efficiency Gains and Cost Reduction from Individual Transferable Quotas: A Stochastic Cost Frontier for the Australian South East Fishery." Journal of Productivity Analysis **23**(3): 285-307.pp300-1.
[768] Costello, C., S. D. Gaines and J. Lynham (2008). "Can catch shares prevent fisheries collapse?" Science **321**(5896): 1678-1681.
[769] The study defined a stock as collapsed if the catch in any given year had fallen to 10 percent of its highest catch in any year prior. See Worm, B., E. B. Barbier, N. Beaumont, J. E. Duffy, C. Folke, B. S. Halpern, J. B. C.

more recent study by Costello et al[770] of over 4700 fisheries found that the introduction of rights-based management (both individual and collective access) would lead to increased profits, biomass and catches compared to the status quo, and higher profits and biomass compared to a catch maximisation strategy. The authors concluded that their modelling based on empirical data demonstrated that rights-based approaches, tailored to the specific social, economic and ecological context, could reconcile economic, biological and, arguably, food security objectives for almost all fisheries.

Together, the arguments in favour of ITQs suggest that they are able to reconcile biological objectives and economic objectives. This means that a well-enforced system of well-defined ITQs under a sustainable TAC can achieve sustainable catches while maximising economic rent[771]. One important caveat is that, as noted in Chapter One, where a TAC is set at MEY, catches are likely to be lower than MSY. This introduces the potential for conflict between stakeholders who prioritise catches over rents, as may be the case with subsidised fleets, and those who prioritise economic returns and the conservation of stocks. While it may be difficult to reconcile these two positions, it is clear that, for any given level of catch, ITQs can maximise the available economic returns. This means that even if a TAC is set at MSY, rather than MEY, ITQs are more likely to maximise the rents generated at that level of catch than other fisheries management instruments. As such, the potential for conflict is not one relating to whether or not ITQs are employed but the level at which the TAC is set.

Other important lessons for the design of ITQs have emerged from empirical cases. For example, Grafton et al found that efficiency gains from the introduction of individual vessel quotas (IVQs) in the British Columbia halibut fishery were constrained by design flaws in the property right. As the name suggests, IVQs attached quota to vessels, which increased the difficulty with which vessel owners could replace their vessel and continue to fish[772]. Limits on the duration and transferability of IVQs, and on ability to divide an IVQ into smaller units, during a trial period (1991-1992) further constrained short run efficiency gains. A more recent study of the same fishery found that the introduction of *transferability* of quota unbundled from the vessel led to a significant reduction in capacity, increased capacity utilisation (and implicitly, technical efficiency) by remaining quota holders and an increase in season length from six days to 245 days[773].

Jackson, H. K. Lotze, F. Micheli, S. R. P. Sala, K. A. Selkoe, J. J. Stachowicz and R. Watson (2006). "Impacts of biodiversity loss on ocean ecosystem services." Ibid. **314**(5800): 787-790.

[770] Costello, C., D. Ovando, T. Clavelle, C. K. Strauss, R. Hilborn, M. C. Melnychuk, T. A. Branch, S. D. Gaines, C. S. Szuwalski, R. B. Cabral, D. N. Rader and A. Leland (2016). "Global fishery prospects under contrasting management regimes." Proc Natl Acad Sci U S A **113**(18): 5125-5129.

[771] Grafton, R. Q., T. Kompas and R. W. Hilborn (2007). "Economics of overexploitation revisited." Science **318**(5856): 1601.

[772] Grafton, R. Q., D. Squires and K. J. Fox (2000). "Private Property and Economic Efficiency: A Study of a Common-Pool Resource." Journal of Law and Economics **XLIII**: 679-713. pp702-3.

[773] Squires, D., Y. Jeon, R. Q. Grafton and J. Kirkley (2010). "Controlling excess capacity in common-pool resource industries: the transition from input to output controls*." Australian Journal of Agricultural and Resource Economics **54**(3): 361-377.

Consideration may also need to be given to the spillover effects of ITQs on other fisheries. For example, the introduction of transferable IFQs in the US Gulf of Mexico red snapper fishery led to increased capacity utilisation and fishing seasons (from 109 days to a full year season). However, their impact on overcapacity was limited (a decrease of between 12 and 39 percent) and many vessels departing the fishery entered other mid-water snapper fisheries[774] [775].

ITEs have enjoyed much less attention in academic literature than ITQs but many examples exist[776] [777], reflecting in part the relative ease of monitoring effort controls. Examples include licence limitations[778], vessel days[779], number of sets and number of hooks. Like ITQs, trading in ITEs will also likely allocate access to more efficient fishers and increase rents from the fishery. However, consistent with their reliance on input controls, efficient fishers are better able to use their regulated inputs to catch more fish, exacerbating effort creep and possibly increasing catches beyond levels anticipated under the TAE. ITEs also create incentives to maximise inputs by substituting unregulated inputs for regulated inputs, and maximise catches[780], again leading to a risk of overfishing. To combat this, either effort needs to be defined comprehensively or TAEs need to be adjusted regularly to counteract effort creep[781].

[774] Solís, D., J. del Corral, L. Perruso and J. J. Agar (2015). "Individual fishing quotas and fishing capacity in the US Gulf of Mexico red snapper fishery." Ibid. **59**(2): 288-307.
[775] This is an example of the "balloon problem" referred to above. See footnote 763.
[776] See Squires, D., M. Maunder, R. Allen, P. Andersen, K. Astorkiza, D. Butterworth, G. Caballero, R. Clarke, H. Ellefsen, P. Guillotreau, J. Hampton, R. Hannesson, E. Havice, M. Helvey, S. Herrick Jr, K. Hoydal, V. Maharaj, R. Metzner, I. Mosqueira, A. Parma, I. Prieto-Bowen, V. Restrepo, S. F. Sidique, S. I. Steinsham, E. Thunberg, I. del Valle and N. Vestergaard (2017). "Effort rights-based management." Fish and Fisheries **18**(3): 440-465.Table 1
[777] See Chapter Two subsection 2.3.3 above.
[778] Townsend, R. E. (1990). "Entry Rrestriction in the Fishery: A Survey of the Evidence." Land Economics **66**(4): 360-378.
[779] Aqorau, T. (2009). "Recent Developments in Pacific Tuna Fisheries: The Palau Arrangement and the Vessel Day Scheme." The International Journal of Marine and Coastal Law **24**(3): 557-581.
[780] Squires, D., M. Maunder, R. Allen, P. Andersen, K. Astorkiza, D. Butterworth, G. Caballero, R. Clarke, H. Ellefsen, P. Guillotreau, J. Hampton, R. Hannesson, E. Havice, M. Helvey, S. Herrick Jr, K. Hoydal, V. Maharaj, R. Metzner, I. Mosqueira, A. Parma, I. Prieto-Bowen, V. Restrepo, S. F. Sidique, S. I. Steinsham, E. Thunberg, I. del Valle and N. Vestergaard (2017). "Effort rights-based management." Fish and Fisheries **18**(3): 440-465. pp8-9.
[781] Ibid. p10.

However, ITEs may be appropriate where there is a high level of uncertainty in biomass[782] [783] and/or a stable and known relationship between effort and catch[784].

In summary, there is therefore strong theoretical and empirical evidence that ITQs, and to a lesser extent ITEs, are capable of supporting biological sustainability and maximising economic returns within the constraint of a biological objective. ITQs can mitigate the negative impacts of the race to fish and establish incentives to optimise investment by harnessing innovation to improve efficiency and profitability and avoid the harmful effects of effort creep. Fishers also have incentives to improve safety, stabilise market prices and maximise catch quality and value. However, where stocks fluctuate within seasons or there is a stable known relationship between effort and catches, ITEs may still prove to be a more effective and practical option.

Ecological objectives

Chapter Two described a range of ecological attributes and values in a fishery, including concerns for the conservation of the target stock and of non-target species, and wider ecosystem impacts of fishing through disturbances to habitats and trophic interactions[785]. As Gibbs noted[786], proponents of ITQs tend to emphasise the preoccupations of economic disciplines and neglect other objectives[787]. As the previous section concluded, economic efficiency and biological sustainability arguments in favour of

[782] This could be due a number of reasons, including infrequent or poor quality stock assessments, weak modelling, underreporting, and knowledge gaps in understanding of the biology and population dynamics of stocks. See ibid. p16.

[783] For example, squid. See Arkhipkin, A. I., P. G. K. Rodhouse, G. J. Pierce, W. Sauer, M. Sakai, L. Allcock, J. Arguelles, J. R. Bower, G. Castillo, L. Ceriola, C.-S. Chen, X. Chen, M. Diaz-Santana, N. Downey, A. F. González, J. Granados Amores, C. P. Green, A. Guerra, L. C. Hendrickson, C. Ibáñez, K. Ito, P. Jereb, Y. Kato, O. N. Katugin, M. Kawano, H. Kidokoro, V. V. Kulik, V. V. Laptikhovsky, M. R. Lipinski, B. Liu, L. Mariátegui, W. Marin, A. Medina, K. Miki, K. Miyahara, N. Moltschaniwskyj, H. Moustahfid, J. Nabhitabhata, N. Nanjo, C. M. Nigmatullin, T. Ohtani, G. Pecl, J. A. A. Perez, U. Piatkowski, P. Saikliang, C. A. Salinas-Zavala, M. Steer, Y. Tian, Y. Ueta, D. Vijai, T. Wakabayashi, T. Yamaguchi, C. Yamashiro, N. Yamashita and L. D. Zeidberg (2015). "World Squid Fisheries." Reviews in Fisheries Science & Aquaculture **23**(2): 92-252. p102.

[784] Squires, D., M. Maunder, R. Allen, P. Andersen, K. Astorkiza, D. Butterworth, G. Caballero, R. Clarke, H. Ellefsen, P. Guillotreau, J. Hampton, R. Hannesson, E. Havice, M. Helvey, S. Herrick Jr, K. Hoydal, V. Maharaj, R. Metzner, I. Mosqueira, A. Parma, I. Prieto-Bowen, V. Restrepo, S. F. Sidique, S. I. Steinsham, E. Thunberg, I. del Valle and N. Vestergaard (2017). "Effort rights-based management." Fish and Fisheries **18**(3): 440-465. p16.

[785] Garcia, S. M., A. Zerbi, C. Aliaume, T. Do Chi and G. Lasserre (2003). The ecosystem approach to fisheries. Issues, terminology, principles, institutional foundations, implementation and outlook. FAO Fisheries Technical Paper. Rome, Food and Agriculture Organisation of the United Nations. **443:** 71.

[786] Gibbs, M. T. (2009). "Individual transferable quotas and ecosystem-based fisheries management: it's all in the T." Fish and Fisheries **10**(4): 470-474. p471.

[787] See for example even in a paper on the limitations on ITQs in addressing multiple objectives constrains discussion on "ecological concerns" of ITQs to a discussion of impacts on the target stock, not the wider ecosystem. See Sumaila, U. R. (2010). "A cautionary note on individual transferable quotas." Ecology and Society **15**(3): Article 36.

ITQs are reasonably clear. Property rights, however, have typically not specified the full range of ecosystem attributes[788].

Some researchers cite apparent mechanisms by which ITQs could address ecological impacts but in fact focus on the importance of the restrictiveness of the TAC rather than the ITQ, or on price signals that reward ecologically beneficial behaviour. A lower TAC with mechanisms to avoid highgrading[789] may reduce effort and could reduce catches of non-target species and damage to habitats[790]. While changes in fishing effort and in gear types can be a useful proxy for ecosystem impacts[791], there is little evidence of ITQs stimulating switches to less ecologically damaging gear types[792]. Branch has also noted that ITQs may, however, incentivise fishers to maintain stock sustainability and thus reduce pressure on governments to increase the TAC[793] [794]. Market premiums captured through certification and eco-labelling programs could influence a fisher's willingness to pay for an ITQ, giving them an advantage in securing rights and an obligation to minimise ecological impacts. Gibbs, however, argues that the link is tenuous and unreliable[795].

Fishers could be expected to take action to avoid bycatch where the private cost of catching non-target species borne by the fisher is outweighed by the benefit of avoiding it. For example, bycatch can reduce technical efficiency by, say, taking up hold space that could otherwise be filled with more valuable (to the fisher) target catch[796]. However, in the absence of an effectively enforced ban on discards, such costs, as well as differential market prices, create incentives to discard low value catch, that is, highgrading[797]. Whether ITQs lead to highgrading has been the subject of much debate but there is a

[788] Hanna, S., S. (1999). "Strengthening Governance of Ocean Fishery Resources." Ecological Economics **31**: 275-286. p283.
[789] Such as a ban on discarding. See further below.
[790] For example, Gibbs, M. T. (2010). "Why ITQs on target species are inefficient at achieving ecosystem based fisheries management outcomes." Marine Policy **34**(3): 708-709.
[791] Branch, T. A. (2009). "How do individual transferable quotas affect marine ecosystems?" Fish and Fisheries **10**(1): 39-57. p50.
[792] Ibid. p50.
[793] Branch's review of the ITQ literature found strong evidence of a stewardship effect, manifested in calls from fishers for reductions in TAC. Ibid. p42.
[794] See also examples of the introduction of individual harvesting rights which have been shown to create incentives for fishers to seek *reductions* in the TAC in some cases. Grafton, R. Q., R. Arnason, T. Bjørndal, D. Campbell, H. F. Campbell, C. W. Clark, R. Connor, D. P. Dupont, R. Hannesson, R. Hilborn, J. E. Kirkley, T. Kompas, D. E. Lane, G. R. Munro, S. Pascoe, D. Squires, S. I. Steinshamn, B. R. Turris and Q. Weninger (2006). "Incentive-based approaches to sustainable fisheries." Canadian Journal of Fisheries and Aquatic Sciences **63**(3): 699-710. p702.
[795] Gibbs, M. T. (2010). "Why ITQs on target species are inefficient at achieving ecosystem based fisheries management outcomes." Marine Policy **34**(3): 708-709. p709.
[796] Anderson, L. G. (1994). "An economic analysis of highgrading in ITQ fisheries regulation programs." Marine Resource Economics **9**(3): 209-226.
[797] Arnason 1994 On Catch discarding in Fisheries, Marine Resource Economics 9(3) 1994 189-208; and Anderson 1994 Highgrading in ITQ fisheries, Marine Resource Economics 9(3) 1994 209-226.

solid body of theoretical evidence that, while ITQs are not the only cause[798], they may exacerbate it in some circumstances[799]. Ensuring that ITQs count catches rather than landings is likely to help[800].

Like Edwards, Hanna argued that property rights regimes fail to address ecosystems objectives because "they do not specify claims to the full range of goods and services provided by an ecosystem" and "ownership" must redefined in terms of a "portfolio of species, perhaps geographically oriented" [801].

Property rights theory would suggest that unbundling rights[802] to match the multispecies attributes of the fishery could help to internalise the external cost of bycatch. This could be achieved by creating a property right in bycatch species or grades of catch[803], as summarised in Figure 3.1 below. Economic modelling by Boyce has shown that there may be some value in establishing ITQs for bycatch in order to capture the resulting external cost. Boyce showed that ITQs for both target species and commercially valuable bycatch had greater potential to maximise social welfare than the open access case. Prohibitions on the sale of bycatch, on the other hand, were more likely to create incentives to reduce bycatch but without the same welfare gains[804]. While value could be captured in the sale of bycatch, the same study has shown that bycatch that has some existence value but no commercial value would require the imposition of a user fee or tax to reflect external costs[805].

Empirical examples of bycatch quotas for non-commercial species are rare. The key advantage of ITQs is that they create incentives to maximise returns and minimise costs. But as Hannesson noted, ITQs for non-commercial species would be akin to emissions quotas, allowing fishers to transfer bycatch quota in-season to those who are better able to maximise catches of target species for a given total

[798] For example, Arnason argues that highgrading can result from incompletely defined property rights (say, by setting a quota on landings rather than catches, or by defining quotas in aggregate rather than by grades of fish to differentiate those to be avoided from those to be marketed) and weak enforcement rather than ITQs per se. Arnason, R. (1994). "On catch discarding in fisheries." Marine Resource Economics **9**(3): 189-207. p200

[799] For example, Anderson concludes that highgrading may occur in the presence of constraints on landings, such as hold capacity, but that in the absence of such constraints, ITQs may lead to highgrading. Anderson, L. G. Ibid."An economic analysis of highgrading in ITQ fisheries regulation programs." 209-226. p225.

[800] Branch, T. A. (2009). "How do individual transferable quotas affect marine ecosystems?" Fish and Fisheries **10**(1): 39-57. p44.

[801] Hanna, S. S. (1998). "Institutions for Marine Ecosystems: Economic Incentives and Fishery Management." Ecological Applications **8**(1 - Supplement): S170-174. S171.

[802] Edwards, S. F. (2003). "Property rights to multi-attribute fishery resources." Ecological Economics **44**(2-3): 309-323.

[803] Arnason suggests this as a theoretical solution to the problem of bycatches of undesirable grades of target species but notes there would be, but does not elaborate on, practical difficulties. Arnason, R. (1994). "On catch discarding in fisheries." Marine Resource Economics **9**(3): 189-207. p200.

[804] Boyce, J. R. (1996). "An Economic Analysis of the Fisheries Bycatch Problem." Journal of Environmental Economics and Management **31**: 314-336.

[805] Ibid. p333.

bycatch, whether by luck or skill[806]. He identified only one example of non-commercial bycatch quota – non-transferable quota for dolphin bycatch in the tuna fishery of the Eastern Pacific[807].

In multispecies fisheries, multispecies ITQs may create incentives to discard some catch in order to match the aggregate catch with quotas, although this has been found to decrease with greater monitoring and enforcement[808]. The New Zealand example was noted in the previous section. Similar mechanisms, including for bycatch species, exist in Australia[809], Canada and Iceland[810]. Those mechanisms included post-catch quota transfers, retrospective quota balancing, rollover allowances, deemed value payments (in New Zealand) for landing fish for which fishers do not have quota, trading ratios that permit trading of one species quota for another at set ratios, discard prohibitions, rules permitting catch on behalf of others (in effect leasing quota), balanced harvests and the use of aggregate quotas where it is not cost effective to define single species quotas[811] [812].

As with single species ITQs, effective catch-quota balancing mechanisms must be designed to meet accurate and enforced TACs for each species[813] [814]. However, as the robust separation model acknowledges, where property rights are not able to internalise ecological externalities, command-and-control instruments may be better suited to addressing habitat destruction and dealing with the complexities of multispecies fisheries than individual property rights regimes[815].

In summary, ITQs may present an opportunity to match individual user rights with multiple ecological attributes. Separate TACs and ITQs for commercially valuable bycatch appear to offer a solution to multispecies fisheries, and some potential may exist for non-commercial bycatch ITQs to internalise the cost of a negative externality akin to pollution[816]. Where this is not feasible due, say, to information

[806] Hannesson, R. (2010). Individual transferable quotas for bycatches: Lessons for the tuna-dolphin issue. Conservation and Management of Transnational Tuna Fisheries. R. L. Allen, J. Joseph and D. Squires. Ames, Wiley-Blackwell**:** 343. p216.
[807] Ibid. p217.
[808] Branch, T. A. (2009). "How do individual transferable quotas affect marine ecosystems?" Fish and Fisheries **10**(1): 39-57. pp45-6.
[809] See also for example, the mechanisms established in New South Wales described in Young, M. D. (1999). "The Design of Fishing-Right Systems: the NSW Experience." Ecological Economics **31**: 305-316.
[810] Sanchirico, J. N., D. Holland, K. Quigley and M. Fina (2006). "Catch-quota balancing in multispecies individual fishing quotas." Marine Policy **30**(6): 767-785.
[811] Ibid. pp772-81.
[812] See also the critique of the balanced harvest approach to ecosystems in Pauly, D., R. Froese and S. J. Holt (2016). "Balanced harvesting: The institutional incompatibilities." Ibid. **69**: 121-123.
[813] Woods, P. J., C. Bouchard, D. S. Holland, A. E. Punt and G. Marteinsdóttir (2015). "Catch-quota balancing mechanisms in the Icelandic multi-species demersal fishery: Are all species equal?" Ibid. **55**: 1-10. pp6-7.
[814] Kempf, A., J. Mumford, P. Levontin, A. Leach, A. Hoff, K. G. Hamon, H. Bartelings, M. Vinther, M. Stäbler, J. J. Poos, S. Smout, H. Frost, S. van den Burg, C. Ulrich and A. Rindorf (2016). "The MSY concept in a multi-objective fisheries environment – Lessons from the North Sea." Ibid. **69**: 146-158.
[815] Steelman, T. A. and R. L. Wallace (2001). "Property Rights and Property Wrongs: Why Context Matters in Fisheries Management." Policy Sciences **34**: 357-379. p369.
[816] Boyce, J. R. (1996). "An Economic Analysis of the Fisheries Bycatch Problem." Journal of Environmental Economics and Management **31**: 314-336. p316.

or implementation costs, other measures could also be employed, including economic incentives (e.g. a tax-like charge on bycatch or a minimum price paid for bycatch), or command-and-control rules[817], such as prohibitions or maximum bycatch limits. The key advantage of ITQs nevertheless remains that for any level of TAC and by extension, for any given limits on bycatch, ITQs can help to ensure that catches are efficient.

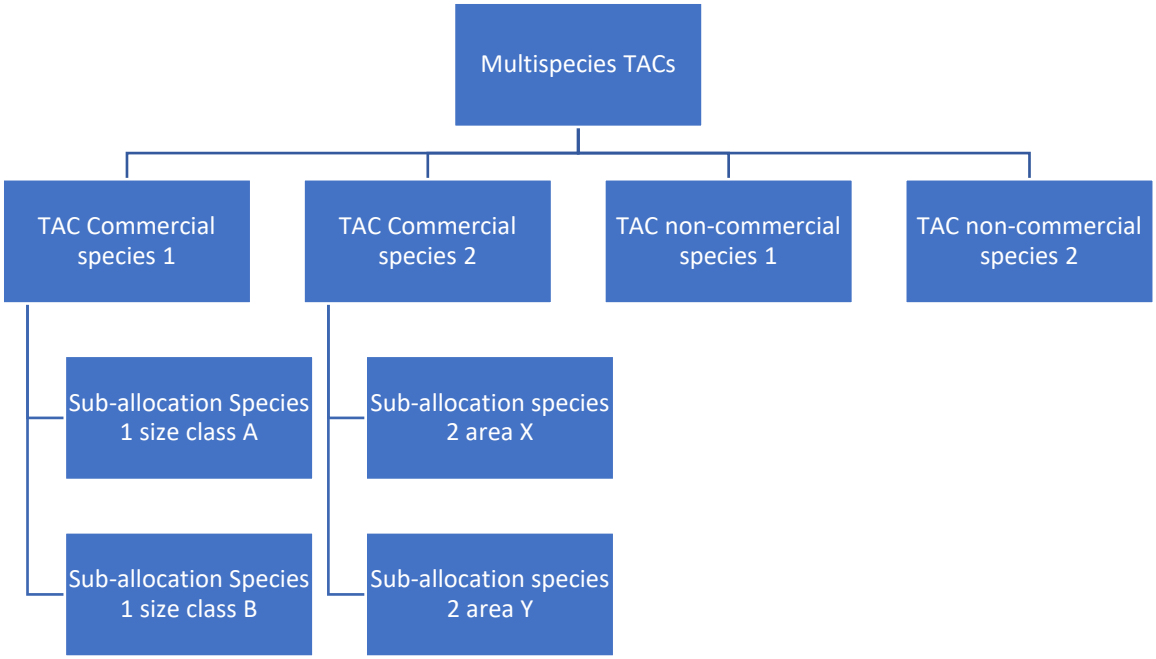

Figure 3.1: Unbundled rights and ecological attributes

Social objectives

This section has noted that holders of well-defined property rights are more likely to invest in the biological sustainability of the fishery, with obvious benefits for future generations who are unlikely to be participants in present day decision-making processes. Well-defined property rights can more closely align private and social time horizons, such that rightholders, whether individuals or a group, are more likely to have lower discount rates than resources users competing in a race to fish[818]. Ultimately, however, the long-term health of the stock is most critically dependent on a TAC set at a biologically sustainable level. Similar arguments can be made for *intergenerational* equity in relation to ecological attributes of the fishery.

Achieving *intragenerational* equity, on the other hand, is a much more complex undertaking and is the source of many criticisms of individual property rights regimes. Intragenerational equity is concerned primarily with distribution in the short term. Decisions are made or influenced by those with immediate,

[817] Steelman, T. A. and R. L. Wallace (2001). "Property Rights and Property Wrongs: Why Context Matters in Fisheries Management." Policy Sciences **34**: 357-379. p371-2.
[818] Hanna, S., S. (1999). "Strengthening Governance of Ocean Fishery Resources." Ecological Economics **31**: 275-286. p283.

direct interests in the fishery and each participant's assessment of what is "equitable" is highly subjective[819].

A central concern has been that property rights "privatise" what once were "public" fisheries and exclude those who formerly had access in favour of those with the resources to buy access[820] [821]. Specific criticisms include concerns about the impacts of ITQs on existing fishers, local employment, coastal communities, future entrants to the fishery, and the interests of developing countries.

Social objectives in a fishery hinge on the number and types of stakeholders and their particular interests. What constitutes distributive justice is therefore highly context-specific. The impact of individual use rights on equity rests largely on how (assignment) and to whom (eligibility) they are allocated. Assignment can occur at a primary stage – that is, the initial allocation of rights by an authority – and at a secondary stage – that is, the transfer of rights between categories of users after the initial assignment has occurred.

Primary assignment and homogenous users

As has been pointed out above, property rights remove competition for catches of a particular fish stock. However, the establishment of a property right in a share of a stock transfers that competition, and therefore opportunities for perceived inequitable outcomes, to the initial point of the assignment of rights.

Property rights may be assigned free of charge or for a price. The free assignment of an ITQ in the primary market is likely to deliver a windfall gain for the initial holder of the right[822]. Such assignments could be on the basis of historical catch or traditional use, recognising existing interests in the fishery. The size of that windfall will, of course, be influenced by a range of factors. For example, a longer duration (up to and including in perpetuity) will likely increase the value of the right[823]. A large windfall will likely lead to a less equitable outcome because subsequent entrants must purchase rights in a secondary market from users who received them free of charge[824].

[819] McCay, B. J. (1995). "Social and Ecological Implications of ITQs: an Overview." Ocean & Coastal Management **28**(1-3): 3-22. p8.
[820] Mansfield, B. (2004). "Neoliberalism in the oceans: "rationalization," property rights, and the commons question." Geoforum **35**(3): 313-326.
[821] See the discussion in subsection 3.2.2 above.
[822] Ørebech, P. (2005). "What Restoration Schemes Can Do? Or, Getting It Right Without Fisheries Transferable Quotas." Ocean Development & International Law **36**(2): 159-178.
[823] It is important to keep in mind the stewardship benefits to be obtained from durable title, as argued by Scott, A. (2000). Introducing Property in Fishery Management: FAO Fisheries Technical Paper 404/1: Use of Property Rights in Fisheries Management. Proceedings of the FishRights99 Conference. R. Shotton. Fremantle, Western Australia, FAO**:** 1-13. p6.
[824] Ørebech, P. (2005). "What Restoration Schemes Can Do? Or, Getting It Right Without Fisheries Transferable Quotas." Ocean Development & International Law **36**(2): 159-178. p165-7.

Conversely it could also be argued that to require a fisher to buy a right to do what they had already been doing may be considered inequitable to the fisher. These are judgements to be made by the community and policy makers. There is a clearer case, however, for perpetual, free rights where they are designed to protect traditional fishing practices or customary fishing rights held by communities[825].

Free assignment begs the question, if not price[826], on what basis should rights be assigned? The most common approach is to allocate rights on the basis of fishing history. This may be a legitimate basis for allocation where all users with a fishing history are assigned rights[827], even if those rights are a reduced proportion of their historical catches. Conversely, one could argue that assignment based on catch history in an overfished fishery rewards fishers who have contributed to overfishing – akin to "polluter benefits" – and encourages strategic behaviour to build up a catch history in anticipation.

There may, however, be some instances in which a windfall gain is less likely to be obtained by the free assignment of ITQs. For example, Grafton[828] has argued that the presumption of a causal link between the creation of ITQs and a windfall gain should be made cautiously. A fishery that is transitioning from a limited access regime to the free assignment of ITQs to existing fishers has in fact already granted exclusive access. It is not the ITQ system that has created the windfall but the prior limited access regime[829]. The key question to ask here is whether the policy change created an exclusive right that previously did not exist.

If exclusive rights are assigned for a price in the primary market, such as through a fixed fee or by auction or other variable pricing mechanism[830], individual users' purchases of rights will likely be constrained by a profit maximisation objective. One could argue that the allocative efficiency of a primary market for rights provides a form of equity – that is, that those enjoying the benefits of the right must pay for it in recognition of the common property nature of a fishery. The move from open access (universal rights) to limited access (exclusive rights) adds value to the right for those who hold them, which suggests a charge would *prima facie* appear legitimate.

Where a price is attached to the allocation of rights, attempts to maximise the allocation of rights by one or a few well-resourced users could lead to a concentration of quota ownership, giving the

[825] McCay, B. J. (1995). "Social and Ecological Implications of ITQs: an Overview." Ocean & Coastal Management **28**(1-3): 3-22. p10.
[826] Here "price" equates to willingness to pay, such that users who are willing to pay the highest price have priority in the assignment of rights.
[827] Grafton, R. Q. (2005). "Comment on "What Restoration Schemes Can Do. Or, Getting It Right Without Fisheries Transferable Quotas"." Ocean Development & International Law **36**(4): 375-379.
[828] Ibid.
[829] Ibid.
[830] Hannesson, R. (2004). The Privatisation of the Oceans. Cambridge Mass., MIT Press. p173

monopolist or oligopolist excessive market power[831] and marginalising vulnerable, small scale fishers[832]. For example, the first 10 years of the Icelandic ITQ system saw an increase in concentration of ITQ holdings[833]. There is little that ITQs or ITEs can do on their own to mitigate this risk[834] but rules could be established to avoid overconcentration. For example, provisions to prevent excessive holdings of quota exist in New Zealand[835] and the United States[836] [837].

Similarly, there may be concerns that certain types of users should not be permitted to hold rights, particularly if they do not have a direct interest in the fishery[838]. For example, Iceland has placed restrictions on the permanent transfer of quotas from local communities[839]. Townsend et al. argued that unrestricted ownership could bring many theoretical benefits[840]. For example, a downstream processor planning to invest in new plant, or a distributor wishing to increase certainty of supply, may acquire rights to reduce supply risks. They have also argued that ownership restrictions could unnecessarily shut out those with the greatest interest in the long-term value of the stock[841], as demonstrated by a lower discount rate. Similar debates about who should be permitted to hold rights continue to occur in

[831] McCay, B. J. (1995). "Social and Ecological Implications of ITQs: an Overview." Ocean & Coastal Management **28**(1-3): 3-22. p8.
[832] Symes, D. and K. Crean (1995). "Privatisation of the Commons: The Introduction of Individual Transferable Quotas in Developed Fisheries." Geoforum **26**(2): 175-185. p181.
[833] Pálsson, G. and A. Helgason (1995). "Figuring fish and measuring men: the ITQ system in the Icelandic cod fishery." Ocean & Coastal Management **28**(1-3): 117-146. p130.
[834] Symes, D. and K. Crean (1995). "Privatisation of the Commons: The Introduction of Individual Transferable Quotas in Developed Fisheries." Geoforum **26**(2): 175-185. p181.
[835] Quota holdings in New Zealand are predominantly capped at 35% or 45% depending on the species, which, would prevent a monopoly but still allows for an oligopoly to form. See Stewart, J. and P. Callagher (2011). "Quota concentration in the New Zealand fishery: Annual catch entitlement and the small fisher." Marine Policy **35**(5): 631-646. p632.
[836] NOAA (2007). Magnuson-Stevens Fishery Conservation Act, as amended by the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act (P.L. 109-479). U. Congress, National Marine Fisheries Service, National Oceanic and Atmospheric Administration (NOAA), US Department of Commerce. **Public Law 94-265**. Section 302A(c)(5): "In developing a limited access privilege program to harvest fish a Council or the Secretary shall – (D) ensure that limited access privilege holders do not acquire an excessive share of the total limited access privileges in the program by— (i) establishing a maximum share, expressed as a percentage of the total limited access privileges, that a limited access privilege holder is permitted to hold, acquire, or use; and (ii) establishing any other limitations or measures necessary to prevent an inequitable concentration of limited access privileges". See also the discussion of these amendments in Anderson, L. G. (2008). "The control of market power in ITQ fisheries." Marine Resource Economics **23**(1): 25-35.
[837] See also the brief survey of similar provisions, and requirements for maximum holdings, in various fisheries in Frost, H. S. and E. Lindebo (2003). Alternative Management Systems in EU Fisheries. Copenhagen, Fødevareøkonomisk Institut**:** 57pp. p29.
[838] In McCay's terms, "absentee ownership". McCay, B. J. (1995). "Social and Ecological Implications of ITQs: an Overview." Ocean & Coastal Management **28**(1-3): 3-22. p9.
[839] Symes, D. and K. Crean (1995). "Privatisation of the Commons: The Introduction of Individual Transferable Quotas in Developed Fisheries." Geoforum **26**(2): 175-185. p179.
[840] Townsend, R. E., J. McColl and M. D. Young (2006). "Design principles for individual transferable quotas." Marine Policy **30**(2): 131-141. p133.
[841] Ibid. p133.

quite mature natural resource rights markets, such as water[842]. In any given situation, rules can be adopted to reflect public concerns about ownership. Fisheries authorities would need to weigh the equity gains of doing so with likely increased transaction costs and constrained efficiency of the market that would result. This discussion reinforces the conclusion that there is an inherent tension between equity and efficiency, suggesting society must decide what level of equity is desired and maximise efficiency within those bounds[843].

Assignment in secondary markets

Secondary markets for transferable rights such as ITQs and ITEs comprise existing and potential new users of the resource who seek to sell, buy or lease rights that have already been acquired by users in the primary market. Risks of concentration of holdings and the acquisition of rights by "undesirable" owners, exist in secondary markets as much as they do in primary markets. For example, Pinkerton and Edwards identified concerns that quota may be obtained in the primary market by "armchair fishermen" (*sic*) as an investment and then leased to genuine fishers. They observed that crew in such situations were seeing declining pay as a result of "lease fees" charged by the lessee skipper, and despite the increasing value of the fishery[844].

Ørebech has argued that the sale of use rights by, and the departure from the fishery of, inefficient vessels will result in increased unemployment among former crew and in coastal communities that had relied upon those vessels for employment and food security[845]. These are very real concerns, particularly as fisheries reap economic gains by reducing the number of active vessels with consequential increases in unemployment[846]. This can understandably drive some governments' reluctance to curtail fishing to sustainable levels[847]. Other have simply prohibited transfers between certain groups to protect one from the other[848].

[842] Seidl, C., S. A. Wheeler and A. Zuo (2020). "Treating water markets like stock markets: Key water market reform lessons in the Murray-Darling Basin." Journal of Hydrology **581**. p12.
[843] See for example the proposal described in Raworth, K. (2017). Doughnut Economics: Seven Ways to Think Like a 21st Century Economist. London, Random House.
[844] Pinkerton, E. and D. N. Edwards (2009). "The elephant in the room: The hidden costs of leasing individual transferable fishing quotas." Marine Policy **33**(4): 707-713.
[845] Ørebech, P. (2005). "What Restoration Schemes Can Do? Or, Getting It Right Without Fisheries Transferable Quotas." Ocean Development & International Law **36**(2): 159-178. p168-70.
[846] See for example Eythórsson, E. (2000). "A decade of ITQ-management in Icelandic fisheries: consolidation without consensus." Marine Policy **24**(6): 483-492. P489.
[847] Although not related to ITQs, this motivation is illustrated well by Schrank's conclusion regarding the Canadian Atlantic northern cod fishery: "Whether or not it has ever been explicit, it is clear that the social goal of the fishery has consistently taken precedence over the goal of economic viability", in Schrank, W. E. (1995). "Extended fisheries jurisdiction: origins of the current crisis in Atlantic Canada's fisheries." Ibid. **19**(4): 285-299. p294.
[848] For example in Norway, as discussed in Symes, D. and K. Crean (1995). "Privatisation of the Commons: The Introduction of Individual Transferable Quotas in Developed Fisheries." Geoforum **26**(2): 175-185. p183.

The power of ITQs to increase economic rents presents governments with potential revenue streams to address some of the social impacts that might arise from any resulting adjustments, or simply to return a dividend to the public[849]. This is a political choice independent of the existence of ITQs but one which is arguably enabled by ITQs – the creation of value in the right to fish presents an opportunity to collect resource rents. Secondary markets would also at least provide a source of compensation for voluntarily exiting the industry rather than struggling on with diminished profitability that will eventually force high-cost fishers out of the fishery anyway[850]. And as noted above, rules can be adopted to restrict ownership.

Equity in the presence of heterogeneity

Heterogeneity of users and substantive differences in their interests can increase complexity and influence the nature of equitable outcomes. Chapter Two identified a range of potential categories of compatible and conflicting interests in a fish stock, including commercial fishers, recreational fisheries, artisanal and subsistence fishers, conservationists and tourism operators[851].

Additionally, equity concerns could arise when existing users or potential users are excluded from access to the resource because they lack the means to acquire rights. Some poorly resourced fishers may in fact be inefficient, while others may be disadvantaged in some systemic way. The former are likely to be excluded from the fishery in order to achieve allocative efficiency. The latter, however, arguably represent a form of heterogeneity which could lead to inequitable allocation of access to the resource and undermine the political legitimacy of an RBM scheme. Two broad ways have been suggested to address equity in such cases. First, revenues from the sale of rights could be distributed in a way that compensates for these inequities. This has been suggested for the use of revenues earned through carbon pricing[852]. Nelson and Crothers suggested a similar process for high seas allocations by RFMOs[853].

Second, following Edwards [854], competing heterogenous interests could be accommodated by unbundling rights and assigning them to each interest. Kearney suggested that sub-allocations of secure rights offer potential solutions to competing claims to a resource, such as indigenous/customary[855] and

[849] See for example the proposal to create a universal dividend from the revenue earned from sale of carbon emissions permits in Boyce, J. K. (2018). "Carbon Pricing: Effectiveness and Equity." Ecological Economics **150**: 52-61. pp58-9.
[850] Grafton, R. Q. (2005). "Comment on "What Restoration Schemes Can Do. Or, Getting It Right Without Fisheries Transferable Quotas"." Ocean Development & International Law **36**(4): 375-379. p377.
[851] Chapter Two subsection 2.2.3.
[852] Boyce, J. K. (2018). "Carbon Pricing: Effectiveness and Equity." Ecological Economics **150**: 52-61.
[853] Crothers, G. T. S. and L. Nelson (2006). "A Governance Framework for High Seas Fisheries." Marine Resource Economics **21**(4): 341-353.
[854] Edwards, S. F. (2003). "Property rights to multi-attribute fishery resources." Ecological Economics **44**(2-3): 309-323. See subsection 3.3.2 above.
[855] For example, industrial commercial fishers are highly mobile, have access to more efficient technologies and, when based in distant ports, are likely to have higher discount rates than local inshore fishers who are dependent on specific nearby fisheries for their long term livelihoods. Ostrom, E. (1990). Governing the

recreational sub-allocations[856], as long as in aggregate they remain within the overall TAC. Such approaches have been implemented in Alaska[857] and New Zealand[858].

The Western Alaskan Community Development Quota (CDQ) Program assigns a share of TACs in federally managed fisheries of the Bering Sea and the Aleutian Islands to six mostly indigenous communities. Compared to commercial industrial fishers, these communities lacked the resources to exploit the nearby groundfish fisheries[859]. The social nature of the CDQ program's objectives is given explicit recognition in the Magnusson-Stevens Act[860].

However, Lyons et al.[861] noted that the underlying rationale of a quota system remains profitability, and tensions between this and the social objectives of the CDQ reveal different views within each community. Marginalised members in a community, they observed, may become further marginalised by the pursuit of profits by the corporations established to manage each community's CDQ, while in others those differences were resolved[862].

Their study suggests that sub-allocations must be clear as to their purpose (profitability vs social objectives) and, to the extent practical, should be assigned to groups with common interests, that is, the highest level of homogeneity possible[863]. Where profitability is the primary objective, such as a domestic commercial fishing fleet, ITQs within the group maybe appropriate. Where objectives are social, other options, such as common property arrangements or a combination of common and private

Commons: The Evolution of Institutions for Collective Action. Cambridge, UK, Cambridge University Press. p216.

[856] See for example the various commercial and non-commercial extractive and non-extractive interests in shared fisheries (but not including community fisheries with primarily a food security objective) compiled by Kearney, R. E. (2001). "Fisheries Property Rights and Recreational/Commercial Conflict: Implications of Policy Developments in Australia and New Zealand." Marine Policy **25**: 49-59. p53.

[857] See the description of the Western Alaska Community Development Program in NOAA (2018). The Western Alaska Community Development Quota Program: October 2018. Juneau, NOAA NMFS**:** 32pp.

[858] Yandle, T. (2007). "Understanding the Consequences of Property Rights Mismatches: a Case Study of New Zealand's Marine Resources." Ecology and Society **12**(2): 27-41.

[859] NOAA (2018). The Western Alaska Community Development Quota Program: October 2018. Juneau, NOAA NMFS**:** 32pp. pp10-12.

[860] "A) IN GENERAL. – There is established the western Alaska community development quota program in order – to provide eligible western Alaska villages with the opportunity to participate and invest in fisheries in the Bering Sea and Aleutian Islands Management Area; to support economic development in western Alaska; to alleviate poverty and provide economic and social benefits for residents of western Alaska; and to achieve sustainable and diversified local economies in western Alaska". NOAA (2007). Magnuson-Stevens Fishery Conservation Act, as amended by the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act (P.L. 109-479). U. Congress, National Marine Fisheries Service, National Oceanic and Atmospheric Administration (NOAA), US Department of Commerce. **Public Law 94-265**. Section 305(i)(1).

[861] Lyons, C., C. Carothers and J. Coleman (2019). "Alaska's community development quota program: A complex institution affecting rural communities in disparate ways." Marine Policy **108**.

[862] Ibid. p11.

[863] Recall Ostrom's findings that self-determined common pool resource management mechanisms are more likely to emerge in relatively homogenous groups. Ostrom, E. (1990). Governing the Commons: The Evolution of Institutions for Collective Action. Cambridge, UK, Cambridge University Press. p211.

property arrangements developed by the communities, may be more appropriate[864]. This example illustrates the point that well-defined property rights do not equate to private property in all circumstances[865].

Allocation between heterogenous groups

While the criteria for allocations between heterogenous groups is not a central theme of the present study, brief consideration of this will help to frame the use of suballocations to achieve equity goals within an RBM system.

Should sub-allocations be established, a basis for the equitable assignment of allocations to each group must be determined. Any process must be legitimate in the eyes of users to avoid perceptions of "ocean grabbing" by private commercial interests at the expense of individual communities and the wider community[866]. The approaches suggested for the case of homogenous users may be more appropriate once sub-allocations have been assigned to different categories of users but are likely to be insufficient for the assignment of sub-allocations *between* each category.

Loomis and Ditton pointed to Deutsch's[867] framework for distributive justice, which links different "value bases" to different decision rules[868]. In cases where the goal is economic efficiency, *equity*, as defined by proportionality, should be applied. Where the goal is the maintenance of social relations, the dominant principle to be applied should be *equality*, and where the goal is personal welfare, *need.*

According to this framework, decision processes applied to each question of what is just or fair in a fishery should therefore consider the nature of the objective and the most appropriate principle to be applied. For example, *equity* appears to make sense in the homogenous case, and would see the benefits enjoyed by each user as proportional to their contribution – that is, proportional to the "price" paid for the rights to enjoy those benefits[869]. Depending on the context, the contribution of each user could be denominated in different ways. For example, among commercial fishers, the contribution would logically be denominated in financial terms, whereas in a community-managed fishery, the price may be defined in terms of a user's contribution to the stewardship of the resource, or simply membership of the community.

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[864] Ibid. See pp60-1, and a specific example of the Nova Scotian inshore fisheries at pp173-8.
[865] Hanna, S., S. (1999). "Strengthening Governance of Ocean Fishery Resources." Ecological Economics **31**: 275-286. p279. See also Section 2.2.2 above
[866] Bennett, N. J., H. Govan and T. Satterfield (2015). "Ocean grabbing." Marine Policy **57**: 61-68.
[867] Deutsch, M. (1975). "Equity, equality and need: what determines which value will be used as the basis for distributive justice?" Journal of Social Issues **31**: 85-13. Cited in Loomis, D. K. and R. B. Ditton (1993). "Distributive justice in fisheries management." Fisheries **18**(2): 14-18.
[868] Loomis, D. K. and R. B. Ditton (1993). "Distributive justice in fisheries management." Fisheries **18**(2): 14-18. p16.
[869] Ibid.

According to Deutsch, representation in decision making fora should be based on *equality*, which in turn could support the achievement of procedural equity in the allocation decision process. This speaks to a broader question of governance but nevertheless influences perceptions of the degree to which outcomes are equitable. Equality appears to be applicable in relation to processes to determine sub-allocations of rights between different groups or processes used to determine the assignment of rights within a group.

Finally, allocations to support human welfare, such as food security, livelihoods or cultural needs on the basis of *need* could be applied in the determination of sub-allocations of rights between heterogenous groups. *Need* could also be applied within a group where some degree of heterogeneity remains, such as the existence of particularly disadvantaged or vulnerable members of the group.

Social objectives, uncertainty and dynamism

This section foreshadowed the possibility that individual rights could be defined as a proportionate rather than volumetric share of a TAC/TAE. New Zealand's ITQs were originally defined by fixed tonnages, requiring the government to buyback quota when stock assessments indicated a reduction in stock size and allowed it to sell the surplus when stocks were abundant[870]. This approach was abandoned in 2001 in favour of fixed proportional shares in the TAC against which a quantitative annual catch entitlement (ACE) is allocated. The size of the ACE thus automatically moves in line with adjustments to the TAC[871].

This approach is consistent with the robust separation model discussed in Chapter Two to maintain relative equity in the presence of fluctuating stock levels[872]. Centralised decision making is still required to adjust the TAC but the need to renegotiate quotas each time a stock is assessed is removed. While this approach also removes the need for a central authority to trade allocations on behalf of the environment (see this subsection above), it may still make sense to withhold a portion of the TAC to be assigned later in the season as a precautionary measure.

[870] Symes, D. and K. Crean (1995). "Privatisation of the Commons: The Introduction of Individual Transferable Quotas in Developed Fisheries." Geoforum **26**(2): 175-185. p177.
[871] Stewart, J. and J. Leaver (2015). "Efficiency of the New Zealand annual catch entitlement market." Marine Policy **55**: 11-22. pp11-2.
[872] See further Young, M. D. and J. C. McColl (2003). "Robust reform: The Case for a New Water Entitlements System for Australia." Australian Economic Review **36**(2): 225-234.

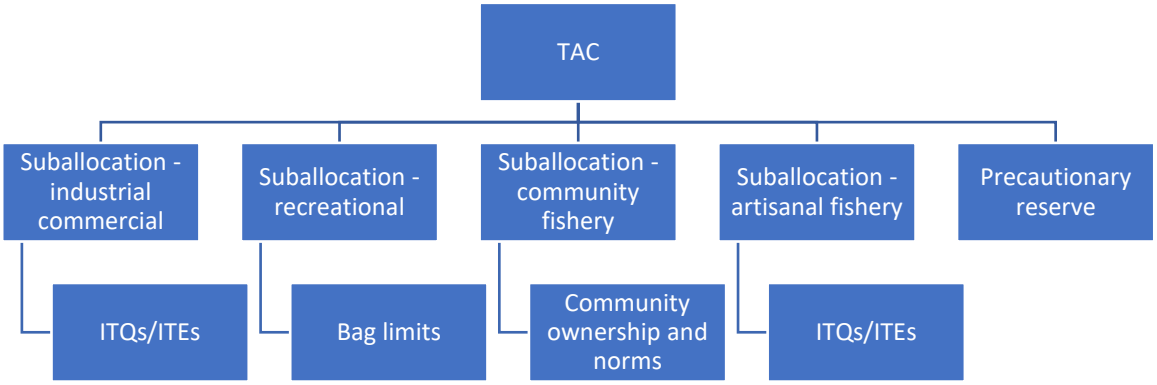

Figure 3.2: Sub-allocations to achieve equity between heterogenous groups

Social objectives: summary

Figure 3.2 above illustrates a hypothetical fishery utilising sub-allocations to achieve equity objectives between heterogenous groups and suggests different management instruments that could be applied within each group. It is important to emphasise that the solution to the equity problem offered by sub-allocations of a TAC or TAE are not dependent on the use of ITQs or ITEs at the individual user scale. The use of ITQs or ITEs as the thing that is allocated within the group is a secondary choice. A sub-allocation could be managed within each group by a limited user open access arrangement, as common property, by command-and-control rules or by ITQs or ITEs. However, the preceding discussion suggests that the combination of equitable sub-allocations and the allocative efficiency of ITQs/ITEs can help to quarantine economic objectives in contexts where profitability is central from situations where it is not. Importantly, the division of a TAC/TAE into sub-allocations will reach a point of diminishing marginal returns such that smaller allocations may be difficult and costly to administer for little gain in equity. Further, if a sub-allocation to a commercial fishery is too small, the secondary market for rights may be too "thin", negating the advantages of transferability[873].

Like those relating to ecological externalities, residual externalities relating to equity considerations may need to be addressed by command-and-control rules, such as: spatial restrictions to further protect coastal and recreational fisheries from industrial commercial fishing; rules relating to ownership qualifications and concentration; and protocols relating to the transfer of rights within and between

[873] Squires, D. and J. Kirkley (1996). "Individual Transferable Quotas in a Multiproduct Common Property Industry." Canadian Journal of Economics **29**(2): 318-342. p336.

categories of users (i.e. between sub-allocations). Such rules are important components of a rights-based-management system[874].

3.3.4 Conclusion: the role of rights-based instruments in addressing complexity

This section has examined the capacity of RBM instruments to address complexity in a fishery. It first considered the capacity of rights-based instruments to address multiple attributes in a fishery, observing that a single right can affect multiple attributes due to spillovers, or externalities. A generalised argument was proposed that the unbundling of rights to address each attribute could aid the achievement of the objective attached to each attribute.

It then examined rights-based instruments' capacity to address biological, economic, ecological and social objectives. While individual use rights can reconcile biological and economic objectives, a deliberate approach is required to ensure that they are designed to accommodate social and ecological objectives. Such an approach hinges on unbundling rights to align with the different attributes of the resource. This could mean identifying spatial, temporal, physical or biological attributes to achieve ecological and other biological objectives or identifying the human purpose of the resource – to make a profit, as a food source or as a cultural asset, for example – to achieve social objectives.

Finally, it noted that key elements of design could also accommodate uncertainty and dynamism by permitting transferability of rights and predictable responses to unpredictable changes in parameters in the fishery. Nevertheless, in some cases, it may mean not employing individual use rights at all but relying on command-and-control instruments determined by a central authority or a community. But there remains substantial scope for RBM systems to be designed in ways that permit them to cope with complexity, nested within a broader marine governance framework without compromising ecological and social objectives. Success depends on ensuring that objectives are clear and matched to appropriate instruments.

3.4 The legal basis for rights-based management of transboundary fisheries

3.4.1 Introduction

For a rights-based fisheries regime to be effective, some form of property right must be recognised by all actors across all relevant maritime areas[875]. Ideally this would be achieved through legal means, without which the exclusivity and security of purported rights would be extremely weak, in turn undermining the confidence with which participants in the scheme would willingly be party to a transfer of rights[876].

[874] See Section 3.1 above.
[875] Section 3.1 above.
[876] Subsection 3.2.4 above.

The present study examines the extent to which regional and subregional instruments provide for well-defined property rights. This is distinct from an analysis of the legal basis for property rights for transboundary fisheries, which is beyond the scope of this study. The latter is nevertheless an essential task if one is to appreciate the feasibility of transboundary property rights and therefore warrants at least brief consideration.

This section therefore briefly describes the legal basis for property rights in transboundary fisheries. It commences with a review of the legal concept of property in western legal tradition as it relates to fisheries access and withdrawal rights in a domestic context[877]. It then considers the sources of authority for the establishment of property rights in transboundary fisheries arising from LOSC and UNFSA and whether a rights-based management scheme is possible across the full range of a transboundary stock. Schlager and Ostrom's bundle of operational and collective choice rights are applied to the transboundary context to identify the likely holders of each right.

3.4.2 The legal concept of property rights

The adoption of RBM in many domestic fisheries[878] indicates a readiness of domestic legal systems to accept some form of transferable access and withdrawal rights. This subsection briefly describes some of the legal concepts underlying property rights in domestic fisheries, with a focus on common law traditions.

As Chapter Two noted, the existence of a right implies a corresponding duty or duties to respect that right. Penner[879] pointed out that universally held rights imply a right *not to be excluded* from using or enjoying the benefits arising from a thing. Private property, on the other hand, implies a right *to exclude* others from using the thing. This means that whereas rights such as human rights are universally held, property rights are held exclusively, and it is the corresponding duties that are universal. Thus, in legal terms property rights are a form of a right *in rem*, which is held with respect to all other persons who in turn are obliged not to interfere with that right (duty *in rem*). Rights *in rem* are distinct from rights *in personam*, which are held with respect to another individual, such as contractual rights[880].

Penner further noted that duties corresponding to rights are imposed in order to protect the rightholder's interest, rather than the public interest[881]. This does not mean that an individual rightholder exercising a right may necessarily harm public interests – other rules may be in force that limit the exercise of the right. The previous section contemplated the imposition on a rightholder of command-and-control rules

[877] The role and status of property in traditional or customary settings is also an important additional avenue of inquiry but that is beyond the scope of the present study. Nevertheless, see the brief discussion in subsection 3.2.5 above.
[878] Subsection 3.2.5 above.
[879] Penner, J. E. (1997). The Idea of Property in Law. Oxford, Clarendon Press. p69.
[880] See further ibid. pp23, 73.
[881] Ibid. pp13-16.

requiring, for example, the use of certain types of fishing gear to avoid ecological impacts of fishing. The key point, however, is that the right permits (but does not oblige) the rightholder to act in their self-interest and not in any other interest. This characteristic of rights becomes relevant when considering the seemingly paradoxical power of individual rights to achieve broader public interests by harnessing self-interest[882].

The evolution of common law concepts of property since the Middle Ages has seen two broad categories arise: real property (land); and personal property (*chattels personal*). As the types and value of personal property has increased over time – "contractual promises, stocks, bonds, human capital, patents, copyrights and the like"[883] – the law has similarly evolved to strengthen the security of personal property and the available remedies such that it now more closely resembles real property in many respects[884].

Legal frameworks pertaining to commercial fisheries rely upon the assertion by the State of jurisdiction over at least the manner in which fish are managed, if not to assert ownership of the fish[885].

Personal property law distinguishes between chattels personal that are tangible things (*choses in possession*) and intangible things (*choses in action*)[886]. The latter forms the legal equivalent of a usufruct right[887]. The benefits arising from a *chose in action* can only be exercised by taking action rather than physical possession of a good (*chose in possession*)[888]. A certificate of ownership is therefore not the property of interest but merely evidence of that ownership. Some form of certification or registration remains valuable, however, as protection against dispossession and evidence of title, particularly in relation to intangible property.

As Gullett observed, common law rights to fish are quite limited[889], whereas property right-like instruments are more typically established and governed by legislation[890]. In a commercial fishery, a *chose in action* is therefore more likely to be established in legislation and may manifest as a licence or

[882] See Chapter Two subsection 2.3.4.
[883] Ziff, B. (2010). Principles of Property Law. Toronto, Ontario, Carswell (Thomson Reuters Canada). p76.
[884] Ziff's brief description of this change in Canadian property law illustrates this development, including on where this transition is incomplete. See ibid. pp74-6.
[885] See the discussion on how this question in Australian jurisdictions in Gullett, W. L. (2008). Fisheries Law in Australia. Australia, LexisNexis Butterworths. p65.
[886] Note also that personal property comprises both *chattels personal* and chattels real, which relate to property. This study is more concerned with the former. See Ziff's useful taxonomy of property in Ziff, B. (2010). Principles of Property Law. Toronto, Ontario, Carswell (Thomson Reuters Canada). pp76-7.
[887] Subsection 3.2.2 above.
[888] Ziff, B. (2010). Principles of Property Law. Toronto, Ontario, Carswell (Thomson Reuters Canada). pp76-7
[889] For example, Gullett identifies four common law rights to fish in Australia: the public rights to fish; .landowners' exclusive right to fish in rivers and lakes on their land; a right held by one person to take produce, including fish, from another person's land (*profit à prendre*); and rights to fish as part of native title. None of these would constitute a right to fish in the sense of an ITQ or ITE in a commercial fishery. Gullett, W. L. (2008). Fisheries Law in Australia. Australia, LexisNexis Butterworths. p65.
[890] Ibid. pp69-70.

as some other form of exclusive right to take a certain quantity of fish or expend a certain amount of fishing effort[891].

If not clear in common law, legislation will therefore likely specify the basis on which property rights are initially acquired by the rightholder. In some jurisdictions, this may be on the basis of first use or first possession. This concept of first possession underlies the *doctrine of prior appropriation* in US water law[892], and resonates with claims that historical catches should be the basis of the allocation of fishing rights[893] [894]. As the previous section noted, rights may also be assigned to a rightholder on some other basis, such as on the basis of need, equality, contributions to stewardship of the resource, the sale of rights by the State or catch history.

A *chose in action* may be transferred, or assigned, to another person in both law and equity[895]. Transfers may be effected as a gift, through a contract for sale or lease, or through compulsory transfers, typically by the State (as in the case of a buyback). While all three modes of transfer are of interest in market-based fisheries management instruments, the more typical circumstances of transfer are likely to be by contract in a secondary market.

Once assigned, it is likely to be in a rightholder's interests to have the right recognised as property, as this strengthens the rightholder's claim for compensation if the property is acquired by the State or infringed upon by another person. Debate about whether ITQs in Australia, for instance, constitute property in a common law sense have been rendered moot by the adoption of personal property security legislation under which statutory fishing rights have accrued much greater security[896]. This has enabled them to be used as collateral against debt through the registration of interests, and to be transferred to another user with a high degree of confidence in title. Some Pacific island countries have adopted

[891] Kaye, S., A. Morrison and K. Azmi (2020). Chapter 5: Legal Issues and Options for Transferability of Pacific Island Tuna Fishing Rights: Current Practice and Models for the Region. Assessing the Potential for Transferability of Access Rights to Enhance Sustainability in Large Pacific Tropical Fisheries. T. Aqorau, K. Azmi, E. Havice et al. Durham, NC, Nicholas Institute for Environmental Solutions, Duke University**:** 58-71. pp67-8.
[892] Donohew, Z. (2009). "Property rights and western United States water markets*." Australian Journal of Agricultural and Resource Economics **53**(1): 85-103. pp89-90.
[893] See for example the case of allocation negotiations in the Indian Ocean Tuna Commission described in Sinan, H. and M. Bailey (2020). "Understanding Barriers in Indian Ocean Tuna Commission Allocation Negotiations on Fishing Opportunities." Sustainability **12**(16). p5 of 12; and the global overview in Seto, K., G. R. Galland, A. McDonald, A. Abolhassani, K. Azmi, H. Sinan, T. Timmiss, M. Bailey and Q. Hanich (2021). "Resource allocation in transboundary tuna fisheries: A global analysis." Ambio **50**(1): 242-259.
[894] Libecap, G. (2007). "Assiging property rights in the common pool: implications of the prevalence of first possession rules for ITQs in fisheries." Marine Resource Economics **22**(4): 407-423. p419.
[895] Ziff, B. (2010). Principles of Property Law. Toronto, Ontario, Carswell (Thomson Reuters Canada). p78.
[896] Kaye, S., A. Morrison and K. Azmi (2020). Chapter 5: Legal Issues and Options for Transferability of Pacific Island Tuna Fishing Rights: Current Practice and Models for the Region. Assessing the Potential for Transferability of Access Rights to Enhance Sustainability in Large Pacific Tropical Fisheries. T. Aqorau, K. Azmi, E. Havice et al. Durham, NC, Nicholas Institute for Environmental Solutions, Duke University**:** 58-71.p66.

similar legislation[897], paving the way for transferability of fishing rights at the individual user scale[898]. The adoption of user scale transferable rights in those jurisdictions has nevertheless been quite limited[899].

As section 3.2 above demonstrated, a legal basis clearly exists therefore for rights-based management at the individual user scale in the domestic legal plane. This section now turns to the international plane.

3.4.3 Legal basis for rights-based management in transboundary fisheries

While rights-based approaches are now well-established in domestic fisheries, the same cannot be said for straddling and high migratory stocks[900]. Their multijurisdictional nature and the absence of a single authority to govern them across their entire range have already been noted as significant barriers to effective fisheries governance (Chapter Two). This section examines the basis in international law for a rights-based management regime for transboundary fisheries at the regional scale by examining the legal framework for each type of maritime zone.

Two questions are important in this discussion. First, does a State have authority in international law to adopt a domestic rights-based management scheme at the individual user scale that forms part of a supranational (i.e. regional or subregional) rights-based management scheme? Second, do States themselves have the ability in international law to participate in a regional or subregional rights-based management scheme?

Waters subject to national sovereignty

LOSC supports the assertion of coastal State jurisdiction over the creation of rights to fish by recognising the sovereignty of a coastal State over its territorial seas, archipelagic waters and internal waters[901] [902]. LOSC contains little detail on the fisheries-related rights of coastal States within their

[897] Ibid. p66.
[898] That said, the same report noted that most PICs' fisheries legislation contained limited provisions on transferability of fishing licences or rights, if any at all.
[899] Kaye, S., A. Morrison and K. Azmi (2020). Chapter 5: Legal Issues and Options for Transferability of Pacific Island Tuna Fishing Rights: Current Practice and Models for the Region. Assessing the Potential for Transferability of Access Rights to Enhance Sustainability in Large Pacific Tropical Fisheries. T. Aqorau, K. Azmi, E. Havice et al. Durham, NC, Nicholas Institute for Environmental Solutions, Duke University**:** 58-71.
[900] Munro, G. R. (2007). "Internationally Shared Fish Stocks, the High Seas, and Property Rights in Fisheries." Marine Resource Economics **22**: 425-443.
[901] LOC Article 2(1): "The sovereignty of a coastal State extends, beyond its land territory and internal waters and, in the case of an archipelagic State, its archipelagic waters, to an adjacent belt of sea, described as the territorial sea"; Article 49(1): "The sovereignty of an archipelagic State extends to the waters enclosed by the archipelagic baselines drawn in accordance with article 47, described as archipelagic waters, regardless of their depth or distance from the coast".
[902] See also the discussion of territoriality and sovereignty in Gavouneli, M. (2007). Part I Jurisdiction in the Law of the Sea. Functional Jurisdiction in the Law of the Sea. Leiden, Boston, Martinus Nijhoff**:** 5-32. pp5-7.

territorial seas and archipelagic waters beyond the power of a coastal State to prevent foreign fishing there[903] and is silent on fisheries in their internal waters.

In relation to straddling stocks and highly migratory stocks, only Articles 6 (precaution) and 7 (compatibility) of UNFSA apply to areas under national jurisdiction "subject to the different legal regimes that apply within areas under national jurisdiction and in areas beyond national jurisdiction as provided for in [LOSC]"[904]. Notably, the compatibility provisions of Article 7 do not refer to measures adopted for territorial seas, archipelagic waters and internal waters[905].

Confirmation of sovereignty, and the absence of any further detail in LOSC or UNFSA, suggests that coastal States have unfettered rights to regulate the management and conservation of fisheries within their territorial seas, including transboundary stocks in their waters[906].

Exclusive economic zones

A coastal State has clear sovereign rights to explore, exploit, conserve and manage the living resources of its EEZ[907]. Coastal States do not simply have the right to determine a total allowable catch in its EEZ but are in fact obliged to[908]. They may adopt regulations relating to a wide range of fisheries management matters in the EEZ, including licensing, establishing which species may be caught, quotas, spatial and temporal closures, and monitoring, control, surveillance and enforcement of rules, and the nationals of other States must comply with those rules[909]. A coastal State's sovereign rights are protected

[903] LOSC Article 19(2): "Passage of a foreign ship shall be considered to be prejudicial to the peace, good order or security of the coastal State if in the territorial sea it engages in any of the following activities: (i) any fishing activities"; Article 21(1)(d): "The coastal State may adopt laws and regulations, in conformity with the provisions of this Convention and other rules of international law, relating to innocent passage through the territorial sea, in respect of all or any of the following: (d) the conservation of the living resources of the sea"; and Article 51(1): "Without prejudice to article 49, an archipelagic State shall respect existing agreements with other States and shall recognize traditional fishing rights and other legitimate activities of the immediately adjacent neighbouring States in certain areas falling within archipelagic waters. The terms and conditions for the exercise of such rights and activities, including the nature, the extent and the areas to which they apply, shall, at the request of any of the States concerned, be regulated by bilateral agreements between them. Such rights shall not be transferred to or shared with third States or their nationals".

[904] LOSC Article 3.

[905] UNFSA Article 7 refers to measures adopted under Article 61 of LOSC, which relates to EEZs.

[906] Hey, E. (1989). The Regime for the Exploitation of Transboundary Marine Fisheries Resources. Dordrecht, Boston, London, Martinus Nijhoff Publishers. p46.

[907] LOSC Article 56 (1)"In the exclusive economic zone, the coastal State has: (a) sovereign rights for the purpose of exploring and exploiting, conserving and managing the natural resources, whether living or non-living, of the waters superjacent to the seabed and of the seabed and its subsoil…".

[908] LOSC Article 61(1): "The coastal State *shall* determine the allowable catch of the living resources in its exclusive economic zone" (emphasis added).

[909] LOSC Article 62(4) "Nationals of other States fishing in the exclusive economic zone shall comply with the conservation measures and with the other terms and conditions established in the laws and regulations of the coastal State. These laws and regulations shall be consistent with this Convention and may relate, inter alia, to the following: (a) licensing of fishermen, fishing vessels and equipment, including payment of fees and other forms of remuneration, which, in the case of developing coastal States, may consist of adequate compensation in the field of financing, equipment and technology relating to the fishing industry" (b) determining the species which may be caught, and fixing quotas of catch, whether in relation to particular stocks or groups of stocks or

by a requirement that other States[910] and their nationals[911] comply with the regulations of the coastal State applying to the latter's EEZ. That a coastal State's rights in its EEZ are exclusive[912] means there is little doubt that a coastal State's sovereign rights include strong perpetual rights to establish property rights-like instruments for the management and conservation of fish stocks within its EEZ. Thus a coastal State is very likely to be able to establish a rights-based management scheme at the individual user scale for a domestic fishery.

However, a coastal State's sovereign rights in its EEZ are tempered by obligations that they be exercised "with due regard" to the rights and duties of other States[913], and that coastal States adopt conservation and management measures taking into account the best scientific evidence available, to prevent overexploitation[914]. Coastal States and fishing States are required to cooperate "…with a view to ensuring conservation and promoting the objective of optimum utilization of…[highly migratory]…species throughout the region, both within and beyond the exclusive economic zone" and to establish an international organisation through which to cooperate where one does not exist[915]. However, the obligation to cooperate in relation to highly migratory species does not detract from the coastal State's sovereign rights to explore, exploit, conserve and manage those stocks[916]. Crucially, cooperation as set out in LOSC Article 64 is to be "with a view to *ensuring conservation and promoting the objective of optimum utilisation* of such species throughout the region" (emphasis added), not, as Goodman pointed out, their *management*[917]. However, where such cooperation results in agreement on binding measures, the coastal State is obliged to comply[918].

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catch per vessel over a period of time or to the catch by nationals of any State during a specified period; and (c) regulating seasons and areas of fishing, the types, sizes and amount of gear, and the types, sizes and number of fishing vessels that may be used".

[910] LOSC Article 58(3): "In exercising their rights and performing their duties under this Convention in the exclusive economic zone, States shall have due regard to the rights and duties of the coastal State and shall comply with the laws and regulations adopted by the coastal State in accordance with the provisions of this Convention and other rules of international law in so far as they are not incompatible with this Part."

[911] LOSC Article 62(4) begins "Nationals of other States fishing in the exclusive economic zone shall comply with the conservation measures and with the other terms and conditions established in the laws and regulations of the coastal State…"

[912] See the discussion in Goodman, C. J. (2019). The Nature and Extent of Coastal State Jurisdiction over Living Resources in the Exclusive Economic Zone. Doctor of Philosophy, Australian National University. p54 and footnote 14.

[913] LOSC Article 56(2).

[914] LOSC Article 61(2).

[915] LOSC Article 64(1).

[916] As Goodman points out, LOSC Article 64(2) provides that the duty to cooperate in Article 64(1) is in addition to Part V (i.e. Articles 55 to 75). Goodman, C. J. (2019). The Nature and Extent of Coastal State Jurisdiction over Living Resources in the Exclusive Economic Zone. Doctor of Philosophy, Australian National University. p61.

[917] Goodman, C. (2017). The Cooperative Use of Coastal State Jurisdiciton with Respect to Highly Migratory Stocks: Insights from the Western and Central Pacific Region. Natural Resourse and the Law of the Sea: Exploration, Allocation, Exploitation of Natural Resources in Areas under National Jurisdiction and Beyond. L. Martin, C. Salonidis, C. G. Hioureas et al., JurisNet LLC. **Volume 2:** 472pp.

[918] UNFSA Article 8(3).

Coastal States are also required to provide other States with access to any surplus available catch[919]. However, any such surplus is to be determined by the coastal State itself[920] which leaves the balance of power strongly in the coastal State's favour[921]. The compatibility requirements of UNFSA also require that measures for the high seas must not undermine existing measures adopted by a coastal State for its EEZ[922]. This suggests some support in UNFSA for a coastal State's right of first possession[923]: if a coastal State has set a TAC (or TAE) for stocks in its EEZ then any subsequent measures adopted for the high seas must accommodate that TAC (or TAE). This suggests that a coastal State is able to establish a rights-based management scheme domestically as part of a regional scheme.

While LOSC and UNFSA appear to support wide coastal State powers to manage fish stocks within its EEZ, the interpretation of "sovereign rights" has been less clear cut than the meaning of sovereignty in the case of the territorial sea, archipelagic waters and internal waters. A significant advance was made, however, in the 2014 *Virginia G* case, in which the International Tribunal on the Law of the Sea confirmed that a coastal State has wide discretion to exercise jurisdiction in relation to its sovereign rights to conserve and manage the living resources in a coastal State's EEZ and that these arise from sovereignty. While the case concerned bunkering activities, ITLOS found that sovereign rights included "all rights necessary for and connected with the exploration, exploitation, conservation and management of the natural resources, including the right to take the necessary enforcement measures"[924].

Thus, the qualifications on a coastal State's sovereign rights are likely to be insufficient to undermine the sovereign nature of those rights, at least insofar as they pertain to economic rights[925]. There is very little doubt therefore that LOSC vests in the coastal State property rights in the fisheries of its EEZ[926], obliging it to comply with binding regional measures, but allowing it to give effect to those measures by implementing a regime of its choosing in domestic law, whether a rights-based scheme or otherwise.

The high seas

[919] LOSC Articles 61 & 62.
[920] This results from the combined effect of LOSC Articles 61(1) & 62(2).
[921] Hey, E. (1989). The Regime for the Exploitation of Transboundary Marine Fisheries Resources. Dordrecht, Boston, London, Martinus Nijhoff Publishers. pp47-8.
[922] LOSC Article 7(2): "…States shall (a)…ensure that measures established for the high seas do not undermine the effectiveness of [conservation and management measures adopted and applied in accordance with Article 61 of LOSC]".
[923] See subsection 3.4.2 above.
[924] M/V "Virginia G" (Panama/Guinea-Bissau), Judgment. Case No.19. ITLOS Reports 2014, p. 4, International Tribunal on the Law of the Sea (ITLOS). paras 211–212. Cited in Goodman, C. J. (2019). The Nature and Extent of Coastal State Jurisdiction over Living Resources in the Exclusive Economic Zone. Doctor of Philosophy, Australian National University. p18.
[925] See the discussion concerning the application of LOSC Article 59 on unattributed rights in Rothwell, D. R. and T. Stephens (2016). The International Law of the Sea. Oxford, Bloomsbury. p91.
[926] Munro, G. R. (2007). "Internationally Shared Fish Stocks, the High Seas, and Property Rights in Fisheries." Marine Resource Economics **22**: 425-443. p426.

The freedom of fishing on the high seas, as codified in LOSC[927], would appear to be a considerable obstacle in establishing a scheme of exclusive rights to fish. Freedom of fishing has the character of a universal right, rather than an exclusive right. Non-exclusivity is underpinned by Article 89, which states that "No State may validly purport to subject any part of the high seas to its sovereignty". Further, while coastal States may assert control over fisheries resources within their EEZs, on the face of it LOSC appears to allow only a flag State to impose a limit on fishing on the high seas by vessels flying its flag[928] and not on other vessels or exclusively on a particular part the high seas. The exclusive jurisdiction of the flag State over its vessels on the high seas thus places control of the exploitation of high seas stocks in the hands of the exploiter of an open access commons without appearing to impose a strong corresponding obligation of stewardship.

The freedom of fishing on the high seas is nevertheless subject to a number of qualifications. Many scholars argue that the enjoyment of the freedom of fishing on the high seas is subject to the condition that it does not diminish another State's enjoyment of the same right[929]. LOSC also adds qualifications, including States' treaty obligations[930], the rights, duties and interests of coastal States[931] and other high seas provisions of the LOSC[932]. The latter includes an obligation in Article 118 that "States shall cooperate with each other in the conservation and management of living resources in the areas of the high seas"[933]. It reiterates the requirement that, in regions for which no appropriate international organisation exists, the coastal State and other States whose nationals harvest these species in the region shall, "as appropriate", cooperate to establish such an organization and participate in its work[934].

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[927] LOSC Article 87(1): "The high seas are open to all States, whether coastal or land-locked. Freedom of the high seas is exercised under the conditions laid down by this Convention and by other rules of international law. It comprises, inter alia, both for coastal and land-locked States:…(e) freedom of fishing, subject to the conditions laid down in section 2".

[928] LOSC Article 94.

[929] Johnston, D. M. (1987). The International Law of Fisheries. New Haven/Dordrecht, New Haven Press/Martinus Nijhoff Publishers. pp303-17; and Borg, S. (2012). Conservation on the High Seas: Harmonizing International Regimes for the Sustainable Use of Living Resources. Cheltenham UK, Northampton, USA, Edward Elgar. pp30-33.

[930] LOSC Article 116(a). Serdy also notes that treaty obligations could include catch or effort limits, although these would need to bind all interested parties to ensure they are genuinely hard limits. See Serdy, A. (2010). Chapter 6. International Fisheries Law and the Transferability of Quota: Principles and Precedents. Conservation and Management of Transnational Tuna Fisheries. R. Allen, J. Joseph and D. Squires. Ames, IA, Wiley-Blackwell**:** pp99-126. p101.

[931] LOSC Article 116(b).

[932] LOSC Article 116© specifically refers to "the provisions of [Section 2]", meaning that the freedom of fishing on the high seas is subject to Articles 116 to 120.

[933] LOSC Article 118.

[934] LOSC Article 118 continues: "…They shall, as appropriate, cooperate to establish subregional or regional fisheries organizations to this end". Note the use of the weaker formulation "as appropriate" compared to the stronger provision in Article 64(1) in relation to highly migratory species: "In regions for which no appropriate international organization exists, the coastal State and other States whose nationals harvest these species in the region shall cooperate to establish such an organization and participate in its work."

Article 119(1) is the first reference in LOSC to catch limits on the high seas. Its reference to the determination of an "allowable catch" appears as a presumption rather than direct obligation[935], but can be inferred from the subsequent text: "…States *shall*: (a) take measures which are designed, on the best scientific evidence available to the States concerned, *to maintain or restore populations of harvested species at levels which can produce the maximum sustainable yield*, as qualified by relevant environmental and economic factors, including the special requirements of developing States, and taking into account fishing patterns, the interdependence of stocks and any generally recommended international minimum standards, whether subregional, regional or global" (emphasis added).

Such measures would reasonably include a catch limit or equivalent limit on effort by vessels flying that particular State's flag, and be designed based on the best scientific evidence available to achieve a population of harvested species capable of producing a qualified MSY[936]. The text provides no guidance on the relative weight to be placed on each of the remaining qualifying factors in Article 119(1)(a), or Article 119(1)(b)[937], but these do not detract from the implied obligation to adopt a limit of some sort.

If they were inclined, States could therefore cooperate to establish an aggregate limit comprising the limits set by all fishing States, which would by default form exclusive shares in a limited pool of access. But they are under no obligation to reach agreement, and as some have asserted, have little incentive to do so[938].

The compatibility requirements of UNFSA strengthen the case for national high seas catch/effort limits and limits applying to EEZs for the same stock to be limited in aggregate to levels "…capable of producing maximum sustainable yield…"[939]. Where such aggregate limits are established, national

[935] LOSC Article 119(1): "In determining the allowable catch and establishing other conservation measures for the living resources in the high seas, States shall:…".
[936] LOSC 119(1)(a): "…take measures which are designed, on the best scientific evidence available to the States concerned, to maintain or restore populations of harvested species at levels which can produce the maximum sustainable yield, as qualified by relevant environmental and economic factors, including the special requirements of developing States, and taking into account fishing patterns, the interdependence of stocks and any generally recommended international minimum standards, whether subregional, regional or global;
[937] LOSC Article 119(1): "…States shall: (b) take into consideration the effects on species associated with or dependent upon harvested species with a view to maintaining or restoring populations of such associated or dependent species above levels at which their reproduction may become seriously threatened."
[938] Crothers, G. T. S. and L. Nelson (2006). "A Governance Framework for High Seas Fisheries." Marine Resource Economics **21**(4): 341-353. p343.
[939] Note the almost identical formulation of this provision in UNFSA Article 5: "In order to conserve and manage straddling fish stocks and highly migratory fish stocks, coastal States and States fishing on the high seas shall, in giving effect to their duty to cooperate in accordance with the Convention: (a) adopt measures to ensure long-term sustainability of straddling fish stocks and highly migratory fish stocks and promote the objective of their optimum utilization; (b) ensure that such measures are based on the best scientific evidence available and are designed to maintain or restore stocks at levels capable of producing maximum sustainable yield, as qualified by relevant environmental and economic factors, including the special requirements of developing States, and taking into account fishing patterns, the interdependence of stocks and any generally recommended international minimum standards, whether subregional, regional or global;".

shares would implicitly be exclusive to the State concerned. The effect of UNFSA is discussed further in the next subsection.

3.4.4 A basis for rights-based management?

A critical question for the viability of rights-based management of highly migratory species is therefore whether international fisheries law permits the establishment of property rights or property-like rights for the access and withdrawal of living resources that occur both within and beyond areas under national jurisdiction. In relation to rights-based approaches specifically, Serdy observed that there was no law of property in public international law[940]. However, there is little doubt that property rights are able to be established by a coastal State in relation to living resources within their territorial sea, archipelagic waters and EEZs, including highly migratory species while they are in waters under national jurisdiction[941]. Such an arrangement could, it was thought, engender better stewardship of the resource compared to the previously open access[942], as envisaged by Scott[943].

With regard to the high seas, as no exclusive rights are vested in any one State, an RBM regime that applies to an entire straddling or highly migratory stock appears possible only through cooperation between interested States[944], including through an RFMO. To be appropriately limited and exclusive, States would also need to rely on the compatibility requirements of UNFSA to support the adoption of effective access and withdrawal rights applying to both the EEZs and the high seas areas across a stock's entire range.

Fishing States are unlikely to find an opportunity that is consistent with international law to adopt conservation and management measures (CMMs) for their vessels on the high seas while disregarding

[940] This contrasts with international commercial transactions, such as trade in goods and services, and the provision of loans, which, as Serdy notes, are usually conducted under the provisions of treaties or under domestic law of the relevant states. See Serdy, A. (2010). Chapter 6. International Fisheries Law and the Transferability of Quota: Principles and Precedents. Conservation and Management of Transnational Tuna Fisheries. R. Allen, J. Joseph and D. Squires. Ames, IA, Wiley-Blackwell**:** pp99-126. p99.

[941] Burke, W. T. (1984). "Highly Migratory Species and the new Law of the Sea." Ocean Development and International Law **14**(3): 273-314. pp276-7.

[942] Aqorau, T. (2007). "Moving Towards a Rights-Based Fisheries Management Regime for Tuna Fisheries in the Western and Central Pacific Ocean." The International Journal of Marine and Coastal Law **22**(1): 125-142. p129.

[943] Scott, A. (1955). "The Fishery: The Objectives of Sole Ownership." Journal of Political Economy **63**(2): 116-124.

[944] Serdy, A. (2010). Chapter 6. International Fisheries Law and the Transferability of Quota: Principles and Precedents. Conservation and Management of Transnational Tuna Fisheries. R. Allen, J. Joseph and D. Squires. Ames, IA, Wiley-Blackwell**:** pp99-126. p99.

the activities and interests of other fishing States and nearby coastal States[945] [946]. Indeed, UNFSA prohibits uncooperative States from participating in fisheries within the area of competence of an RFMO[947]. This, and the qualifications and obligations mentioned earlier, drive all interested States toward cooperation and by extension, compliance with the CMMs of that RFMO and other treaty obligations. As Rayfuse has argued, UNFSA effectively rendered the notion of the freedom of the high seas dead[948].

Whether cooperation yields agreement on effective CMMs, whether rights-based or command and control, with which fishing States comply is another question. Hannesson argues that the consensus decision-making that characterises most RFMOs is unlikely to result in the establishment of ITQs[949]. Serdy also concluded that the prospects for transboundary rights-based fisheries management were hampered by the conflict over initial allocations – despite the Coasean arguments that this should not matter[950]. He nevertheless suspected that participating States would argue against property rights in transboundary fisheries while "gradually and perhaps unwittingly consolidating them in practice"[951].

Stronger port State and market State measures that prevent the landing and sale of fish caught in contravention of RFMO rules are likely to increase the cost of non-compliance and push fishers and flag States into cooperation with an RFMO. Such measures could be a step on the path toward the establishment of property rights by RFMOs[952] [953].

At its most fundamental, effective cooperation toward property rights would entail agreeing on a TAC or TAE and allocating shares in it among participants[954]. UNFSA clearly allows for this, subject to the

[945] See also the discussion regarding the influence of emerging values and norms on long-standing international legal principles such as freedom of fishing on the high seas in Borg, S. (2012). Conservation on the High Seas: Harmonizing International Regimes for the Sustainable Use of Living Resources. Cheltenham UK, Northampton, USA, Edward Elgar. pp9-10.

[946] See also more generally Reynolds, J. L. (2019). "An economic analysis of international environmental rights." International Environmental Agreements-Politics Law and Economics **19**(6): 557-575.

[947] UNFSA Article 8(4).

[948] Rayfuse, R. (1999). "The United Nations Agreement on Straddling and Highly Migratory Fish Stocks as an Objective Regime: A Case of Wishful Thinking?" Australian Year Book of International Law **20**: 30pp.

[949] Hannesson, R. (2011). "Rights based fishing on the high seas: Is it possible?" Marine Policy **35**(5): 667-674. p670.

[950] Posner notes that Coase's proposition relied on the unlikely presumption of zero transaction costs. Posner, R. A. (1992). Economic Analysis of the Law. Boston, Toronto, London, Little, Brown and Company. p51

[951] Serdy, A. (2016). The New Entrants Problem in International Fisheries Law. Cambridge, Cambridge University Press. p308.

[952] See Hannesson, R. (2011). "Rights based fishing on the high seas: Is it possible?" Marine Policy **35**(5): 667-674. p671.

[953] This idea is also developed by deSombre, E. (2010). Chapter 16 Flags of Convenience and Property Rights on the High Seas. Conservation and Management of Transnational Tuna Fisheries. R. Allen, J. Joseph and D. Squires. Ames, Wiley-Blackwell**:** pp269-282.

[954] UNFSA provides little guidance on how allocations are to be determined, beyond the need to take into account the interests of artisanal and subsistence fishers (Article 5i), provisions relating to the interests of new entrants (Article 11), and provisions concerning special requirements of developing states (Articles 24-26). ON LOSC, see also Borg who notes that LOSC represented a series of compromises, resulting in many gaps,

considerable hurdle of securing agreement by all parties. New entrants to the fishery would therefore need to obtain a share of the TAC/TAE either by securing any unallocated TAC/TAE, securing an allocation acquired through politically difficult reductions in existing participants' allocations, or by purchasing quota from existing participants[955]. The latter option implies a form of transferability from an existing participant to a new participant.

In summary, there are likely to be no international legal barriers to the establishment by a flag State or coastal State of a domestic property-rights-based system of management for a transboundary stock. States also appear to have the ability in international law to participate as actors in a regional or subregional rights-based management scheme for a transboundary stock. The barriers are therefore more likely to be political.

3.4.5 Conclusion

This brief analysis has shown that LOSC establishes a framework that could support rights-based management in transboundary fisheries. LOSC shifted the extent of control over fisheries by coastal States from waters within 3nm of their coast to those within 200nm, transferring a large share of the world's fish stocks from the international commons to the hands of coastal States. Coastal States have clear, unfettered rights to establish measures for the conservation and management of fish stocks within territorial seas, archipelagic waters and internal waters and so present no impediments to RBM for inshore fisheries.

Coastal States have similarly strong rights to conserve and manage stocks in their EEZs, particularly for stocks that are confined to the EEZ of a single coastal State, but also for shared stocks. Empirical evidence[956] confirms that coastal States may, and indeed do, employ RBM domestically for shared stocks within their EEZ. This may be sufficient for straddling stocks that are relatively immobile. For highly migratory stocks whose abundance and location are influenced by environmental factors from season to season, it is likely not to be.

At a regional scale, the duty to cooperate and compatibility requirements of LOSC and UNFSA provide at least a theoretical basis for a region-wide RBM scheme for highly migratory species. In reality, the freedom of fishing on the high seas presents a considerable political challenge. The duty to cooperate is not a duty to agree, but where agreement is reached fishing States are bound by those agreements.

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including allocations and the determination of MSY. Borg, S. (2012). Conservation on the High Seas: Harmonizing International Regimes for the Sustainable Use of Living Resources. Cheltenham UK, Northampton, USA, Edward Elgar. pp101-4.

[955] FAO (2002). Report of the Norway-FAO Expert Consultation on the Management of Shared Fish Stocks, Bergen, Nowray, 7-10 October 2002, Food and Agriculture Organisation of the United Nations. para 63

[956] Subsection 3.2.5 above.

3.5 A model of transboundary fishery allocations through jurisdictional scales

3.5.1 Introduction

The previous section established that, in a typical single jurisdiction case employing a rights-based management system for a commercial fishery, the State sets an available limit for a designated stock and assigns exclusive rights to individual users to a share of that limit. The State also typically determines the rules that apply to users and non-users, and ensures compliance by them. A coastal State has the right to exercise these functions within its EEZ and other waters under its jurisdiction and a flag State has the right to exercise those functions over its vessels on the high seas. This is to say that in a single jurisdiction model, a coastal State possesses all three collective choice rights – management, exclusion and alienation[957] – with respect to its EEZ.

As Chapter Two noted[958], effective management of highly migratory species requires cooperation between interested States (whether coastal States or fishing States) and the adoption of measures that apply to the entire geographic range of the stock and/or compatible measures applying to each zone of the region – whether within or beyond the jurisdiction of any one coastal State – and to each flag State and its vessels. In such cases, the holder of each collective choice right and each operational right shifts through each scale, from the regional scale, to the national scale and the individual user scale.

This section aims to develop a model for RBM in a transboundary context. It first considers the application of transboundary operational and collective choice rights. It then develops the model in two stages: a simple transboundary fishery; and a more complex transboundary fishery in which vessels flying the flags of different States fish in each other's waters.

3.5.2 Operational and collective choice rights in a transboundary fishery

While flag States are subject to the coastal State's sovereign rights within an EEZ, they arguably hold all three collective choice rights with respect to the high seas. The latter is subject to an important caveat: that a single flag State may not assign use rights to high seas stocks that are exclusive with respect to vessels flying another State's flag.

Understanding the respective roles of RFMOs, coastal States, fishing States and fishers can be aided by applying Schlager and Ostrom's bundle of operational and collective choice rights to the transboundary fishery[959]. Aqorau et al. conducted a similar exercise in a study focusing on transferability of rights

[957] Subsection 3.2.3 above.
[958] See Chapter Two subsection 2.4.6.
[959] Subsection 3.2.3 above.

between individual users in Pacific island countries[960]. The added complexity of multiple jurisdictional zones means that the same actors will hold different roles at each scale, as shown in Table 3.1 below.

Table 3.1: Operational and collective choice rights in a transboundary fishery

Operational or Collective Choice Right	National scale		Regional scale	Position
	EEZ	**High Seas**		
Alienation	Coastal State	Flag State	LOSC/UNFSA	Owner
Exclusion	Coastal State	Flag State	RFMO	Proprietor
Management	Coastal State	Flag State	RFMO	Claimant
Withdrawal	Individual users	Individual users	Member States	Authorised user
Access	Individual users	Individual users	Member States	Authorised user

At the regional scale, RFMO member flag States hold access and withdrawal rights for the high seas and coastal States for their respective EEZs. These rights are determined by RFMOs exercising their rights of management and exclusion at the regional scale. The RFMO is understood to be the collective membership of the RFMO, not a separate, independent entity. Individual States are not entirely disempowered but must act cooperatively with other member parties to arrive at decisions on limits, allocations and the rules governing how States' access and withdrawal rights are to be exercised. A similar collective function is played in the exercise of the right of alienation. Here the global community, as represented by the State Parties to LOSC and UNFSA, have determined that RFMOs effectively hold those rights of management and exclusion.

At the national scale, the high seas and EEZ must be treated separately. On the high seas, the flag State authorises vessels flying its flag to hold access and withdrawal rights, and therefore arguably holds rights of alienation, management and exclusion at the national scale by virtue of the right of freedom of fishing on the high seas under LOSC.

However, UNFSA effectively holds the right of alienation at the regional scale by placing the regional scale rights of exclusion and management in the hands of the RFMO[961]. That is to say, the RFMO may accept States with a real interest[962] as participants in the fishery, determine any high seas limits to be applied to each stock or each fishery, and allocate those limits to each flag State[963]. While an RFMO

[960] Aqorau, T., K. Azmi, E. Havice, S. Kaye, S. Kininmonth, M. Mataika, S. McTee, A. Morrison, L. Olsen, M. Soboil, S. Suamalie, S. Taufa, Thomas-Smyth and J. Virdin (2020). Assessing the Potential for Transferability of Access Rights to Enhance Sustainability in Large Pacific Tropical Fisheries. Durham, NC**:** 154pp.

[961] Although not a legal analysis, this interpretation of UNFSA is supported by Hannesson, R. (2011). "Rights based fishing on the high seas: Is it possible?" Marine Policy **35**(5): 667-674. p669: "…[UNFSA]…assigns the right to manage fisheries on the high seas to…RFMOs".

[962] See Chapter Two subsection 2.4.6.

[963] Note that an RFMO making any decision is an act of the collective membership, not a separate entity superior to members. See UNFSA Article 10: "In fulfilling their obligation to cooperate through subregional or regional fisheries management organizations or arrangements, States shall:… (b) agree, as appropriate, on

may hold exclusion and management rights for the high seas, it may not always exercise them if it is unable to agree on high seas limits.

Coastal States hold sovereign rights with respect to the living resources within their EEZ under LOSC and therefore hold the right of alienation at the national scale. The coastal State may determine who may possess management and exclusion rights within their jurisdiction, who in turn may determine access and withdrawal rights. The coastal State may also determine that subnational entities for some fisheries may hold rights of management and exclusion but in the case of highly migratory species, these are likely to be held by a national authority.

3.5.3 A four State model of a transboundary fishery

Compatibility as understood in UNFSA is a form of "horizontal compatibility" in the sense that contemporary limits must be consistent across all zones. However, limits must also be compatible from the regional scale through to the individual user scale – that is, limits in aggregate at any scale should not exceed the limit above it. We can call this consistency through scales "vertical compatibility".

The model in Figure 3.3 below represents a simple four State case of RBM in a transboundary fishery comprising two fishing States (A and B) and two coastal States (C and D). The model illustrates a hierarchy of limits, which are assigned through descending jurisdictional scales across the geographic range of the stock to ensure vertical compatibility. At the top of the Figure, a gross limit for the entire geographic range of the stock is set as a TAC or TAE for the *regional scale*.

According to the model the catch or effort limit set at the regional scale is then divided into a high seas portion and a portion for the aggregate of all EEZs within the range of the stock – that is, a gross EEZ portion. For ease of reference, this level of assignment will be referred to as the "*zonal scale*". The model assumes that, consistent with LOSC, coastal States assert their sovereign rights in their EEZs – what might be termed a "zone-based approach" – rather than acquiescing to a system based entirely on flag State allocations and which does not differentiate between EEZs and high seas areas.

In the simple model in Figure 3.3 fishing States A and B are considered to be qualified for, and seek, management and exclusion rights to the high seas portion. The high seas portion is assigned at the *national scale* to fishing States A and B as an exclusive right to a share of the limit on fishing on the high seas – here termed a "*national high seas allocation*". The flag State may then assign access and withdrawal rights to a share of its national high seas allocation to individual users at the *individual user scale*.

participatory rights such as allocations of allowable catch or levels of fishing effort". In effect this means that any agreement on a property rights regime for the high seas would need to be sufficiently attractive to enough participants to carry an agreement. See Hannesson, R. (2011). "Rights based fishing on the high seas: Is it possible?" Marine Policy **35**(5): 667-674. p671.

Management and exclusion rights to shares in the gross EEZ portion – that is, "national EEZ allocations" – are assigned to coastal States C and D at the *national scale*. Coastal States may then exercise these rights by assigning access and withdrawal rights to a share in the national EEZ allocation to users at the *individual user scale*.

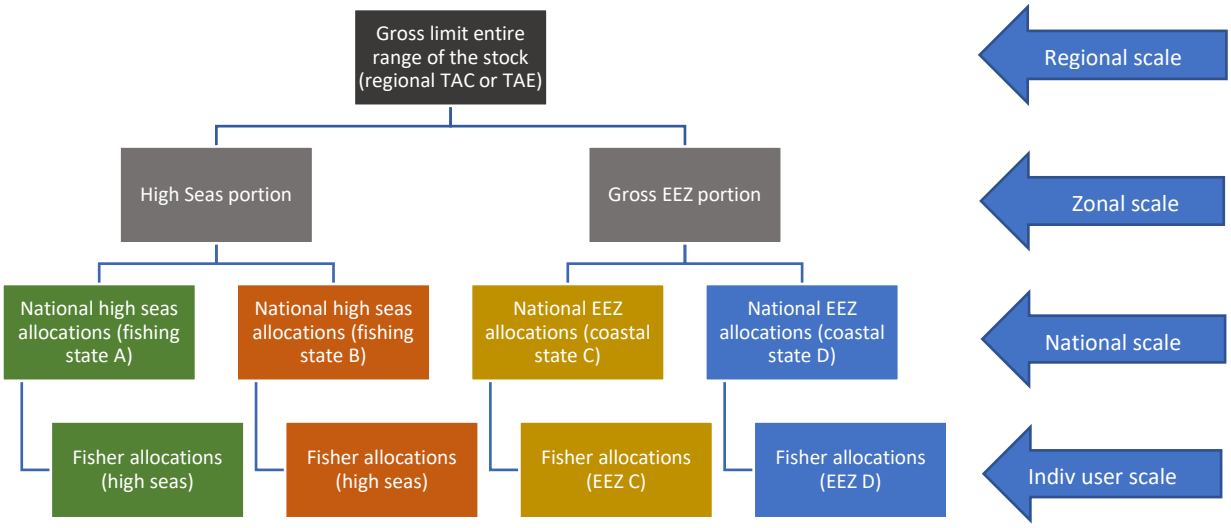

Figure 3.3: A simple four State model of fishing rights in a transboundary fishery

Figure 3.4 below modifies the simple model in Figure 3.3 by introducing the possibility that vessels flying the flag of a coastal State may wish to fish on the high seas as well as within its home EEZ (coastal State D), and that foreign vessels may wish to fish in the EEZ of a coastal State. A coastal State has two possible bases on which to establish its eligibility for a high seas allocation: First as a fishing State, similar to States A and B (coastal State D); and second, as a coastal State with an EEZ adjacent to high seas areas within the region, regardless of whether its vessels are capable of fishing on the high seas (coastal State C)[964]. The first case is clear cut. All States have a right to fish on the high seas, including landlocked and geographically disadvantaged States. The second case is more likely to rest on a question of equity. An RFMO could agree that all members – that is, all interested States – are eligible for a share of high seas catches, including coastal States that do not have fleets capable of harvesting those catches, coastal States with waters adjacent to high seas areas[965], and on the basis of the special requirements of developing States.

[964] Coastal state C's vessels may not be suited to high seas fishing at present but may wish to in the future. IATTC has allowed for this in relation to purse seine capacity limits for the Eastern Pacific Ocean, implicitly on the basis of adjacency. See IATTC (1998). Resolution on Fleet Capacity, Inter-American Tropical Tuna Commission (IATTC). **C-98-11**. paras 3, 5; discussed in Seto, K., G. R. Galland, A. McDonald, A. Abolhassani, K. Azmi, H. Sinan, T. Timmiss, M. Bailey and Q. Hanich (2021). "Resource allocation in transboundary tuna fisheries: A global analysis." Ambio **50**(1): 242-259.

[965] UNFSA Article 7(1): "Without prejudice to the sovereign rights of coastal States for the purpose of exploring and exploiting, conserving and managing the living marine resources within areas under national jurisdiction as provided for in the Convention, and the right of all States for their nationals to engage in fishing on the high

The modified model also includes a "high seas trustee", which for the moment should be regarded as the hypothetical holder of the authority to assign the high seas portion to qualifying interested States (in this case, all four States A, B, C and D). Most obviously, the high seas trustee authority would be vested in the relevant RFMO or an agreement negotiated directly between interested States[966]. In whatever form it takes, the high seas trustee would assign national scale high seas allocations to qualifying States, which would in turn assign rights at the individual user scale.

The modified model also introduces the possibility that other States may wish to fish in the EEZs of coastal States. Two scenarios are presented in Figure 3.4. First, vessels flying the flag of fishing State B seek access to the EEZs of coastal States C and D. Second, vessels flying the flag of coastal State C seek access to the EEZ of adjacent coastal State D.

The two coastal States could then choose one of at least two variations for the assignment of individual use rights to the vessels that seek access to their EEZs. Coastal State C illustrates the first possibility by assigning a portion of its national EEZ allocation as sub-allocations to its domestic fleet to maintain an equitable level of access, and the remainder to distant water fishing States, in this case State B. States C and B then assign shares of their respective allocations to vessels flying their flag. Coastal State D, on the other hand, skips this intermediate step and assigns allocations of its national EEZ allocation directly to individual users, whether they are domestic fishers or foreign fishers from States B and C.

seas in accordance with the Convention: (a) with respect to straddling fish stocks, the relevant coastal States and the States whose nationals fish for such stocks in the adjacent high seas area shall seek, either directly or through the appropriate mechanisms for cooperation provided for in Part III, to agree upon the measures necessary for the conservation of these stocks in the adjacent high seas area".

[966] See also the suggestion that a high seas fishing corporation be established, in Crothers, G. T. S. and L. Nelson (2006). "A Governance Framework for High Seas Fisheries." Marine Resource Economics **21**(4): 341-353.

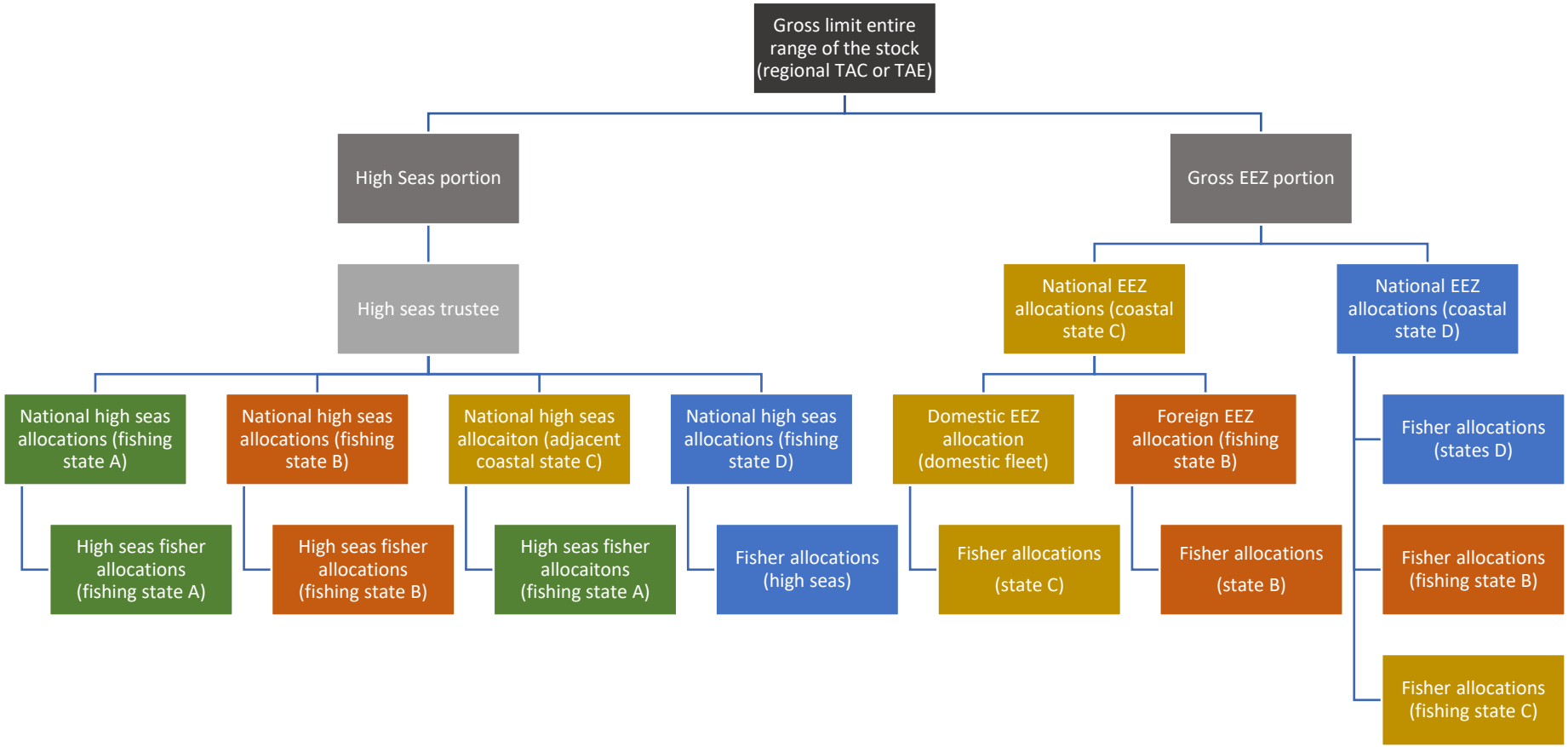

Figure 3.4: A modified model of fishing rights in a transboundary fishery

3.5.4 Conclusion

This section has proposed a model for an RBM regime in a transboundary fishery. It considered the possession of operational and collective choice rights in a transboundary fishery and presented two models of allocation possibilities. The first was as simple as possible, while the second model added some complexity in terms of interactions between different zones and States. There are many other possible variations to these two models. For example, coastal States could pool allowable catches for their EEZs and assign individual user rights to the combined area of the EEZs[967]. Subregional groupings could also establish separate allocation regimes that could also interact with external parties through allocations and transfers of rights. Finally, some scales could be made redundant. For example, the high seas trustee could assign high seas allocations directly to vessels, rather than through the intermediate step of assigning national high seas allocations. However, it is suggested that RFMO members are unlikely to relinquish their national scale management and exclusion rights in order to protect national interests.

Recall also from subsection 3.3.3 above that sub-allocations at each scale could be used to achieve biological or social objectives by quarantining access to a certain portion of allowable catch, adding further complexity to the model. For example, high seas allocations could be divided into spatially differentiated sub-allocations to protect stocks in particular areas. A portion of a high seas limit could be assigned to developing countries, which are less likely to have developed a high seas fishing capacity and therefore lack a catch history. And a portion of a national EEZ allocation could be assigned to subsistence fishers and commercial fishers as two distinct groups, along similar lines to that of coastal State C in Figure 3.4.

3.6 Analytical framework: well-defined property rights

3.6.1 Introduction

Section 3.2.4 above demonstrated that a generalised, single-jurisdiction model of an RBM scheme must address at least three key qualities:

- the entire stock available for use by individual users must be **limited**;
- **exclusive** shares in the limited stock must be assigned to individual users as individual access and withdrawal rights;

[967] See the discussion in Parris, H. and A. Lee (2009). Allocation Models in the Western and Central Pacific Fisheries Commission and Implications for Pacific Island States. Navigating Pacific Fisheries: Legal and Policy Trends in the Implementation of International Fisheries Instruments in the Western and Central Pacific Region. Q. Hanich and M. Tsamenyi. Wollongong, Ocean Publications, Australian National Centre for Ocean Resources and Security (ANCORS), University of Wollongong**:** 250-283. p279.

- the title held by an individual over an access or withdrawal right should be **secure** – that the rights are durable and cannot be altered in an ad hoc manner or withdrawn without a clear basis for doing so.

In addition to being limited, exclusive and secure, it also noted that, in order to maximise economic efficiency over time, a property right should be **transferable** between users. And to support an adaptive, robust system of governance, property rights must exhibit a degree of predictable **flexibility** in the way the system responds to unpredictable exogenous factors. Finally, mechanisms should be in place to ensure compliance with the aggregate limit and the security and exclusivity of the individual rights – that is, a degree of **accountability**.

In this section an analytical framework is developed to address the preliminary research question and in turn support an inquiry into the extent to which property rights are "well-defined" at the regional and subregional scales (central research question). First, criteria are established against which the extent to which property rights are well-defined may be assessed based on the work of other researchers. It then develops an analytical framework based on those criteria, each with a series of exploratory questions drawing on the reviews in Chapter Two and this chapter.

3.6.2 Criteria for well-defined property rights

The analytical framework for this study draws on the frameworks of characteristics of property rights developed by Devlin and Grafton[968] and Scott[969], with refinements drawing on Squires[970] and the SEASALT framework[971] developed by the Environmental Defense Fund (EDF), a US-based non-government organisation[972].

SEASALT is useful as a practical example of the employment of property rights characteristics to assess the strength of property rights provisions in national fisheries legislation. The SEASALT framework is based on seven criteria for effective RBM: secure, exclusive, accountable, scaled, all sources, limited and transferable.

[968] Devlin, R. A. and R. Q. Grafton (1998). Economic Rights and Environmental Wrongs: Property Rights for the Common Good. Cheltenham, Edward Elgar. Discussed and cited in Grafton, R. Q., V. Adamowicz, D. Dupont, H. Nelson, R. J. Hill and S. Renzetti (2004). The Economics of the Environment and Natural Resources. Malden, MA, Blackwell Publishing. pp38-9.
[969] Scott, A. (2000). Introducing Property in Fishery Management: FAO Fisheries Technical Paper 404/1: Use of Property Rights in Fisheries Management. Proceedings of the FishRights99 Conference. R. Shotton. Fremantle, Western Australia, FAO: 1-13.
[970] Squires, D. (2010). Chapter 3. Property and Use Rights in Fisheries. Conservation and Management of Transnational Tuna Fisheries. R. L. Allen, J. Joseph and D. Squires. Ames, IA, Wiley-Blackwell: 39-64.
[971] Bonzon, K., K. McIlwain, C. K. Strauss and T. Van Leuvan (2013). Catch Shares Design Manual: Vol.1 A Guide for Managers and Fishermen, Environmental Defense Fund. p4.
[972] EDF. (2020). "Environmental Defense Fund Webpage." Retrieved 12 August, 2020, from www.edf.org.

A simplified version of the SEASALT Framework was used in a preliminary study into the extent to which RBM at the individual user scale was supported in domestic legislation in the 15 Pacific island members of the FFA. The results of the study were presented in an unpublished working paper for the Pacific Catalyst consortium, of which EDF is a partner[973].

Although the present study focuses on rights-based instruments at the regional, sub-regional and national scales, the preliminary study yielded a number of observations in relation to the methodology, which have informed the development of an analytical framework for the present study. Three insights are of particular relevance here.

First, the preliminary study was restricted to primary legislation as the study was intended to be an initial, simple assessment. Not surprisingly, the legislation in many jurisdictions was found to delegate a substantial proportion of the regulatory framework to subordinate instruments such as regulations and fishery management plans. A fuller picture of the legal framework could therefore be gained from an examination of subordinate legislation and policy documents. In the present study, CMMs and their sub-regional equivalents are taken to be the key source of rules for the management of highly migratory species in the WCPO. However, it is acknowledged that many guidelines and procedures adopted by regional and subregional fisheries management mechanisms are also in place to support the effective implementation of those CMMs.

Second, the SEASALT *scaled* criterion was found to be redundant at a national scale in relation to transboundary fisheries. The scaled criterion requires that "management units are set at an appropriate biological level taking into consideration social and political systems". The appropriate biological scale – that is, the geographic range of the stocks – in a transboundary fishery, by definition, extends beyond a single coastal State's jurisdictional waters. While some tunas are found to migrate between the WCPO and eastern Pacific Ocean (EPO), management arrangements are or could be put in place to account for this[974]. While there may be arguments for a single basin-wide arrangement, it is argued that the scale of management arrangements under the WCPFC and its members is biologically appropriate for WCPO tuna stocks[975], taking into account social and political systems in existence in the region. Any questions regarding spatial coverage in this study will therefore be concerned with scale *within* the WCPO.

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[973] Azmi, K. (2019). Rights-based Fisheries Management: A Snapshot of Fisheries Legislation in Selected Pacific Island Countries, Pacific Catalyst (PC) consortium members: iTuna Intel, Environmental Defence Fund, Duke University, University of the South Pacific, University of Wollongong.

[974] Convention on the Conservation of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (WCPF Convention). Agreed on 5 September 2000, Honolulu. Entered into force on 19 June 2004. **40 International Legal Materials 278 2001**. Article 22, particularly paragraphs 3 & 4.

[975] Climate change is expected to cause a shift in the distribution of WCPO tuna stocks toward and into the EPO from the WCPO. This will likely require some modification to the proposition that the WCPFC-CA accounts for the full geographic range of the stocks for which it has a mandate. Bell, J. D., A. Ganachaud, P. C. Gehrke, S. P. Griffiths, A. J. Hobday, O. Hoegh-Guldberg, J. E. Johnson, R. Le Borgne, P. Lehodey, J. M. Lough, R. J. Matear, T.

Third, it was observed that some of the criteria in the SEASALT Framework use slightly different definitions and nomenclature compared to Devlin and Grafton[976], Scott[977] and Squires[978]. Overlaps in definitions are dealt with in the next subsection.

3.6.3 Property rights analysis criteria: Revised definitions

This subsection aims to reconcile the differences in the number and definition of characteristics of property rights proposed by Devlin and Grafton[979], Scott[980], Squires[981] and the SEASALT Framework as the basis for analytical criteria for RBM in the WCPO. The reconciliation is summarised in Table 3.2 below. Revised definitions are intended to ensure that the criteria are comprehensive but also as mutually exclusive as possible. Exploratory questions are proposed to aid the assessment of management instruments against each criterion based on the discussion in Chapters One and Two.

Limited

The starting point for any effective fisheries management regime is that a limit is placed on overall catches or the equivalent level of fishing effort for each harvested species (i.e. attribute) of the fishery.

SEASALT is the only framework to feature a standalone *limited*. It gives prominence to the need for any limits to be "scientifically appropriate". As a limit to achieve an objective of biological sustainability, MSY could be regarded as a scientifically based catch limit. "Scientifically appropriate" appears to allow for other factors to be considered in determining limits. This could allow scope for equity considerations to push limits to be set at levels above MSY to satisfy all demands on the resource and undermine the biological objective. Limits that aim to support economic maximisation objectives or broader ecological objectives are likely to mean catches will be lower than MSY, but nevertheless sustainable. The key determinant for setting a catch or effort limit is therefore that it is biologically

D. Pickering, M. S. Pratchett, A. S. Gupta, I. Senina and M. Waycott (2013). "Mixed responses of tropical Pacific fisheries and aquaculture to climate change." Nature Climate Change: 9.

[976] Devlin, R. A. and R. Q. Grafton (1998). Economic Rights and Environmental Wrongs: Property Rights for the Common Good. Cheltenham, Edward Elgar. Discussed and cited in Grafton, R. Q., V. Adamowicz, D. Dupont, H. Nelson, R. J. Hill and S. Renzetti (2004). The Economics of the Environment and Natural Resources. Malden, MA, Blackwell Publishing. pp38-9.

[977] Scott, A. (2000). Introducing Property in Fishery Management: FAO Fisheries Technical Paper 404/1: Use of Property Rights in Fisheries Management. Proceedings of the FishRights99 Conference. R. Shotton. Fremantle, Western Australia, FAO: 1-13.

[978] Squires, D. (2010). Chapter 3. Property and Use Rights in Fisheries. Conservation and Management of Transnational Tuna Fisheries. R. L. Allen, J. Joseph and D. Squires. Ames, IA, Wiley-Blackwell: 39-64.

[979] Devlin, R. A. and R. Q. Grafton (1998). Economic Rights and Environmental Wrongs: Property Rights for the Common Good. Cheltenham, Edward Elgar.

[980] Scott, A. (2000). Introducing Property in Fishery Management: FAO Fisheries Technical Paper 404/1: Use of Property Rights in Fisheries Management. Proceedings of the FishRights99 Conference. R. Shotton. Fremantle, Western Australia, FAO: 1-13.

[981] Squires, D. (2010). Chapter 3. Property and Use Rights in Fisheries. Conservation and Management of Transnational Tuna Fisheries. R. L. Allen, J. Joseph and D. Squires. Ames, IA, Wiley-Blackwell: 39-64.

sustainable on the basis of the best available scientific information, ideally independent of political considerations[982].

Although Devlin and Grafton[983] and Scott[984] dis not include a separate *limited* dimension, it is arguably integral to their definition of *exclusive*. A limit on the aggregate of exclusive rights is a necessary condition for exclusivity of individual rights. For the purposes of this study, it was considered useful to separate the two criteria to explicitly identify limits at aggregate and subordinate scales, and to permit the assignment of separate instruments to biological and economic objectives – that is, a TAC/TAE and exclusive transferable shares in the TAC/TAE respectively.

Other considerations in developing a working definition of the *limited* criterion include the application of the precautionary approach and accounting for *all sources* of fish mortality across the geographic range of the stock. There is substantial support in the binding and non-binding international legal instruments supporting the application of the precautionary approach, including with respect the determination of a TAC/TAE. To maintain a hard limit, new entrants must not lead to existing catch or effort limits being exceeded. Measures that do not address *all sources* of mortality are likely to undermine any limit for an individual species[985]. This is particularly the case for fisheries governed by gear-specific effort-based measures in which the subject gear type takes multiple species and where harvested species (whether target species or non-target species) are caught by other gears.

SEASALT also sought to identify the extent to which management arrangements are *scaled* to an "appropriate biological level taking into consideration social and political systems". As noted in the previous subsection, the largest extent of the management unit for highly migratory species is likely to be an entire ocean basin or region within a basin. The system of RFMOs envisaged in UNFSA is therefore assumed to closely match the full geographic extent of the highly migratory species of each basin or region or that appropriate arrangements are in place to address any inconsistencies[986]. However,

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[982] See for example the proposal for an "environmental standard setter" by Crothers, G. T. S. and L. Nelson (2006). "A Governance Framework for High Seas Fisheries." Marine Resource Economics **21**(4): 341-353. pp345-6.

[983] Devlin, R. A. and R. Q. Grafton (1998). Economic Rights and Environmental Wrongs: Property Rights for the Common Good. Cheltenham, Edward Elgar. Discussed and cited in Grafton, R. Q., V. Adamowicz, D. Dupont, H. Nelson, R. J. Hill and S. Renzetti (2004). The Economics of the Environment and Natural Resources. Malden, MA, Blackwell Publishing. pp38-9.

[984] Scott, A. (2000). Introducing Property in Fishery Management: FAO Fisheries Technical Paper 404/1: Use of Property Rights in Fisheries Management. Proceedings of the FishRights99 Conference. R. Shotton. Fremantle, Western Australia, FAO**:** 1-13.

[985] The SEASALT criterion *all sources* finds support in the Code of Conduct's provisions on management frameworks and procedures. See para 7.3.1: "To be effective, fisheries management should be concerned with the whole stock unit over its entire area of distribution and take into account previously agreed management measures established and applied in the same region, *all removals* and the biological unity and other biological characteristics of the stock" (emphasis added).

[986] Note also FAO (1995). Code of Conduct for Responsible Fisheries (Code of Conduct). Adopted on 31 October 1995 at the twenty-eighth session of the FAO Conference by Resolution 4/95. Food and Agriculture Organisation of the United Nations. Rome. para 7.3.1, which states that "To be effective, fisheries

arrangements at the subregional scale or for a portion of the regional scale may not match the geographic extent of the stocks that such arrangements purport to control. The SEASALT *scaled* criterion was therefore retained within the *limited* criterion.

The definition of *limited* used in this study therefore incorporates references to the precautionary approach, and accounts for all sources of mortality across the full range of the stock.

> *Definition: Hard limits on total fishing effort or catches are set at precautionary, science-based levels for each harvested target and non-target species and account for all sources of mortality of that species, appropriately scaled throughout the full extent of its range.*
>
> *Questions:*
>
> - *Are hard limits set on either total fishing effort or total catch?*
> - *Are the limits based on the precautionary approach?*
> - *Are limits based primarily on the best scientific evidence available?*
> - *Do the limits apply to the full geographic range of the stock?*
> - *Do the limits account for catches of the limited species by all gear types?*
> - *Is bycatch of another target species required to be recorded against limits for that species?*

Assessments of each instrument can therefore acknowledge the existence of limits regardless of how they are set, but additionally reward the use of the best available scientific evidence for those limits, and a requirement that a precautionary approach be applied.

Exclusive

It is assumed that, in a transboundary fishery, *exclusive* shares of the TAC/TAE are assigned through each scale, reflecting the cascade of limits to achieve a biological objective at each scale.

SEASALT defined rights as *exclusive* when "secure privileges are assigned to an entity (individual or group) and are clearly recognised and defendable by law". This definition contains elements that are arguably aspects of *security* or *quality of title*. Devlin and Grafton[987] and Scott[988], on the other hand,

management should be concerned with the *whole stock unit over its entire area of distribution*…" (emphasis added).

[987] Devlin, R. A. and R. Q. Grafton (1998). Economic Rights and Environmental Wrongs: Property Rights for the Common Good. Cheltenham, Edward Elgar. Discussed and cited in Grafton, R. Q., V. Adamowicz, D. Dupont, H. Nelson, R. J. Hill and S. Renzetti (2004). The Economics of the Environment and Natural Resources. Malden, MA, Blackwell Publishing. pp38-9.

[988] Scott, A. (2000). Introducing Property in Fishery Management: FAO Fisheries Technical Paper 404/1: Use of Property Rights in Fisheries Management. Proceedings of the FishRights99 Conference. R. Shotton. Fremantle, Western Australia, FAO: 1-13.

focused their conceptualisations of *exclusivity* on the ability to exclude non-right holders from enjoying, or interfering with, the benefits of the right.

SEASALT separately defines *accountability* as "participants are required to stay within their allocated share of the overall catch and/or comply with other controls on fishing mortality." This study accepts that accountability is inherent in the maintenance of exclusivity (and security) and defines *exclusivity* accordingly. A disadvantage of this approach is that the many different aspects of accountability – essentially MCS and enforcement – may be obscured in a composite criterion. This study does not attempt to assess the effectiveness of MCS and enforcement in practice, but acknowledges that this is an essential aspect of any assessment of the effectiveness of any fisheries management regime, whether rights-based or otherwise.

Squires[989] provided some assistance in the synthesis of a revised definition of *exclusivity* by noting the relationship between exclusivity and the definition of rights as a *share* of an aggregate total: "Shares in the aggregate of rights assigned to an individual, group, or State, which has the ability to exclude others from either using or benefitting from a flow of benefits from a resource or asset." The revised definition used in this study therefore focuses on the exclusive enjoyment of a share of the available limit.

> *Definition: Shares in a limited aggregate are assigned to an individual, group, or State which exclude others from enjoying the benefits flowing from the resource*
>
> *Questions:*
>
> - *Are national scale limits exclusive shares in the regional/subregional TAC/TAE?*
> - *Are exemptions to the limit prohibited?*
> - *Are new entrants either excluded or required to be accommodated only from within existing limits?*
> - *Are penalties imposed for exceeding national limits?*

Secure

Each right must be protected by ensuring rightholders do not act beyond the boundaries specified by the right, and that non-rightholders respect the rights of rightholders.

Devlin and Grafton's[990] definition of *quality of title* emphasised the legal protections afforded to a property right, which SEASALT reserved for the *exclusive* criterion (i.e. rights are "clearly recognised

[989] Squires, D. (2010). Chapter 3. Property and Use Rights in Fisheries. Conservation and Management of Transnational Tuna Fisheries. R. L. Allen, J. Joseph and D. Squires. Ames, IA, Wiley-Blackwell: 39-64.
[990] Devlin, R. A. and R. Q. Grafton (1998). Economic Rights and Environmental Wrongs: Property Rights for the Common Good. Cheltenham, Edward Elgar. Discussed and cited in Grafton, R. Q., V. Adamowicz, D. Dupont, H. Nelson, R. J. Hill and S. Renzetti (2004). The Economics of the Environment and Natural Resources. Malden, MA, Blackwell Publishing. pp38-9.

and defendable by law"). Devlin and Grafton[991] also included reference to evidence of ownership, such as the equivalent of a certificate of title or a register of titles, as suggested by Young and McColl[992].

The SEASALT definition of *security* on the other hand, focused on length of tenure, which is captured by others as *duration*. A longer duration is understood to confer greater certainty for the rightholder and therefore greater security of title. For example, perpetual entitlements (defined as a percentage share) could be assigned at the zonal scale to the high seas and aggregate EEZs, and shares in the latter can be assigned in perpetuity to coastal States to lock in a particular relative distribution of benefits[993]. However, perpetual rights may not always be achievable or desirable. In domestic fisheries perpetual rights may be assigned to fishers with extensive catch histories. However, States are likely to be reluctant to assign perpetual rights to foreign users, whether through primary assignment or secondary market transfers.

The definition of *security* applied in this study follows SEASALT and includes duration as an integral element. SEASALT also separately specifies an *accountability* criterion, which encompasses the actions taken to ensure that exclusivity is maintained. Devlin and Grafton[994] and Scott[995] omitted an *accountability* criterion, which suggests that compliance and enforcement actions are inherent in their definition of *quality of title*. However, as noted above, it is assumed for the purposes of this study that rules are complied with and that accountability measures are therefore redundant. *Security* is thus influenced by the legal status of a right, the legal strength of evidence of title, and the discretion with which authorities may amend, suspend or withdraw a right.

Security may be enhanced when opportunities for a central authority to reduce or resume rights held by an individual rightholder are limited. It follows that, within the period of validity of a right, the only way a secure right may be reduced (other than through inbuilt flexibility mechanisms – see *flexible* below), would be for the central authority (i.e. an RFMO) to buy them back.

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[991] Devlin, R. A. and R. Q. Grafton (1998). Economic Rights and Environmental Wrongs: Property Rights for the Common Good. Cheltenham, Edward Elgar. Discussed and cited in Grafton, R. Q., V. Adamowicz, D. Dupont, H. Nelson, R. J. Hill and S. Renzetti (2004). The Economics of the Environment and Natural Resources. Malden, MA, Blackwell Publishing. pp38-9.

[992] Young, M. D. and J. C. McColl (2003). "Robust reform: The Case for a New Water Entitlements System for Australia." Australian Economic Review **36**(2): 225-234.

[993] While not fully developed in this study, the suggestion is that where long term stock distribution patterns are predicted to shift due to climate change, the interests of coastal states could be protected to some degree by perpetual allocations to their EEZ that could be transferred to other maritime zones to reflect new distributions.

[994] Devlin, R. A. and R. Q. Grafton (1998). Economic Rights and Environmental Wrongs: Property Rights for the Common Good. Cheltenham, Edward Elgar. Discussed and cited in Grafton, R. Q., V. Adamowicz, D. Dupont, H. Nelson, R. J. Hill and S. Renzetti (2004). The Economics of the Environment and Natural Resources. Malden, MA, Blackwell Publishing. pp38-9.

[995] Scott, A. (2000). Introducing Property in Fishery Management: FAO Fisheries Technical Paper 404/1: Use of Property Rights in Fisheries Management. Proceedings of the FishRights99 Conference. R. Shotton. Fremantle, Western Australia, FAO**:** 1-13.

Finally, CCMs that have recourse to an independent arbiter to resolve disputes are more likely to view their rights as secure than where no recourse exists other than renegotiation within the RFMO.

Definition: The extent to which the right is durable and recognised in, and defendable by, law.

Questions:

- *Are national scale limits recorded (e.g. in a regional register or binding CMM)?*
- *Are all rightholders required to not exceed their allocation?*
- *Are national limits valid for more than one year?*
- *Are national limits valid until the Parties agree to amend them?*
- *Are disputes able to be resolved by recourse to an independent arbiter?*

Transferable

Transfers could occur at each scale between numerous combinations of buyers and sellers, including between:

- different coastal States
- different users within the same or different EEZs;
- different States or users with high seas allocations;
- the same or different States' EEZ allocations and high seas allocations; or
- the same or different users' EEZ allocations and high seas allocations

Restrictions could be imposed on certain types of transfers, such as those that result in a transfer of catches or effort between the high seas and an EEZ. Which transfers may be permitted or prohibited are policy questions.

There is little substantive difference between the SEASALT and Devlin and Grafton[996] definitions of *transferability*. The definitions used for this study combines the language of both, and of Squires[997], for clarity.

Devlin and Grafton[998] defined an additional criterion of *divisibility* as "the ability of the holder of the right to divide up the asset or the flow of benefits from the asset". SEASALT implied *divisibility* within

[996] Devlin, R. A. and R. Q. Grafton (1998). Economic Rights and Environmental Wrongs: Property Rights for the Common Good. Cheltenham, Edward Elgar. Discussed and cited in Grafton, R. Q., V. Adamowicz, D. Dupont, H. Nelson, R. J. Hill and S. Renzetti (2004). The Economics of the Environment and Natural Resources. Malden, MA, Blackwell Publishing. pp38-9.

[997] Squires, D. (2010). Chapter 3. Property and Use Rights in Fisheries. Conservation and Management of Transnational Tuna Fisheries. R. L. Allen, J. Joseph and D. Squires. Ames, IA, Wiley-Blackwell: 39-64.

[998] Devlin, R. A. and R. Q. Grafton (1998). Economic Rights and Environmental Wrongs: Property Rights for the Common Good. Cheltenham, Edward Elgar. Discussed and cited in Grafton, R. Q., V. Adamowicz, D. Dupont, H. Nelson, R. J. Hill and S. Renzetti (2004). The Economics of the Environment and Natural Resources. Malden, MA, Blackwell Publishing. pp38-9.

its definition of *transferable*, in that smaller portions of the right maybe transferred. Divisibility can be useful when a right holder does not believe they can fully utilise their entire allocation, or when a transfer occurs mid-season by which time part of an allocation has been used[999]. As *divisibility* is closely associated with *transferability*, it has been incorporated into the definition of the latter in this study.

> *Definition: The ability to sell, buy, lease or gift rights, or portions of a right, to the benefits flowing from an asset either permanently or temporarily.*
>
> *Questions:*
>
> - *Can a national limit in full or in part be transferred to another Party/CCM?*
> - *Are new entrants required to acquire an allocation through a transfer from another Party/CCM?*
> - *Is the process for effecting a transfer clear?*
> - *Are transfers recorded in a register?*

Flexible

Devlin and Grafton defined *flexibility* as a measure of the limitations and obligations relating to the exercise of rights that are not covered by other criteria. Squires[1000] described *flexibility* as the ability to "readily accommodate or adapt to a changing world, including climate, ecosystems, markets, and economic systems in general". Flexibility underwritten by transferability is covered under the *transferable* criterion. SEASALT did not include a criterion addressing flexibility.

A right could be said to be *flexible* if it is defined as a proportional share (an entitlement), rather than volumetric share (allocation), of a limited available pool. As the TAC/TAE is adjusted to reflect revised stock assessments in accordance with a set frequency and clear rules, allocations would adjust automatically in accordance with the distribution of entitlements. This is to say that *flexibility* reflects *predictable changes* in response to *unpredictable changes* in exogenous factors (i.e. predictable responses to uncertainty) and thus contributes to the robustness of the management system. In contrast, arbitrary or random changes to rules (i.e. unpredictable responses to uncertainty) diminish robustness and, from the perspective of a rightholder, diminshes *security*. The predictability of changes to a TAC/TAE would be enhanced by a harvest strategy or equivalent mechanism.

[999] While a catch or effort based (e.g. vessel days) allocation diminishes through a season, Serdy notes that where the transferable right relates to vessel capacity (he gives the example of the IATTC), capacity does not diminish through a season. See Serdy, A. (2010). Chapter 6. International Fisheries Law and the Transferability of Quota: Principles and Precedents. Conservation and Management of Transnational Tuna Fisheries. R. Allen, J. Joseph and D. Squires. Ames, IA, Wiley-Blackwell: pp99-126. p102. That said, the ability to use that capacity does diminish over time if the right is valid for a fixed period.

[1000] Squires, D. Ibid.Chapter 3. Property and Use Rights in Fisheries. R. L. Allen, J. Joseph and D. Squires: 39-64.

Definition: The limit readily and predictably accommodates or adapts to changes in certain parameters, such as stock size, climatic conditions, ecosystems, markets, preferences and economic systems in general

Questions:

- *Is a TRP in place for the target stock(s)?*
- *Are harvest control rules in place for the target stock(s)?*
- *Can a TAC/TAE be adjusted year to year on the basis of environmental factors and stock assessments?*
- *Are national limits defined as a proportional (rather than volumetric) share of the regional TAC/TAE?*
- *Are there clear processes in place for a TAC/TAE to be adjusted?*

Table 3.2: Comparison of the characteristics of property rights by Devlin and Grafton and Scott with the SEASALT framework

This table illustrates the overlaps and differences between three different frameworks for the evaluation of property rights and reconciles them in the final column to provide a analytical framework for the present study ("thesis"). *Security* and quality of title are similar dimensions, which can incorporate or separate out *duration*. Similarly, *exclusive* can incorporate *limited* and accountable, or treat them as separate dimensions. The SEASALT definition of *exclusive* also contains elements of *security*.

<table>
<tr><th>Devlin and Grafton[1001]</th><th>Scott[1002]</th><th>SEASALT[1003]</th><th>Thesis</th></tr>
<tr><td>Quality of title</td><td>Quality of title</td><td rowspan="2">Secure</td><td rowspan="3">Secure</td></tr>
<tr><td>Duration</td><td>Duration</td></tr>
<tr><td></td><td></td><td>Accountable</td></tr>
<tr><td rowspan="4">Exclusivity</td><td rowspan="4">Exclusive</td><td>Scaled</td><td rowspan="3">Limited</td></tr>
<tr><td>Limited</td></tr>
<tr><td>All sources</td></tr>
<tr><td>Exclusive</td><td>Exclusive</td></tr>
<tr><td>Transferability</td><td>Transferability</td><td rowspan="2">Transferable</td><td rowspan="2">Transferable</td></tr>
<tr><td>Divisibility</td><td></td></tr>
<tr><td>Flexibility</td><td></td><td></td><td>Flexible</td></tr>
</table>

[1001] Devlin, R. A. and R. Q. Grafton (1998). Economic Rights and Environmental Wrongs: Property Rights for the Common Good. Cheltenham, Edward Elgar. Discussed and cited in Grafton, R. Q., V. Adamowicz, D. Dupont, H. Nelson, R. J. Hill and S. Renzetti (2004). The Economics of the Environment and Natural Resources. Malden, MA, Blackwell Publishing. pp38-9.

[1002] Scott, A. (2000). Introducing Property in Fishery Management: FAO Fisheries Technical Paper 404/1: Use of Property Rights in Fisheries Management. Proceedings of the FishRights99 Conference. R. Shotton. Fremantle, Western Australia, FAO: 1-13.

[1003] Bonzon, K., K. McIlwain, C. K. Strauss and T. Van Leuvan (2013). Catch Shares Design Manual: Vol.1 A Guide for Managers and Fishermen, Environmental Defense Fund.

3.6.4 Scoring

Each question will be scored against a four point scale reflecting whether participants in a rights-based scheme (States) must implement that aspect of the scheme, or may implement it or whether the arrangement is silent (implying may), or may not implement that aspect:

- 3: required
- 2: may
- 1: silent
- 0: may not

A degree of judgement will need to be exercised to determine whether silence in an instrument should be interpreted as prohibiting or not prohibiting a certain action.

The maximum score for each question is therefore 3 and for all five criteria the maximum score is 72.

3.6.5 Conclusion

This section responded to research question two – *how can the extent to which a property right is "well-defined" be assessed?* – by proposing an analytical framework comprising a synthesis of existing conceptions of well-defined property rights. The framework comprises five criteria based a synthesis of similar framework proposed by Scott[1004], Devlin and Grafton[1005], and Squires[1006], and implemented in practice by the Environmental Defense Fund[1007]. The definition of each criterion an its exploratory question are summarised in Table 3.3 below.

[1004] Scott, A. (2000). Introducing Property in Fishery Management: FAO Fisheries Technical Paper 404/1: Use of Property Rights in Fisheries Management. Proceedings of the FishRights99 Conference. R. Shotton. Fremantle, Western Australia, FAO: 1-13.

[1005] Devlin, R. A. and R. Q. Grafton (1998). Economic Rights and Environmental Wrongs: Property Rights for the Common Good. Cheltenham, Edward Elgar. Discussed and cited in Grafton, R. Q., V. Adamowicz, D. Dupont, H. Nelson, R. J. Hill and S. Renzetti (2004). The Economics of the Environment and Natural Resources. Malden, MA, Blackwell Publishing. pp38-9.

[1006] Squires, D. (2010). Chapter 3. Property and Use Rights in Fisheries. Conservation and Management of Transnational Tuna Fisheries. R. L. Allen, J. Joseph and D. Squires. Ames, IA, Wiley-Blackwell: 39-64.

[1007] Bonzon, K., K. McIlwain, C. K. Strauss and T. Van Leuvan (2013). Catch Shares Design Manual: Vol.1 A Guide for Managers and Fishermen, Environmental Defense Fund.

Table 3.3: Property rights criteria, definitions and exploratory questions

Criterion	Definition	Exploratory questions
Limited	*Hard limits on total fishing effort or catches are set at precautionary science-based levels for each harvested target and non-target species and account for all sources of mortality of that species appropriately scaled throughout the full extent of its range.*	• *Are hard limits set on either total fishing effort or total catch?* • *Are limits based primarily on the best scientific evidence available?* • *Are the limits based on the precautionary approach?* • *Do the limits apply to the full geographic range of the stock?* • *Do the limits account for catches of the limited species by all gear types?* • *Is bycatch of another target species required to be recorded against limits for that species?*
Exclusive	*Shares in a limited aggregate are assigned to an individual, group, or State which exclude others from enjoying the benefits flowing from the resource*	• *Are national scale limits exclusive shares in the regional/subregional TAC/TAE?* • *Are exemptions to the limit prohibited?* • *Are new entrants either excluded or required to be accommodated only from within existing limits?* • *Are penalties imposed for exceeding national limits?*
Secure	*The extent to which the right is durable and recognised in, and defendable by, law.*	• *Are national scale limits recorded (e.g. in a regional register or binding CMM)?* • *Are all right holders required to not exceed their allocation?* • *Are national limits valid for more than one year?* • *Are national limits valid until the Parties agree to amend them?* • *Are disputes able to be resolved by recourse to an independent arbiter?*
Transferable	*The ability to sell, buy, lease or gift rights, or portions of a right, to the benefits flowing from an asset either permanently or temporarily.*	• *Can a national limit in full or in part be transferred to another Party/CCM?* • *Are new entrants required to acquire an allocation through a transfer from another Party/CCM?* • *Is the process for effecting a transfer clear?* • *Are transfers recorded in a register?*
Flexible	*The limit readily and predictably accommodates or adapts to changes in certain parameters, such as stock size, climatic conditions, ecosystems, markets, preferences and economic systems in general*	• *Is a TRP in place for the target stock(s)?* • *Are harvest control rules in place for the target stock(s)?* • *Can a TAC/TAE be adjusted year to year on the basis of environmental factors and stock assessments?* • *Are national limits defined as a proportional (rather than volumetric) share of the regional TAC/TAE?* • *Are there clear processes in place for a TAC/TAE to be adjusted?*

3.7 Conclusion

This chapter responded to two preliminary research questions:

- What could a rights-based management system look like in a transboundary fishery?
- How can the extent to which a property right is "well-defined" be assessed?

It commenced in Section 3.2 by surveying the different ways in which property rights can be understood. It was observed that property rights in common pool resources are typically defined as use rights, which represent a right to take or use an exclusive share of a resource, rather than ownership of the resource itself. Such rights may pertain to access and withdrawal of the resource or the right to manage and exclude access to the resource and determine *who* may manage and exclude access. Different individuals or groups may possess and exercise each of these rights as part of right-based management system. It also noted that the quality of a property right can be measured against a number of dimensions. Critically, they should represent an exclusive share of a limited pool and held with a sufficient degree of security to incentivise the rightholder to husband the resource in the present in order to retain its value in the future. Rights may also be transferable to ensure they are allocated to the most efficient user, and flexible in a predictable way to adapt to uncertainty over time. Well-defined property rights are those in which these dimensions are strong. Examples of property rights in fisheries were provided.

In Section 3.3 I argued that, while rights-based management systems may not be well-suited to addressing all aspects of a complex social-ecological system, they can be designed in ways that can support the complexity of multiple objectives, uncertainty and dynamism in concert with other instruments. It observed that unbundled rights presented an opportunity to align instruments with different objectives associated with different attributes. Rights-based instruments were found to be capable of reconciling, to a significant degree, both biological and economic objectives. While property rights theory suggested that rights-based instruments may be capable of addressing ecological objectives, in practice, it was likely to be simpler and more cost effective to employ command-and-control rules. Social objectives were found to be an often contentious aspect of RBM. The focus on maximising economic rents often came at the expense of existing stakeholders who were marginalised by the introduction of such schemes. However, many examples also demonstrated that, when designed with clear objectives and the social-ecological complexity of the fishery in mind, they may in fact strengthen social outcomes. Empirical examples supported the use of sub-allocations as one possible solution to addressing distributional equity within a broader RBM framework.

Section 3.4 examined the basis for rights-based management in international law, concluding that RBM was possible in transboundary fisheries but was far from likely to emerge from cooperation between States. It noted that empirical evidence suggested that some foundational aspects of RBM had been established between several coastal and fishing States, most notably through RFMOs, and that where

RBM was employed, it was typically at a domestic level within a broader regional allocation regime rather than a region-wide RBM scheme. This may be adequate for straddling stocks that are comparatively immobile. It is unlikely to be capable of securing all potential gains in fisheries for highly migratory stocks, the abundance and distribution of which are influenced by environmental factors from season to season. Very little research has been conducted into RBM for highly migratory stocks at a region-wide scale.

Section 3.5 proposed a stylised model of a transboundary fishery in response to preliminary question one. It depicted a hierarchy of allocations from the regional scale to the individual user scale with a range of possible interactions between coastal States and fishing States and their fleets. Section 3.6 set out an analytical framework based on the conclusions drawn from Chapters Two and Three in response to preliminary question two. The framework includes five criteria, and a total of 24 exploratory questions. Each of these questions is to be assessed against a four-point scale to reveal an overall score for each management instrument indicating the extent to which any property rights established by the instrument are well-defined.

4 Subregional instruments in the Western and Central Pacific

4.1 Introduction

This Chapter responds to the subregional aspects of the central research question[1008] by assessing the extent to which the institutional arrangements in place at a subregional scale in the Western and Central Pacific Ocean (WCPO), lay a foundation for well-defined property rights. It assesses key subregional instruments for the conservation and management of fisheries targeting the stocks of interest to the Pacific island members of the Pacific Islands Forum Fisheries Agency (FFA) against the property rights criteria set out in Chapter Three.

The bulk of the chapter considers instruments focused on tropical fisheries adopted by the Parties to the *Nauru Agreement Concerning Cooperation in the Management of Fisheries of Common Stocks*[1009] (PNA – the Parties to the Nauru Agreement). The Nauru Agreement was agreed by seven Pacific island countries in 1982[1010], with Tuvalu acceding as the eighth Party in 1991[1011]. The Nauru Agreement brought together the most productive waters for tuna in the Pacific[1012] and sought to "co-ordinate and harmonise the management of fisheries with regard to common stocks within the Fisheries Zones [of the Parties], for the benefit of their peoples"[1013]. Through the Agreement, the Parties laid the foundation for the eventual establishment of two important transboundary rights-based management arrangements – the vessel day schemes (VDS) for the purse seine and longline fisheries in PNA waters – as well as several other declarations and arrangements. As Figures 4.1 and 4.2 illustrate, the two schemes, particularly the purse seine VDS, accounted for a substantial share of the fisheries that they targeted.

The Chapter commences in section 4.2 by outlining the background to the PNA and assesses the Nauru Agreement itself and its implementing arrangements. Section 4.3 examines the Palau Arrangement, including the two management schemes establishing the purse seine and longline vessel day schemes, while section 4.4 considers the Federated States of Micronesia Arrangement.

[1008] *To what extent does the institutional framework at a regional or subregional scale in the WCPO provide a basis for well-defined property rights for the conservation and management of WCPO tuna stocks?*
[1009] PNA (2010). Nauru Agreement Concerning Cooperation in the Management of Fisheries of Common Stocks (the Nauru Agreement). Agreed on 11 February 1982 at Nauru. Amended in April 2010. PNAO. Available at https://www.pnatuna.com/content/nauru-agreement. Accessed on 24 May 2018, Office of the Parties to the Nauru Agreement (PNAO).
[1010] The eight Parties to the Nauru Agreement are Federated States of Micronesia, the Republic of Kiribati, the Republic of the Marshall Islands, the Republic of Nauru, the Republic of Palau, the Independent State of Papua New Guinea, Solomon Islands and Tuvalu.
[1011] Tamate, J. M. M. M. (2013). Balancing the scales: the experience of the Parties to the Nauru Agreement. Doctor of Philosophy thesis, University of Wollongong. p53.
[1012] Catches in the EEZs of the PNA amount to 54% of the volume and 47% of the value of catches of the four key tuna species in the WCPFC-CA. Author's analysis based on FFA (2020). Value of WCPFC-CA Tuna Catches 2019. Honiara, Pacific Islands Forum Fisheries Agency.
[1013] Nauru Agreement Article 1.

Section 4.5 turns to the southern longline fishery and the Tokelau Arrangement. Although the Tokelau Arrangement has not yet developed into a fully operational management scheme like the purse seine VDS, it clearly draws on many of the lessons of the VDS and arguably builds on it. Section 4.6 concludes the Chapter.

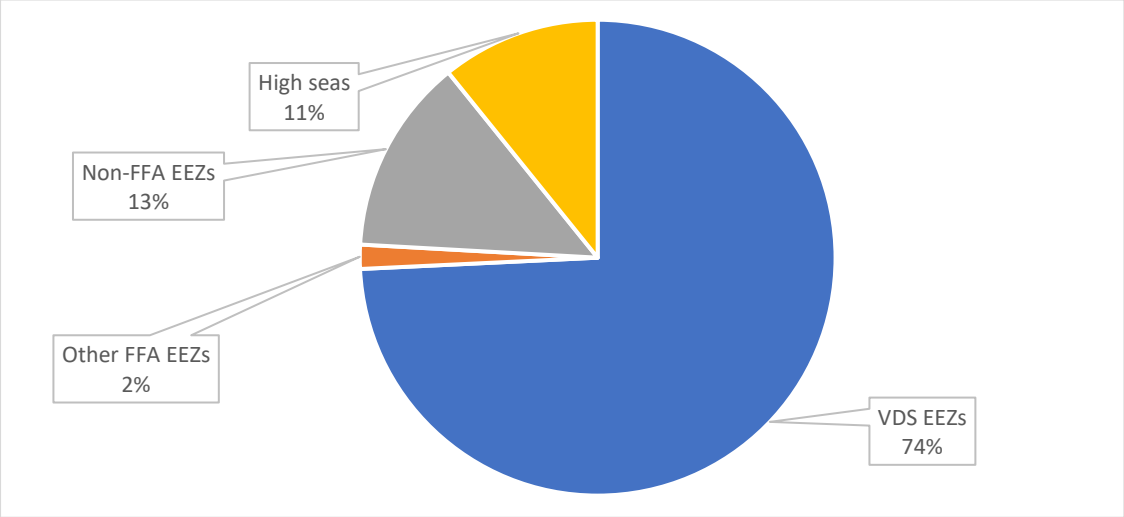

Figure 4.1: Distribution of purse seine catches in the WCPO (2017-2019)

Figure 4.1 summarises the share of WCPO purse seine catch volumes over the three years from 2017 to 2019 taken in the waters of PNA purse seine VDS Participants, other FFA members and non-FFA members, and in high seas areas. PNA waters account for 98 per cent of purse seine catches (all species) in FFA waters, and 74 per cent of all purse seine catches in the WCPO[1014].

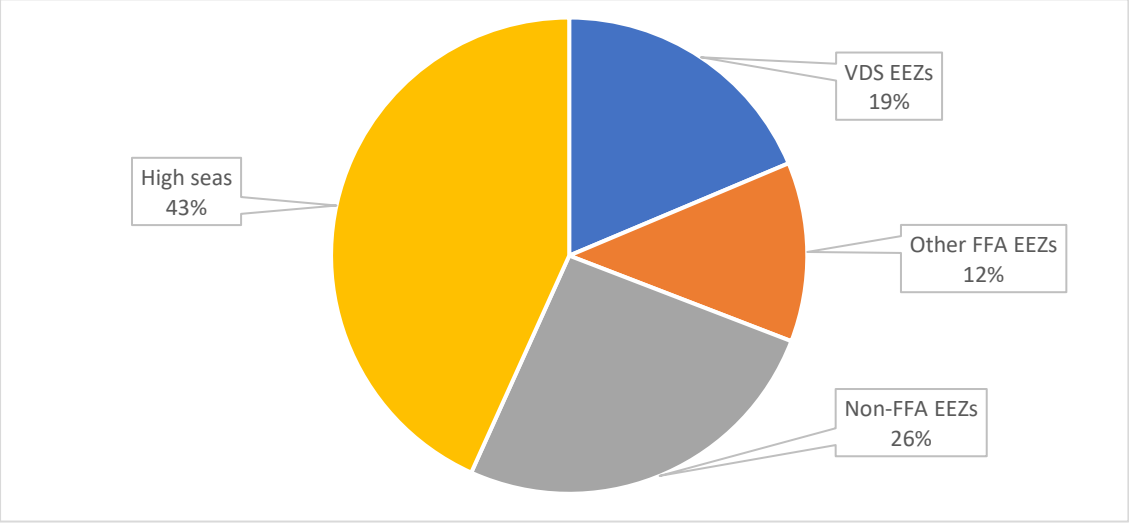

Figure 4.2: Distribution of longline catches in the WCPO (2017-2019)

Figure 4.2 summarises the share of WCPO longline catch volumes over the three years from 2017 to 2019 taken in the waters of PNA longline VDS Participants, other FFA members and non-FFA members, and in high seas areas. Catch es in the waters of VDS participants account for over 60 per cent of purse seine catches (all species) in FFA waters, and 19 per cent of all longline catches in the WCPO[1015].

[1014] Data source: FFA (2020). Value of WCPFC-CA Tuna Catches 2019. Honiara, Pacific Islands Forum Fisheries Agency.
[1015] Ibid.

4.2 The Parties to the Nauru Agreement

4.2.1 Background

The Nauru Agreement applies to the "common stocks" of the "Fisheries Zones" – that is, the EEZs – of the Parties and all fishing vessels targeting those stocks[1016]. In its current form (as amended in April 2010), the Nauru Agreement is ostensibly designed to support the objectives of the Bikenibeu Declaration[1017] and the Koror Declaration[1018] [1019], which aim to increase the economic value of the tuna resources of the combined EEZs of the PNA and to increase the share of those benefits accruing to the PNA. The Nauru Agreement therefore pursues both an overall economic maximisation objective and a social objective. It is silent on biological and ecological objectives, but notes that the Parties are "mindful of their dependence, as developing island States, upon the rational and optimal utilisation of the living resources" of their EEZs"[1020].

Although a binding instrument[1021], the Nauru Agreement has a largely enabling role in cooperative fisheries management by the PNA[1022]. It sets a framework for the establishment of operational measures such as: uniform minimum licence terms and conditions[1023]; standardised licensing procedures[1024], including the possibility of a centralised licensing system [1025]; and cooperative MCS [1026] and enforcement[1027]. Following the 2010 amendments, its provisions apply to all vessels, rather than only foreign vessels[1028]. The practical effect of this was to expand the power to agree to minimum licence terms and conditions for domestic vessels without precluding the Parties from agreeing on terms and conditions that apply to foreign vessels only.

The Nauru Agreement is only binding on the eight coastal State Parties. To bind DWFNs and their vessels, the Parties must either include equivalent provisions in bilateral agreements or have equivalent

[1016] Nauru Agreement (as amended in April 2010) Article I and the chapeau of Article II.
[1017] PNA (2009). Bikenibeu Declaration by Ministers for Fisheries of the Parties to the Nauru Agreement: Securing Greater Value from Their Common Fisheries Wealth. Bikenibeu, Tarawa, Kiribati, Parties to the Nauru Agreement.
[1018] PNA (2010). Koror Declaration: Committing Parties to the Nauru Agreement to Joint Efforts to Increase the Economic Value and Derive Greater Benefits from the Tuna Resource. Koror, Palau, 25 February 2010, Parties to the Nauru Agreement.
[1019] Nauru Agreement (as amended in April 2010) Preamble.
[1020] Nauru Agreement (as amended in April 2010) Preamble.
[1021] Nauru Agreement (as amended in April 2010) Article XI(1): "This Agreement is a binding international agreement concluded among States and is governed by international law."
[1022] Nauru Agreement (as amended in April 2010) Article I "The Parties shall seek…to co-ordinate and harmonise the management of fisheries with regard to common stocks within the Fisheries Zones, for the benefit of their peoples."
[1023] Nauru Agreement (as amended in April 2010) Article II paragraphs (b) and (c).
[1024] Nauru Agreement (as amended in April 2010) Article III.
[1025] Nauru Agreement (as amended in April 2010) Article III(b).
[1026] Nauru Agreement (as amended in April 2010) Article VI.
[1027] Nauru Agreement (as amended in April 2010) Article VII.
[1028] See for example Nauru Agreement (as amended in April 2010) Articles II, III and VI.

measures adopted under rules that also bind DWFNs, such as CMMs of the WCPFC. To bind foreign vessels in domestic law, the Parties must adopt corresponding rules at a national scale (e.g. domestic legislation and/or licensing conditions foreign vessels)[1029].

The key agreements and arrangements of the PNA, including those establishing the vessel day schemes, are listed in Table 4.1 below.

[1029] Nauru Agreement First Implementing Arrangement Article III(2) requires that Parties provide to the depositary any legislation enacted to give effect to the Arrangement.

Table 4.1: Key instruments of the Parties to the Nauru Agreement[1030]

Document	Year	Content
Nauru Agreement[1031]	1982 (amended 2010)	An agreement to "co-ordinate and harmonise the management of fisheries with regard to common stocks within the Fisheries Zones [of the Parties], for the benefit of their peoples" (Article I). Provisions include a duty to: • "establish, as a minimum, uniform terms and conditions under which the Parties may licence fishing vessels to fish within the Fisheries Zones regarding [aspects of monitoring, control and surveillance]" (Article. II(b)); • "establish other uniform terms and conditions under which the Parties may licence fishing vessels to fish within the Fisheries Zones" (Article II(c); • "explore the possibility of establishing, without prejudice to the sovereign rights of the Parties, a centralised licensing system of fishing vessels." (Article III(c)) • duty to "conclude arrangements where necessary to facilitate the implementation of the terms and to attain the objectives of this Agreement" (Article IX) 2010 Amendments: • References to Bikenibeu Declaration and Koror Declaration added • Tuvalu added as a signatory • Formalised the establishment of the PNAO in a new Article V, and amended the original obligation to seek the assistance of the FFA in implementing the Nauru Agreement to, inter alia, an option to seek additional services from the FFA Secretariat • Deleted the word "foreign" in Article II(b) & (c), Article III and Article VI to apply HMTCs, licence terms and conditions, standardised licensing procedures and coordinated MCS and enforcement to all vessels, not just foreign vessels.
Palau Arrangement for the Management of the Western Pacific Fishery as Amended[1032]	2 October 1992, annex 1 amended April 1994, September 2010; entered	Sets out in relation to all catches by purse seine vessels, including bycatch, in PNA waters and adjacent high seas where purse seine vessels operate: • management arrangements between the PNA (Arts 3 & 4); • prioritisation of licence allocation to domestic vessels first, followed by domestic or jointly operated vessels of another party; then locally-based foreign fishing vessels; then foreign fishing vessels with existing access

[1030] Most documents are available at Key Documents | www.pnatuna.com.

[1031] PNA (2010). Nauru Agreement Concerning Cooperation in the Management of Fisheries of Common Stocks (the Nauru Agreement). Agreed on 11 February 1982 at Nauru. Amended in April 2010. PNAO. Available at https://www.pnatuna.com/content/nauru-agreement. Accessed on 24 May 2018, Office of the Parties to the Nauru Agreement (PNAO).

[1032] PNA (2010). Palau Arrangement for the Management of the Western Pacific Fishery, Agreed on 2 October 1992. Entered into force on 1 November 1995. Amended on 27-29 April 1994 and 11 September 2010, Office of the Parties to the Nauru Agreement.

	into force 1995	and good compliance; and finally new foreign fishing vessels (Art 5); and • licence allocation criteria (Art 6), including maximum number of licences to be allocated to flag States (set out in Annex 1). 2010 amendments: • broaden its application to all fishing vessels, not just purse seine vessels; • clarification that PNA Management Meetings will consider management measures to implement Management Schemes and "management mechanism[s]" instead of directing the allocation of licences (including by deleting Annex 1 on the licence allocation numbers to flag States); • reflect the role of the PNAO rather than the FFA Secretariat; • delete original Article 5 on licence allocation and old Article 6 on licence allocation criteria and • other minor amendments, including a new provision on the effect of amendments to the Arrangement.
(First) Arrangement Implementing the Nauru Agreement Setting Forth Minimum Terms and Conditions of Access to the Fisheries Zones of the Parties[1033]	1982 (amended 5 May 1993, 26 November 2010)	PNA members established: • harmonised minimum terms and conditions for foreign fishing access agreements and common formats for licensing requirements for foreign fishing vessels fishing the common stocks of fish within PNA Fisheries Zones; • common catch reporting and logbook rules; • common requirements for reporting of vessel position and entry and exit, and vessel identification Amendments: • Added Tuvalu as a signatory; • Amendment to implement a mandatory PNA crewing requirement of 10% on all purse seine fishing vessels licenced in PNA waters from January 1, 2012, to be gradually increased to 20% over five years.
Second Arrangement Implementing the Nauru Agreement Setting Forth Minimum Terms and Conditions of Access to the Fisheries Zones of the Parties[1034]	1990	Additional minimum terms and conditions for foreign access agreements and licences, including: • ban on transhipment at sea; • high seas catch reporting and logbooks; • requirement to carry observers when requested; and • electronic positioning and data transfer technology.

[1033] PNA (2010). First Arrangement Implementing the Nauru Agreement Setting Forth Minimum Terms and Conditions of Access to the Fisheries Zones of the Parties (as amended in 2010). Agreed 5 May 1993. Amended 26 November 2010, Office of the Parties to the Nauru Agreement.

[1034] PNA (1990). Second Arrangement Implementing the Nauru Agreement Setting Forth Additional Terms and Conditions of Access to the Fisheries Zones of the Parties. Agreed on 19 September 1990, Office of the Parties to the Nauru Agreement.

FSM Agreement on Regional Fisheries Access[1035]	14 Nov 1994 (amended May 2008, June 2016, refined Oct 2016)	Objective is to maximise sustainable economic benefits from the exploitation of the tuna resources of the Central and Western Pacific, including through the establishment of a licensing regime for purse seine vessels of the PNA members operating in PNA EEZs, based on criteria that ensure genuine and quantifiable economic benefits to the Parties. Includes provisions for: • Register of eligible fishing vessels • Criteria for applications for regional access licences (detailed in Annex III) • An Administrator (the PNAO) and meetings of the Parties • Provisions for payment and transfer of licence fees • Cooperative surveillance and enforcement, including port State measures and an observer program to be established by the Parties • Licence conditions (Annex V)
Palau Arrangement for the Management of the Western Pacific Fishery as Amended – Management Scheme (Purse Seine Vessel Day Scheme)[1036]	2004 (amended April 2016 & Oct 2016)	Established the purse seine vessel day scheme among the PNA and Tokelau
Bikenibeu Declaration[1037]	21 October 2009 (amended 2013)	PNA members agreed to: • to establish the Office of the PNA; • to conduct further work on closure of additional high seas areas to address IUU fishing; • to the PNA developing new measures to enhance economic returns from fisheries to PNA members, including requirements to refuel in port, land catches in PNA ports, and carry PNA nationals as crew; and • on the importance of PNA longline VDS.
Koror Declaration Committing Parties to the Nauru Agreement to Joint Efforts to Increase the Economic Value and Derive Greater Benefits from the Tuna Resource[1038]	25 February 2010	PNA agreed to, inter alia: • explore ways to control output and limit effort in fisheries for highly migratory fish stocks; • confirm the adoption of the purse seine VDS; • prohibit purse seine vessels licensed by the PNA from fishing in additional high seas areas (between 10degN and 20degS and 170degE and 140degW; and

[1035] PNA (2013). Federated States of Micronesia Arrangement on Regional Fisheries Access (FSM Arrangement). Agreed on 30 November 1995. Entered into force on. Amended by SFSMA5 on 26 June 2013. Refined 19 October 2013 (sic). Pohnpei, Office of the Parties to the Nauru Agreement.

[1036] PNA (2016). Palau Arrangement for the Management of the Western Pacific Fishery - Management Scheme (Purse Seine Vessel Day Scheme). Signed 2 October 1992. Entered into force 1 November 1995. Amended April 2016 & October 2016, Office of the Parties to the Nauru Agreement.

[1037] PNA (2009). Bikenibeu Declaration by Ministers for Fisheries of the Parties to the Nauru Agreement: Securing Greater Value from Their Common Fisheries Wealth. Bikenibeu, Tarawa, Kiribati, Parties to the Nauru Agreement.

[1038] PNA (2010). Koror Declaration: Committing Parties to the Nauru Agreement to Joint Efforts to Increase the Economic Value and Derive Greater Benefits from the Tuna Resource. Koror, Palau, 25 February 2010, Parties to the Nauru Agreement.

		• proceed with the full assessment for Marine Stewardship Council certification of the skipjack fishery as sustainable.
Palau Arrangement for the Management of the Western Pacific Tuna Fishery – Management Scheme (Longline Vessel Day Scheme)[1039]	2016 (amended Oct 2016)	Established the longline vessel day scheme among the PNA and Tokelau
Third Arrangement Implementing the Nauru Agreement Setting Forth Additional Terms and Conditions of Access to the Fisheries Zones of the Parties[1040]	2008 (amended 11 September 2010, 7 April 2011, 1 May 2019)	Additional minimum terms and conditions for foreign access agreements and licences, including: • requirement to retain until landing or transhipment all catches of SKJ, BET and YFT by purse seine vessels; • three month FAD closure (July-Sept); • ban on purse seine sets on whale sharks; • ban on fishing in two high seas pockets and an additional high seas area between 10degN and 20degS and 170degE and 150degW; • requirement for all foreign purse seine vessels to carry an observer; and • requirement to carry and use an Automatic Location Communicator Amendments: • establishing restrictions on purse seine mesh size; • providing the PNA with the option to impose additional FAD closures of up to 3 months each year.
PNA Resolution 2013-01 on Renewed Commitment to Cooperation in Fisheries Management and Development, Koror	1 March 2013	The PNA and Tokelau: • Reaffirmed their commitment to adhering to (purse seine) VDS limits and to strengthen the implementation of the VDS and other arrangements; • Agreed to a TAE for 2013 and that it would be allocated by mutual agreement among the Parties; • Recommitted to vessel length adjustment factors for 2013 and to review them in 2014; • Increased the benchmark fee for a vessel day to US$6000 for 2014; • Institute the longline VDS (i.e. open the arrangement for signature by the PNA); and • Reforms the FSM Agreement "to strengthen the contribution that it makes to the promotion of domestic tuna development through preferential access to Parties' waters for domestic vessels".

[1039] PNA (2016). Palau Arrangement for the Management of the Western Pacific Fishery as amended - Management Scheme (Longline Vessel Day Scheme) as amended October 2016. PNA, Office of the Parties to the Nauru Agreement.

[1040] PNA (2019). A Third Arrangement Implementing the Nauru Agreement Setting Forth Additional Terms and Conditions of Access to the Fisheries Zones of the Parties (Third Implementing Arrangement). Agreed 16 May 2008, as amended on 11 September 2010, 7 April 2011, and 1 May 2019). Majuro, Office of the Parties to the Nauru Agreement.

FSM Arrangement - amendments	26 June 2013	
Resolution of PNA + Tokelau Ministers from Their Seventh Special Meeting, Honiara 3 July 2013; Majuro 13 June 2014	2013/2014	Amended the 3rd Implementing Arrangement by deleting subparagraph c of Regulation I(3) "any additional high seas areas located within 10degrees N and 20 degrees S latitude and 170 degrees E and 150 degrees W longitude"
MOU Between the PNA on Minimum Bench Mark Fee for a Fishing Day Under the VDS	13 June 2014	New minimum benchmark fee for 2015
Purse Seine VDS TAE for 2018-2020	5-7 April 2017	Sets out the agreed TAE for PNA and for Tokelau for 2018, 2019, 2020

4.2.2 Nauru Agreement

The Nauru Agreement does not by itself establish any fisheries management instruments but lays a foundation for the Parties to agree to a range of measures and instruments.

Article II(b) enumerates specific areas for which the Parties are required to establish minimum uniform licence terms and conditions to be attached to fishing licenses, including in relation to observers[1041], logbooks[1042], reporting by vessels[1043], and vessel identification[1044]. However, Article II(c) provides an apparent open-ended power to "seek to establish other uniform terms and conditions…(v) as the Parties may from time to time consider necessary". The preceding subparagraphs could be regarded as limiting subparagraph (v) to matters concerning compliance and not catch or effort limits[1045].

Any limitations therein are overcome by Article IX, which provides for "arrangements to facilitate the implementation of the terms and to attain the objectives of…the Agreement" (hereafter "implementing arrangements")[1046]. There appear to be no limitations on the content of the implementing arrangements other than that they facilitate the implementation, and address the objectives, of the Agreement[1047].

Three implementing arrangements have been adopted under the Nauru Agreement, the provisions of which apply to specific vessel types and fisheries. The first and second implementing arrangements focus solely on foreign access agreements and foreign fishing vessel licences[1048] [1049]. They set out standardised licensing procedures, and minimum MCS requirements. The first implementing arrangement also includes minimum crewing requirements while the second implementing arrangement includes a ban on transhipment at sea by all foreign fishing vessels licensed to fish by a Party[1050]. Both are excluded from this study.

[1041] Nauru Agreement (as amended in April 2010) Article II(b)(ii).
[1042] Nauru Agreement (as amended in April 2010) Article II(b)(iii).
[1043] Nauru Agreement (as amended in April 2010) Article II(b)(iv).
[1044] Nauru Agreement (as amended in April 2010) Article II(b)(v).
[1045] The *ejusdem generis* rule would support this conclusion if it were applied to subparagraph (v) in light of subparagraphs (i) on access fees; (ii) catch and effort data; (iii) supply of other information as deemed necessary; (iv) other compliance measures.
[1046] Nauru Agreement (as amended in April 2010) Article IX: "The Parties shall conclude arrangements where necessary to facilitate the implementation of the terms and to attain the objectives of this Agreement. The Parties concluding such arrangements shall lodge copies with the depositary of this Agreement".
[1047] The pertinent provision here is Nauru Agreement Third Implementing Arrangement Article I, which sets a broad scope to coordinate the management of common stocks in the Parties' EEZs.
[1048] Nauru Agreement First Implementing Arrangement Article II: "The Parties shall establish the following minimum terms and conditions and utilize the following common formats in all their subsequent foreign fishing access agreements and their licensing requirements concerning foreign fishing vessels fishing the common stocks of fish within the Fisheries Zones".
[1049] Nauru Agreement Second Implementing Arrangement Article I sets out additional terms and conditions to be included by the Parties in "all their subsequent foreign fishing agreements and their licensing requirements concerning foreign vessels fishing within [PNA waters]".
[1050] Nauru Agreement Second Implementing Arrangement Article I para 1.

The third implementing arrangement focuses primarily on purse seine vessels[1051], with most of its provisions applying to both foreign and domestic vessels[1052]. Again, it sets out additional minimum terms and conditions, all of which on their own are command-and-control rules covering catch retention[1053], three-month FAD closure[1054], prohibition on setting on whale sharks[1055], certain high seas closures[1056], vessel monitoring[1057], minimum mesh size[1058] and a ban on bunkering and provisioning purse seine vessels on the high seas areas of the WCPFC-CA east of 130 degrees East[1059]. The majority are aimed at strengthening compliance and accountability. However, catch retention, minimum mesh size requirements and FAD closures target biological objectives, while the ban on setting on whale sharks has a clear ecological objective. Of the three implementing arrangements, only the catch retention rules in the third implementing arrangement appear to have direct implications for rights-based management.

No instruments directly established by the Nauru Agreement and its three implementing arrangements are considered to form a right-like instrument. The Nauru Agreement's provisions relate to vessel licences and therefore operate at the individual user scale, rather than the national scale. However, some licence conditions could conceivably support sub-regional scale and national scale instruments in an indirect manner.

The Nauru Agreement can be considered an enabling agreement such that where it is silent on, but does not prohibit, RBM, a positive conclusion should be drawn. In contrast, implementing arrangements under the Nauru Agreement are assumed to be explicit about what is permitted under that arrangement. Complete silence is therefore generally interpreted as meaning that a particular element of RBM is not permitted under that implementing arrangement.

[1051] Exceptions to this appear to include Nauru Agreement Third Implementing Arrangement Article I paragraphs 3 (high seas closures), paragraph 4(b) (operation of automatic location communicators by licensed vessels). These provisions specify "[a] vessel" and "a licensed vessel" respectively.
[1052] Nauru Agreement Third Implementing Arrangement Article I: "…the Parties shall establish the following minimum terms and conditions in all of their subsequent foreign fishing agreements and their licensing requirements for vessels fishing the common stocks of fish within [PNA waters]…". The only provision that specifically applies to foreign purse seine vessels is in Article 4(a): "In order to monitor compliance with the catch retention and FAD closure requirements, all foreign purse seine vessels shall carry at all times an observer from either the national observer programme of a Party or an existing sub-regional observer programme".
[1053] Nauru Agreement Third Implementing Arrangement Article I para 1.
[1054] Nauru Agreement Third Implementing Arrangement Article I para 2.
[1055] Nauru Agreement Third Implementing Arrangement Article I para 2A.
[1056] Nauru Agreement Third Implementing Arrangement Article I para 3 closes two high seas pockets to an vessel for the period of validity of its licence.
[1057] Nauru Agreement Third Implementing Arrangement Article I para 4.
[1058] Nauru Agreement Third Implementing Arrangement Article I para 5.
[1059] Nauru Agreement Third Implementing Arrangement Article I para 6. Paragraph 6(2) provides an exemption for Kiribati-flagged purse seine vessels in certain high sea areas.

As noted above[1060], Article IX of the Nauru Agreement appears to allow for additional implementing arrangements and does not limit their scope to the extent that it would preclude the establishment of a RBM scheme.

Property rights analysis

Scores against the property rights criteria for the Nauru Agreement is summarised in Table 4.2 below and in detailed in the Annex, Table A.1. They are silent on most questions and as such provide little basis for an RBM scheme at a subregional scale. Article IX of the Nauru Agreement appears to provide the possibility of RBM but the language of the Agreement gives no hint that this was contemplated by the Parties. The subregional scale of the Agreement means that any scheme established by the PNA would fall short of applying to stocks across their full geographic range but could apply to all gear types (*limited* score = 6).

The Nauru Agreement, and by extension, its implementing arrangements, are binding on the PNA but there is little in the Agreement that would bind the Parties to an RBM scheme. Minimum licence conditions relating to accountability would support the security of any prospective rights-based instrument adopted by the Parties at any scale but this is outside the scope of the analysis (*secure* score = 5).

The only provision relating to transferability is a prohibition on the transfer of foreign fishing vessel licences[1061], which therefore applies to a portion of vessels at the individual user scale. However, it is not clear that an allocation of effort or catch rights established under another mechanism would be attached to a licence. No provisions refer to transferable allocations between Parties (*transferable* score = 4). It is virtually silent on *exclusivity* (score = 4) and *flexibility* (score = 5).

One of the few questions in the analytical framework to be directly addressed is a prohibition on discards by purse seine vessels. The Third Implementing Arrangement requires catches by the purse seine vessels in PNA waters to be retained but does not specify that retained catches are to be recorded against catch limits (*limited* score – 2). More broadly, harmonised licence conditions would certainly assist the implementation of a sub-regional scale RBM scheme but the scheme itself would not be able to be established under the Nauru Agreement.

In summary, the Nauru Agreement scored a total of 24 out of a possible top score of 72. The Third Implementing Arrangement is scored at just 2 due to a prohibition on discards of SKJ, BET and YFT[1062], with scores of zero for all criteria except *limited.*

[1060] See footnotes 1046 and 1047 above.
[1061] Nauru Agreement First Implementing Arrangement Article II(1)(f).
[1062] Nauru Agreement Third Implementing Arrangement Article I(1): "All bigeye, skipjack and yellowfin tuna taken by a purse seine vessel shall be retained on board and then landed or transhipped, except for:…".

Table 4.2: Nauru Agreement assessment against property rights criteria

Criterion	Question	Score	Ref
Limited	set a hard subregional scale catch or effort limit?	1	Art. IX
	base limits on the best scientific evidence available?	1	
	base limits on the precautionary approach?	1	
	apply limits to the full geographic range of the stock?	0	Art. II
	ensure limits account for catches of the limited species by all gear types?	2	Art. II(c)
	power to record bycatch of other target species against limits for that species?	1	
	Subtotal	**6**	
Exclusive	allocate national scale limits as a share of the regional TAC/TAE?	1	
	new entrants either excluded or able to participate without adding to TAC/TAE?	1	Art. X(4)
	prohibit exemptions to the limit (or exemptions not provided for)?	1	
	to impose penalties for exceeding national limits?	1	
	Subtotal	**4**	
Secure	national limits valid for more than one year?	1	
	national limits valid until Parties agree to amend them? (default = perpetuity)	1	
	make national limits binding on Parties?	2	
	resolve disputes through recourse to an independent arbiter	0	
	establish a record of national scale limits (e.g. in a regional register or CMM)?	1	
	Subtotal	**5**	
Transferable	permit national limits to be transferred to another Party in full or in part?	1	
	require new entrants to acquire an allocation through a transfer from a CCM?	1	
	specify a process for effecting a transfer?	1	
	record transfers in a register?	1	
	Subtotal	**4**	
Flexible	set a TRP for the target stock(s)?	1	
	establish harvest control rules for the target stock(s)?	1	
	adjust a TAC/TAE on the basis of environmental factors and stock assessments?	1	
	define national limits as a proportional (rather than volumetric) share of the regional TAC/TAE?	1	
	establish clear processes for a TAC/TAE to be adjusted?	1	
	Subtotal	**5**	
TOTAL		**24**	

4.3 The Palau Arrangement for the Management of the Western Pacific Fishery

4.3.1 Palau Arrangement

The *Palau Arrangement for the Management of the Western Pacific Fishery* (the Palau Arrangement) was agreed by the PNA on 2 October 1992[1063] and entered into force on 1 November 1995. It has been amended twice, in 1994 and 2010. The Palau Arrangement notes the existence of the three "implementing arrangements" to the Nauru Agreement[1064], which are explicitly linked to, inter alia, Article IX of the Nauru Agreement and which must be lodged with the depositary of the Nauru Agreement (FFA Secretariat). The Palau Arrangement does not contain an explicit reference to Article IX of the Nauru Agreement and its depositary is the Government of Solomon Islands. It therefore does not appear to be an "arrangement" as envisaged under Article IX of the Nauru Agreement.

There are no explicit objectives in the Palau Arrangement but the Preamble notes the Parties' regard for the objectives of the FFA Convention[1065] and the Nauru Agreement, and "in particular the promotion of regional cooperation and coordination of fisheries policies and the need for implementation of these objectives through regional and sub-regional arrangements". The Parties also recognise the importance of addressing ecological, biological and social[1066] objectives, and of ecologically sound practices to ensure conservation and optimum utilisation of fish stocks[1067].

The provisions of the Palau Arrangement apply to the "Fisheries Management Area", defined as the EEZs of the Parties, "including adjacent high seas areas in the Western Pacific within which fishing vessels operate"[1068]. The extent of the "adjacent high seas" is unclear.

[1063] PNA (2010). Palau Arrangement for the Management of the Western Pacific Fishery, Agreed on 2 October 1992. Entered into force on 1 November 1995. Amended on 27-29 April 1994 and 11 September 2010, Office of the Parties to the Nauru Agreement.
[1064] Palau Arrangement (as amended in 2010) Article 3.2(d).
[1065] FFA (1979). South Pacific Forum Fisheries Agency Convention (FFA Convention). Opened for signature 10 July 1979 at Honiara. Entered into force 9 August 1979. Honiara, Pacific islands Forum Fisheries Agency.
[1066] Palau Arrangement Preamble: "MINDFUL of the *dependence of countries of the Pacific* upon the rational development and utilization of the living marine resources and the continued abundance of these resources" (emphasis added).
[1067] Palau Arrangement Preamble: "RECOGNISING that in order to ensure sustained conservation of living marine resources both within and beyond the exclusive economic zone, fisheries management regimes must effectively maintain the ecological relationship between dependent and associated populations, prevent any decrease in the size of harvested populations below those necessary to ensure their stable recruitment, and avoid adverse impacts upon the marine environment and further recognising that in order to ensure conservation and promote optimum utilisation of the living resources fishing must be carried out only on the basis of ecologically sound practices, effectively monitored and enforced;"
[1068] Palau Arrangement Article 1.1(d): ""Fisheries Management Area" (hereinafter referred to as "the Area") means the exclusive economic zones or fisheries zones of the Parties hereto including adjacent high seas areas in the Western Pacific within which fishing vessels operate."

As amended, the Palau Arrangement's application extends beyond its original focus on purse seine vessels, to all fishing vessels operating in the Fisheries Management Area and to all tuna and tuna like species and incidental bycatch taken by fishing vessels in the Fisheries Management Area[1069].

The Palau Arrangement itself does not establish any management instruments but provides for the consideration by management meetings of "management measures", most notably the implementation of "Management Schemes"[1070]. These measures could include rights-based instruments but the Palau Arrangement provides little guidance on the characteristics or quality of those instruments. Other instruments envisaged include spatial and temporal closures[1071] and measures for the regulation of fishing effort[1072], although these examples are not intended to limit the measures available to the PNA[1073]. The Parties therefore have wide ranging powers to adopt measures for the management of stocks in the Fisheries Management Area. Two management schemes have been established and are assessed in subsections 4.3.2 and 4.3.3 respectively.

Property right analysis

The scores for the assessment of the Palau Arrangement against the property rights criteria are summarised in Table 4.3 below and detailed in the Annex, Table A.2.

The maximum potential extent of the Management Area being limited to the EEZs of FFA members and the vague notion of the adjacent high seas falls short of the full geographic extent of the stocks of the highly migratory species of the WCPO. The Parties' authority to adopt measures for the adjacent high seas is also limited by the extent to which coastal States may bind fishing States that are not Parties (*limited* score = 6).

The Palau Arrangement includes the clear intention that decisions made by the Parties in a "Management Meeting"[1074] are to be binding upon them[1075]. It is, paradoxically, a non-binding head agreement under which the Parties may agree to binding conservation and management measures, including "Management Schemes" under Article 3.2(b)(ii) that may apply to any vessel targeting tuna

[1069] Palau Arrangement Article 2.1.
[1070] Palau Arrangement Article 3.2: "The functions of the Management Meeting are –…(b) "to consider management measures, which may include, but are not limited to - …(ii) the implementation and operation of Management Schemes, and the review and amendment of those Management Schemes as appropriate".
[1071] Palau Arrangement Article 3.2(b)(iii): "the establishment of closed areas and closed seasons".
[1072] Palau Arrangement Article 3.2(b)(i): "the regulation of fishing effort by fishing vessels which have good standing on the Vessel Register". The Vessel Register is that maintained by the FFA (Article 1.1(l)).
[1073] Palau Arrangement Article 3.2(b)(iv) allows for consideration of "any other management measure deemed necessary from time to time".
[1074] Palau Arrangement Article 3.1: "The Parties to this Arrangement will have a management meeting at least once a year for the purpose of reviewing the current status of tuna stocks and to establish necessary measures for their management and conservation. The Parties may hold other management meetings as may be necessary."
[1075] Palau Arrangement Article 4: "The decisions of the Management Meeting will be arrived at by consensus and will be binding on the Parties."

and tuna like species in the EEZs of the Parties. The Palau Arrangement provides little other support for secure rights (*secure* score = 5).

The Palau Arrangement is similarly silent on elements relating to exclusivity (*exclusive* score = 4). Any catch or effort limit imposed on the Management Area would need to be proportionate to the share of the entire geographic range of the target stock accounted for by the Parties' EEZs. In this way additional EEZs could be added without undermining biological sustainability. It neither provides for, nor precludes, transferability of any instrument established under it (*transferable* score = 4).

The powers of the Parties to establish any management measures deemed necessary do not preclude the establishment of *flexible* RBM instruments. But again, the Palau Arrangement provides no guidance on the shape of these measures (score = 5). The Palau Arrangement is therefore assessed as scoring 24 out of a possible total of 72 – identical to the Nauru Agreement.

Table 4.3: Palau Arrangement assessment against property rights criteria

Criterion	Question	Score	Ref
Limited	set a subregional scale catch or effort limit?	1	Art3.2(b)(i)(ii)(iv)
	base limits on the best scientific evidence available?	1	Art3.2(a)
	base limits on the precautionary approach?	1	Art3.2(a)
	apply limits to the full geographic range of the stock?	0	Art1.1(d), 2.1
	ensure limits account for catches of the limited species by all gear types?	2	Art2.1
	power to record bycatch of the target species against limits for that species?	1	Art3.2(b)(i)(ii)(iv)
	Subtotal	**6**	
Exclusive	allocate national scale limits as a share of the regional TAC/TAE?	1	Art3.2(b)(i)(ii)(iv)
	new entrants either excluded or able to participate without adding to TAC/TAE?	1	Art3.2(b)(i)(ii)(iv)
	prohibit exemptions to the limit (or exemptions not provided for)?	1	Art3.2(b)(i)(ii)(iv)
	to impose penalties for exceeding national limits?	1	Art3.2(b)(i)(ii)(iv)
	Subtotal	**4**	
Secure	national limits valid for more than one year?	1	Art3.2(b)(i)(ii)(iv)
	national limits valid until Parties agree to amend them? (default = perpetuity)	1	Art3.2(b)(i)(ii)(iv)
	make national limits binding on Parties?	2	Art4
	resolve disputes beyond bilateral negotiation	0	Art8
	establish a record of national scale limits (e.g. in a regional register or CMM)?	1	Art3.2(b)(i)(ii)(iv)
	Subtotal	**5**	
Transferable	transfer a national limit in full or in part to another CCM?	1	Art3.2(b)(i)(ii)(iv)
	require new entrants to acquire an allocation through a transfer from a CCM?	1	Art3.2(b)(i)(ii)(iv)
	specify a process for effecting a transfer?	1	Art3.2(b)(i)(ii)(iv)
	record transfers in a register?	1	Art3.2(b)(i)(ii)(iv)
	Subtotal	**4**	
Flexible	set a TRP the target stock(s)?	1	Art3.2(b)(i)(ii)(iv)
	establish harvest control rules for the target stock(s)?	1	Art3.2(b)(i)(ii)(iv)
	adjust a TAC/TAE on the basis of environmental factors and stock assessments?	1	Art3.1, 3.2(a)(b)(i)(ii)(iv)
	define national limits as a proportional (rather than volumetric) share of the regional TAC/TAE?	1	Art3.2(b)(i)(ii)(iv)
	establish clear processes for a TAC/TAE to be adjusted?	1	Art3.2(b)(i)(ii)(iv)
	Subtotal	**5**	
TOTAL		**24**	

4.3.2 Purse seine vessel day scheme

This Management Scheme under the Palau Arrangement establishes a purse seine VDS, an effort-based control on vessels operating within the waters of participating coastal States and territories. Its objective is to "to support collaboration between Parties to enable them to maximize their net economic returns from the sustainable use of tuna resources by purse seine vessels"[1076] by "seek[ing] to limit the level of fishing by purse seine vessels in their EEZs to the levels of total allowable effort agreed by the Parties to the Palau Arrangement"[1077].

The Parties to the Palau Arrangement are to meet annually to, inter alia, determine the TAE to be applied under the Scheme[1078] and any high seas controls to which fishing parties operating under the VDS are to be subject[1079]. Under the VDS, effort is defined in terms of fishing days[1080] adjusted for vessel length[1081]. Each Party is allocated a Party Allowable Effort (PAE) and must "take all necessary measures" to ensure that vessels operating in its EEZ or in the EEZs of other Parties under the FSM Arrangement (see section 4.4 below) do not exceed it[1082].

Property rights criteria

The purse seine VDS is assessed against each property rights criterion below. The scores are summarised in Table 4.4 below and in detail in the Annex, Table A.3.

[1076] PNA (2016). Palau Arrangement for the Management of the Western Pacific Fishery - Management Scheme (Purse Seine Vessel Day Scheme). Signed 2 October 1992. Entered into force 1 November 1995. Amended April 2016 & October 2016, Office of the Parties to the Nauru Agreement. Article 2.1: "This Management Scheme is made pursuant to the Palau Arrangement. The objective of this Management Scheme is to support collaboration between Parties to enable them to maximize their net economic returns from the sustainable use of tuna resources by purse seine vessels".
[1077] Ibid. Article 2.2: "Through this Management Scheme, the Parties shall seek to limit the level of fishing by purse seine vessels in their EEZs to the levels of total allowable effort agreed by the Parties to the Palau Arrangement."
[1078] Ibid. Article 2.4: "The annual meeting of the Parties to the Palau Arrangement will consider matters relating to the administration of this Management Scheme. In particular, but without limiting the matters the meeting can consider, it will be a function of the annual meeting to…(iv) Set the TAE in accordance with the provisions of this Management Scheme".
[1079] Ibid. Article 2.4(vi): "Determine controls on high seas fishing to be applied to fishing parties operating under this Management Scheme or other arrangements, treaties or agreements".
[1080] Ibid. Article 1.1(iv): "Fishing day means any calendar day, or part of a calendar day, during which a purse seine vessel is in the EEZ of a Party outside of a port, but does not include a calendar day, or part of a calendar day, referred to in Article 6". Non-fishing days are defined in Schedule two to the Management Scheme.
[1081] Ibid. Article 5" The following provisions shall govern the calculation of a Party's use of its PAE or Adjusted PAE during a Management Year, and shall be applied by the Administrator:… (iv) Every fishing day by a purse seine vessel with a length overall of less than 50 metres shall equate to a deduction of one half of a fishing day. (v) Every fishing day by a purse seine vessel with a length overall of between 50 metres and 80 metres shall equate to a deduction of one fishing day. (vi) Every fishing day by a purse seine vessel with a length overall in excess of 80 metres shall equate to a deduction of one and one half fishing days".
[1082] Ibid. Article 4.1: "Each Party shall take all necessary measures to ensure that the total number of fishing days: i) by purse seine vessels in its EEZ, excluding vessels operating under the PAE of their home Parties in accordance with Article 3.2; and ii) by its FSM Arrangement vessels operating in the EEZs of other Parties in accordance with Article 3.2 does not exceed that Party's PAE or Adjusted PAE in any Management Year".

The purse seine VDS scores well across all criteria compared to the Palau Arrangement. It sets a hard limit that is allocated annually across all Participants in reasonably *secure* (score = 10), *exclusive* (score = 10) and *transferable* (score = 10) volumetric shares at the national scale. Once allocated, a PAE is held by the Party for the Management Year and there do not appear to be any provisions allowing discretionary changes to it[1083].

A central weakness is the limited geographic scope of the scheme. Potential leakage of effort to the high seas by non-VDS vessels is significant. Following the removal of a previous ban on fishing in the Eastern High Seas pocket by vessels licensed by the PNA, effort there increased by approximately 3000-4000 fishing days, accounting for up to 10% of the TAE[1084]. The *limited* criterion is also undermined by the lack of explicit reliance on the best available scientific evidence and the precautionary approach (*limited* score = 7). Similarly, the focus on purse seine gear does not allow for mortality of target species by other gear types.

Other weaknesses are concentrated in process elements of the criteria. For example, while new entrants are permitted there is no clear process for their treatment. Intuitively, if new coastal State Parties were to join the VDS, the TAE would increase by a value reflecting the stocks in the additional EEZ. In this sense it does not add to the total amount of purse seine effort that would have been applied in the newly expanded area but simply brings the additional area under the VDS. This proposition has been borne out by the addition of Tokelau as a non-Party Participant in the purse seine VDS. Tokelau was allocated its own TAE (as opposed to a PAE) of 972 fishing days in 2018, and provisionally for 2019 and 2020, in addition to the TAE for the PNA[1085]. Tokelau's allocation is adjusted proportionately to any changes in the TAE[1086].

It is conceivable, therefore, that in practice all PAEs remain constant as a share of the TAE and that they move according to adjustments to the TAE but this is not explicit in the VDS. While effort creep is presumably one factor that could lead to an adjustment in TAE, the Management Scheme also expressly allows for separate measures to be adopted by the Parties to address this[1087].

[1083] The Purse Seine VDS permits adjustments to a PAE during a Management Year, however, these appear to be predictable and non-discretionary. For example: overages are to be addressed by bringing forward fishing days from the following year's PAE (Article 10.3); and Parties are permitted to transfer PAE to another Party (Article 7). Actions under Article 7 and 10 result in an "Adjusted PAE", as defined in Article 1.1(ii): "*Adjusted PAE*, in relation to a Party, means that Party's PAE as adjusted pursuant to Article 7 or 10." Ibid.

[1084] PNA (2017). Purse Seine VDS TAE for 2018-2020. Majuro, 5-7 April 2017, Office of the Parties to the Nauru Agreement. **PA22/WP.4; VDS-T&SC6/WP.1**. para 12.

[1085] Ibid. para 21 and Table 2.

[1086] Ibid. para 22.

[1087] PNA (2016). Palau Arrangement for the Management of the Western Pacific Fishery - Management Scheme (Purse Seine Vessel Day Scheme). Signed 2 October 1992. Entered into force 1 November 1995. Amended April 2016 & October 2016, Office of the Parties to the Nauru Agreement.Article 2.4: "The annual meeting of the Parties to the Palau Arrangement will consider matters relating to the administration of this Management Scheme. In particular, but without limiting the matters the meeting can consider, it will be a function of the

Processes to permit flexibility are also comparatively weak. No provisions are made for harvest strategies so any adjustments to the TAE are assumed to be determined by negotiations between the Parties. Parties may bring forward fishing days from the following year's PAE, although a penalty is applied if the number of excess days is 100 or greater[1088]. These provisions could be used by a Party to take advantage of abundant stocks in its EEZ in the current year.

As suggested in Chapter Three, equity considerations could be addressed in the allocation process. However, the process for allocating the TAE among Participants is not public and therefore difficult to assess.

It is worth noting the effect of the VDS at the individual user scale. The VDS does not specify whether the PAE must be assigned by Parties and Participants as exclusive allocations at the individual user scale. Parties are required to ensure purse seine vessels in their EEZ and vessels flying their flag comply with the VDS[1089]. However, such compliance does not necessarily mean the VDS is replicated at the individual user scale. In the typical case of vessels within a Party's EEZ, there are no provisions suggesting that the number of licensed vessels should be limited or that they must be allocated shares of the PAE. Some aspects of the language of the Management Scheme could be interpreted as presuming that licensed vessels report vessel days used until the PAE is reached[1090] – arguably an Olympic fishery – rather than fishing against an exclusive share of the PAE that was allocated before fishing activity occurred. Article 8.5, on the other hand, implies that the Parties may expect to allocate fishing days to licensed vessels[1091].

Clearer provisions are made for an FSM Arrangement vessel fishing outside its home Party's EEZ. Such vessels must cease fishing outside their home Party's EEZ when they reach the number of fishing

annual meeting to:…(ii) Receive a briefing from the Administrator on catch and effort levels and any observed or potential increase in average effective fishing effort for each fishing day since the introduction of the Management Scheme (effort creep): a. In respect of any observed effort creep the Parties shall take the necessary management action to ensure such effort creep is not detrimental to the fishery. b. Options for management action by the Parties shall include controls on vessel length, vessel capacity, well size, the use of fish aggregating devices or any other necessary measure."

[1088] Ibid. Article 10.3: "If a Party exceeds its PAE for a Management Year, that Party's PAE for the following Management Year shall be adjusted by deducting: (i) If the excess is less than 100 days – the amount of the excess; (ii) If the excess is 100 days or more – 120% of the excess".

[1089] Ibid. Article 10.1: "Each Party shall take all necessary measures to ensure that every purse seine vessel that is licensed to fish in its EEZ, every purse seine for which it is the home Party under the FSM Arrangement and every purse seine vessel that is entitled to fly its flag, comply with the requirements of this Management Scheme".

[1090] For example, ibid. Article 8.2 sets out how the Management Scheme addresses situations in which the number of vessel days used under a Party's PAE reaches 80% of its PAE. If the PAE had been allocated at the beginning of the Management Year, such contingencies would not be required.

[1091] Ibid. Article 8.5: "Parties shall notify the Administrator of any licence issued to a vessel under the VDS Register, including the duration of the license, days allocated to each vessel or fleet and restrictions imposed thereunder."

days allocated to it by its home Party[1092]. This appears to be the only clear, exclusive individual user scale limit envisaged by the Management Scheme. However, once the vessel returns to its home Party EEZ, it would appear to be subject to whatever arrangement the home Party has adopted.

The adoption of fishing days as the basis for the TAE and PAE nevertheless provides a basis for a Party or Participant to allocate exclusive portions of its PAE to all purse seine vessels that it licenses. Further, the Management Scheme provides for the Parties to agree on fees to be levied upon "vessels registered to operate under" the VDS and a "scheme for the administration of such fees"[1093], and the establishment of a "scheme for standardising fees for the sale of vessel days"[1094]. The Parties' practice has been to set a benchmark fee for a fishing day through a memorandum of understanding. Most recently the Parties set a non-negotiable minimum benchmark fee of US$8000 per fishing day for foreign fishing vessels, commencing in 2015[1095]. The sale of fishing days to vessels is, in effect, a method of allocating fishing days as exclusive rights. However, no similar benchmark price applies to domestic vessels under the VDS and Parties must be assumed to be free to adopt whatever arrangement they wish.

At the individual user scale, eligible purse seine vessels are registered for a single Management Year[1096], suggesting that each vessel must reapply each year for registration. This one-year duration effectively flows through to vessel licences as a licensed vessel may only fish in the VDS Management Area if it is registered in the VDS Register[1097]. However, there is no requirement in the VDS that a Party must issue a licence to a vessel that is on the VDS Register or allocate vessel days to it.

The purse seine VDS scored 42 out of a total of 72 points.

[1092] Such vessels are to be allocated fishing days from within their home Party's PAE in accordance with ibid. Article 3.2. The requirement to cease fishing outside its home Party's EEZ is in Article 3.3.
[1093] Ibid. Article 14.1: "The Parties to the Palau Arrangement may, at any meeting, agree upon or vary any fees to be charged by vessels registered to operate under this Management Scheme and the scheme for administration of any such fees".
[1094] Ibid. Article 14.2: "The Parties to the Palau Arrangement may, at any meeting, agree upon a scheme for standardising fees for the sale of vessel days."
[1095] PNA (2014). Memorandum of Understanding on Minimum Benchmark Fee for a Fishing Day under the Vessel Day Scheme. Meeting of the Parties to the Palau Arrangement, Majuro, Republic of Marshall Islands, 13 June 2014, Office of the Parties to the Nauru Arrangement.
[1096] PNA (2016). Palau Arrangement for the Management of the Western Pacific Fishery - Management Scheme (Purse Seine Vessel Day Scheme). Signed 2 October 1992. Entered into force 1 November 1995. Amended April 2016 & October 2016, Office of the Parties to the Nauru Agreement. Article 1.1(xiv): "VDS Register Registration Period means the registration period from 1 January to 31 December"; and 8.6: "Subject to Article 8.7, the registration of a purse seine vessel on the VDS Register shall remain in effect until the end of the VDS Register registration period".
[1097] Ibid. Article 8.2: "A purse seine vessel must be registered on the VDS Register in order to undertake fishing activities pursuant to this Management Scheme. Each Party shall ensure that every licence of a purse seine vessel includes a condition that no fishing activity may be undertaken pursuant to the licence during any period when the vessel is not registered on the VDS Register".

Table 4.4: Purse seine Vessel Day Scheme

Criterion	Question	Score	Ref
Limited	set a subregional scale catch or effort limit?	3	Art.2.4(iv)
	base limits on the best scientific evidence available?	2	Art.12.2(i)
	base limits on the precautionary approach?	1	
	apply limits to the full geographic range of the stock?	0	Art.1.1(xv), 2.4(vi), 4.1
	ensure limits account for catches of the limited species by all gear types?	0	Art.2.1, 2.2, 3.1
	power to record bycatch of the target species against limits for that species?	1	Art.9.2
	Subtotal	**7**	
Exclusive	allocate national scale limits as a share of the regional TAC/TAE?	3	Art.12.3
	new entrants either excluded or able to participate without adding to TAC/TAE?	1	
	prohibit exemptions to the limit (or exemptions not provided for)?	3	Art.12.3
	to impose penalties for exceeding national limits?	3	Art.4, 8, 10
	Subtotal	**10**	
Secure	national limits valid for more than one year?	1	Art.12.4
	national limits valid until Parties agree to amend them? (default = perpetuity)	3	Art.12.4
	make national limits binding on Parties?	3	Art.4.1, 10
	resolve disputes beyond bilateral negotiation	0	
	establish a record of national scale limits (e.g. in a regional register or CMM)?	3	Art.1.1(xi)
	Subtotal	**10**	
Transferable	transfer a national limit in full or in part to another CCM?	3	Art.7.1
	require new entrants to acquire an allocation through a transfer from a CCM?	1	Art.11.5
	specify a process for effecting a transfer?	3	Art.7.2
	record transfers in a register?	3	Art.7.3
	Subtotal	**10**	
Flexible	set a TRP the target stock(s)?	1	Art.12.2
	establish harvest control rules for the target stock(s)?	1	
	adjust a TAC/TAE on the basis of environmental factors and stock assessments?	2	Art.12.2
	define national limits as a proportional (rather than volumetric) share of the regional TAC/TAE?	0	Art.1.1(xi)
	establish clear processes for a TAC/TAE to be adjusted?	1	Art.12.2
	Subtotal	**5**	
TOTAL		**42**	

4.3.3 Longline Vessel Day Scheme

This Management Scheme establishes the Longline VDS under the Palau Arrangement[1098]. There are many similarities between the longline and purse seine vessel days schemes. However, they do differ on some aspects and these are worth highlighting.

The Longline VDS Management Scheme aims to "enhance the management of longline fishing vessel effort in the waters of the Parties"[1099] in order to achieve several objectives relating to conservation and optimal utilisation[1100], economic returns[1101], local industry development[1102], equitable participation[1103], greater control of the tropical longline fishery[1104], data collection and monitoring[1105], compliance[1106] and collaboration between the Parties[1107]. These objectives do not include one that directly addresses ecological objectives beyond the "optimal utilisation" of tuna resources. One objective explicitly addresses equity[1108], although this is couched in terms of equity vis a vis non-Parties rather than equity between Parties.

The longline VDS applies to all licensed longline vessels, except artisanal vessels[1109], operating in the waters of the Parties[1110]. Although the Management Scheme contains no definition of "the waters of the Parties", it is suggested that, consistent with the definition of the "Fisheries Management Area" in the Palau Arrangement, it comprises the EEZs of the Parties but not adjacent high seas areas[1111], or the territorial seas, archipelagic seas and internal waters of the Parties[1112]. Like the purse seine VDS, the

[1098] PNA (2016). Palau Arrangement for the Management of the Western Pacific Fishery as amended - Management Scheme (Longline Vessel Day Scheme) as amended October 2016. PNA, Office of the Parties to the Nauru Agreement.
[1099] Ibid. Article 2.1: "This Management Scheme is made pursuant to the Palau Arrangement for the management of longline fishing effort of the Western and Central Pacific. The objective of this Management Scheme is to enhance the management of longline fishing vessel effort in the waters of the Parties by encouraging collaboration between all Parties, and:…".
[1100] Ibid. Article 2.1(i): "promote optimal utilization, conservation and management of tuna resources".
[1101] Ibid. Article 2.1(ii): "maximize economic returns, employment generation and export earnings from sustainable harvesting of tuna resources".
[1102] Ibid. Article 2.1(iii): "support the development of domestic locally based longline fishing industries".
[1103] Ibid. Article 2.1(iv): "secure an equitable share of fishing opportunities and equitable participation in the tropical longline fisheries for the Parties".
[1104] Ibid. Article 2.1(v): "increase control of the tropical longline fishery for the Parties".
[1105] Ibid. Article 2.1(vi): "enhance data collection and monitoring of the fishery".
[1106] Ibid. Article 2.1(vii): "promote effective and efficient administration, management and compliance".
[1107] Ibid. Article 2.1(viii): "encourage collaboration between the Parties".
[1108] Ibid. Article 1(iv): "secure an equitable share of fishing opportunities and equitable participation in the tropical longline fisheries for the Parties".
[1109] Ibid. Article 3: "The scheme shall not apply to artisanal vessels"; Artisanal vessels are defined in Article 1.1(iii).
[1110] Ibid. Article 2.1: "…The objective of this Management Scheme is to enhance the management of longline fishing vessel effort in the waters of the Parties…"
[1111] Ibid. Article 2.5(vi) provides for the Parties to consider controls on high seas fishing by vessels operating under the VDS or other arrangements, treaties or agreements.
[1112] PNA (2010). Palau Arrangement for the Management of the Western Pacific Fishery, Agreed on 2 October 1992. Entered into force on 1 November 1995. Amended on 27-29 April 1994 and 11 September 2010, Office

longline VDS Management Scheme is an effort-based scheme and does not specify the species targeted or caught as bycatch by such vessels. It seems reasonable to conclude that it applies to all species caught by longline vessels in the waters of the Parties.

The longline VDS is structured similarly to the purse seine VDS. The main instrument for achieving the objectives of the longline VDS is a limit on the number of fishing days permitted to be used by longline vessels[1113] – total allowable effort (TAE)[1114] – as agreed for each Management Year by the Parties[1115]. The TAE is applied to the subregional scale and is allocated at the national scale to the Parties as Party Allowable Effort (PAE)[1116].

The Management Scheme assumes that licences will be issued to eligible longline vessels[1117] but does not itself directly provide for licensing of vessels. Instead, the Management Scheme establishes a Longline VDS Register[1118] and requires that all vessels that "undertake fishing activities" under the longline VDS to be registered[1119]. Article 7.2 stipulates that all licences issued to longline vessels must include a condition prohibiting fishing activity[1120] by the vessel under the licence if it is not registered on the Longline VDS Register[1121]. Vessel days under the TAE are only available to *licensed* longline

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of the Parties to the Nauru Agreement. Article 1.1(d) defines the Fisheries Management Area as "the exclusive economic zones of the Parties hereto including adjacent high seas areas in the Western Pacific within which fishing vessels operate" and therefore does not include their territorial seas, archipelagic seas or internal waters. As the Longline VDS applies to the "waters of the Parties", the area of its application would not include adjacent high seas areas, consistent with LOSC Article 89.

[1113] PNA (2016). Palau Arrangement for the Management of the Western Pacific Fishery as amended - Management Scheme (Longline Vessel Day Scheme) as amended October 2016. PNA, Office of the Parties to the Nauru Agreement. Article 2.2: "Through this Management Scheme, the Parties shall seek to limit the level of fishing by longline vessels in their waters to the levels of total allowable effort agreed by the Parties to the Palau Arrangement".

[1114] Ibid. Article 1.1(xi) defines TAE as "the maximum number of fishing days by all licensed longline vessels in the waters of the Parties to the Palau Arrangement in any Management Year".

[1115] Ibid. Article 2.5: "The annual meeting of the Parties to the Palau Arrangement will…(iv): Set the TAE in accordance with the provisions of this Management Scheme".

[1116] Ibid. Article 1.1(x) defines the PAE as "…the total number of fishing days for a Management Year allocated to that Party and presented to the Parties each year"; Article 11.3: "The TAE shall be allocated amongst the Parties as their Party Allowable Effort (PAE) in the manner agreed to by Parties".

[1117] See for example, the definition of the TAE in ibid. Article 1.1(xi) (see footnote 1114 above), which refers to "fishing days by all *licensed* longline vessels" (emphasis added), and is reiterated in Article 11.1: "Subject to article 3, the TAE is the maximum number of fishing days undertaken by all licensed longline vessels in all waters of the Parties to the Palau Arrangement in any Management Year".

[1118] Defined in ibid. Article 1.1(xii) as "…the register established and maintained pursuant to Article 7", and established by Article 7.1: "The Administrator shall establish and maintain a Longline VDS Register under the Palau Arrangement Longline Fishery Vessel Day Scheme (the Longline VDS Register)".

[1119] Ibid. Article 7.2: "A longline vessel must be registered on the Longline VDS Register in order to undertake fishing activities pursuant to this Management Scheme. Each Party shall ensure that every licence of a longline vessel includes a condition that no fishing activity may be undertaken pursuant to the licence during any period when the vessel is not registered on the Longline VDS Register".

[1120] "Fishing activities" is defined in ibid. Article 1.1(v).

[1121] An exception to this is contained in ibid. Article 7.3, which permits domestic vessels operating under an "alternative monitoring mechanism" established by the relevant Party are not required to be registered on the Longline VDS Register.

vessels[1122]. Further, Article 2.2 evinces an intention by the Parties that the Management Scheme applies to *all* longline vessels in their EEZs, by omitting the world "licensed" in its requirement that "the Parties...seek to limit the level of fishing by longline vessels in their waters to the…[TAE]". It can be concluded therefore that the Parties' intention is that all longline vessels, other than artisanal vessels, undertaking fishing activities in the waters of the Parties must operate under the longline VDS and all such vessels must be registered on the Longline VDS Register and hold a valid licence in order to do so[1123]. In the absence of an issuing authority under the Palau Arrangement or any other regional or subregional arrangement, such a licence must be issued at the national scale, and therefore by the relevant coastal State Party.

As with the purse seine VDS, the defining element of the Scheme is the fishing day. A fishing day is defined as "any calendar day, or part of a calendar day, during which a longline vessel is in the waters of a Party outside of a port"[1124] and is adjusted to account for vessel length[1125]. Unlike the purse seine VDS, the Management Scheme does not refer to non-fishing days.

While the VDS defines "fishing activities"[1126], it makes no explicit link between the definitions of a fishing day and fishing activities. There is little doubt that fishing activities as defined in the Management Scheme would be consistent with activities carried out on a fishing day. But a fishing day is defined more broadly than fishing activities, relying entirely on whether the vessel is in port, not on what activities it undertakes. Certainly, in cases where a vessel is not carrying out fishing activities it is not required to be registered[1127] (or licensed, following the argument in the preceding paragraph). Accordingly, unlicensed vessels transiting through the waters of the Parties do not contribute to the calculation of vessels days used.

[1122] Ibid. Article 1.1(xii). See footnote 1118 above.

[1123] One of the most ambiguous provisions of the Longline VDS is ibid. Article 7.3, which permits Parties to establish alternative monitoring mechanisms for domestic longline vessels. It is not clear what such mechanisms are an alternative to: "A Party may establish an alternative monitoring mechanism and ensure all fishing activities by its domestic longline vessels fishing in its exclusive economic zone under that monitoring mechanism are reported to PNA FIMS. Domestic longline vessels operating under such mechanism shall not be required to be on good standing on the FFA Vessel Register but must be registered on the Longline VDS Register." Article 7 relates to the Longline VDS Register but Article 7.3 clearly states that all domestic longline vessels that are subject to alternative monitoring mechanisms must be registered on the Longline VDS Register. It is unclear therefore what any alternative monitoring mechanism may be alternative to.

[1124] Ibid. Article 1.1(v): "*Fishing day* means any calendar day, or part of a calendar day, during which a longline vessel is in the waters of a Party outside of a port".

[1125] Ibid. Article 5.1(ii) equates a fishing day by a vessel of a length overall (defined by Article 1.1(vi)) of less than or equal to 40m to 0.8 of a standard fishing day, and in accordance with Article 5.1(iii) by vessels over 40m to 1.3 vessel days.

[1126] Defined in ibid. Article 1.1(iv).

[1127] This conclusion is drawn on the basis that, in accordance with ibid. Article 7.2, vessels must be registered in order to undertake fishing activities, the reverse also applies – that is, that vessels that are not undertaking fishing activities are not required to be registered (or licensed). See also Article 5.1(v): "…unlicensed vessels transiting the waters of the Parties shall not be included in the calculation or attribution of a fishing day".

Property rights analysis

The longline VDS is assessed against each property rights criterion below. Scores are summarised in Table 4.5 below and in detail in the Annex, Table A.4.

The longline VDS establishes a similarly strong RBM scheme compared to the purse seine VDS (overall score = 42), with same attendant weaknesses. It scored slightly stronger on the *security* criterion due to the explicit provisions allowing for the TAE to be set for up to three years (score = 11) and slightly weaker on *exclusivity* (score = 9).

As with the purse seine VDS, there is no guarantee in the Management Scheme that fishing days are exclusive at the individual user scale. While vessels appear to be required to hold a licence to operate under the longline VDS, there is no clear requirement in the Management Scheme that the number of licences issued must be limited, or that fishing days be allocated to licence holders. This allows a Party to license as many vessels as there are registered on the Longline VDS Register and those vessels may then fish as much as they can until the PAE for all vessels in the Party's waters is met – effectively an Olympic fishery.

The main provisions relating to vessels relate to registration. If a vessel meets the requirements for registration[1128], the Administrator must register it[1129]. However, registration does not oblige a Party to issue a licence and so does not guarantee that the vessel may fish in the waters of a Party.

The Management Scheme appears to provide wide discretion to Parties to the request the deletion of a vessel from the Longline VDS Register. Article 7.7 sets out three situations in which the Administrator must delete the vessel from the Register[1130]. However, Article 7.8 then restricts this power in that vessels may only be deleted with the consent of all Parties. There also appears to be some tension between the apparent high level of discretion of the Parties to request a deletion on one hand, and the obligation in Article 7.4(iv) of the Administrator to register a vessel if, inter alia, "[t]he Administrator is satisfied that the vessel will be able to comply with the requirements of the Management Scheme"[1131] on the other.

[1128] These are contained in ibid. Article 7.4: "A longline vessel may only be registered on the Longline VDS Register if…".

[1129] Ibid. Article7.5: "The Administrator must register a longline vessel on the Longline VDS Register if the requirements of Article 7.4 have been satisfied in relation to that vessel. Upon a longline vessel becoming registered on the Longline VDS Register, the Administrator must notify the vessel owner and the relevant Party of that fact, and of the commencement date of the registration. Subject to Article 7.7, the registration of a longline vessel on the Longline VDS Register shall remain in effect until the end of the Longline VDS Register registration period".

[1130] These are the same as for the Purse Seine VDS: In ibid. Article 7.7: (i) on the request of the owner; (ii) on the request of the a party; or (iii) if the Administrator is satisfied that the vessel has failed to comply with Management Scheme.

[1131] Ibid. Article 7.4: "A longline vessel may only be registered on the Longline VDS Register if…(iv) the Administrator is satisfied that the vessel will be able to comply with the requirements of this Management Scheme."

The further requirement in Article 7.8 that vessels that have been deleted must meet the requirements of Article 7.4 to be re-registered suggests that compliance with 7.4 qualifies any discretion that Parties might have to request a deletion in Article 7.7(ii). In summary, compliant vessels are likely to be assured of registration but this does not provide an automatic right to fish in the waters of the Parties.

Vessel registration is valid for the duration of the VDS Register Registration Period[1132], which is one calendar year[1133]. Implicitly, vessels must reapply for registration for each subsequent year. As licences are not established under the Management Scheme, no duration is specified, although the requirement that licences must include a condition that the vessel may only undertake fishing activities when registered on the Longline VDS Register[1134] effectively limits the ability of licensed vessels to fish for one year at a time. Similarly, no provisions are made for the allocation of fishing days to vessels so no duration is attached to a fishing day at the individual user scale.

[1132] Ibid. Article 7.5. See footnote 1129 above.
[1133] Ibid. Article 1.1(xiii): "*VDS Register Registration Period* means the period from 1 January to 31 December, or such alternative period as the Parties may agree".
[1134] Ibid. See footnotes 1118 and 1119 above.

Table 4.5: Assessment of the longline vessel day scheme

Criterion	Question	Score	Ref
Limited	set a subregional scale catch or effort limit?	3	Art.2.2, 2.5, 4
	base limits on the best scientific evidence available?	2	Art.11.2
	base limits on the precautionary approach?	1	Art.11.2
	apply limits to the full geographic range of the stock?	0	
	ensure limits account for catches of the limited species by all gear types?	0	Art.2.2
	power to record bycatch of the target species against limits for that species?	1	
	Subtotal	**7**	
Exclusive	allocate national scale limits as a share of the regional TAC/TAE?	3	Art.11.3
	new entrants either excluded or able to participate without adding to TAC/TAE?	1	
	prohibit exemptions to the limit (or exemptions not provided for)?	2	Art.3
	to impose penalties for exceeding national limits?	3	Art.9.3
	Subtotal	**9**	
Secure	national limits valid for more than one year?	2	Art.2.3
	national limits valid until Parties agree to amend them? (default = perpetuity)	3	Art.11.6
	make national limits binding on Parties?	3	Art. 11.1
	resolve disputes beyond bilateral negotiation	0	
	establish a record of national scale limits (e.g. in a regional register or CMM)?	3	Art.1.1(xi)
	Subtotal	**11**	
Transferable	transfer a national limit in full or in part to another CCM?	3	Art.6.1
	require new entrants to acquire an allocation through a transfer from a CCM?	1	
	specify a process for effecting a transfer?	3	Art.6.1
	record transfers in a register?	3	Art.9.4
	Subtotal	**10**	
Flexible	set a TRP the target stock(s)?	1	
	establish harvest control rules for the target stock(s)?	1	
	adjust a TAC/TAE on the basis of environmental factors and stock assessments?	2	Art.11.2
	define national limits as a proportional (rather than volumetric) share of the regional TAC/TAE?	0	Art.1.1(x)
	establish clear processes for a TAC/TAE to be adjusted?	1	Art11.2
	Subtotal	**5**	
TOTAL		**42**	

4.4 FSM Arrangement

The *Federated States of Micronesia Arrangement for Regional Fisheries Access*[1135] (FSM Arrangement) is a non-binding instrument agreed by the PNA in 1995 and amended in 2013. The area of application – the "Arrangement Area" – is defined in Article 1(c) as the EEZs of the Parties except certain closed areas[1136] and does not include any high seas areas. The Arrangement applies to "fishing vessels of the parties", which are defined as purse seine vessels flying the flag of a Party or based in a Party[1137]. Fishing under regional access licences must only be for tunas and incidental bycatch caught by purse seine gear[1138].

The preamble highlights a number of objectives that the Parties have set elsewhere, including in the 1979 FFA Convention[1139], the 1982 Nauru Agreement[1140], and the 2009 Bikenibeu Declaration[1141] and 2010 Koror Declaration[1142]. The objectives of the FSMA itself are primarily to maximise the economic benefits of the tuna resources of the WCPO[1143] by promoting greater participation by the Parties' nationals in the fisheries and the development of national fisheries industries[1144] [1145]. This objective does not aim to maximise overall economic returns but to secure a greater share of the returns to the Parties, and as such, possesses the character of a social objective.

[1135] PNA (2013). Federated States of Micronesia Arrangement on Regional Fisheries Access (FSM Arrangement). Agreed on 30 November 1995. Entered into force on. Amended by SFSMA5 on 26 June 2013. Refined 19 October 2013 (sic). Pohnpei, Office of the Parties to the Nauru Agreement.
[1136] Closed areas are specified for each Party and comprise predominantly territorial seas of the Parties and waters within a specified distance of FADs. See further FSM Arrangement Annex V Schedule 2.
[1137] FSM Arrangement Article 1(g): ""fishing vessel of the Parties" means any purse seine fishing vessel flying the flag of or based in a Party to this Arrangement".
[1138] FSM Arrangement Annex V(5): "The vessel shall not be used for fishing for any kinds of fish other than tunas, except that other kinds of fish may be caught as an incidental by-catch, nor for any method of fishing other than the purse seine method".
[1139] South Pacific Forum Fisheries Agency Convention. Agreed in Honiara on July 10th, 1979. Entered into force 9 August 1979.
[1140] PNA (1982). Nauru Agreement Concerning the Cooperation in the Management of Fisheries of Common Interest. Agreed 11 February 1982. Entered into force 2 December 1982. Amended May 2010, Office of the Parties to the Nauru Agreement.
[1141] PNA (2009). Bikenibeu Declaration by Ministers for Fisheries of the Parties to the Nauru Agreement: Securing Greater Value from Their Common Fisheries Wealth. Bikenibeu, Tarawa, Kiribati, Parties to the Nauru Agreement.
[1142] PNA (2010). Koror Declaration: Committing Parties to the Nauru Agreement to Joint Efforts to Increase the Economic Value and Derive Greater Benefits from the Tuna Resource. Koror, Palau, 25 February 2010, Parties to the Nauru Agreement.
[1143] FSM Arrangement Article 2: "The objectives of this Arrangement shall be: (a) to cooperate to secure, for the mutual benefit of the Parties, the maximum sustainable economic benefits from the exploitation of the tuna resources of the Central and Western Pacific".
[1144] FSM Arrangement Article 2: "The objectives of this Arrangement shall be:…(b) to promote greater participation by nationals of the Parties in fisheries and assist in the development of national fisheries industries of the Parties".
[1145] The FSM Arrangement Article 2(c), (d), (e) and (f) also contain objectives but these are embody the means by which the objectives in paragraphs (a) and (b) will be achieved, such as the establishment of a licensing regime, and criteria by which to judge which vessels will deliver benefits to the Parties.

The FSM Arrangement establishes four mechanisms that combine to achieve its objectives:

- Register of Eligible Fishing Vessels
- Regional access licence
- Eligibility criteria
- Area closures[1146].

The objectives are to be achieved primarily through a licensing regime providing access to the "waters of the Arrangement Area" to "fishing vessels of the Parties" on "conditions no less favourable" than those given to foreign vessels[1147] that are consistent with the Palau Arrangement[1148]. Central to the achievement of these objectives is the establishment and enforcement of criteria that ensure fishing operations deliver economic benefits to the Parties[1149]. These criteria are to be used to determine the eligibility of a vessel to be entered into a "Register of Eligible Fishing Vessels". Each "home Party"[1150] is responsible for determining whether their vessels meet the criteria for registration. Eligibility criteria for entry onto the Register of Eligible Vessels all relate to the extent to which the applicant vessel is likely to contribute to the flow of benefits to a Party. These include the level of local equity in the vessel or enterprise; the flag of the vessel; the number nationals of a Party employed; the proportion of catch offloaded locally; the proportion of fuel purchases made locally; and the level of contribution to government revenue or the amount of onshore investment[1151].

Only vessels that are registered on the Register of Eligible Fishing Vessels and on the VDS Register[1152] may apply, through the home Party, to the Administrator[1153] for a "regional access licence"[1154] [1155].

[1146] FSM Arrangement Schedule V Article 6: "Except as may be permitted by the home Party in the waters of the home Party or as may be otherwise permitted by this Arrangement, the vessel shall not be used for fishing in any Closed Area"; and Article 7: "The vessel shall not be used for fishing in any Limited Area except in accordance with the requirements set out in Schedule 3, which are applicable to that Limited Area".
[1147] FSM Arrangement Article 2(c).
[1148] FSM Arrangement Article 2(e).
[1149] FSM Arrangement Article 2(d), which notes that such benefits should be "in the form of domestic or locally based vessels or onshore development, including processing…". Criteria for eligibility are set out in Annex III.
[1150] Defined in FSM Arrangement Article 2(h) as "the Party which has issued a licence, permit or authorization to the vessel, authorizing the vessel to fish in the exclusive economic or fisheries zone of that Party and through which the application for entry on the Register of Eligible Fishing Vessels pursuant to Article 3 is made".
[1151] FSM Arrangement Annex III.
[1152] See the discussion under Palau Arrangement Management Scheme (Purse Seine Vessel Day Scheme) below
[1153] The Administrator is designated as the Chief Executive Officer of the Parties to the Nauru Agreement Office, in accordance with Palau Arrangement Management Scheme (Purse Seine VDS) Article 11.1.
[1154] FSM Arrangement Article 6(1). According to Article 6(2), a regional access licence authorises a vessel to fish in the Arrangement Area, that is, in the EEZ of the Party that issued the licence and in the EEZs of other Parties.
[1155] See also FSM Arrangement Article 6(5), which provides for the cancellation of licences of any vessel deleted from the Register of Eligible Vessels.

Licensed vessels must operate in accordance with Annex V[1156], which requires licensed vessels to comply with applicable national laws listed in Schedule 1[1157] and a prohibition on fishing in closed and limited areas[1158].

Of the four mechanisms identified above, only the regional access licences have the potential to constitute a right-like instrument, if they can be limited and issued on an exclusive basis.

Property rights analysis

There are at least two ways in which a regional access licence could be associated with a quantitative limit: by limiting the number of licences issued; or by limiting the total catch or effort permitted by all licence holders.

On the first, the FSMA itself contains no provisions requiring a limit on the total number of vessels that may be registered or on the total number of licences that may be issued either by individual Parties or by all Parties in aggregate. If the home Party considers the vessel to be eligible for registration[1159] then the Party may apply to have the vessel entered in the Register of Eligible Vessels[1160], and the Administrator must register it[1161]. Vessels so registered are eligible for a regional access licence[1162] and may apply through the home Party to the Administrator for a licence in accordance with Annex IV[1163]. Annex IV does not include any criteria for the approval of a licence but does set out grounds on which an application may be denied[1164]. None of these relate to limits on the number of licensed vessels. In

[1156] FSM Arrangement Article 6(3): "It shall be a condition of any regional access licence issued pursuant to this Arrangement that the vessel in respect of which the regional access licence is issued is operated in accordance with the requirements of Annex V."
[1157] FSM Arrangement Article 4: "The operator of the vessel shall comply with each of the applicable national laws as amended from time to time, and shall be responsible for the compliance by the vessel and its crew with each of the applicable national laws, and the vessel shall be operated in accordance with those laws".
[1158] FSM Arrangement Articles 6, 7.
[1159] Eligibility criteria are set out in FSM Arrangement Annex III.
[1160] FSM Arrangement Article 3(2): "Where a Party to this Arrangement is satisfied that a fishing vessel of that Party satisfies the eligibility criteria, that Party may apply to enter such fishing vessel on the Register of Eligible Fishing Vessels."
[1161] FSM Arrangement Article 3(3): "Upon receipt of a duly completed application the Administrator shall forthwith enter the vessel concerned on the Register of Eligible Fishing Vessels."
[1162] FSM Arrangement Article 6(1): "Before a fishing vessel of the Parties may be issued with a regional access licence pursuant to this Arrangement, the vessel must first be duly registered on the Register of Eligible Fishing Vessels and the VDS Register."
[1163] FSM Arrangement Article 6(2): "Where a fishing vessel of the Parties is duly registered in accordance with the provisions of Article 3, the operator may apply, through the home Party of the vessel, to the Administrator, in accordance with the procedures set out in Annex IV, for a regional access licence authorizing the vessel to fish in the Arrangement Area."
[1164] FSM Arrangement Annex IV para 4: "A regional access licence shall be denied: (a) where the application is not in accordance with the requirements of this Annex; (b) where the fishing vessel in respect of which application for a regional access licence has been made is not an eligible fishing vessel; (c) where the fishing vessel in respect of which application for a regional access licence has been made does not, at the time of making the application, have good standing on the FFA Vessel Register and the VDS Register; or (d) where there has been a failure to satisfy a final judgment or other final determination for a breach of this Arrangement by the operator of the vessel in respect of which application for a regional access licence has

conclusion, there is no limit on the number of licences that may be issued and no provision to impose a limit should the Parties wish to.

On the second, the FSM Arrangement is implicitly intended to be implemented in conjunction with the purse seine VDS. Each vessel's VDS Register number must be entered on the Register of Eligible Fishing Vessels[1165]. There are explicit links between fees collected and distributed by the Administrator and fees for fishing days[1166]. Licence holders are required to report weekly the number of fishing days used[1167], and, under the purse seine VDS, these are deducted from the home Party's PAE[1168]. Holders of regional access licences would therefore require an allocation of vessel days under the purse seine VDS in order to undertake fishing activities under that licence. Provisions relating to regional access licences make no reference to measures of fishing effort or to catch limits other than the links to the purse seine VDS described above.

As such the FSMA does not need to have its own catch or effort limits attached. This supports the conclusion that a regional access licence under the FSM Arrangement constitutes a separate instrument that permits access by vessels flagged to and/or based in the Parties to all Parties' EEZs to achieve a social objective of directing a greater share of economic returns to the Parties, rather than a rights-based instrument targeted at maximising the overall economic returns of the fishery. The Register and the eligibility criteria serve merely to enable the regional access licence to function as intended, not as management instruments in their own right. No further analysis against the RBM criteria is required.

In summary, FSM Arrangement licences do not, on their own, form a basis for a rights-based instrument given the absence of any provisions for a limit on the number of licences to be issued. However, they

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been made, until such time as the final judgment or other final determination is satisfied, and provided that a subsequent change in ownership of a vessel shall not affect the application of this provision".

[1165] Article 3(2).

[1166] Article 10(2): "The Administrator shall distribute any amount received pursuant to this Arrangement less administrative costs in accordance with the formula and the manner agreed by the Parties from time to time. Any amount distributed shall include fees for fishing days attributable for a distribution period and the fee for a fishing day shall be determined by the Parties from time to time". A "fishing day" is defined in Article 1(fbis) as "a day of fishing as defined in the Palau Arrangement for the Management of the Western Pacific Fishery as Amended – Management Scheme (Purse Seine Vessel Day Scheme) except operations complying with a non fishing day described in the Purse Seine Vessel Day Scheme".

[1167] Annex V Schedule 5 Part 1.

[1168] Palau Arrangement Management Scheme (Purse Seine Vessel Day Scheme) Article 3: "3.1 This Management Scheme shall apply to purse seine vessels operating under a valid licence issued under the FSM Arrangement. 3.2 When an FSM Arrangement vessel operates outside its home Party's EEZ, a separate allocation of fishing days from its PAE shall be made by the Home Party to the 6 Administrator, using the form set out in Schedule 3 (a). Payment must be made to the Administrator for those allocated fishing days in advance. 3.3 Once the number of fishing days allocated to an FSM Arrangement vessel by its home Party is reached, the vessel must immediately cease fishing outside its home Party's EEZ, unless alternative arrangements for the vessel to operate in the EEZ of other Parties under the PAEs of those Parties has been notified to the Administrator."; and Article 4: "Each Party shall take all necessary measures to ensure that the total number of fishing days: i) by purse seine vessels in its EEZ, excluding vessels operating under the PAE of their home Parties in accordance with Article 3.2; and ii) by its FSM Arrangement vessels operating in the EEZs of other Parties in accordance with Article 3.2".

provide Parties with the opportunity to exercise individual user scale allocations of vessel days in the EEZs of other Parties. This in effect permits national scale allocations (PAE) to be transferred to other Parties without transferring the individual user scale allocations to a different vessel.

4.5 Tokelau Arrangement

The *Tokelau Arrangement for the Management of the South Pacific Albacore Fishery*[1169] (Tokelau Arrangement) is a non-binding arrangement[1170] agreed in 2014 by 10 Pacific coastal States and one Territory[1171]. It applies to "all fisheries that take south Pacific albacore tuna (SPA), whether specifically targeted or taken as bycatch, wherever they may occur in the"[1172] EEZs of the Participants[1173] or Associate Participants[1174] [1175].

The overall objective of the Tokelau Arrangement is "to promote optimal utilisation, conservation and management of stocks within the scope of this Arrangement", and lists a number of management approaches through which these objectives could be achieved[1176], covering a range of biological, social

[1169] Tokelau Arrangement for the Management of the South Pacific Albacore Fishery, Agreed 22 October 2014. Final agreed text by SC-SPTBF17. Entered into force on 14 December 2014.
[1170] Tokelau Arrangement Paragraph 3.1: "…This Arrangement does not create legally binding rights or obligations". Full text of Article 3.1 at footnote 1172 below.
[1171] The 11 Participants are Tokelau, Vanuatu, Australia, Cook Islands, New Zealand, Niue, Samoa, Tonga, Tuvalu, Fiji, Solomon Islands. See Adams, T. (2015). Status of the Tokelau Arrangement. 2nd Meeting of the Participants to the Tokelau Arrangement. Honiara, 22-23 October 2015, Research Gate. **TKA2-IP1**.
[1172] Tokelau Arrangement Paragraph 3.1: "The understandings found in this document will apply to all fisheries that take south Pacific albacore tuna, whether specifically targeted or taken as bycatch, wherever they may occur in the Area. This Arrangement does not create legally binding rights or obligations."
[1173] Tokelau Arrangement Paragraph 1.1(c): ""Participant" means an FFA member signatory to this Arrangement, and "Participants" means all such signatories;"
[1174] Associate Participants are defined in Tokelau Arrangement Article 1.1(d) as "a State or Territory Associated with this Arrangement under Paragraph 8". Paragraph 8.1: "Upon this Arrangement coming into effect, an FFA member or any FFA non-member State or Territory which has an exclusive economic zone overlapping the effective range of the stocks covered by this Arrangement may become an Associate Participant to this Arrangement…"; and Paragraph 11.3: "After this Arrangement comes into effect, it will be open for association by other members of the FFA and by other island Territories in accordance with the procedure set out in paragraph 8."
[1175] Tokelau Arrangement Paragraph 1.1(a) defines the "Fisheries Management Area", or the "Area" as "the exclusive economic zones or fisheries zones (hereinafter referred to as 'exclusive economic zones') of the Participants and Associate Participants hereto within which vessels taking stocks within the Scope of the Arrangement operate."
[1176] Tokelau Arrangement Article 2.1: "The objective of this Arrangement is to promote optimal utilisation, conservation and management of stocks within the scope of this Arrangement through the development of management approaches for: i) maximising economic returns, employment generation and export earnings from sustainable harvesting of these resources; ii) supporting the development of domestic and locally based fishing industries; iii) securing an equitable share of fishing opportunities and equitable participation in fisheries for these resources for the Participants; iv) increasing control of the fishery for the Participants; v) enhancing data collection and monitoring of the fishery; vi) promoting effective and efficient administration, management and compliance; and encouraging collaboration between the Participants."

and economic elements. Article 4.3 provides a correspondingly wide range of powers to the Management Committee[1177] to adopt measures to address these objectives[1178].

Measures to regulate catch and/or effort[1179], potentially in conjunction with a harvest strategy[1180], would address a biological objective. Associated measures employing "defined allocation units", zone limits and trading arrangements[1181] clearly provide the Management Committee with the power to establish a rights-based scheme for SPA to achieve an economic objective. The strength of these provisions is assessed against the property rights criteria below.

Measures to "restore or add local value to the fishery" primarily address a social objective. Mechanisms to achieve this suggested in the Tokelau Arrangement, such as "the use of allocation units as equity in joint ventures, allocation unit pooling and multi-zone access schemes", could combine with a rights-based system and suggest there is an intention among the Participants that rights would possess an economic value.

The remainder of the measures or management schemes for which the Management Committee has the power to adopt[1182] have the character of a command-and-control instrument to address a wide range of objectives. These include measures or management schemes to: restrict gear, and adopt spatial and temporal closures[1183]; and agree minimum licence fees and standards[1184]. Mechanisms relating to licensed vessel lists and authorisations[1185] amount to accountability instruments. Finally, the measures and management approaches foreshadowed in Article 4.3(b) are not exhaustive, allowing for any other mechanisms "deemed necessary"[1186].

[1177] The Management Committee is established by Tokelau Arrangement Article 4.1: "The Participants to this Arrangement will meet at least once a year for the purpose of reviewing the status of stocks within the scope of this Arrangement and to establish necessary measures for their management and conservation."
[1178] Tokelau Arrangement Article 4.3: "The functions of the Management Meeting are - …".
[1179] Article 4.3: "The functions of the Management Meeting are…(b) to consider management measures or Management Schemes, which may include, but are not limited to - (i) the regulation of fishing catch and/or effort and mitigation of bycatch by fishing vessels operating within the Scope of this Arrangement".
[1180] Article 4.3(b)(ii): "the implementation of a harvest strategy, including consideration of precautionary target and limit reference points, indicators and harvest control rules for any fish stock under the Scope of the Arrangement, if not already regionally agreed".
[1181] Article 4.3(b)(iii): "the definition of catch allocation units, and the determination of zone limits and inter-zone trading mechanisms".
[1182] Note the Tokelau Arrangement Article 4.3(b) states that a function of the Management Committee is to "consider" measures and management schemes. It is suggested that the intention of the Participants is that the Management Committee have the power to *adopt* measures rather than simply *consider* them but this is open to interpretation.
[1183] Article 4.3(b)(vi): "the establishment of fishing gear restrictions, closed areas and closed seasons; …"
[1184] Article 4.3(b)(vi): See footnote 1183 above.
[1185] Article 4.3(b)(vii): "the establishment and publication of a regularly updated list of vessels licenced to fish commercially in the fisheries waters of each Participant and Associate Participants or authorised by them to fish in the high seas of the WCPFC Convention Area, and taking stocks covered by the Scope of this Arrangement;…"
[1186] Article 4.3(b)(viii): "any other matter deemed necessary from time to time."

Property rights analysis

The Tokelau Arrangement is assessed against each property rights criterion below. Scores are summarised in Table 4.6 below and in detail in the Annex, Table A.5.

The Participants in the Tokelau Arrangement have not yet adopted a Management Scheme against which to conduct an assessment comparable to the PNA's purse seine and longline vessel day schemes. Nevertheless, the Arrangement itself provides a foundation for RBM for SPA, an intention underscored by the transitional arrangements that remain in place.

A TAC has been set, albeit a bottom-up one, which suggests socio-economic considerations may outweigh biological ones. The clear intention to establish harvest strategies for the stock foreshadows science-based, precautionary limits, although these are still likely to be balanced against non-biological considerations. As an output control, the limits apply to all gear types and all sources of mortality. This strengthens the limits considerably. However, the limited geographic scope of the Arrangement leaves high seas catches out of reach and dependent on the adoption of compatible measures by interested States.

Exemptions are permitted in order to avoid a disproportionate burden arising from any management measure. However, any disproportionate burden arising from the allocation among Participants of a TAC would most easily be avoided by simply adjusting allocations accordingly. As such, this provision appears more likely to relate to other measures, such as those aimed at bycatch mitigation or MCS rules[1187].

The Arrangement requires each Participant to ensure that its vessels and nationals, comply with measures under the Arrangement[1188]. Curiously, there are no provisions requiring Participants themselves to stay within their respective catch or effort limits, which would appear to leave compliance by foreign vessels in the Arrangement Area the subject of licence conditions or domestic regulations of the relevant Participant. Accordingly, there are no explicit provisions imposing penalties for non-compliance with limits by either a Participant or a vessel. That said, the adoption of penalties is not

[1187] Tokelau Arrangement Articles 4.3(b)(v): "the consideration of mechanisms for quantifying by zone the burden of conservation falling upon Participants and Associate Participants as a result of any management measure, with a view to determining whether such burden falls disproportionately on a Small Island Developing State or Territory; and the development of mechanisms for removing or otherwise compensating for any such disproportionate burden".

[1188] Tokelau Arrangement Article 5.3: "Each Participant and Associate Participant will be responsible for ensuring that its nationals and fishing vessels comply with any applicable management measures adopted by the Management Meeting."

precluded by the broad range of powers given to the Management Meeting[1189], and is supported by the intention to adopt binding Management Schemes[1190].

In summary, the Tokelau Arrangement is assessed as scoring 37 out of an over 72 possible points overall. It was the best performing sub-regional instrument on the *limited* criterion (score = 12) and by a small margin on the *flexible* criterion (score = 7) due to more explicit references to harvest strategies. However, rights under the Tokelau Arrangement were found to be significantly less *secure* (score = 6) and *transferable* (score = 5) and marginally less *exclusive* than the two VDSs (score = 7).

[1189] Tokelau Arrangement Article 4.3(b)(viii): "any other matter deemed necessary from time to time".
[1190] Tokelau Arrangement Article 4.5: "The Management Meeting will also consider the development of a mechanism to include binding management measures or Management Schemes".

Table 4.6: Tokelau Arrangement

Criterion	Question	Score	Ref
Limited	set a subregional scale catch or effort limit?	3	Art.4.3(b)(i)(iii), 4.4
	base limits on the best scientific evidence available?	2	Art.4.3(a), 4.3(b)(ii)
	base limits on the precautionary approach?	2	Art.4.3(b)(ii)
	apply limits to the full geographic range of the stock?	0	Art.1.1(a), 3.1
	ensure limits account for catches of the limited species by all gear types?	3	Art.3.1
	power to record bycatch of the target species against limits for that species?	2	Art.3.1
	Subtotal	**12**	
Exclusive	allocate national scale limits as a share of the regional TAC/TAE?	2	Art.4.3(iii)
	new entrants either excluded or able to participate without adding to TAC/TAE?	3	Art.8
	prohibit exemptions to the limit (or exemptions not provided for)?	1	Art.4.3(b)(v)
	to impose penalties for exceeding national limits?	1	Art.4.3(b)(viii), 4.5
	Subtotal	**7**	
Secure	national limits valid for more than one year?	1	
	national limits valid until Parties agree to amend them? (default = perpetuity)	2	Art.4.4, Note
	make national limits binding on Parties?	2	Art.4.5
	resolve disputes beyond bilateral negotiation	0	Art.10.2
	establish a record of national scale limits (e.g. in a regional register or CMM)?	1	Art.4.4
	Subtotal	**6**	
Transferable	transfer a national limit in full or in part to another CCM?	2	Art.4.3(b)(iii)
	require new entrants to acquire an allocation through a transfer from a CCM?	1	Art.4.3(b)(iii)
	specify a process for effecting a transfer?	1	Art.4.3(b)(iii)
	record transfers in a register?	1	Art.4.3(b)(iii)
	Subtotal	**5**	
Flexible	set a TRP the target stock(s)?	2	Art.4.3(b)(ii)
	establish harvest control rules for the target stock(s)?	2	Art.4.3(b)(ii)
	adjust a TAC/TAE on the basis of environmental factors and stock assessments?	1	Art.4.3(a), (b)(ii)(iii)
	define national limits as a proportional (rather than volumetric) share of the regional TAC/TAE?	1	Art.4.3(b)(iii), 4.4
	establish clear processes for a TAC/TAE to be adjusted?	1	Art.4.3(b)(ii)(iii)
	Subtotal	**7**	
TOTAL		**38**	

4.6 Conclusion

This Chapter has analysed the key subregional fisheries management instruments of the Western and Central Pacific Ocean against the property rights criteria identified in Chapter Three. The FSM Arrangement was found not to form the basis for a rights-based instrument. Only one implementing arrangement of the Nauru Agreement – the third – addressed just one criterion – *limited* – and no others. The Nauru Agreement itself was found to provide little basis for an RBM scheme. The remaining

instruments were found to possess some elements of a rights-based management instrument. Their scores against each criterion are summarised in Table 4.7 below.

Table 4.7: Subregional instruments: scores against property rights criteria

	Limited	Exclusive	Secure	Transferable	Flexible	Total
Nauru Agreement	6	4	5	4	5	24
PNA Third Implementing Arrangement	2	0	0	0	0	2
Palau Arrangement	6	4	5	4	5	24
Purse seine VDS	7	10	10	10	5	42
Longline VDS	7	9	11	10	5	42
Tokelau Arrangement	12	7	6	5	7	37

Of these arrangements, the purse seine and longline vessel day schemes are the most well-developed, although it should be noted that the VDS has been operational in the purse seine fishery for much longer. The Palau Arrangement provides the basis for the two management schemes but is in fact silent on almost all questions under each criterion. The detail is instead specified in the individual management schemes.

The longline VDS has scored slightly higher than the purse seine VDS on the *secure* criterion because the longline VDS permits TAEs to be set up to three years in advance, even though they may only be valid for one year at a time. This provides a higher degree of certainty to Participants than simple annual determinations made prior to the commencement of each year. While recent practice indicates a preference for setting the purse seine TAE more than one year in advance, this is not expressly provided for in the management scheme[1191]. Any stability, and hence security, in national PAEs of course assumes that PAEs remain constant while the TAE remains constant.

Although a relatively recent arrangement, the Tokelau Arrangement scored slightly lower than the two VDSs. However, it is more accurate to compare it to the Palau Arrangement as an enabling instrument for management schemes. Against this benchmark it performs very well. A key defining feature of the Tokelau Arrangement is that it is a catch- rather than effort-based scheme. As Chapter Three noted, this brings significant advantages compared to an effort-based scheme that are not captured in the property rights criterion. Importantly, the output-based limit allows the instrument to target a single attribute – that is, SPA – and can be applied to all gear types that catch SPA.

Although the criteria do not distinguish between output and input-based controls, some questions under the *limited* and *flexible* criteria naturally favour output-based controls. The Tokelau Arrangement

[1191] Palau Arrangement Management Scheme (Purse Seine VDS) Article 12.2: "The TAE will be set and confirmed by the Parties at their previous year's annual meeting *or at such other time agreed to by the Parties*…" (emphasis added). The longline VDS (Article 11.2) is worded identically. However, the latter includes an additional provision in Article 2.3, which explicitly allows for TAEs to be determined up to three years in advance.

therefore scored well on both criteria compared to the two VDSs. It is agnostic in relation to gear types and whether bycatch of SPA is to be included in calculations of catches against national limits. It also has explicit reference to the precautionary approach. These features make for a far stronger limit on catches than those afforded by the VDSs. On *flexibility*, the Tokelau Arrangement, unlike the VDSs also makes explicit reference to elements of a harvest strategy, including target reference points and harvest control rules. That said, harvest strategies are not directly linked to the determination of the TAC. It also does not appear to preclude proportional national allocations of the TAC to Participants whereas the VDSs appear to assume volumetric PAEs allocated from the TAE for each year.

Beyond these minor differences, all three arrangements – the purse seine and longline VDSs and the Tokelau Arrangement – across the board scored quite low against each criterion and are silent on many questions. This leaves much of the detail to be determined by management meetings of the Parties in the case of the PNA, and by management schemes by the Parties to the Tokelau Arrangement. Judging from the text of each arrangement, this assumes that a high level of trust among the Parties is essential for an effective scheme.

The next Chapter turns to measures adopted by the WCPFC at a regional scale. The subregional and regional scale analyses are then discussed as a whole in Chapter Six.

5 Regional instruments in the Western and Central Pacific

5.1 Introduction

This Chapter responds to the regional aspects of the central research question[1192] by assessing the extent to which the institutional arrangements in place in the Western and Central Pacific Ocean (WCPO), lay a foundation for well-defined property rights at a regional scale. It assesses key conservation and management measures (CMMs) of the Western and Central Pacific Fisheries Commission (WCPFC) for fisheries targeting the four key tuna stocks of interest to Pacific island countries[1193], and other key species of interest to the members of the Pacific Islands Forum Fisheries Agency (FFA), against the five property rights criteria set out in Chapter Three.

The Chapter commences in section 5.2 with an outline of the key features of the institutional framework of the WCPFC. Section 5.3 assesses the basis for rights-based management in the WCPF Convention against the property rights criteria. Section 5.4 identifies which instruments adopted by the WCPFC are within the scope of this study and which are outside its scope. Sections 5.5 and 5.6 examine those instruments that have been identified as having some of the basic characteristics of a rights-like instrument, while section 5.7 considers measures that contain "enabling" features of rights-based management. Detailed analyses of each instrument is contained in the Annex to this study. Section 5.8 concludes the Chapter.

5.2 Institutional Framework

5.2.1 Introduction

Despite the diverse nature of States and territories with an interest in the fisheries of the WCPO, they have long shared a common desire to improve control over high seas fishing[1194]. In 1997 negotiations commenced through a Multilateral High-Level Conference (MHLC) to establish a regional fisheries

[1192] Central research question: To what extent does the institutional framework at a regional or subregional scale in the WCPO provide a basis for well-defined property rights for the conservation and management of WCPO tuna stocks?

[1193] Skipjack (SKJ), bigeye tuna (BET), yellowfin tuna (YFT) and south Pacific albacore (SPA).

[1194] Tarte, S. (1999). "Negotiating a Tuna Management Regime for the Western and Central Pacific: The MHLC Process 1994-1999." The Journal of Pacific History **34**(3): 273-280. p274. While this suggests that even fishing states had reached a point where they would support, in principle, limits on the freedom of fishing, self-interest is likely to remain a strong motivation to resist real cuts in effort or catches. See for example the ongoing debate over high seas purse seine and longline catches in WCPFC (2020). Summary Report. Sixteenth Regular Session of the Western and Central Pacific Fisheries Commission (WCPFC16), 5-11 December 2019, Port Moresby, WCPFC. paras 298-312 and 318-334.

management mechanism for highly migratory stocks of the WCPO[1195] [1196]. The WCPFC was thus established under the *Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean* (WCPF Convention)[1197]. The objective of the WCPF Convention is to "ensure, through effective management, the long-term conservation and sustainable use of highly migratory fish stocks in the western and central Pacific Ocean in accordance with [LOSC and UNFSA]."

The Convention gives effect, at a regional scale, to the requirements in LOSC and UNFSA that fishing and coastal States "…cooperate with a view to ensuring conservation and promoting the objective of optimum utilization of highly migratory fish stocks[1198] throughout their range"[1199] [1200]. In particular, by establishing the WCPFC[1201], the WCPF Convention operationalises the requirement in LOSC and in UNFSA to establish an organisation or arrangement through which to cooperate in relation to highly migratory species[1202] [1203].

Negotiations to establish the WCPFC came at a "watershed" moment in the conservation and management of WCPO tuna[1204], and a "test case" for the implementation of UNFSA[1205]. This subsection

[1195] The MHLC process commenced in 1994 but its first meeting was largely technical in nature. It was not until the second MHLC in 1997 in Marshall Islands that a concerted effort commenced to establish a regional fisheries management mechanism (encapsulated in the Majuro Declaration). See para 9 of MHLC (2000). Final Act of the Multilateral High-Level Conference on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Multilateral High-Level Conference on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific, Honolulu. 30 August to 5 September 2000, WCPFC.

[1196] See also Tarte's summary of the MHLC process in Tarte, S. (1999). "Negotiating a Tuna Management Regime for the Western and Central Pacific: The MHLC Process 1994-1999." The Journal of Pacific History **34**(3): 273-280.

[1197] Convention on the Conservation of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (WCPF Convention). Agreed on 5 September 2000, Honolulu. Entered into force on 19 June 2004. **40 International Legal Materials 278 2001**.

[1198] In effect this includes all tuna species and billfish species listed in LOSC Annex 1, except sauries, in accordance with WCPF Convention Article 3(3).

[1199] WCPF Convention preamble: "*Recognizing* that, under the 1982 Convention and the Agreement, coastal States and States fishing in the region shall cooperate with a view to ensuring conservation and promoting the objective of optimum utilization of highly migratory fish stocks throughout their range".

[1200] See also Tarte, S. (1999). "Negotiating a Tuna Management Regime for the Western and Central Pacific: The MHLC Process 1994-1999." The Journal of Pacific History **34**(3): 273-280. p274.

[1201] WCPF Convention Article 9(1) establishes the WCPFC

[1202] LOSC Article 64(1); UNFSA Article 8.

[1203] See further Chapter One subsection 1.4.6.

[1204] Cartwright and Willock point to the growing fishing capacity in the WCPO and shift of fishing effort to the region from other tuna fisheries. Cartwright, I. and A. Willock (2000). Oceania's Birthright: The Role of Rights-based Management in Tuna Fisheries of the Western and Central Pacific. FAO Fisheries Technical Paper 404/1 Use of Property Rights in Fisheries Management. Proceedings of the FishRights99 Conference, Fremantle, Western Australia, 11 - 19 November 1999. R. Shotton. Rome, FAO.

[1205] Tarte, S. (1999). "Negotiating a Tuna Management Regime for the Western and Central Pacific: The MHLC Process 1994-1999." The Journal of Pacific History **34**(3): 273-280. p277.

sets out three key foundational elements of the WCPFC – that is, the Convention Area, the power to adopt CMMs and decision making – and briefly notes some observations regarding its performance.

5.2.2 Convention Area

Other than its northern limits[1206], the boundaries of the WCPFC Convention Area (WCPFC-CA) are defined in the WCPF Convention[1207], and depicted in the map in Figure 5.1. The WCPFC-CA covers over half of the Pacific Ocean, bounded by the western edges of the Pacific Ocean, as far south as 60 degrees south latitude and extending eastward to beyond French Polynesia and Hawaii. The WCPFC-CA is understood to exclude "waters in South-East Asia which are not part of the Pacific Ocean; nor is it intended to include the waters of the South China Sea"[1208]. The WCPFC-CA overlaps at its eastern boundary with that of the Inter American Tropical Tuna Commission (IATTC).

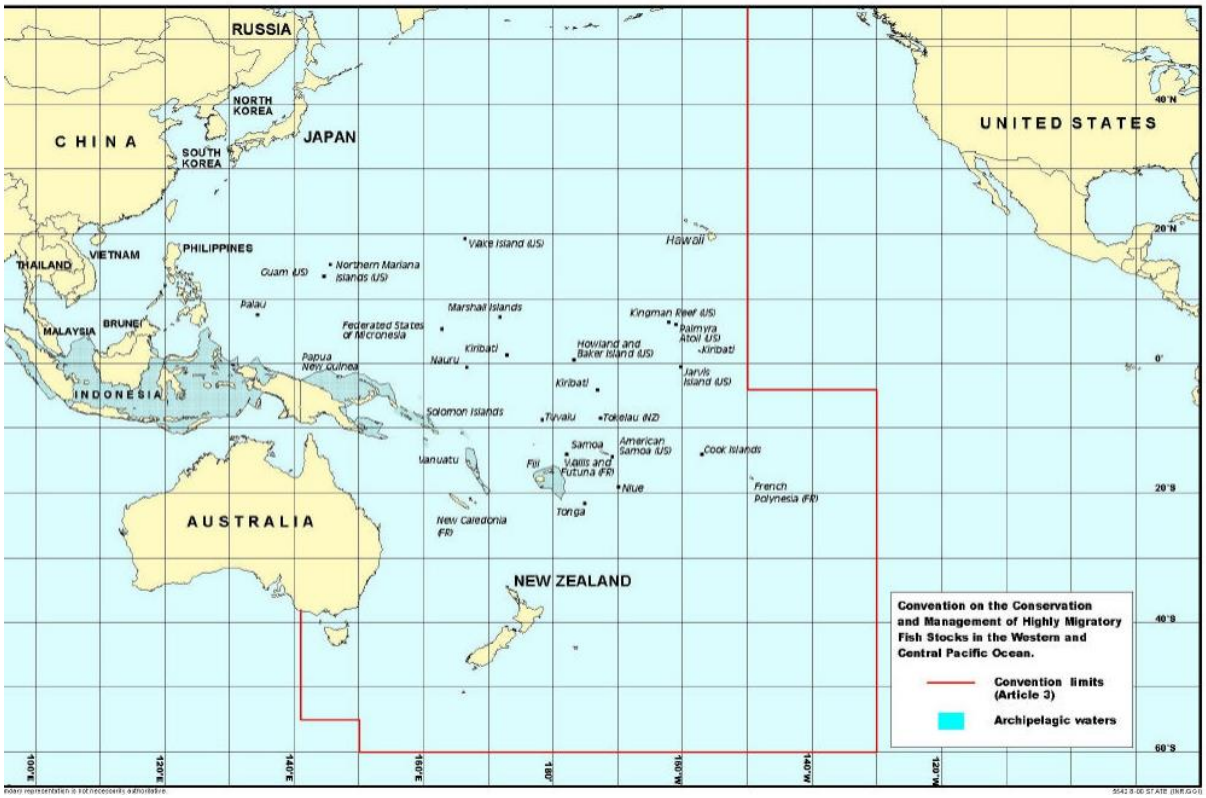

Figure 5.1: WCPFC Convention Area Map[1209]

[1206] The WCPF Convention does not define the northern limits of the Convention Area.

[1207] Defined in Article 3(1) of the Convention on the Conservation of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (WCPF Convention). Agreed on 5 September 2000, Honolulu. Entered into force on 19 June 2004. **40 International Legal Materials 278 2001**.

[1208] MHLC (2000). Report of the Seventh Session. Multilateral High-Level Conference on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific, 30 August – 5 September 2000, Honolulu, Hawai'i. Closing Remarks by the Chairman, Ambassador Satya N. Nandan, to the Seventh Session of the Multilateral High-Level Conference Annex 8.

[1209] WCPFC. (2017). "Western and Central Pacific Fisheries Convention Area Map." Retrieved 11 February, 2021, from https://www.wcpfc.int/doc/convention-area-map.

The EEZs of the 15 Pacific island members of the FFA collectively amount to approximately 19.5 million km^2 [1210] [1211], accounting for around 19% of the WCPFC-CA. Their concentration around the equator[1212] and the southwestern subtropical Pacific, however, gives several PICTs a significantly greater level of control over the four key tuna species (SKJ, YFT, BET, SPA) than many coastal States in other regions[1213].

5.2.3 Power to Adopt Conservation and Management Measures

Consistent with the preamble to the WCPFC Convention[1214], Article 5 authorises the Commission to "adopt measures to ensure long-term sustainability of highly migratory fish stocks in the Convention Area and promote the objective of their optimum utilization"[1215]. In language almost identical to that of UNFSA, the Convention requires the Commission to "ensure that such measures are based on the best scientific evidence available and are designed to maintain or restore stocks at levels capable of producing maximum sustainable yield, as qualified by relevant environmental and economic factors, including the special requirements of developing States in the Convention Area, particularly small island developing States, and taking into account fishing patterns, the interdependence of stocks and any generally recommended international minimum standards, whether subregional, regional or global"[1216]. Article 5 further lists a range of principles and measures that the Commission shall apply or adopt, including in relation to: the precautionary approach[1217]; non-target species and associated and

[1210] EEZ area data were obtained from Pauly, D. and D. Zeller. (2016). "Tools and Data: Basic Search: EEZ." Retrieved 21 September, 2018, from http://www.seaaroundus.org/data/#/eez.. EEZ areas are approximations based on the methodology in Zeller, D. and D. Pauly. (2015, 11 June 2015). "Methods: EEZ, LMEs, shelf etc." Retrieved 21 September 2018, from http://www.seaaroundus.org/sea-around-us-area-parameters-and-definitions/#_Toc421807899., and derived from databases developed by Claus, S., N. De Hauwere, B. Vanhoorne, P. Deckers, F. Souza Dias, F. Hernandez and J. Mees (2014). "Marine Regions: Towards a global standard for georeferenced marine names and boundaries." Marine Geodesy **37**(2): 99-125.

[1211] The total area of FFA members' EEZs is larger than the land area of largest country in the world, based on data in Mattyasovszky, M. (2018, 23 March 2018). "The Largest Countries in the World." Retrieved 21 September, 2018, from https://www.worldatlas.com/articles/the-largest-countries-in-the-world-the-biggest-nations-as-determined-by-total-land-area.html.

[1212] Cartwright and Willock note that FFA members' EEZs occupy 75 percent of the productive equatorial zone 10 degrees north and south of the equator. Cartwright, I. and A. Willock (2000). Oceania's Birthright: The Role of Rights-based Management in Tuna Fisheries of the Western and Central Pacific. FAO Fisheries Technical Paper 404/1 Use of Property Rights in Fisheries Management. Proceedings of the FishRights99 Conference, Fremantle, Western Australia, 11 - 19 November 1999. R. Shotton. Rome, FAO.

[1213] See Chapter One section 1.5.

[1214] In particular: "*Acknowledging* that compatible, effective and binding conservation and management measures can be achieved only through cooperation between coastal States and States fishing in the region". WCPF Convention Preamble.

[1215] WCPF Convention Article 5(a).

[1216] WCPF Convention Article 5(b). Note the language in the WCPF Convention, apart from the reference to "…in the Convention Area…" and "…particularly small island developing States…", is identical to that in UNFSA Article 5(b).

[1217] WCPF Convention Article 5(c).

dependent species[1218]; waste and discards[1219]; biodiversity protection[1220]; overfishing and excess fishing capacity[1221]; the interests of artisanal and subsistence fishers[1222]; data sharing[1223]; and monitoring, control, surveillance and enforcement[1224].

Article 7(1) of the WCPF Convention requires the principles set out in, and CMMs adopted under, Article 5 to be applied by coastal States in areas under their national jurisdiction[1225]. In incorporating the compatibility requirement in UNFSA[1226], Article 8(1) of the WCPF Convention requires that members must cooperate for the purpose of achieving compatible measures in respect of highly migratory stocks in areas within and beyond national jurisdiction[1227]. To achieve compatibility, CMMs adopted by the Commission must not undermine CMMs for the same stocks adopted under LOSC Article 61 by coastal States for areas within their national jurisdiction[1228] or previous measures adopted by relevant coastal and fishing States for the high seas[1229]. In effect, this means that the WCPFC does not have exclusive authority to adopt measures for highly migratory species in the WCPO.

At its first regular session, the Commission agreed that it shall, in accordance with Article 5 of the WCPF Convention, adopt CMMs "necessary to address sustainability concerns", including in relation to: "(a) Catch and/or effort limits; (b) Capacity limits for large-scale tuna fishing vessels; (c) Measures to address impacts of large-scale tuna fishing vessels so as to ensure compatibility between measures applied outside areas of national jurisdiction and measures being applied by coastal States to manage fishing by such vessels within their zones; (d) Time and area closures; and (e) Mitigation measures to address the mortality of non-target species e.g. seabirds, turtles and sharks"[1230]. While unnecessary from a legal standpoint, given Article 5, this resolution sets a clear intention that the WCPFC should be able

[1218] WCPF Convention Article 5(d).
[1219] WCPF Convention Article 5(e).
[1220] WCPF Convention Article 5(f).
[1221] WCPF Convention Article 5(g).
[1222] WCPF Convention Article 5(h).
[1223] WCPF Convention Article 5(i).
[1224] WCPF Convention Article 5(j).
[1225] WCPF Convention Article 7(1) is not intended to derogate from coastal states' sovereign rights within their EEZs, stating that these principles and measures shall be applied "in the exercise of their sovereign rights for the purpose of exploring and exploiting, conserving and managing highly migratory stocks" as per LOSC Article 56(1)(a).
[1226] UNFSA Article 7.
[1227] WCPF Convention Article 8(1) states, inter alia, that "[c]onservation and management measures established for the high seas and those adopted for areas under national jurisdiction shall be compatible in order to ensure conservation and management of highly migratory fish stocks in their entirety". See also WCPF Convention Article 8(4) in relation to high seas pockets.
[1228] WCPF Convention Article 8(2)(b)(i).
[1229] WCPF Convention Article 8(2)(b)(ii).
[1230] WCPFC (2004). Resolution on Conservation and Management Measures. CMM 2004-04. Pohnpei, Western and Central Pacific Fisheries Commission. para 4.

to adopt a wide range of measures that, at face value, could include elements of a rights-based scheme or a system of command-and-control rules.

The WCPF Convention provides for CMMs to be adopted by its members both individually[1231] and collectively as the WCPFC for target stocks[1232] and non-target species[1233]. In some instances, whether a provision applies to individual CCMs or collective (Commission) CCMs is unclear. Article 5, for example, identifies a range of measures and principles to be adopted or applied by "members of the Commission…in giving effect to their duty to cooperate" but it does not appear that they must be adopted or applied by the Commission as a whole[1234]. References to "members of the Commission", rather than "the Commission", appear in several other provisions of the WCPF Convention[1235]. Indeed, the general requirement that "members of the Commission…cooperate for the purpose of achieving compatible measures" for the high seas and for areas under national jurisdiction[1236] implies that individual members may establish CMMs within the extent of their jurisdiction[1237], and it is an express function of the Commission to ensure that such cooperation occurs[1238]. The compatibility obligations of the Commission as a whole are premised on the ability of the Commission itself to also adopt measures[1239], and this power is clearly set out in Article 10 on the functions of the Commission.

[1231] WCPF Convention Article 4 recognises the rights of States under LOSC and UNFSA: "Nothing in this Convention shall prejudice the rights, jurisdiction and duties of States under the 1982 Convention and the Agreement. This Convention shall be interpreted and applied in the context of and in a manner consistent with the 1982 Convention and the Agreement".

[1232] WCPF Convention Article 10(1)(a): "determine the total allowable catch or total level of fishing effort within the Convention Area for such highly migratory fish stocks as the Commission may decide and adopt such other conservation and management measures and recommendations as may be necessary to ensure the long-term sustainability of such stocks".

[1233] WCPF Convention Article 10(1)(c): "adopt, where necessary, conservation and management measures and recommendations for non-target species and species dependent on or associated with the target stocks, with a view to maintaining or restoring populations of such species above levels at which their reproduction may become seriously threatened."

[1234] WCPF Convention Article 7(1) reinforces this conclusion by stating that: "The principles and measures for conservation and management enumerated in article 5 shall be applied by coastal States within areas under national jurisdiction in the Convention Area in the exercise of their sovereign rights for the purpose of exploring and exploiting, conserving and managing highly migratory fish stocks."

[1235] See for example WCPF Convention Article 6 of the application of the precautionary approach, and Article 8 on the compatibility of conservation and management measures.

[1236] WCPF Convention Article 8(1).

[1237] See also WCPF Convention Article 10(1) chapeau, which states that the power of the Commission to collectively adopt CMMs is established "[w]ithout prejudice to the sovereign rights of coastal States", and Article 7(1), which requires coastal States to apply the principles and measures in Article 5 within areas under their national jurisdiction "in the exercise of their sovereign rights…".

[1238] WCPF Convention Article 10(1): "…the functions of the Commission shall be to: (b) promote cooperation and coordination between members of the Commission to ensure that conservation and management measures for highly migratory fish stocks in areas under national jurisdiction and measures for the same stocks on the high seas are compatible;"

[1239] WCPF Convention Article 8(2): "In establishing compatible conservation and management measures for highly migratory fish stocks in the Convention Area, the Commission shall:…".

The functions that explicitly fall within the purview of the Commission, as opposed to the "members of the Commission", allow for a broad range of instruments to be employed. Its functions may include the determination of a TAC or TAE and adoption of other CMMs for: the long-term sustainability of highly migratory stocks[1240]; the adoption of measures for non-target species and dependent and associated species[1241]; the allocation of total allowable catch (TAC) or effort (TAE)[1242], and development of criteria for its allocation[1243]; collection of scientific and other data[1244]; establishment of MCS and enforcement[1245]; and the adoption of "any measures…necessary for the achievement of this Convention"[1246]. Without appearing to exclude other choices, Article 10(2) elaborates some of these powers to include measures relating to catch,[1247] effort[1248] and capacity[1249] limits; temporal and spatial restrictions[1250]; the size of individual harvested species[1251]; and permissible fishing gear and technology[1252].

The WCPF Convention therefore allows for the adoption of rules to determine who may fish, where and when they may fish, the manner in which they may fish, how much fishing effort they may expend and how much of each species and size they may or may not catch. This hints at the possibility of right-based instruments. The question of whether these powers permit the adoption of well-defined property rights is addressed in section 5.3 below in accordance with the criteria defined in Chapter Three.

5.2.4 Decision Making

The powers and responsibilities of the Commission under the Convention are held collectively by the Commission's 26 members, taking into account the interests of participating territories[1253]. Decision-making in the Commission was a particularly contentious issue during the MHLC process, with fishing

[1240] WCPF Convention Article 10(1)(a).
[1241] WCPF Convention Article 10(1)(c).
[1242] WCPF Convention Article 10(4): "The Commission may adopt decisions relating to the allocation of the total allowable catch or the total level of fishing effort. Such decisions, including decisions relating to the exclusion of vessel types, shall be taken by consensus". Note that this does not allow for the allocation of total allowable capacity.
[1243] WCPF Convention Article 10(1)(g) and further elaborated in Article 10(3).
[1244] WCPF Convention Article 10(1)(d), €, (f) and (j).
[1245] WCPF Convention Article 10(1)(i).
[1246] WCPF Convention Article 10(1)(o).
[1247] WCPF Convention Article 10(2)(a).
[1248] WCPF Convention Article 10(2)(b).
[1249] WCPF Convention Article 10(2)(c).
[1250] WCPF Convention Article 10(2)(d) and also (g), which provides for measures relating to "particular subregions or regions".
[1251] WCPF Convention Article 10(2)(e).
[1252] WCPF Convention Article 10(2)(f).
[1253] The requirement to take into account the interests of participating territories in WCPF Convention Article 43(3) also relates to the carrying out of the broader functions of the Commission. The Rules of Procedure state that a participating Territory may not break a consensus but contain substantial provisions minimise such situations arising. See WCPFC (2004). Rules of Procedure. As adopted at the Inaugural Session, Pohnpei, Federated States of Micronesia, 9-10 December 2004. WCPFC. Annex II paras 7 & 8.

States keen to retain an ability to opt out of decisions they did not support and the MHLC Chair keen to provide flexibility to avoid deadlocks. The WCPF Convention thus establishes a hybrid whereby Commission decisions are "[a]s a general rule" required to be taken by consensus[1254], which has been the case in practice, but with the option to proceed to a vote. Where consensus is not able to be achieved, Article 20(2) provides that the Commission can decide by procedural vote (by majority) to vote on the substantive question. Votes on substantive questions require a three-fourths majority comprising three-fourths of FFA members and three-fourths of non-FFA members. This "two-chamber" approach reflects attempts by the Convention negotiators to balance the respective interests of Pacific island countries and territories, with those of other members[1255]. Decisions on allocations, however, must be taken by consensus[1256].

5.2.5 Interested Parties

Chapter Two[1257] noted the requirement in UNFSA that interested parties cooperate in the conservation and management of straddling and highly migratory stocks through a regional fisheries management arrangement or organisation, and that States that are not party to such arrangements or have not agreed to comply with CMMs adopted by them are not permitted to fish in the area of competence of such an arrangement or organisation.

This subsection briefly examines the diversity of parties with an interest in the WCPO tuna fisheries. For the purposes of this study, interested parties include members of the WCPFC, participating territories and cooperating non-members (CNM). Collectively the WCPFC refers to Commission members, participating territories and CNMs by the acronym "CCM". Interested parties may also include prospective new entrants.

The Commission's membership comprises 24 contracting State parties[1258], as well as Taiwan and the European Union. Taiwan is permitted to participate in the Commission as a fishing entity under the

[1254] WCPF Convention Article 20(1).
[1255] While each of the two groupings have mixed interests and indeed States with different interests, broadly speaking FFA members' interests are predominantly as coastal States while non-FFA members' interests are predominantly those of fishing States. Obvious exceptions to this are countries such as Indonesia and Philippines, which have clear and substantial interests as both coastal States and fishing States but are not FFA members.
[1256] WCPF Convention Article 10(4): "The Commission may adopt decisions relating to the allocation of the total allowable catch or the total level of fishing effort. Such decisions, including decisions relating to the exclusion of vessel types, shall be taken by consensus."
[1257] Chapter Two subsection 2.4.6.
[1258] WCPF Convention Article 34(1) includes among the Parties to which the Convention is open for signature the United Kingdom in respect of Pitcairn, Henderson, Ducie and Oeno Islands. However, as at December 2020 the UK had not signed the Convention.

nomenclature "Chinese Taipei" in accordance with Article 9(2) of the WCPF Convention[1259] [1260] [1261]. The EU (as the European Community) acceded to the Convention in December 2004[1262]. These provisions further develop the related provision in UNFSA[1263] by giving fishing entities effectively equal standing to Contracting Parties[1264]. In addition, seven participating territories have been authorised by the relevant Contracting Parties (France, United States and New Zealand) in accordance with Article 43(1) to participate in the WCPFC.

Commission members may request that non-parties fishing in the Convention Area cooperate to implement WCPFC CMMs[1265], as provided for in UNFSA Article 8(3). The Convention provides that CNMs may participate in the fisheries of the Convention Area commensurate with their commitment to and compliance with CMMs for relevant stocks[1266], and may be invited to participate in Commission meetings as observers[1267]. As at December 2020[1268], the WCPFC has accepted nine CNMs as complying

[1259] WCPF Convention Article 9(2) states that a "fishing entity referred to in the Agreement, which has agreed to be bound by the regime established by this Convention in accordance with the provisions of Annex I, may participate in the work, including decision-making, of the Commission in accordance with the provisions of this article and Annex I." Annex 1(1) sets out the processes by which a fishing entity may formally agree to be bound by the provisions of the Convention. Annex 1(2) defines "members of the Commission" as including fishing entities and Contracting Parties.

[1260] See also Lodge, M. W. (2006). "The Practice of Fishing Entities in Regional Fisheries Management Organizations: The Case of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean." Ocean Development & International Law **37**(2): 185-207.; and Tsamenyi, M. Ibid."The Legal Substance and Status of Fishing Entities in International Law: A Note." 123-131.

[1261] Chinese Taipei signed an Arrangement for the Participation of Fishing Entities in 2000, and in November 2004 advised the Depository (New Zealand) that it was in a position to be bound by the Convention and participate as a Commission member in accordance with Article 9(2).See WCPFC (2017). Status of the Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean. Prepared by the Depository, New Zealand. 24 November 2017, Manila, WCPFC.

[1262] WCPFC (2004). Summary Record. First Regular Session of the Western and Central Pacific Fisheries Commission (WCPFC1), Pohnpei, 9-10 December 2004, Western and Central Pacific Fisheries Commission (WCPFC). para 6.

[1263] UNFSA, in accordance with Article 1(3), "applies mutatis mutandis to other fishing entities whose vessels fish on the high seas".

[1264] Tsamenyi argues that fishing entities, that is Taiwan, have certain rights and obligations in relation to RFMOs that put it on an equal footing with states. Tsamenyi, M. (2006). "The Legal Substance and Status of Fishing Entities in International Law: A Note." Ocean Development & International Law **37**(2): 123-131. p127.

[1265] WCPF Convention Article 32(4).

[1266] WCPF Convention Article 32(4).

[1267] WCPF Convention Article 32(5).

[1268] WCPFC (2021). Draft Summary Report for review and comments. Seventeenth Regular Session of the Western and Central Pacific Fishieries Commission (WCPFC17), Electronic Meeting, 8-15 December 2020, Western and Central Pacific Fishieries Commission (WCPFC).

participants in the fishery or as observers in accordance with Article 32[1269] and CMM2019-01[1270]. The status and rights of CNMs for each year are agreed at the regular session of the WCPFC in the preceding year[1271].

CCMs may have interests in WCPO fisheries as coastal States – that is, States that possess EEZs within the area of competence of the WCPFC – or as actual or potential fishing States, and in some cases, both. DWFNs from within the region tend to be coastal States located in the north Pacific – including China, Taiwan, Republic of Korea, Japan, United States and Canada. A number of DWFNs from outside the region operate in WCPO fisheries, most notably Spain, represented in the WCPFC by the EU. Despite the continued dominance of large and/or developed DWFNs, catches by vessels flagged to FFA members have been growing in both absolute terms and as a share of total catches[1272].

In addition, CCMs vary in terms of their level of development. Seven members are classified by the UN as developed countries and the remaining members and all participating territories and CNMs are developing[1273]. All 17 members of the FFA are members or participating territories of the WCPFC[1274]. Apart from Australia and New Zealand, all FFA members are small island developing States (SIDS) and four of those are classified as least developed countries (LDCs) by the UN[1275].

5.2.6 Conclusion

This section has outlined some of the key foundational elements of the WCPFC, including its Convention Area, its power to adopt CMMs and its decision-making rules. With a diverse membership and a default decision-making process by consensus, one would expect that agreement on substantive

[1269] WCPF Convention Article 32(4) authorises the Commission it a Commission member to request that a non-party cooperate fully with Commission CMMs while Article 32(5) provides that non-parties may request to be invited to attend meeting as observers. As at WCPFC16 (December 2019) these were Ecuador, El Salvador, Mexico, Panama, Liberia, Thailand and Vietnam. All are DWFNs, although some only operate carrier vessels in the WCPFC-CA. See WCPFC (2020). Summary Report. Sixteenth Regular Session of the Western and Central Pacific Fisheries Commission (WCPFC16), 5-11 December 2019, Port Moresby, WCPFC. paras 59-66

[1270] CMM2019-01 on Cooperating Non-Members sets out the process for application and approvals for CNM status and the rights and obligations of CNMs. CMM2019-01 was adopted at WCPFC16, and replaced CMM2009-11 by amending paragraphs 3 and 6 "to include consideration of the attendance by an applicant for CNM status at the TCC and Commission meetings where its application is considered, subject to the applicant being able to attend the meeting as an observer". Ibid. para 51.

[1271] See for example ibid. paras 35-66.

[1272] The share of total catch value for the four key tuna species taken by FFA-flagged vessels has grown from 7% in 1997 to 28% in 2020. FFA (2019). Value of WCPFC-CA Tuna Catches 2018. Honiara, Pacific Islands Forum Fisheries Agency (FFA).

[1273] Note that the World Bank classifies some developing countries as high income. The Republic of Korea, Chinese Taipei and four participating territories are classified as high income.

[1274] New Caledonia and French Polynesia were admitted to the Pacific Islands Forum (PIF) in 2016. PIF members are eligible to seek membership of the FFA but they have not yet done so.

[1275] See further Hanich, Q. (2012). "Interest and Influence: A Snapshot of the Western and Central Pacific Tropical Tuna Fisheries." Retrieved 4 March, 2015, from http://ro.uow.edu.au/uowbooks/1.; Hanich, Q. and Y. Ota (2013). "Moving Beyond Rights-Based Management: A Transparent Approach to Distributing the Conservation Burden and Benefit in Tuna Fisheries." The International Journal of Marine and Coastal Law **28**(1): 135-170.

decisions is difficult to achieve. However, in comparison to other RFMOs, it has performed quite well. For example, a 2010 study by Cullis-Suzuki and Pauly found that, of 18 RFMOs, the WCPFC had the best theoretical performance in relation to governance of fish stocks in high seas areas and was ranked fifth of 14 RFMOs on performance in practice[1276]. A 2014 study of bycatch governance in 13 RFMOs found the WCPFC to be one of the top performers, scoring above average on all but one of the 13 criteria[1277] [1278].

5.3 WCPF Convention: Property rights criteria

This section assesses the extent to which the WCPF Convention provides a basis for the adoption of well-defined rights-based instruments by the WCPFC against the property rights criteria identified in Chapter Three. Score for each criterion and exploratory question are contained in Table 5.1 below.

5.3.1 Limited

A number of provisions in the Convention relate to the determination of catch, effort or capacity limits. One of the Commission's key functions is to determine the TAC or TAE for highly migratory stocks of the Convention Area and to adopt measures to ensure their long-term sustainability[1279]. Additional provisions permitting the Commission to adopt measures relating to the "quantity of any species or stock which may be caught"[1280], "the level of fishing effort"[1281] or limits on fishing capacity[1282] may be applied to the full extent of the range of the stocks for which it has responsibility or to specific areas within the Convention Area[1283].

[1276] Cullis-Suzuki, S. and D. Pauly (2010). "Failing the high seas: A global evaluation of regional fisheries management organizations." Marine Policy **34**(5): 1036-1042.
[1277] Gilman, E., K. Passfield and K. Nakamura (2014). "Performance of regional fisheries management organizations: ecosystem-based governance of bycatch and discards." Fish and Fisheries **15**(2): 327-351.
[1278] See also the relatively high assessment of the WCPFC against 11 other RFMOs across 28 criteria in Pentz, B., N. Klenk, S. Ogle and J. A. D. Fisher (2018). "Can regional fisheries management organizations (RFMOs) manage resources effectively during climate change?" Marine Policy **92**: 13-20.
[1279] WCPF Convention Article 10(1): "Without prejudice to the sovereign rights of coastal States for the purpose of exploring and exploiting, conserving and managing highly migratory fish stocks within areas under national jurisdiction, the functions of the Commission shall be to: (a) determine the total allowable catch or total level of fishing effort within the Convention Area for such highly migratory fish stocks as the Commission may decide and adopt such other conservation and management measures and recommendations as may be necessary to ensure the long-term sustainability of such stocks".
[1280] WCPF Convention Article 10(2): "In giving effect to paragraph 1, the Commission may adopt measures relating to, inter alia: (a) the quantity of any species or stocks which may be caught".
[1281] WCPF Convention Article 10(2)(b): "the level of fishing effort".
[1282] WCPF Convention Article 10(2)(c): "limitations of fishing capacity, including measures relating to fishing vessel numbers, types and sizes".
[1283] WCPF Convention Article 3(3): "This Convention applies to all stocks of highly migratory fish within the Convention Area except sauries. Conservation and management measures under this Convention shall be applied throughout the range of the stocks, or to specific areas within the Convention Area, as determined by the Commission."

The power to adopt limits is backed by compatibility requirements that reflect those in UNFSA[1284], including reciprocal duties not to undermine existing measures[1285] and a duty to take into account existing subregional measures[1286]. Ultimately, the WCPFC's power to adopt CMMs is bound to the purpose of conserving and sustainably managing stocks "in the Convention Area in their entirety"[1287] but they do not necessarily need to apply to stocks across the full extent of their range[1288] [1289].

As in UNFSA Article 5, Members are required to adopt measures[1290] that are "based on the best scientific advice available and are designed to maintain or restore stocks at levels capable of producing maximum sustainable yield"[1291]. However, like UNFSA, the economic factors that qualify this provision mean the best available science is not the only factor to be considered in determining a TAC/TAE. The scientific basis for reference points and CMMs more broadly is supported by the Commission's functions regarding data standards and the collection, verification, evaluation and dissemination of scientific data and advice[1292], and the ability to enter into agreement with regional

[1284] WCPF Convention Article 8: "(1) Conservation and management measures established for the high seas and those adopted for areas under national jurisdiction shall be compatible in order to ensure conservation and management of highly migratory fish stocks in their entirety. To this end, the members of the Commission have a duty to cooperate for the purpose of achieving compatible measures in respect of such stocks"; "(2) In establishing compatible conservation and management measures for highly migratory fish stocks in the Convention Area, the Commission shall: (a) take into account the biological unity and other biological characteristics of the stocks and the relationships between the distribution of the stocks, the fisheries and the geographical particularities of the region concerned, including the extent to which the stocks occur and are fished in areas under national jurisdiction".

[1285] See WCPFC Convention Article 8(2)(b)(c)(d).

[1286] See WCPFC Convention Article 8(2): "In establishing compatible conservation and management measures for highly migratory fish stocks in the Convention Area, the Commission shall: (c) take into account previously agreed measures established and applied in accordance with the 1982 Convention and the Agreement in respect of the same stocks by a subregional or regional fisheries management organization or arrangement;"

[1287] WCPF Convention Article 5 chapeau: "In order to conserve and manage highly migratory fish *stocks in the Convention Area in their entirety*, the members of the Commission shall…" (emphasis added).

[1288] The Commission may also adopt spatial and temporal limits in accordance with Article 10(2)(d): "the areas and periods in which fishing may occur".

[1289] WCPF Convention Article 3(3): "Conservation and management measures under this Convention shall be applied throughout the range of the stocks, or to specific areas within the Convention Area, as determined by the Commission…".

[1290] WCPF Convention Article 5(a).

[1291] MSY is qualified by language almost identical to that in UNFSA, with an additional reference to SIDS: WCPF Convention Article 5: "…the members of the Commission shall… (c) ensure that such measures are based on the best scientific evidence available and are designed to maintain or restore stocks at levels capable of producing maximum sustainable yield, as qualified by relevant environmental and economic factors, including the special requirements of developing States *in the Convention Area, particularly small island developing States*, and taking into account fishing patterns, the interdependence of stocks and any generally recommended international minimum standards, whether subregional, regional or global". (italicised text is additional to the language in UNFSA Article 5(b).

[1292] WCPF Convention Article 10(1): "Without prejudice to the sovereign rights of coastal States for the purpose of exploring and exploiting, conserving and managing highly migratory fish stocks within areas under national jurisdiction, the functions of the Commission shall be to: (d) adopt standards for collection, verification and for the timely exchange and reporting of data on fisheries for highly migratory fish stocks in the Convention Area in accordance with Annex I of the Agreement, which shall form an integral part of this Convention; (e) compile and disseminate accurate and complete statistical data to ensure that the best

organisations such as the Pacific Community (SPC)[1293] and FFA to obtain the best available scientific information[1294] [1295].

Members are required also to apply the precautionary approach[1296] in accordance with the guidelines in UNFSA Annex II[1297], and set stock-specific reference points, again based on the best scientific evidence available. Like UNFSA, Members are required to be cautious when information is uncertain, unreliable or inadequate[1298] or in relation to new or exploratory fisheries[1299], and ensure that reference points are not exceeded, or take predetermined action if they are[1300]. For new and exploratory fisheries, the Convention also requires that the Commission adopt "cautious conservation and management measures, including, inter alia, catch limits and effort limits"[1301].

The WCPFC-CA places a limit on the effect of its CMMs to *within* the Convention Area. In cases where a stock's full range extends beyond the WCPFC-CA, the WCPF Convention requires the Commission to cooperate with other RFMOs, notably the IATTC, to ensure both organisations' measures are consistent with each other. However, the language of this provision falls well short of creating an obligation that consistent CMMs must be adopted in every case[1302].

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scientific information is available, while maintaining confidentiality, where appropriate; (f) obtain and evaluate scientific advice, review the status of stocks, promote the conduct of relevant scientific research and disseminate the results thereof".

[1293] SPC provides scientific services to the WCPFC under WCPFC and SPC (2016). Memorandum of Understanding Between the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean and the Pacific Community. 15 March 2016.

[1294] WCPF Convention Article 22(5): "The Commission may enter into relationship agreements with the organizations referred to in this article and with other organizations as may be appropriate, such as the Pacific Community and the South Pacific Forum Fisheries Agency, with a view to obtaining the best available scientific and other fisheries-related information to further the attainment of the objective of this Convention and to minimize duplication with respect to their work."

[1295] See also WCPF Convention Article 23(2): "Each member of the Commission shall: (a) provide annually to the Commission statistical, biological and other data and information in accordance with Annex I of the Agreement and, in addition, such data and information as the Commission may require;".

[1296] WCPF Convention Article 5: "…the members of the Commission shall…(c): apply the precautionary approach in accordance with this Convention and all relevant internationally agreed standards and recommended practices and procedures".

[1297] WCPF Convention Article 6(1): "In applying the precautionary approach, the members of the Commission shall: (a) apply the guidelines set out in Annex II of the Agreement, which shall form an integral part of this Convention, and determine, on the basis of the best scientific information available, stock-specific reference points and the action to be taken if they are exceeded".

[1298] WCPF Convention Article 6(2): "Members of the Commission shall be more cautious when information is uncertain, unreliable or inadequate. The absence of adequate scientific information shall not be used as a reason for postponing or failing to take conservation and management measures".

[1299] WCPF Convention Article 6(5).

[1300] WCPF Convention Article 6(1)(a) and (3). See further subsection 4.3.5 *Flexible* below.

[1301] WCPF Convention Article 6(5): "For new or exploratory fisheries, members of the Commission shall adopt as soon as possible cautious conservation and management measures, including, inter alia, catch limits and effort limits…".

[1302] WCPF Convention contains a general obligation to cooperate with other RMFOs in Article 22(2), and a specific obligation in relation to the IATTC in Article 22(4): "The Commission shall cooperate with the Inter-American Tropical Tuna Commission to ensure that the objective set out in article 2 of this Convention is

The Commission may adopt measures relating to the type of fishing gear that may be used[1303] and the Convention is not restricted to certain types of gear. By implication, CMMs may apply to mortality by all or particular gear types but this is not explicit.

Beyond gear type, other provisions suggest the WCPFC may institute measures that account for all sources of mortality, including as bycatch. For example, measures that are "designed to maintain or restore stocks at levels capable of producing [MSY]"[1304] and "take into account the biological unity…of the stocks"[1305] suggest that they should address mortality across the entire stock. Commission members' duties to "assess the impacts of fishing, other human activities and environmental factors on target stocks, non-target species, and species belonging to the same ecosystem or dependent upon or associated with the target stocks"[1306] and to "…minimize waste, discards, catch by lost or abandoned gear, pollution originating from fishing vessels, catch of non-target species…and impacts on associated or dependent species…"[1307] have similar implications[1308]. The Convention thus allows for measures to address bycatch and discards and to include them in calculations of catch or effort against a TAC or TAE, but this is not an explicit requirement.

The WCPFC Convention is assessed as scoring 10 out of a possible 18 points for the *limited* criterion.

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reached. To that end, the Commission shall initiate consultation with the Inter-American Tropical Tuna Commission *with a view to reaching agreement* on a consistent set of conservation and management measures, including measures relating to monitoring, control and surveillance, for fish stocks that occur in the Convention Areas of both organizations." (emphasis added).

[1303] WCPFC Convention Article 10(2): "…the Commission may adopt measures relating to, inter alia (f) the fishing gear and technology which may be used".

[1304] WCPF Convention Article 5(b): "ensure that such measures are based on the best scientific evidence available and are designed to maintain or restore stocks at levels capable of producing maximum sustainable yield, as qualified by relevant environmental and economic factors, including the special requirements of developing States in the Convention Area, particularly small island developing States, and taking into account fishing patterns, the interdependence of stocks and any generally recommended international minimum standards, whether subregional, regional or global".

[1305] WCPF Convention Article 8(2): "In establishing compatible conservation and management measures for highly migratory fish stocks in the Convention Area, the Commission shall: (a) take into account the biological unity and other biological characteristics of the stocks and the relationships between the distribution of the stocks, the fisheries and the geographical particularities of the region concerned, including the extent to which the stocks occur and are fished in areas under national jurisdiction".

[1306] WCPF Convention Article 5(d): "assess the impacts of fishing, other human activities and environmental factors on target stocks, non-target species, and species belonging to the same ecosystem or dependent upon or associated with the target stocks".

[1307] WCPF Convention Article 5(e): "adopt measures to minimize waste, discards, catch by lost or abandoned gear, pollution originating from fishing vessels, catch of non-target species, both fish and non-fish species, (hereinafter referred to as non-target species) and impacts on associated or dependent species, in particular endangered species and promote the development and use of selective, environmentally safe and cost-effective fishing gear and promote the development and use of selective, environmentally safe and cost-effective fishing gear and techniques".

[1308] See also WCPF Convention Article 10(1)(c): "…adopt, where necessary, conservation and management measures and recommendations for non-target species and species dependent on or associated with the target stocks, with a view to maintaining or restoring populations of such species above levels at which their reproduction may become seriously threatened".

5.3.2 Exclusive

The Commission may determine allocations of a TAC or TAE to the national scale[1309] and may develop allocation criteria[1310] based on factors specified in Article 10(3)[1311]. Exclusivity of allocations is bolstered by the prohibition on unauthorised fishing for highly migratory stocks on high seas areas of the Convention Area[1312] or in the EEZ of another State[1313].

The combined effect of UNFSA Article 8(4)[1314], and WCPF Convention Articles 20(5)[1315], 21[1316] and Article 37[1317] is that the Convention only allows vessels flying the flag of a State or entity that is bound by the Convention and/or Commission CMMs to fish for highly migratory stocks in the Convention Area. The only exceptions to this would be States that are Party to neither UNFSA nor the WCPF Convention[1318]. Members are required to request non-parties to the WCPF Convention whose vessels fish in the Convention Area to cooperate fully with the Commission's CMMs and, as noted in subsection 5.2.5 above, the Convention provides for the participation of non-members in fisheries that are subject to the competence of the Commission[1319]. Although all CCMs are bound by CMMs[1320], there is nothing

[1309] WCPF Convention Article 10(4): "The Commission may adopt decisions relating to the allocation of the total allowable catch or the total level of fishing effort. Such decisions, including decisions relating to the exclusion of vessel types, shall be taken by consensus".
[1310] WCPF Convention Article 10 (1): "Without prejudice to the sovereign rights of coastal States for the purpose of exploring and exploiting, conserving and managing highly migratory fish stocks within areas under national jurisdiction, the functions of the Commission shall be to: (g) develop, where necessary, criteria for the allocation of the total allowable catch or the total level of fishing effort for highly migratory fish stocks in the Convention Area".
[1311] WCPF Convention Article 10(3): "In developing criteria for allocation of the total allowable catch or the total level of fishing effort the Commission shall take into account, inter alia…".
[1312] WCPF Convention Article 24(2).
[1313] WCPF Convention Article 24(3)(a).
[1314] UNFSA Article 8(4): "Only those States which are members of such an organization or participants in such an arrangement, or which agree to apply the conservation and management measures established by such organization or arrangement, shall have access to the fishery resources to which those measures. apply." The main risk to WCPFC fisheries is therefore posed vessels flying the flag of those States that are not Party to UNFSA or the WCPF Convention, and therefore not bound by this rule.
[1315] WCPF CMMs are binding on all members, subject to Article 20(6) and (7), which provide for the rights of a member that has voted against a decision of was absent: Article 20(5): "Subject to paragraphs 6 and 7, a decision adopted by the Commission shall become binding 60 days after the date of its adoption."
[1316] WCPF Convention Article 21 on transparency of decision-making.
[1317] WCPF Convention Article 37: "No reservations or exceptions may be made to this Convention".
[1318] *Pacta tertiis* rule. See further, *Security*
[1319] WCPF Convention Article 32(4): "The members of the Commission shall, individually or jointly, request non-parties to this Convention whose vessels fish in the Convention Area to cooperate fully in the implementation of conservation and management measures adopted by the Commission with a view to ensuring that such measures are applied to all fishing activities in the Convention Area. Such cooperating non-parties to this Convention shall enjoy benefits from participation in the fishery commensurate with their commitment to comply with, and their record of compliance with, conservation and management measures in respect of the relevant stocks."
[1320] WCPF Convention Article 23(1): "Each member of the Commission shall promptly implement the provisions of this Convention and any conservation, management and other measures or matters which may be agreed pursuant to this Convention from time to time and shall cooperate in furthering the objective of this Convention." In addition, Article 24(1) requires Flag State to ensure their vessels comply with WCPFC CMMs.

in the Convention to prevent the Commission from adopting a CMM containing provisions that provide an exemption or special rules for a particular member. This is not an unreasonable possibility given the preference for consensus-based decision making[1321] and has been borne out in practice[1322]. Nevertheless, a CCM cannot simply exempt itself from a measure – exemptions must be agreed to by the Commission.

There are no express provisions relating to the power of the Commission to impose penalties for exceeding an allocation but the power to do so is, in all likelihood, inherent in the Commission's broad powers to adopt CMMs. For example, the power to adopt measures "relating to allocation" would reasonably include the power to adopt penalties for exceeding that allocation[1323]. The onus is broadly on Members to enforce the provisions of the Convention and Commission CMMs[1324], including a duty to ensure a vessel flying its flag, having been found to have committed a serious violation, ceases fishing for Convention stocks in the Convention Area until any sanctions imposed by the flag State or relevant coastal State have been complied with[1325].

Other States and entities may accede to the Convention[1326], or participate in its fisheries by agreeing to fully implement the WCPFC's CMMs[1327]. This presents the possibility of new entrants either with

[1321] WCPF Convention Article 20 (1): "As a general rule, decision-making in the Commission shall be by consensus. For the purposes of this article, "consensus" means the absence of any formal objection made at the time the decision was taken."

[1322] For example, see WCPFC (2018). Conservation and Management Meaure for Bigeye, Yellowfin and Skipjack Tuna in the Western and Central Pacific Ocean. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2018-01**. Attachment 2 Measure for Philippines.

[1323] WCPFC Convention Article 10(4).

[1324] WCPFC Convention Article 25(1): "Each member of the Commission shall enforce the provisions of this Convention and any conservation and management measures issued by the Commission."

[1325] WCPFC Convention Article 25(4): "Each member of the Commission shall ensure that, where it has been established, in accordance with its laws, that a fishing vessel flying its flag has been involved in the commission of a serious violation of the provisions of this Convention or of any conservation and management measures adopted by the Commission, the vessel concerned ceases fishing activities and does not engage in such activities in the Convention Area until such time as all outstanding sanctions imposed by the flag State in respect of the violation have been complied with. Where the vessel concerned has conducted unauthorized fishing within areas under the national jurisdiction of any coastal State Party to this Convention, the flag State shall, in accordance with its laws, ensure that the vessel complies promptly with any sanctions which may be imposed by such coastal State in accordance with its national laws and regulations or shall impose appropriate sanctions in accordance with paragraph 7. For the purposes of this article, a serious violation shall include any of the violations specified in article 21, paragraphs 11 (a) to (h) of the Agreement and such other violations as may be determined by the Commission."

[1326] The key provision here is WCPF Convention Article 35(1): "This Convention shall remain open for accession by the States referred to in article 34, paragraph 1, and by any entity referred to in article 305, paragraph 1, subparagraphs (c), (d) and (e) of the 1982 Convention which is situated in the Convention Area." Also Article 35(2): "After the entry into force of this Convention, the Contracting Parties may, by consensus, invite other States and regional economic integration organizations, whose nationals and fishing vessels wish to conduct fishing for highly migratory fish stocks in the Convention Area to accede to this Convention."

[1327] WCPFC Convention Article 32(4): "The members of the Commission shall, individually or jointly, request non-parties to this Convention whose vessels fish in the Convention Area to cooperate fully in the implementation of conservation and management measures adopted by the Commission with a view to ensuring that such measures are applied to all fishing activities in the Convention Area. Such cooperating non-parties to this Convention shall enjoy benefits from participation in the fishery commensurate with their

waters under their national jurisdiction in the Convention Area[1328] or whose vessels wish to fish for highly migratory species in the Convention Area[1329]. It is difficult to see the former occurring given that almost all coastal States and territories within the WCPFC-CA are already members or participating territories in their own right[1330]. New member or participant fishing States, on the other hand, could potentially add pressure to increase the TAC or TAE to accommodate new fishing interests without reducing allocations to other CCMs. The Convention delegates to the Commission the "means by which the fishing interests of any new member…may be accommodated"[1331], leaving open the possibility that exclusivity could be undermined by new entrants.

The Convention is assessed as scoring six of a possible 12 points for the *exclusive* criterion.

5.3.3 Secure

Any measures adopted by the Commission, including CMMs, are binding on all Members and cooperating non-members[1332]. Again, however, the exact provisions of a CMM will determine whether they are truly binding.

While there is no time limit on the duration of allocations in the Convention, Commission decisions on allocations may only be made by consensus[1333], which could support quite stable allocations, once

commitment to comply with, and their record of compliance with, conservation and management measures in respect of the relevant stocks."

[1328] WCPFC Convention Article 35(1) and LOSC Article 305(1)(c), (d) and (e). One exception is the United Kingdom, with respect to Pitcairn has not yet acceded to the Convention. It remains to be seen whether it will following the conclusion of the UK's departure from the European Union.

[1329] WCPFC Convention Article 35(2): "After the entry into force of this Convention, the Contracting Parties may, by consensus, invite other States and regional economic integration organizations, whose nationals and fishing vessels wish to conduct fishing for highly migratory fish stocks in the Convention Area to accede to this Convention." Although this provision permits the Parties to *invite* new entrants, this is subject to the corresponding provisions in UNFSA Article 8.

[1330] Note that Pitcairn's EEZ is in the IATTC-WCPFC overlap area (and in the IATTC Convention Area) but is not a Participating Territory of the WCPFC. The United Kingdom is eligible to accede to the WCPFC in respect of Pitcairn but has not done so. See WCPF Convention Articles 34(1) and 35.

[1331] WCPFC Convention Article 10(1): "Without prejudice to the sovereign rights of coastal States for the purpose of exploring and exploiting, conserving and managing highly migratory fish stocks within areas under national jurisdiction, the functions of the Commission shall be to:…(k) agree on means by which the fishing interests of any new member of the Commission may be accommodated".

[1332] WCPF Convention Article 23(1): "Each member of the Commission shall promptly implement the provisions of this Convention and any conservation, management and other measures or matters which may be agreed pursuant to this Convention from time to time and shall cooperate in furthering the objective of this Convention." In addition, Article 24(1) requires Flag State to ensure their vessels comply with WCPFC CMMs.

[1333] WCPF Convention WCPF Convention Article 10(4): "The Commission may adopt decisions relating to the allocation of the total allowable catch or the total level of fishing effort. Such decisions, including decisions relating to the exclusion of vessel types, shall be taken by consensus".

agreed. Disputes between members are to be resolved in accordance with UNFSA Part VIII[1334] [1335], which opens the possibility of dispute resolution between the concerned parties, by conciliation or arbitration[1336].

While no provisions require that national allocations be recorded in a register, the fact that they will be agreed under a CMM suggests strongly that they will be recorded *in* the CMM, and therefore possess some legal force[1337]. At the individual user scale, States are required to maintain[1338] and share with the Commission[1339] a record of authorisations to fish on the high seas or in other States' EEZs but there is no indication in the Convention as to the degree to which the record constitutes evidence of a legally enforceable right to fish. At best it could provide evidence of an access right but none of the vessel record information required to be shared with the Commission could be construed as constituting a clear quantified withdrawal right[1340].

Authorisations to fish exclusively within the EEZ of the flag State of the vessel are notably absent from the requirement to maintain and share a record of vessels. Whether such a record is required for domestic vessels therefore rests exclusively in the hands of the relevant State.

[1334] WCPF Convention Article 31: "The provisions relating to the settlement of disputes set out in Part VIII of the Agreement apply, mutatis mutandis, to any dispute between members of the Commission, whether or not they are also Parties to the Agreement." In effect this points to the dispute settlement mechanisms in Part XV of LOSC.

[1335] Disputes concerning fishing entities are to be dealt with in accordance with WCPF Convention Annex I(3): "If a dispute concerning the interpretation or application of this Convention involving a fishing entity cannot be settled by agreement between the parties to the dispute, the dispute shall, at the request of either party to the dispute, be submitted to final and binding arbitration in accordance with the relevant rules of the Permanent Court of Arbitration."

[1336] See LOSC Part XV Settlement of Disputes.

[1337] WCPF Convention Article 10(4).

[1338] WCPF Convention Article 24(4) "Each member of the Commission shall, for the purposes of effective implementation of this Convention, maintain a record of fishing vessels entitled to fly its flag and authorized to be used for fishing in the Convention Area beyond its area of national jurisdiction, and shall ensure that all such fishing vessels are entered in that record."

[1339] WCPF Convention Article 24(5): "Each member of the Commission shall provide annually to the Commission, in accordance with such procedures as may be agreed by the Commission, the information set out in Annex IV to this Convention with respect to each fishing vessel entered in the record required to be maintained under paragraph 4 and shall promptly notify the Commission of any modifications to such information."

[1340] WCPF Convention Annex IV "The following information shall be provided to the Commission in respect of each fishing vessel entered in the record required to be maintained under article 24, paragraph 4, of this Convention: 1. Name of fishing vessel, registration number, previous names (if known), and port of registry; 2. Name and address of owner or owners; 3. Name and nationality of master; 4. Previous flag (if any); 5. International Radio Call Sign; 6. Vessel communication types and numbers (INMARSAT A, B and C numbers and satellite telephone number); 7. Colour photograph of vessel; 8. Where and when built; 9. Type of vessel; 10. Normal crew complement; 11. Type of fishing method or methods; 12. Length; 13. Moulded depth; 14. Beam; 15. Gross register tonnage; 16. Power of main engine or engines; 17. The nature of the authorization to fish granted by the flag State; 18. Carrying capacity, including freezer type, capacity and number and fish hold capacity." Item 17 provides the closest basis for a quantifiable right to be specified but the provision is vague.

The Convention is assessed as scoring 10 out of a possible 15 points for the *secure* criterion.

5.3.4 Transferable

The Commission's power to "adopt decisions relating to allocation" of TAC or TAE[1341] arguably allows for such decisions to specify whether allocations may be transferred and how transfers may be conducted. Beyond this, the WCPF Convention does not appear to advance or place any constraints on the provisions in UNFSA relating to the transferability of allocations, either in whole or in part, of access and withdrawal rights at any scale.

That allocations may be *transferable*, but not explicitly so, has resulted in a score of four out of a possible 12 points for the this criterion.

5.3.5 Flexible

The breadth of measures and regulations that the Commission may adopt for the conservation and management of fish stocks permits the adoption of allocation systems that are as flexible as the members are able to agree.

For example, in implementing the precautionary approach, Commission members are required to apply the guidelines in UNFSA Annex II and determine stock-specific reference points and actions to be taken if they are exceeded[1342]. Such actions (i.e. harvest control rules) may be in response to a range of uncertainties[1343], for which measures could reasonably be expected, but not guaranteed, to address through some degree of built-in flexibility. Members are required to revise CMMs when new information arises[1344], and to adopt emergency measures in response to "a natural phenomenon [that] has a significant adverse impact on the status of highly migratory fish stocks", although these introduce an element of unpredictability in the rules if not tied to harvest control rules[1345]. Some provisions call

[1341] WCPF Convention Article 10(4): "The Commission may adopt decisions relating to the allocation of the total allowable catch or the total level of fishing effort. Such decisions, including decisions relating to the exclusion of vessel types, shall be taken by consensus".
[1342] WCPF Convention Article 6(1): "In applying the precautionary approach, the members of the Commission shall: (a) apply the guidelines set out in Annex II of the Agreement, which shall form an integral part of this Convention, and determine, on the basis of the best scientific information available, stock-specific reference points and the action to be taken if they are exceeded".
[1343] WCPF Convention Article 6(1)(b): Members are required to "take into account, inter alia, uncertainties relating to the size and productivity of the stocks, reference points, stock condition in relation to such reference points, levels and distributions of fishing mortality and the impact of fishing activities on non-target and associated or dependent species, as well as existing and predicted oceanic, environmental and socio-economic conditions".
[1344] WCPF Convention Article 6(4): "Where the status of target stocks or non-target or associated or dependent species is of concern, members of the Commission shall subject such stocks and species to enhanced monitoring in order to review their status and the efficacy of conservation and management measures. They shall revise those measures regularly in the light of new information".
[1345] WCPF Convention Article 6(6): "If a natural phenomenon has a significant adverse impact on the status of highly migratory fish stocks, members of the Commission shall adopt conservation and management measures on an emergency basis to ensure that fishing activity does not exacerbate such adverse impacts. Members of

for more predictable flexibility, such as requirements that members agree in advance to measures to be taken should reference points be exceeded[1346], and provide for the gradual development of new and exploratory fisheries, through, among other things, precautionary CMMs and catch and effort limits[1347].

Catch and effort allocations are not defined as either volumetric or proportional limits and therefore could conceivably be defined as either.

The WCPF Convention is assessed as scoring eight of a possible 15 points for the *flexible* criterion.

5.3.6 Conclusion

This section has analysed the WCPF Convention against the property rights criteria identified in Chapter Three. It scored 38 in total, with relatively high scores on limited, secure and flexible. Table 5.1 summarises the analysis by scoring the Convention against the questions under each criterion. A more detailed analysis supporting these scores is contained in the Annex, Table A.1.

the Commission shall also adopt such measures on an emergency basis where fishing activity presents a serious threat to the sustainability of such stocks. Measures taken on an emergency basis shall be temporary and shall be based on the best scientific information available".

[1346] WCPF Convention Article 6(3): "Members of the Commission shall take measures to ensure that, when reference points are approached, they will not be exceeded. In the event they are exceeded, members of the Commission shall, without delay, take the action determined under paragraph 1(a) to restore the stocks.

[1347] WCPF Convention Article 6(5): "For new or exploratory fisheries, members of the Commission shall adopt as soon as possible cautious conservation and management measures, including, inter alia, catch limits and effort limits. Such measures shall remain in force until there are sufficient data to allow assessment of the impact of the fisheries on the long-term sustainability of the stocks, whereupon conservation and management measures based on that assessment shall be implemented. The latter measures shall, if appropriate, allow for the gradual development of the fisheries."

Table 5.1: WCPF Convention: evaluation against property rights criteria

Criteria	Question	Score	Ref
Limited	set a regional or subregional scale catch or effort limit?	2	Art.10(1)(a);(2)(a)(b)(c),6(5)
	base limits on the best scientific evidence available?	2	Art.5(b)
	base limits on the precautionary approach?	2	Art.5(c),6
	apply limits to the full geographic range of the stock?	2	Art.3(3),8,22(4)
	ensure limits account for catches of the limited species by all gear types?	1	Art.10(2)(f)
	power to record bycatch of the target species against limits for that species?	1	Art.10(1)(c)
	Subtotal	**10**	
Exclusive	allocate national scale limits as a share of the regional TAC/TAE?	2	Art.10(1)(g),10(4)
	new entrants either excluded or able to participate without adding to TAC/TAE?	1	Art.10(1)(k),32,35,
	prohibit exemptions to the limit (or exemptions not provided for)?	2	Art.20(5),37
	to impose penalties for exceeding national limits?	1	Art25
	Subtotal	**6**	
Secure	national limits valid for more than one year?	1	Art.10(4)
	national limits valid until Parties agree to amend them? (default = perpetuity)	3	Art.10(4)
	make national limits binding on Parties?	2	Art.23(1),24(1)
	resolve disputes beyond bilateral negotiation	2	Art.31
	establish a record of national scale limits (e.g. in a regional register or CMM)?	2	Art.10(4),24(4)(5)
	Subtotal	**10**	
Transferable	transfer a national limit in full or in part to another CCM?	1	Art.10(4)
	require new entrants to acquire an allocation through a transfer from a CCM?	1	Art.10(4)
	specify a process for effecting a transfer?	1	Art.10(4)
	record transfers in a register?	1	Art.10(4)
	Subtotal	**4**	
Flexible	set a TRP the target stock(s)?	2	Art.6(1)(a)
	establish harvest control rules for the target stock(s)?	2	Art.6(1)(a)(b)(3)
	adjust a TAC/TAE on the basis of environmental factors and stock assessments?	2	Art.6(1)(3)(5)(6)
	define national limits as a proportional (rather than volumetric) share of the regional TAC/TAE?	1	
	establish clear processes for a TAC/TAE to be adjusted?	1	
	Subtotal	**8**	
TOTAL		**38**	

5.4 Scoping: Rights-based instruments in WCPFC CMMs

5.4.1 Introduction

This section defines the scope of the analysis in the remainder of this Chapter. Specifically, it assesses each WCPFC CMM that was in force as at 17 February 2021[1348] to determine whether it is within or outside the scope of the study.

Of interest to the study are CMMs that establish one or more fisheries management instrument that may establish a right-like instrument. The geographic focus is centred on CMMs with application to fisheries in the tropical and southern areas of the WCPO and therefore of particular interest to Pacific island members of the FFA. CMMs that are excluded from the study therefore include those that:

- establish meta rules relating to WCPFC governance, including rules about the adoption of CMMs (subsection 5.4.2); or
- establish accountability rules that are entirely concerned with compliance with other CMMs (subsection 5.4.3); or
- apply to stocks exclusively in the north Pacific (subsection 5.4.4); or
- set command and control rules, which establish a right, duty or prohibition that applies to all participants in the fishery without quantitatively limiting those rights, duties or prohibitions, with the effect that compliance will result in a public good benefit, rather than an exclusive benefit to the complying participant (subsection 5.4.5).

Some measures that fit into the above categories are likely to enable RBM in ways that address elements of the property rights criteria (subsection 5.4.6). Measures that may directly provide a basis for right-like instruments are characterised by limits on capacity, effort or catch that are, or could be, allocated in exclusive portions (rights) to potential users of a resource (subsection 5.4.7). This means that exercising a right arising from such a rule has predominantly private benefits. These, and CMMs that enable RBM, are assumed to be within scope.

5.4.2 CMMs that establish meta rules

Four CMMs operate at a meta-level of governance, which is to say that they set out rules by which the WCPFC operates or establish rules for the adoption of rules. A fifth CMM is primarily a meta-rule but is assessed as enabling RBM and is therefore included in the scope of the study (CMM2014-6 on harvest strategies).

[1348] All 41 CMMs that are currently in force are compiled in WCPFC (2021). Conservation and Management Measures (CMMs) and Resolutions of the WCPFC. Compiled 17 Feb 2021. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). They are available at WCPFC. (2021). "Conservation and Management Measures (last updated 17 February 2021)." Retrieved 8 May, 2021, from https://www.wcpfc.int/conservation-and-management-measures.

CMM2004-04 provides for the Commission to adopt at its second regular session CMMs which "may include, inter alia, (a) [c]atch and/or effort limits; (b) [c]apacity limits for large scale tuna fishing vessels; (c) [m]easures to address impacts of large-scale tuna fishing vessels so as to ensure compatibility between measures applied outside areas of national jurisdiction and measures being applied by coastal States to manage fishing by such vessels within their zones; (d) time and area closures; and (e) [m]itigation measures to address the mortality of non-target species e.g. seabirds, turtles and sharks"[1349]. CMM2004-04 sets out, inter alia, matters on which the WCPFC may adopt measures, including measures that could provide a basis for elements of RBM instruments. However, it adds little to the powers already specified in the WCPF Convention Article 10(2), with the possible clarification on bycatch in paragraph (e)[1350].

CMM 2013-06[1351] and **CMM 2013-07**[1352] both relate to the special requirements of developing States. CMM 2013-06 sets out criteria against which proposed new CMMs must be assessed in order to ensure that they avoid placing a disproportionate burden on small island developing States and territories (SIDSTs), in accordance with Article 30 of the WCPF Convention. CMM 2013-07 identifies a range of ways in which CCMs shall cooperate "to enhance the ability of developing States, particularly the least developed among them and SIDS and territories in the Convention Area, to develop their own domestic fisheries for highly migratory fish stocks, including but not limited to the high seas within the Convention Area"[1353]. These two CMMs aim to ensure that CMMs address certain social objectives but do not themselves directly address social objectives. They are excluded from this study.

CMM2019-01[1354] gives effect to Article 32 of the WCPF Convention, which sets out the process and procedures by which non-members may seek cooperating non-member (CNM) status, enabling them to participate in WCPFC fisheries in compliance with WCPFC CMMs.

CMM2014-06[1355] commits the Commission to establishing a harvest strategy for key fisheries and stocks. It sets out principles and elements of harvest strategies and a work plan to develop harvest strategies. It does not itself set TRPs or LRPs or establish harvest control rules, without which CMM

[1349] WCPFC (2004). Resolution on Conservation and Management Measures. CMM 2004-04. Pohnpei, Western and Central Pacific Fisheries Commission. para 4.
[1350] See subsection 5.2.3 above.
[1351] WCPFC (2013). Conservation and Management Measure on the Criteria for the Consideration of Conservation and Management Proposals. WCPFC. Agreed at the Tenth Regular Session of the Western and Central Pacific Fisheries Commission (WCPFC), Cairns, Australia 2-6 December 2013 **CMM 2013-06**.
[1352] WCPFC (2013). Conservation and Management Measure on the Special Requirements of Small Island Developing States and Territories. WCPFC. Agreed at the Tenth Regular Session of the Western and Central Pacific Fisheries Commission (WCPFC), Cairns, Australia 2-6 December 2013 **CMM 2013-07**.
[1353] CMM2013-07 para 2.
[1354] WCPFC (2019). Conservation and Management Measure on Cooperating Non-Members. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2019-01**.
[1355] WCPFC (2014). Conservation and Management Measure on Establishing a Harvest Strategy for Key Fisheries and Stocks in the Western and Central Pacific Ocean. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM 2014-06**.

2014-06 has no substantive effect on the management of the WCPO tuna fisheries. However, subsequent CMMs that give effect to CMM2014-06 may do so. CMM 2014-06 is included in the analysis.

5.4.3 Accountability CMMs

The central purpose of 20 CMMs is to establish components of the compliance, MCS and enforcement framework of the WCPFC. These are elements that would fall under the SEASALT criterion of "accountability"[1356]. Accountability mechanisms are essential for the effective implementation of fisheries management measures by deterring, eliminating and reducing non-compliance. This is the case whether those measures are command and control rules or rights-based instruments.

However, the focus of this study is on those measures that establish right-like instruments, not whether mechanisms for ensuring compliance with those measures are in place or how effectively those measures, or indeed those compliance mechanisms, are implemented. Compliance with CMMs is therefore assumed. Sixteen accountability CMMs are excluded from the study. The remaining four accountability CMMs are also assessed as enabling RBM for the purposes of this analysis (see subsection 5.4.6).

The following is a brief summary of the 17 CMMs excluded from the study due to their focus on accountability rules.

Two CMMs set out vessel identification requirements. **CMM2004-03**[1357] establishes requirements for the implementation of the *FAO Standard Specification for the Marking and Identification of Fishing Vessels Fishing for Highly Migratory Stocks in the WCPFC*. **CMM2013-04**[1358] implements the WCPFC Unique Vessel Identifier.

Four CMMs establish and guide the work of the WCPFC Regional Observer Program (ROP). **CMM2006-07**[1359] initiated processes to establish the ROP. **CMM2017-03**[1360] sets out measures to be taken in relation to the safety of observers under the ROP. **CMM2018-05**[1361] confirms the establishment of the ROP, its objectives, the functions, rights and responsibilities of observers and the roles, rights

[1356] See Chapter Two section 2.6.
[1357] WCPFC (2004). Conservation and management measures on specifications for the marking and identification of fishing vessels. Pohnpei, Western and Central Pacific Fisheries Commision (WCPFC). **CMM2004-03**.
[1358] WCPFC (2013). Conservation and Management Meaure for WCPFC Implementation of a Unique Vessel Identifier (UVI). Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2013-04**.
[1359] WCPFC (2006). Conservation and Management Measure for the Regional Observer Programme. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2006-07**.
[1360] WCPFC (2017). Conservation and Management Measure on Protection of WCPFC ROP observers. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2017-03**.
[1361] WCPFC (2018). Conservation and Management Measure for the Regional Observer Programme. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2018-05**.

and duties of the Commission, individual members, Secretariat and vessels. **CMM2012-03**[1362] relates to the implementation of the ROP north of 20ºN.

CMM2006-08[1363] sets out the WCPFC boarding and inspection procedures and defines "serious violation"[1364] under the WCPF Convention[1365].

CMM2009-06[1366] regulates transhipment in the WCPFC-CA and implements or further strengthens the transhipment provisions of the WCPF Convention[1367].

CMM2009-09[1368] establishes rules related to vessels without nationality and declares that fishing for highly migratory stocks by vessels without nationality in high seas areas of the WCPFC-CA constitutes a serious violation[1369].

CMM2009-10[1370] provides for an arrangement to collect data from canneries in "a Non-CCM"[1371] relating to purse seine catches in the WCPFC-CA.

CMM2014-02[1372] establishes the Commission vessel monitoring system.

CMM2016-02[1373] sets out compliance and monitoring rules relating to the eastern high seas pocket between the EEZs of French Polynesia, Kiribati, and Cook Islands.

CMM2017-02[1374] establishes port inspection processes and procedures.

[1362] WCPFC (2012). Conservation and Management Measure or Implementiation of the ROP by Vessels Fishing for Fresh Fish North of 20 degreesN. Pohnpei, Western and Central P{acific Fisheries Commission (WCPFC). **CMM2012-03**.

[1363] WCPFC (2006). Conservation and Management Measure for the Western and Central Pacific Fisheries Commission Boarding and Inspection Procedures. Pohnpei, Western and Central P{acific Fisheries Commission (WCPFC). **CMM2006-08**.

[1364] CMM2006-08 para 37.

[1365] WCPF Convention Article 25(4).

[1366] WCPFC (2009). Conservation and Management Measures on the Regulation of Transhipment. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2009-06**

[1367] WCPF Convention Article 29.

[1368] WCPFC (2009). Conservation and Management Meaure for Vessels Without Nationality. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2009-09**.

[1369] CMM2009-09 para 2.

[1370] WCPFC (2009). Conservation and Management Measure to Monitor Landings of Purse Seine Vessels at Ports so as to Ensure Reliable Catch Data by Species. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2009-10**.

[1371] This measure relates to data collection in canneries in Thailand. See WCPFC (2010). Summary Report. Sixth Regular Session of the Western and Central Paciifc Fisheries Commission (WCPFC6), 7-11 December 2009, Papeete, Western and Central Paciifc Fisheries Commission (WCPFC). paras 315-22.

[1372] WCPFC (2014). Conservation and Management Measure for the Commission Vessel Monitoring System. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2014-02**.

[1373] WCPFC (2016). Conservation and Management Measure for the Eastern High Seas Pocket Special Management Area. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2016-02**.

[1374] WCPFC (2017). Conservation and Management Measure for Port State Minimum Standards. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2017-02**.

CMM2019-06[1375] sets out the principles and processes for the WCPFC Compliance Monitoring System.

CMM2019-07 [1376] establishes the WCPFC list of vessels presumed to have carried out illegal, unreported and unregulated fishing.

CMM2019-08 [1377] provides for the treatment of chartered vessels, including processes for the notification of charter arrangements and their inclusion in the RFV.

Four accountability CMMs are assessed as providing useful RBM enabling features. **CMM2013-05**[1378] sets out daily high seas catch and effort reporting requirements, including in relation to bycatch and discards. **CMM2014-03**[1379] establishes the WCPFC Record of Fishing Vessels (RFV)[1380]. **CMM 2018-06**[1381] on the WCPFC Record of Fishing Vessels (RFV) and Authorisations to Fish can also be described as addressing a central objective relating to accountability. However, it also provides for specific conditions to be attached to authorisations and recorded in the RFV that provide a basis for fisheries management instruments. These instruments could include licence limitations and other capacity or effort limits. All three CMMs are retained in the group of CMMs for consideration in this study (section 5.7 below).

CMM2019-01 contains a range of compliance requirements to be met by CNMs[1382] in addition to the meta-rules noted in subsection 5.4.2 above. Of relevance to this study, paragraph 12 requires that "the Commission shall, where necessary, determine how the participatory rights of CNMs will be limited by the conservation and management measures adopted by the Commission". As such this CMM may contribute to the assessment of elements relating to new entrants and is therefore included as an RBM-enabling measure.

[1375] WCPFC (2019). Conservation and Management Measure for Compliance Monitoring Scheme. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2019-06**.
[1376] WCPFC (2019). Conservation and Management Measure to establish a list of vessels presumed to have carried out Illegal, Unreported and Unregulated Fishing Activities in the WCPO. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2019-07**.
[1377] WCPFC (2019). Conservation and Management Measure for Charter Notification Scheme. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2019-08**.
[1378] WCPFC (2013). Conservation and Management Measure on Daily Catch and Effort Reporting. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2013-05**.
[1379] WCPFC (2014). Conservation and Management Measure on Standards, Specifications and Procedures for the WCPFC Record of Fishing Vessels. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2014-03**.
[1380] The RFV is publicly accessible at https://www.wcpfc.int/record-fishing-vessel-database
[1381] WCPFC (2018). Conservation and Management Measure for WCPFC Record of Fishing Vessels and Authorisation to Fish. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2018-06**.
[1382] See subsection 5.4.2 above. CMM2019-01 para 11.

5.4.4 CMMs relating exclusively to the North Pacific

Three CMMs relate entirely to the North Pacific and are therefore excluded from the study. These include:

- **CMM2012-03** on implementation of the ROP by vessels fishing north of 20N is also an accountability CMM[1383];
- **CMM2020-02**[1384] on Pacific bluefin; and
- **CMM2019-03**[1385] on North Pacific albacore.

CMM2010-01[1386] on striped marlin in the North Pacific is included in the study as there is debate as to whether it constitutes a separate northern stock[1387].

5.4.5 Command and control CMMs

Seven measures contain instruments that can only be characterised as command-and-control rules.

CMM2008-04[1388] gives effect to UNGA Resolution 46/215[1389] by banning the use of large-scale driftnets on high seas areas of the WCPFC-CA[1390].

CMM2009-05[1391] prohibits fishing vessels from fishing within one nautical mile of, or interacting with, a data buoy.

[1383] See subsection 5.4.3 above.
[1384] WCPFC (2020). Conservation and Management Measure for Pacific Bluefin Tuna. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2020-02**.
[1385] WCPFC (2019). Conservation and Management Measure for North Pacific Albacore. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM 2019-03**.
[1386] WCPFC (2010). Conservation and Management Measure for North Pacific Striped Marlin. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2010-01**.
[1387] CMM2010-01 Preamble: "Acknowledging the advice from the Scientific Committee that the information provided by the ISC does not support classification of North Pacific Striped Marlin as a "northern stock" under Annex 1 of the WCPFC Rules of Procedure".
[1388] WCPFC (2008). Conservation and Management Measure to Prohibit the Use of Large-scale Driftnets on the High Seas in the Convention Area. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC) **CMM2008-04**.
[1389] UNGA (1991). Resolution on large-scale pelagic driftnet fishing and its impact on the living marine resources of the world's oceans and seas. . 10 February. United Nations General Assembly (UNGA). Adopted in New York on 20 Dec. 1991, A/46/PV.79, United Nations. **A/RES/46/215**.
[1390] CMM2008-04 para 1: "The use of large-scale driftnets on the high seas within the Convention Area shall be prohibited and such nets shall be considered prohibited fishing gear, the use of which shall constitute a serious violation in accordance with Article 25 of the Convention". Footnote 1 defines large scale driftnets as "gillnets or other nets or a combination of nets that are more than 2.5 kilometers in length whose purpose is to enmesh, entrap, or entangle fish by drifting on the surface of, or in, the water column".
[1391] WCPFC (2009). Conservation and Management Measure Prohibiting Fishing on Data Buoys. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2009-05**.

CMM2017-04[1392] encourages CCMs that are entitled to "ratify, accept, approve or accede to the annexes of MARPOL and the London Protocol" to do so, and to undertake other specific measures in relation to vessels flying their flag in the WCPFC-CA. The predominance of exhortation rather than strict prohibitions[1393] suggests this measure is less "command-and-control" in the common sense of the phrase but nevertheless meets the definition applied in this study as it does not establish limited rights to pollute.

CMM2018-03[1394] contains rules regarding gear to be employed to prevent seabird bycatch by longline vessels. It does not set any limits on seabird bycatch and is therefore judged to establish command-and-control rules.

CMM2018-04[1395] contains rules to reduce sea turtle mortality. It does not establish limits on turtle bycatch and is therefore regarded as establishing command-and-control rules.

CMM2019-05[1396] prohibits targeting or setting on mobulid rays, and prohibits retaining on board, transhipping or landing any mobulid rays in whole or in part that have been caught in the WCPFC-CA.

CMM2009-02[1397] clarifies certain aspects of the seasonal closure of fish aggregating devices (FADs) in CMM2018-01[1398]. The seasonal FAD closures do not limit effort but simply prohibit setting on FADs during certain periods. CMM2009-02 also contains catch retention rules, which have the character of command-and-control rules but may be relevant to the *limited* property rights criterion (see subsection 4.4.6 below).

5.4.6 RBM-enabling CMMs

As noted above, a number of CMMs contain enabling elements that extend beyond simply ensuring compliance with right-like instruments. These CMMs are relevant to particular elements of the property rights criteria and therefore warrant consideration in this analysis. The CMMs include **CMM2009-**

[1392] WCPFC (2017). Conservation and Management Measure on Marine Pollution. Pohnpei, Western and Central Pacific Commission (WCFPC). **CMM2017-04**.
[1393] CMM2017-04 contains one specific prohibition in para 2: "CCMs shall prohibit their fishing vessels operating within the WCPFC Convention Area from discharging any plastics (including plastic packaging, items containing plastic and polystyrene) but not including fishing gear".
[1394] WCPFC (2018). Conservation and Management Measure to Mitigate impacts of Fishing for Highly Migratory Fish Stocks on Seabirds. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2018-03**.
[1395] WCPFC (2018). Conservation and Management of Sea Turtles. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2018-04**.
[1396] WCPFC (2019). Conservation and Management Measure on Mobulid Rays caught in association with fisheries in the WCPFC Convention Area. Pohnpei, Western and Central Pacific Fisheries Commission (WCFPC). **CMM2019-05**.
[1397] WCPFC (2009). Conservation and Management Measure on the Application of High Seas FAD Closures and Catch Retention. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2009-02**.
[1398] CMM2009-02 refers to CMM2008-01 which at the time CMM2009-02 was adopted, was the current tropical tuna measure. CMM2008-01 has since been replaced by a series of measures, the most recent being CMM2018-01. On CMM2018-01 see subsection 5.4.7 below.

02[1399] on catch retention rules, **CMM 2013-05**[1400] on daily catch and effort reporting, **CMM2019-01**[1401] on cooperating non-members, **CMM2019-08**[1402] on chartering, and **CMM2014-03**[1403] and **CMM2018-06**[1404] on the record of fishing vessels and authorisations to fish. In addition, **CMM2014-06**[1405] and **CMM2015-06**[1406] on harvest strategies also provide RBM-enabling features. All eight enabling CMMs are assessed in section 5.7 below.

5.4.7 RBM-like CMMs

The seven remaining CMMs include provisions that attempt to set a limit on capacity, effort or catches in particular fisheries or for particular stocks and allocate that limit to CCMs. They are therefore regarded as establishing instruments that resemble rudimentary property rights. These CMMs are **CMM2006-04**[1407] on striped marlin in the southwest Pacific, **CMM2010-01**[1408] on striped marlin in the north Pacific, **CMM2009-03** [1409] on swordfish, **CMM2015-02** [1410] on south Pacific albacore, **CMM2018-01**[1411] and **CMM2020-01**[1412] on tropical tuna, and **CMM2019-04**[1413] on sharks. They may

[1399] See subsection 5.4.5 above.
[1400] See subsection 5.4.3 above.
[1401] See subsection 5.4.3 above.
[1402] See subsection 5.4.3 above.
[1403] See subsection 5.4.3 above.
[1404] See subsection 5.4.3 above.
[1405] WCPFC (2014). Conservation and Management Measure on Establishing a Harvest Strategy for Key Fisheries and Stocks in the Western and Central Pacific Ocean. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM 2014-06**.
[1406] WCPFC (2015). Conservation and Management Measure on a Target Reference Point for WCPO Skipjack Tuna. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2015-06**.
[1407] WCPFC (2006). Conservation and Management Measure for Striped Marlin in the Southwest Pacific. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2006-04**.
[1408] See subsection 5.4.4 above.
[1409] WCPFC (2009). Conservation and Management Measure for Swordfish. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2009-03**.
[1410] WCPFC (2015). Conservation and Management Measure for South Pacific Albacore. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2015-02**.
[1411] WCPFC (2018). Conservation and Management Meaure for Bigeye, Yellowfin and Skipjack Tuna in the Western and Central Pacific Ocean. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2018-01**.
[1412] When it was agreed, CMM2018-01 was to expire on 10 February 2021. CMM2020-01 extended the effect of CMM2018-01 to 15 February 2022 and attached CMM2018-01 in full. CMM2018 is therefore regarded as no longer in force but its provisions remain in force under CMM2020-01. However, other than where the expiry date is relevant, all references to provisions in CMM2018-01 are cited as CMM2018-01. Where the expiry date is relevant, CMM2020-01 will be referred to. WCPFC (2020). Conservation and Management Measure for Bigeye, Yellowfin and Skipjack Tuna in the Western and Central Pacific Ocean. CMM 2020-01. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM 2020-01**.
[1413] WCPFC (2019). Conservation and Management Measure for Sharks. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2019-04**. This measure consolidated several existing CMMs into a single measure upon entry into force on 1 November 2020. Those CMMs were: "CMM 2010-07 Conservation and Management Measure for Sharks, CMM 2011-04 Conservation and Management Measure for Oceanic Whitetip Sharks, CMM 2012-04 Conservation and Management Measure for the protection of whale sharks from purse seine operations, CMM2013-08 Conservation and Management Measure for Silky Sharks, and CMM 2014-05 Conservation and Management Measure for Sharks". WCPFC (2019). Outcomes Document

also contain command-and-control instruments but it is the right-like provisions that are central to the analysis in this Chapter. Right-like instruments in these seven CMMs are assessed in sections 5.5 and 5.6 below.

5.4.8 Conclusion

A total of 41 CMMs are currently in force as at 17 February 2021 plus the now expired CMM2018-01[1414]. Table 5.2 lists each CMM and indicates whether they are within the scope or out of the scope of the study. Of the 42 CMMs (41 current CMMs and CMM2018-01), 29 are considered to be out-of-scope. They comprise measures that are purely accountability CMMs, meta rules and command-and-control rules and/or apply only to the north Pacific. Six CMMs were found to enable RBM and seven were found to establish right-like instruments. All 13 CMMs are assessed to be within the scope of this study. The remainder of this Chapter assesses each of the in-scope CMMs against the property rights criteria.

WCPFC16. 16th Regular Session of the Western and Central Pacific Fisheries Commission, 5-11 December 2019, Port Moresby, WCPFC. para 59.

[1414] See footnote 1412 above.

Table 5.2: Preliminary analysis of WCPFC CMMs

CMM#	Subject	Category	In Scope?
2004-03	Marking and Identification of Fishing Vessels	Accountability rules	OUT
2004-04	Resolution on CMMS	Meta-rules	OUT
2006-04	Striped Marlin in the Southwest Pacific	Right-like instruments	IN
2006-07	Regional Observer Programme	Accountability rules	OUT
2006-08	WCPFC Boarding and Inspection Procedures	Accountability rules	OUT
2008-04	Prohibition on Large Scale Driftnets on the High Seas	Command and control	OUT
2009-02	High Seas FAD Closures and Catch Retention	RBM enabler	IN
2009-03	Swordfish	Right-like instruments	IN
2009-05	Prohibition on Fishing on Data Buoys	Command and control	OUT
2009-06	Regulation of Transhipment	Accountability rules	OUT
2009-09	Vessels without nationality	Accountability rules	OUT
2009-10	Monitoring Landings of Purse Seine Vessels at Ports	Accountability rules	OUT
2010-01	North Pacific Striped Marlin	Right-like instruments	IN
2011-03	Protection of cetaceans from purse seine fishing operations	Command and control	OUT
2012-03	Implementation of the ROP by vessels fishing north of 20N	Accountability rules North Pacific	OUT
2013-04	Unique Vessel Identifier	Accountability rules	OUT
2013-05	Daily catch and effort reporting	RBM enabler	IN
2013-06	Criteria for the consideration of conservation and management proposals	Meta rules	OUT
2013-07	Special requirements of Small Island Developing States and Territories 2013	Meta rule	OUT
2014-02	WCPFC Vessel Monitoring System	Accountability rules	OUT
2014-03	Standards, specifications & procedures for the WCPFC RFV	RBM enabler	IN
2014-06	Harvest strategy approach for key fisheries and stocks	RBM enabler	IN
2015-02	South Pacific Albacore	Right-like instruments	IN
2015-06	Target reference point for skipjack tuna	RBM enabler	IN
2016-02	Eastern High Seas Pocket Special Management Area	Accountability rules	OUT
2017-02	Minimum standards for port State measures	Accountability rules	OUT
2017-03	Protection of ROP observers	Accountability rules	OUT
2017-04	Marine Pollution	Command and control	OUT
2018-01	Tropical tuna (SKJ, BET, YFT)	Right-like instruments	IN
2018-03	Mitigation of the impact of fishing on highly migratory species on seabirds	Command and control	OUT
2018-04	Sea Turtles	Command and control	OUT
2018-05	Regional Observer Programme	Accountability rules	OUT
2018-06	Record of Fishing Vessels (RFV) and Authorisation to Fish	RBM enabler	IN
2019-01	Cooperating Non-Members	Accountability rules Meta rules; RBM Enabler	OUT
2019-03	North Pacific Albacore	North Pacific	OUT
2019-04	Sharks	Right-like instruments	IN
2019-05	Manta and Mobulid Rays	Command and control	OUT
2019-06	Compliance monitoring scheme	Accountability rules	OUT
2019-07	IUU Vessel List	Accountability rules	OUT
2019-08	Charter notification scheme	Accountability rules RBM enabler	IN
2020-01	Tropical tuna	Right-like instruments	IN
2020-02	Pacific Bluefin	North Pacific	OUT

5.5 Tropical tuna (CMM2018-01 and CMM2020-01)

5.5.1 Introduction

CMM2018-01 is the primary measure for the management of the three tropical tuna species – SKJ, YFT and BET. Its expiry date of 10 February 2021 was extended to 15 February 2022 at WCPFC17 under CMM2020-01[1415]. CMM 2018-01 otherwise remains intact. Its objective is stated as "Pending the establishment of harvest strategies, and any implementing CMM, the purpose of this measure is to provide for a robust transitional management regime that ensures the sustainability of bigeye, skipjack, and yellowfin tuna stocks"[1416] and is thus known as an "interim" or "bridging" measure. Its preamble acknowledges the purse seine VDS[1417] and notes that FFA members intend to adopt zone-based longline limits in place of existing flag-based bigeye catch limits and FAD set limits in the purse seine fishery[1418]. Its interim status is also acknowledged by reference to the interim nature of the SKJ TRP in CMM2015-06[1419].

CMM2018-01 applies to all high seas areas and EEZs within the WCPFC-CA unless individual provisions state otherwise[1420].

CMM2018-01 is a composite of several instruments. Some apply broadly to all fisheries in the Convention Area while others are applied to a specific fishery, defined by gear type. Table 5.3 below categorises the instruments contained within CMM2018-01 according to whether they appear to establish or support RBM instruments, or constitute command-and-control, accountability or meta rules. In all, six provisions may establish some form of RBM instrument and two may enable elements of an RBM system. Each of the former is dealt with separately below, while the latter are referred to where relevant.

[1415] See footnote 1412 above.
[1416] CMM2018-01 para 1: "Pending the establishment of harvest strategies, and any implementing CMM, the purpose of this measure is to provide for a robust *transitional* management regime that ensures the sustainability of bigeye, skipjack, and yellowfin tuna stocks" (emphasis added).
[1417] CMM2018-01 Preamble: "Noting further that the Parties to the Nauru Agreement have adopted and implemented a Vessel Day Scheme for the longline fishery, a Vessel Day Scheme for the purse seine fishery and a registry for FADs in the zones of the Parties, and may establish longline effort limits, or equivalent catch limits for longline fisheries within their exclusive economic zones".
[1418] CMM2018-01 Preamble: "Noting furthermore that the Members of the Pacific Islands Forum Fisheries Agency have indicated their intention to adopt a system of zone-based longline limits to replace the current system of flag-based bigeye catch limits within their EEZs, and a system of zone-based FAD set limits to replace the FAD closure and flag-based FAD set limits in their EEZs".
[1419] CMM2018-01 Preamble: "Acknowledging that the Commission has…agreed to an interim target reference point (TRP) of 50% of the recent average spawning biomass [for SKJ] in the absence of fishing (CMM 2015-06)"
[1420] CMM2018-01 para 3.

Table 5.3: Instruments within CMM2018-01

RBM instruments	Enable RBM	Command-and-control instruments	Meta rules	Accountability rules
Instrumented buoys para 23-24 Purse seine effort control para 25-30 Longline catch limits para 39-44 Purse seine vessel limits para 45-46 Longline vessel limits para 47-49 Other commercial fisheries para 51	Compatibility provisions para 2 Area of application para 3-4 Harvest strategies para 11-15 Purse seine catch retention para 31-32	Purse seine FAD closures para16-18 Non-entangling FADs para 19-22	Small island developing States para 5-7 Other commercial fisheries para 50-1 Review and final provisions para 55-57	Monitoring and control purse seine fishery para 33-37 Data provision requirements para 52-54

The measure sets interim spawning biomass targets for the three species, pending agreement on TRPs, and these were to be reviewed in 2019[1421] [1422]. It reaffirms the interim TRP for SKJ at 50 percent on average[1423]. Interim TRPs for YFT[1424] and BET[1425] are set at or above the average depletion levels for 2012-2015 (i.e. $SB/SB_{F=0}$ >= average $SB/SB_{F=0, avg\ 2012-2015}$).

CMM2018-01 does not link the TRP and LRPs to catches by any particular gear types or catch limits. Harvest control rules have not been set for any of the four tuna species but it could reasonably be expected that these would include agreement of a top-down TAC or TAE designed to move spawning biomass toward the TRP and away from the LRP[1426]. Neither the TRP nor the LRP therefore currently relate to a limit on catch or effort.

5.5.2 Purse seine effort and catch limits

Paragraphs 25 to 30 establish limits for the purse seine fishery aimed at limiting catches of the three tropical tuna species in EEZs and the high seas. Each zone is dealt with separately below.

EEZ limits

[1421] CMM2018-01 para 15.
[1422] WCPFC16 agreed to retain the existing TRPs as set out in paras 12-14. WCPFC (2020). Summary Report. Sixteenth Regular Session of the Western and Central Pacific Fisheries Commission (WCPFC16), 5-11 December 2019, Port Moresby, WCPFC. para 275.
[1423] CMM2018-01 para 13.
[1424] CMM2018-01 para 14.
[1425] CMM2018-01 para 12.
[1426] CMM 2014-06 para 7(e).

In the first, now superseded, tropical tuna measure (CMM2005-01)[1427], coastal CCMs were required to limit purse seine effort in their waters to "either 2004 levels, or the average of 2001 to 2004 levels" from 2006[1428]. It gave formal status to the national allocations that purse seine VDS participants had agreed under the 2005 iteration of the Palau Arrangement[1429] until 1 December 2007[1430] [1431].

Subsequent measures have by and large retained effort limits explicitly based on effort history. In 2008 the WCPFC agreed to a single benchmark year of 2004 for VDS participants[1432] [1433]. Non-PNA coastal CCMs were merely required to adopt "compatible measures" – which, in light of the full text of para 11, could include measures compatible with effort limits and/or FAD limits (see below) – to limit bigeye catches in their EEZs in those same a periods[1434]. Despite the vagueness of non-PNA limits, Attachment B to CMM2008-01 set out baseline effort levels from 2001 to 2007 for the PNA as a whole and 10 other coastal CCMs. There was no explicit link between Attachment B and the PNA and non-PNA provisions in the body of the CMM but it appears that these were intended to set out the limits (i.e. 2004 levels) that should be applied by the PNA and by non-PNA members in any "compatible" measures.

[1427] WCPFC (2005). Conservation and Management Measure for Bigeye and Yellowfin Tuna in the Western and Central Pacific Ocean. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM 2005-01**.
[1428] CMM2005-01 para 8: "CCMs shall take necessary measures to ensure that purse seine effort levels do not exceed either 2004 levels, or the average of 2001 to 2004 levels, in waters under their national jurisdiction, beginning in 2006."
[1429] PNA (2004). Palau Arrangement for the Management of the Western Pacific Fishery - Management Scheme (Purse Seine Vessel Day Scheme) (as amended by VDS Working Group Meeting-Honiara 7 & 13 October 2005). Agreed in 2004. Majuro, Office of the Parties to the Nauru Agreement.
[1430] CMM2005-01 para 10(i): "10 (i) For those FFA Member Countries who are Parties to the Nauru Agreement, the provisions of paragraph 8 will be implemented as a Vessel Day Scheme that will limit days fished to a level no greater than 2004 levels and will be fully implemented by 1 December 2007. Until that time, the current measures under the Palau Arrangement shall remain in force."
[1431] Note non-PNA members were also required to implement similar measures. CMM2005-01 para 10(ii): "Other non-PNA member countries shall implement similar measures to limit purse seine effort in waters under their jurisdiction to no greater than 2004 levels, or to the average of 2001 to 2004 levels."
[1432] CMM2008-01 para 11 for 2009: "For the members of the FFA who belong to the PNA, this measure will be implemented through their domestic processes and legislation, including the Vessel Day (VDS) Scheme which limits total days fished in the EEZs of PNA members to no greater than 2004 levels (Attachment C)." Attachment C contained a copy of the Palau Arrangement: PNA (2016). Palau Arrangement for the Management of the Western Pacific Fishery - Management Scheme (Purse Seine Vessel Day Scheme). Signed 2 October 1992. Entered into force 1 November 1995. Amended April 2016 & October 2016, Office of the Parties to the Nauru Agreement.
[1433] CMM2008-01 para 17 for 2010 and 2011: "For the members of the FFA who are members of the PNA, this measure will be implemented through their domestic processes and legislation, including: (a) the VDS which limits total days fished in the EEZs of PNA members to no greater than 2004 levels (Attachment C)"
[1434] WCPFC (2008). Conservation and Management Measure for Bigeye and Yellowfin Tuna in the Western and Central Pacific Ocean. WCPFC. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2008-01**. para 12: "Other non-PNA CCMs shall implement compatible measures to reduce purse seine fishing mortality on bigeye tuna in their EEZs"; and identical para 18.

CMM2011-01 shifted the historical benchmark for effort limits in PNA members' EEZs to 2010 rather than 2004 levels[1435] and the following year a new CMM[1436] established a new two-tier arrangement for non-PNA coastal CCMs:

- those with large historical purse seine effort history (i.e. over 1000 days) were to be limited to either 2001-2004 average levels or 2010 levels[1437];
- those with effort history under 1000 days annually were required to "establish effort limits or equivalent catch limits for purse seine fisheries within their EEZs that reflect the geographical distributions of skipjack, yellowfin, and bigeye tunas, and are consistent with the objectives for those species"[1438].

Although the parameters of the latter provision are open to interpretation, "small" purse seine coastal CCM were unlikely to be able to exceed annual effort of 1000 days. In CMM2013-01, this benchmark was increased such that CCMs with effort exceeding "1500 days annually over the period 2006-2010" were required to "limit effort in their EEZs to 2001-2004 average or 2010 levels"[1439].

Subsequent replacement interim tropical tuna measures were then adopted annually and retained this framework until CMM2017-01. After lengthy negotiations[1440], CMM2017-01 did away with the tiered provisions and simply recorded notified limits in an Attachment[1441] as notified by CCMs[1442]. The current measure, CMM2018-01, retains the same quantitative effort and catch limits as CMM2017-01. While it does not explicitly link historical effort levels, the evolution of its antecedents, as described above, indicates that historical effort levels are understood in the interpretation of the measure.

Most of the EEZ limits are expressed in terms of effort, defined as vessel days, and those for the nine purse seine VDS participants are clustered under a single limit of 44,033 days. Australia, New Zealand and New Caledonia are limited by catch volume for each species, although New Zealand and New Caledonia have only specified limits for SKJ and therefore are assumed to have a zero limit for purse

[1435] WCPFC (2011). Conservation and Management Measure for the Temporary Extension of CMM2008-01. Pohnpei, Western and Central Pacific Fisheries Commission. **CMM2011-01**. paragraphs 1-2.
[1436] WCPFC (2012). Conservation and Management Measure for Bigeye, Yellowfin and Skipjack. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2012-01**. This was the first tropical tuna measure to expressly include SKJ.
[1437] CMM2012-01 paragraph 13: "Other coastal States with effort in their EEZs exceeding 1,000 days annually over the period of 2006-2010 shall limit effort in their EEZs to 2001-04 average or 2010 levels".
[1438] CMM2012-01 paragraph 14.
[1439] CMM2013-01 paragraph 22.
[1440] See the record of the meeting in WCPFC (2018). Summary Report Fourteenth Regular Session of the Western and Central Pacific Fisheries Commission (WCPFC14), Manila, 3-7 December 2017, Western and Central Pacific Fisheries Commission (WCPFC). paragraphs 219-58.
[1441] CMM2017-01 Attachment 1 Table1. Three states recorded catch limits rather than effort limits, and of these New Zealand and New Caledonia recorded catch limits only for SKJ. Australia recorded limits for all three tropical tuna species.
[1442] Those CCMs that had still not notified the Commission of their EEZ limit were to do so by 31 December 2018. See CMM2017-01 paragraph 25.

seine catches of BET and YFT. Unlike the effort limits, these catch limits for SKJ are well in excess of their corresponding catch histories in the benchmark years[1443]. The zone-based EEZ limits thus amount to 48,883 vessel days plus 90,000 tonnes of SKJ, 600 tonnes of BET and 600 tonnes of YFT.

CMM2018-01 Attachment 1 Table 1 includes a note that the six non-PNA island members of the FFA[1444] "are developing joint arrangements which may incorporate measures such as pooling and transferability of limits between EEZs"[1445]. In effect this foreshadows an intention to develop an arrangement along the lines of the PNA purse seine VDS. However, little progress has been made to date.

High seas purse seine effort limits

High seas limits on purse seine effort are set out in CMM2018-01 Attachment 1, Table 2 in accordance with paras 26-28. The limits apply to purse seine fishing between 20ºN and 20ºS by non-SIDS CCMs, with restrictions on transfers of effort outside that area[1446]. These limits are assigned to flag CCMs and aggregate to a bottom-up zonal limit for the high seas. Philippines "traditional fresh/ice chilled fishing vessels operating as a group" are separately allocated 4659 days to be used by a maximum of 36 vessels in high seas pocket between PNG, FSM, Palau, and Indonesia (high seas pocket one)[1447]. Not including the Philippines allocation, the sum of flag CCM high seas limits in the CMM amount to 2282 days.

Again, these limits evolved from historical levels and were first identified as quantitative levels for eight Members in CMM2013-01[1448] and have been maintained unchanged in the current measure[1449]. High seas limits were initially set on the basis of historical catches[1450]. These limits remained in place until the adoption of CMM2012-01, which simply required CCMs to "take measures not to increase

[1443] See FFA (2020). Value of WCPFC-CA Tuna Catches 2019. Honiara, Pacific Islands Forum Fisheries Agency.
[1444] Cook Islands, Fiji, Niue, Samoa, Tonga, Vanuatu, known collectively as the South Pacific Group.
[1445] CMM2018-01 Attachment 1 Table 1.
[1446] CMM2018-01 para 27, although the wording for transfers to each area is different: "CCMs shall ensure that the effectiveness of these effort limits for the purse seine fishery are not undermined by a transfer of effort in days fished into areas within the Convention Area south of 20ºS. In order not to undermine the effectiveness of these effort limits, CCMs shall not transfer fishing effort in days fished in the purse seine fishery to areas within the Convention Area north of 20ºN." The former appears to provide scope to transfer effort south as long as it does not undermine the effectiveness of the limits applying between the two latitudes, while the latter is an outright prohibition.
[1447] CMM2018-01 Att2.
[1448] CMM2013-01 Attachment D. Note that one of the eight, Indonesia, is recorded as having an effort limit of "(0)". In addition, alternative high seas arrangements are made for Philippines. Limits for two CNMs, Ecuador and El Salvador, are indicated as "subject to CNM (sic) on participatory rights".
[1449] CMM2018-01 Attachment 1 Table 2, including the same qualifications for Indonesia, Philippines, Ecuador and El Salvador.
[1450] See CMM 2006-01 para 3. Available at https://www.wcpfc.int/conservation-and-management-measures/past. Accessed on 27 February 2020.

fishing days on high seas"[1451] and in 2013 high seas limits were recorded in an attachment to CMM2013-01 and have remained at those levels in the current CMM.

Property rights analysis

Table 5.4 below summarises the assessment of the purse seine catch and effort limits against the property rights criteria, with further detail in the Annex, Table A.6.

Purse seine effort and catch limits for EEZs and the high seas contain some of the basic elements of property rights, including *exclusive* (score = 8) allocations of an overall *limit* (score = 7). TRPs could form the basis of overall catch or effort limits but these have not yet been translated into a TAC or TAE for each species. The regional scale limit comprises a firm bottom-up aggregate of each CCM's allocation based on historical catches but these appear to be broadly consistent with scientific advice. The limit is undermined by the incomplete geographic coverage of the measure and the focus on purse seine gear. Catch retention rules allow for the possibility of accounting for mortality of species also targeted by other gear types.

Exclusivity of allocations is weakened by unclear rules governing new entrants and exemptions for SIDS. There are no penalties other than a carry forward provision for overages in any given year. National purse seine effort limits are equivalent to national allocations for the high seas and EEZs.

Allocations are reasonably *secure* (score = 8), albeit with some important weaknesses. The CMM explicitly rejects any notion that high seas limits confer rights on a flag State and "are without prejudice to future decisions of the Commission"[1452]. There is no equivalent provision in relation to zone-based rights. Coastal State limits are therefore assessed as more secure than high seas flag State limits. High seas limits are nevertheless recorded in the CMM, providing some assurance that agreed limits will not be disputed during their period of validity. The durability of allocations is short, with an expiry date of no more than one year hence, subject to a consensus decision to extend or renew the measure.

CMM2018-01 makes no provision for *transfers* of national allocations between CCMs (score = 0). Initial steps have been taken toward harvest strategies. However, the adoption of interim target reference points for tropical tuna stocks has not yet been translated into effort or catch limits and there are no provisions for harvest control rules or other *flexibility* mechanisms (score = 4).

The purse seine effort and catch limits are given an overall rating of 27 against the five property rights criteria.

[1451] CMM2012-01 para 15. Available at https://www.wcpfc.int/conservation-and-management-measures/past. Accessed on 27 February 2020.
[1452] CMM2018-01 para 28.

Table 5.4: CMM 2018-01 Interim tropical tuna measure: Purse seine effort and catch limits

Criterion	Question	Score	Para
Limited	set a regional or subregional scale catch or effort limit?	3	25, 26, Att1
	base limits on the best scientific evidence available?	2	
	base limits on the precautionary approach?	0	
	apply limits to the full geographic range of the stock?	0	25, 26, Att1
	ensure limits account for catches of the limited species by all gear types?	0	
	power to record bycatch of the target species against limits for that species?	2	31-32
	Subtotal	**7**	
Exclusive	allocate national scale limits as a share of the regional TAC/TAE?	3	25, 26 Att 1
	new entrants either excluded or able to participate without adding to TAC/TAE?	3	Att 1 Tables 1 & 2
	prohibit exemptions to the limit (or exemptions not provided for)?	0	26
	to impose penalties for exceeding national limits?	2	30
	Subtotal	**8**	
Secure	national limits valid for more than one year?	1	55
	national limits valid until Parties agree to amend them? (default = perpetuity)	0	
	make national limits binding on Parties?	3	25, 26
	resolve disputes beyond bilateral negotiation	1	
	establish a record of national scale limits (e.g. in a regional register or CMM)?	3	Att 1
	Subtotal	**8**	
Transferable	transfer a national limit in full or in part to another CCM?	0	
	require new entrants to acquire an allocation through a transfer from a CCM?	0	
	specify a process for effecting a transfer?	0	
	record transfers in a register?	0	
	Subtotal	**0**	
Flexible	set a TRP the target stock(s)?	3	12-14
	establish harvest control rules for the target stock(s)?	1	
	adjust a TAC/TAE on the basis of environmental factors and stock assessments?	0	
	define national limits as a proportional (rather than volumetric) share of the regional TAC/TAE?	0	Att1
	establish clear processes for a TAC/TAE to be adjusted?	0	
	Subtotal	**4**	
TOTAL		**27**	

5.5.3 Limits on deployment of drifting FADs with activated instrumented buoys

CMM2018-01 contains provisions on fish aggregating devices (FADs) in the purse seine fishery, including five-month FAD closures, requirements for the design of non-entangling FADs and a limit on the number of drifting FADs deployed with activated instrumented buoys[1453] to 350 by each vessel[1454]. The first two constitute command-and-control rules. The third possesses some of the rudimentary elements of a right-like instrument[1455].

There is no stated objective for the FAD deployment limits, with possibilities including reducing marine debris, reducing CPUE and reducing the impact of FAD sets on juvenile yellowfin and bigeye[1456].

Property rights analysis

Table 5.5 summarises the assessment of the FAD deployment limits against the property rights criteria. Further detail is contained in the Annex, Table A.7.

The FAD deployment limit achieved a total score of 27. A positive assessment of each criterion should be considered in the context that the limit only contributes to the achievement of the objective for which it was designed. That objective is unclear. As a rights-based instrument, the limit is simply an effective way to limit access to the deployment of FADs, and create value in that right.

The *limit* (score = 7) applies to the entire WCPFC-CA but does not guarantee a biological outcome for the targeted species given significant weaknesses in the limit. While there is no doubt that there is a scientific basis for restricting FAD sets, the quantum of the FAD deployment limit is not obviously based on science[1457]. It is also intrinsically restricted to a single gear type. An overall limit on FAD

[1453] CMM2018-01 para 23: "…An instrumented buoy is defined as a buoy with a clearly marked reference number allowing its identification and equipped with a satellite tracking system to monitor its position..."
[1454] CMM2018-01 para 23: "A flag CCM shall ensure that each of its purse seine vessels shall have deployed at sea, at any one time, no more than 350 drifting Fish Aggregating Devices (FADs) with activated instrumented buoys."
[1455] As a measure in addition to a three-month FAD closure, the WCPFC had previously permitted CCMs to choose between either an additional two month FAD closure or to limit the number of FAD sets by its vessels. See WCPFC (2013). Conservation and Management Measures for Bigeye, Yellowfin and Skipjack Tuna in the Western and Central Pacific Ocean. WCPFC. Pohnpei, Western and Central Pacific Fisheries Commission. **CMM 2013-01**. para 17(a). However, these were removed in favour of the current measures in 2017. See WCPFC (2018). Summary Report Fourteenth Regular Session of the Western and Central Pacific Fisheries Commission (WCPFC14), Manila, 3-7 December 2017, Western and Central Pacific Fisheries Commission (WCPFC). paras 219-58.
[1456] WCPFC (2018). Chair's Report. Third Meeting of the FAD Management Options Intersessional Working Group (FADMO IWG 03), Majuro, 3 October 2018, Western and Central Pacific Fisheries Commission."The IWG recommends that the Commission considers adopting objectives for FAD management with respect to defining an appropriate number of FADs per purse seine vessel or category [e.g. size] of vessel limiting FAD numbers; the IWG discussed potential objectives, i.e. reducing marine debris, limiting economic impact [through reduced CPUE] and reducing the impact of FAD fishing on juvenile tuna, but there was no agreement on all of them."
[1457] See the note against Japan's Option 4, which states that SPC cannot assess the proposed 350 FAD limit, in WCPFC Chair (2017). Support for development of a tropical tuna bridging measure - Circular 2017-92.

deployments can only be achieved in conjunction with a limit on the number of vessels able to deploy FADs. These are addressed elsewhere in CMM2018-01 and are discussed in subsection 5.5.4 below.

The limit does not provide for economic gains to be secured because the aggregate limit does not create scarcity[1458] and individual limits are not *transferable* (score = 0).

The absence of exemptions strengthens the *exclusivity* of the limit (score = 9) and the simplicity of the instrument lends itself to a relatively high level of *security* (score = 11). However, this also means the limits are not *flexible* (score = 4) and there is no indication that the FAD deployment limit will be adjusted under future harvest strategies for relevant species.

Fourteenth Regular Session of the Western and Central Pacific Fisheries Commission. Manila, 3-7 December 2017, Western and Central Pacific Fisheries Commission (WCPFC). **WCPFC14-2017-09C**.

[1458] Escalle et al estimate that the median number of drifting FADs deployed by each vessel each day ranges from 45 to 75 from 2016 to 2019. Escalle, L., S. R. Hare, T. Vidal, M. Brownjohn, P. Hamer, G. Pilling and H. Browman (2021). "Quantifying drifting Fish Aggregating Device use by the world's largest tuna fishery." ICES Journal of Marine Science. p12.

Table 5.5: CMM 2018-01 Interim tropical tuna measure: Limit on FADs with instrumented buoys

Criterion	Question	Score	Para
Limited	set a regional or subregional scale catch or effort limit?	3	23
	base limits on the best scientific evidence available?	0	
	base limits on the precautionary approach?	0	
	apply limits to the full geographic range of the stock?	3	3
	ensure limits account for catches of the limited species by all gear types?	0	
	record bycatch of target species against limits for that species?	1	31
	Subtotal	**7**	
Exclusive	allocate national scale limits as a share of the regional TAC/TAE?	3	23
	new entrants either excluded or able to participate without adding to TAC/TAE?	3	45, 46
	prohibit exemptions to the limit (or exemptions not provided for)?	3	
	to impose penalties for exceeding national limits?	0	
	Subtotal	**9**	
Secure	national limits valid for more than one year?	1	55
	national limits valid until Parties agree to amend them? (default = perpetuity)	0	
	make national limits binding on Parties?	3	
	resolve disputes beyond bilateral negotiation	1	
	establish a record of national scale limits (e.g. in a regional register or CMM)?	2	23
	Subtotal	**7**	
Transferable	transfer a national limit in full or in part to another CCM?	0	
	require new entrants to acquire an allocation through a transfer from a CCM?	0	
	specify a process for effecting a transfer?	0	
	record transfers in a register?	0	
	Subtotal	**0**	
Flexible	set a TRP for the target stock(s)?	3	12-14
	establish harvest control rules for the target stock(s)?	1	
	adjust a TAC/TAE on the basis of environmental factors and stock assessments?	0	
	define national limits as a proportional (rather than volumetric) share of the regional TAC/TAE?	0	
	establish clear processes for a TAC/TAE to be adjusted?	0	
	Subtotal	**4**	
TOTAL		**27**	

5.5.4 Purse seine capacity limits

CMM 2018-01 places a limit on the number of large[1459] purse seine vessels with freezing capacity flying the flag of a CCM operating between 20ºN and 20ºS[1460]. SIDS and Indonesia are exempt from this provision[1461]. Vessel numbers are required to remain at the levels applicable under the now superseded CMM2013-01[1462] and CCMs are required to ensure that any new vessels replace capacity rather than add to it or that new vessels do not increase capacity or effort in the Convention Area[1463].

Property rights analysis

The purse seine capacity limits instrument in CMM2018-01 is assessed against each property rights criterion below. Score are summarised in Table 5.6 below with further detail in the Annex, Table A.8.

Purse seine capacity limits are arguably redundant given the application of effort limits for the same vessels. This is likely to stifle innovation and efficiency improvements. However, as noted in the previous subsection, they provide an important complement to the FAD deployment limits. The overall score for purse seine capacity limits is 19.

The *limit* (score = 5) suffers a number of weaknesses, including the poor definition of capacity, an absence of any clear scientific basis, the restricted geographic coverage of the instrument, the presence of exemptions, the ability to game the limits through "capacity creep" and the absence of an agreed, recognised register of the actual capacity limits in place.

The absence of any penalties for exceeding capacity limits and an unclear approach to new entrants are the main weaknesses in their *exclusivity* (score = 6). Notwithstanding the expiry date for the CMM, the capacity limits have been enduring. The limited duration, lack of clarity of the definition of capacity and the absence of an independent dispute resolution process and a record of allocations constrains the level of *security* (score = 4).

While incidental transfers between vessels flying the same flag appear to be permitted, no specific provisions provide for *transferability* at the national scale – that is, between CCMs (score = 0). An

[1459] Large here is defined as larger than 24m in length and with freezing capacity. See WCPFC CMM 2018-01 para 45.
[1460] The purse seine vessel limits in WCPFC CMM 2017-01 para 45 are contained in CMM 2013-01.
[1461] CMM2018-01 para 45: "CCMs, other than Small Island Developing States and Indonesia4 , shall keep the number of purse seine vessels flying their flag larger than 24m with freezing capacity operating between 20oN and 20oS (hereinafter "LSPSVs") to the applicable level under CMM 2013-01".
[1462] CMM2013-01 para 49: "Other than SIDS and Indonesia, CCMs shall not increase the number of purse seine vessels flying their flag larger than 24m with freezing capacity between 20N and 20S (hereinafter "LSPSVs") above the current level". Also, footnote 9 to this paragraph: "China shall limit its number of flagged purse seine vessels to 20 vessels to accommodate vessels moving back under its flag from the flags of other CCMs."
[1463] CMM2018-01 para 46 requires that any new vessels either "…replace a previous vessel or vessels, shall have a carrying capacity or well volume no larger than the vessel(s) being replaced, or shall not increase the catch or effort in the Convention Area from the level of the vessels being replaced…".

obvious arrangement for new entrants would be to permit transfers of capacity limits from existing CCMs to new entrants, which Serdy noted has occurred in the IATTC between vessels flying different flags[1464]. There is no link between the TRPs for relevant species and capacity limits at this stage, resulting in limited predictable *flexibility* (score = 4).

[1464] Serdy, A. (2010). Chapter 6. International Fisheries Law and the Transferability of Quota: Principles and Precedents. Conservation and Management of Transnational Tuna Fisheries. R. Allen, J. Joseph and D. Squires. Ames, IA, Wiley-Blackwell**:** pp99-126.

Table 5.6: CMM2018-01: Purse seine capacity limits

Criterion	Question	Score	Ref
Limited	set a regional or subregional scale catch or effort limit?	3	45, 46
	base limits on the best scientific evidence available?	0	45
	base limits on the precautionary approach?	0	45
	apply limits to the full geographic range of the stock?	0	45
	ensure limits account for catches of the limited species by all gear types?	0	45
	power to record bycatch of the target species against limits for that species?	2	31
	Subtotal	**5**	
Exclusive	allocate national scale limits as a share of the regional TAC/TAE?	3	45
	new entrants either excluded or able to participate without adding to TAC/TAE?	3	46
	prohibit exemptions to the limit (or exemptions not provided for)?	0	45
	to impose penalties for exceeding national limits?	0	
	Subtotal	**6**	
Secure	national limits valid for more than one year?	1	55
	national limits valid until Parties agree to amend them? (default = perpetuity)	0	CMM2020-01
	make national limits binding on Parties?	3	
	resolve disputes beyond bilateral negotiation	0	
	establish a record of national scale limits (e.g. in a regional register or CMM)?	0	
	Subtotal	**4**	
Transferable	transfer a national limit in full or in part to another CCM?	0	
	require new entrants to acquire an allocation through a transfer from a CCM?	0	46
	specify a process for effecting a transfer?	0	
	record transfers in a register?	0	
	Subtotal	**0**	
Flexible	set a TRP the target stock(s)?	3	12-14
	establish harvest control rules for the target stock(s)?	1	
	adjust a “limit” on the basis of environmental factors and stock assessments?	0	
	define national limits as a proportional (rather than volumetric) share of the regional TAC/TAE?	0	
	establish clear processes for a TAC/TAE to be adjusted?	0	
	Subtotal	**4**	
TOTAL		**19**	

5.5.5 Tropical longline bigeye catch limits

Although paragraphs 39-44 collectively refer to the longline fishery, the provisions within those paragraphs specifically address bigeye tuna (BET). The measure is therefore considered to be an output control for a specific gear type.

The CMM sets longline bigeye catch limits at the national scale in accordance with CMM2018-01 Attachment 1 Table 3[1465] as an "interim measure"[1466]. While the CMM does not make explicit which zones the limits apply to, or whether the limits are flag-based or zone-based, it can only be reasonably concluded that they are limits to be applied to flag States in both the high seas and EEZs of the WCPFC-CA[1467]. This contrasts with the zone-based, and largely effort-based approach for the control of purse seine effort within EEZs. Vessels flying the flag of a SIDS or Indonesia are exempt from provisions relating to capacity limits[1468].

Property rights analysis

Table 5.7 below summarises the longline BET catch limits against the property rights criteria with further detail in the Annex, Table A.9.

Overall the limits were assessed as quite weak (overall score = 23). The bottom-up *limit* on longline BET catches covers the entire WCPFC-CA but is otherwise quite soft (score = 5). It does not cover catches of BET by other relevant gear types. Conversely, it also does not account for mortality of other species by the same longline vessels. Also, the limits do not cover all flags whose vessels catch BET[1469]. There is no *transferability* (score = 0) and virtually no provision for predictable *flexibility* in national limits (score = 4). As a bottom-up limit, national allocations are *exclusive* but are undermined by exemptions (for SIDS[1470] [1471]) (score = 7). *Security* of limits is undermined by the expiry date of the measure and the absence of an independent dispute resolution mechanism (score = 7). Paragraph 42 states that "[national] limits…do not confer the allocation of rights to any CCM and are without prejudice to future decisions of the Commission".

[1465] Table 3 is titled "Bigeye Longline Catch Limits".
[1466] WCPFC CMM 2018-01 para 39. The interim nature of the measure is understood to refer to the anticipated harvest strategies and implementing CMM referred to in paragraph 1.
[1467] In the absence of any specific reference to spatial application in paragraphs 39-44, WCPFC CMM 2018-01 para 3 applies: "This Measure applies to all areas of high seas and all EEZs in the Convention Area except where otherwise stated in the Measure".
[1468] WCPFC CMM 2018-01 paras 47, 48.
[1469] Catch limits are assigned to China, Indonesia, Japan, Korea, Chinese Taipei and the United States. See WCPFC CMM 2018-01 Attachment 1 Table 3. Spain, Vietnam, French Polynesia and New Caledonia recorded small catches in 2019.
[1470] CMM2018-01 para 5: "With the exception of paragraphs 16-25, 31, 33-38, and 50-54, nothing in this Measure shall prejudice the rights and obligations of those small island developing State Members and Participating Territories in the Convention Area seeking to develop their domestic fisheries."
[1471] In 2019 FFA SIDS caught 20% of all BET longline catches. FFA (2020). Value of WCPFC-CA Tuna Catches 2019. Honiara, Pacific Islands Forum Fisheries Agency.

There are signs of a move toward stronger rights in the CMM's requirement that the Commission "agree on hard limits for bigeye and a framework to allocate those limits amongst all Members and Participating Territories that adequately take into account Articles 8, 10 (3) and 30 of the Convention" by 2021[1472]. This includes a clear intention to strengthen the scientific basis of limits.

[1472] CMM2018-1 para 44: "By 2020 the Commission shall agree on hard limits for bigeye and a framework to allocate those limits amongst all Members and Participating Territories that adequately take into account Articles 8, 10 (3) and 30 of the Convention". This deadline has been extended to 2021 by CMM2020-01.

Table 5.7: CMM2018-01 Longline bigeye catch limits

Criterion	Question	Score	Ref
Limited	set a regional or subregional scale catch or effort limit?	2	5, 39
	base limits on the best scientific evidence available?	0	Att1 Table 3
	base limits on the precautionary approach?	0	
	apply limits to the full geographic range of the stock?	3	3
	ensure limits account for catches of the limited species by all gear types?	0	Att1 Table 3
	power to record bycatch of the target species against limits for that species?	0	
	Subtotal	**5**	
Exclusive	allocate national scale limits as a share of the regional TAC/TAE?	3	39, Att1 Table 3
	new entrants either excluded or able to participate without adding to TAC/TAE?	2	
	prohibit exemptions to the limit (or exemptions not provided for)?	0	5
	to impose penalties for exceeding national limits?	2	39
	Subtotal	**7**	
Secure	national limits valid for more than one year?	1	55
	national limits valid until Parties agree to amend them? (default = perpetuity)	0	
	make national limits binding on Parties?	3	
	resolve disputes beyond bilateral negotiation	0	
	establish a record of national scale limits (e.g. in a regional register or CMM)?	3	Att1 Table 3
	Subtotal	**7**	
Transferable	transfer a national limit in full or in part to another CCM?	0	
	require new entrants to acquire an allocation through a transfer from a CCM?	0	
	specify a process for effecting a transfer?	0	
	record transfers in a register?	0	
	Subtotal	**0**	
Flexible	set a TRP the target stock(s)?	3	12
	establish harvest control rules for the target stock(s)?	1	
	adjust a TAC/TAE on the basis of environmental factors and stock assessments?	0	
	define national limits as a proportional (rather than volumetric) share of the regional TAC/TAE?	0	
	establish clear processes for a TAC/TAE to be adjusted?	0	
	Subtotal	**4**	
TOTAL		**23**	

5.5.6 Tropical longline capacity limits

CMM 2018-01 establishes two types of capacity limits for longline vessels targeting bigeye. First, CCMs are required not to increase the number of "longline vessels with freezing capacity targeting bigeye tuna above the applicable level under CMM 2013-01"[1473]. A second and similar limit applies to "ice-chilled longline vessels targeting bigeye tuna and landing exclusively fresh fish" or at the level applying under limited licence programs in place when CMM2013-01 was in effect[1474].

SIDS and Indonesia are exempt from both capacity limits[1475], with the qualification that this does not create a precedent for non-SIDS CCMs[1476]. SIDS and participating territories are able to construct or purchase vessels for domestic fleets without restriction[1477]. CCMs that have adopted domestic quotas under a legislative/regulatory framework are also exempt from both limits[1478] [1479]. This exemption implicitly acknowledges that an ITQ system or similar effectively renders capacity limits redundant. Such domestic quota systems are implicitly to be adopted by a flag State for its fleet, given that they are offered as an alternative to flag-based capacity limits[1480].

Property rights analysis

The tropical longline capacity limit in CMM2018-01 is assessed against each property rights criterion below. Scores are summarised in Table 5.8 below, with further detail in the Annex, Table A.10.

Capacity limits for longline vessels targeting bigeye are poorly defined, using only vessel numbers as a metric (overall score = 19). Vessels numbers are *limited* in a rudimentary way (score = 5) as a bottom-up limit based on historical capacity. However, exemptions for SIDS and Indonesia, and the lack of penalties and provisions for new entrants undermine *exclusivity* (score = 6). The limits are *insecure* (score = 4) and non-*transferable* (score = 0) and offer no immediate avenues for predictable *flexibility* in their application (score = 4).

[1473] WCPFC CMM 2018-01 para 47: "CCMs, other than Small Island Developing States and Indonesia5 , shall not increase the number of their longline vessels with freezing capacity targeting bigeye tuna above the applicable level under CMM 2013-01".
[1474] WCPFC CMM 2018-01 para 48: "CCMs…shall not increase the number of their ice-chilled longline vessels targeting bigeye tuna and landing exclusively fresh fish above the applicable level under CMM 2013-01, or above the number of licenses under established limited entry programmes applying during the operation of CMM 2013-01".
[1475] WCPFC CMM 2018-01 paras 47, 48, and identical footnotes 5 and 7: "This paragraph shall not create a precedent with respect to application of exemptions to non-SIDS CCMs."
[1476] See WCPFC CMM 2017-01 footnotes 6, 8.
[1477] CMM2018-01 para 49.
[1478] WCPFC CMM 2017-01 footnotes 7, 9.
[1479] See also, WCPFC CMM 2017-01 para 49, which preserves the right of SIDS to "construct or purchase vessels from other CCMs for their domestic fleets".
[1480] Note also that catch limits in CMM2018-01 are flag-based rather than zone-based. It is unclear whether a zone-based quota system would qualify as an alternative measure and how this would be achieved. Quota systems referred to in para 48 are also not directly linked to any quantitative limits in CMM2018-01, noting that flag-basedcatch limits are only in place for six CCMs.

Table 5.8: CMM2018-01: Tropical longline capacity limits

Criterion	Question	Score	Ref
Limited	set a regional or subregional scale catch or effort limit?	2	47, 48
	base limits on the best scientific evidence available?	0	
	base limits on the precautionary approach?	0	
	apply limits to the full geographic range of the stock?	3	3
	ensure limits account for catches of the limited species by all gear types?	0	47, 48
	power to record bycatch of the target species against limits for that species?	0	31
	Subtotal	**5**	
Exclusive	allocate national scale limits as a share of the regional TAC/TAE?	3	47, 48
	new entrants either excluded or able to participate without adding to TAC/TAE?	3	
	prohibit exemptions to the limit (or exemptions not provided for)?	0	47, 48, 49
	to impose penalties for exceeding national limits?	0	
	Subtotal	**6**	
Secure	national limits valid for more than one year?	1	47, 48
	national limits valid until Parties agree to amend them? (default = perpetuity)	0	CMM2020-01
	make national limits binding on Parties?	3	
	resolve disputes beyond bilateral negotiation	0	
	establish a record of national scale limits (e.g. in a regional register or CMM)?	0	
	Subtotal	**4**	
Transferable	transfer a national limit in full or in part to another CCM?	0	
	require new entrants to acquire an allocation through a transfer from a CCM?	0	
	specify a process for effecting a transfer?	0	
	record transfers in a register?	0	
	Subtotal	**0**	
Flexible	set a TRP the target stock(s)?	3	12
	establish harvest control rules for the target stock(s)?	1	
	adjust a TAC/TAE on the basis of environmental factors and stock assessments?	0	
	define national limits as a proportional (rather than volumetric) share of the regional TAC/TAE?	0	
	establish clear processes for a TAC/TAE to be adjusted?	0	
	Subtotal	**4**	
TOTAL		**19**	

5.5.7 Other commercial tropical tuna fisheries

The preceding instruments apply to purse seine fisheries and longline fisheries with the objective of limiting catches of SKJ, YFT and BET. Paragraph 51[1481] aims to fill the remaining gaps by covering "other commercial fisheries" that target SKJ, YFT and BET. Interpreted broadly, other commercial fisheries could include catches of the three species in: (i) high seas purse seine fisheries outside the tropical band[1482]; (ii) all high seas fisheries using other gear types; and (iii) EEZs by gear types other than purse seine[1483]. It does not seek to limit non-commercial fisheries. The provision requires CCMs to "take necessary measures" to limit catches of the three species in "other commercial fisheries" in which catches exceed 2000 tonnes to either the average for 2001-2004 or 2004 levels.

Property rights criteria

The limits applying to other commercial tropical tuna fisheries in CMM2018-01 is assessed against each property rights criterion below. Scores are summarised in Table 5.9 below, with further detail in the Annex, Table A.11.

Provisions for other commercial tropical tuna fisheries are far too brief to allow for many of the elements of well-defined property rights (overall score = 23). The *limit* (score = 8) is weakened by the lack of a consistent definition of "other commercial fisheries" and their basis in historical catches rather than science and precaution. Allocations appear to be quite *exclusive* (score = 7) but inconsistent definitions open opportunities to for allocations to overlap, thus reducing exclusivity. The binding nature of the CMM supports *secure* allocations (score = 4) but their short duration and the absence of a clear, reliable register of allocations significantly weakens it.

The absence of *transferability* (score = 0) and limited *flexibility* (score = 4) also further weakens the strength of any property-like instrument established by paragraph 51. The WCPFC has nevertheless signalled its intention to address measures to manage catches of the three species beyond the purse seine and longline fisheries.

[1481] CMM2018-01 para 51 full text: "CCMs shall take necessary measures to ensure that the total catch of their respective other commercial tuna fisheries for bigeye, yellowfin or skipjack tuna, but excluding those fisheries taking less than 2,000 tonnes of bigeye, yellowfin and skipjack, shall not exceed either the average level for the period 2001-2004 or the level of 2004."
[1482] i.e. high seas purse seine fisheries not covered by CMM2018-01 para 26.
[1483] i.e. catches in EEZs by non-purse seine gear not covered by CMM2018-01 para 25.

Table 5.9: CMM2018-01: Other commercial tropical tuna fisheries

Criterion	Question	Score	Ref
Limited	set a regional or subregional scale catch or effort limit?	2	51
	base limits on the best scientific evidence available?	0	
	base limits on the precautionary approach?	0	
	apply limits to the full geographic range of the stock?	3	
	ensure limits account for catches of the limited species by all gear types?	2	
	power to record bycatch of the target species against limits for that species?	1	
	Subtotal	**8**	
Exclusive	allocate national scale limits as a share of the regional TAC/TAE?	2	51
	new entrants either excluded or able to participate without adding to TAC/TAE?	3	
	prohibit exemptions to the limit (or exemptions not provided for)?	2	5, 50, 51
	to impose penalties for exceeding national limits?	0	
	Subtotal	**7**	
Secure	national limits valid for more than one year?	1	5
	national limits valid until Parties agree to amend them? (default = perpetuity)	0	
	make national limits binding on Parties?	3	
	resolve disputes beyond bilateral negotiation	0	
	establish a record of national scale limits (e.g. in a regional register or CMM)?	0	
	Subtotal	**4**	
Transferable	transfer a national limit in full or in part to another CCM?	0	
	require new entrants to acquire an allocation through a transfer from a CCM?	0	
	specify a process for effecting a transfer?	0	
	record transfers in a register?	0	
	Subtotal	**0**	
Flexible	set a TRP the target stock(s)?	3	
	establish harvest control rules for the target stock(s)?	1	
	adjust a TAC/TAE on the basis of environmental factors and stock assessments?	0	
	define national limits as a proportional (rather than volumetric) share of the regional TAC/TAE?	0	
	establish clear processes for a TAC/TAE to be adjusted?	0	
	Subtotal	**4**	
TOTAL		**23**	

5.5.8 Conclusion

This section has evaluated the instruments within CMM2018-01 that have been identified as providing a basis for a right-like instrument for the management of an element of the tropical tuna fisheries of the WCPO, that is, those fisheries targeting primarily SKJ, BET and YFT. These instruments include purse seine effort limits, purse seine capacity limits, FAD deployment limits, longline catches of BET, longline capacity and "other commercial fisheries". The WCPFC Technical and Compliance Committee (TCC) has noted that there is limited data against which to verify CCMs' reporting against vessel capacity limits in the measure[1484].

The suite of instruments contained within CMM2018-01 represent a solid attempt to limit various outputs or inputs of the region's tropical tuna fisheries. However, as the evaluations against the property rights criteria show, much work is needed to develop those instruments into well-defined property rights.

Some provisions in CMM 2018-01 affect all instruments, and warrant a brief mention. The absence of any dedicated provisions for straightforward, independent dispute resolution in the CMM undermine security of all instruments. Nevertheless, the WCPF Convention incorporates the dispute settlement mechanisms of UNFSA[1485]. The inclusion of an expiry date for the entire CMM[1486] puts all allocations in doubt each year. CCMs are therefore subject to a deliberate decision by the WCPFC to rollover the measure each year, such that one CCM could put at jeopardy all allocations.

Finally, the Commission's commitment to develop harvest strategies for the four key tuna species is likely to support predictable flexibility in the long term. However, progress has been slow and there is no clear intention to link harvest control rules, when they eventuate, to specific instruments.

5.6 Other fisheries

5.6.1 Introduction

This section assesses the remaining right-like instruments that directly set and allocate limits, that is, fisheries for stocks other than tropical tuna. These include south Pacific albacore, sharks, striped marlin, and swordfish.

[1484] WCPFC TCC (2019). Summary Report TCC15. Fifteenth Regular Session of the Technical and Compliance Committee (TCC15). September 25 – October 1 2019, Pohnpei WCPFC. para125.
[1485] Convention on the Conservation of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (WCPF Convention). Agreed on 5 September 2000, Honolulu. Entered into force on 19 June 2004. **40 International Legal Materials 278 2001**. Article 31: "The provisions relating to the settlement of disputes set out in Part VIII of the Agreement apply, mutatis mutandis, to any dispute between members of the Commission, whether or not they are also Parties to the Agreement."
[1486] WCPFC (2018). Conservation and Management Meaure for Bigeye, Yellowfin and Skipjack Tuna in the Western and Central Pacific Ocean. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2018-01**. para 57 (revised in December 2020 to 15 February 2021).

5.6.2 South Pacific albacore (CMM 2015-02)

South Pacific albacore (SPA) stocks are assessed as not overfished and overfishing is not occurring. However, many CCMs – including FFA members[1487] and major DWFNs such as China[1488] and Chinese Taipei[1489] – shared, or at least appreciated[1490], the challenge of poor economic performance in the fishery. After several years' delay, WCPFC15 agreed to an interim TRP of 56% of $SB_{F=0}$ to be achieved within 20 years in order to achieve an 8% increase in CPUE for the southern longline fishery. The TRP would be reviewed every three years in line with the schedule of SPA stock assessments[1491].

CMM2015-02 aims to limit the number of each flag State's vessels actively fishing for SPA in the Convention Area south of 20°S to 2005 levels or "recent historical (2000-2004) levels"[1492], along similar lines to the purse seine and longline capacity limits in CMM2018-01. Although couched in terms of capacity, that is, potential effort, the expression "actively fishing" suggests this measure aims to limit actual effort rather than capacity along the lines of a licence limitation[1493]. Regardless of how it is characterised, it does not take account of the capacity of each vessel or other elements of effort (e.g. time, hooks)[1494], and therefore is likely to be quite weak. Nevertheless, it does set a basis for a crude form of right akin to a limited licence. There is a reasonable case to suggest that a capacity-like limit at the national scale is aimed at improving economic outcomes.

Property rights analysis

[1487] WCPFC (2019). Summary Report. Fifteenth Regular Session the Western and Central Pacific Fisheries Commission (WCPFC15), 10-14 December 2018, Honolulu, Western and Central Pacific Fisheries Commission (WCPFC). para 187.
[1488] Ibid. para 200.
[1489] Chinese Taipei is recorded as merely acknowledging that SPA is an important resource to its industry ibid. para 203.
[1490] Japan, for example, stated that it "understands the economic difficulties fishermen in FFA members face". Ibid. para 201.
[1491] Ibid. para 207, 209.
[1492] CMM2015-02 para 1.
[1493] FFA has proposed that vessels actively fishing be defined as vessels that catch more than five tonnes of south Pacific albacore in a calendar year – but this has not been adopted by the WCPFC. See WCPFC (2016). Summary Report. Twelfth Regular Session of the Western and Central Pacific Fisheries Commission (WCPFC12), 3-8 December 2015, Bali, Indonesia, Western and Central Pacific Fisheries Commission. paras 343-6.
[1494] Longline effort does appear to have increased since the reference period. The highest longline effort (defined as number of hooks) in the area south of 10°S during the reference period (2000-2005) was in 2002. In six of the following 14 years the number of hooks deployed was higher than in 2002, with all six occurring after the reference period (ie: after 2005). See Brouwer, S., G. Pilling, P. Williams and WCPFC_Secretariat (2018). Trends in the South Pacific Albacore Longline and Troll Fisheries. Fifteenth Regular Session of the Western and Central Pacific Fisheries Commission (WCPFC). 10-14 December 2018, Honolulu, WCPFC. **WCPFC 2018-IP02**. p11 Figure 3. Data for vessel days in the analysis cited above commence in 2008 so a comparison to the reference period is not possible. However, the number of vessel days employed south of 10oS is consistently higher in subsequent years than in 2008 and peaked in 2013. See p23 Figure A1-2.

The limits applying to south Pacific albacore in CMM2015-02 are assessed against each property rights criterion below. Scores are summarised in Table 5.10 below, with further detail in the Annex, Table A.12.

CMM2015-02 provides for very weak right-like allocations of effort-like, bottom-up capacity limits, similar in form to the purse seine and longline capacity limits in CMM2018-01 (overall score = 22). However, the incomplete geographic coverage and the weak definition of capacity considerably undermines the *limits* (score = 6). *Exclusivity* is undermined by the lack of penalties for non-compliance, and the presence of exemptions for SIDSTs (score = 4). *Security* is reasonably strong due to the default continuation of the measure but is let down by the absence of register of limits (score = 8). The lack of *transferability* (score = 0) and weak *flexibility* (score = 4) mechanisms also make for poorly-defined rights.

Table 5.10: CMM2015-02 South Pacific Albacore

Criterion	Question	Score	Ref
Limited	set a regional or subregional scale catch or effort limit?	2	1
	base limits on the best scientific evidence available?	0	
	base limits on the precautionary approach?	0	
	apply limits to the full geographic range of the stock?	0	
	ensure limits account for catches of the limited species by all gear types?	3	
	power to record bycatch of the target species against limits for that species?	1	
	Subtotal	**6**	
Exclusive	allocate national scale limits as a share of the regional TAC/TAE?	3	1
	new entrants either excluded or able to participate without adding to TAC/TAE?	1	
	prohibit exemptions to the limit (or exemptions not provided for)?	0	2
	to impose penalties for exceeding national limits?	0	
	Subtotal	**4**	
Secure	national limits valid for more than one year?	2	
	national limits valid until Parties agree to amend them? (default = perpetuity)	3	
	make national limits binding on Parties?	3	
	resolve disputes beyond bilateral negotiation	0	
	establish a record of national scale limits (e.g. in a regional register or CMM)?	0	
	Subtotal	**8**	
Transferable	transfer a national limit in full or in part to another CCM?	0	
	require new entrants to acquire an allocation through a transfer from a CCM?	0	
	specify a process for effecting a transfer?	0	
	record transfers in a register?	0	
	Subtotal	**0**	
Flexible	set a TRP the target stock(s)?	3	WCPFC15
	establish harvest control rules for the target stock(s)?	1	
	adjust a TAC/TAE on the basis of environmental factors and stock assessments?	0	
	define national limits as a proportional (rather than volumetric) share of the regional TAC/TAE?	0	
	establish clear processes for a TAC/TAE to be adjusted?	0	
	Subtotal	**4**	
TOTAL		**22**	

5.6.3 Sharks (CMM 2019-04)

In 2019 the WCPFC adopted a new, comprehensive measure (CMM2019-04) for sharks[1495], which replaced five existing CMMs[1496]. For the purposes of the new CMM, sharks are defined as all species of sharks, rays, skates and chimaeras of the class *chondrichthyes*[1497] and applies to all sharks listed in Annex 1 of LOSC and any sharks associated with WCPFC fisheries[1498]. It entered into force on 1 November 2020 and Indonesia was allowed a further year to comply[1499], although in the meantime remained bound by the measures that CMM2019-04 replaced[1500].

The CMM aims to "ensure the long-term conservation and sustainable use of sharks"[1501] in the EEZs and high seas of the WCPFC-CA[1502]. It comprises several instruments, most of which do not lay a foundation for rights-based management, but some of which may support it. The key provision pointing to rights-based instruments is paragraph 16 and Annex 2 paragraphs 5. Purely command-and-control rules include those in paragraphs 17, 18, 20 and 21.

Ecological objectives relating to all shark bycatch are addressed by several command-and-control rules. These include specific gear requirements for longline vessels targeting tuna and billfish[1503], a duty to safely release shark bycatch with minimal harm[1504] and specific handling and MCS and reporting requirements for sharks that are not to be retained on board[1505]. Some provisions relate to particular species, including whale sharks[1506], oceanic whitetip sharks and silky sharks[1507].

[1495] WCPFC (2019). Outcomes Document WCPFC16. 16th Regular Session of the Western and Central Pacific Fisheries Commission, 5-11 December 2019, Port Moresby, WCPFC.. para 59.
[1496] CMM 2019-04 replaced replace CMM 2010-07 (sharks), CMM 2011-04 (oceanic whitetip sharks), CMM 2012-04 (protection of whale sharks from purse seine operations), CMM 2013-08 (silky sharks) and CMM 2014-05 (sharks).
[1497] CMM2019-04 para 1(1).
[1498] CMM2019-04 para 3.
[1499] WCPFC (2019). Outcomes Document WCPFC16. 16th Regular Session of the Western and Central Pacific Fisheries Commission, 5-11 December 2019, Port Moresby, WCPFC. para 60.
[1500] See CMM2019-04 footnote 4.
[1501] CMM2019-04 para 2: "The objective of this Conservation and Management Measure (CMM) is, through the application of the precautionary approach and an ecosystem approach to fisheries management, to ensure the long-term conservation and sustainable use of sharks".
[1502] CMM2019-04 para 4: "This measure shall apply to the high seas and exclusive economic zones of the Convention Area."
[1503] CMM2019-04 para 14 requires vessels targeting tuna and billfish to implement one of two specified gear modifications.
[1504] CMM2019-04 para 17. It may be overstating the degree of obligation here, given the use of "should" rather than "shall": "Where sharks are unwanted bycatch they *should* be released alive using techniques that result in minimal harm, taking into account the safety of the crew" (emphasis added).
[1505] CMM2019-04 para 18: "CCMs shall ensure that sharks that are caught and are not to be retained, hauled (*sic*) alongside the vessel before being cut free in order to facilitate a species identification. This requirement shall only apply when an observer or electronic monitoring camera is present, and should only be implemented taking into consideration the safety of the crew and observer."
[1506] CMM2019-04 para 21 on whale sharks.
[1507] CMM2019-04 para 20 on oceanic White tip sharks and silky sharks.

For longline fisheries, CCMs are required to develop national management plans that include, inter alia, "measures to avoid or reduce catch and maximize live release of species whose retention is prohibited by the Commission"[1508]. The CMM also includes some non-binding provisions such as an exhortation to implement the *International Plan of Action for the Conservation and Management of Sharks*[1509] [1510] and requirements that CCMs "encourage" the implementation of WCPFC guidelines relating to sharks.

A single provision carried over from CMM2014-05 appears to require that CCMs adopt national measures to limit catches of target shark species by longline fisheries under national management plans[1511]. Its wording is ambiguous but likely establishes a duty – "CCMs shall develop…". Annex 2 paragraph 5 elaborates that national management plans are to be reported in part 2 of each CCM's annual report and that it shall include: "(1) specific authorizations to fish such as a license and a TAC or other measure to limit the catch of shark to acceptable levels; (2) measures to avoid or reduce catch and maximize live release of species whose retention is prohibited by the Commission".

These requirements appear to be cumulative rather than alternatives and establish a basis for CCMs to adopt national catch or effort limits and potentially allocate TAC/TAE to individual users through licences or similar instruments as part of a rights-based management scheme. However, the CMM is not prescriptive about the exact form of national measures to limit catches. Such a scheme would necessarily be limited to the national scale and any region-wide limit to achieve a regional scale biological objective would simply be the sum of all nationally determined TAC/TAEs, rather than a science-based, region-wide, top-down limit. National TACs are not obviously enforceable by the WCPFC, nor necessarily stable.

The remaining instruments established by CMM2019-04 are all clearly command-and-control rules. By and large they either prohibit or mandate certain actions, and where they do not, they merely *encourage* certain actions. Instruments targeting social objectives comprise carve-outs for Indonesia (albeit temporarily[1512]) and coastal States, ostensibly for the benefit of traditional fishing activities. There are no apparent provisions permitting a sub-allocation of a TAC/TAE for traditional fishing to be set aside but the carve-out in para 5 appears to permit this at a national scale.

[1508] CMM2019-04 Annex 2 para 5(2).
[1509] CMM2019-04 para 6: "CCMs should implement, as appropriate, the FAO International Plan of Action for the Conservation and Management of Sharks (IPOA). For implementation of the IPOA, each CCM should, as appropriate, include its National Plan of Action for sharks in Part 2 Annual Report." It is arguable that CMMs should take into account FAO IPOAs and agreed RFMO guidelines as "generally recommended international minimum standards, whether subregional, regional or global". See WCPF Convention Article 5(b).
[1510] FAO (1999). International Plan of Action for the Conservation and Management of Sharks (IPOA-Sharks). Adopted by the twenty-third session of the FAO Committee on Fisheries in February 1999 and endorsed by the FAO Council in June 1999. Rome, Food and Agriculture Organisation of the United Nations (FAO).
[1511] CMM2019-04 para16: "For longline fisheries targeting sharks, CCMs shall develop and report their management plans in their Part 2 Annual Report."
[1512] See footnote 4 in CMM2019-04: "This CMM shall not apply to Indonesia before November 1st 2021. Until then, all the existing CMMs related to sharks and rays shall apply to Indonesia."

Property rights analysis

The national limits referred to in CMM2019-04 Annex 2 paragraph 5 are assessed below. Scores are summarised in Table 5.11, with further detail in the Annex, Table A.13.

CMM2019-04 is assessed as meeting very few property rights criteria (overall score = 15). As outlined in Chapter Two, command-and-control rules were likely to be appropriate and relatively simple to implement to mitigate catches and mortality of threatened shark species to meet ecological objectives[1513]. However, the fact that some species were permitted to be harvested established a prima facie case for the adoption of a rights-based approach at the regional scale to achieve biological and economic objectives for the stock.

The CMM applies to the entire region but only allows for, rather than mandates, catch or effort limit for permitted shark species at the national scale for longline fisheries. A regional longline limit on shark catches – either catch-based or by licence limitations – would comprise the aggregate of all nationally-determined limits. However, the CMM does not specify whether the duty is upon coastal States or flag States. It could reasonably be assumed to mean that coastal States must determine their national limits for their EEZ and flag States must determine a limit for their vessels on the high seas. There is no clear mechanism to ensure that the compatibility requirements of the WCPF Convention are adhered to as each national plan must simply be reported in each CCM's annual report rather than approved by the Commission.

The implications for catch limits of provisions concerning the treatment of sharks retained on board require close attention. Paragraph 7[1514] requires the full utilisation[1515] of all sharks and prohibits finning[1516]. The language of the provision suggests that the obligation applies to all CCMs regardless of whether they are acting as a coastal State or flag State. Notwithstanding this, paragraph 12 singles out flag States to ensure compliance by their vessels[1517]. Paragraph 8 specifically requires flag States "to require their vessels to land sharks with fins naturally attached to the carcass" until and including 2022[1518] or employ one of three alternative methods specified in paragraph 9[1519]. In either case, shark

[1513] Chapter Two subsection 2.3.3.
[1514] CMM 2019-04 para 7: "CCMs shall take measures necessary to require that all sharks retained on board their vessels are fully utilized. CCMs shall ensure that the practice of finning is prohibited."
[1515] CMM2019-04 para 1(2) defines "full utilisation" as "Retention by the fishing vessel of all parts of the shark excepting head, guts, vertebrae and skins, to the point of first landing or transhipment".
[1516] CMM2019-04 para 1(3) defines "finning" as "Removing and retaining all or some of a shark's fins and discarding its carcass at sea".
[1517] CMM2019-04 para 12: "CCMs shall take measures necessary to prevent their fishing vessels from retaining on board (including for crew consumption), transshipping, and landing any fins harvested in contravention of this CMM".
[1518] CMM2019-08 para 8: "In order to implement the obligation in paragraph 7, in 2020, 2021 and 2022, CCMs shall require their vessels to land sharks with fins naturally attached to the carcass."
[1519] CMM2019-04 para 9: "Notwithstanding paragraph 8, in 2020, 2021 and 2022, CCMs may take alternative measures as listed below to ensure that individual shark carcasses and their corresponding fins can be easily

carcasses and their corresponding fins are required to be landed or transhipped together[1520]. Neither paragraph 7 nor 8 specifically require all sharks to be retained but the clear intention is that if a fin of a shark is retained, then the whole carcass must be retained.

Indeed, specific requirements relating to oceanic whitetip sharks and silky sharks prohibit vessels "from retaining on board, transshipping, storing on a fishing vessel or landing" either species[1521] and to ensure their safe release with minimum harm in accordance with any safe release and handling guidelines[1522]. A strict reading of this provision suggests that dead oceanic whitetip sharks and silky sharks should also not be retained. The provision is therefore an outright ban on catches of the two species rather than an opening to a quota system. Similar provisions apply to whale sharks in the purse seine fishery[1523]. Provisions for sharks that are permitted to be retained, whether as bycatch or target species, allow for their inclusion in any applicable quota.

Nationally-determined limits are not guaranteed to be compatible with each other or within a regionally-determined, science-based, regional scale limit. Effective implementation of UNFSA Article 7[1524] within the measure would go some way to addressing this gap. Such *limits* are therefore dependent on the strength and quality of national plans of action (score = 8). National limits are therefore also unlikely to be *exclusive*, reflected in the lowest possible assessment for this criterion (score = 0).

Paradoxically, the lack of provisions relating to the security of national catch limits provides substantial comfort to CCMs. They may determine an "acceptable" limit without reference to any supra-national authority and there is no obvious scope for other CCMs to challenge this. However, limits are not binding on the CCM. On balance, the level of *security* is low (score = 6), and any strengths therein (relating to the duration of any national limits permitted by the measure) are likely to have negative

identified on board the vessel at any time:…". Para 10 permits CCMs' vessels on the high seas to use other alternative methods endorsed by the TCC and the Commission. According to para 11, the WCPFC intends to consider whether it should adopt the alternatives employed under para 9.

[1520] CMM2019-04 para 13: "CCMs shall take measures necessary to ensure that both carcasses and their corresponding fins are landed or transshipped together, in a manner that allows inspectors to verify the correspondence between an individual carcass and its fins when they are landed or transshipped."

[1521] CMM2019-04 para 20(1): "CCMs shall prohibit vessels flying their flag and vessels under charter arrangements to the CCM from retaining on board, transshipping, storing on a fishing vessel or landing any oceanic whitetip shark, or silky shark, in whole or in part, in the fisheries covered by the Convention."

[1522] CMM2019-04 para 20(2): "CCMs shall require all vessels flying their flag and vessels under charter arrangements to the CCM to release any oceanic whitetip shark or silky shark that is caught as soon as possible after the shark is brought alongside the vessel, and to do so in a manner that results in as little harm to the shark as possible, following any applicable safe release guidelines for these species". WCPFC 15 adopted Best Handling Practices for the Safe Release of Sharks (other than Whale Sharks and Mantas/Mobulids). See WCPFC SC (2019). Summary Report SC15. Fifteenth Regular Session of the WCPFC Scientific Committeec (SC15), 12-20 August 2019, Pohnpei, WCPFC. para 342 and Attachment J. Note that CMM2019-04 para 17 implies that implementation of the guidelines by vessels is not obligatory: "CCMs *should encourage* their fishing vessels to use any Commission adopted guidelines for the safe release and handling of sharks" (emphasis added).

[1523] CMM 2019-04 para 21.

[1524] See the discussion on the compatibility requirements of UNFSA in Chapter Two subsection 2.4.6.

consequences for the stocks as they cannot be challenged, for example, on whether they are sufficiently science-based or precautionary. There are no provisions supporting *flexibility* (score = 0) or *transferability* at the national scale, although transferability through bilateral arrangements is not prohibited (score = 1).

Table 5.11: CMM2019-04: Sharks

Criterion	Question	Score	Ref
Limited	set a regional or subregional scale catch or effort limit?	1	Annex2 para 5
	base limits on the best scientific evidence available?	1	Para 2
	base limits on the precautionary approach?	1	Para 2
	apply limits to the full geographic range of the stock?	3	
	ensure limits account for catches of the limited species by all gear types?	0	Para 16
	power to record bycatch of the target species against limits for that species?	2	Paras 7, 8, 9
	Subtotal	**8**	
Exclusive	allocate national scale limits as a share of the regional TAC/TAE?	0	
	new entrants either excluded or able to participate without adding to TAC/TAE?	0	
	prohibit exemptions to the limit (or exemptions not provided for)?	0	
	to impose penalties for exceeding national limits?	0	
	Subtotal	**0**	
Secure	national limits valid for more than one year?	3	
	national limits valid until Parties agree to amend them? (default = perpetuity)	3	
	make national limits binding on Parties?	0	
	resolve disputes beyond bilateral negotiation	0	
	establish a record of national scale limits (e.g. in a regional register or CMM)?	0	
	Subtotal	**6**	
Transferable	transfer a national limit in full or in part to another CCM?	1	
	require new entrants to acquire an allocation through a transfer from a CCM?	0	
	specify a process for effecting a transfer?	0	
	record transfers in a register?	0	
	Subtotal	**1**	
Flexible	set a TRP the target stock(s)?	0	
	establish harvest control rules for the target stock(s)?	0	
	adjust a TAC/TAE on the basis of environmental factors and stock assessments?	0	
	define national limits as a proportional (rather than volumetric) share of the regional TAC/TAE?	0	
	establish clear processes for a TAC/TAE to be adjusted?	0	
	Subtotal	**0**	
TOTAL		**15**	

5.6.4 Striped Marlin (CMM 2006-04 and CMM2010-01)

Striped marlin occurs in the tropical, subtropical and temperate waters of the Pacific and Indian Oceans. In the western Pacific their range extends to between 45º north and south, tending toward more temperate waters, exhibiting a range similar to that of albacore[1525]. The stock is likely to be a single population with some substructuring[1526]. The Scientific Committee also does not view striped marlin in the north Pacific as a northern stock[1527]. It therefore makes sense to treat the striped marlin in the northern Pacific and south western Pacific jointly. Striped marlin are taken primarily by longline gear but other commercial gear types have recorded catches[1528].

As Table 5.12 below summarises two CMMs that aim to limit catches and capacity in the northern and southern Pacific respectively. CMM2006-04 sets flag State capacity limits on vessels targeting striped marlin in the south west Pacific (i.e. in the WCPFC-CA south of 15ºS). Each flag State is limited to the number of vessels fishing for striped marlin in any one year from 2000 to 2004[1529]. CMM 2010-01 sets an overall flag-based catch limit for striped marlin north of the equator at 80% of levels caught in 2000 to 2003[1530]. Both limits set bottom-up aggregate caps based on self-reported vessel and catch histories respectively.

Table 5.12: Instruments applying to striped marlin in the WCPO

Instrument	Aggregate limit	Area of application	Allocated to	Allocations
CMM2006-04 para 1	Capacity	South of 15ºS High seas & EEZs	Flag States	Bottom up
CMM2010-01	Catch	North of equator High seas and EEZs	Flag States	Bottom up

[1525] FAO. (2020). "Tetrapturus audax (Philippie 1887)." Species Fact Sheets Retrieved 2 November, 2020, from http://www.fao.org/fishery/species/2501/en.
[1526] Bromhead, D. and J. Pepperell (2004). Chapter Two: Biology and ecology of striped marlin. Striped Marlin: Biology and Fisheries: Final Report to the Fisheries Management Research Fund and the Fisheries Resources Research Fund. D. Bromhead, J. Pepperell, B. Wise and J. Findlay. Canberra, Bureau of Rural Sciences. p18.
[1527] CMM2010-01 Preamble: "Acknowledging the advice from the Scientific Committee that the information provided by the ISC does not support classification of North Pacific Striped Marlin as a "northern stock" under Annex 1 of the WCPFC Rules of Procedure".
[1528] SPC reports the longline catches of striped marlin in the WCPFC-CA in 2018 amounted to 2961 tonnes and 403 tonnes by other commercial gears. SPC (2019). Western and Central Fisheries Commission Tuna Fishery Yearbook 2018. Pohnpei, WCPFC**:** 149pp. Table 100 pp148-9.
[1529] CMM2006-04 para 1: CCMs "…shall limit the number of their fishing vessels fishing for striped marlin in the Convention Area south of 150 S, to the number in any one year between the period 2000 – 2004".
[1530] CMM2010-01 para 4. The 20% reduction was to be achieved by phased reductions in each flag state's 2000-2003 catch levels in 2011, 2012 and 2013 per para 5.

Property rights analysis

The limits applying to striped marlin in CMM2006-04 and CMM2010-01 are assessed against each property rights criterion in summary form in Tables 5.13 and 5.14 respectively below, with further detail in the Annex, Tables A.15 and A.16.

These two CMMs aim to address what is likely to be a single stock – western and central Pacific striped marlin – by using two differently defined limits to be applied in different zones, separated by 15° of latitude in which neither measures applies. The northern zone (overall score = 28) scores marginally higher than the south-west zone (overall score = 26) due primarily to the former being specified in terms of catch volumes rather than vessel numbers. This allows for slightly stronger score for the *limited* criterion for the northern zone (score = 12), including through the effect of the implied inclusion of *all catches* of striped marlin in the north Pacific compared to the more ambiguous phrase "fishing vessels fishing for striped marlin" in the southwest Pacific (score = 10)[1531].

Both measures are assessed similarly for *exclusivity* (score = 6) and *security* (score = 10). Exceptions for SIDSTs and the absence of any penalties for non-compliance undermine the former while the absence of dispute resolution mechanisms and weak registers detract from the former. Neither measure provides for *transfers* (score = 0) or *flexibility* (score = 0).

[1531] The TCC has noted that there is limited data against which to verify CCMs' reporting against both limits. WCPFC TCC (2019). Summary Report TCC15. Fifteenth Regular Session of the Technical and Compliance Committee (TCC15). September 25 – October 1 2019, Pohnpei WCPFC. para125.

Table 5.13: CMM 2006-04: Striped marlin in the South West Pacific

Criterion	Question	Score	Ref
Limited	set a regional or subregional scale catch or effort limit?	2	1, 4
	base limits on the best scientific evidence available?	2	Preamble
	base limits on the precautionary approach?	2	Preamble
	apply limits to the full geographic range of the stock?	0	1
	ensure limits account for catches of the limited species by all gear types?	3	1
	power to record bycatch of the target species against limits for that species?	1	1
	Subtotal	**10**	
Exclusive	allocate national scale limits as a share of the regional TAC/TAE?	3	1
	new entrants either excluded or able to participate without adding to TAC/TAE?	3	
	prohibit exemptions to the limit (or exemptions not provided for)?	0	2, 5
	to impose penalties for exceeding national limits?	0	
	Subtotal	**6**	
Secure	national limits valid for more than one year?	3	
	national limits valid until Parties agree to amend them? (default = perpetuity)	3	
	make national limits binding on Parties?	3	
	resolve disputes beyond bilateral negotiation	0	
	establish a record of national scale limits (e.g. in a regional register or CMM)?	1	
	Subtotal	**10**	
Transferable	transfer a national limit in full or in part to another CCM?	0	
	require new entrants to acquire an allocation through a transfer from a CCM?	0	
	specify a process for effecting a transfer?	0	
	record transfers in a register?	0	
	Subtotal	**0**	
Flexible	set a TRP the target stock(s)?	0	
	establish harvest control rules for the target stock(s)?	0	
	adjust a TAC/TAE on the basis of environmental factors and stock assessments?	0	
	define national limits as a proportional share of the regional TAC/TAE?	0	
	establish clear processes for a TAC/TAE to be adjusted?	0	
	Subtotal	**0**	
TOTAL		**26**	

Table 5.14: CMM 2010-01: Striped marlin in the North Pacific

Criterion	Question	Score	Ref
Limited	set a regional or subregional scale catch or effort limit?	3	5
	base limits on the best scientific evidence available?	3	Preamble, 5
	base limits on the precautionary approach?	1	
	apply limits to the full geographic range of the stock?	0	1
	ensure limits account for catches of the limited species by all gear types?	3	5
	power to record bycatch of the target species against limits for that species?	2	5
	Subtotal	**12**	
Exclusive	allocate national scale limits as a share of the regional TAC/TAE?	3	5
	new entrants either excluded or able to participate without adding to TAC/TAE?	3	
	prohibit exemptions to the limit (or exemptions not provided for)?	0	3
	to impose penalties for exceeding national limits?	0	
	Subtotal	**6**	
Secure	national limits valid for more than one year?	3	5
	national limits valid until Parties agree to amend them? (default = perpetuity)	3	5
	make national limits binding on Parties?	3	
	resolve disputes beyond bilateral negotiation	0	
	establish a record of national scale limits (e.g. in a regional register or CMM)?	1	
	Subtotal	**10**	
Transferable	transfer a national limit in full or in part to another CCM?	0	
	require new entrants to acquire an allocation through a transfer from a CCM?	0	
	specify a process for effecting a transfer?	0	
	record transfers in a register?	0	
	Subtotal	**0**	
Flexible	set a TRP the target stock(s)?	0	
	establish harvest control rules for the target stock(s)?	0	
	adjust a TAC/TAE on the basis of environmental factors and stock assessments?	0	
	define national limits as a proportional share of the regional TAC/TAE?	0	
	establish clear processes for a TAC/TAE to be adjusted?	0	
	Subtotal	**0**	
TOTAL		**28**	

5.6.5 Swordfish (CMM2009-03)

As summarised in Table 5.15 below, CMM 2009-03 establishes flag State limits on the number of vessels fishing for swordfish[1532] [1533] and flag State swordfish catch limits[1534] in the Convention Area south of 20°S. Each flag State is limited to the number of vessels fishing for swordfish in any one year from 2000 to 2005[1535]. Swordfish catches in that area are limited to the level in one year from 2000 to 2006[1536] with overages to be carried forward[1537].

Although the CMM uses the term "effort", it is argued that the limits on the number of vessels fishing for swordfish shares similarity to a capacity limit, as it represents at best a cap on *potential effort*, not actual effort deployed[1538]. That said, capacity limits could help to bolster economic returns by keeping a lid on CPUE. However, strong catch-based rights-based instruments would arguably render capacity limits in the same fishery redundant.

Table 5.15

Table 5.15: Instruments applying to swordfish in CMM2009-03

Instrument	Aggregate limit	Area of application	Allocated to	Allocations
CMM2009-03 para 1 & Annex 1	Capacity	South of 20°S High seas & EEZs	Flag States	Bottom up
CMM2009-03 Paras 2 and 4	Catch	South of 20°S High seas & EEZs	Flag States	Bottom up

[1532] CMM2009-03 is unclear as to whether this limit relates to vessels targeting swordfish as opposed to those that catch swordfish, whether as bycatch or as a target species. Para 1: "…limiting the number of their fishing vessels for swordfish [sic] in the Convention Area south of 20°S…". The wording is perhaps clumsy – "fishing vessels for swordfish probably should read "vessels fishing for swordfish". The latter would more clearly indicate that that the measure is aimed at limiting vessels *targeting* swordfish. However, the presence of data for vessels taking swordfish as bycatch suggests this is not the case.

[1533] Further, Australia has pointed to the inconsistent interpretation of "fishing for swordfish" in relation to CMM2008-03 on Sea Turtles, and in the context of avoiding turtle bycatch, suggested that "…it is the method of fishing — by shallow set — for any purpose that contributes to bycatch of sea turtles and is therefore the relevant consideration…".

[1534] CMM2009-03 para 2: "In addition to vessel limits established under paragraph 1, CCMs shall exercise restraint through limiting the amount of swordfish caught by fishing vessels flagged to them in the Convention Area south of 20°S to the amount caught in any one year during the period 2000 – 2006."

[1535] CMM2009-03 para 1 and Annex 1.

[1536] CMM2009-03 para 2. See footnote 1534 above.

[1537] CMM2009-03 para 9: "As an interim measure, and without prejudice to future decisions of the Commission relating to monitoring and responding to compliance with conservation and management measures, until the Commission adopts a scheme relating to compliance with CMMs which includes responses when a flag State exceeds any limits assigned to it, if it is determined by the Commission that the catch of vessels flying the flag of a CCM exceeds the total catch specified for them under paragraphs 2 and 4 above, that CCM will be subject to a reduction in their catch limit equal to the exceeded amount. The reduction will apply in the year immediately after it has been determined that the catch limit has been exceeded."

[1538] "Para 195…While the stock was assessed in 2017 as not overfished nor subject to overfishing, SC noted a rapid decline in biomass from the 1990s through 2010, and a consistent gradual decline in biomass since then. Australia considered the current measure to be relatively weak, with little capacity to prevent substantial future increases in fishing mortality across the area of the stock, which presents a real risk for the stock's future".

Table 5.16 replicates the data in Annex 1 of CMM 2009-03[1539]. Although the Table includes vessel numbers from 2000 to 2007, paragraph 1 clearly states that CCMs are limited to a number of vessels in the period 2000 to 2005. The bold figure for each CCM represents the nominated maximum limit for that CCM over the period 2000 to 2005, that is, the highest number of that period. The United States has only provided data for years outside the range stipulated in paragraph 1.

Putting aside this discrepancy for the moment, the final column indicates the total number of vessels targeting swordfish in each year from 2000 to 2007. The average annual total for this period is 313 and highest number is 405, in 2003. However, the sum of the highest numbers for each country is 490 vessels, which is 85 more vessels (or 21% higher) than the highest year. The aggregate limit imposed by paragraph 1 is therefore well in excess of historical capacity.

Table 5.16: Historical vessel numbers targeting swordfish and swordfish catches (CMM 2009-03 Annex 1)

Year	Australia	Belize	Cook Islands	EU	Japan	Korea	New Caledonia (Bycatch)	New Zealand	Chinese Taipei			USA	Annual total
									Seasonal >100GRT	Bycatch >100 GRT	Bycatch <100 GRT		
2000	140	0		0		22	15	103	10	41	17		**348**
2001	**159**	0		0		22	12	132	10	41	17		**393**
2002	144	0		0		22	11	**151**	10	42	17		**397**
2003	134	0	**16#**	0		**24**	15	132	**12**	**55**	17		**405**
2004	121	0	15	8		22	**25**	99	8	39	17		**354**
2005	100	0	6	14		23	15	57	6	40	19		**280**
2006	55	0	8			6			4	27	26	2	**128**
2007	54	**1^**		**15***		4		74^^	3	16	**30**	2	**199**
Best	159	1	16	15	NA	24	25	151	12	55	30	2	490
Catch [1540]	2126			3170.36	588	42.25	NA	1027	466			74 [1541]	4566.61 +US

Table 5.16 also reveals that New Caledonia and Chinese Taipei are targeting other species and taking swordfish as bycatch. If this is the case, a strict reading of the measure – that the capacity limit applies

[1539] This table included the following footnotes: "*See EU Annual Report (Part 1) for the period 1 January – 31 December 2007; ^See Belize catch and effort data (by-catch) reported to the Commission on 29 April 2008; ^^See New Zealand Annual Report (Part 2) for the period 1 January-31 December 2007; # Note application of paragraph 5; this figure is without prejudice to the Cook Islands right to develop its domestic fishery".

[1540] Nominated maximum total catch of swordfish south of 20°S in 2009 as reported in WCPFC (2010). Review of CCMs' Implementation of, and Compliance with, Conservation and Management Measures. Technical and Compliance Commiteee Sixth Regular Session. Pohnpei, 30 September to 5 October 2010, Western and Central Pacific Fisheries Commission (WCPFC). **WCPFC-TCC6-2010/22 Rev 1**. Attachment 6.

[1541] The US specifies "74 vessels (Samoa)" rather than a catch volume.

to "vessels targeting swordfish" – would therefore not apply to vessels that catch swordfish as bycatch. New Caledonia and Chinese Taipei vessels would therefore escape the capacity limit.

They are nevertheless included in the Table with an identified maximum limit, evincing an intention that the measure does in fact apply to the two CCMs. The capacity limit would therefore likely have the unintended effect of limiting the number of vessels targeting other species that are caught using the same gear and fishing method. Interpreted as such, the capacity limit conflates multiple attributes and so makes it difficult to address different stock objectives for each species. The catch limits overcome this somewhat and underscore the redundancy of the capacity limits.

CMM2009-03 does not record catch volumes as required by para 2 but requires CCMs to advise their maximum catch levels by 30 April 2010. CCMs reported catch levels to the WCPFC Technical and Compliance Committee (TCC) in 2010[1542].

Property rights analysis

The capacity and catch limits applying to swordfish in CMM2009-03 are assessed against each property rights criterion below. Scores for capacity limits and catch limits are summarised in Table 5.17 and Table 5.18 below, with further detail in the Annex, Tables A.17 and A.18.

CMM2009-03 establishes some rudimentary elements of two rights-based instruments in the form of bottom-up capacity limits (overall score = 19) and catch limits (overall score = 22) applied to flag States. However, these limits apply to a limited geographic range and do not appear to account for catches by all CCMs that have vessels that take swordfish in the WCPFC-CA. Australia has noted that increased catches north of 20°S are unrestricted and catches on high seas areas there have increased. It argued that this significant gap in the measure increased the likelihood that overfishing will occur and that the CMM cannot be regarded as having a direct basis in science and do not reflect the most recent stock assessment (2017)[1543].

Catch limits are assessed as more well-defined than capacity limits due to a slightly stronger score for the *limited* criterion (scores = 9 and 7 respectively) due inherent weaknesses in capacity limits and the stronger coverage of bycatch under the catch limit. Neither limit appears science-based or precautionary. Finally, although this study assumes that all measures are complied with, it is worth

[1542] WCPFC (2010). Review of CCMs' Implementation of, and Compliance with, Conservation and Management Measures. Technical and Compliance Commiteee Sixth Regular Session. Pohnpei, 30 September to 5 October 2010, Western and Central Pacific Fisheries Commission (WCPFC). **WCPFC-TCC6-2010/22 Rev 1**. Attachment 6.
[1543] Note the assessment by Australia that CMM2009-03 fails to meet the requirement in WCPF Convention Article 5b that measures be based on the best available scientific information. Australia (2019). Strengthening the Management of South Pacific Broadbill Swordfish (*Xiphias Gladius*). Sixteenth Regular Session of the Western and Central Pacific Fisheries Commission (WCPFC). 5-11 December 2019, Port Moresby, WCPFC. **WCPFC16-2019-DP19**.

noting that there is limited data against which to verify CCMs' reporting against swordfish catch and capacity limits[1544].

There is little in either instrument to provide *exclusivity* against new entrants and exemptions for SIDSTs, with catch limits subject to bring-forward provisions for overages (score = 3), for which there are no equivalents in the capacity limit (score = 2). Both instruments are reasonably *secure* (score = 10) due largely to the indefinite duration of the two limits. Neither limit is *transferable* (score = 0) and there are no mechanisms for predictable *flexibility* (score = 0).

Inconsistencies between CCMs that have notified a vessel number and CCMs that have notified a catch volume[1545] could mean that those CCMs are only held accountable for the limit that they have notified (i.e. catch *or* capacity rather than catch *and* capacity). This does not appear to be the intention of the CMM and thus represents a significant weakness. In addition, SPC has recorded catches by 22 CCMs in 2016 to 2018, far exceeding the number of flag States with nominated vessel histories or catch histories under the CMM.

[1544] WCPFC TCC (2019). Summary Report TCC15. Fifteenth Regular Session of the Technical and Compliance Committee (TCC15). September 25 – October 1 2019, Pohnpei WCPFC. para125.

[1545] Cooks & New Caledonia have not reported catches but reported vessels fishing for swordfish. Japan reported catches but no vessels. The US reported vessels (74) rather than catches, but only has listed 2 vessels in CMM2009-03 Annex 1. The former appears to be related to vessels operating out of American Samoa. See table 5.16 above and WCPFC (2010). Review of CCMs' Implementation of, and Compliance with, Conservation and Management Measures. Technical and Compliance Commiteee Sixth Regular Session. Pohnpei, 30 September to 5 October 2010, Western and Central Pacific Fisheries Commission (WCPFC). **WCPFC-TCC6-2010/22 Rev 1**. Attachment 6.

Table 5.17: CMM 2009-03: Swordfish capacity limits

Criterion	Question	Score	Ref
Limited	set a regional or subregional scale catch or effort limit?	2	1, Annex 1
	base limits on the best scientific evidence available?	0	WCPFC16-2019-DP19
	base limits on the precautionary approach?	0	WCPFC16-2019-DP19
	apply limits to the full geographic range of the stock?	0	2, Preamble
	ensure limits account for catches of the limited species by all gear types?	3	1
	power to record bycatch of the target species against limits for that species?	2	1, Annex 1
	Subtotal	**7**	
Exclusive	allocate national scale limits as a share of the regional TAC/TAE?	2	1, Annex 1
	new entrants either excluded or able to participate without adding to TAC/TAE?	0	1
	prohibit exemptions to the limit (or exemptions not provided for)?	0	5, 6
	to impose penalties for exceeding national limits?	0	9
	Subtotal	**2**	
Secure	national limits valid for more than one year?	3	
	national limits valid until Parties agree to amend them? (default = perpetuity)	3	
	make national limits binding on Parties?	2	
	resolve disputes beyond bilateral negotiation	0	
	establish a record of national scale limits (e.g. in a regional register or CMM)?	2	
	Subtotal	**10**	
Transferable	transfer a national limit in full or in part to another CCM?	0	
	require new entrants to acquire an allocation through a transfer from a CCM?	0	
	specify a process for effecting a transfer?	0	
	record transfers in a register?	0	
	Subtotal	**0**	
Flexible	set a TRP the target stock(s)?	0	WCPFC16-2019-09
	establish harvest control rules for the target stock(s)?	0	
	adjust a TAC/TAE on the basis of environmental factors and stock assessments?	0	
	define national limits as a proportional share of the regional TAC/TAE?	0	
	establish clear processes for a TAC/TAE to be adjusted?	0	
	Subtotal	**0**	
TOTAL	**Total**	**19**	

Table 5.18: CMM 2009-03: Swordfish catch limits

Criterion	Question	Score	Ref
Limited	set a regional or subregional scale catch or effort limit?	3	2, Annex 2
	base limits on the best scientific evidence available?	0	WCPFC16-2019-DP19
	base limits on the precautionary approach?	0	WCPFC16-2019-DP19
	apply limits to the full geographic range of the stock?	0	2, Preamble
	ensure limits account for catches of the limited species by all gear types?	3	2
	power to record bycatch of the target species against limits for that species?	3	2
	Subtotal	**9**	
Exclusive	allocate national scale limits as a share of the regional TAC/TAE?	2	2, Annex 2
	new entrants either excluded or able to participate without adding to TAC/TAE?	0	2
	prohibit exemptions to the limit (or exemptions not provided for)?	0	5, 6
	to impose penalties for exceeding national limits?	1	9
	Subtotal	**3**	
Secure	national limits valid for more than one year?	3	
	national limits valid until Parties agree to amend them? (default = perpetuity)	3	
	make national limits binding on Parties?	2	
	resolve disputes beyond bilateral negotiation	0	
	establish a record of national scale limits (e.g. in a regional register or CMM)?	2	
	Subtotal	**10**	
Transferable	transfer a national limit in full or in part to another CCM?	0	
	require new entrants to acquire an allocation through a transfer from a CCM?	0	
	specify a process for effecting a transfer?	0	
	record transfers in a register?	0	
	Subtotal	**0**	
Flexible	set a TRP the target stock(s)?	0	WCPFC16-2019-09
	establish harvest control rules for the target stock(s)?	0	
	adjust a TAC/TAE on the basis of environmental factors and stock assessments?	0	
	define national limits as a proportional share of the regional TAC/TAE?	0	
	establish clear processes for a TAC/TAE to be adjusted?	0	
	Subtotal	**0**	
TOTAL		**22**	

5.6.6 Conclusion

This section has assessed six catch-, effort-, and capacity-based instruments adopted for fish stocks other than tropical tuna stocks against the five RBM criteria. These fisheries are less economically important than the tropical tuna fisheries but nevertheless represent important components of the stocks and wider ecosystems under the mandate of the WCPFC.

All six instruments were scored quite low. The catch-based limits for striped marlin in the north Pacific scored the highest of this group at 28 out of a possible 72 points and the nationally determined catch or effort limits for sharks scored just 14.

5.7 RBM enabling measures

5.7.1 Introduction

Several CMMs enable elements of RBM to be implemented more effectively than is provided for in CMMs that directly limit and allocate capacity, effort or catch. These include CMMs on harvest strategies, authorisations and data reporting. All CMMs that establish elements of a compliance framework (accountability CMMs) also enable RBM by ensuring that rights are respected and protected. However, as noted in subsection 5.4.3 above, compliance with CMMs is assumed in this study and accordingly, accountability CMMs are generally excluded from the analysis. Nevertheless, some accountability CMMs have RBM enabling functions.

This section assesses CMMs that enable elements of the property rights criteria. They include CMMs on harvest strategies (subsection 5.7.2), authorisations and the Commission Record of Fishing Vessels (subsection 5.7.3), catch retention rules (subsection 5.7.4), scientific data (subsection 5.7.5), chartering arrangements (subsection 5.7.6) and cooperating non-members (subsection 5.7.7).

5.7.2 Harvest strategies (CMM2014-06 and CMM2015-06)

CMM2014-06 sets out the WCPFC's intention to develop and implement harvest strategies for key stocks[1546]. Harvest strategies specify pre-determined actions to respond to changes in stock assessments and other environmental variables for each stock. Paragraph 7 identifies the key elements of a harvest strategy, including management objectives, target and limit reference points, acceptable levels of risk, monitoring strategy, harvest control rules (or management procedures) and management strategy evaluations[1547].

[1546] CMM2014-06 para 1: "To agree that the Commission shall develop and implement a harvest strategy approach for each of the key fisheries or stocks under the purview of the Commission according to the process set out in this conservation and management measure (CMM)." The stocks to be the subject of harvest strategies are identified in para 13: SKJ, BET, YFT, South Pacific albacore, Pacific bluefin and North Pacific albacore, with the possibility of agreeing to other fisheries or stocks.
[1547] CMM2014-06 para 7.

The CMM commits the Secretariat to developing a workplan to develop harvest strategies[1548], the most recent version of which was endorsed by WCPFC 16 in 2019[1549]. Limit reference points (LRPs) have been agreed for all four key tuna species and interim target reference points (interim TRPs) have been agreed for SKJ and SPA, allowing work to progress on single stock harvest strategies for those two species, including consideration of candidate harvest control rules[1550]. CMM2014-06 touches on elements related to the *limited* and *flexible* criteria.

Property rights analysis: limited

The establishment of TRPs provides a basis for science-based, precautionary limits on harvests[1551]. However, TRPs are to be based on management objectives determined on the basis of "agreed biological, ecological, economic and/or social objectives"[1552]. TRPs are therefore not likely to be based purely on scientific evidence but balanced with other, possibly conflicting, considerations[1553].

Under CMM2015-06, an interim TRP has been agreed for SKJ at 50% of unfished spawning biomass and was to be reviewed in 2019[1554]. WCPFC agreed a TRP for SPA in 2019 of 56% of the unfished spawning biomass[1555]. TRPs have not been set for any other species[1556].

At this stage TRPs have not been directly linked to the determination of catch, effort or capacity limits. This is necessary to control fishing in a way that moves biomass of the target stock above the LRP where necessary and toward the TRP. The TRPs in their current form and application therefore do not contribute to a stronger assessment for the *limited* criterion. Nevertheless, while harvest strategies

[1548] CMM2014-06 para 13

[1549] WCPFC (2020). Summary Report. Sixteenth Regular Session of the Western and Central Pacific Fisheries Commission (WCPFC16), 5-11 December 2019, Port Moresby, WCPFC. Attachment H.

[1550] SPC (2019). An overview of progress in developing WCPFC harvest strategies. WCPFC Sixteenth Regular Session. Port Moresby, 5-11 December 2019, Western and Central Pacific Fisheries Commission (WCPFC). **WCPFC16-2019-09**.

[1551] CMM2014-06 preamble: "Recalling Article 6 (3) of the UN Fish Stocks Agreement and Article 6 of the Convention, which call for the establishment of precautionary stock-specific reference points to implement the precautionary approach, as well as action to be taken if such points are exceeded".

[1552] CMM2014-06 para 5.

[1553] WCPFC (2020). Summary Report. Sixteenth Regular Session of the Western and Central Pacific Fisheries Commission (WCPFC16), 5-11 December 2019, Port Moresby, WCPFC. para 140.

[1554] CMM2015-06 paras 1, 2, 8.

[1555] WCPFC (2020). Summary Report. Sixteenth Regular Session of the Western and Central Pacific Fisheries Commission (WCPFC16), 5-11 December 2019, Port Moresby, WCPFC. para 207: "WCPFC15 agreed on an interim target reference point (TRP) for south Pacific albacore at 56 percent of spawning stock biomass in the absence of fishing (0.56 SBF=0)1 with the objective of achieving an 8 percent increase in catch per unit of effort (CPUE) for the southern longline fishery as compared to 2013 levels.2 If a future stock assessment indicates that this interim TRP will not result in the desired longline CPUE, then the interim TRP will be revised in order to meet this objective. The TRP shall be reviewed every 3 years, consistent with the SP albacore assessment schedule".

[1556] Note that CMM 2018-01 (paras12 and 14) sets a target for BET and YFT of "maintained at or above the average SB/SBF=0 for 2012-2015" in the absence of an agreed TRP.

provide a strong basis for the adoption of science-based, precautionary limits, as noted above, TRPs are also able to take into account other factors.

The application of harvest strategies is not limited by gear type or geographic application and these matters are assumed to be dealt with by the operative CMM for each stock or fishery. Bycatch is not mentioned but as the TRP and LRP are reference points for stock biomass, it is interpreted as applying to all sources of mortality of each stock. These elements will make a positive contribution to harvest strategies if they do eventually translate into a TAC for each species.

Property rights analysis: flexible

Harvest control rules provide a basis for predictable responses to unpredictable changes in stock assessments through anticipated adjustments to catch and effort limits. The CMM committed the Commission to agreeing to a workplan and timeline for the development of harvest strategies, including harvest control rules, for SKJ, BET, YFT, northern and southern albacore, Pacific bluefin and other fisheries or stocks as agreed[1557]. Harvest control rules are not yet in place for any WCPFC stocks and this is reflected in the generally weak assessment of each CMM against the *flexible* criterion.

5.7.3 Authorisations and Record of Fishing Vessels (CMM2014-03 and CMM2018-06)

CMM2014-03 establishes the Commission Record of Fishing Vessels (RFV), a fully searchable, public record[1558] and identifies the fields to be included in it[1559].

CMM2018-06 requires flag CCMs to authorise their vessels to fish in the Convention Area and to "manage the number of authorisations to fish and the level of fishing effort commensurate with the fishing opportunities available to that member in the Convention Area"[1560]. While the CMM does not itself place limits on the total number of authorisations able to be issued to vessels fishing for highly migratory stocks in the WCPFC-CA, this provision does place an additional obligation on flag CCMs to enforce, at the individual user scale within their jurisdiction, any national limits on vessel numbers and fishing effort that are contained within other CMMs.

[1557] CMM2014-06 para 13.
[1558] CMM2014-03 para 1: "The WCFPC RFV shall consist of an electronic database that, at a minimum:…(b) Is fully and readily searchable by public users, with the exception of any data deemed by the WCPFC to be non-public domain data and/or to be maintained only on the secure portion of the WCPFC web site"".
[1559] CMM2014-03 Attachment 1.
[1560] CMM2018-02 para 1(e). Footnote 2 specifies that "member" should be taken to include cooperating non-members.

The RFV[1561] is to contain, among other things, a record of all authorisations to fish for WCPFC stocks in the Convention Area beyond the flag State's area of national jurisdiction[1562]. The RFV therefore could be considered a form of register of authorisations and could be used to register allocations of catch and or effort at the individual user scale. With additional adaptation, the RFV could also record capacity, effort and catch allocations at the national scale[1563].

Both the authorisations to fish and the role of the RFV are assessed against all five property rights criteria to ascertain the extent to which they support RBM.

Property rights analysis: limited

As noted above, the requirement that CCMs ensure that "authorisations to fish and fishing effort are commensurate with fishing opportunities available in the Convention Area" supports the translation of national scale capacity and effort limits to the individual user scale. A stronger word than "commensurate" could have been used but where a national limit is recorded in a CMM, the argument that the aggregate of individual authorisations could be permitted to exceed the national limit is very weak. The duty nevertheless rests on CCMs to determine what "commensurate" means and assert flag State jurisdiction to enforce it, and leaves the method of translating the national limit to the individual user scale up to the CCM.

The WCPF Convention only requires flag CCMs to authorise their vessels to fish outside the flag CCM's jurisdiction[1564], not within its own jurisdiction. Coastal CCMs are therefore not limited in the number of authorisations it may issue to its vessels fishing within their own waters which considerably limits the geographic effect of authorisations.

[1561] CMM2018-06 para 12: "The Commission shall, in accordance with article 24(7) of the Convention and based on the information provided to the Commission in accordance with the Convention and these procedures, establish and maintain its own record of fishing vessels authorized to fish in the Convention Area beyond the national jurisdiction of the member of the Commission whose flag the vessel is flying. Such record shall be known as the WCPFC Record of Fishing Vessels (the "Record")."

[1562] CMM2014-03 sets out in some detail the requirements for data to be entered into the RFV. Importantly the WCPFC Secretariat is required to "Ensure that vessel data, once received from CCMs, are not altered, manipulated, or interfered with in any way, except as necessary to incorporate such data into the RFV in accordance with these [standards, specification and procedures".

[1563] CMM2014-03 also sets out standards, specifications and procedures for the RFV.

[1564] WCPF Convention, with respect to other coastal states' EEZs Article 24(1): "Each member of the Commission shall take such measures as may be necessary to ensure that: (b) fishing vessels flying its flag do not conduct unauthorized fishing within areas under the national jurisdiction of any Contracting Party"; and Article 24(3): "It shall be a condition of every authorization issued by a member of the Commission that the fishing vessel in respect of which the authorization is issued: (a) conducts fishing within areas under the national jurisdiction of other States only where the fishing vessel holds any licence, permit or authorization that may be required by such other State"; and with respect to the high seas, Article 24 (2): "No member of the Commission shall allow any fishing vessel entitled to fly its flag to be used for fishing for highly migratory fish stocks in the Convention Area beyond areas of national jurisdiction unless it has been authorized to do so by the appropriate authority or authorities of that member."

Property rights analysis: exclusive

CMM2018-06 requires CCMs to ensure that only vessels flying the flag of that CCM may fish for highly migratory stocks in the WCPFC-CA[1565]. This appears to include vessels fishing for such stocks within their own EEZ and could support exclusivity but adds little to what is already in the WCPFC Convention.

However, CMM2018-06 only requires the inclusion in the RFV of authorisations to fish beyond the waters of the vessel's flag State. Members are required to maintain their own national RFV but this is only required to contain authorisations to fish beyond the flag CCM's waters[1566].

On balance the absence of a requirement to authorise a vessel to fish within its flag CCM's waters significantly undermines the exclusivity of any authorisations issued to vessels.

Property rights analysis: secure

The RFV appears to have some legal standing in that a vessel whose authorisation is not recorded on the RFV is to be interpreted as not authorised[1567]. The RFV thus acts as a de facto register of authorisations and could act as a register of capacity, catch and effort allocations attached to authorisations. Vessels that are not on the RFV are considered unauthorised to fish in the WCPFC-CA, with serious consequences for vessels, other than those conducting purely domestic fishing, if found to be acting in contravention of this requirement[1568]. The absence of a requirement to record any authorisations to fish in the vessel's own waters in the Commission RFV, however, undermines its value as a registry of all authorisations.

[1565] CMM2018-06 para 1: "Each member of the Commission shall: (c) take necessary measures to ensure that fishing for highly migratory fish stocks in the Convention Area is conducted only by vessels flying the flag of a member of the Commission, and in respect of non-member carriers and bunkers, in accordance with Section D of this Measure".

[1566] CMM2018-06 para 5: "Pursuant to article 24(4) of the Convention, each member of the Commission shall maintain a record of fishing vessels entitled to fly its flag and authorized to fish in the Convention Area beyond its area of national jurisdiction, and shall ensure that all such fishing vessels are entered in that record."

[1567] CMM2018-06 para 17: "…any vessel not included in the WCPFC Record of Fishing Vessels shall be deemed not to be authorized to fish for, retain on board, transship or land highly migratory fish stocks in the Convention Area beyond the national jurisdiction of its flag State".

[1568] CMM2018-06 para 17: "…any vessel not included in the WCPFC Record of Fishing Vessels shall be deemed not to be authorized to fish for, retain on board, transship or land highly migratory fish stocks in the Convention Area beyond the national jurisdiction of its flag State. Each member of the Commission shall prohibit such activities by any vessel entitled to fly its flag that is not included on the Record and shall treat a violation of this prohibition as a serious violation. Such vessels shall be eligible to be considered for IUU listing"; and para 18: "Each CCM shall further prohibit landing at its ports or transshipment to vessels flying its flag of highly migratory fish stocks caught in the Convention Area by vessels not entered on the Record or the Register"; and para 21: "Paragraphs 17 to 19 do not apply in respect of vessels that operate entirely in the Exclusive Economic Zone of a CCM and that are flagged to that CCM."

The CMM is silent, however, on whether the legal standing of the RFV, focusing on the need to hold an authorisation rather than compliance with the need to register that authorisation.

Property rights analysis: transferable

There are no provisions in CMM2018-06 that indicate authorisations may be transferred between CCMs or between vessels, other than incidental transfers associated with reflagging[1569]. As noted above, the RFV could act as a formal register for transfers of catch or effort allocations at the individual or national scale, but it does not currently have that function. CCMs are required to keep the RFV up to date, including by providing the Secretariat with details of any vessels entered into its national record or amended or deleted, within 15 days. These requirements may need to be amended to ensure a real-time record of transfers is maintained and available.

Property rights analysis: flexible

No provisions support flexibility of measures but again, any adjustments to future allocations as a result of the operation of harvest strategies would need to be reflected in the register in as close to real time as possible. This would require amendments to the CMM.

5.7.4 Catch retention rules (CMM2009-02)

CMM2009-02 sets out, among other things, catch retention rules for the tropical purse seine fishery[1570]. It elaborates on provisions in CMM2018-01 paragraphs 31 and 32[1571]. Critically, the observer must estimate the species composition of the discards before those fish are discarded[1572], and the operator must advise the Executive Director of the WCPFC of the estimated tonnage and composition of discarded and retained fish from that set[1573]. Reliance on self-reporting of discard quantities is of dubious reliability but minor enhancements to provide for independent verification would enable the CMM to contribute to greater potential scores for the bycatch subsidiary question under the *limited* criterion for instruments applicable to the tropical purse seine fishery. In its current form, however, it provides little additional benefit to RBM.

[1569] See Chapter Two section 2.5.
[1570] That is, purse seine vessels operating between 20ºN and 20ºS. CMM2009-02 para 1: "The objectives of this Measure are: a. to ensure consistent and robust application of FAD closures and catch retention in the high seas between 200 S and 200 N through the specification of minimum standards. b. to apply high standards to the application of the FAD closure and catch retention in order to remove any possibility for the targeting of aggregated fish, or the discard of small fish".
[1571] See subsection 5.5.2 above.
[1572] CMM2009-02 para 11: "Fish shall not be discarded from the vessel until after an observer has estimated the species composition of the fish to be discarded."
[1573] CMM2009-02 para 12: "The operator of the vessel shall submit to the Executive Director a report that includes the following information within forty-eight 48 hours after any discard:...h. Estimated tonnage and species composition of discarded fish; i. Estimated tonnage and species composition of retained fish from that set".

5.7.5 Scientific data to be provided to the Commission (CMM2013-05)

CMM2013-05 also requires specific daily effort and catch reporting by flag States. Effort reporting is required for each day that each vessel is on the high seas, and catch data for days on which fishing operations were undertaken[1574]. Daily catch reports must include catch data and interaction data as required by the *Scientific Data to be Provided to the Commission* and "other Commission decisions"[1575].

The WPFC has agreed to *Scientific Data to be Provided to the Commission* at several of its Regular Sessions, most recently in 2013[1576] [1577]. While the requirements are primarily accountability measures, catch, effort and capacity (number of vessels) data reporting supports the inclusion of bycatch in the calculation of catches under any limit imposed on catches of each species (criterion: *limited*). The data requirements cover all five tuna species, as well as marlins, swordfish and sharks, including discards and releases[1578].

Some geographic delimitations mean that the comprehensiveness of data will vary between species. For example, all five tuna species are well covered by catch data requirements in the WCPFC-CA. Catch data for some shark species is only required south of 20°S.

While the data reporting requirements do not guarantee that bycatch is to be included in calculations of catches against catch limits, they do provide a data source from which such calculations could be made. Given the limited nature of the CMM, it is not assessed against the property rights criteria.

[1574] CMM2013-05 para 1: "Each CCM shall ensure that the master of each vessel flying its flag in the Convention Area shall complete an accurate written or electronic log of every day that it spends at sea on the high seas of the Convention Area as follows: a. for days with fishing operations, the log must be completed by recording the effort and catch at the end of each fishing operation (i.e. end of a purse-seine set, end of a longline -haul, or at the end of the day in the case of all other fishing methods); or b. for days with no fishing operations but where any other „fishing effort1 " occurred, then the relevant activities (e.g. "SEARCHING", "DEPLOY/RETRIEVE FAD") must be entered in the log at the end of the day; or c. for days with no fishing operations and no other „fishing effort 1 ", the main activity of the day must be entered in the log at the end of the day".

[1575] CMM2013-05 para 2: "Information recorded for each day with fishing operations shall, at a minimum, include the following: a. The information specified in sections 1.3 to 1.6 of ANNEX 1 of the Scientific Data to be Provided to the Commission; b. Catch information about other species not listed in those sections, but required to be reported by CCMs under other Commission decisions such as, inter alia, key shark species according to FAO species codes. c. Interaction information about other species not listed in those sections, but required to be reported by CCMs under other Commission decisions such as, inter alia, key cetaceans, seabirds and sea turtles".

[1576] WCPFC (2016). Summary Report. Thirteenth Regular Session of the Western and Central Pacific Fisheries Commission (WCPFC13), Denarau Island, Fiji, 5-9 December 2016, Western and Central Pacific Fisheries Commission. para 127.

[1577] WCPFC (2016). Scientific Data to be Provided to the Commission - Summary Report Attachment G. WCPFC Thirteenth Regular Session, Denarau, 5-9 December 2016, Western and Central Pacific Fisheries Commission (WCPFC).

[1578] Ibid. para 1.

5.7.6 Chartering arrangements (CMM2019-08)

CMM2019-08 provides for a charter notification scheme, which permits any vessel chartered by a member or participating Territory to be considered an "integral part of the domestic fleet of the Chartering Member or Participating Territory"[1579]. This allows SIDS to take advantage of exemptions under various measures and expand their fishing activities in excess of limits established by those measures, particular those limits based on flag States' fishing history.

The measure could also allow new entrants to participate in a WCPFC fishery by entering vessels on the RFV[1580] and signing a charter arrangement with a SIDS that enjoys an exemption to any limits for that fishery. However, the flag State must already be a CCM of the Commission in order to enter a vessel on the RFV. This is conceivable if, say, a CCM that has traditionally had a tropical longline fleet could charter longliners to a SIDS CCM to operate in the southern longline fleet in order to overcome vessel limits in the latter fishery. The pool of new entrants is thus limited to existing CCMs but nevertheless provides a potentially large loophole through which to expand fishing activity in an ostensibly limited fishery. While this is an important aspect of the overall management framework, the CMM is not assessed against the property rights criteria but it is suggested that they will require amendment to give full effect to any reforms to catch and effort limits proposed in this study.

5.7.7 Cooperating non-members (CMM2019-01)

CMM2019-01 sets out the process and qualifications for application for CNM status by a non-member "with an interest in the fishery, or whose vessels fish or intend to fish in the Convention Area". The key provision of interest is in paragraph 12 which states that "[t]he Commission shall, where necessary, determine how the participatory rights of CNMs will be limited by the conservation and management measures adopted by the Commission". In doing so the Commission is required to take into account a range of factors including stock status and the current level of fishing effort among many other non-exhaustive factors[1581]. The breadth of considerations, and the use of non-obligatory language ("take into

[1579] CMM2019-08 para 1: "The provisions of this measure shall apply to Commission Members and Participating Territories that charter, lease or enter into other mechanisms with vessels eligible under paragraph 4 flagged to another State or Fishing Entity for the purpose of conducting fishing operations in the Convention Area as an integral part of the domestic fleet of that chartering Member or Participating Territory."
[1580] CMM2019-08 para 4: "Only vessels listed on the WCPFC Record of Fishing Vessels or the WCPFC Interim Register of Non-CCM Carriers and Bunkers, and not on the WCPFC IUU vessel list, or IUU List of another RFMO, are eligible for charter."
[1581] CMM2019-01 para 12: "…In giving effect to this paragraph, the Commission shall take into account inter alia: a. the status of the highly migratory fish stocks and the existing level of fishing effort in the fishery; b. the special requirements of developing States in the Convention Area, in particular small island developing States, and of territories and possessions, in relation to conservation and management of highly migratory fish stocks in the Convention Area and development of fisheries for such stocks; c. the respective interests, fishing patterns and fishing practices of new and existing members or participants; d. the respective contributions of new and existing members or participants to conservation and management of the stocks, to the collection and provision of accurate data and to the conduct of scientific research on the stocks; e. the needs of coastal fishing communities which are dependant mainly on fishing for the stocks; f. the needs of coastal States whose

account") means the Commission is not bound to restrict new entrants' acquisition of participatory rights to transfers of portions of existing limits from existing participants. This potentially weakens the extent to which a CMM establishes limited access to a fishery and the exclusivity of existing right-holders' rights. Further, any limits determined by the Commission for CNMs may be "reviewed" by the Commission. CNM status is determined annually[1582] and CNMs are able to participate in Commission meetings only as observers[1583] and are therefore not party to any decision to alter their allocations. The security of an allocation assigned to a CNM is therefore likely to be weak.

Again, while this is an important element of the management framework, the CMM is not assessed against the property rights criteria.

5.7.8 Conclusion

This section has considered CMMs containing instruments that, at face value, represent accountability CMMs but which contain important features that are relevant to elements of the property rights criteria applied in this Chapter.

Harvest strategies and the record of fishing vessels are a starting point in the establishment of predictably flexible measures and a secure register respectively but in their current form fall well short of the requirements to support well-defined property rights.

Rules regarding authorisations to fish and the Commission RFV establish a platform that could be used as a register of property rights. This would require substantial revisions to the CMM to perform this role effectively. In the meantime, there is no evidence in the CMM of an intention by the Commission to use authorisations as a method of controlling fishing but rather ensuring compliance. CMM2018-06 is therefore not scored against the property rights criteria.

Provisions for CNMs in CMM2019-01 provide little security for the participatory rights of new entrants but also little certainty for existing participants in terms of the exclusivity of their own rights. Chartering arrangements also appear to provide a significant gap in the limited and exclusive nature of any right by allowing non-exempt flag States to expand activity by chartering their vessels to CNMs that enjoy exemptions from limits. The removal of exemptions for SIDS in many instruments would go a long way to nullifying the negative effects of chartering arrangements.

economies are overwhelmingly dependent on the exploitation of living marine resources; and g. the interests of developing States from the subregion or region in whose areas of national jurisdiction the stocks also occur."

[1582] CMM2019-01 para 8: "The Commission shall accord CNM status on an annual basis. It may renew the CNM status subject to a review of the CNM's compliance with the Convention's objectives and requirements."

[1583] CMM2019—01 para 10: "CNMs are entitled to participate at meetings of the Commission and its subsidiary bodies as Observers".

5.8 Conclusion

This Chapter has assessed the extent to which the institutional framework for the WCPFC supports well-defined property rights for the management of WCPO tuna stocks and other highly migratory species. The WCPF Convention was assessed against a set of property rights criteria and found to provide a sound basis for rights-based management. But it is by no means a complete framework. Many of the elements of well-defined property rights are left to be determined by the Commission itself in the form of binding CMMs. Each CMM was therefore assessed against the same five property rights criteria.

Seven of the 42 CMMs adopted as at December 2020 were found to directly establish rudimentary rights-like instruments and a further eight were found to contain enabling features of direct relevance to some elements of the assessment criteria beyond simply providing for compliance with other CMMs.

The assessment of each CMM was conducted in isolation of other CMMs, the Convention and the subregional measures that were the subject of analysis in Chapter Three. Chapter Six considers the full set of subregional and regional instruments as a whole, drawing on the analyses in Chapters Four and Five, with reference to the characterisation of the transboundary fisheries problem in Chapter Two and the framing of property rights characteristics in Chapter Three.

6 Discussion: Reforms for a robust system

6.1 Introduction

This chapter responds to the reflective research question: *What reforms could be made to strengthen rights-based approaches for the conservation and management of highly migratory species in the WCPO to deal with complexity?*

I discuss the results of the analysis presented in the preceding two chapters with reference to the analytical framework set out in Chapter Three. Consistent with the robust separation framework described in Chapter Two, I argue that a rights-based management (RBM) system needs to be designed within a broader governance framework to ensure that it deliberately supports the achievement of multiple objectives, and that the methodical analysis of fisheries instruments against a well-established set of property rights criteria can aid the identification of reforms to that end.

Section 6.2 summarises the overall results of the analysis of 20 right-like instruments adopted at the regional and subregional scales. Section 6.3 examines the cross-sectional results for each of the five property rights criteria, and each of the 24 exploratory questions, across all instruments to identify possible systemic and specific reforms that would strengthen the property rights characteristics of management instruments employed across the region.

Section 6.4 evaluates the results against each of the four types of management objectives – biological, ecological, economic and social – and their implications for management instruments' capacity to cope with uncertainty and dynamism. I do not attempt a full analysis of the WCPO against the robust separation framework but offer some reflections on its potential to deal with multiple objectives based on the foregoing property rights analysis. Section 6.5 concludes the chapter.

6.2 Summary of results

This section reviews the overall results across 20 assessed rights-like instruments, as summarised in Figure 6.1 below. At the subregional level, FSM Arrangement is excluded from the analysis. Chapter Four found that the FSM Arrangement licences do not, on their own, form a basis for a rights-based instrument given the absence of any provisions providing for a limit on the number of licences to be issued. However, they provide the Parties with the opportunity to exercise individual user scale allocations of vessel days in the EEZs of other Parties. This in effect permits national scale allocations (PAE) to be transferred to other Parties without transferring the individual user scale allocations to a different vessel. Several regional scale enabling instruments[1584] and key regional and subregional

[1584] Primarily assessed in Chapter Five section 5.7.

foundational conventions, agreements and arrangements[1585] are referred to where relevant. While they are not central to this analysis, in some cases they permit more well-defined rights to be adopted than have been adopted to date.

The best performing instruments are the two vessel day schemes (VDSs) for the tropical purse seine and longline fisheries adopted by the PNA. Both scored 42 out of a possible maximum of 72, with the former pushing slightly ahead on the *exclusive* criterion, due to the absence of exemptions, and the latter slightly ahead on *secure*, due to the provision explicitly allowing for three-year TAE to be set. The purse seine VDS has in practice been set for three years but this is not clearly set out in the management scheme. However, a firm TAE does not itself translate into firm allocations, pointing to a need for a clearer articulation of the longevity of PAE.

As the maximum possible score is 72 there is still some way to go to achieving stronger rights even for the two VDSs. This is particularly the case in relation to the predictability of changes to the PAE in response to uncertainty (*flexible*) and the incomplete application of the measure to the entire geographic range of the stock (*limited*).

The Tokelau Arrangement is not far behind the VDSs (overall score = 37). It scored more strongly on the *limited* and *flexible* criteria but weaker on the other three. It is arguable that the Tokelau Arrangement has some advantages over the vessel day schemes due to its focus on a single species and its definition as an output control rather than an input control. This allows the Tokelau Arrangement to set a strong limit on albacore catches whether as a target species or as bycatch in its area of application[1586] using all gear types.

That all three top performers are subregional arrangements is consistent with Ostrom's finding that smaller groups with shared interests are more likely to agree on more progressive measures than larger more heterogenous ones[1587]. A notable example of this is the far stronger provisions for *transferability* in the two VDSs (score = 10 for both) than in the measures adopted by the WCPFC. Even the Tokelau Arrangement, which was assessed far weaker against the *transferable* criterion (score = 5), was still ahead of any WCPFC instrument.

It should be noted that the Tokelau Arrangement acts as an enabling instrument under which measures or management schemes, akin to a VDS, may be adopted. In this sense, the Arrangement sets strong parameters for future schemes. The Palau Arrangement is therefore the PNA's equivalent of the Tokelau Arrangement, and performs poorly in comparison (overall score = 24). This is largely due to its lower

[1585] These include the Nauru Agreement, the Palau Arrangement, the Tokelau Arrangement and the WCPF Convention.
[1586] The area of application is limited to the EEZs of the participants. See Tokelau Arrangement Article 1.1(a).
[1587] See Chapter Three section 3.2.2; Ostrom, E. (1990). Governing the Commons: The Evolution of Institutions for Collective Action. Cambridge, UK, Cambridge University Press. p211.

degree of specificity regarding the content of management schemes, despite which the VDSs still scored highly[1588].

This suggests that any management schemes adopted under the Tokelau Arrangement should score better than the VDSs against the five property rights criteria. However, this is not borne out by the regional instruments adopted by the WCPFC. The WCPF Convention was assessed more strongly (overall score = 38) than all the assessed CMMs adopted under it. The WCPFC thus *may* adopt strong measures but it is *not obliged* to. This can perhaps be explained by the larger, more heterogenous WCPFC, which is likely to find it easier to agree on principles in the Convention than on concrete binding measures that will have a direct impact on individual members' interests.

Such dynamics thus appear to weaken the purse seine effort limits (overall score = 27) and longline catch limits (overall score = 23) in CMM2018-01 to well below those of their subregional counterparts, the purse seine and longline VDSs. As a result, the stronger rights under the vessel day schemes are not apparent in the CMM.

An obvious disadvantage of the subregional arrangements is that they do not apply to the entire geographic range of the stock and therefore cannot be regarded as fully limited. Expansion to a wider area would require bringing in more coastal States but these arrangements' ability to control the high seas are limited. A more effective, but politically difficult, approach would be for the WCPFC to adopt similar arrangements for the entire WCPFC-CA. Existing subregional arrangements could remain nested within the regional structure and continue to act as "laboratory" for innovative approaches to RBM.

Interestingly, the limit on the number of FADs with instrumented buoys that may be deployed by each vessel is one of the simplest yet highest scoring instruments adopted by the WCPFC. While its score is not high in absolute terms (overall score = 27), the clarity of the per vessel limit, combined with the limit on the number of vessels flying the flag of each CCM, places a clear limit on the number of this particular type of FAD. That right appears to be relatively *secure* and *exclusive* but its adaptive capacity is let down by a lack of *transferability* and weak *flexibility*. While a *limit* is set, it does not appear to create scarcity[1589], further weakening *exclusivity* and incentives to *transfer* rights. Finally, it should be noted that this instrument does not directly control catches or effort but is akin to a capacity limit, and therefore is likely to be subject to the usual attendant disadvantages.

Simplicity, however, does not guarantee a higher score. The capacity limits for the tropical purse seine and longline fleets, while brief, are among the weakest instruments in CMM2018-01 (overall score = 19 for each). The purse seine capacity limits provide an important complement to the FAD deployment

[1588] It is worth recalling the paradox that the Tokelau Arrangement and the Palau Arrangement are both *non-binding* arrangements under which the Parties have agreed to adopt *binding* management schemes.
[1589] See Chapter Five, subsection 5.5.3.

limits but otherwise provide little assurance to the Commission that capacity will be limited due to the risk of reflagging to exempted CCMs. Like any definition of capacity or effort, there is a risk that vessel operators will find ways to overcome those limits. Limiting effort or catches by a new vessel to that of the vessel(s) it replaced is only provided as an alternative to capping "carrying capacity or well volume"[1590], which can be overcome by more frequent landings or transhipments where permitted. The longline capacity limits do not include such provisions but the focus on vessel numbers leaves wide scope to expand catches and/or effort while remaining within the capacity limit. However, considered in the context of the purse seine effort limits and the longline catch limits of CMM2018-01, both capacity limits are effectively redundant.

Similarly, provisions for other tropical commercial tuna fisheries are also simple and were assessed as modestly well-defined (overall score = 23). Although the provision's language is hedged – "CCMs shall take necessary measures to ensure…" – the cap on catches of the three tropical tuna species is more strongly limited than other tropical tuna instruments (score = 8), aided by its role in addressing any geographic gaps in the application of other instruments. Although apparently insignificant, exemptions are permitted for CCMs whose vessels caught less than 2000 tonnes in a specified historical period, the provision is vaguely worded.

Instruments for stocks and fisheries adopted by the WCPFC other than those in CMM2018-01 are assessed as similarly modest. The measure for south Pacific albacore (SPA) (CMM2015-02) was assessed as similar in quality to limits on other tropical commercial tuna fisheries (CMM2018-01, discussed above) and swordfish (CMM2009-03, see below). Like the other tuna-related limits, the SPA measure scored poorly for the *limited* criterion (score = 6). Notwithstanding the weaknesses of a capacity-limit and the geographic constraints of the measure, like striped marlin in the south west Pacific (see below), it is not limited to specific gear types and therefore is more likely to cover a greater proportion of all sources of mortality than the tropical tuna measure. As a key tuna stock, SPA is subject to a TRP, and eventually a harvest strategy. This lays a foundation for a stronger score for the *flexibility* criterion in the future (score = 4).

Again, the contrast between the higher score of the sub-regional Tokelau Arrangement and the weaker regional CMM2015-02 is clear. CMM2015-02 nevertheless places a rudimentary limit on some areas outside the area of application of the Tokelau Arrangement (EEZs of the participants), providing some additional confidence in the latter's catch limit.

The two CMMs for striped marlin performed slightly better than other non-tropical tuna measures but there is a noticeable difference in the catch-based provisions applying to the stock in the north Pacific (overall score = 28) compared to the capacity limits applying to the south west Pacific (overall score =

[1590] CMM2018-01 para 46.

26) [1591]. The difference is due to a stronger score for the *limited* criterion (scores = 12 and 10 respectively), which can be accounted for by a number of features: first, the limit in the south west is defined by the number of vessels, with substantial opportunity for effort creep; second, that limit does not appear to be in line with scientific advice, which notes declining stocks without requiring a commensurate reduction in capacity; and third, while the treatment of bycatch in both measures is unclear, "catches" was judged more likely to include bycatch than "fishing vessels fishing for striped marlin". As such, striped marlin in the north Pacific is assessed to have the strongest limit of all WCPFC stocks for which CMMs have been adopted. Both striped marlin measures were assessed as weak for *exclusivity* (scores = 6) but reasonably *secure* (scores = 10). However, neither is t*ransferable* (scores = 0) or *flexible* (scores = 0), the latter owing to the absence of any plans to develop harvest strategies.

Swordfish limits were found to be quite weak, with the capacity limits scoring slightly less than the catch limits (overall scores = 19 and 22 respectively). Again, the instrument defined by catch proved to possess a stronger, albeit modest, *limit* (score = 9) compared to the capacity limit (score = 7) and was marginally more *exclusive*, though very weakly so (score = 3 and 2 respectively).

The new comprehensive shark measure (CMM2019-04) was shown to establish very poorly defined rights (overall score = 14) with no *exclusivity* (score = 0) due to the self-determined limits to be established in national plans and little *security* (score = 6). All non-tuna instruments are not *transferable* and provide no *flexibility* (scores = 0) but, other than sharks, were found to be reasonably *secure* (score = 10).

As an enabling instrument, the WCPF Convention does not automatically add to the scores against each criterion for each CMM. Instead, the Convention sets a benchmark by permitting individual CMMs adopted under it to achieve that score[1592]. Indeed, the Convention scored at least one (silent) on each question under each criterion, which is to say that none of the qualities under each criterion are prohibited and that CMMs could therefore theoretically achieve a maximum score, thus exceeding the score for the Convention itself. The Convention is weakest on the *transferable* criterion, scoring one for each of the questions for a total score of four, thus leaving any transferability provisions to be determined in individual CMMs.

Silence in the Convention also allows for weaker CMMs to be adopted. For example, the Convention permits limits to be defined by specific gear types (*limited* criterion) and leaves ambiguous the treatment of bycatch of target species (*limited* criterion). The treatment of new entrants (*exclusive* criterion) and dispute resolution[1593] in relation to allocations could have been dealt with more explicitly in the

[1591] See Chapter Five subsection 5.6.4.
[1592] While beyond the scope of the present study, there may be an avenue of research to be conducted into the extent to which WCPFC CMMs conform to the requirements, or at least the ideals, of the WCPF Convention.
[1593] See further subsection 6.3.4 below.

Convention. However, the Convention does not need to be amended to permit the adoption of well-defined property rights by the WCPFC.

Among the enabling measures adopted by the WCPFC, the harvest strategies measure[1594] provides the most useful contribution to the strength of rights associated with the four tuna stocks considered in this study. They indicate the potential of the *limited* (overall score = 8) and *flexible* (score = 11) criteria in elements not addressed well by the instruments themselves. This is particularly the case for the *flexible* criterion, which fleshes out some of the elements of a harvest strategy not yet addressed in the CMM2018-01 and CMM2015-02. These include provisions to establish harvest control rules and adjust the TAC/TAE. However, the measure still lacks important elements that would strengthen the predictability of the effects of a change in the TAC on allocations. The *limited* criterion implicitly allows for limits derived from TRPs and harvest control rules to apply to all sources of mortality of the target stock (geographic, gear type and bycatch) but there is nothing in the measure to guarantee that this will be the case. As noted in Chapter Five, TRPs and limits are not required to be based purely on scientific information nor, therefore, are they likely to be precautionary[1595]. The harvest strategy measure therefore adds some benefits to future CMMs, once harvest strategies are fully developed but it could do more to strengthen *flexibility*.

[1594] CMM2014-06. See Chapter Five subsection 5.7.2.
[1595] Chapter Five subsection 5.7.2.

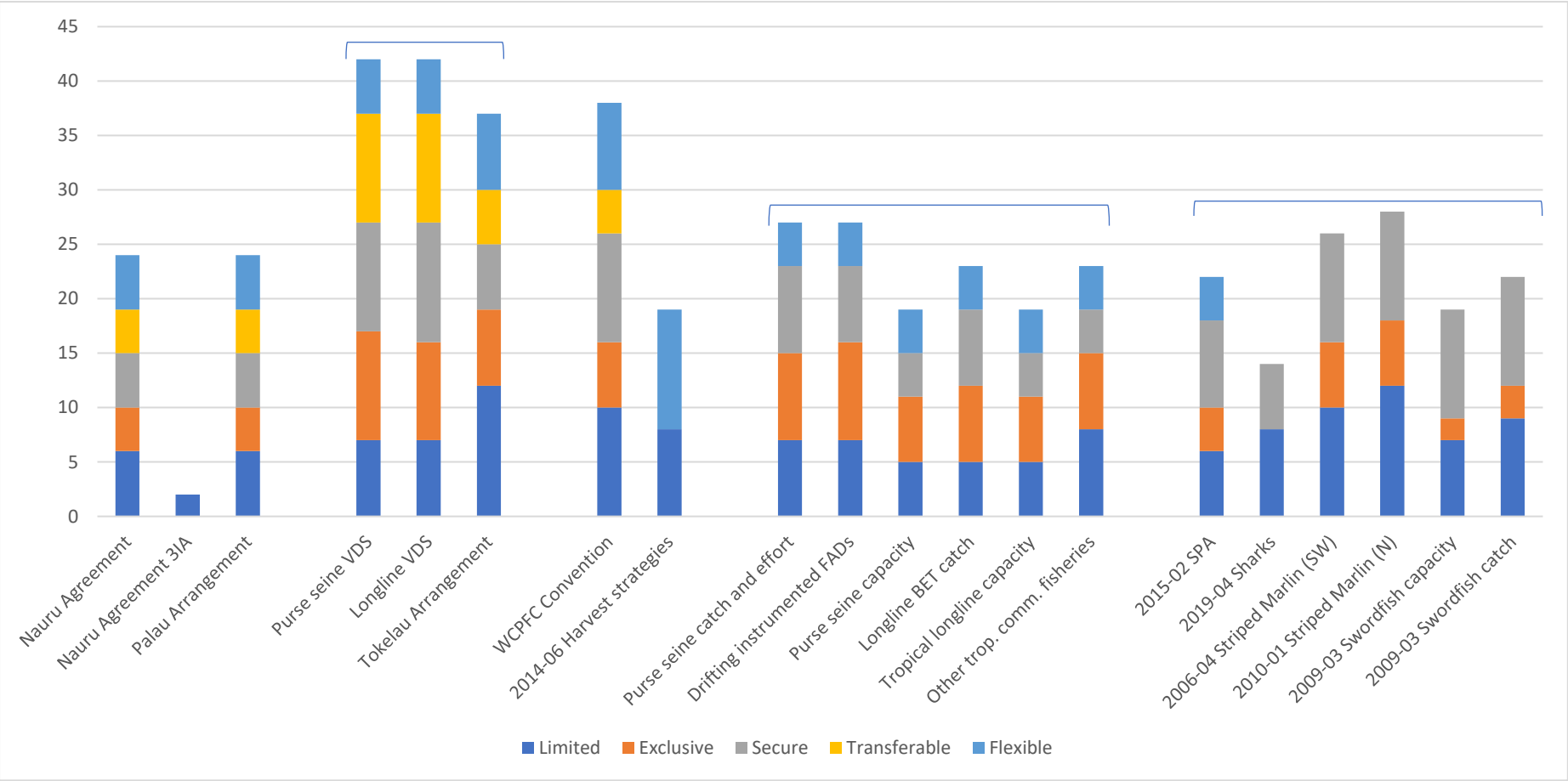

Figure 6.1: Summary of scores against property rights criteria: all instruments

Figure 6.1 displays the scores for the assessment of each instrument adopted by the WCPFC against each property rights criterion. Three clusters of rights-like instruments are shown. The first cluster includes all assessed right-like instruments adopted at a sub-regional scale. The second groups together all rights-like instruments contained in the WCPFC's CMM 2018-01 (interim tropical tuna measure). The third groups together all other rights-like instruments adopted by the WCPFC. The remaining instruments are regarded as enabling instruments. These include the Nauru Agreement, the Third Implementing Arrangement to the Nauru Agreement (3IA), the Palau Arrangement, the WCPF Convention and CMM2014-06 (Harvest strategies).

6.3 Reforms for well-defined property rights

6.3.1 Introduction

This section takes a cross-sectional approach to examine the results of the analyses in Chapters Four and Five for each of the 24 exploratory questions under each property rights criterion. It aims to identify possible reforms that could help to strengthen the extent to which management instruments in the WCPO resemble well-defined property rights.

6.3.2 Limited

This subsection discusses the results against the *limited* criterion. The scores for each instrument against each exploratory question are summarised in Table 6.1 below.

Set a regional or subregional scale catch or effort limit

The two vessel day schemes (VDSs), the Tokelau Arrangement, the purse seine-related instruments in CMM2018-01[1596] and the catch limits for striped marlin the north Pacific all achieved a maximum score (3) for this question. However, only the VDSs currently offer top-down limits. All limits adopted by the WCPFC appear to be bottom-up, derived from the aggregate of individual CCMs' limits. At the extreme, the WCPFC's comprehensive sharks measure[1597] delegates the determination of national limits to CCMs under national plans of action. The absence of any compatibility provisions in the measure means there is no effective regional-scale limit on shark catches.

A top-down limit makes a clear statement that the limit is based on regional criteria rather than historical catch or effort or CCMs' claims. While a bottom-up limit is still a hard limit, national "allocations" must be regarded as proportional limits rather than volumetric in order in order to facilitate adjustments to the limit[1598].

Capacity limits may limit potential catch or effort but do not directly control effort or catch, and were therefore scored lower than effort or catch limits. Further, capacity limits in the WCPFC-CA are generally poorly defined[1599], typically using a simple metric of vessel numbers as the unit of management. The WCPFC has made a more convincing attempt to control capacity in the tropical purse seine fleet in CMM2018-01 by ensuring that a replacement vessel does not exceed certain metrics of the vessel or vessels it replaces. Capacity limits are nevertheless likely to be redundant in the presence of effective individual catch or effort limits[1600] and it is argued that, where this is the case, they should

[1596] These include the purse seine effort, catch and capacity limits and the limit on the deployment of drifting FADs with instrumented buoys of CMM2018-01.
[1597] CMM 2019-04.
[1598] See further subsection 6.3.6: Flexible below.
[1599] For example, CMM2015-02 South Pacific Albacore; CMM2018-01 Tropical longline capacity limits.
[1600] See Chapter Three subsection 3.3.3.

be removed. This is likely to be the case for swordfish south of 20°S and for the tropical purse seine and longline fisheries.

Limits for the same stock are in some cases also defined using different units of management in different areas. This is certainly the case for the tropical purse seine fishery, south Pacific albacore and striped marlin and there is no apparent mechanism to compare the different units to enable trade-offs between two areas or different gear types. Existing limits could be translated into the same management unit – for example, catch volumes – for the same stock caught in different geographic spaces where there is a scientific basis to do so, and for different gear types.

Base limits on the best scientific evidence available

Most instruments were assessed poorly against this question. No instruments within the tropical tuna measure make a clear link between scientific evidence and the limits therein – all but the FAD limits are clearly based on historical catch, effort or capacity – and were therefore scored as zero. While there may be a scientific basis for the adoption of particular historical data, this is not apparent in the measure. The limits under the SPA measure and the two swordfish measures are similarly determined. This is not to say that the measures are inconsistent with the WCPFC Convention. Article 5 clearly qualifies the requirement that measures be based on the "best scientific evidence available"[1601].

Subregional arrangements fair better than their WCPFC counterparts. The purse seine VDS, longline VDS and the Tokelau Arrangement all provide at least some scope for a scientific basis to be reflected in the determination of limits. This aligns well with the assessment that they exhibit top-down limits. Nevertheless, scientific evidence is still just one factor among other social and economic ones to be considered in determining limits. For the VDS management schemes this perhaps reflects the lack of clear direction in the Palau Arrangement.

The WCPFC's non-tuna measures also largely scored better than its tuna instruments, with swordfish an exception. The catch limit for striped marlin in the north Pacific[1602] was the only instrument to achieve a maximum score. Although the limits are based on catch history, the measure incorporates phased reductions over three years ostensibly in line with scientific advice. Its counterpart for the south west Pacific also claimed to be based on scientific evidence but the absence of reductions in capacity, the unit of management, appeared to be inconsistent with that advice. The sharks measure pays similar

[1601] WCPF Convention Article 5: "…the members of the Commission shall… (c) ensure that such measures are based on the best scientific evidence available and are designed to maintain or restore stocks at levels capable of producing maximum sustainable yield, as qualified by relevant environmental and economic factors, including the special requirements of developing States in the Convention Area, particularly small island developing States, and taking into account fishing patterns, the interdependence of stocks and any generally recommended international minimum standards, whether subregional, regional or global". See further the discussion in Chapter Five Section 5.3.1.
[1602] CMM 2010-01.

heed to science through a reference to the ecosystems approach to fisheries management but as limits are nationally determined there is no guarantee that the region-wide limit will be science-based.

An obvious reform would be to ensure that limits are top-down and determined on the basis of the best available scientific evidence to preserve biological sustainability and any attendant ecological objectives that may be achieved by limiting catches[1603]. The planned development of harvest strategies for the four tuna species should go a long way to addressing this gap in WCPFC tuna measures, however, they do not lock in science as the primary basis for harvest limits[1604]. The type of reforms suggested here are discussed further in section 6.4.

Base limits on the precautionary approach

A similar pattern emerges in relation to the precautionary approach, albeit with much lower scores for those that registered a score above zero. The Tokelau Arrangement was rated the strongest, although the reference to the precautionary approach was embedded in the development of future harvest strategies by the Parties, rather than itself setting a precautionary limit. As the WCPFC harvest strategy measure[1605] and the tuna measures[1606] show, such an approach has not yet flowed through from the former to the latter.

The measure for striped marlin in the southwest Pacific claimed to apply a precautionary measure by holding capacity steady but this appeared to be inconsistent with the assessment that stocks were declining. Conversely, the measure for striped marlin in the north Pacific was silent on the precautionary approach but appeared to apply a degree of precaution by mandating phased reductions in catches.

Apply limits to the full geographic range of the stock

Assessments against this question yielded binary results – instruments either did or did not apply to the full geographic range of the stock. Those that did included the WCPFC's longline bigeye (BET) catch and capacity limits, catch limits for other commercial fisheries for YFT, SKJ and BET and the drifting FAD limit as well as the sharks measure. No geographic limits were placed on these instruments.

More problematic were those that did, including the three subregional instruments – consistent with the limited scope of the Nauru Agreement, Palau Arrangement and the Tokelau Arrangement – and all other WCPFC instruments. Regarding the latter, the WCPFC Convention is assessed as permitting measures to apply either the full convention area or parts of it[1607].

[1603] That is, trophic impacts as discussed in Chapter Two subsection 2.2.3.
[1604] CMM2014-06 para 4: "…Harvest strategies are proactive, adaptive and provide a framework for taking the best available information about a stock or fishery and applying an evidence and risk-based approach to setting harvest levels…". This appears to allow other factors relating to the fishery to be taken into account.
[1605] CMM2014-06
[1606] CMM2018 -01 and CMM2015-02..
[1607] See discussion in Chapter Five subsection 5.3.1.

Both swordfish limits[1608] apply only south of 20°S and there are no measures for the remaining areas of the convention area. Catches of striped marlin are unlimited between the equator and 15°S, despite the fact that the northern and southern stocks are not considered to be distinct[1609]. Capacity limits for vessels targeting SPA are limited to catches south of 20°S[1610], leaving stocks of SPA in tropical waters unmanaged[1611]. There is no evidence to suggest that these spatial gaps are designed to address differential spatial impacts of harvests but it is clear that they all undermine the limits applied under each measure and should be addressed.

For subregional measures, compatibility also plays a critical role in ensuring the patchwork of instruments is consistent with a regional objective. The Tokelau Arrangement necessarily covers a limited geographic range, as it applies only to the EEZs of the participants. CMM2015-02 covers only some of those gaps but as long as its limit is defined in terms of capacity (vessel numbers), compatibility will be difficult to achieve.

The purse seine vessel day scheme has been incorporated into CMM2018-01, which recognises the TAE adopted by the PNA and adds EEZ limits and high seas limits for non-PNA countries. However, the effort and catch limits in CMM2018-01 do not entirely fill in the spatial gaps left by the VDS, other than through capacity limits[1612]. High seas limits only apply to the area between 20°N and 20°S. While CCMs are not able to transfer effort from this area to beyond it[1613], there is nothing to stop them increasing effort outside the tropical band while maintaining effort within it. While the measure commits the WCPFC to "agree[ing] on hard effort or catch limits in the high seas of the Convention Area", progress is behind schedule[1614].

In contrast, the longline BET catch limits in CMM2018-01 cover the full extent of the WCPFC-CA. However, as they are flag-based limits they do not yet recognise the longline VDS, which is zone-based and therefore only covers the EEZs of the participants. Indeed, it is also argued that the longline BET catch limits also do not cover all flag CCMs that catch BET[1615]. Further, the longline VDS is not targeted solely at BET. Compatibility between the two measures will therefore be difficult to achieve in their current form.

[1608] See Chapter Five subsection 5.6.5.
[1609] See Chapter Five subsection 5.6.5.
[1610] CMM2015-02 para 1.
[1611] North Pacific albacore is governed as a separate stock by CMM 2019-03, which applies to water north of the equator.
[1612] See Chapter Five subsection 5.5.2.
[1613] CMM2018-01 para 27.
[1614] The commitment was to do this work by 2020 but this was not achieved, noting that the COVID-19 pandemic forced the regular schedule of meetings to be held virtually. WCPFC 17 agreed to push the deadline back (see CMM2020-01 preamble) to 2021 to further this work. See WCPFC (2021). Summary Report. Seventeenth Regular Session of the Western and Central Pacific Fisheries Commission (WCPFC17), Electronic Meeting, 8-15 December 2020, Western and Central Pacific Fisheries Commission (WCPFC). paras 183-94.
[1615] See Chapter Five subsection 5.5.5.

This analysis of geographic coverage reveals the extent of the WCPFC's failure to adopt compatible limits, pointing to the need to remove or fill in spatial gaps. The provisions for other commercial fisheries in CMM2018-01 go some way to addressing this but it is difficult to judge whether they are sufficiently compatible with the tropical purse seine and longline instruments in the rest of the measure. Any spatial gaps will undermine catch and effort limits and effectively exempt vessels that fish exclusively within those areas from the Commission's CMMs.

Ensure limits account for catches of the limited species by all gear types

Gear coverage by the assessed instruments follows a similar pattern to spatial coverage, with again largely binary results. All non-tropical tuna WCPFC CMMs, other than CMM2019-04 (sharks) apply to all vessels targeting a particular species – that is, swordfish, striped marlin, SPA (both CMM2015-02 and the Tokelau Arrangement).

All instruments restricted to a single gear type score zero for this question. The Palau Arrangement does not require management schemes to be defined by a particular gear type, thus permitting future management schemes of the PNA to address this gap. The purse seine effort limits and longline catch limits in CMM2018-01 are similarly restrictive. The exception in CMM2018-01 is the catch limit provision for other commercial fisheries, which focuses on SKJ, BET and YFT caught by all other gear. Although this is not a complete catch-all, it goes a long way to filling significant gaps in the measure, albeit in a very simple fashion.

Catch-based limits would ensure that limits for each particular species encompass those taken by any gear type. Disaggregated biological objectives, such as limiting catches of juvenile BET in purse seine FAD sets, could be addressed through sub-quotas for juveniles or "exchange rates" to translate catches of juveniles to the equivalent in adult individuals. The latter would require purse seine fishers to purchase BET quota from existing rightholders at a ratio appropriate to the differential impact of catches of juveniles.

Power to record bycatch of the target species against limits for that species

This question reveals some additional complexities arising from instruments defined by gear type. Recording bycatch in fisheries that do not target the species but where that species is targeted in other fisheries strengthens the capacity of a catch limit to account for all sources of mortality. For example, this would be relevant where purse seiners take juvenile BET in FAD sets but are targeted as adults in the tropical longline fishery. However, purse seine vessels are only limited in their use of FADs, not in their catches of BET.

Longliners targeting SPA remain bound by CMM2019-04 on sharks and by BET catch limits where they interact with SPA. However, they may be able to take incidental catches of striped marlin as they are not "fishing for striped marlin" (CMM 2006-04).

The swordfish catch limits in CMM2009-03 are not restricted to catches by vessels *targeting* swordfish[1616] and therefore should apply to any catches of swordfish whether intentional or otherwise and would logically apply to vessels targeting striped marlin and SPA (score = 3). In contrast, it is unclear whether the capacity limits only apply to vessels *targeting* swordfish[1617] (score = 2), nor how the instrument deals with vessels that switch from targeting one species to another. The catch limit for striped marlin in the north Pacific is similarly stronger than the capacity limit applying in the southwest, which covers vessels *targeting* the species.

The tuna measures all performed weakly against this question, with most being silent. The Tokelau Arrangement illustrates again the generally superior outcomes in subregional groupings compared to the weaker WCPFC measure for SPA (CMM2015-02). While the purse seine VDS appears to be silent, the purse seine discard and catch retention provisions that appear in CMM2018-01[1618] in fact build upon the Nauru Agreement Third Implementing Arrangement[1619]. As such, the combined effect is to place the purse seine VDS on par with the CMM2018-01 purse seine effort limits. However, both instruments fall short of requiring those catches to be recorded against limits for the respective species but likely prevent highgrading.

Reforms: Limited

The assessed instruments point to a need for several reforms or principles upon which to base future reforms. These include:

- the extension of limits to the full geographic range of the respective stock, including by filling gaps between two comparable instruments;
- existing limits could be translated into the same management unit for the same stock across different geographic spaces, preferably catch limits;
- sub-allocations or exchange rates may be required to account for differential impacts of different gear types on different age profiles, based on advice from an independent science provider;
- catch limits should be derived from stock assessments and the TRP for each stock, and determined by an independent science provider, including new TRPs for billfish species and sharks. This implies the adoption of top-down science-based and precautionary limits rather than bottom-up limits based on historical fishing activity or national claims;
- once firm catch of effort limits have been established, any capacity limits for vessels targeting the same stocks should be removed;

[1616] CMM2009-03 para 2: "…CCMs shall exercise restraint through limiting the amount of swordfish caught by fishing vessels flagged to them…".
[1617] CMM2009-03 para 1: "limiting the number of their fishing vessels for swordfish".
[1618] CMM2018-01 para 31.
[1619] Nauru Agreement Third Implementing Arrangement Article I para 1.

- establish a single limit for each stock caught by any vessel using any gear type, and irrespective of whether the catch was taken as a target species or not. Such a system would require the vessel operator to ensure they had a portfolio of quotas to match their catch composition through, say, catch-quota balancing;
- the limit could then be subdivided to allow for the maintenance of spatially distinct sub-populations or to ensure catches are distributed in order to avoid local depletions;
- catch retention rules could be extended across all vessels to help avoid highgrading and ensure that all catches are accounted for.

Catch-based limits demonstrate a strong ability to meet the limited criterion due to their greater ability to account for all sources of mortality – that is, by different gear types and as target species or bycatch. This is a consequence of their greater ability to unbundle limits to match different biological attributes of the fishery. This assumes that catch based limits are applied to a stock across its entire range rather than to a particular fishery, defined by geography and gear.

However, it is recognised that the PNA and, to a large extent, the WCPFC have opted for effort-based controls and that a shift away from these to catch-based controls may be difficult both practically and politically. If that is to be the case, existing effort controls should at least be:

- expanded to cover the entire geographic range of each stock;
- expanded to cover all gear types known to take each species whether as a target species or as bycatch; and
- derived from a top-down TAC based on the estimated relative impact of each gear type on each stock.

Table 6.1: Limited criterion: summary of results: all instruments

	Subregional						Regional enabling		CMM 2018-01 tropical tuna						Other regional measures					
Criterion: Limited	*Nauru Agreement*	*Nauru Agreement 3IA*	*Palau Arrangement*	*Purse seine VDS*	*Longline VDS*	*Tokelau Arrangement*	*WCPFC Convention*	*2014-06 Harvest strategies*	*Purse seine catch and effort*	*Drifting instrumented FADs*	*Purse seine capacity*	*Longline BET catch*	*Tropical longline capacity*	*Other trop. comm. fisheries*	*2015-02 SPA*	*2019-04 Sharks*	*2006-04 Striped Marlin (SW)*	*2010-01 Striped Marlin (N)*	*2009-03 Swordfish capacity*	*2009-03 Swordfish catch*
set a regional or subregional scale catch or effort limit?	1	0	1	3	3	3	2	0	3	3	3	2	2	2	2	1	2	3	2	3
base limits on the best scientific evidence available?	1	0	1	2	2	2	2	2	2	0	0	0	0	0	0	1	2	3	0	0
base limits on the precautionary approach?	1	0	1	1	1	2	2	2	0	0	0	0	0	0	0	1	2	1	0	0
apply limits to the full geographic range of the stock?	0	0	0	0	0	0	2	1	0	3	0	3	3	3	0	3	0	0	0	0
ensure limits account for catches of the limited species by all gear types?	2	0	2	0	0	3	1	1	0	0	0	0	0	2	3	0	3	3	3	3
power to record bycatch of the target species against limits for that species?	1	2	1	1	1	2	1	2	2	1	2	0	0	1	1	2	1	2	2	3
Limited subtotal	**6**	**2**	**6**	**7**	**7**	**12**	**10**	**8**	**7**	**7**	**5**	**5**	**5**	**8**	**6**	**8**	**10**	**12**	**7**	**9**

6.3.3 Exclusive

This subsection discusses the results against the *exclusive* criterion. The scores for each instrument against each exploratory question under the criterion are summarised in Table 6.2 below.

Allocate national scale limits as a share of the regional TAC/TAE

Allocations are generally weak and unlikely to possess the level of exclusivity required of a well-defined property right. The WCPF Convention and the Tokelau Arrangement explicitly allow for the allocation of limits without mandating it, while the Palau Arrangement is silent without prohibiting it. In practice, limits under the Palau Arrangement are allocated in a top-down process while almost every WCPFC instrument that sets a limit applies a bottom-up approach to allocations of TAC or TAE. This satisfies the requirement that national limits are allocated among CCMs in the sense that CCMs hold a share in the limit, and this is reflected in high scores for most instruments.

Only the FAD deployment limit is a rudimentary top-down limit but its simplicity does not allow for any equity considerations to be taken into account other than the principle that each vessel is entitled to deploy an equal number of FADs. The sharks measure (CMM2019-04) permits each CCM to determine their own limit such that no limit at the national scale can be considered genuinely exclusive against all others.

The assessment of the two swordfish instruments (CMM2009-03) is qualified by the incomplete record of CCMs subject to capacity and catch limits such that some CCMs may not have a limit recorded against them.

New entrants either excluded or able to participate without adding to TAC/TAE?

Several measures do not appear, in their current form, to permit new entrants as allocations are on the basis of catch, effort or vessel history.

Subregional arrangements established by coastal States could permit new entrants by adding their EEZs to the area of application without adding to the overall limit. Flag States must seek access to a share of catches permitted in those EEZs so new flag State entrants also will not add to the limit. This is not explicit in the Palau Arrangement but it is clear in the Tokelau Arrangement[1620].

The WCPF Convention is silent on the effect of new members on any catch or effort limits but it has set out factors to be taken into account in considering the participatory rights of cooperating non-members in CMM 2019-01[1621]. Those factors imply that such rights should not increase catches or effort but this is not explicit.

[1620] Tokelau Arrangement Article 8.2.
[1621] CMM2019-01 para 12.

The drifting FAD deployment limits in CMM2018-01 appear to permit any new vessel to deploy FADs without adding to the aggregate limit as long as those vessels comply with the purse seine capacity limits.

Silence has been interpreted as not permitting new entrants but this is debatable. It may be helpful therefore to make explicit reference to the treatment of new entrants if they are anticipated. This will certainly be the case if limits are to be allocated in the future on the basis of equity considerations other than catch, effort or capacity history.

Prohibit exemptions to the limit (or exemptions not provided for)

Exemptions are widely employed in the assessed instruments, with only the WCPFC's FAD deployment limit and the purse seine VDS exhibiting clear universal coverage, albeit with limited geographic coverage. The longline VDS and the WCPFC's catch limits for other commercial tropical tuna fisheries only allow exemptions for artisanal vessels and small scale commercial catches respectively and are otherwise comprehensive. The Tokelau Arrangement, on the other hand, is silent but provides for measures that could include exceptions to address a disproportionate burden.

Blanket exemptions for SIDSTs appear in all other WCPFC measures. This contrast between regional and subregional instruments is not unexpected given the relatively similar development status of participants in the latter. Exemptions could allow large increases in catches and effort if a SIDST decides to develop its domestic fleet. Catch and effort limits are also at risk of being avoided by the treatment of chartering arrangements[1622] and reflagging of vessels from non-SIDS to SIDS.

The question thus arises whether exemptions are the appropriate method for addressing social objectives. Exemptions directly trade off biological objectives for social objectives. The robust separation model suggests that the limit should apply to all participants to achieve a biological objective and that social objectives should be achieved through the allocation of that limit, not through exemptions. The development of an allocation process in the WCPFC should therefore be undertaken with an assumption that the exemptions will be removed.

Impose penalties for exceeding national limits?

Very few instruments impose genuine penalties. Provisions, such as the purse effort and catch limits and longline BET catch limits in CMM 2018-01, which allow a participant to bring forward catch or effort from the following year's limit to account for an overage in the current year reflect flexibility

[1622] For example, for the longline BET catch limits and longline and purse seine capacity limits in CMM2018-01 catch and effort is to be attributed to the chartering state: para 8: "For the purposes of paragraphs 39-41 and 45-49, attribution of catch and effort shall be to the flag State, except that catches and effort of vessels notified as chartered under CMM 2016-05 or its replacement shall be attributed to the chartering Member, or Participating Territory. Attribution for the purpose of this Measure is without prejudice to attribution for the purposes of establishing rights and allocation."

rather than a penalty. On the other hand, that unused limits cannot be carried forward to the next year suggests that the intention is that it act as a penalty. This is reflected in a partial score against this question. The additional penalties applied by the two corresponding vessel day schemes for exceeding limits beyond a certain margin earned them a stronger assessment. No other instruments provide for penalties of any sort, including carry forwards.

Penalties should be strong enough to provide an incentive to comply and are judged to be possible under the WCPF Convention, the Palau Arrangement and the Tokelau Arrangement. Those in the vessel day schemes apply to coastal State participants while those in CMM2018-01 apply variously to coastal States and flag States. What is not clear is how a penalty imposed on a CCM translates to an impact on individual vessels fishing under an authorisation provided by that CCM. In such cases, it is likely to be difficult to sanction such a vessel, or indeed identify which particular vessels are contributing to the breach without an effective RBM scheme at the individual user scale. A detailed solution is beyond the scope of this study, suffice to suggest that a mechanism be developed to make clear how vessel authorisations will be treated by the regional or subregional body to ensure that breaches in aggregate at the national scale have effect at the individual scale. In keeping with the theme of this study, an RBM scheme at the individual user scale within in participating CCMs would be one option.

Reforms: Exclusive

Several reform proposals emerge from the foregoing analysis, including:

- Centrally and independently determined, science-based and precautionary limits should be allocated in a top-down process to participating States and territories on the basis of equity. Proposing a method of allocation or a definition of equity are both beyond the scope of this study, but it is argued that the objective of allocation should be to achieve an equity objective only.
- No exemptions to a limit should be permitted. Exemptions allow the limit to be breached and compromise biological objectives in favour of equity. In some cases, this is likely to be minor but in others, including those employed to achieve equity objectives, exemptions may lead to catches significantly above sustainable limits.
- Sub-allocations could be employed to protect equity, including for the purposes of ensuring food security and livelihoods in coastal and artisanal fisheries. These would not equate to exemptions but would quarantine vulnerable stakeholders from industrial commercial fishing, allowing different management regimes to be applied[1623].
- Strong penalties would help to maintain exclusivity by ensuring that one participant's actions do not impinge upon another's. Here it is proposed that penalties like those in the vessel day

[1623] See Chapter Three subsection 3.3.3.

schemes be applied to CCMs that breach their allocated limit beyond an allowance for a reasonable degree of flexibility between fishing years.

- Requiring new entrants to obtain an allocation from within the applicable limit would also maintain exclusivity of existing participants' rights and prevent the limit being exceeded. This is particularly relevant to new fishing State entrants intending to fish on the high seas[1624]. Equity considerations suggest that provision for new entrants should be incorporated into allocation processes and in rules governing transfers. There is little evidence that the treatment of new entrants has been considered in any deliberate, systematic way in the formulation of WCPFC CMMs[1625].
- Vessels operating under an authorisation issued by an in-breach CCM should be treated in such a way as to ensure that catch and effort levels at the individual scale are consistent with the national and regional scales. This would avoid a situation where the CCM is in breach but vessels flying its flag are not.

[1624] As noted previously, DWFNs can negotiate access to a share of a coastal state's allocation to fish within that coastal state's EEZ, as is currently the case.
[1625] The current measure on cooperating non-members, CMM2019-01, is largely process-focussed.

Table 6.2: Exclusive criterion: summary of results: all instruments

	Subregional						Regional enabling		CMM 2018-01 tropical tuna						Other regional measures					
Criterion: Exclusive	*Nauru Agreement*	*Nauru Agreement 3IA*	*Palau Arrangement*	*Purse seine VDS*	*Longline VDS*	*Tokelau Arrangement*	*WCPFC Convention*	*2014-06 Harvest strategies*	*Purse seine catch and effort*	*Drifting instrumented FADs*	*Purse seine capacity*	*Longline BET catch*	*Tropical longline capacity*	*Other trop. comm. fisheries*	*2015-02 SPA*	*2019-04 Sharks*	*2006-04 Striped Marlin (SW)*	*2010-01 Striped Marlin (N)*	*2009-03 Swordfish capacity*	*2009-03 Swordfish catch*
allocate national scale limits as a share of the regional TAC/TAE?	1	0	1	3	3	2	2		3	3	3	3	3	2	3	0	3	3	2	2
new entrants either excluded or able to participate without adding to TAC/TAE?	1	0	1	1	1	3	1	-	3	3	3	2	3	3	1	0	3	3	0	0
prohibit exemptions to the limit (or exemptions not provided for)?	1	0	1	3	2	1	2	-	0	3	0	0	0	2	0	0	0	0	0	0
to impose penalties for exceeding national limits?	1	0	1	3	3	1	1	-	2	0	0	2	0	0	0	0	0	0	0	1
Exclusive subtotal	**4**	**0**	**4**	**10**	**9**	**7**	**6**	**-**	**8**	**9**	**6**	**7**	**6**	**7**	**4**	**0**	**6**	**6**	**2**	**3**

6.3.4 Secure

This section examines the assessed instruments against the *secure* criterion. Scores against each exploratory question are summarised in Table 6.3.

National limits valid for more than one year

Assessed instruments revealed a wide variety of responses to this question. CMM2018-01's expiry date has restricted it to one year validity and any extensions require amendment to the CMM. The precariousness of the measure was illustrated by the near failure to agree in 2020 to extend the agreement for a further year[1626]. Some leeway could be given to limits that have remained in place through a succession of revisions to the tropical tuna measure but this is insufficient, in light of the expiry date, to push the score above one.

All limits in CMM2018-01 remain subject to a consensus agreement to renew it in full in order to maintain those limits. This contrasts with limits established in the non-tuna CMMs where they remain in place until amended by the Commission. This means that a single CCM could block a change to the limits, leaving them in place in perpetuity. While this provides a substantial degree of certainty, and therefore security, it provides little opportunity for a positive assessment under the *flexible* criterion.

A logical path would be to agree to remove the expiry date from CMM2018-01 to provide a greater level of security for the six instruments under it and move the default to perpetuity rather than expiry, while addressing flexibility through harvest strategies.

The longline VDS can be set for up to three years under the current management scheme. This has also been the practice for the purse seine VDS but such a provision is not explicit in the management scheme.

National limits valid until Parties agree to amend them

The expiry date of CMM2018-01 rules out the possibility that any of the limits therein will be valid in perpetuity unless the Commission determines otherwise. The vessel day schemes, on the other hand, are subject to review but if a consensus cannot be reached the previous year's PAEs remain in place. This in effect makes validity in perpetuity the default. This could result in a situation where the PNA could subject itself to a limit where other CMMs are not limited.

All other WCPFC instruments scored well on this question as they have no expiry date and therefore remain in place until the Commission decides to change them. The current interim limits under the Tokelau Arrangement also have no expiry date.

[1626] WCPFC (2021). Summary Report. Seventeenth Regular Session of the Western and Central Pacific Fisheries Commission (WCPFC17), Electronic Meeting, 8-15 December 2020, Western and Central Pacific Fisheries Commission (WCPFC). paras 183-94.

Make national limits binding on Parties

This question provided the most consistently strong responses across the assessed instruments. All WCPFC CMMs are binding[1627] and therefore only qualified by specific language. The sharks CMM (CMM 2019-02) is the only instrument where this appears to be an issue, given its use of nationally determined limits on shark catches.

Although the Palau Arrangement and Tokelau Arrangement appear to be non-binding, management schemes made under them are intended to be binding. Under the Palau Arrangement this has been given effect through the adoption of the two vessel day schemes.

Resolve disputes beyond bilateral negotiation

Participants in subregional arrangements must rely on bilateral or multilateral negotiation to resolve disputes. No WCPFC CMM contains provisions for the independent resolution of disputes at the regional scale but under the WCPF Convention the dispute resolution mechanisms of UNFSA Part VIII, and therefore Part XV of LOSC, are to be applied *mutatis mutandis* to any dispute between CCMs[1628]. The time and resources required to pursue a dispute through UNFSA and LOSC mechanisms are, generally speaking, likely to be burdensome, particularly for relatively minor instances of technical dispute or non-compliance. The procedures in UNFSA for the resolution of technical disputes[1629] are likely to offer a less burdensome route. In practice, it is argued that disputes involving compliance with CMMs are still more likely to be resolved through negotiation and the Commission's internal compliance procedures.

Establish a record of national scale limits (e.g. in a regional register or CMM)

No formal registers of allocations exist at either the subregional or regional scales. However, some CMMs provide clear lists of national scale allocations. These form a part of the binding CMM and therefore may be claimed to be an authoritative source. As a register these CMMs fall short of the legal and operational functions of a domestic land titles or personal property register but a low benchmark has been set here for a score of three.

CMMs that refer to historical catch, effort or capacity levels but do not clearly set out what those levels were are therefore less authoritative as there is no definitive source of those historical levels identified in the CMM. This is the case for CMMs applying to sharks (CMM 2019-02) and tropical longline and

[1627] WCPF Convention Article 23(1), 25(1).
[1628] WCPF Convention Annex 2 also contains provisions to establish a panel to review decisions of the Commission. It is difficult to determine whether this provides any recourse for CCMs who believe another CCM has breached a CMM. For a review to occur, a decision must have been taken. This is unlikely to be the case unless a CCM is contesting a decision to place or not place a vessel on the WCPFC IUU list.
[1629] UNFSA Article 29.

purse seine capacity limits (CMM 2018-01). Swordfish capacity and catch limits (CMM 2009-03), however, manage to do this, albeit in incomplete fashion.

Reforms: Secure

Several possible reforms arise from the analysis of instruments against the *secure* criterion.

- Volumetric allocations are likely to be more secure if measures do not have an expiry date or are set on a multiyear rolling basis. While this reduces flexibility, CCMs are able to allocate rights to individual users to a share of their national allocation for a longer period, with likely positive impacts on the value of those rights.
- Defining national allocations as proportional shares would enable rights to be both durable and flexible as the TAC/TAE would be set independently of the CMM.
- The WCPFC could establish an allocations dispute settlement mechanism under a stand-alone CMM within the framework of Article 29 of UNFSA. Such a mechanism would need to engender trust in its independence and the efficiency of its processes. This would be a complex undertaking but would provide a greater degree of security of allocations and transfers.
- A single regional scale register administered by the WCPFC Secretariat recording allocations at the national scale, and ideally at the individual user scale, would similarly strengthen security. The register would need to have legal status and bind all CCMs to recognise the allocations therein, with recourse to the dispute mechanisms described above.

Table 6.3: Secure criterion: summary of results: all instruments

	Subregional						Regional enabling		CMM 2018-01 tropical tuna						Other regional measures					
Criterion: Secure	*Nauru Agreement*	*Nauru Agreement 3IA*	*Palau Arrangement*	*Purse seine VDS*	*Longline VDS*	*Tokelau Arrangement*	*WCPFC Convention*	*2014-06 Harvest strategies*	*Purse seine catch and effort*	*Drifting instrumented FADs*	*Purse seine capacity*	*Longline BET catch*	*Tropical longline capacity*	*Other trop. comm. fisheries*	*2015-02 SPA*	*2019-04 Sharks*	*2006-04 Striped Marlin (SW)*	*2010-01 Striped Marlin (N)*	*2009-03 Swordfish capacity*	*2009-03 Swordfish catch*
national limits valid for more than one year?	1	0	1	1	2	1	1	-	1	1	1	1	1	1	2	3	3	3	3	3
national limits valid until Parties agree to amend them? (default = perpetuity)	1	0	1	3	3	2	3	-	0	0	0	0	0	0	3	3	3	3	3	3
make national limits binding on Parties?	2	0	2	3	3	2	2	-	3	3	3	3	3	3	3	0	3	3	2	2
resolve disputes beyond bilateral negotiation	0	0	0	0	0	0	2	-	1	1	0	0	0	0	0	0	0	0	0	0
establish a record of national scale limits (e.g. in a regional register or CMM)?	1	0	1	3	3	1	2	-	3	2	0	3	0	0	0	0	1	1	2	2
Secure subtotal	**5**	**0**	**5**	**10**	**11**	**6**	**10**	**-**	**8**	**7**	**4**	**7**	**4**	**4**	**8**	**6**	**10**	**10**	**10**	**10**

6.3.5 Transferable

This section examines the assessed instruments against the *transferable* criterion. Where an instrument does not provide for transferable rights (exploratory question one), the remaining questions are redundant as they are premised on transferability being possible. On this, a clear distinction is observable between regional and subregional instruments. Scores against each exploratory question are summarised in Table 6.4 below.

Permit transfers a national limit in full or in part to another CCM

No WCPFC instruments permit a CCM to transfer any allocations to another CCM either in full or in part. It is worth noting, however, that a one-off transfer was recorded in CMM2018-01 between Japan and China[1630] signalling that bilaterally agreed transfers may be possible under any newly negotiated CMM. However, the existence of one-off transfers such as this also confirms that a systematic mechanism for transfers is not in place.

Only the two vessel day schemes provide explicitly for transferability of vessel days between participants at the national scale. The respective provisions commence with slightly different language: under the longline VDS the Parties "shall develop a scheme to facilitate the transfer of days between the Parties…"[1631]; under the purse seine VDS "[a]ny two Parties may agree to a transfer between themselves all or part of their PAE for a Management Year…". The provisions are otherwise close to identical and were assessed as equivalent in strength.

Recalling that it more closely resembles an enabling instrument, the Tokelau Arrangement permits the establishment of "interzone trading mechanisms"[1632] but these have not yet been incorporated into a management scheme.

Require new entrants to acquire an allocation through a transfer from a CCM

No instrument provides explicitly for new entrants to acquire rights from an existing rightholder in order to participate in the fishery. All three subregional instruments restrict new participants to FFA members, all of whom are coastal State or territories. As new entrants they would bring EEZs and a corresponding portion of the stock to the scheme, thus negating the need to obtain a transfer. Distant water fleets from non-FFA members would be required to obtain an allocation of days from a participant in order to fish in that participant's EEZ as occurs in the purse seine VDS. However, this is a matter of assignment to allow access rather than a matter of transfers between equivalent assignees.

[1630] CMM2018-01. A note in Annex 1 Table 3 states that "Japan will make an annual one-off transfer of 500 metric tonnes of its bigeye tuna catch limit to China".
[1631] Longline VDS Art.6.1.
[1632] Tokelau Arrangement Article 4.3(iii)(b).

Specify a process for effecting a transfer

Both vessel day schemes provide a clear and simple process for effecting transfers between participants and these are known to have occurred frequently under the purse seine VDS. As an enabling instrument, like the Palau Arrangement, the Tokelau Arrangement is silent on the detail of any transfer processes but authorises management schemes to include "inter-zone trading mechanisms"[1633].

Record transfers in a register

Transfers under the two vessel day schemes are effectively recorded in adjusted PAEs following the notification of a transfer by two participants. This is not a register as such[1634] but was assessed as a sufficient equivalent as the PAEs possessed a binding status under the two management schemes. An equivalent provision would presumably be incorporated into any future management scheme adopted under the Tokelau Arrangement but in the meantime the Arrangement remains silent.

The WCPFC's Record of Fishing Vessels (RFV) provides a ready platform for the registration of national scale allocations and transfers, when and if they become possible under WCPFC rules[1635]. If transfers were permitted between individual users operating in different zones, considerable amendments to CMM2014-03 and CMM2018-06 would be required, including to broaden the scope to include in the RFV vessels operating exclusively in the EEZ of its flag State. Whether the WCPFC RFV should also record allocations at the individual scale would require further investigation and would require a considerably higher level of cooperation than is currently exhibited by CCMs.

Reforms: Transferable

All assessed enabling instruments of the WCPFC are silent on transferability of allocations. This has been interpreted as permitting the participants to establish mechanisms for transferability, not prohibiting it. The presence of transferability provisions in subregional instruments but not in the WCPFC regional arrangements again reflects the increased difficulty of achieving consensus in a larger, more heterogenous group.

Subregional transferability, however, is restricted to the allocations of rights to access fisheries within selected EEZs. There are no mechanisms for transfers between CCMs fishing on the high seas or between the high seas and EEZs for the same stock. The limited geographic application of transfers acts as significant constraint on the region's ability to adapt to changes in economic circumstances or to the movement of stocks in response to seasonal and longer term climatic shifts.

[1633] Tokelau Arrangement Article 4.3(b)(iii).
[1634] See subsection 5.3.5.3 *Secure* above.
[1635] See Chapter Five subsection 5.7.3.

To propose that the WCPFC permit allocations to be transferred between CCMs would be to oversimplify the challenges and very likely premature given the assessments of the current instruments. Instead, it is suggested that more immediate reforms are necessary preconditions to effective *transferability*. These include ensuring that catches and/or effort are more comprehensively *limited*, both geographically and across gear types, and to strengthen the *security* and *exclusivity* of allocations as described elsewhere in the section.

Table 6.4: Transferable criterion: summary of results: all instruments

	Subregional						Regional enabling		CMM 2018-01 tropical tuna						Other regional measures					
Criterion: Transferable	*Nauru Agreement*	*Nauru Agreement 3IA*	*Palau Arrangement*	*Purse seine VDS*	*Longline VDS*	*Tokelau Arrangement*	*WCPFC Convention*	*2014-06 Harvest strategies*	*Purse seine catch and effort*	*Drifting instrumented FADs*	*Purse seine capacity*	*Longline BET catch*	*Tropical longline capacity*	*Other trop. comm. fisheries*	*2015-02 SPA*	*2019-04 Sharks*	*2006-04 Striped Marlin (SW)*	*2010-01 Striped Marlin (N)*	*2009-03 Swordfish capacity*	*2009-03 Swordfish catch*
permit transfers of a national limit in full or in part to another CCM?	1	0	1	3	3	2	1	-	0	0	0	0	0	0	0	0	0	0	0	0
require new entrants to acquire an allocation through a transfer from a CCM?	1	0	1	1	1	1	1	-	0	0	0	0	0	0	0	0	0	0	0	0
specify a process for effecting a transfer?	1	0	1	3	3	1	1	-	0	0	0	0	0	0	0	0	0	0	0	0
record transfers in a register?	1	0	1	3	3	1	1	-	0	0	0	0	0	0	0	0	0	0	0	0
Transferable subtotal	**4**	**0**	**4**	**10**	**10**	**5**	**4**	-	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

6.3.6 Flexible

This subsection reviews the assessments of each instrument under the *flexible* criterion. Scores for each exploratory question are summarised in Table 6.5 below.

Set a TRP the target stock(s)

TRPs or interim TRPs are in place as part of plans in the WCPFC to develop harvest strategies for the four key tuna species. There are no specific plans for the development of harvest strategies for other harvested species, such as Pacific bluefin, marlins, sharks and swordfish.

The Tokelau Arrangement is the only subregional instrument to foreshadow harvest strategies for SPA but it is not clear how this would interact with the regional harvest strategy under the WCPFC. For the purposes of compatibility, it would make sense for any harvest strategy applied under the Tokelau Arrangement would be that adopted by the WCPFC.

Establish harvest control rules for the target stock(s)

The WCPFC is to establish harvest control rules, or management procedures, for each of the four key tuna species[1636] but at this stage no instruments contain any specific references to them in anticipation. Again, the Tokelau Arrangement explicitly allows for harvest control rules but this is not matched by the Palau Arrangement.

Adjust a TAC/TAE on the basis of environmental factors and stock assessments

Both vessel day schemes allow for the annual review and determination of the TAE. This is only implicit in the reference to harvest control rules in the Tokelau Arrangement.

Adjustments to the TAEs in the two VDSs may be in response to a range of factors, including environmental factors but also "economic, management and other" factors. It would be reasonable to conclude, therefore, that while the Parties must have "regard to" the best available scientific advice and information, it does not need to follow that advice. The weighting of each factor, and therefore the basis of any adjustments to the TAE, is therefore at risk of changing from year to year, increasing the unpredictability of changes to the TAE.

WCPFC CMMs set bottom-up limits but do not provide internal mechanisms for their review without amending the CMM.

Define national limits as a proportional share of the regional TAC/TAE

[1636] CMM2014-06 and WCPFC (2018). WCPFC14 Summary Report: Attachment L: Work Plan for the Adoption of Harvest Strategies Under CMM 2014-06 Updated at the 14th Regular Session of the WCPFC, Manila, 3-7 December 2017., WCPFC.

Silence in enabling instruments suggests that it is possible at subregional and regional scales to define national allocations in terms of proportional shares. Where national allocations have been set, these are specified in volumetric terms – either catch, effort or capacity. It is plausible that the same ratios between these volumetric shares could be preserved in future iterations but this is not explicit in any instrument and therefore far from certain.

Establish clear processes for a TAC/TAE to be adjusted

Similarly, silence in enabling instruments allows for the processes used to determine adjustments to a TAC/TAE to be specified but no instrument does this. The two vessel day schemes and the Tokelau Arrangement allow for adjustments to be made within the bounds of the instrument – that is, without amending the instrument itself – but the process for those adjustments is not clear.

Reforms: Flexible

In Chapter Two, I argued that a robust management system is one that is able to cope with change without having to dismantle the fundamental system[1637]. The *flexibility* criterion is central to this proposition.

The WCPFC has set a path toward predictable flexibility for the four key tuna species by embarking on the development of harvest strategies. That process, as set out in CMM2014-06, goes only part of the way. There are clear provisions for the adoption of TRPs and LRPs and for the review, through management strategy evaluations, and adjustment of limits based on environmental and other factors. However, the factors on which those adjustments should be based are broad and the processes for making those adjustments and the flow-on impacts on national allocations remain unclear.

It is proposed therefore that, as the WCPFC develops harvest strategies and allocation processes, it could:

- define allocations as proportional rather than volumetric shares;
- reduce the factors for consideration in setting a TAE/TAC to focus more narrowly on biological and ecological objectives; and
- expand the adoption of harvest strategies to key non-tuna target species.

The Tokelau Arrangement introduces the challenge of ensuring compatibility between harvest strategies at the subregional and regional scales. Parties to the Tokelau Arrangement are all members of the WCPFC and therefore bound by its CMMs, particularly those relating to limits and harvest strategies for SPA. As the WCPFC is more well-progressed in relation to harvest strategies than the Parties to the Tokelau Arrangement, the latter are likely to be required to act in a manner consistent with WCPFC

[1637] Chapter Two subsection 2.3.5.

measures[1638]. It may be advisable, therefore, for subregional arrangements to dispense with their own harvest strategies except to the extent that they provide for the clear and predictable effect of region-wide harvest strategies on allocations at the sub-regional or national scale. This is, of course, subject to the capacity of the WCPFC to agree on harvest strategies.

[1638] UNFSA Article 7(2)(c) requires States, in adopting measures for the same stocks, to take into account "previously agreed measures established and applied…by a subregional or regional fisheries management organisation or arrangement".

Table 6.5: Flexible criterion: summary of results: all instruments

	Subregional						Regional enabling		CMM 2018-01 tropical tuna						Other regional measures					
Criterion: Flexible	*Nauru Agreement*	*Nauru Agreement 3IA*	*Palau Arrangement*	*Purse seine VDS*	*Longline VDS*	*Tokelau Arrangement*	*WCPFC Convention*	*2014-06 Harvest strategies*	*Purse seine catch and effort*	*Drifting instrumented FADs*	*Purse seine capacity*	*Longline BET catch*	*Tropical longline capacity*	*Other trop. comm. fisheries*	*2015-02 SPA*	*2019-04 Sharks*	*2006-04 Striped Marlin (SW)*	*2010-01 Striped Marlin (N)*	*2009-03 Swordfish capacity*	*2009-03 Swordfish catch*
set a TRP the target stock(s)?	1	0	1	1	1	2	2	3	3	3	3	3	3	3	3	0	0	0	0	0
establish harvest control rules for the target stock(s)?	1	0	1	1	1	2	2	3	1	1	1	1	1	1	1	0	0	0	0	0
adjust a TAC/TAE on the basis of environmental factors and stock assessments?	1	0	1	2	2	1	2	3	0	0	0	0	0	0	0	0	0	0	0	0
define national limits as a proportional share of the regional TAC/TAE?	1	0	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
establish clear processes for a TAC/TAE to be adjusted?	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Flexible subtotal	**5**	**0**	**5**	**5**	**5**	**7**	**8**	**11**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**0**	**0**	**0**	**0**	**0**

6.3.7 Conclusion

This section has discussed the results of the analysis conducted in Chapters Four and Five by considering each criterion and each exploratory question across all assessed instruments. The scope for further improvements to the instruments to address the *limited* criterion, suggests that much work is needed to strengthen caps on harvests and effort to levels consistent with the biological sustainability of all stocks across their entire range. More firm limits will support more *exclusive* allocations which, bolstered by a greater degree of *security* and predictable *flexibility*, will facilitate *transferability* in a way that ensures transfers deliver economic benefits and allow participants to adapt to changing circumstances and reduce some aspects of uncertainty. Improving the transferability of rights is therefore likely to be a lower priority in the short to medium term.

The analysis has also revealed some improvements that could be made to the methodology. The five criteria appear to be sufficient in scope and as mutually exclusive as possible given that they are significantly mutually reinforcing. However, the individual exploratory questions under each criterion could be amended to enhance the results. Four examples are provided below.

First, the *limited* criterion does not explicitly differentiate between bottom-up and top-down limits. A top-down limit is arguably implicit in one that is based on the best scientific evidence available, not historical catches. This could be made clearer in the exploratory question concerning science-based limits. A second and related adjustment to the methodology is that the separate question on precaution could be incorporated into the exploratory question on whether the limit is science-based. The precautionary approach is inherently science-based and recognises uncertainty or gaps in scientific information.

Third, the *limited* criterion does not distinguish between whether a right is defined by inputs (including effort or capacity) or outputs (i.e. catch). The analysis in Chapter Three argued that input-based controls were likely to be less effective due to effort creep and the prospect of regulatory catch-up. Property rights defined by output controls are more easily unbundled to match the multiple attributes of the fishery, and therefore arguably incorporate more well-defined property rights. Chapter Three nevertheless acknowledged that input-based controls may be simpler to implement and monitor in some circumstances. Additional exploratory questions could be employed to assess whether the management unit by which the limit, and the associated right to a share in the limit, is well aligned with biological attributes of the fishery. Such a question is inherently biased toward output-based controls but would be highly relevant in the multispecies fisheries of the WCPO. The effect of input and output-based controls is discussed further in the next section.

Fourth, the analysis against the *flexible* criterion focused on harvest strategies. There may be other approaches that could provide a similar degree of flexibility but it is argued that, given the commitments in the region to apply ecosystems approaches, harvest strategies are an appropriate mechanism.

Despite these limitations, this section has demonstrated that a systematic analysis according to well-established property rights criteria can identify the strengths and weaknesses of a rights-like management regime. Applied to the fisheries for highly migratory species in the WCPO, it has revealed several reforms that would contribute to more well-defined property rights in a robust management system.

6.4 Reforms for a robust system

In this section I argue that a transboundary rights-based management system can be designed in such a way as to support the achievement of biological, ecological, economic and social objectives in the presence of uncertainty and dynamism – that is, a robust system. As part of a robust system, RBM may address these objectives directly or be framed in a way that accommodates them in a broader management framework. The section examines the influence of the current property rights regime in the WCPO on each objective and recommends reforms to create a more robust management system.

6.4.1 Biological objectives

As argued in Chapter Two, the key biological objective is the sustainability of the stock. The point at which biological objectives may be achieved is when a volumetric TAC or TAE is set at each scale for a given period. The instrument assigned to achieve the biological objective of the fishery is therefore simply the TAC/TAE for any target stock, first at the regional scale, then cascading down to national scales and below, subject to the condition that TACs/TAEs at any sub-regional scale must in aggregate equal the regional TAC for that species or TAE for the applicable measure of effort.

The preceding analysis has shown that catch, effort and capacity limits in the WCPO are at best based only partially on science, and in many cases, not at all. However, the WCPFC has set in train a process to adopt long term target reference points (TRPs) for the four key tuna species. In time, TRPs and harvest control rules (HCRs) or management procedures will be adopted to ensure that catch and/or effort limits are a direct result of the HCRs to move biomass toward the TRP and away from any limit reference point (LRP).

The WCPFC's harvest strategy measure[1639] acknowledges that trade-offs are likely between conflicting management objectives[1640] and requires the Commission to reconcile them to the extent possible. As this is an inherently political exercise, it is argued that those conflicts are unlikely to be satisfactorily

[1639] WCPFC (2014). Conservation and Management Measure on Establishing a Harvest Strategy for Key Fisheries and Stocks in the Western and Central Pacific Ocean. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM 2014-06**.

[1640] CMM2014-06 Annex 1 para 2: "For each harvest strategy, the Commission shall determine agreed conceptual management objectives for that fishery or stock. In determining these objectives, the trade-offs between each objective, as well as trade-offs between objectives for different fisheries or stocks and harvest strategies shall be considered and any contradictions and tensions between competing objectives should be reconciled to the extent possible".

resolved. Instead, and consistent with the robust separation model, it is proposed that the management objectives that guide the determination of TRPs and HCRs should focus primarily on biological objectives, and therefore give primacy to scientific evidence and precaution.

A focus on biological objectives implies the removal of other objectives from CMMs that set out factors for consideration in determining catch and effort levels. This is most clearly the case for social objectives, which have been shown to conflict with biological objectives[1641].

Some economic and ecological objectives, however, may need to be taken into account in setting catch and effort limits, and may be consistent with biological objectives. A TAC/TAE may be set at a level commensurate with MSY, an economic objective would be enhanced by setting the limit at MEY. MEY typically entails a reduction in catches, such that catches will not be maximised but will remain biologically sustainable. Whether an RFMO aligns a TAC/TAE with MSY or MEY is a choice the RFMO can make and probably cannot avoid.

The TAC/TAE may also take into account predator-prey relationships. As Chapter Three noted, a catch or effort limit could be set to minimise the trophic impacts of harvests of target species, although this may come at a cost to total catch. In a transboundary fishery this may be the most feasible strategy compared to the much more complex approach of, say, a balanced harvest to reflect ecosystem structures[1642]. Other ecological objectives, such as conservation of non-target species, the protection of habitats and the prevention of marine pollution, may be able to be unbundled from biological objectives and therefore addressed through separate rights-based, and they can be addressed through command-and-control instruments[1643].

The TAC/TAE would therefore ideally be based on the best available scientific information, using a precautionary approach, not social objectives, and modified by aggregate economic objectives and selected ecological objectives. Bottom-up limits, established by aggregating each CCM's claim, conflate biological and social objectives. The preceding analysis has shown that the WCPFC exhibits this in a majority of its instruments. Bottom-up limits predetermine allocations before a biologically sensible limit has been set, and provide a ready platform for negotiations to accommodate claims without regard to biological realities. The WCPFC will need to shift from this approach toward top-down limits if its harvest strategies are to have a genuine impact on harvests.

In terms of geographic coverage, as noted in the previous section, a region-wide TAC/TAE for each species or fishery represents an ideal. Once a TAC/TAE has been set, sub-allocations may be set at any scale to achieve secondary biological objectives to maintain the spatial distribution of sub-populations

[1641] See Hilborn, R. (2007). "Defining success in fisheries and conflicts in objectives." Marine Policy **31**(2): 153-158. See also the discussion in Chapter Two subsection 2.2.3.
[1642] Chapter Three subsection 3.3.3.
[1643] Chapter Three subsection 3.3.3.

as long as they are consistent with any sub-allocations at higher scales and the regional scale TAC/TAE. If understanding of sub-stocks reveals more distinct populations within the region, a regional scale limit may be more sensibly built up from sub-regional limits.

More immediately, region-wide coverage would enable any spatial gaps to be filled and the entire range of each species to be covered by a single common limit. This would be particularly effective in the case of the two striped marlin measures and the SPA measure. Such an approach would also ensure that there is no doubt about the limits applying to tropical purse seine fisheries and other purse seine fisheries. Moves toward high seas limits in the WCPFC bode well, however these are focused on allocations rather than aggregate limits and are therefore likely to perpetuate the Commission's reliance on bottom-up limits.

Converting all effort and capacity limits to catch limits would enable instruments to be unbundled and assigned to separate biological attributes – that is, separate species – to permit conflicts between those objectives to be traded-off in a market for transferable rights at the individual user scale. For example, catch limits for each of the three tropical tuna species would enable fishers to make a decision about whether they set on FADs or on unassociated schools based on their own assessment of the costs and benefits of each alternative. Where they choose to set on FADs, they would need to obtain quota for YFT and BET either from the primary market or in the secondary market from other fishers. A further consequence of such a reform would be the removal of seasonal FAD closures and possibly the FAD deployment limit. However, there may be other reasons to retain the FAD deployment limit, such as the reduction of marine pollution.

As argued in Chapter Three, compared to effort limits, catch limits are better able to accommodate unbundled biological attributes and provide fisheries managers with greater, more nuanced, control over each stock[1644]. This could be further aided by sub-allocations of a catch quota to differentiate between age profiles of target species. For example, in the FAD example above, a sub-allocation could be applied to juvenile BET. Requiring purse seine vessels to obtain quota for juvenile BET catches would internalise the external cost of purse seine fishing on future BET stocks that is currently borne in fisheries targeting mature BET. In effect, this would mean the robust separation of instruments and objectives at a much finer scale than a single biological objective[1645].

[1644] Edwards, S. F. (2003). "Property rights to multi-attribute fishery resources." Ecological Economics **44**(2-3): 309-323.

[1645] Young, M. D. and J. C. McColl (2002). Robust Separation: A Search for a Generic Framework to Simplify Registration and Trading of Interests in Natural Resources, Commonwealth Scientific and Industrial Research Organisation: 1-48.

6.4.2 Ecological objectives

As noted above, ecological objectives for the purposes of this study could comprise: maintenance of trophic balances; conservation of non-target species; protection of habitats; and prevention of pollution.

Where balanced harvests are not feasible, the impact of catches of target species on trophic balances may be addressed through the determination of the TAC or TAE that takes into account such impacts[1646]. As noted in the previous subsection, this comes with an inherent trade-off against catch maximisation objectives for target species but may be the most practical solution[1647].

Chapter Three noted that it may be possible to adopt a TAC and catch quota for non-target species. This could form part of a balanced harvest approach to maintain trophic relationships, or as bycatch quotas to directly protect certain species. Such use rights would operate similarly to catch quotas for target species, but as a maximum allowable level of bycatch in a similar fashion to emissions permits. No WCPFC instruments currently operate in this manner to address ecological objectives and, as the previous subsection suggested, may be difficult to achieve. The current measure for sharks is perhaps the most likely candidate. An alternative may be to assign rights to use particular gear types, such as the WCPFC's FAD deployment limits, to limit their use and impose a cost on the user to reflect the ecological externalities of their use.

Where it is not feasible to address externalities arising from bycatch through property rights, the fisheries manager is left with little choice but to employ command-and-control rules, such as catch bans, safe release rules, gear restrictions and/or mandatory or prohibited fishing practices. Again, these can be deployed at any scale but should reasonably be expected to be consistent through scales.

The relative simplicity of command-and-control rules means they are far more common than bycatch quotas. This can be observed in the WCPFC, which has adopted command-and-control rules[1648] for sea turtles[1649], sea birds[1650], sharks[1651] and certain forms of marine pollution[1652]. The WCPFC has also

[1646] As suggested by Patrick, W. S. and J. S. Link (2015). "Hidden in plain sight: Using optimum yield as a policy framework to operationalize ecosystem-based fisheries management." Marine Policy **62**: 74-81.
[1647] Hilborn, R. (2010). "Pretty Good Yield and exploited fishes." Ibid. **34**(1): 193-196.
[1648] See Chapter Five subsection 5.4.5.
[1649] WCPFC (2018). Conservation and Management of Sea Turtles. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2018-04**.
[1650] WCPFC (2018). Conservation and Management Measure to Mitigate impacts of Fishing for Highly Migratory Fish Stocks on Seabirds. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2018-03**.
[1651] WCPFC (2019). Conservation and Management Measure for Sharks. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC). **CMM2019-04**.
[1652] WCPFC (2017). Conservation and Management Measure on Marine Pollution. Pohnpei, Western and Central Pacific Commission (WCFPC). **CMM2017-04**.

adopted a CMM banning the use of large-scale driftnets on the high seas[1653]. These instruments focus primarily on gear controls, catch prohibitions and safe release requirements. As separate command and control instruments, they conform to the robust separation model.

Other command-and-control rules aimed at ecological objectives are contained within CMMs that are primarily focused on rights-like instruments. Some minor administrative reforms could help to protect those rules. The WCPFC's command-and-control rules regarding non-entangling FADs[1654], for example, could be separated from the broader tropical tuna CMM to ensure that those rules remain in place even when disagreement prevents the measure from being renewed due to unrelated disagreements. Such an approach would create greater clarity between instruments designed to control harvests through right-like instruments and command-and-control rules to address ecological objectives. While the immediate substantive effect of separating such instruments would be minimal, it would enable future negotiations over catch and effort limits and allocations to be carried out without placing ecological instruments at risk.

6.4.3 Economic objectives

Recall from Chapter Two that the central economic objective in a fishery is to maximise the efficiency of the allocation of resources, and therefore maximise the overall economic returns. It was argued that targeting catches at a level corresponding to MEY could in part reconcile biological objectives (biological sustainability of the target stock) and economic returns[1655]. However, as Chapter Three observed, while MEY may contribute to the maximisation of economic returns, those returns will dissipate if access is not limited. It demonstrated that economic returns will be maximised by a combination of MEY and transferable access and withdrawal rights[1656]. However, it was also noted that, regardless of whether MEY or some other limit is applied, such rights are capable of maximising returns for any given catch limit constraint.

The assignment of allocations in the primary market by auctions is generally regarded as likely to maximise efficiency as the most efficient fishers are likely to be willing to pay the highest price for those rights. Auctions are also likely to maximise rents captured by the fisheries authority. However, revenue from the sale of rights does not in itself represent additional economic value but a transfer from users to the central authority in which the rights are vested. The redistribution of those revenues may provide an avenue through which to address equity objectives.

[1653] WCPFC (2008). Conservation and Management Measure to Prohibit the Use of Large-scale Driftnets on the High Seas in the Convention Area. Pohnpei, Western and Central Pacific Fisheries Commission (WCPFC) **CMM2008-04**.
[1654] CMM2018-01 paras 19-22.
[1655] Chapter Two subsection 2.2.3.
[1656] Chapter Three subsection 3.3.3.

A secondary market enables rights to be transferred from less efficient users to more efficient users after the initial assignment has occurred. According to Coase Theorem, this should result in an efficient allocation of resources regardless of the initial allocation of rights. Transferability in a secondary market is therefore critical to maximising economic returns regardless of to whom rights were initially assigned. The implication of this proposition is significant when the robust separation framework is considered – that equity objectives should be addressed in the primary market and economic objectives should be addressed in the secondary market.

The absence of transferability provisions in any WCPFC CMM signals a considerable weakness in a region that claims to prioritise the maximisation of economic returns. Indeed, intentions to maximise economic returns are often couched in distributive terms[1657]. That the PNA and the Parties to the Tokelau Arrangement have managed to agree on the need for transferability – and in the former case, implement it – reinforces the conclusion that smaller, more homogenous groups are more likely to agree on effective measures. They also demonstrate that it is possible at a national scale (i.e. transfers between States).

Two instruments are therefore relevant to the achievement of economic objectives. First, an exclusive, transferable right to harvest a specified volume of catch (an ITQ) or deploy a specified amount of effort (an ITE) in a set period enables catches to be taken by the most efficient user. The second instrument comprises trading protocols at each scale which determine how rights at that scale may be transferred[1658]. For example, a regional or subregional agreement or CMM could set out the trading protocols for transfers between States and between zones. Individual States could determine their own trading protocols, consistent with regional protocols, for transfers between individual users in their EEZ or between vessels flying their flag on the high seas. A group of coastal States could also agree to subregional trading protocols to enable the transfer of rights between individual users operating in each other's EEZs. This is one of the functions of the PNA's management schemes for the purse seine and longline VDSs.

In the face of likely shifts in biomass toward the eastern Pacific due to climate change[1659], the WCPFC would also do well to consider transferability to support the adaptive capacity of limits. Temporary transfers to eastern coastal States or fleets operating on the high seas would be consistent with an economic maximisation objective as it would permit rights to be exercised where stocks are more abundant and where CPUE would likely be higher without surrendering the long term sovereign rights

[1657] Moss-Christian, R. (2016). Draft Management Objectives Under Harvest Strategy Approach. Thirteenth Regular Session of the WCPFC, Denarau Island, Fiji, 5-9 December 2016, WCPFC. **WCPFC13-2016-11B**. p3.
[1658] See the description of the robust separation model in Chapter Two subsection 2.3.5.
[1659] Bell, J. D., A. Ganachaud, P. C. Gehrke, S. P. Griffiths, A. J. Hobday, O. Hoegh-Guldberg, J. E. Johnson, R. Le Borgne, P. Lehodey, J. M. Lough, R. J. Matear, T. D. Pickering, M. S. Pratchett, A. S. Gupta, I. Senina and M. Waycott (2013). "Mixed responses of tropical Pacific fisheries and aquaculture to climate change." Nature Climate Change: 9.

of western Pacific coastal States. However, at this stage, as a mechanism to mitigate the impacts of climate change, this is speculative and requires further research. An important element of such a mechanism would also require cooperation with the IATTC.

6.4.4 Social Objectives

Chapter One characterised social objectives as relating to the relative distribution of costs and benefits among stakeholders, rather than their absolute value. In an offshore commercial fishery, costs and benefits can be distributed in a number of ways, including through the initial assignment of rights to fish or the distribution of the financial returns from the fishery. This study focuses on the former as it is integral to the fisheries management problem. The latter, on the other hand, represents a redistribution problem that is likely to be managed outside the fisheries management sphere as the subject of broader government responsibility, and is therefore beyond the scope of this study.

The previous subsection observed that, in accordance with the robust separation model, social objectives could be achieved through the assignment of rights in a primary market to heterogenous groups. Two instruments in the robust separation model are therefore critical: long term rights to a proportional share of the available resource (entitlements); and allocation plans, which determine the criteria and process for the allocation of those shares.

Agreeing on the criteria by which rights are assigned, to whom they are assigned, and the size of each party's share is a central challenge[1660] to the establishment of an effective RBM system[1661], and to the effective functioning of an RFMO[1662]. It is not the intention of this study to consider fully the merits of different methods of assignment beyond the discussion of principles in Chapter Three. The models in this study assume no particular method of assigning allocations at any scale, nor any eligibility criteria against which coastal and fishing States or individual users would qualify as entitled to seek an allocation[1663]. Whatever method is used, it is each party's perception of the relative size of its allocation that ultimately determines whether an equitable outcome has been achieved. However, it is worth noting a few hypothetical examples for the purposes of building a model of a robust system for the management of a transboundary fishery. These are summarised in Table 6.6 and described below.

[1660] Ostrom, E. (1990). Governing the Commons: The Evolution of Institutions for Collective Action. Cambridge, UK, Cambridge University Press.
[1661] Joseph, J., D. Squires, W. Bayliff and T. Groves (2010). Chapter 2. Addressing the Problem of Excess Fishing Capacity in Tuna Fisheries. Conservation and Management of Transnational Tuna Fisheries. R. Allen, J. Joseph and D. Squires. Ames, IA, Wiley-Blackwell: 11-38. p100.
[1662] Lodge, M. W. (2007). Recommended Best Practices for Regional Fisheries Management Organizations: Report of an independent panel to develop a model for improved governance by Regional Fisheries Management Organizations: Executive Summary. p7.
[1663] As noted under Economic Objectives above, Chapter Three suggested that the sale or auction of rights was a form of assignment.

Following the argument in Chapter Three[1664], it would be reasonable to assign rights (*sub-allocations*) between heterogenous groups on the basis of *need* to secure an equitable distribution between, say, vulnerable and less vulnerable groups. For example, a portion of zonal allocations between developing coastal States and the high seas could favour the former on the basis of the special requirements of, and the need to avoid placing a disproportionate burden on, developing States. Within a group of coastal States, a "high security" sub-allocation, which would not be subject to adjustments based on harvest control rules, could be assigned to developing States on the basis of *need*, with the remainder assigned on the basis of *proportionality*[1665]. Each coastal State could then apply a similar approach to the assignment of sub-allocations to heterogenous users to ensure an equitable outcome across, say, foreign commercial fishers, domestic commercial fishers, and domestic subsistence and artisanal fishers operating within its EEZ.

The assignment of rights *within* each group of homogenous users would similarly be subject to different rules, influenced by the group's particular characteristics, and consistent with equity objectives for that group. For instance, the initial assignment of rights to commercial distant water fishing fleets could be regarded as equitable if allocated in *proportion* to each user's contribution (e.g. payment of a set fee, through an auction) or fishing history. The assignment of rights within a coastal community characterised by subsistence fishing may be subject to rules determined by that community[1666], including, for instance, rules based on *equality*[1667].

High seas allocations could be assigned in a variety of ways. An RFMO could assign short term volumetric shares in a high seas zonal allocation directly to distant water fleets by using, say, an auction system[1668] [1669]. The returns from an auction could then be redistributed to RFMO members on an equitable basis and/or reinvested in improved MCS or research as a public good. Alternatively, a system of longer term entitlements to a proportional share in a high seas zonal allocation could be assigned to RFMO members on the basis of a combination of *need* (e.g. dependence of the state on fisheries, developing status), *equality* (reflecting RFMO membership status) and *proportionality* (e.g. fishing history, contribution to resource stewardship, compliance etc), as described above.

[1664] Chapter Three subsection 3.3.3

[1665] Building on Loomis, D. K. and R. B. Ditton (1993). "Distributive justice in fisheries management." Fisheries **18**(2): 14-18.

[1666] Ostrom, E. (1990). Governing the Commons: The Evolution of Institutions for Collective Action. Cambridge, UK, Cambridge University Press.

[1667] Loomis, D. K. and R. B. Ditton (1993). "Distributive justice in fisheries management." Fisheries **18**(2): 14-18.

[1668] Crothers, G. T. S. and L. Nelson (2006). "A Governance Framework for High Seas Fisheries." Marine Resource Economics **21**(4): 341-353.

[1669] See for example the proposal for the straddling blue whiting stocks of the north Atlantic in Trondsen, T., T. Matthiasson and J. A Young (2006). "Towards a market-oriented management model for straddling fish stocks." Marine Policy **30**(3): 199-206.

The WCPF Convention provides the Commission with wide ranging powers. However, a more detailed legal analysis would be required to ensure that it could operate as the "high seas trustee"[1670] for the region. For example, this role may require a corporate structure[1671] that the WCPFC does not currently fulfil.

Again, this study does not propose any single approach to assigning allocations but merely offers the above examples and possibilities. The key point is that, under the principle of robust separation, social objectives can be achieved in a rights-based management scheme through the initial assignment of rights at each scale within a transboundary fishery. The robust separation model therefore suggests that, in terms of instruments, allocation plans at each scale (Table 6.6. below) would determine the process by which long term entitlements in the resource are assigned to participants at the next scale down. Allocation plans would ideally specify the eligibility criteria for the receipt of an entitlement (who), the formula or process (how) for the determination of the size of each long-term entitlement (proportional share).

Once these allocations have been assigned, economic objectives would then be achieved through the transferability of those rights in the secondary market, as discussed in the previous subsection. Participants in the secondary market could comprise homogenous or heterogenous users – the more open the criteria for participation in the secondary market, the greater the potential for the efficient allocation of rights.

However, equity considerations may mean that transfers between heterogenous users are prohibited or restricted to temporary trades (leasing) or trades in seasonal allocations rather than long term entitlements. In such a scenario, disadvantaged users (e.g. those who lack the capacity to harvest the resource) can capture the benefit stream from the resource by transferring short term rights to other users, who do have the capacity to exercise them and are therefore willing to pay for them, without relinquishing long term rights. This already occurs when coastal States assign access and withdrawal rights to DWFNs or their fleets to fish in their EEZs but could also permit coastal States to transfer rights held for their EEZ to DWFNs wishing to fish on the high seas. The latter would remove the constraint on many developing coastal States to enjoy some benefits of high seas stocks in the absence of a fishing history or distant water fishing capacity. In addition, defining rights in terms of fleet capacity assigned to flag States locks participants into a rigid structure that blocks the ability of SIDS to fulfil their ambitions to develop their own distant water fleets, should they choose to. Defining rights as catch or effort limits would give SIDS the choice to assign them at the individual user scale to their fleets of DWFNs.

[1670] See Chapter Three section 3.5.3.
[1671] Crothers, G. T. S. and L. Nelson (2006). "A Governance Framework for High Seas Fisheries." Marine Resource Economics **21**(4): 341-353.

Table 6.6: Addressing equity at different scales

Scale	Possible allocation principles
Zonal scale when determining the distribution shares in the TAC/TAE between the high seas and aggregate EEZs	Long term average stock distribution; special requirements of developing coastal States
National scale when determining the assignment of shares in the **high seas** portion of the TAC/TAE among interested States	Special requirements of developing States; fishing history
Individual user scale when assigning the **high seas** portion of the TAC/TAE directly to distant water fishing vessels	Proportionality (e.g. auctions)
National scale when determining the assignment of shares in the **aggregate EEZ allocation** among coastal States;	Special requirements of developing States; fishing history
Intermediate national scale when determining the assignment of share in a **national EEZ allocation** between foreign fleets and domestic and commercial fishers and subsistence fishers;	Need
Individual user scale when determining the assignment of a **national EEZ allocation** to fishers	Commercial fishers: proportionality (e.g. auctions); Subsistence fishers: equality, proportionality, need (nationally-determined or community-determined rules).

6.4.5 Dynamism and uncertainty

Dynamism and uncertainty may be accounted for within the transboundary fisheries model in different ways depending on whether changes in the social-ecological system relate to biological, ecological, economic or social attributes of the fishery. Applying the robust separation model to the fisheries for highly migratory species in the WCPO has a number of implications for the design of a rights-based management system. The extent to which limits were precautionary was assessed under the *limited* criterion, with most instruments performing poorly. However, precaution assists a management system to deal with uncertainty at a given point in time. This subsection discusses whether right-like instruments in the WCPO are designed to deal with dynamic uncertainty – that is, changes in influential biological, environmental, economic and social factors over time. It focuses on two property rights criteria: *flexibility* and *transferability*.

The first relates to the achievement of biological and equity objectives and the interaction between them. As argued in Chapter Three, withdrawal limits at the regional scale, and their spatial distribution at the zonal and subregional scales, should be precautionary and determined on the basis of the best available scientific evidence. Those limits can then be adjusted over time in response to changes in a range of defined biological and environmental parameters. While the value of each parameter may not be predictable, the response of a catch or effort limit to changes in those parameters, such as stock abundance, should be.

The assessed instruments have been shown to be at best only partially based on science and compromised by equity claims resulting in allocations based on historical catch and effort and exemptions, particularly for SIDS.

The WCPFC is on a path toward the use of harvest strategies to drive the adjustment of catch and effort limits to maintain the spawning biomass of each stock at or near an agreed target reference point. This will permit predictable adjustments to those limits in response to unpredictable changes in agreed parameters through harvest strategies. The WCPFC has not yet defined the relationship between TRPs and catch and effort limits and it should be acknowledged that this will be a slow and difficult process in an organisation governed by consensus.

Nevertheless, as the WCPFC moves closer to fully formed harvest strategies, it will need to contemplate whether its current approach to defining catch and effort limits – that is, in absolute volumetric terms – is conducive to translating harvest strategies into adjustments to allocations of those limits. Chapter Three proposed that allocations defined as proportional shares in a limit would permit automatic adjustments to allocations while maintaining relative equity between participants. The preceding analysis has shown that no regional or subregional allocations are explicitly defined as proportional shares.

As has been noted previously[1672], agreeing on allocations is one of the most difficult aspects of international fisheries negotiations. Moving from negotiations on volumetric allocations to proportional allocations is likely to be equally difficult. Indeed, they may be more difficult as there is no room to avoid the zero-sum game. All proportional allocations must add up to 100% so one participant's gain is another's loss. Claims for volumetric allocations can avoid this problem by simply adding up to a total that may exceed biologically sustainable levels. Avoiding this trade-off requires limits to be allocated within biologically sustainable limits. While proposing a process that resolves allocation problems is beyond the scope of this study, it is argued that, in a management system that maintains biological sustainability, moving to proportional allocations does not create additional problems but would in fact focus negotiations on a single objective:

- negotiations on proportional allocations would focus purely on relative equity;
- the determination of regional scale TAC or TAE would become an independent process based on the best available scientific evidence[1673], not equity considerations such as catch histories or the special requirements of developing States.

[1672] See Chapter Two section 2.5, and Chapter Three subsection 3.3.3.

[1673] Recall from Chapter Three subsection 3.3.3 that this is consistent with the understanding that the best available scientific evidence could include taking into account trophic impacts of catches of target species and therefore ecological considerations, as well as economic considerations where MEY is the desired target, where MEY is lower than MSY.

It may be optimistic to suggest, as Young and McColl did[1674], that robust separation would depoliticize negotiations. But it could make them simpler.

The second aspect of the adaptive quality of an RBM regime concerns *transferability*. Transferability at the national scale – that is, between participating States and territories – has only been implemented or contemplated at the subregional scale in the WCPO. It could be harnessed to achieve greater efficiencies across the entire region.

As observed in Chapter Three, transferability can improve economic outcomes by ensuring that rights are held by the most efficient user. This study has emphasised that economic efficiency in a robust system can be maximised for a given set of biological, ecological and social constraints but not independently of them.

Transfers within the same zone should yield efficiency gains without any interzonal distributional impacts. It is up to individual States to determine whether rights may be transferred between vessels, if not prohibited by regional or subregional rules.

If transfers between zones are likely to harm equity or biological objectives then they could be prohibited. The reverse may also be true – transfers between zones may be desirable where the distribution of stocks shifts in response to changes in environmental conditions. Efficiency gains would be achieved if transfers were permitted to allow increased fishing in zones with higher abundance (and therefore a higher CPUE) and less fishing in zones of lower abundance in any given year. Transfers to zones of greater abundance, or to vessels operating in such zones, could therefore be expected to improve efficiency of the fishery as a whole, and reduce the risk of localised depletions.

Importantly, transfers between zones could help to maintain equity. If transfers are not permitted, the only way to take advantage of a shift in stock distribution would be to increase TAC/TAE where distribution has shifted to one zone and reduce it where abundance has decreased. This could, for example, deliver a windfall to a gaining coastal State and impose a cost on another, or it could deliver a windfall to a DWFN whose vessel fish on the high seas as the expense of a coastal State. There is a clear winner and loser. Transferability would enable the latter to temporarily transfer some rights to the former at an agreed price to ensure both States receive a share of the benefits in the short term without affecting long-term equity.

Short term transfers could also be harnessed to protect the interests of coastal States in the face of long-term shifts in stock distribution in response to climate change. This would be predicated on whether it is determined that it is desirable to maintain an equitable balance of distribution of collective choice

[1674] Young, M. D. and J. C. McColl (2002). Robust Separation: A Search for a Generic Framework to Simplify Registration and Trading of Interests in Natural Resources, Commonwealth Scientific and Industrial Research Organisation: 1-48. pp18-20.

rights (i.e. the right to determine who may harvest a share of a TAC/TAE) that reflects average stock distributions prior to visible climate change impacts[1675].

Other conditions are likely to apply to transfers, for example, to avoid monopolisation and maintain an acceptable level of competition in the secondary market or to maintain equity by ensuring access is limited to certain categories of holders of rights within a particular sub-allocation. At the national scale, a maximum holding could help to prevent monopolisation by well-resourced States or those that subsidise their industries[1676]. At the individual user scale, these choices could include rules restricting transfers to those between members of a homogenous category of users (e.g. between foreign commercial fishers only, or between domestic artisanal fishers only) or conversely by permitting, say, coastal communities to lease rights to commercial fishers. Whatever policy choices are made, these should be clearly set out in "trading protocols" to govern transfers.

Transfers are, of course, predicated on the *security* and *exclusivity* of the right. Any moves to improve transferability would necessarily include first strengthening the exclusivity and security of rights to enhance their value and the incentive to effect transfers. Measures to ensure compliance with the limits in each zone for each State would need to consider adjusted limits following all transfers. This could include ensuring any record or register of national allocations is updated to reflect individual user interzonal transfers and suggests that a single register of all national and individual allocations for all zones would make this process simpler to administer and more transparent, and strengthen the security of rights. The logical starting point would be the WCPFC record of fishing vessels.

6.4.6 Conclusion

This section has made a case for the design of a robust transboundary rights-based management system that can support the achievement of biological, ecological, economic and social objectives in the presence of uncertainty and dynamism. It identified a number of reforms that could move the management framework of the WCPO toward that of a robust system – one that can withstand small changes in its environment and remain close to its original equilibrium, or in fact appear unstable but remain structurally stable.

It found that biological objectives in the WCPO were predominantly addressed by a limit on catches, effort or capacity but that those adopted by the WCPFC tended to comprise an aggregate of each CCM's fishing histories or claims. Such limits were found to be based on equity objectives – as perceived by individual CCMs – as much as scientific evidence. It was argued that, following the robust separation framework, limits should be formulated on a much narrower set of criteria to address objectives

[1675] It is acknowledged that this is a speculative idea that requires further development.
[1676] Subsidies are likely to be a significant challenge where rights are auctioned for the high seas or able to be transferred between coastal states, allowing some states to monopolise rights and provide them to their fleets at a discount.

supporting biological sustainability of target stocks, modified only by economic considerations to the extent that they support the adoption of MEY as a target, and by ecological considerations defined by the trophic impacts of catches. It was also argued that biological objectives could be disaggregated to match individual biological attributes, with each to be assigned a separate instrument (i.e. limit), and that species-specific catch limits provided the only realistic way to achieve this.

Other ecological objectives would most practically be addressed by command-and-control rules, as they currently are in the WCPFC. While rights-based approaches make theoretical sense, it is not suggested that the WCPFC embark on such a complex undertaking until it has at least established robust RBM schemes for target stocks, if at all. In the robust separation framework, command-and-control rules for non-target species would equate to licence conditions[1677].

I argued that economic objectives – regardless of whether or not the biological objective is defined by MEY – should be facilitated by maximising opportunities to assign rights to the most efficient user in the primary market and by trading protocols in the secondary market. The latter could also be employed to protect national scale equity in the face of shifting migratory patterns of target stocks. However, this would require the far more secure and exclusive allocations than are currently in place in order to establish an agreed level of long-term equity. Although not central to this study, it was suggested that allocations at different scales and between heterogenous groups could be determined on different bases, depending on the context, and that a distinction could be made between high security allocations based on need and lower security allocations based on proportionality[1678].

Proportional allocations – that is, shares as a percentage of a limit rather than stable volumetric shares – were central to the proposition that social objectives could be achieved in the presence of dynamism and uncertainty. Flexibility through harvest strategies was proposed as central to the achievement of structural robustness, allowing limits to achieve biological objectives to be adjusted in a way that protected equitable allocations while allowing for predictability in the response of limits to unpredictable changes in system parameters.

Finally, the definition of rights as either catch, effort or capacity limits has an important influence on their ability to influence multiple objectives. The array of instruments adopted subregionally and regionally in the WCPO are defined variously in all three ways. Notwithstanding their arguable practical advantages, input-based limits are likely to constrain economic returns due to the incentives that they create to overcapitalise on unregulated inputs. They also frustrate biological objectives due to effort creep and their constrained ability to assign rights to different biological attributes. Further, limits defined by fleet capacity create rigidities that remove the ability of developing State participants to develop their own fleets due to a lack of fishing history. Transfers at the national scale could help to

[1677] Chapter Two subsection 2.3.5.
[1678] Loomis, D. K. and R. B. Ditton (1993). "Distributive justice in fisheries management." Fisheries **18**(2): 14-18.

overcome this but it is argued that catch-based limits would provide greater flexibility to developing States to choose whether to transfer their rights to DWFNs or assign them to domestic fleets.

6.5 Conclusion

This chapter has drawn on the analysis in Chapters Four and Five to identify reforms to strengthen rights-based approaches for the conservation and management of highly migratory species in the WCPO to deal with complexity.

Section 6.2 drew together the overall results of the analysis of right-like instruments adopted at the regional and subregional scales. It identified the two vessel days schemes of the PNA as having the most well-defined property rights against the five criteria in the analytical framework established in Chapter Three. However, even these two schemes fell well short of the ideal.

Section 6.3 considered each of the five property rights criteria and associated exploratory questions across all instruments to identify systemic and specific reforms that could support more well-defined property rights. It found that limits set by most instruments contained significant weaknesses, such as inadequate geographic coverage and gaps in coverage of mortality by other gear types or as bycatch. Most were found to be bottom-up limits and therefore unlikely to be science-based. Subregional scale instruments allowed for transfers at the national scale but this criterion was absent in all regional instruments. Security and exclusivity were generally weak, particularly due to the liberal use of exemptions. Harvest strategies have the potential to introduce stronger flexibility into regional scale instruments but these require considerable development.

Section 6.4 turned to the capacity of RBM instruments in the region to address four types of management objectives – biological, ecological, economic and social – in the presence of uncertainty and dynamism. It argued that RBM could support multiple objectives either directly or, if designed appropriately, indirectly by accommodating elements of a broader governance framework. The influence of the definition of limits as either catch-, effort- or capacity-based was also discussed.

7 Conclusion

This study has aimed to contribute to a deeper understanding of how rights-based management can be applied at a regional scale for transboundary fish stocks, with a particular focus on highly migratory species. It did so by examining the extent to which key measures in place for fisheries targeting highly migratory species in the Western and Central Pacific Ocean (WCPO) consist of well-defined property rights. However, it did not aim to simply describe the quality of right-like instruments. It sought to identify how an RBM system could be designed in a transboundary fishery to ensure that it is robust to changes in biological, environmental, economic and human factors in a way that ensure its management institutions remained stable even while the system itself may experience perturbations. This study was thus based on the premise that an RBM system would be vastly stronger if it is able to cope with multiple conflicting objectives in the presence of uncertainty and dynamism. The analytical framework on which the study was based thus aimed to incorporate not just the qualities of well-defined property rights but also the qualities of property rights that accommodate and support a *robust management system*[1679].

This thesis commenced in Chapter One by reviewing the state of the world's transboundary fisheries, observing that they are increasingly under pressure. While overfishing was identified as a major proximate cause, the question of what causes overfishing was considerably more complex, with many falling under the broad heading of a *failure of governance*.

I argued that one way to understand a failure of governance in a single jurisdiction fishery was to consider the multiple biological, ecological, economic and social objectives that a fisheries manager and policymaker must contend with, and that it was likely to be impossible to achieve all objectives simultaneously. The complexity of such a social-ecological system was further complicated by uncertainty and dynamism in a range of environmental, economic and social factors. Viewed in this way, the fisheries problem was characterised as a *wicked problem*. It observed that transboundary fisheries compounded these challenges in a way that exhibited the characteristics of a *super wicked problem* – one in which: inaction increases the cost of resolving the problem over time; those with the greatest capacity have the least incentive to act to solve the problem; and the institutional frameworks to deal with the problem are absent.

The Chapter noted the widespread adoption of rights-based management to address domestic fisheries problems and the relatively well-developed right-like instruments adopted for fisheries targeting highly migratory species in the WCPO. The region was notable for its commitment to adopting RBM, particularly among the predominantly small island developing States members of the Pacific Islands Forum Fisheries Agency (FFA). The present study was thus proposed with the WCPO tuna fisheries of

[1679] Jen, E. (2003). "Stable or Robust? What's the Difference?" Santa Fe Institute Working Paper **2002**(12 069): 13.

interest to the FFA as the focus. Its aim was to contribute to a deeper understanding of how RBM can be applied at a regional scale for highly migratory fish stocks by assessing the extent to which the institutional framework at a regional or subregional scale in the WCPO provide a basis for well-defined property rights for the conservation and management of WCPO tuna stocks. In doing so, it set out to identify reforms to strengthen the capacity of rights-based approaches to deal with complexity.

Chapter Two set out in more detail the broader problem of transboundary fisheries by building on the basic common pool resources problem and the complexity of multiple objectives. Holistic approaches to managing fisheries – epitomised by ecosystems approaches – and the precautionary approach were widely seen as an appropriate solution to addressing multiple objectives and coping with uncertainty. It was noted that a range of management instruments were available to fisheries managers. Economic theory supported the use of *well-defined individual property rights* to address the basic common pool resource problem of an open access fishery – one in which no one is excluded but in which catches by one individual user reduce the available stock for others. The concept of *robust separation* [1680] was proposed as a way to combine multiple, but separate, instruments – including transferable property rights – assigned to separate biological, ecological, economic and social objectives as part of a robust management system. It noted, however, that little research has been conducted into the extent to which property rights are employed in transboundary fisheries, and even less so on how well-defined any transboundary property rights are.

Chapter Three addressed two preliminary research questions: what could a rights-based management system look like in a transboundary fishery?; and how can the extent to which a property right is "well-defined" be assessed? It considered the characteristics of property rights in terms of their nature and ownership, as a bundle of operational or collective choice rights, and as an instrument characterised by a number of dimensions against which the extent to which a property right could be considered to be well-defined.

It then examined the capacity of property rights to address multiple conflicting management objectives and their strengths and limitations. Transferable property rights, or market-based instruments, were found to be able to reconcile biological sustainability of the renewable stock while maximising the economic returns for any given overall limit on catches. Property rights were nevertheless found to be wanting in their ability to address ecological and social objectives but could be designed to accommodate those objectives within a broader governance framework .

The Chapter then turned to the basis in international law for the application of property rights in transboundary fisheries and proposed a model for what a rights-based management system could look like in a transboundary fishery that, employing the robust separation framework, could be designed to

[1680] Young, M. D. and J. C. McColl (2003). "Robust reform: The Case for a New Water Entitlements System for Australia." Australian Economic Review **36**(2): 225-234.

address this complexity. The Chapter concluded by setting out an analytical framework comprising five criteria and 24 subsidiary exploratory questions for the assessment of property rights-based instruments in a transboundary fishery.

Chapters Four and Five presented the analysis of right-like instruments in the WCPO at subregional and regional scales respectively in response to the central research question: To what extent does the institutional framework at a regional or subregional scale in the WCPO provide a basis for well-defined property rights for the conservation and management of WCPO tuna stocks?

Chapter Four assessed the agreements and arrangements of the Parties to the Nauru Agreement, including the two vessel day schemes, and the Tokelau Arrangement. Both VDSs were assessed as having the most well-defined right-like instruments of any assessed in this study. However, as an enabling instrument, the Tokelau Arrangement was found to provide a stronger basis for management schemes comprising rights-based instruments than its equivalent in the PNA, the Palau Arrangement. Drawing on Ostrom[1681], it was suggested that the PNA and the Parties to the Tokelau Arrangement are more likely to produce stronger management instruments due to the relatively homogenous nature of their members.

Chapter Five turned to regional scale instruments adopted by the WCPFC. While the tropical tuna conservation and management measure (CMM2018-01) effectively incorporated the two VDSs, its corresponding instruments for the purse seine and longline fisheries were far weaker overall. It weighed the relative merits of instruments defined by catch, effort and capacity, noting that the analytical framework contained an inherent bias toward catch-based instruments due to their superior ability to be assigned to disaggregated attributes of the resources – at its simplest, multiple interacting species.

Drawing on the reviews of the transboundary fisheries problem in Chapter Two and rights-based management in Chapter Three, Chapter Six responded to the reflective question: what reforms could be made to strengthen rights-based approaches for the conservation and management of highly migratory species in the WCPO to deal with complexity? The general impression of poorly defined property rights suggests that the term "right-like" remains appropriate, rather than fully fledged "property rights". While *security* and *exclusivity* are reasonably well established, they are inconsistently applied across the instruments. Limits placed on catches, effort and capacity were found to exhibit weaknesses across almost all elements of the *limited* criterion and *transferability* was virtually non-existent. The gradual development of harvest strategies portends well for the improvement of the *flexibility* of management instruments but this is a slow and often contentious process.

[1681] Ostrom, E. (1990). Governing the Commons: The Evolution of Institutions for Collective Action. Cambridge, UK, Cambridge University Press.

The study set out to propose reforms that are directed at enabling rights-based instruments to address complexity directly where they can, or to accommodate complexity where they cannot do so directly. The political feasibility of those reforms was not a central focus of this study some of the key obstacles are worth consideration in closing.

The study proposed that catch, effort or capacity limits be based on science to meet primarily biological objectives. Ideally the WCPFC would delegate the determination of limits to the independent science provider and oblige itself to accept and implement limits proposed by the provider. The WCPFC has a well-established independent science provider but the interface between science and management in the RFMO presents a stumbling block to implementation of this reform. Although the WCPFC allows for voting, ultimately decisions are taken by consensus and CCMs can argue that they do not fully understand the advice in order to delay action, or that there is insufficient evidence to justify a particular proposed response. Delays justified on the basis of insufficient information are clearly contrary to the rationale for the precautionary approach and the WCPF Convention[1682]. This argument is likely to provide little practical comfort. Indeed, assessments of key stocks as not overfished and not subject to overfishing reduces the imperative to change the way in which the Commission sets limits. Market influences will therefore probably be the strongest potential influence on CCMs in considering reforms to depoliticise the determination of limits.

This study has also proposed that unbundled biological attributes of the fisheries would be best addressed by defining all limits as species-specific catch limits. Institutional inertia is likely to mean resistance to shifts away from effort-based regimes, particularly those adopted for the most successful, and most well-defined right-like management systems – that is the two VDSs and the associated instruments contained within CMM2018-01. However, arguments that effort-based instruments are easier to monitor and enforce than catch-based limits are likely to diminish as technologies such as electronic monitoring are deployed over time[1683].

In addition, blunt instruments, such as FAD closures, present a zero-sum game in conflicts between purse seine interests and tropical longline interests. The opportunity presented by unbundling to resolve disputes over differential impacts of fishing methods on each species may therefore be appealing – purse seine interests could benefit from an end to seasonal FAD closures while longline interests would benefit from purse seine fleets paying for their impact on juvenile BET and YFT.

[1682] MHLC (2000). Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (WCPF Convention). Agreed on 5 Sepember 2000. Entered into force on 19 June 2004. Multilateral High Level Conference (MHLC), 40 International Legal Materials 278 (2001). Article 6(2).

[1683] van Helmond, A. T. M., L. O. Mortensen, K. S. Plet-Hansen, C. Ulrich, C. L. Needle, D. Oesterwind, L. Kindt-Larsen, T. Catchpole, S. Mangi, C. Zimmermann, H. J. Olesen, N. Bailey, H. Bergsson, J. Dalskov, J. Elson, M. Hosken, L. Peterson, H. McElderry, J. Ruiz, J. P. Pierre, C. Dykstra and J. J. Poos (2019). "Electronic monitoring in fisheries: Lessons from global experiences and future opportunities." Fish and Fisheries **21**(1): 162-189.

Further unbundling to address attributes such as population age profiles and spatial distribution will increase the complexity of the management system. A cost-benefit analysis will need to be undertaken to ensure that any added complexity does not outweigh the gains. Separate instruments for juvenile BET and YFT are the most obvious example of the former, and is discussed above in the context of purse seine FAD sets. Unbundling to address spatial attributes is likely to be less controversial. Delegating to the science provider decisions to establish sub-allocations for sub-populations of target species as scientific understanding of those populations improves would be consistent with the proposed approach to setting aggregate limits. Such decisions are more likely to be acceptable if they do not become a de facto allocation process between EEZs. Instead, they could identify as large portions of the WCPFC-CA as possible or be restricted to the high seas. Appropriate transition arrangements would be required to reduce the impact of shocks and institutional uncertainty on existing participants.

Separate command-and-control instruments to address ecological objectives are likely to be only as contentious as the substance of the measure itself, not their form (i.e. command-and-control). The WCPFC has shown a willingness to adopt such measures for sharks, rays, turtles, seabirds and cetaceans, as well as particular gear requirements or prohibitions. This study did not recommend that the WCPFC adopt rights-based measures for non-target species. While this is theoretically possible, it would be preferable to refine its approach to target species before considering whether to extend this to non-target species.

I have left open the question of whether to adopt biomass levels associated with MEY as a TRP. Not all CCMs pursue an economic objective, preferring instead to maximise catches. The use of subsidies is also likely to confound estimations of MEY. The independent science provider could make recommendations on catch levels to achieve MEY. However, it would be presumptuous to oblige the Commission to follow those recommendation in the same way that I have proposed that it adopt recommendations on catch limits to achieve MSY.

The other lever available to CCMs to maximise economic returns, albeit within whatever biological, ecological and social bounds the Commission sets, is transferability [1684]. While subregional arrangements appear quite comfortable with transferability between likeminded participants at the national scale, there is some reluctance to permit transfers to DWFNs and other coastal States in the WCPFC, and at the individual user scale between vessels. Concerns among some coastal States, particularly SIDS, about whether transferability would cede control of their fisheries to DWFNs are, in my opinion, manageable. Although this study has avoided the difficult question of the basis for allocations, it strongly recommends that proportional shares in a TAC be held *in perpetuity* by coastal States to reflect long term historical catch patterns (regardless of the fishing State concerned) and biomass distribution, modified by equity considerations. This gives coastal States the option of effecting

[1684] Coase, R. N. (1960). "The Problem of Social Cost." Journal of Law and Economics **3**: 1-44.

short term transfers to either other coastal States and DWFNs or directly to vessels flying foreign States' flags or to their own vessels. This would in fact provide greater control over how the coastal State uses its allocations and provide flexibility to address changes in stock distribution due to El Niño cycles and longer term climate change, and to reflect the state of development of its own fishing fleet and its development ambitions.

Requiring DWFNs to acquire rights to fish in an EEZ is not controversial – this is standard practice in PNA waters and is entirely consistent with the coastal State's sovereign rights under LOSC. Permitting transfers of rights to fish from a coastal State to a DWFN for use on the high seas, if biologically justifiable, would provide an avenue to add to the latter's high seas allocation without adding to overall catches while providing a return to the coastal State. However, requiring DWFNs to purchase rights to fish on the high seas during primary assignment would likely face substantial political obstacles. DWFNs are likely to resist further erosions to the freedom to fish on the high seas. Nevertheless, I would suggest that this proposition is worth further exploration[1685].

As noted above, I have resisted including a detailed consideration of allocations in this study. However, my central argument on social objectives is that separating equity considerations from processes to determine overall catch limits allows those limits to be set independently, and apolitically, and quarantines the more difficult negotiations on allocations from biological considerations. I am under no illusions that this approach will be simple – they will be at least as difficult as current negotiations. Indeed, negotiating percentage shares may be too abstract to some CCMs. However, there is nothing to prevent the use of models to illustrate how shares would translate into volumetric allocations under different catch limit scenarios.

I have, however, made a strong recommendation to remove exemptions from limits for SIDS and other developing States. This will likely be resisted by those CCMs but a corresponding allocation process that takes account of their development status and special requirements could address those concerns without jeopardising biological sustainability. One approach could be to include a high security allocation that forms a stable base for developing States, and a variable lower security allocation that is adjusted in accordance with the TAC.

The proposed reforms will take time. The use of RBM domestically is variable across CCMs of the WCPFC so considerable effort will be required to develop a shared understanding of what it is, and what it is not. A comprehensive reform is unlikely to gain support among CCMs. A more likely scenario is that individual reforms could be adopted in a piecemeal fashion, although, as the preceding discussion has noted, some will have a greater chance of success if paired with other reforms that balance their impact among interested parties. And finally, the proposed reforms are themselves, not intended to be

[1685] Building on Crothers, G. T. S. and L. Nelson (2006). "A Governance Framework for High Seas Fisheries." Marine Resource Economics **21**(4): 341-353.

exhaustive, but indicative of the possible changes revealed by a methodical analysis of property rights in the region.

Despite the quite weak assessments of instruments in this study, the WCPO appears to be ahead of its counterpart RFMOs in adopting measures that resemble rights-based instruments and there is a desire among a large portion of its members to further develop them. Whether it can develop RBM frameworks to deal with the complexity of transboundary fisheries remains to be seen. Importantly, as a consensus-based organisation, these reforms will only succeed if they are driven by the CCMs themselves. It is likely that the region's success so far has created expectations that it can do more. Political challenges will always be present but this study has shown that its path towards a strong RBM system characterised by well-defined property rights could result in a more robust system. It is hoped that this study will make a useful contribution toward that goal.

Annex: Property rights analysis tables

This annex contains detailed tables to substantiate the analysis and scoring for instruments assessed in Chapters Four and Five.

Table A.1: Nauru Agreement

Criterion	Question:	Agreement Score	Ref	3rd IA Score	Ref	
Limited	set a hard subregional scale catch or effort limit?	1	Art. IX	0		No provisions for sub-regional scale limits to be placed on effort or catches under the Nauru Agreement. None of the areas in which the Nauru Agreement specifies licence and access agreement conditions relate to the adoption of national scale limits[1686].
	base limits on the best scientific evidence available?	1		0		Silent
	base limits on the precautionary approach?	1		0		Silent
	apply limits to the full geographic range of the stock?	0	Art. II	0	Art. I(3)	To the extent that the "common stocks" referred to in Article I of the Nauru Agreement refer to highly migratory species, the Nauru Agreement does not apply to the full extent of the range of those stocks as it applies only to the waters of the Parties[1687]. Article I(3) of the third implementing arrangement prohibits fishing in two high seas pockets but these only have effect if vessels are licensed to fishing PNA waters. All other vessels are not prevented from fishing in those high seas areas.
	ensure limits account for catches of the limited species by all gear types?	2	Art. II(c)	0		Some elements of a limit could be attached to licence conditions imposed upon individual vessels. Licence conditions imposed in accordance with the Nauru Agreement could include recording of catches against all gear types, recording bycatch of other target species and prohibition of discards, all of which would aid the imposition of hard limits at the national scale. The Nauru Agreement does not specify these conditions but they appear possible under Article II(c).
	power to record bycatch of other target species against limits for that species?	1		2	Art. I(1)	A prohibition on discards by purse seine vessels has been adopted under the Third Implementing Arrangement. This could support species-specific catch limits that account for sources of mortality of big eye and yellowfin that would otherwise not count toward a quota in other fisheries for those species (e.g. longline catch quotas). However, the restriction of the application of this provision to purse seine gear only[1688] excludes its provisions from addressing mortality by other gear types.
	Subtotal	**6**		**2**		

[1686] PNA (1982). Nauru Agreement Concerning the Cooperation in the Management of Fisheries of Common Interest. Agreed 11 February 1982. Entered into force 2 December 1982. Amended May 2010, Office of the Parties to the Nauru Agreement. Article II: "The Parties shall seek to establish a coordinated approach to fishing the common stocks in the Fisheries Zones by vessels and in particular:…".

[1687] Nauru Agreement (as amended in April 2010) Preamble defines the Fisheries Zones: "NOTING that in accordance with the relevant principles of international law each of the Parties has established an exclusive economic zone or fisheries zone (hereinafter respectively called the "Fisheries Zones")…", and Article II, which sets out of the minimum terms and conditions to be attached to licences issued to fishing vessels seeking to fish in the Fishing Zones. Applies to the Fisheries Zones

[1688] Nauru Agreement Third Implementing Arrangement Article I(1): "All bigeye, skipjack and yellowfin tuna taken by a purse seine vessel shall be retained on board and then landed or transhipped, except for:…".

Exclusive	allocate national scale limits as a share of the regional TAC/TAE?	1		0		No provisions contemplate exclusive rights in any catch or effort limits at any scale. While catch limits could be imposed as licence conditions at the individual user scale under Article II(c)(v)[1689], no provisions appear to allow this at the national scale. At best, Article IX could provide scope for an implementing arrangement to establish an RBM scheme but there is no evidence in the Agreement to suggest that was contemplated by the signatories.
	new entrants either excluded or able to participate without adding to TAC/TAE?	1	Art. X(4)	0		Other States may accede to the Nauru Agreement with the consent of the Parties but no provisions set out how new Parties are able to participate in the TAC/TAE[1690].
	prohibit exemptions to the limit (or exemptions not provided for)?	1		0		No references to exemptions from the provisions of the Agreement or its implementing arrangements
	to impose penalties for exceeding national limits?	1		0		No references to penalties
	Subtotal	**4**		**0**		

[1689] Nauru Agreement (as amended in April 2010) Article II(c): "seek to establish other uniform terms and conditions under which the Parties may licence fishing vessels to fish within the Fisheries Zones, including…(v) such other terms and conditions as the Parties may from time to time consider necessary".

[1690] Nauru Agreement Article X(4): "Following entry into force, this Agreement shall be open for accession by other States with the concurrence of the Parties to this Agreement."

Secure	national limits valid for more than one year?	1		0		Does not explicitly contemplate national scale limits. No conditions relating to the duration of national allocations, or individual licences or allocations of quota or effort are prescribed in the implementing arrangements or expressly envisaged in the Nauru Agreement.
	national limits valid until Parties agree to amend them? (default = perpetuity)	1		0		Silent
	make national limits binding on Parties?	2		0		Silent on whether any limits would be binding. However, Parties are bound to apply licence conditions, including any individual user scale limits, should they be established. To permit the effective enforcement of the minimum terms and conditions established under the Nauru Agreement on non-PNA DWFNs, the individual Parties must include them in licence conditions issued to applicable vessels or adopt legislation to that effect. The level of security afforded to a licence or any allocation attached to it would be dependent on domestic legislation.
	resolve disputes through recourse to an independent arbiter	0		0		No provisions on the resolution of disputes.
	establish a record of national scale limits (e.g. in a regional register or CMM)?	1		0		Silent
	Subtotal	**5**		**0**		

Transferable	permit national limits to be transferred to another Party in full or in part?	1		0		Silent
	require new entrants to acquire an allocation through a transfer from a CCM?	1		0		Silent
	specify a process for effecting a transfer?	1		0		Silent
	record transfers in a register?	1		0		Silent
	Subtotal	**4**		**0**		
Flexible	set a TRP for the target stock(s)?	1		0		Silent
	establish harvest control rules for the target stock(s)?	1		0		Silent
	adjust a TAC/TAE on the basis of environmental factors and stock assessments?	1		0		Silent
	define national limits as a proportional (rather than volumetric) share of the regional TAC/TAE?	1		0		Silent
	establish clear processes for a TAC/TAE to be adjusted?	1		0		Silent
	Subtotal	**5**		**0**		
TOTAL		**24**		**2**		

Table A.2: Palau Arrangement

Criterion	Question	Score	Ref	
Limited	set a subregional scale catch or effort limit?	1	Art3.2(b)(i)(ii)(iv)	The broad ranging power of the management meeting under Article 3.2(b)(ii) to adopt management measures appears to be broad enough to the Parties to adopt limits on fishing effort or catch. These powers are not explicit and do not constitute duties. The details of such measures are, however, to be detailed in any management schemes adopted by the Parties.
	base limits on the best scientific evidence available?	1	Art3.2(a)	Does not specify whether any limits must be based on the best available scientific evidence but this could be prescribed in a management scheme.
	base limits on the precautionary approach?	1	Art3.2(a)	Does not specify whether any limits must be based on a precautionary approach but this could be prescribed in a management scheme.
	apply limits to the full geographic range of the stock?	0	Art1.1(d), 2.1	The Parties' powers to limit catch or effort is constrained by the incomplete coverage by the Palau Arrangement of the geographic extent of relevant stocks[1691].
	ensure limits account for catches of the limited species by all gear types?	2	Art2.1	Silent on whether a limit must apply to all or specific gear types. Nothing in the Palau Arrangement prevents a management scheme from including such provisions.
	power to record bycatch of the target species against limits for that species?	1	Art3.2(b)(i)(ii)(iv)	Silent on whether bycatch must be retained and recorded against limits for that species. Nothing in the Palau Arrangement prevents a management scheme from including such provisions.
	Subtotal	**6**		

[1691] Palau Arrangement PNA (2010). Palau Arrangement for the Management of the Western Pacific Fishery, Agreed on 2 October 1992. Entered into force on 1 November 1995. Amended on 27-29 April 1994 and 11 September 2010, Office of the Parties to the Nauru Agreement. Article 1.1(d): "In this Arrangement - "Fisheries Management Area" (hereinafter referred to as "the Area") means the exclusive economic zones or fisheries zones of the Parties hereto including adjacent high seas areas in the Western Pacific within which fishing vessels operate."

Exclusive	allocate national scale limits as a share of the regional TAC/TAE?	1	Art3.2(b)(i)(ii)(iv)	Article 3.2(b)(ii) is silent on, but conceivably permits, the allocation of a share in a catch or effort limit to the Parties with respect to their EEZs at the national scale and to vessels of Parties and non-Parties at the individual user scale.
	new entrants either excluded or able to participate without adding to TAC/TAE?	1	Art3.2(b)(i)(ii)(iv)	The Palau Arrangement is open to accession by non-PNA members of the FFA[1692], and thus permits new coastal State entrants to participate in any management scheme adopted by the Parties. Where a new entrant brings a new EEZ, and thus the equivalent additional components of a highly migratory stock, to the scheme, the TAC/TAE could increase by a corresponding amount without affecting biological outcomes or diminishing the exclusivity of the rights of other Parties. As noted above, the new entrants are limited to FFA members, which suggests that additional EEZs could be brought into a management scheme without exceeding biologically sustainable limits.
	prohibit exemptions to the limit (or exemptions not provided for)?	1	Art3.2(b)(i)(ii)(iv)	Prohibitions on exemptions to any limit are not expressly provided for but could form part of a management scheme.
	to impose penalties for exceeding national limits?	1	Art3.2(b)(i)(ii)(iv)	Penalties for exceeding a limit are not expressly provided for but could form part of a management scheme.
	Subtotal	**4**		
Secure	national limits valid for more than one year?	1	Art3.2(b)(i)(ii)(iv)	Broad powers of management meetings mean the Parties are able to adopt a wide range of binding measures [1693]. While not explicit in the Palau Arrangement, such powers could include the adoption of measures that set the duration of aggregate catch and/or effort limits and national allocations (at more than one year and potentially in perpetuity).
	national limits valid until Parties agree to amend them? (default = perpetuity)	1	Art3.2(b)(i)(ii)(iv)	Silent
	make national limits binding on Parties?	2	Art4	The clear intention that the Palau Arrangement binds the Parties
	resolve disputes beyond bilateral negotiation	0	Art8	Only provides for disputes to be resolved between the Parties involved, rather than arbitration[1694], thus undermining the binding nature of the Arrangement.
	establish a record of national scale limits (e.g. in a regional register or CMM)?	1	Art3.2(b)(i)(ii)(iv)	Silent but does not preclude establishment of a record national allocations in a register
	Subtotal	**5**		

[1692] Palau Arrangement Article 9.4: "Any Party may withdraw from this Arrangement by giving written notice to the depositary. Withdrawal shall take effect one year after receipt of such notice".

[1693] Palau Arrangement Article 4: "The decisions of the Management Meeting will be arrived at by consensus and will be binding on the Parties".

[1694] Palau Arrangement Article 8: "8.1 At the request of any Party, consultations will be held with any other Party within sixty (60) days of the date of receipt of the request. All other Parties will be notified of such requests for consultations and any Party will be permitted to participate in such consultations. 8.2 Any dispute arising out of the interpretation or implementation of this Arrangement between two or more Parties will be settled through peaceful negotiations."

Transferable	transfer a national limit in full or in part to another CCM?	1	Art3.2(b)(i)(ii)(iv)	Silent
	require new entrants to acquire an allocation through a transfer from a CCM?	1	Art3.2(b)(i)(ii)(iv)	Silent
	specify a process for effecting a transfer?	1	Art3.2(b)(i)(ii)(iv)	Silent
	record transfers in a register?	1	Art3.2(b)(i)(ii)(iv)	Silent
	Subtotal	**4**		
Flexible	set a TRP the target stock(s)?	1	Art3.2(b)(i)(ii)(iv)	Silent
	establish harvest control rules for the target stock(s)?	1	Art3.2(b)(i)(ii)(iv)	Silent
	adjust a TAC/TAE on the basis of environmental factors and stock assessments?	1	Art3.1, 3.2(a)(b)(i)(ii)(iv)	Silent
	define national limits as a proportional (rather than volumetric) share of the regional TAC/TAE?	1	Art3.2(b)(i)(ii)(iv)	Silent
	establish clear processes for a TAC/TAE to be adjusted?	1	Art3.2(b)(i)(ii)(iv)	Silent
	Subtotal	**5**		
TOTAL		**24**		

Table A.3: Purse seine Vessel Day Scheme

Criterion	Question	Score	Ref	
Limited	set a subregional scale catch or effort limit?	3	Art.2.4(iv)	The Parties are to meet annually to, inter alia, set the TAE for the following Management Year[1695].
	base limits on the best scientific evidence available?	2	Art.12.2	Scientific evidence is just one factor to be considered in setting the TAE. The Parties are required to set the TAE "having regard to" several factors including "[t]he best available scientific, economic, management and other relevant advice and information"[1696]. Other considerations include the WCPF Convention[1697], the objectives of the VDS[1698], and submissions from any party, individual or organisation[1699].
	base limits on the precautionary approach?	1		Contains no explicit references to the precautionary approach, although it could conceivably be a considered an element of "the best available scientific…advice and information" under Article 12.2(i).
	apply limits to the full geographic range of the stock?	0	Art.1.1(xv), 2.4(vi), 4.1	The VDS TAE does not cover the full geographic extent of the stock, only stocks in the EEZs of the Parties[1700] between 20°N and 20°S. The Scheme allows for adoption by the Parties of measures to control fishing on the high seas by purse seine vessels under this or other agreements or arrangements[1701].
	ensure limits account for catches of the limited species by all gear types?	0	Art.2.1, 2.2, 3.1	The VDS does not account for mortality of the target species by all gear types[1702]. The VDS does not refer to any particular species. The target species are, by implication, primarily skipjack, which is the main target species of the tropical purse seine fishery. However, all species caught by purse seine gear are caught by other gear types.
	power to record bycatch of the target species against limits for that species?	1	Art.9.2	Catch and effort reporting provisions do not specify whether discards should be recorded and the Management Scheme sets no limits on bycatch and discards[1703].
	Subtotal	**7**		

[1695] PNA (2016). Palau Arrangement for the Management of the Western Pacific Fishery - Management Scheme (Purse Seine Vessel Day Scheme). Signed 2 October 1992. Entered into force 1 November 1995. Amended April 2016 & October 2016, Office of the Parties to the Nauru Agreement. Article 2.4: "The annual meeting of the Parties to the Palau Arrangement will…(iv) Set the TAE in accordance with the provisions of this Management Scheme."

[1696] Ibid. Article 12.2: "The TAE will be set and confirmed by the Parties at their previous year's annual meeting or at such other time agreed to by the Parties, having regard to (i) The best available scientific, economic, management and other relevant advice and information".

[1697] Ibid. Article 12.2(ii): "the provisions of the Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean".

[1698] Ibid. Article 12.2(iii): "the objectives of the Management Scheme…".

[1699] Ibid. Article 12.2(iv): "any submission on this issue from any party, individual or organisation".

[1700] Ibid. Articles 1.1(xv), 4.1. See footnotes 1706 and 1708 below.

[1701] Ibid. Article 2.4: "…(vi) Determine controls on high seas fishing to be applied to fishing parties operating under this Management Scheme or other arrangements, treaties or agreements."

[1702] Ibid. Article 2.2: "Through this Management Scheme, the Parties shall seek to limit the level of fishing by purse seine vessels in their EEZs to the levels of total allowable effort agreed by the Parties to the Palau Arrangement"; and 3.1: "This Management Scheme shall apply to purse seine vessels operating…under the FSM Arrangement".

[1703] Ibid. Articles 9.2 assumes that catch and effort "eReports" are required.

Exclusive	allocate national scale limits as a share of the regional TAC/TAE?	3	Art.12.3	The TAE is allocated to each Party as a volumetric PAE[1704]. A Party's PAE include fishing days used by all licensed[1705] purse seine vessels in its EEZ[1706] and operating under the FSM Arrangement[1707] [1708].
	new entrants either excluded or able to participate without adding to TAC/TAE?	1		While new participants are envisaged, the manner in which new Participants are accommodated is not addressed in the Management Scheme. According to Article 12.3, the TAE is to be allocated to Parties and there is no mention of Participants[1709]. New coastal State participants would bring their EEZ and so additional stocks into the VDS.
	prohibit exemptions to the limit (or exemptions not provided for)?	3	Art.12.3	No provisions permitting exemptions from the VDS, for example, to address equity considerations. Article 12.3 requires that the TAE "shall be allocated amongst the Parties as their…PAE…in the manner agreed to by the Parties".
	to impose penalties for exceeding national limits?	3	Art.4, 8, 10	Any overages must be deducted from the following year's PAE. Amounts brought forward are to be increased by 20% if overages amount to 100 days or more[1710]. Carry forwards are prohibited[1711]. Vessels may be deleted from the VDS Register at the request of a Party[1712] (and therefore excluded from the VDS[1713]), or if the Administrator is satisfied that the vessel has not complied with the Management Scheme[1714], with all other Parties' consent[1715].
	Subtotal	**10**		

[1704] Ibid. Article 12.3: "The TAE shall be allocated amongst the Parties as their Party Allowable Effort (PAE) in the manner agreed to by the Parties".
[1705] Ibid. Article 5(ix): "There shall be no deduction from the days attributed to a Party of any fishing day or part of a fishing day for any time spent by an unlicensed purse seine vessel in the fisheries zone of a Party".
[1706] Ibid. Article 4.1: "Each Party shall take all necessary measures to ensure that the total number of fishing days: i) by purse seine vessels in its EEZ, excluding vessels operating under the PAE of their home Parties in accordance with Article 3.2…".
[1707] Ibid. Articles 3.1: "This Management Scheme shall apply to purse seine vessels operating under a valid licence issued under the FSM Arrangement"; and 3.2: "When an FSM Arrangement vessel operates outside its home Party's EEZ, a separate allocation of fishing days from its PAE shall be made by the Home Party to the Administrator, using the form set out in Schedule 3 (a). Payment must be made to the Administrator for those allocated fishing days in advance".
[1708] Ibid. Article 4.1: "…(ii) by its FSM Arrangement vessels operating in the EEZs of other Parties in accordance with Article 3.2."
[1709] Ibid. Article 12.3. See footnote 1704 above.
[1710] Ibid. Article 10.3(i): Overages of 100 days result in a reduction of the following year's PAE by the amount of the overage. Article 10.3(ii): Overages of 100 or more days will attract a 120% penalty the following year.
[1711] Ibid. Article 4.2: "Each Party shall take all necessary measures to ensure that the total number of fishing days: "
[1712] Ibid. Article 8.7: "The Administrator must delete a vessel from the VDS Register if:…ii A Party requests that a vessel be deleted from the VDS Register".
[1713] Ibid. Article 8.2: "A purse seine vessel must be registered on the VDS Register in order to undertake fishing activities pursuant to this Management Scheme. Each Party shall ensure that every licence of a purse seine vessel includes a condition that no fishing activity may be undertaken pursuant to the licence during any period when the vessel is not registered on the VDS Register."
[1714] Ibid. (Purse Seine VDS) Article 8.7 "The Administrator must delete a vessel from the VDS Register if:…(iii) The Administrator is satisfied that the vessel has failed to comply with the requirements of this Management Scheme."
[1715] Ibid. Article 8.8: Any Party may object to the deletion of a vessel from the Register by the Administrator.

Secure	national limits valid for more than one year?	1	Art.12.4	PAE is generally allocated to Parties for a single Management Year (1 January to 31 December), and reallocated in accordance with the TAE set for each year[1716]. The process for the determination of PAE allocations from year to year is able to change with the agreement of all Parties[1717]. In practice the Parties have agreed in principle to set longer term TAEs and in 2017 set a provisional TAE for 2019 and 2020 (in addition to confirming the 2018 TAE)[1718].
	national limits valid until Parties agree to amend them? (default = perpetuity)	3	Art.12.4	Where agreement cannot be reached on a new allocation, the existing PAEs remain in place[1719].
	make national limits binding on Parties?	3	Art.4.1, 10	Each Party is required to "take all necessary measures to ensure the total number of fishing days" used does not exceed its PAE within a Management Year[1720] Management schemes arise from decisions of management meetings, which are intended to be binding on the Parties[1721] and Parties have a general duty to "take all necessary measures" to ensure that all licensed purse seine vessels in its EEZ, and all purse seine vessels for which it is the home party[1722] or flag State comply with the Management Scheme[1723].
	resolve disputes beyond bilateral negotiation	0		Silent
	establish a record of national scale limits (e.g. in a regional register or CMM)?	3	Art.1.1(xi)	Each Party's PAE for each Management Year is set out in a format prescribed in Schedule 1 of the Management Scheme[1724]
	Subtotal	**10**		

[1716] Ibid. Article 12.4: "Each PAE shall be updated and confirmed by Parties at their previous year's annual meeting or at such other time agreed to by the Parties, using the most recent data…".
[1717] This is implied in ibid. Articles 2.4(iv) and 12.3: "The TAE shall be allocated amongst the Parties as their…PAE…in the manner agreed to by the Parties".
[1718] PNA (2017). Purse Seine VDS TAE for 2018-2020. Majuro, 5-7 April 2017, Office of the Parties to the Nauru Agreement. **PA22/WP.4; VDS-T&SC6/WP.1**. para 21 table 2
[1719] PNA (2016). Palau Arrangement for the Management of the Western Pacific Fishery - Management Scheme (Purse Seine Vessel Day Scheme). Signed 2 October 1992. Entered into force 1 November 1995. Amended April 2016 & October 2016, Office of the Parties to the Nauru Agreement. Article 12.4: "…If agreement cannot be reached on updating of PAEs for a Management Year, the PAEs for the previous Management year shall apply".
[1720] Ibid. Article 4.1 See footnotes 1706 and 1708 above.
[1721] PNA (2010). Palau Arrangement for the Management of the Western Pacific Fishery, Agreed on 2 October 1992. Entered into force on 1 November 1995. Amended on 27-29 April 1994 and 11 September 2010, Office of the Parties to the Nauru Agreement. Article 4: "The decisions of the Management Meeting will be arrived at by consensus and will be binding on the Parties."
[1722] "Home party" is a term defined in PNA (2013). Federated States of Micronesia Arrangement on Regional Fisheries Access (FSM Arrangement). Agreed on 30 November 1995. Entered into force on. Amended by SFSMA5 on 26 June 2013. Refined 19 October 2013 (sic). Pohnpei, Office of the Parties to the Nauru Agreement. Article 1(h).
[1723] PNA (2016). Palau Arrangement for the Management of the Western Pacific Fishery - Management Scheme (Purse Seine Vessel Day Scheme). Signed 2 October 1992. Entered into force 1 November 1995. Amended April 2016 & October 2016, Office of the Parties to the Nauru Agreement. Article 10.1.
[1724] Ibid. Article 1.1(xi): "Party Allowable Effort (PAE), in relation to a Party, means the total number of fishing days for a Management Year allocated to that Party pursuant to Article 12, and presented to the Parties each year in accordance with the table at Schedule 1."

Transferable	transfer a national limit in full or in part to another CCM?	3	Art.7.1	Provides for transfers of all or part of a Party's unused PAE to another Party[1725], and the Parties are required to ensure transfers "are not detrimental to the fishery, this Management Scheme, or its objectives"[1726]. Pooling of PAE is also permitted, with the detail of procedures to give effect to any pooling agreements left to the relevant Parties[1727].
	require new entrants to acquire an allocation through a transfer from a CCM?	1	Art.11.5	Silent on the treatment of new entrants. Could be dealt with in special meetings of the Parties[1728].
	specify a process for effecting a transfer?	3	Art.7.2	All transfers must be notified to, and approved by, the Administrator[1729], who must then adjust the Parties' PAEs[1730].
	record transfers in a register?	3	Art.7.3	Notifications could constitute a register of transfers, although it is not public[1731]. Adjusted PAEs must be notified to the Parties[1732].
	Subtotal	**10**		

[1725] Ibid. Article 7.1: "Any two Parties may agree to a transfer between themselves of all or part of their PAE for a Management Year, provided that (i) A Party may not agree to transfer to other Parties more than 100% of its PAE; (ii) A Party may not agree to transfer any part of its PAE which that Party has already used at the time the request is made."

[1726] Ibid. Article 2.4: "…it will be a function of the annual meeting to:…(iii) Receive a briefing from the Administrator on any transfer of fishing days between Parties. In respect of any deliberation on this matter the Parties will take into account the need to ensure that such transfers are not detrimental to the fishery, this Management Scheme, or its objectives".

[1727] Ibid. Article 7.4: "The Parties may agree on arrangements for pooling days that include the transfer of all or part of their PAEs for pooling. Where such arrangements have been agreed to, the Parties shall adopt appropriate procedures for transfer and adjustments of PAEs to give effect to such arrangement."

[1728] Ibid. Article 11.5: "The Administrator shall convene a special meeting of the Parties to consider the operation of this Management Scheme if the Administrator receives a written request for such a meeting, and where that request is supported by a minimum of three (3) additional Parties".

[1729] Ibid. Article 7.2: "A Party that proposes to transfer PAE pursuant to an agreement under Article 7.1 must provide a transfer notification, signed by both the transferring and the receiving Party, to the Administrator using the form set out in Schedule 3 (b) and according to any transfer administration procedures that have been agreed by the Parties on the recommendation of the Administrator, no later than 31 January of the Management Year following the Management Year that the proposed transfer relates to. The transfer will be approved by the Administrator provided it meets the requirements of the Vessel Day Scheme."

[1730] Ibid. Article 10.4: "The Administrator shall promptly provide a report to all Parties with details of any PAE adjustment pursuant to this Article, and a statement of that Party's Adjusted PAE for any Management Year affected by the adjustment".

[1731] Ibid. Article 7.3: "If the Administrator is satisfied that the Parties have complied with the requirements of Articles 7.1 and 7.2, the Administrator shall adjust the PAE of the relevant Parties in accordance with the transfer notification".

[1732] Ibid. Article 10.4. See footnote 1730 above.

Flexible	set a TRP the target stock(s)?	1	Art.12.2	The VDS does not contain any references to a TRP.
	establish harvest control rules for the target stock(s)?	1		The VDS does not contain any references to harvest control rules or similar.
	adjust a TAC/TAE on the basis of environmental factors and stock assessments?	2	Art.12.2	The TAE can be adjusted from year to year through the annual process to set the TAE, "having regard to" the factors in Article 12.2, including "(i) [t]he best available scientific, economic and management and other relevant advice and information"[1733]. No clearly set out formula for such adjustments. PAEs must then be adjusted accordingly, but not necessarily automatically[1734], as the process to allocate PAEs is to be determined by the Parties, potentially on an annual basis, with no clear guidance for what factors to consider in doing so[1735].
	define national limits as a proportional (rather than volumetric) share of the regional TAC/TAE?	0	Art.1.1(xi)	PAE is defined in volumetric terms[1736].
	establish clear processes for a TAC/TAE to be adjusted?	1	Art.12.2	No clear process other than at annual meetings or other such time as agreed[1737].
	Subtotal	**5**		
TOTAL		**42**		

[1733] Ibid. Article 12.2: See footnotes 1696 to 1699 above.
[1734] If each Party were entitled in perpetuity to a percentage of the TAE then PAEs would automatically be determined on an annual basis when that year's TAE is set. This is in fact the case for Tokelau's TAE, which in 2017 was "adjusted proportionately" with changes in the PNA TAE. See PNA (2017). Purse Seine VDS TAE for 2018-2020. Majuro, 5-7 April 2017, Office of the Parties to the Nauru Agreement. **PA22/WP.4; VDS-T&SC6/WP.1**. para 22.
[1735] PNA (2016). Palau Arrangement for the Management of the Western Pacific Fishery - Management Scheme (Purse Seine Vessel Day Scheme). Signed 2 October 1992. Entered into force 1 November 1995. Amended April 2016 & October 2016, Office of the Parties to the Nauru Agreement.. Article 12.3. See footnote 1704 above.
[1736] Ibid. Article 1.1(xi): "Party Allowable Effort (PAE), in relation to a Party, means the total number of fishing days for a Management Year allocated to that Party pursuant to Article 12, and presented to the Parties each year in accordance with the table at Schedule 1".
[1737] Ibid. Article 12.2. See footnotes 1696 to 1699 above.

Table A.4: Longline vessel day scheme

Criterion	Question	Score	Ref	
Limited	set a subregional scale catch or effort limit?	3	Art.2.2, 2.5, 4	The Management Scheme provides for the Parties to set a limit on fishing effort by longline vessels in the waters of the Parties[1738]. Slightly qualified language on the strict application of this limit can be found in Article 2.2, which requires to the Parties merely to "seek to limit" fishing effort to the TAE, and Article 4, which requires each Party to "take all necessary measures" to stay within their allocated PAE.
	base limits on the best scientific evidence available?	2	Art.11.2	While the Management Scheme allows for the TAE to be set at a level having regard to the best available scientific advice and information[1739], like the purse seine VDS, the Parties must "hav[e] regard to" a range of other factors. These include the "the best available…economic, management and other relevant advice and information"[1740], the WCPF Convention[1741], the special requirements of the Parties as SIDS[1742], the objectives of the longline VDS[1743], and submissions from any stakeholder[1744].
	base limits on the precautionary approach?	1	Art.11.2	The best available scientific information and advice could include consideration of precautionary limits but the Management Scheme does not refer to the precautionary approach.
	apply limits to the full geographic range of the stock?	0		Limited to a specific portion of the geographic range of the likely target stocks – that is, primarily BET and YFT but SPA and other billfish species are also taken by longline vessels, whether as target species or bycatch[1745].
	ensure limits account for catches of the limited species by all gear types?	0	Art.2.2	The TAE only accounts for mortality by longline gear[1746], not other gear types.
	power to record bycatch of the target species against limits for that species?	1		No reference to the inclusion in the TAE or otherwise of bycatch or the treatment of discards.
	Subtotal	**7**		

[1738] PNA (2016). Palau Arrangement for the Management of the Western Pacific Fishery as amended - Management Scheme (Longline Vessel Day Scheme) as amended October 2016. PNA, Office of the Parties to the Nauru Agreement. Article 1.1(xi) defines the total allowable effort (TAE), Article 2.2 requires the Parties to "seek to limit" fishing effort up to the TAE in the waters of the Parties, and Article 2.5 states that the Parties will meet annually to, inter alia, set the TAE.
[1739] Ibid. Article 11.2(i). See footnote 1765 below.
[1740] Ibid. Article 11.2(i). See footnote 1765 below.
[1741] Ibid. Article 11.2(ii). See footnote 1765 below.
[1742] Ibid. Article 11.1(iii). See footnote 1765 below.
[1743] Ibid. Article 11.2(iv). See footnote 1765 below and Article 2.1 – see Chapter Four subsection 4.3.3.
[1744] Ibid.Article 11.2(v) specifies "any party, individual or organisation".
[1745] Ibid. Article 1.1(xi): "Total Allowable Effort (TAE) means the maximum number of fishing days by all licensed longline vessels in the waters of the Parties to the Palau Arrangement in any Management Year."
[1746] Ibid. Article 2.2: "…the Parties shall seek to limit the level of fishing *by longline vessels* in their waters to the…[TAE]…agreed by the Parties to the Palau Arrangement".

Exclusive	allocate national scale limits as a share of the regional TAC/TAE?	3	Art.11.3	The TAE is allocated to Parties as PAE[1747] and fishing days used by eligible longline vessels in the Party's EEZ accrue against the PAE of that Party, with adjustments made for vessel length[1748].
	new entrants either excluded or able to participate without adding to TAC/TAE?	1		The Management Scheme is only open to Parties to the Palau Arrangement[1749], all of which are coastal States. Any new Parties that accede to the Palau Arrangement would presumably bring an additional EEZ to the Scheme, and therefore an equivalent amount of fishing effort already expended in that area into the calculation of the TAE. Such presumptions are not specified in the Management Scheme but could reasonably be expected to be the case, as has been the case in the purse seine VDS
	prohibit exemptions to the limit (or exemptions not provided for)?	2	Art.3	The only exemptions to the longline VDS are available to artisanal vessels[1750]. This is unlikely to cause a noticeable level of fishing in excess of the TAE, given current capacity of artisanal fleets of the Parties, but it nevertheless represents an exception that provides a theoretical opportunity to exceed the PAE/TAE. Conversely, the scheme does not provide for allocations of TAE, or set-asides, for artisanal fishers.
	to impose penalties for exceeding national limits?	3	Art.9.3	Overages of less than 10% of the PAE must be covered by bringing an equal number of vessels days from the following year's PAE where the overage and the following year's PAE is to be reduced by 120% in the case of overages of 10% or more[1751]. The application of the Management Scheme to all longline vessels not in port[1752], other than unlicensed vessels in transit[1753], significantly improves the ability of coastal States to monitor fishing days within its EEZ, and therefore strengthen exclusivity.
	Subtotal	**9**		

[1747] Ibid. Article 11.3: "The TAE shall be allocated amongst the Parties as their Party Allowable Effort (PAE) in the manner agreed to by Parties".
[1748] Ibid. Article 5.1 sets out the basis for the calculation of vessel days used against a PAE.
[1749] Ibid. Article 15.1: "This Management Scheme will be open for signature by the Parties to the Palau Arrangement".
[1750] Ibid. Article 3: "The scheme shall not apply to artisanal vessels".
[1751] Ibid. Article 9.3: "If the level of longline fishing in the waters of a Party exceeds its PAE for a Management Year, that Party's PAE for the following Management Year shall be adjusted by deducting: (i) If the excess is less than 10% of the PAE – the amount of the excess; (ii) If the excess is 10% of the PAE or more – 120% of the excess."
[1752] Ibid. Article 5.1: See footnote 1748 above and 1753 below.
[1753] Ibid. Article 5.1(v): "Notwithstanding (i), unlicensed vessels transiting the waters of the Parties shall not be included in the calculation or attribution of a fishing day". Article 5.1(i): "If a longline vessel reports during any fishing day from positions in the waters of any Parties, that fishing day shall be deducted from the Parties' PAEs according to the actual times spent in their waters based on the best available information in accordance with procedures agreed by the Parties."

Secure	national limits valid for more than one year?	2	Art.2.3	Although the TAE is set for one year, TAEs can be set for up to three years in advance[1754]. A PAE is clearly an exclusive allocation of the TAE, but it is not clear whether the PAE can be adjusted from year to year even if the TAE has been set for three years.
	national limits valid until Parties agree to amend them? (default = perpetuity)	3	Art.11.6	Article 11.6 appears to assume that PAEs are ordinarily to be adjusted annually but will endure where agreement cannot be reached[1755].
	make national limits binding on Parties?	3	Art. 11.1	The Management Scheme includes a general obligation that Parties comply with their PAE, by requiring each to "take all necessary measures" to stay within its PAE[1756] but the nature of those measures is not prescribed by the Management Scheme[1757].
	resolve disputes beyond bilateral negotiation	0		provides no independent legal channels through which to protect a Party's allocation of fishing days during any given Management Year.
	establish a record of national scale limits (e.g. in a regional register or CMM)?	3	Art.1.1(xi)	A formal record of vessel days provided for in the Management Scheme is at the national scale[1758]. Any adjustments to PAEs[1759] resulting from overages or transfer are also be to notified to the Parties[1760] [1761]. There are no provisions in the Management Scheme for a record or register of fishing days allocated to vessels, should a Party choose to adopt measures to this effect.
	Subtotal	**11**		

[1754] Ibid. Article 2.3: "At the beginning of the Management Scheme, the Parties will meet to set the TAE for the first Management Year and may set the TAEs for the subsequent two Management Years. Prior to the end of each Management Year, the Parties will meet to set the TAE for the subsequent Management Year if it has not been set. The Parties may set the TAE each year for up to three years in advance."

[1755] Ibid. Article 11.6: "Each PAE shall be updated and confirmed by Parties at their previous year's annual meeting or at such other time agreed to by the Parties, using the most recent data. If agreement cannot be reached on updating of PAEs for a Management Year, the PAEs for the previous Management year shall apply".

[1756] Ibid. Article 4: "Each Party shall take all necessary measures to ensure that the number of fishing days by longline vessels in its waters does not exceed that Party's PAE or Adjusted PAE in any Management Year".

[1757] See ibid. Article 9 on compliance.

[1758] Ibid. Article 1.1(xi). See footnote 1745 above; and Article 11.6: "Each PAE shall be updated and confirmed by Parties at their previous year's annual meeting or at such other time agreed to by the Parties, using the most recent data."

[1759] Adjusted PAE is defined in ibid. Article 1.1(ii): "Adjusted PAE, in relation to a Party, means that Party's PAE as adjusted pursuant to Article 6 or 9."

[1760] The requirement to notify adjusted PAEs in ibid. Article 9.4. See footnote 1761 below. Adjusted PAE is defined in Article 1.1(ii) (see footnote 1759 above), and consistent with the definition, PAEs may be adjusted as a result of transfers of fishing days between Parties (Article 6) or adjustments due to overages (Article 9.3)

[1761] Ibid. Article 9.4: "The Administrator shall promptly provide a report to all Parties with details of any PAE adjustment pursuant to this Article, and a statement of that Party's Adjusted PAE for any Management Year affected by the adjustment".

Transferable	transfer a national limit in full or in part to another CCM?	3	Art.6.1	Parties are able to transfer up to 100 percent of unused vessel days under their PAE to another Party, in accordance with a scheme to be developed under Article 6.1[1762].
	require new entrants to acquire an allocation through a transfer from a CCM?	1		There are no clear provisions relating to new Parties but as noted above, new coastal State Parties will likely bring their EEZ to the VDS and thus not need to receive transferred vessels days from existing Parties. There are no provisions for transfers of fishing days at the individual user scale.
	specify a process for effecting a transfer?	3	Art.6.1	Parties that transfer fishing days to another Party must provide a notification to the Administrator, who must approve the transfer[1763].
	record transfers in a register?	3	Art.9.4	The net impact of transfers at the national scale are in effect recorded in notifications of adjusted PAEs[1764].
	Subtotal	**10**		

[1762] Ibid. Article 6.1: "The Parties shall develop a scheme to facilitate the transfer of days between the Parties…".
[1763] In accordance with ibid. Article 6.2 and 6.3 the Administrator must approve a transfer if they are satisfied that it meets the requirements of the Management Scheme (Article 6.2) and the requirements of Article 6.1 and 6.2 (Article 6.3) before adjusting the PAE of the relevant Parties.
[1764] Ibid. Article 9.4. See footnote 1761 above.

Flexible	set a TRP the target stock(s)?	1		The longline VDS does not set a TRP for target stocks.
	establish harvest control rules for the target stock(s)?	1		The longline VDS does not set harvest control rules for target stocks.
	adjust a TAC/TAE on the basis of environmental factors and stock assessments?	2	Art.11.2	The Parties will set the TAE each year based on a range of environment, social factors and submissions from any party[1765]. This implies an annual opportunity to adjust the TAE.
	define national limits as a proportional (rather than volumetric) share of the regional TAC/TAE?	0	Art.1.1(x)	PAEs are volumetric rather than proportional[1766].
	establish clear processes for a TAC/TAE to be adjusted?	1	Art11.2	The process for revising the TAE is given in minimal detail[1767].The TAE is ordinarily set annually[1768] but can be made either more or less frequently[1769]. This would allow the TAE to be adjusted annually, although the language used is to "set" the TAE, rather than adjust the previous year's TAE. In practice this is likely to be the same thing given the same factors are to be considered each time[1770].
	Subtotal	**5**		
TOTAL		**42**		

[1765] Ibid. Article 11.2: "The TAE will be set and confirmed by the Parties at their previous year's annual meeting or at such other time agreed to by the Parties, having regard to: i) the best available scientific, economic, management and other relevant advice and information; ii) the provisions of the Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean; iii) the special requirements of the Parties as small island developing states; iv) the objectives of the Longline Vessel Day Scheme; and v) any submission on this issue from any party, individual or organisation."

[1766] Ibid. Article 1.1(x): "Party Allowable Effort (PAE), in relation to a Party, means the total number of fishing days for a Management Year allocated to that Party and presented to the Parties each year".

[1767] Ibid. Article 11.2. See footnote 1765 above.

[1768] Ibid. Article 2.5: "The annual meeting of the Parties to the Palau Arrangement will consider matters relating to the administration of the Longline VDS. In particular, but without limiting the matters the meeting can consider, it will be a function of the annual meeting to:…(iv) Set the TAE in accordance with the provisions of this Management Scheme".

[1769] Ibid. Article 11.2: "The TAE will be set and confirmed by the Parties at their previous year's annual meeting or at such other time agreed to by the Parties…".

[1770] Ibid. Article 11.2. See footnote 1765 above.

Table A.5: Tokelau Arrangement

Criterion	Question	Score	Ref	
Limited	set a subregional scale catch or effort limit?	3	Art.4.3(b)(i)(iii), 4.4	Management measures or schemes may cover the "regulation of fishing catch and/or effort"[1771] and "the determination of zone limits"[1772]. More forcefully, Article 4.4 provides for a transitional arrangement that, in effect, institutes an immediate limit for each EEZ[1773]. In aggregate, limits applying to the EEZs of the Participants equates to a subregional scale limit, albeit a bottom-up one.
	base limits on the best scientific evidence available?	2	Art.4.3(a), 4.3(b)(ii)	Management Meetings of the Participants are required to consider "scientific data relating to catch, bycatch and operations of fishing vessels…" among other factors[1774] but this is not linked explicitly to the determination of catch or effort limits.
	base limits on the precautionary approach?	2	Art.4.3(b)(ii)	Any harvest strategy should include "consideration of precautionary target and limit reference points, indicators and harvest control rules"[1775],
	apply limits to the full geographic range of the stock?	0	Art.1.1(a), 3.1	The geographic extent of any limits will be incomplete due to restricted range of the Arrangement Area[1776] [1777] to the EEZs of the Participants. High seas areas and the EEZs of non-Participants are notably absent.
	ensure limits account for catches of the limited species by all gear types?	3	Art.3.1	the application of limits under the Tokelau Arrangement to all fisheries suggests that such limits should be applied to all gear types targeting SPA or that take SPA as bycatch.
	power to record bycatch of the target species against limits for that species?	2	Art.3.1	the application of limits under the Tokelau Arrangement to all fisheries suggests that such limits should be applied to all gear types targeting SPA or that take SPA as bycatch.
	Subtotal	**12**		

[1771] Tokelau Arrangement Article 4.3: "The functions of the Management Meeting are - b) to consider management measures or Management Schemes, which may include, but are not limited to - (i) the regulation of fishing catch and/or effort and mitigation of bycatch by fishing vessels operating within the Scope of this Arrangement."
[1772] Tokelau Arrangement Article 4.3(b): "(iii) the definition of catch allocation units, and the determination of zone limits and inter-zone trading mechanisms;".
[1773] Tokelau Arrangement Article 4.4: "As a transitional measure until a Management Meeting implements Paragraph 4.3 (b) (iii), the Catch Allocation Unit will be one tonne of south Pacific albacore tuna (Thunnus alalunga), and zone limits will be those agreed by FFC 89 based on the recommendations of the FFC Sub-Committee on South Pacific Tuna and Billfish". The limits are set out at the end of the Arrangement. See Tokelau Arrangement for the Management of the South Pacific Albacore Fishery, Agreed 22 October 2014. Final agreed text by SC-SPTBF17. Entered into force on 14 December 2014. Retrieved from https://www.ffa.int/tka_public on 11 September 2020.
[1774] Tokelau Arrangement Article 4.3: "(a) to consider all available information including scientific data relating to catch, bycatch and operations of fishing vessels taking stocks under the Scope of the Arrangement and economic and socioeconomic information relating to the impact of the fishery on Participants…".
[1775] Tokelau Arrangement Article 4.3(b): "(ii) the implementation of a harvest strategy, including consideration of precautionary target and limit reference points, indicators and harvest control rules for any fish stock under the Scope of the Arrangement, if not already regionally agreed".
[1776] Tokelau Arrangement Article 3.1: "The understandings found in this document will apply to all fisheries that take south Pacific albacore tuna, whether specifically targeted or taken as bycatch, wherever they may occur in the Area. This Arrangement does not create legally binding rights or obligations".
[1777] Tokelau Arrangement Article 1.1(a) essentially defines the "Fisheries Management Area" as the EEZs of the Participants and Associate Participants.

Exclusive	allocate national scale limits as a share of the regional TAC/TAE?	2	Art.4.3(iii)	Exclusive national scale limits may be allocated to Participants[1778].
	new entrants either excluded or able to participate without adding to TAC/TAE?	3	Art.8	New entrants ("Associate Participants"[1779]) must be coastal States[1780] and will therefore bring new EEZs to the Area, and so may permit an increase in the TAC/TAE without undermining the biological sustainability of the limit. This conclusion is underscored by Article 8.2, which demonstrates a commitment to maintaining sustainable limits in the presence of new entrants[1781].
	prohibit exemptions to the limit (or exemptions not provided for)?	1	Art.4.3(b)(v)	No specific provisions prohibiting exemptions for Participants from limits. Article 4.3(b)(v) theoretically allows exemptions as a mechanism to address a disproportionate burden falling on a Participant.
	to impose penalties for exceeding national limits?	1	Art.4.3(b)(viii), 4.5	The adoption of penalties is not precluded by the broad range of powers given to the Management Meeting[1782], and is supported by the intention to adopt binding Management Schemes[1783].
	Subtotal	**7**		

[1778] Tokelau Arrangement Article 4.3(b)(iii). See footnotes 1771 and 1772 above.

[1779] Tokelau Arrangement Article 1.1(d): ""Associate Participant" means a State or Territory Associated with this Arrangement under Paragraph 8."

[1780] Tokelau Arrangement Article 8.1: "Upon this Arrangement coming into effect, an FFA member or any FFA non-member State or Territory which has an exclusive economic zone overlapping the effective range of the stocks covered by this Arrangement may become an Associate Participant to this Arrangement…"; and 11.3: "After this Arrangement comes into effect, it will be open for association by other members of the FFA and by other island Territories in accordance with the procedure set out in paragraph 8."

[1781] Tokelau Arrangement Articles 8.2: "The minimum requirement to qualify as an Associate Participant under paragraph 8.1 will be a commitment by the Associate Participant to implement catch limits for species under the scope of this Arrangement within its exclusive economic zone provided that such limits are calculated in a way that is fully compatible with calculation of limits for other zones covered by this Arrangement".

[1782] Tokelau Arrangement Article 4.3(b): "The functions of the Management Meeting are – (b) to consider management measures or Management Schemes, which may include, but are not limited to - (viii) any other matter deemed necessary from time to time".

[1783] Tokelau Arrangement Article 4.5: "The Management Meeting will also consider the development of a mechanism to include binding management measures or Management Schemes".

Secure	national limits valid for more than one year?	1		The Arrangement does not specify the duration of national allocations but authorises the Management Meeting to consider "the definition of catch allocation units, and the determination of zone limits and inter-zone trading mechanisms"[1784], and "any other matter deemed necessary from time to time"[1785]. Together, these provide scope to set a duration of a national allocation at more than one year.
	national limits valid until Parties agree to amend them? (default = perpetuity)	2	Art.4.4, Note	Transitional national allocations ("zone limits")[1786] do not have an expiry date. However, the absence of a Management Scheme leaves open the question of whether allocations have a time limit and the implications of the expiry of any time limit.
	make national limits binding on Parties?	2	Art.4.5	Although the Tokelau Arrangement is explicitly non-binding[1787], Management Meetings may "consider the development of a mechanism to include binding management measures or Management Schemes"[1788].
	resolve disputes beyond bilateral negotiation	0	Art.10.2	Disputes between Participants can only be resolved by negotiation between the concerned Participants, with no recourse to a neutral arbiter[1789]
	establish a record of national scale limits (e.g. in a regional register or CMM)?	1	Art.4.4	It is unclear whether national allocations would be recorded in the equivalent of a register but the Arrangement does not preclude this. A transitional measure specifying national allocations ("zone limits") as per those agreed by the 89th meeting of the Forum Fisheries Committee[1790], could be construed as an intention to document agreed allocations.
	Subtotal	**6**		
Transferable	transfer a national limit in full or in part to another CCM?	2	Art.4.3(b)(iii)	A clear intention in Article 4.3(b)(iii) that national allocations be transferable between Participants ("inter-zone trading mechanisms"), although this falls short of mandating it[1791].
	require new entrants to acquire an allocation through a transfer from a CCM?	1	Art.4.3(b)(iii)	As new entrants are restricted to FFA coastal States, they would all bring additional stock through their EEZs to the Tokelau Arrangement. There is therefore no need for them to acquire an allocation through a transfer from an existing Participant but nothing to prevent such a process from being adopted.
	specify a process for effecting a transfer?	1	Art.4.3(b)(iii)	Implied scope to specify the process for executing transfers.
	record transfers in a register?	1	Art.4.3(b)(iii)	Implied scope to specify the process for recording of transfers.
	Subtotal	**5**		

[1784] Tokelau Arrangement Article 4.3(b)(iii). See footnotes 1771 and 1772 above.
[1785] Tokelau Arrangement Article 4.3(b)(viii): See footnote 1782 above.
[1786] Tokelau Arrangement Article 4.4. See footnote 1773 above.
[1787] Tokelau Arrangement Article 3.1: "…This Arrangement does not create legally binding rights or obligations."
[1788] Tokelau Arrangement Article 4.5. See footnote 1783 above.
[1789] Tokelau Arrangement Article 10.2: "Any differences arising out of the interpretation or implementation of this Arrangement between two or more Participants will be settled through peaceful negotiations."
[1790] Tokelau Arrangement Article 4.4. See footnote 1773 above.
[1791] Tokelau Arrangement Article 4.3(b)(iii). See footnotes 1771 and 1772 above.

Flexible	set a TRP the target stock(s)?	2	Art.4.3(b)(ii)	Participants may develop and implement harvest strategies, including TRPs, LRPs and harvest control rules[1792].
	establish harvest control rules for the target stock(s)?	2	Art.4.3(b)(ii)	Participants may develop and implement harvest strategies, including TRPs, LRPs and harvest control rules[1793].
	adjust a TAC/TAE on the basis of environmental factors and stock assessments?	1	Art.4.3(a), (b)(ii)(iii)	While the Arrangement does not specify the requirements for HCRs, the intention to implement harvest strategies[1794] provides a sound basis for the development of processes to make predictable adjustments to a TAC or TAE in response to unpredictable environmental fluctuations and new stock assessments over time. A broad range of scientific, economic and socioeconomic factors are to be considered[1795] in the determination of zone limits[1796], and implicitly a subregional TAC/TAE in aggregate.
	define national limits as a proportional (rather than volumetric) share of the regional TAC/TAE?	1	Art.4.3(b)(iii), 4.4	The Management Committee is authorised to define national allocation units and to date these have been volumetric rather than proportional[1797]. Nevertheless, proportional allocations are not precluded
	establish clear processes for a TAC/TAE to be adjusted?	1	Art.4.3(b)(ii)(iii)	The Arrangement does not specify the process for the implementation of harvest strategies, the application of HCRs or the determination of zone limits.
	Subtotal	**7**		
TOTAL		**38**		

[1792] Tokelau Arrangement Article 4.3: See footnote 1771 above.
[1793] Tokelau Arrangement Article 4.3(b)(ii). See footnotes 1771 and 1775 above.
[1794] Tokelau Arrangement Article 4.3(b)(ii). See footnotes 1771 and 1775 above.
[1795] Tokelau Arrangement Article 4.3(a). See footnote 1774 above.
[1796] Tokelau Arrangement Article 4.3(b)(iii). See footnotes 1771 and 1772 above.
[1797] Tokelau Arrangement Article 4.3(b)(iii) (see footnotes 1771 and 1772 above); and Article 4.4 (see footnote 1773 above).

Table A.6: CMM 2018-01 Interim tropical tuna measure: Purse seine effort and catch limits

Criterion	Question	Score	Para	
Limited	set a regional or subregional scale catch or effort limit?	3	25, 26, Att1	High seas areas between 20°N and 20° S are limited catch or effort levels set out in Attachment 1 Table 2[1798]. Para 25 sets limits on fishing effort or catches in the EEZs of coastal States in the WCPFC-CA[1799]. These limits are notified by the coastal State rather than as allocations of a top-down limit. The various iterations of the interim tropical tuna measure since the first was adopted in 2005 demonstrate a clear path from historical effort levels to the current effort and catch limits in CMM2018-01. Coastal CCMs were to have notified their EEZ limits by 31 December 2018 but at least five CCMs had not[1800] at the time the CMM was published.
	base limits on the best scientific evidence available?	2		As zone-based EEZ and flag-based high seas limits are based on notified historical catch, there does not appear to be a direct link between such "bottom-up" limit and the science-based "top-down" implied catch levels under the interim TRPs. However, according to the preamble, benchmark historical catch and effort levels are broadly consistent with scientific advice.
	base limits on the precautionary approach?	0		Similarly, limits are not set on the basis of the precautionary approach.
	apply limits to the full geographic range of the stock?	0	25, 26, Att1	The combined EEZ and high seas limits do not cover the full geographic range of the three target species. High seas effort limits are restricted to between 20°N and 20°S. There is no clear mechanism to give effect to the requirement in para 27 that CCMs ensure purse seine effort is not transferred outside this tropical band. The CMM records the Commission's commitment that "[b]y 2020 the Commission shall agree on hard effort or catch limits in the high seas of the Convention Area and a framework for the allocation of those limits in the high seas"[1801].
	ensure limits account for catches of the limited species by all gear types?	0		The limits for both EEZs and the high seas do not account for all sources of mortality of the relevant species as they apply only to purse seine catches.
	power to record bycatch of the target species against limits for that species?	2	31-32	Catch retention rules[1802] lay a foundation for the inclusion of juvenile bigeye and yellowfin catches in catches against limits of those species[1803].
	Subtotal	**7**		

[1798] CMM2018-01 para 26: "CCMs…shall restrict the level of purse seine effort on the high seas in the area 20°N to 20°S to the limits set out in Attachment 1, Table 2…".
[1799] CMM2018-01 para 25: "Coastal CCMs within the Convention Area shall restrict purse seine effort and/or catch of skipjack, yellowfin and bigeye tuna within their EEZs in accordance with the effort limits established and notified to the Commission and set out in Table 1 of Attachment 1."
[1800] Coastal CCMs that have not notified zone limits are marked in CMM2018-01 Attachment 1 Table 1 (Indonesia, Korea, Philippines, Chinese Taipei, Wallis and Futuna).
[1801] CMM2018-01 para 28, now 2021 per CMM2020-01: "…the works to be completed by 2020 shall be deferred to 2021".
[1802] CMM2018-01 para 31-32.
[1803] WCPFC CMM 2018-01 para 50 foreshadows further measures to address fisheries that also target SKJ, YFT and BET, while para 51 requires CCMs to take measures to ensure that the total catch in fisheries that take less than 2000 tonnes of BET, YFT and SKJ of SKJ, YFT and BET remain at or below the average level for 2001-2004 or at 2004 levels.

Exclusive	allocate national scale limits as a share of the regional TAC/TAE?	3	25, 26 Att 1	The individual coastal CCM and flag CCM limits form an allocation of the limit, albeit not as allocations in a top-down limit. Indeed, paragraph 28 clearly states that the national high seas limits "do not confer allocations of rights to any CCM". In the absence of an effective regional scale limit, there is no clear top-down assignment of a regional scale limit to the zonal scale or national scale. However, coastal State catch and effort limits (zone limits) are exclusive at the national scale in the sense that no other State may assert control over a coastal State's allocation of catch or effort within its waters[1804]. The five CCMs that have not notified their national EEZ limits should not add any more fishing pressure if they simply reflect historical catches in those EEZs. The treatment of new entrants' access to high seas allocations is deferred to a CMM on cooperating non-members (CNMs)[1805].
	new entrants either excluded or able to participate without adding to TAC/TAE?	3	Att 1 Tables 1 & 2	No provisions are made for new entrants
	prohibit exemptions to the limit (or exemptions not provided for)?	0	26	The exemption for SIDS from high seas flag-based limits[1806] means there is a substantial potential gap in the overall limit. As the limits only apply to CCMs that are not SIDS, effort could theoretically increase above the aggregate limit through, say, the expansion of a SIDS's fleet or chartering arrangements with vessels flagged to a non-SIDS CMM[1807].
	to impose penalties for exceeding national limits?	2	30	Where CCMs exceed their national limit in a calendar year, overages are to be deducted from the following year's limit[1808] but no penalty is imposed.
	Subtotal	**8**		

[1804] Even the word "allocation" is misleading because the coastal state's limit has not been allocated from a regional pool in a top-down fashion, but notified by the state in a bottom-up process.
[1805] CMM2019-01. See Chapter Five section 5.4.
[1806] CMM2018-01 para 26: "CCMs *that are not Small Island Developing States* shall restrict the level of purse seine effort on the high seas in the area 20oN to 20oS to the limits set out in Attachment 1, Table 2, *except that the Philippines* shall take measures on the high seas in accordance with Attachment 2." (emphasis added)
[1807] See CMM2018-01 para 8: "For the purposes of paragraphs 39-41 and 45-49, attribution of catch and effort shall be to the flag State, except that catches and effort of vessels notified as chartered under CMM 2016-05 or its replacement [CMM2019-08] shall be attributed to the chartering Member, or Participating Territory"; and para 9: "For purposes of paragraphs 39-41 and 45-49, catches and effort of United States flagged vessels operating under agreements with its Participating Territories shall be attributed to the Participating Territories"; and CMM2019-08 on the Charter Notification Scheme (see Chapter Five subsection 5.7.6).
[1808] CMM2018-01 para 30: "Where the catch and effort limits in paragraphs 25 and 26 have been exceeded, any overage of the annual limits by a CCM or the collective annual limits of a group of CCMs shall be deducted from the limits for the following year for that CCM or group of CCMs."

Secure	national limits valid for more than one year?	1	55	The EEZ and high seas effort limits appear to have endured multiple iterations of the CMM, which suggests they are reasonably secure. However, the revised expiry date of 15 February 2022[1809] provides no certainty beyond one year. The CMM explicitly rejects any notion that high seas limits confer rights on a flag State and "are without prejudice to future decisions of the Commission"[1810] such that there is little certainty that the limits will extend beyond the period of validity of the measure. There is no equivalent provision in relation to zone-based rights.
	national limits valid until Parties agree to amend them? (default = perpetuity)	0		There is no expectation that the limits are in place for more than a year. The CMM was adopted pending the adoption of harvest strategies for all three species and any implementing CMM. The formal expiry date was extended by one year to 15 February 2022 and therefore requires an active decision of the Commission to extend it[1811]. The CMM anticipates agreement by 2020 (now 2021)[1812] on "hard effort or catch limits in the high seas areas of the Convention Area and a framework for the allocation of those limits among all [CCMs]"[1813].
	make national limits binding on Parties?	3	25, 26	The CMM is binding on all CCMs.
	resolve disputes beyond bilateral negotiation	1		There are no provisions for dispute resolution in the CMM.
	establish a record of national scale limits (e.g. in a regional register or CMM)?	3	Att 1	Security is enhanced by the recording of limits in the CMM, which in effect forms a simple but legally binding register.
	Subtotal	**8**		

[1809] CMM2020-01.
[1810] CMM2018-01 para 28.
[1811] WCPFC CMM 2018-01 para 55 also provides for annual reviews of this CMM.
[1812] In accordance with CMM 2020-01: "…the works to be completed by 2020 shall be deferred to 2021."
[1813] CMM2018-01 para 28.

Transferable	transfer a national limit in full or in part to another CCM?	0		There are no provisions relating to transferability of purse seine effort limits other than a prohibition on transfers of high seas effort limits to areas outside the tropical band[1814]. It is unclear whether "transfer" refers to the movement of vessels outside the tropical band or the assignment of effort from vessels fishing between 20°N and 20°S to vessels outside that band. The absence of explicit provisions relating to high seas transfers suggests that this provision should be interpreted narrowly, that is, that a flag CCM may not exercise its high seas limit outside the tropical band. It is unclear whether purse seine effort is limited outside the tropical band so it is not clear how this restriction is to operate or be monitored and enforced. The CMM does not provide for transfers between flag CCMs.
	require new entrants to acquire an allocation through a transfer from a CCM?	0		The CMM is silent on whether new entrants are required to receive a transfer of high seas fishing days from an existing CCM.
	specify a process for effecting a transfer?	0		No provisions specified
	record transfers in a register?	0		No provisions specified
	Subtotal	**0**		

[1814] CMM2018-01 para 27: "CCMs shall ensure that the effectiveness of these effort limits for the purse seine fishery are not undermined by a transfer of effort in days fished into areas within the Convention Area south of 20°S. In order not to undermine the effectiveness of these effort limits, CCMs shall not transfer fishing effort in days fished in the purse seine fishery to areas within the Convention Area north of 20°N."

Annex

Flexible	set a TRP the target stock(s)?	3	12-14	CMM2018-01 refers to TRPs for the three tropical tuna species[1815] but the planned development of harvest control rules in 2018 and 2019[1816] has not yet eventuated.
	establish harvest control rules for the target stock(s)?	1		Harvest control rules should provide a basis for the automatic adjustment of a TAC or TAE subject to stock assessments, should a hard TAC or TAE be established. But in the meantime, there is no mechanism to translate a revised stock assessment into adjustments in a TAC or TAE.
	adjust a TAC/TAE on the basis of environmental factors and stock assessments?	0		No provisions
	define national limits as a proportional (rather than volumetric) share of the regional TAC/TAE?	0	Att1	In the absence of proportional allocations, there is no mechanism to translate adjustments in the TAE into revised national limits.
	establish clear processes for a TAC/TAE to be adjusted?	0		No process defined
	Subtotal	**4**		
TOTAL		**27**		

[1815] CMM2018-01 para 12-14.

[1816] WCPFC (2018). WCPFC14 Summary Report: Attachment L: Work Plan for the Adoption of Harvest Strategies Under CMM 2014-06 Updated at the 14th Regular Session of the WCPFC, Manila, 3-7 December 2017., WCPFC. Attachment L Work Plan for the Adoption of Harvest Strategies Under CMM 2014-06.

Table A.7: CMM 2018-01 Interim tropical tuna measure: Limit on FADs with instrumented buoys

Criterion	Question	Score	Para	
Limited	set a regional or subregional scale catch or effort limit?	3	23	Each flag CCM is required to ensure that each of its purse seine vessels has deployed at any one time a maximum of 350 such FAD-like objects[1817] in the Convention Area[1818]. This is akin to a capacity limit rather than an effort limit because it does not limit the number of sets a flag CCM's vessels may deploy on a FAD. The aggregate of each flag CCM's limit effectively forms a bottom-up regional scale limit. However, the absence of provisions relating to limits on the deployment or use of other types of FAD suggests such a limit is incomplete[1819] [1820].
	base limits on the best scientific evidence available?	0		There is no evidence that the quantum of the limit has been informed by scientific evidence. Actual deployment numbers are likely to be well below the limit[1821].
	base limits on the precautionary approach?	0		As noted above, actual deployment numbers are below the limit so the limit is unlikely to be precautionary.
	apply limits to the full geographic range of the stock?	3	3	The limits apply to all EEZs and high seas areas of the entire WCPFC-CA[1822].
	ensure limits account for catches of the limited species by all gear types?	0		They necessarily apply only to purse seine vessels and therefore must form a part of a wider framework in order to limit mortality of the three tropical tunas.
	record bycatch of target species against limits for that species?	1	31	The purse seine catch retention provisions in paragraphs 31 and 32 complement the FAD deployment limit but, as noted above, only provide a basis for inclusion of juvenile catches in any wider limit on those species.
	Subtotal	**7**		

[1817] CMM2018-01 para 23. Flag CCMs and their vessels are also required to comply with a coastal state's rules relating to FADs when operating in the coastal state's EEZ. This is consistent with a coastal state's sovereign rights relating to fishing within its EEZ but is also expressly provided for in para 23.
[1818] CMM2018-01 para 3: "This Measure applies to all areas of high seas and all EEZs in the Convention Area except where otherwise stated in the Measure."
[1819] *FAD* is defined in CMM2009-02 para 3: "any object or group of objects, of any size, that has or has not been deployed, that is living or non-living, including but not limited to buoys, floats, netting, webbing, plastics, bamboo, logs and whale sharks floating on or near the surface of the water that fish may associate with".
[1820] Note however that setting on schools associated with cetaceans (CMM2011-03) and whale sharks (CMM2019-04 para 21) is prohibited.
[1821] WCPFC SC (2020). Report on analyses of the 2016/2020 PNA FAD tracking programme. Scientific Committee Sixteenth Regular Session. Electronic Meeting, 11-20 August 2020, Western and Central Pacific Fisheries Commission (WCPFC). **SC16-MI-IP-14**. p13.
[1822] CMM2018-01 para 3.

Exclusive	allocate national scale limits as a share of the regional TAC/TAE?	3	23	Each vessel is limited to 350 FADs with activated instrument buoys deployed by vessels flying its flag at any given time. Like the purse seine effort limits, this limit forms a bottom-up limit rather than a top-down allocation.
	new entrants either excluded or able to participate without adding to TAC/TAE?	3	45, 46	The limit is given greater effect by purse seine capacity limits elsewhere in the measure (see table A.8 below). New entrants at the individual user scale therefore must replace existing vessels.
	prohibit exemptions to the limit (or exemptions not provided for)?	3		The provisions do not allow for any exemptions
	to impose penalties for exceeding national limits?	0		No specific penalties are specified for non-compliance
	Subtotal	**9**		
Secure	national limits valid for more than one year?	1	55	The CMM was adopted pending the adoption of harvest strategies for all three species and any implementing CMM, and has a revised expiry date of 15 February 2022.
	national limits valid until Parties agree to amend them? (default = perpetuity)	0		Provision for annual reviews of this CMM[1823] and the expiry date of 15 February 2022 provide little long-term *security* for FAD limits.
	make national limits binding on Parties?	3		As with all CMMs, the FAD limit is binding.
	resolve disputes beyond bilateral negotiation	1		No provisions
	establish a record of national scale limits (e.g. in a regional register or CMM)?	2	23	While there is likely to be no need for a register of FAD deployment limits given they are identical for each vessel, the real need is for a register of formal, recognised record of vessel numbers (Chapter Five subsection 5.7.3).
	Subtotal	**7**		

[1823] WCPFC CMM 2018-01 para 55 provides for annual reviews of this CMM.

Transferable	transfer a national limit in full or in part to another CCM?	0		There are no provisions relating to transferability of FAD limits at either the national or individual user scales.
	require new entrants to acquire an allocation through a transfer from a CCM?	0		
	specify a process for effecting a transfer?	0		
	record transfers in a register?	0		
	Subtotal	**0**		
Flexible	set a TRP for the target stock(s)?	3	12-14	TRPs for all three tropical tuna species associated with FADs have been set[1824].
	establish harvest control rules for the target stock(s)?	1		Harvest controls are to be determined
	adjust a TAC/TAE on the basis of environmental factors and stock assessments?	0		No indication that TRPs and HCRs will translate to the determination of FAD deployment limits.
	define national limits as a proportional (rather than volumetric) share of the regional TAC/TAE?	0		
	establish clear processes for a TAC/TAE to be adjusted?	0		
	Subtotal	**4**		
TOTAL		**27**		

[1824] CMM2018-01 paras 12-14.

Table A.8: CMM2018-01 Interim tropical tuna measure: Purse seine capacity limits

Criterion	Question	Score	Ref	
Limited	set a regional or subregional scale catch or effort limit?	3	45, 46	Like the effort limits referred to above, purse seine capacity limits in paragraphs 45 and 46 attempt to establish a bottom-up regional scale limit – in this case preventing growth in purse seine capacity employed in the Convention Area between 20°N and 20°S. These provisions also allow CCMs and their vessels to use one of four options to constrain capacity or effort of new vessels: that is, that new vessels not exceed either the "carrying capacity" or "well volume" of, or either catch or effort employed by, the vessel or vessels it replaced. While this may constrain capacity deployed, vessels could reasonably be expected to aim to maximise catches by selecting the measure that places the weakest constraint on catches. Carrying capacity is not defined and both it and well volume are only single measures of capacity. "Effort" is defined elsewhere in the CMM as vessel days and could reasonably be assumed to have the same meaning in this provision. While a fourth option is to limit the catches of a new vessel to that of the vessel or vessels it replaced, CCMs aiming to increase catches can rely on carrying capacity, well-volume or effort limits instead. Therefore, while certain measures of vessel capacity may be limited by this CMM, they are unlikely, on their own, to place a hard limit on effort or catches by those vessels. Effort is nevertheless limited by other provisions in the CMM, which also render the capacity limits redundant.
	base limits on the best scientific evidence available?	0	45	Capacity limits are based on historical capacity and there is no evidence to suggest they are informed by science or a precautionary approach.
	base limits on the precautionary approach?	0	45	As above
	apply limits to the full geographic range of the stock?	0	45	Although the majority of purse seine catches are taken in tropical waters, the restricted geographic application of the capacity limit leaves some areas of range of the relevant stocks unaffected.
	ensure limits account for catches of the limited species by all gear types?	0	45	As with all gear-specific limits, the purse seine capacity limit does not account for mortality of target stocks by other gear types. Further, the capacity limit does not apply to carrier vessels. While this could seriously undermine the impact of capacity limits on catches, CMM2009-06 prohibits most transhipments at sea by purse seine vessels[1825].
	power to record bycatch of the target species against limits for that species?	2	31	The catch retention requirements in paragraph 31 will have some influence on the effectiveness of the capacity limits to constrain catch levels by preventing high grading to ensure maximum use of well volume.
	Subtotal	**5**		

[1825] CMM2009-06 para 25. Should the prohibition on purse seine transhipments at sea be repealed, the capacity limits in CMM2018-01 may need to be revised.

Exclusive	allocate national scale limits as a share of the regional TAC/TAE?	3	45	Capacity limits are, by default, allocated to CCMs at the level applicable in CMM2013-01.
	new entrants either excluded or able to participate without adding to TAC/TAE?	3	46	There are no provisions for new entrants other than new vessels flying the same flag[1826] and as allocations are based on historical capacity, no new entrants are likely, other than through exemptions. This may not prevent a future, separate decision of the Commission to grant participatory rights relating to purse seine capacity to a new CNM over and above these limits.
	prohibit exemptions to the limit (or exemptions not provided for)?	0	45	Exemptions applying to SIDS and Indonesia[1827] undermine the exclusivity of national capacity limits and there are no provisions for the application of chartering arrangements[1828] or reflagging of vessels to exempt CCMs.
	to impose penalties for exceeding national limits?	0		There are no penalties for exceeding a capacity limit.
	Subtotal	**6**		

[1826] CMM2018-01 para 46: In cases where a vessel is replaced "the authorization to fish in the Convention Area of the replaced vessel shall be immediately revoked by the flag CCM…".

[1827] CMM2018-01 para 45: "CCMs, *other than Small Island Developing States and Indonesia…*shall keep the number of purse seine vessels flying their flag larger than 24m with freezing capacity operating between 20°N and 20°S (hereinafter "LSPSVs") to the applicable level under CMM 2013-01" (emphasis added).

[1828] Catches and effort are to be attributed to the chartering state where such arrangements are notified under CMM2016-05. However, it is unclear how this provision applies to attribution of capacity limits. See CMM2018-01 para 8: "For the purposes of paragraphs 39-41 and 45-49, attribution of catch and effort shall be to the flag State, except that catches and effort of vessels notified as chartered under CMM 2016-05 or its replacement shall be attributed to the chartering Member, or Participating Territory. Attribution for the purpose of this Measure is without prejudice to attribution for the purposes of establishing rights and allocation".

Secure	national limits valid for more than one year?	1	55	Provision for annual reviews of this CMM provide little long-term *security* for capacity limits[1829]. The longevity of the capacity limits to date[1830] indicates that annual reviews have not placed the limits at serious risk but they are nevertheless subject to the expiry date of the CMM (15 February 2022)
	national limits valid until Parties agree to amend them? (default = perpetuity)	0	CMM2020-01	Capacity limits remain valid until the expiry of the CMM (15 February 2022) so an active decision is required to renew the limits.
	make national limits binding on Parties?	3		There are no specific provisions relating to the security of capacity limits beyond the generally binding nature of the CMM
	resolve disputes beyond bilateral negotiation	0		There are no provisions in the CMM for the resolution of disputes.
	establish a record of national scale limits (e.g. in a regional register or CMM)?	0		Although the limits are binding, capacity remains poorly defined in the CMM and there is no recording of what the applicable limits were under CMM2013-01. This will make the limits difficult to enforce or contest.
	Subtotal	**4**		
Transferable	transfer a national limit in full or in part to another CCM?	0		There are no provisions relating to transferability of national capacity limits.
	require new entrants to acquire an allocation through a transfer from a CCM?	0	46	For individual vessels, some form of incidental transferability is permitted between vessels flying the same flag when a new vessel replaces an old one. There are no provisions for transfers between vessels flying different flags or between CCMs.
	specify a process for effecting a transfer?	0		
	record transfers in a register?	0		
	Subtotal	**0**		

[1829] WCPFC CMM 2018-01 para 55.

[1830] Capacity limits are those applicable under CMM2013-01.

Flexible	set a TRP the target stock(s)?	3	12-14	No provisions indicate any form of predictable flexibility in relation to capacity limits. There is no link between the TRP for target stocks and the determination of capacity limits.
	establish harvest control rules for the target stock(s)?	1		Harvest controls are to be determined
	adjust a "limit" on the basis of environmental factors and stock assessments?	0		
	define national limits as a proportional (rather than volumetric) share of the regional TAC/TAE?	0		
	establish clear processes for a TAC/TAE to be adjusted?	0		
	Subtotal	**4**		
TOTAL		**19**		

Table A.9: CMM2018-01 Interim tropical tuna measure: Longline bigeye catch limits

Criterion	Question	Score	Ref	
Limited	set a regional or subregional scale catch or effort limit?	2	5, 39	The TRP for bigeye provides a basis for a bottom-up catch limit at the regional scale, comprising the national limits as set out in Attachment 1 Table 3 of CMM2018-01. However, these national limits apply only to six flag States and the provisions do not prejudice the rights of SIDS to developing their domestic fisheries[1831]. Any other members that caught less than 2000 tonnes annually in 2004 are required to ensure that their catches do not exceed 2000 tonnes[1832].
	base limits on the best scientific evidence available?	0	Att1 Table 3	National catch limits appear to be determined by the Commission[1833] and the Commission shall "review the bigeye catch limits…in 2018 and 2019 based on any revised stock assessments and the recommendations of the Scientific Committee"[1834]. This suggests that future limits may be informed by science. However, current limits appear to be based on historical catches rather than science or a precautionary approach[1835].
	base limits on the precautionary approach?	0		As above
	apply limits to the full geographic range of the stock?	3	3	There is no geographic restriction on the limit within the WCPFC-CA[1836]
	ensure limits account for catches of the limited species by all gear types?	0	Att1 Table 3	As the limit focuses solely on longline catches, it does not account for catches of BET by other gear types, such as purse seine gear.
	power to record bycatch of the target species against limits for that species?	0		There are no applicable provisions relating to catch retention of discards of bigeye in the longline fishery.
	Subtotal	**5**		

[1831] CMM2018-01 para 5: "With the exception of paragraphs 16-25, 31, 33-38, and 50-54, nothing in this Measure shall prejudice the rights and obligations of those small island developing State Members and Participating Territories in the Convention Area seeking to develop their domestic fisheries."
[1832] CMM2018-01 para 43: "Subject to paragraph 5, each Member that caught less than 2,000 tonnes in 2004 shall ensure that its bigeye catch does not exceed 2,000 tonnes annually".
[1833] This is implied in WCPFC CMM 2018-01 para 40: "The Commission may also take into account in setting any bigeye catch limits any plan submitted…". See further footnote 1842 below.
[1834] WCPFC CMM 2018-01 para 40. See footnote 1842 below.
[1835] The first limit on bigeye appears in CMM2005-01 para 17: "The catch of bigeye for each CCM for the next 3 years shall not exceed the average annual bigeye catch for the years 2001-2004 or the year 2004." And footnote 2: "The year 2004 shall apply only to China and the United States".
[1836] CMM2018-01 para 3: "This Measure applies to all areas of high seas and all EEZs in the Convention Area except where otherwise stated in the Measure."

Exclusive	allocate national scale limits as a share of the regional TAC/TAE?	3	39, Att1 Table 3	National longline catch limits appear to be exclusive in that the apparent limit comprises a bottom-up aggregate of the national catch limits of the six CCMs listed in Attachment 1 Table 3. Other non-SIDS CCMs are effectively allocated a limit of 2000 tonnes each[1837].
	new entrants either excluded or able to participate without adding to TAC/TAE?	2		There are no clear provisions governing the entry of new fishing States into the longline fishery. New members would also appear to have access to a 2000 tonne limit.
	prohibit exemptions to the limit (or exemptions not provided for)?	0	5	Exemptions for SIDS, permitting them to develop their domestic longline fisheries[1838], implies that SIDS may increase their catches, thus undermining the exclusivity of other CCMs' allocations.
	to impose penalties for exceeding national limits?	2	39	Any overages are to be deducted from the following year's limit but no additional penalties are incurred[1839].
	Subtotal	**7**		

[1837] CMM2018-01 para 43. See footnote 1832 above.
[1838] CMM2018-01 para 5. See footnote 1831 above.
[1839] WCPFC CMM 2018-01 para 39: "Where the limits in Table 3 have been exceeded, any overage of the catch limit by a CCM listed in Table 3 shall be deducted from the catch limit for the following year for that CCM".

Secure	national limits valid for more than one year?	1 55		CMM 2018-01 is intended to be an interim measure until the establishment of harvest strategies[1840]. The national limits in Attachment 1 Table 3 are valid for only one year[1841] and were to be reviewed in 2019[1842]. However, the CMM expires on 15 February 2022 following the rollover of the measures at WCPFC17. Using similar language to the purse seine provisions, the Commission has committed to "agreeing hard limits for bigeye and a framework to allocate those limits amongst all [CCMs]" by 2020[1843], which suggests an intention to set a long term aggregate limit[1844].
	national limits valid until Parties agree to amend them? (default = perpetuity)	0		The current limits have been in place since CMM2013-01 and will likely remain in place until the CMM expires[1845],. An extension would require an active decision of the Commission Further, national limits do not constitute "rights" and "are without prejudice to future decisions of the Commission"[1846]. National limits therefore cannot be regarded as *secure* in the long term.
	make national limits binding on Parties?	3		The generally binding nature of CMMs provides a basis for the establishment of secure rights.
	resolve disputes beyond bilateral negotiation	0		No provisions
	establish a record of national scale limits (e.g. in a regional register or CMM)?	3	Att1 Table 3	National limits are recorded in the CMM
	Subtotal	**7**		

[1840] WCPFC CMM 2018-01 para 1: "Pending the establishment of harvest strategies, and any implementing CMM, the purpose of this measure is to provide for a robust transitional management regime that ensures the sustainability of bigeye, skipjack, and yellowfin tuna stocks."
[1841] WCPFC CMM 2018-01 para 56 states this explicitly, and para 55 states that the CMM shall be reviewed annually.
[1842] WCPFC CMM 2018-01 para 40: "The Commission shall review the bigeye catch limits specified in Table 3 in 2019 based on any revised stock assessments and the recommendations of the Scientific Committee. The Commission may also take into account in setting any bigeye catch limits any plan submitted to the Secretariat by a CCM listed in Attachment 1, Table 3 to increase the level of monitoring and control of its longline vessels fishing in the Convention Area."
[1843] WCPFC CMM 2018-01 para 44: "By 2020 the Commission shall agree on hard limits for bigeye and a framework to allocate those limits amongst all Members and Participating Territories that adequately take into account Articles 8, 10 (3) and 30 of the Convention."
[1844] This is despite the provision referring to plural catch limits rather than a single catch limit, as in a TAC. The subsequent clauses however clearly refer to the allocation of those limits, which suggests that the limits are a single TAC.
[1845] Note that the CMM expires on 10 February 2021 (para 57).
[1846] WCPFC CMM 2018-01 para 42: "The limits set out in Attachment 1, Table 3 do not confer the allocation of rights to any CCM and are without prejudice to future decisions of the Commission."

Transferable	transfer a national limit in full or in part to another CCM?	0		There are no provisions in the CMM for general transferability of catch limits between States or individual users. There are no provisions explicitly addressing divisibility of national limits, although the provision permitting a one-off transfer from Japan to China[1847] indicates that there is no prohibition on divisibility of national catch limits.
	require new entrants to acquire an allocation through a transfer from a CCM?	0		No requirements that new entrants seek a transfer of catch limits to enter the fishery
	specify a process for effecting a transfer?	0		However, provision for a one-off transfer in 2018 from Japan to China suggests that specific transfers could be negotiated and endorsed by the Commission at the time of the renewal of the measure each year.
	record transfers in a register?	0		No provisions
	Subtotal	**0**		

[1847] A footnote in WCPFC CMM 2018-01 Attachment 1 Table 3 notes that "Japan will make an annual one-off transfer of 500 metric tonnes of its bigeye tuna catch limit to China."

Flexible	set a TRP the target stock(s)?	3	12	Limits are regarded as interim[1848] and are "without prejudice to attribution for the purposes of establishing rights and allocations"[1849]. The WCPFC may revise any limits based on recommendations by the SC. However, there is no clear basis in the CMM for such adjustments
	establish harvest control rules for the target stock(s)?	1		The anticipated adoption of harvest strategies[1850] provides a basis for the automatic adjustment of a TAC or TAE subject to stock assessments, should a hard TAC or TAE be established. In the meantime,
	adjust a TAC/TAE on the basis of environmental factors and stock assessments?	0		There is no mechanism to translate adjustments in a TAC or TAE into adjustments to national limits on the basis of stock assessments and the TRP[1851].
	define national limits as a proportional (rather than volumetric) share of the regional TAC/TAE?	0		National limits are volumetric rather than proportional but annual adjustments appear possible given the measure is renewed each year.
	establish clear processes for a TAC/TAE to be adjusted?	0		
	Subtotal	**4**		
TOTAL		**23**		

[1848] CMM2018-01 para39 and para 44, which records the decision of the Commission that "By 2020 the Commission shall agree on hard limits for bigeye and a framework to allocate those limits amongst all Members and Participating Territories that adequately take into account Articles 8, 10 (3) and 30 of the Convention".
[1849] CMM2018-01 para 8. "Attribution for the purpose of this Measure is without prejudice to attribution for the purposes of establishing rights and allocation", and para 42: "The limits set out in Attachment 1, Table 3 do not confer the allocation of rights to any CCM and are without prejudice to future decisions of the Commission."
[1850] WCPFC CMM 2018-01 para 1: "Pending the establishment of harvest strategies, and any implementing CMM, the purpose of this measure is to provide for a robust transitional management regime that ensures the sustainability of bigeye, skipjack, and yellowfin tuna stocks."
[1851] CMM2018-01 para 12: "Pending agreement on a target reference point the spawning biomass depletion ratio (SB/SBF=0) is to be maintained at or above the average SB/SBF=0 for 2012-2015."

Table A.10: CMM2018-01 Interim tropical tuna measure: Tropical longline capacity limits

Criterion	Question	Score	Ref	
Limited	set a regional or subregional scale catch or effort limit?	2	47, 48	National capacity limits provide a bottom-up aggregate capacity limit defined in terms of vessel numbers. As a capacity limit, catch and effort are not certain to be limited.
	base limits on the best scientific evidence available?	0		Limits are based on historical capacity, not based on scientific evidence or a precautionary approach.
	base limits on the precautionary approach?	0		As above
	apply limits to the full geographic range of the stock?	3	3	The limits apply to the entire WCPFC-CA and therefore the entire geographic range of BET stocks.
	ensure limits account for catches of the limited species by all gear types?	0	47, 48	Limits are gear-specific so they do not account for mortality of BET attributable to other gear types.
	power to record bycatch of the target species against limits for that species?	0	31	BET caught by the purse seine fishery are to be retained but are not recorded against any limits for BET. Those purse seine vessels are not part of this longline capacity limit[1852].
	Subtotal	**5**		
Exclusive	allocate national scale limits as a share of the regional TAC/TAE?	3	47, 48	The national limits – capacity frozen at levels according to CMM2013-01 – are a form of exclusive allocation of a bottom-up limit.
	new entrants either excluded or able to participate without adding to TAC/TAE?	3		There are no provisions for new entrants. As allocations are based on historical capacity, no new entrants are likely, other than through exemptions. However, this may not prevent a future, separate decision of the Commission to grant participatory rights relating to longline capacity to a new CNM over and above these limits.
	prohibit exemptions to the limit (or exemptions not provided for)?	0	47, 48, 49	Exemptions for SIDS and Indonesia[1853] nevertheless undermine the strength of capacity limits, particularly where those States have open registers. Exemptions for States imposing quotas[1854] is unlikely to undermine the capacity limit. However, quota arrangements are more likely to be established by coastal States for their EEZs rather than the high seas.
	to impose penalties for exceeding national limits?	0		There are no provisions for penalties for exceeding capacity limits.
	Subtotal	**6**		

[1852] CMM2018-01 para 31: "to create an incentive to reduce the non-intentional capture of juvenile fish, to discourage waste and to encourage an efficient utilization of fishery resources, CCMs shall require their purse seine vessels fishing in EEZs and on the high seas within the area bounded by 20oN and 20oS to retain on board and then land or transship at port all bigeye, skipjack, and yellowfin tuna". Some exceptions are permitted.

[1853] Cmm2018-01 paras 47 and 48 both commence: "CCMs, other than Small Island Developing States and Indonesia…". Para 49 further states that "Nothing in this measure shall restrict the ability of SIDS or Participating Territories to construct or purchase vessels from other CCMs for their domestic fleets".

[1854] CMM2018-01 para 48 footnote 8: "The provisions of this paragraph do not apply to those CCMs who apply domestic quotas, including individual transferable quotas, within a legislated/regulated management framework".

Secure	national limits valid for more than one year?	1	47, 48	Capacity limits remain valid until the expiry of the CMM (15 February 2022) but may be subject to change in annual reviews of the CMM[1855]. The fact that this provision has not changed substantively since CMM 2013-01 was in operation suggests that the limits are likely to continue in any successor measure. However, the CMM itself does not provide certainty in this regard.
	national limits valid until Parties agree to amend them? (default = perpetuity)	0	CMM2020-01	Capacity limits remain valid until the expiry of the CMM (15 February 2022) so an active decision is required to renew the limits.
	make national limits binding on Parties?	3		There are no specific provisions relating to the security of capacity limits beyond the generally binding nature of the CMM.
	resolve disputes beyond bilateral negotiation	0		No provisions set out dispute resolution procedures
	establish a record of national scale limits (e.g. in a regional register or CMM)?	0		No provisions record the limits to which CCMs are bound[1856].
	Subtotal	**4**		
Transferable	transfer a national limit in full or in part to another CCM?	0		No provisions allow specifically for transfer of capacity limits.
	require new entrants to acquire an allocation through a transfer from a CCM?	0		
	specify a process for effecting a transfer?	0		
	record transfers in a register?	0		
	Subtotal	**0**		

[1855] WCPFC CMM 2018-01 para 55: "The Commission shall review this CMM annually to ensure that the various provisions are having the intended effect."
[1856] The corresponding paragraphs in CMM2013-0,1 paras 51 and 52, refer to current levels but these levels are not documented in the measure.

Flexible	set a TRP the target stock(s)?	3	12	As with other instruments applying to BET, a TRP is set for in paragraph 12. However, there is no translation of the TRP to capacity limits and
	establish harvest control rules for the target stock(s)?	1		Harvest control rules have not yet been established.
	adjust a TAC/TAE on the basis of environmental factors and stock assessments?	0		
	define national limits as a proportional (rather than volumetric) share of the regional TAC/TAE?	0		
	establish clear processes for a TAC/TAE to be adjusted?	0		
	Subtotal	**4**		
TOTAL		**19**		

Table A.11: CMM2018-01 Interim tropical tuna measure: Other commercial tropical tuna fisheries

Criterion	Question	Score	Ref	
Limited	set a regional or subregional scale catch or effort limit?	2	51	While paragraph 51 appears to set a bottom-up limit on catches of BET, SKJ and YFT by fisheries other than purse seine and longline, a number of weaknesses in the definition of the limit undermines its strength. The unit of management is not clearly specified[1857] but could conceivably include fisheries defined by a coastal CCM for its EEZ (such as small scale fisheries in Indonesia and the Philippines[1858]) or fisheries defined by a flag CCM on the high seas. Indeed, there is no regional definition of "other commercial fisheries" or requirement that the definitions of such fisheries be consistent with each other[1859].
	base limits on the best scientific evidence available?	0		The limits are based on historical catches rather than science and a precautionary approach.
	base limits on the precautionary approach?	0		The limits are based on historical catches rather than science and a precautionary approach.
	apply limits to the full geographic range of the stock?	3		The measure appears designed to address mortality of the three species by covering any geographic gaps in their range.
	ensure limits account for catches of the limited species by all gear types?	2		The measure appears designed to address mortality of the three species by all gear types employed in commercial fisheries
	power to record bycatch of the target species against limits for that species?	1		The measure is silent on catch retention and discards
	Subtotal	**8**		

[1857] The operative language is in CMM2018-01 para 51: "*CCMs* shall take necessary measures to ensure that the total catch of their *respective other commercial tuna* fisheries for bigeye, yellowfin or skipjack tuna, but excluding those fisheries taking less than 2,000 tonnes of bigeye, yellowfin and skipjack, shall not exceed either the average level for the period 2001-2004 or the level of 2004." (emphasis added).

[1858] WCPFC (2021). Draft Summary Report for review and comments. Seventeenth Regular Session of the Western and Central Pacific Fishieries Commission (WCPFC17), Electronic Meeting, 8-15 December 2020, Western and Central Pacific Fishieries Commission (WCPFC). paras 196-200.

[1859] CMM2018-01 para 50: "To assist the Commission in the further development of provisions to manage the catch of bigeye, yellowfin, and skipjack tunas, the Scientific and Technical and Compliance Committees during their meeting in 2019 will provide advice to the Commission on which fisheries should be included in this effort and what information is needed to develop appropriate management measures for those fisheries." The difficulties in defining and ensuring compliance in "other commercial fisheries" are illustrated by the discussion at WCPFC 16 on the definition and ability to manage compliance in such fisheries. See WCPFC (2020). Summary Report. Sixteenth Regular Session of the Western and Central Pacific Fisheries Commission (WCPFC16), 5-11 December 2019, Port Moresby, WCPFC. paras 367-76.

Exclusive	allocate national scale limits as a share of the regional TAC/TAE?	2	51	As with all bottom-up limits, catch limits appear to be exclusive allocations at the national scale. However, the poor definition of limits means limits may be defined in ways that are inconsistent with each.
	new entrants either excluded or able to participate without adding to TAC/TAE?	3		Silent on new entrants. New entrants without a fishing history are presumably not able to take these three species.
	prohibit exemptions to the limit (or exemptions not provided for)?	2	5, 50, 51	There are no exemptions for SIDSTs[1860]. As no specific provisions apply to CCMs whose catches in other commercial fisheries are less than 2000 tonnes[1861], they can be assumed to be limited to 2000 tonnes each. It is unclear whether the 2000 tonne threshold applies to each species or all three species collectively. The former interpretation could theoretically produce catches three times the volume of the latter.
	to impose penalties for exceeding national limits?	0		There are no penalties for non-compliance.
	Subtotal	**7**		
Secure	national limits valid for more than one year?	1	5	Like other provisions in CMM2018-01, the longevity of the limits improves confidence in the durability of allocations. However, the revised expiry date of 15 February 2022[1862], and anticipated annual reviews[1863] provides little confidence that this will remain the case.
	national limits valid until Parties agree to amend them? (default = perpetuity)	0		The expiry date means an active decision is required to renew the measure
	make national limits binding on Parties?	3		The binding nature of the CMM supports secure allocations
	resolve disputes beyond bilateral negotiation	0		There are no provisions for dispute settlement.
	establish a record of national scale limits (e.g. in a regional register or CMM)?	0		The quantum of the quantitative limits applying to each CCM under this provision are also not specified in the CMM[1864] which could lead to contestation of data sources.
	Subtotal	**4**		

[1860] CM2018-01 para 5: "With the exception of paragraphs 16-25, 31, 33-38, and 50-54, nothing in this Measure shall prejudice the rights and obligations of those small island developing State Members and Participating Territories in the Convention Area seeking to develop their domestic fisheries."
[1861] CMM2018-01 para 51: "CCMs shall take necessary measures to ensure that the total catch of their respective other commercial tuna fisheries for bigeye, yellowfin or skipjack tuna, but excluding those fisheries taking less than 2,000 tonnes of bigeye, yellowfin and skipjack, shall not exceed either the average level for the period 2001-2004 or the level of 2004".
[1862] CMM2018-01 para 57; CMM 2020-01.
[1863] CMM2018-01 para 55: "The Commission shall review this CMM annually to ensure that the various provisions are having the intended effect."
[1864] This is a similar framing to early iterations of the tropical tuna measure.

Transferable	transfer a national limit in full or in part to another CCM?	0		There are no provisions for the transferability of national allocations.
	require new entrants to acquire an allocation through a transfer from a CCM?	0		
	specify a process for effecting a transfer?	0		
	record transfers in a register?	0		
	Subtotal	**0**		
Flexible	set a TRP the target stock(s)?	3		As with other instruments in CMM 2018-01, a TRP is in place for each of the three target species[1865].
	establish harvest control rules for the target stock(s)?	1		Harvest control rules are to be developed.
	adjust a TAC/TAE on the basis of environmental factors and stock assessments?	0		There are no mechanisms to adjust a TAC, or national allocations in response to changes in stock assessments
	define national limits as a proportional (rather than volumetric) share of the regional TAC/TAE?	0		Allocations are volumetric
	establish clear processes for a TAC/TAE to be adjusted?	0		There are no mechanisms to adjust a TAC, or national allocations in response to changes in stock assessments
	Subtotal	**4**		
TOTAL		**23**		

[1865] CMM2018-01 paras 12-14.

Table A.12: CMM2015-02 South Pacific Albacore

Criterion	Question	Score	Ref	
Limited	set a regional or subregional scale catch or effort limit?	2	1	The capacity limit is defined by the number of individual vessels targeting SPA. However, the absence of a more detailed definition of capacity undermines its ability to constrain effort or catches.
	base limits on the best scientific evidence available?	0		The limit is purportedly based on the advice of the SC[1866] but does not directly reduce catches or prevent effort from increasing as recommended by SC, and therefore cannot be considered to be based on science or a precautionary approach.
	base limits on the precautionary approach?	0		As above
	apply limits to the full geographic range of the stock?	0		The measure is limited geographically by not including catches of southern albacore stocks between the equator and 20°S.
	ensure limits account for catches of the limited species by all gear types?	3		The measure is not limited by gear type
	power to record bycatch of the target species against limits for that species?	1		As the limit includes all vessels "actively fishing" for SPA, performance against the national limits is unlikely to include discards and bycatch taken by vessels targeting other species
	Subtotal	**6**		
Exclusive	allocate national scale limits as a share of the regional TAC/TAE?	3	1	The limit is a bottom-up aggregate of all national limits and therefore can be regarded as exclusive allocations of the limit.
	new entrants either excluded or able to participate without adding to TAC/TAE?	1		Exclusivity is marginally strengthened by the absence of provisions for new entrants in general.
	prohibit exemptions to the limit (or exemptions not provided for)?	0	2	SIDSTs are effectively exempted from the limit with respect to domestic fisheries within waters under their jurisdiction[1867]. New developing entrants are therefore able to expand effort beyond the historical levels in paragraph 1. "A responsible level of development" of such fisheries is unlikely to be attainable given SC's advice.
	to impose penalties for exceeding national limits?	0		No provisions
	Subtotal	**4**		

[1866] In SC, W. (2015). Summary Report SC11 Eleventh Regular Session of the Scientific Committee (SC) of the Western and Central Pacific Fisheries Commission (WCPFC), 5-13 August 2015, Pohnpei, WCPFC. The SC advised WCPFC12 in 2015 that "further increases in effort will yield little or no increase in long-term catches and result in further reduced catch rates" (para 47) and that "longline fishing mortality and longline catch be reduced to avoid further decline in the vulnerable biomass so that economically viable catch rates can be maintained" (para 50).

[1867] CMM2015-02 para 2: "The provisions of paragraph 1 shall not prejudice the legitimate rights and obligations under international law of small island developing State and Territory CCMs in the Convention Area for whom South Pacific albacore is an important component of the domestic tuna fishery in waters under their national jurisdiction, and who may wish to pursue a responsible level of development of their fisheries for South Pacific albacore."

Secure	national limits valid for more than one year?	2		Although they are to be reviewed annually[1868], national scale limits have been in place for more than one year.
	national limits valid until Parties agree to amend them? (default = perpetuity)	3		Limits will continue until the Commission decides to alter them
	make national limits binding on Parties?	3		The CMM is binding
	resolve disputes beyond bilateral negotiation	0		There are no provisions for dispute resolution.
	establish a record of national scale limits (e.g. in a regional register or CMM)?	0		Agreed limits are not documented in the CMM so there is a risk that limits are contestable.
	Subtotal	**8**		
Transferable	transfer a national limit in full or in part to another CCM?	0		The CMM contains no provisions relating to transferability of national allocations between CCMs.
	require new entrants to acquire an allocation through a transfer from a CCM?	0		
	specify a process for effecting a transfer?	0		
	record transfers in a register?	0		
	Subtotal	**0**		
Flexible	set a TRP the target stock(s)?	3	WCPFC15	An interim TRP has been set for SPA[1869] and. National effort scale limits are volumetric rather than proportional shares of an overall limit.
	establish harvest control rules for the target stock(s)?	1		Harvest control rules are proposed[1870]
	adjust a TAC/TAE on the basis of environmental factors and stock assessments?	0		No provisions set out how harvest control rules will affect the limit and national allocations
	define national limits as a proportional (rather than volumetric) share of the regional TAC/TAE?	0		
	establish clear processes for a TAC/TAE to be adjusted?	0		
	Subtotal	**4**		
TOTAL		**22**		

[1868] CMM2015-02 para 5.

[1869] WCPFC15 agreed a TRP for SPA of 56% of the unfished spawning biomass ($0.56SB_{F=0}$). WCPFC (2019). Summary Report. Fifteenth Regular Session the Western and Central Pacific Fisheries Commission (WCPFC15), 10-14 December 2018, Honolulu, Western and Central Pacific Fisheries Commission (WCPFC). para 207.

[1870] WCPFC (2021). Attachment H: Indicative Work Plan for the Adoption of Harvest Strategies Under CMM 2014-06. Seventeenth Regular Session of the Western and Central Pacific Fisheries Commission (WCPFC17), Electronic Meeting, 8-15 December 2020, Western and Central Pacific Fisheries Commission (WCPFC).

Table A.13: CMM2019-04 Sharks

Criterion	Question	Score	Ref	
Limited	set a regional or subregional scale catch or effort limit?	1	Annex2 para 5	CCMs are required to adopt national measures to limit catches of target shark species by longline fisheries under national management plans[1871]. Such nationally determined limits are unlikely to be compatible with each other and therefore do not represent, in aggregate, a regionally-agreed limit.
	base limits on the best scientific evidence available?	1	Para 2	The measure notes that it is to be achieved "through…the precautionary approach and an ecosystem approach to fisheries management" it is not clear that this will flow through to national plans. As limits are self-declared, there is no guarantee that they will be based on scientific evidence or a precautionary approach[1872].
	base limits on the precautionary approach?	1	Para 2	As above
	apply limits to the full geographic range of the stock?	3		National plans appear to apply to the entire geographic range of the stock[1873].
	ensure limits account for catches of the limited species by all gear types?	0	Para 16	National plans are limited to longline fisheries[1874].
	power to record bycatch of the target species against limits for that species?	2	Paras 7, 8, 9	For sharks that are permitted to be retained, the requirement that the entire carcass be landed or transhipped provides some support for the attribution of those species to catches under any quota in place.
	Subtotal	**8**		

[1871] CMM2019-04 para16: "For longline fisheries targeting sharks, CCMs shall develop and report their management plans in their Part 2 Annual Report."
[1872] CMM2019-04 para 2: "The objective of this Conservation and Management Measure (CMM) is, through the application of the precautionary approach and an ecosystem approach to fisheries management, to ensure the long-term conservation and sustainable use of sharks".
[1873] CMM2019-04 para 4: "This measure shall apply to the high seas and exclusive economic zones of the Convention Area."
[1874] CMM 2019-04 para 16. See footnote 1871 above.

Exclusive	allocate national scale limits as a share of the regional TAC/TAE?	0		Nationally determined limits are incompatible with a regional scale limit and therefore cannot be regarded as exclusive allocations of a limit. This being the case, while individual quota systems may be in place at the national scale, this does not translate automatically to an RBM scheme at a regional scale. Any increase in a national TAC by one CCM reduces the stock available to other CCMs, rendering each CCM's limit non-exclusive.
	new entrants either excluded or able to participate without adding to TAC/TAE?	0		New entrants must be presumed to enjoy the same rights and obligations under the CMM and therefore would likely add to overall catches.
	prohibit exemptions to the limit (or exemptions not provided for)?	0		If a regional scale limit were in place, traditional fishing activities would likely be exempt. A general provision recognises the "…sovereignty and sovereign rights of coastal States, including for traditional fishing activities and the rights of traditional fishers, to apply alternative measures for the purpose of exploring, exploiting, conserving and managing sharks…within areas under their national jurisdiction"[1875].
	to impose penalties for exceeding national limits?	0		No penalties are specified for breaching national limits.
	Subtotal	**0**		
Secure	national limits valid for more than one year?	3		National limits are nationally determined and therefore held in perpetuity or until otherwise determined by the CCM or until the Commission as a whole adopts a different measure containing regional scale limits with which national management plans must conform.
	national limits valid until Parties agree to amend them? (default = perpetuity)	3		National limits are nationally determined and therefore held in perpetuity or until otherwise determined by the CCM or until the Commission as a whole adopts a different measure containing regional scale limits with which national management plans must conform.
	make national limits binding on Parties?	0		National autonomy means that national limits are not binding on each other
	resolve disputes beyond bilateral negotiation	0		No provisions
	establish a record of national scale limits (e.g. in a regional register or CMM)?	0		No record of national limits is maintained, other than what is reported by CCMs in their Annual Reports.
	Subtotal	**6**		

[1875] CMM2019-04 para 5. The provisions commences "*Nothing in this measure shall prejudice* the sovereignty and sovereign rights of coastal States…" (emphasis added). This is in addition to the temporary exemption granted to Indonesia.

Transferable	transfer a national limit in full or in part to another CCM?	1		There are no provisions for transferability of portions of national catch limits to other CCMs or to new entrants. Transfers could conceivably be achieved between two or more CCMs by mutual agreement but this is not provided for in the measure.
	require new entrants to acquire an allocation through a transfer from a CCM?	0		
	specify a process for effecting a transfer?	0		
	record transfers in a register?	0		
	Subtotal	**1**		
Flexible	set a TRP the target stock(s)?	0		No TRP has been set for any target shark species
	establish harvest control rules for the target stock(s)?	0		As the aggregate limit can change as each CCM revises its national limit, it is unlikely to be stable or predictably flexible.
	adjust a TAC/TAE on the basis of environmental factors and stock assessments?	0		
	define national limits as a proportional (rather than volumetric) share of the regional TAC/TAE?	0		
	establish clear processes for a TAC/TAE to be adjusted?	0		
	Subtotal	**0**		
TOTAL		**15**		

Table A.14: CMM 2006-04 Striped marlin in the South West Pacific

Criterion	Question	Score	Ref	
Limited	set a regional or subregional scale catch or effort limit?	2	1, 4	Capacity limits are self-reported[1876]. Capacity is only defined in para 1 as the number of vessels, with no other restrictions on vessel length, well capacity or other metric[1877].
	base limits on the best scientific evidence available?	2	Preamble	The CMM is based on the recommendations of the Scientific Committee[1878] and acknowledges that striped marlin stocks in the south west Pacific have been declining but does not reduce the number of vessels[1879].
	base limits on the precautionary approach?	2	Preamble	The preamble claims that holding limits steady to be a precautionary measure, although, as noted above, a reduction in harvests would appear warranted. Further, the limit has not been updated since 2006.
	apply limits to the full geographic range of the stock?	0	1	The gap in the geographic range between the equator and 15ºS leaves catches in that band unregulated, undermining the two limits (para 1).
	ensure limits account for catches of the limited species by all gear types?	3	1	Gear type is not specified[1880] and therefore presumed to cover all gear types.
	power to record bycatch of the target species against limits for that species?	1	1	The limit applies to "fishing vessels fishing for striped marlin"[1881]. CCMs' interpretations have varied as to whether vessels that catch striped marlin as bycatch qualify as "fishing for striped marlin"[1882].
	Subtotal	**10**		

[1876] CMM2006-04 para 4: "In accordance with paragraph 1, CCMs shall provide information to the Commission, by 1 July 2007, on the number of their vessels that have fished for striped marlin in the Convention area south of 15º S, during the period 2000 – 2004, and in doing so, nominate the maximum number of vessels that shall continue to be permitted to fish for striped marlin in the area south of 150 S…"

[1877] CMM2006-04 para 1: "Commission Members, Cooperating Non-Members, and participating Territories (CCMs) shall limit the number of their fishing vessels fishing for striped marlin in the Convention Area south of 15º S, to the number in any one year between the period 2000 – 2004.

[1878] CMM2006-04 Preamble: "Further noting that the Scientific Committee has recommended as a precautionary measure that there be no increases in fishing mortality on this stock until estimates of stock status are more certain, as increases in fishing mortality are likely to move the stock towards an overfished state".

[1879] CMM 2006-04 Preamble: "Noting that the first regional assessment undertaken for striped marlin in the Southwestern Pacific region has indicated consistent declines in stock abundance; Further noting that the Scientific Committee has recommended as a precautionary measure that there be no increases in fishing mortality on this stock until estimates of stock status are more certain, as increases in fishing mortality are likely to move the stock towards an overfished state".

[1880] CMM2006-04 para 1. See footnote 1877 above.

[1881] CMM2006-04 para 1. See footnote 1877 above.

[1882] See for example WCPFC (2008). Summary Report. Fourth Regular Session of the Western and Central Pacific Fisheries Commission (WCPFC4), Tumon, Guam, 2-7 December 2007, Western and Central Pacific Fisheries Commission (WCPFC). paras 263-265, in which the US clarified that the vessels it had reported in compliance with CMM2006-04 para 4 had caught striped marlin as bycatch. Japan, on the other hand, had not submitted vessel numbers as catches by its vessels had been bycatch. French Polynesian vessels had also caught striped marlin as bycatch but offered to submit required data.

Exclusive	allocate national scale limits as a share of the regional TAC/TAE?	3	1	Establishes a bottom-up capacity limit, creating exclusive allocations by default. Limits are distributed among flag States.
	new entrants either excluded or able to participate without adding to TAC/TAE?	3		The absence of provisions for new entrants is interpreted as not permitting new entrants, as they would not possess a fishing history
	prohibit exemptions to the limit (or exemptions not provided for)?	0	2, 5	The limit does not apply to coastal CCMs that have taken "significant steps" – defined as a commercial moratorium on landing striped marlin caught within their waters – to address striped marlin[1883]. The moratorium does not include landings in a third country port of striped marlin caught in a different coastal CCM's waters. SIDSTs can arguably avoid the capacity limits for vessels targeting striped marlin in the south west Pacific[1884].
	to impose penalties for exceeding national limits?	0		Contains provisions for penalties in cases where limits are exceeded.
	Subtotal	**6**		

[1883] CMM2006-04 para 5: "Paragraphs 1-4 do not apply to those coastal states CCMs south of 15 degrees south in the Convention Area who have already taken, and continue to take, significant steps to address concerns over the status of striped marlin in the Southwestern Pacific region, through the establishment of a commercial moratorium on the landing of striped marlin caught within waters under their national jurisdiction."

[1884] CMM2006-04 para 2. "Paragraph 1 shall not prejudice the legitimate rights and obligations under international law of small island developing State and Territory CCMs, in the Convention Area who may wish to pursue a responsible level of development of their own fisheries for striped marlin in the Convention Area south of 150 S from 2000 - 2004 levels, and the legitimate rights and obligations of coastal states who may wish to pursue a responsible level of development within their fisheries waters".

Secure	national limits valid for more than one year?	3		Limits are not time-bound.
	national limits valid until Parties agree to amend them? (default = perpetuity)	3		Limits are not time-bound and are therefore held in perpetuity or until the CMM is amended by the Commission.
	make national limits binding on Parties?	3		The CMM is binding to the extent that it can be monitored
	resolve disputes beyond bilateral negotiation	0		Contains no provisions for the resolution of disputes.
	establish a record of national scale limits (e.g. in a regional register or CMM)?	1		Requires self-reporting and there is no agreed central register of limits to be applied. The closest mechanism to a register is each CCM's notifications provided to the Commission for historic vessel numbers in the southwest Pacific[1885]. Responses to the latter requirement have been mixed[1886].
	Subtotal	**10**		
Transferable	transfer a national limit in full or in part to another CCM?	0		There are no explicit provisions for transferability of vessel limits in the southwest Pacific.
	require new entrants to acquire an allocation through a transfer from a CCM?	0		
	specify a process for effecting a transfer?	0		
	record transfers in a register?	0		
	Subtotal	**0**		

[1885] CMM2006-04 para 4: CCMs were required to notify by 1 July 2007 the number of their vessels that have fished for striped marlin south of 15°S from 2000 to 2004 and "nominate the maximum number of vessels that shall continue to be permitted to fish for striped marlin in the area south of 15°S."

[1886] See for example WCPFC (2008). Summary Report. Fourth Regular Session of the Western and Central Pacific Fisheries Commission (WCPFC4), Tumon, Guam, 2-7 December 2007, Western and Central Pacific Fisheries Commission (WCPFC). para 262: "Four CCMs have provided this information to the Commission and two other CCMs, Vanuatu and the USA, have provided other related information."

Flexible	set a TRP the target stock(s)?	0		There is no TRP set for striped marlin.
	establish harvest control rules for the target stock(s)?	0		There are no plans for the development of a harvest strategy.
	adjust a TAC/TAE on the basis of environmental factors and stock assessments?	0		There are no clear plans to adjust the limits or review the CMM
	define national limits as a proportional share of the regional TAC/TAE?	0		Allocations of vessel numbers and catch are volumetric, not proportional
	establish clear processes for a TAC/TAE to be adjusted?	0		
	Subtotal	**0**		
TOTAL		**26**		

Table A.15: CMM 2010-01 Striped marlin in the North Pacific

Criterion	Question	Score	Ref	
Limited	set a regional or subregional scale catch or effort limit?	3	5	Striped marlin in the north Pacific are managed by a catch limit, albeit based on self-reported catch histories by each flag CCM[1887]. The preamble notes that the FFA plans to institute zone-based limits rather than flag-based limits[1888] but this has no immediate effect on the operation of the CMM.
	base limits on the best scientific evidence available?	3	Preamble, 5	The limit is ostensibly based on the best scientific evidence available to the International Scientific Committee (ISC)[1889] and the CMM provides for a phased reduction of catches by 20% over three years[1890].
	base limits on the precautionary approach?	1		Silent
	apply limits to the full geographic range of the stock?	0	1	The gap in the geographic range of the two CMMs between the equator and 15°S leaves catches in that band unregulated, undermining the two limits[1891].
	ensure limits account for catches of the limited species by all gear types?	3	5	No gear is specified, which implies that the limit should cover catches by all gear types
	power to record bycatch of the target species against limits for that species?	2	5	The simple reference to limiting "catches" implies the inclusion of bycatch in limits. Explicit reference to bycatch would strengthen this conclusion.
	Subtotal	**12**		

[1887] CMM2010-01 para 4: "The total catch of North Pacific Striped Marlin will be subject to a phased reduction such that by 1 January 2013 the catch is [80%] of the levels caught in 2000 to 2003".
[1888] CMM2010-01 Preamble: "Also noting that the Pacific Islands Forum Fisheries Agency (FFA) Members will be adopting a system of zone-based longline limits to replace the current system of flag-based arrangements within their Exclusive Economic Zones (EEZs)".
[1889] CMM2010-01 Preamble: "Noting with concern that the best available scientific advice from the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC) on the status of North Pacific Striped Marlin shows that the stock is subject to fishing mortality above levels that are sustainable in the long term".
[1890] CMM2010-01 para 5 requires catches to be reduced from 2000-2003 levels by 10% in 2011, 15% in 2012 and 20% in 2013.
[1891] CMM 2006-04 para 1; CMM2010-01 para 1.

Exclusive	allocate national scale limits as a share of the regional TAC/TAE?	3	5	Establishes exclusive bottom-up limits based on the catch history of each flag CCM.
	new entrants either excluded or able to participate without adding to TAC/TAE?	3		The absence of provisions for new entrants is interpreted as not permitting new entrants, as they would not possess a catch history.
	prohibit exemptions to the limit (or exemptions not provided for)?	0	3	Apparent exemption for SIDSTs[1892]
	to impose penalties for exceeding national limits?	0		Contains no provisions for penalties in cases where limits are exceeded.
	Subtotal	**6**		
Secure	national limits valid for more than one year?	3	5	North Pacific striped marlin catch limits are valid in perpetuity or until amended by the Commission[1893]. The measure was due to be reviewed in 2011 to reflect a new stock assessment. However, this assessment was not conducted[1894] and to date the CMM has not been amended[1895].
	national limits valid until Parties agree to amend them? (default = perpetuity)	3	5	North Pacific striped marlin catch limits are valid in perpetuity or until amended by the Commission[1896].
	make national limits binding on Parties?	3		The CMM is binding
	resolve disputes beyond bilateral negotiation	0		Contains no provisions for the resolution of disputes.
	establish a record of national scale limits (e.g. in a regional register or CMM)?	1		Requires self-reporting and there is no agreed central register of vessel or catch limits to be applied. The closest mechanism to a register is each CCM's Annual Reports Part 2[1897].
	Subtotal	**10**		

[1892] CMM2010-01 para 3: "Nothing in this measure shall prejudice the legitimate rights and obligations of Small Island Developing State Members and participating territories in the Convention Area seeking to develop their own domestic fisheries."
[1893] CMM2010-01 para 5: "Each flag/chartering CCM with vessels fishing in the convention area north of the equator shall be subject to the following catch limits for North Pacific Striped Marlin for the years 2011 and beyond:…"
[1894] WCPFC (2008). Summary Report. Fourth Regular Session of the Western and Central Pacific Fisheries Commission (WCPFC4), Tumon, Guam, 2-7 December 2007, Western and Central Pacific Fisheries Commission (WCPFC). para 76(d)
[1895] CMM2010-01 para 9: "This measure shall be amended in 2011 based on the revised stock assessment for north Pacific striped marlin."
[1896] CMM2010-01 para 5: "Each flag/chartering CCM with vessels fishing in the convention area north of the equator shall be subject to the following catch limits for North Pacific Striped Marlin for the years 2011 and beyond:…"
[1897] CMM2010-01 para 8: "Each year CCMs shall report in their Part 2 annual reports their implementation of this measure, including the measures applied to flagged/chartered vessels to reduce their catch and the total catch taken against the limits established under paragraphs 5 and 7".

Transferable	transfer a national limit in full or in part to another CCM?	0		No explicit provisions for transferability of catch limits. Catches by vessels under charter or similar arrangements are to be counted against the limits allocated to the chartering CCM[1898]. Chartering State does gain additional allowable catch and therefore does not constitute a form of incidental transfer.
	require new entrants to acquire an allocation through a transfer from a CCM?	0		
	specify a process for effecting a transfer?	0		
	record transfers in a register?	0		
	Subtotal	**0**		
Flexible	set a TRP the target stock(s)?	0		There is no TRP set.
	establish harvest control rules for the target stock(s)?	0		There are no plans for the development of a harvest strategy.
	adjust a TAC/TAE on the basis of environmental factors and stock assessments?	0		There are no clear plans to adjust the limit or review the CMM.
	define national limits as a proportional share of the regional TAC/TAE?	0		
	establish clear processes for a TAC/TAE to be adjusted?	0		
	Subtotal	**0**		
TOTAL		**28**		

[1898] CMM2010-01 para 2: "For the purposes of this measure, vessels operated under charter, lease or other similar mechanisms as an integral part of the domestic fleet of a coastal State, shall be considered to be vessels of the host State or Territory. Such charter, lease or other similar mechanism shall be conducted in a manner so as not to charter known IUU vessels."

Table A.16: CMM 2009-03 Swordfish capacity limits

Criterion	Question	Score	Ref	
Limited	set a regional or subregional scale catch or effort limit?	2	1, Annex 1	The CMM sets a bottom-up limit comprising the aggregate of all national scale capacity limits[1899]. Capacity is, however, a weaker definition of the limit than effort or catch.
	base limits on the best scientific evidence available?	0	WCPFC16-2019-DP19	Australia has argued that CMM2009-03 fails to meet the requirement in WCPF Convention Article 5b that measures be based on the best available scientific information [1900]
	base limits on the precautionary approach?	0	WCPFC16-2019-DP19	According to the preamble, both limits are based on the SC recommendation that there be no increase in swordfish catch or effort as a precautionary measure[1901]. As limits are based on the best year in a given period, they allow for a potential increase in capacity and catches.
	apply limits to the full geographic range of the stock?	0	2, Preamble	The measure does not apply north of 20°S. No other CMM addresses swordfish north of 20°S but para prohibits CCMs from shifting fishing effort north of 20°S[1902]. No limits apply to catch, effort or capacity in tropical[1903] and northern swordfish[1904] fisheries, or indeed in the eastern Pacific[1905].
	ensure limits account for catches of the limited species by all gear types?	3	1	The limit does not specify the gear type to which this CMM applies which suggests that no gear types should be excluded.
	power to record bycatch of the target species against limits for that species?	2	1, Annex 1	A limit on "the number of…fishing vessels [fishing] for swordfish" could not reasonably apply to vessels that take swordfish as bycatch, as this could conceivably apply to all longliners. However, some CCMs have specified a limit on the number of its vessels that took swordfish as bycatch.

[1899] CMM2009-03 para 1.

[1900] See Australia (2019). Strengthening the Management of South Pacific Broadbill Swordfish (*Xiphias Gladius*). Sixteenth Regular Session of the Western and Central Pacific Fisheries Commission (WCPFC). 5-11 December 2019, Port Moresby, WCPFC. **WCPFC16-2019-DP19**. pp8-9 and Table 2.

[1901] CMM2009-03 Preamble: "Noting that due to the uncertainty in the 2008 stock assessment for south-western Pacific swordfish, the SC recommended that there be no further increase in catch or effort in order to keep the stock above its associated reference points; Further noting that the Scientific Committee has recommended that there be no increases in fishing mortality for south-central Pacific swordfish as a precautionary measure given the lack of a formal assessment and that constraining fishing mortality to current levels is recommended until there is a better understanding of fishing impacts in the south-central Pacific stock and the relationship between this stock and other south Pacific stocks is more certain;"

[1902] CMM2009-03 para 3: "CCMs shall not shift their fishing effort for swordfish to the area north of 20°S, as a result of this measure."

[1903] The WCPFC Scientific Committee has noted that Catches of South Pacific swordfish between the equator and 20°S represent around half of total catches of the stock. See WCPFC SC (2017). Summary Report. Thirteenth Regular Session of the WCPFC Scientific Committee (SC13), 9-17 August 2017, Raratonga, Western and Central Pacific Fisheries Commission (WCFPC). para 142.

[1904] WCPFC SC (2019). Summary Report SC14. Fourteenth Regular Session of the Scientific Committee (SC14), 8-16 August 2019, Busan, WCPFC.

[1905] See the description of swordfish stock distribution and structure in, and proposals put forward by, Australia (2019). Strengthening the Management of South Pacific Broadbill Swordfish (*Xiphias Gladius*). Sixteenth Regular Session of the Western and Central Pacific Fisheries Commission (WCPFC). 5-11 December 2019, Port Moresby, WCPFC. **WCPFC16-2019-DP19**.

	Subtotal	**7**		
Exclusive	allocate national scale limits as a share of the regional TAC/TAE?	2	1, Annex 1	National capacity limits resemble exclusive national scale shares of a subregional, bottom-up limit. However, exclusivity is undermined by the incomplete record of CCMs bound by both capacity limits[1906] and catch limits[1907].
	new entrants either excluded or able to participate without adding to TAC/TAE?	0	1	There are no provisions for new entrants. Under the current measure, CCMs without a fishing history in the relevant dates are excluded from fishery south of 20°S but are free to enter the fishery north of that latitude. Whether the CMM could be revised to accommodate a new entrant south of 20°S remains to be seen.
	prohibit exemptions to the limit (or exemptions not provided for)?	0	5, 6	Capacity limits shall not "prejudice the legitimate rights and obligations under international law" of SIDS and participating territories in the WCPFC-CA to develop "their own fisheries"[1908]. The meaning of "their own fisheries" is not defined but could include both fishing by any vessel within the coastal CCM's waters and fishing by vessels flying its flag on the high seas. This appears to represent a broad exemption for SIDTs that could undermine exclusivity. The exemption is compounded by chartering provisions permitting coastal CCMs to charter foreign vessels, including as part of a fishery development activity[1909].
	to impose penalties for exceeding national limits?	0	9	There are no penalties and no equivalent "bring forward" provisions for capacity limits.
	Subtotal	**2**		

[1906] CMM2009-03 para 1 and Annex 1.

[1907] WCPFC (2010). Review of CCMs' Implementation of, and Compliance with, Conservation and Management Measures. Technical and Compliance Commiteee Sixth Regular Session. Pohnpei, 30 September to 5 October 2010, Western and Central Pacific Fisheries Commission (WCPFC). **WCPFC-TCC6-2010/22 Rev 1**. Attachment 6.

[1908] CMM2009-03 para 5: "Paragraphs 1 to 4 and paragraph 9 shall not prejudice the legitimate rights and obligations under international law of small island developing State and participating Territory CCMs, in the Convention Area who may wish to pursue a responsible level of development of their own fisheries in the Convention Area."

[1909] CMM2009-03 para 6: "For the purposes of these measures, vessels operated under charter, lease or other similar mechanisms as an integral part of the domestic fleet of a coastal State, shall be considered to be vessels of the host State or Territory. Such charter, lease or other similar mechanism shall be conducted in a manner so as not to charter known IUU vessels".

Annex

Secure	national limits valid for more than one year?	3		The WCPFC has stipulated that compliance with CMM2009-03 should be assessed every three years[1910].
	national limits valid until Parties agree to amend them? (default = perpetuity)	3		There is no end date for CMM2009-03 and while the CMM contains a provision for review in 2011[1911], the CMM, and the allocations and limits therein, can be assumed to remain in force in perpetuity or until the Commission amends it.
	make national limits binding on Parties?	2		Although the CMM is binding, CCMs have noted the data gaps to ensure compliance with quantitative limits on swordfish under CMM2009-03[1912].
	resolve disputes beyond bilateral negotiation	0		No provisions for the settlement of disputes beyond negotiations between the parties.
	establish a record of national scale limits (e.g. in a regional register or CMM)?	2		Exclusivity is undermined by the incomplete record of CCMs bound by capacity limits[1913].
	Subtotal	**10**		
Transferable	transfer a national limit in full or in part to another CCM?	0		The CMM contains no provisions permitting or prohibiting national scale allocations to be permanently or temporarily transferred to another CCM in full or in part.
	require new entrants to acquire an allocation through a transfer from a CCM?	0		
	specify a process for effecting a transfer?	0		
	record transfers in a register?	0		
	Subtotal	**0**		

[1910] WCPFC (2016). WCPFC13 Outcomes document. Western and Central Pacific Fisheries Commission 13th Regular Session, Fiji, 5-9 December 2016, WCPFC. para 158 and Attachment I Table 1.

[1911] CMM2009-03 para 11.

[1912] "There are presently nine quantitative limits where there are limited or no additional data presently available to WCPFC to verify the CCM's report on their implementation against the limit. [CMM 2005-03 02 (NP albacore), CMM 2006-04 01 (SW Striped Marlin), CMM 2009-03 01, 02 (Swordfish), CMM 2010-01 05 (NP striped marlin), CMM 2018-01 45, 47, 48 (Tropical tuna vessel limits), CMM 2018-01 51, CMM 2017-08 (Pacific Bluefin)]. TCC has recommended that the Commission should consider whether additional reporting or revised formulations of quantitative limits should be considered so that WCPFC has more ready access to data that can be used to verify a CCM's implementation of a quantitative limit." WCPFC TCC (2019). Summary Report TCC15. Fifteenth Regular Session of the Technical and Compliance Committee (TCC15). September 25 – October 1 2019, Pohnpei WCPFC., Att C Para 9.

[1913] CMM2009-03 para 1 and Annex 1.

Annex

Flexible	set a TRP the target stock(s)?	0	WCPFC16-2019-09	No TRP has been determined for swordfish[1914]
	establish harvest control rules for the target stock(s)?	0		No plans for the development of a harvest strategy[1915]
	adjust a TAC/TAE on the basis of environmental factors and stock assessments?	0		
	define national limits as a proportional share of the regional TAC/TAE?	0		
	establish clear processes for a TAC/TAE to be adjusted?	0		
	Subtotal	**0**		
TOTAL	**Total**	**19**		

[1914] SPC (2019). An overview of progress in developing WCPFC harvest strategies. WCPFC Sixteenth Regular Session. Port Moresby, 5-11 December 2019, Western and Central Pacific Fisheries Commission (WCPFC). **WCPFC16-2019-09**.
[1915] Ibid.

Table A.17: CMM 2009-03 Swordfish catch limits

Criterion	Question	Score	Ref	
Limited	set a regional or subregional scale catch or effort limit?	3	2, Annex 2	The CMM sets a bottom-up limit comprising the aggregate of all national scale catch[1916] limits
	base limits on the best scientific evidence available?	0	WCPFC16-2019-DP19	Australia has argued that CMM2009-03 fails to meet the requirement in WCPF Convention Article 5b that measures be based on the best available scientific information[1917].
	base limits on the precautionary approach?	0	WCPFC16-2019-DP19	According to the preamble, both limits are based on the SC recommendation that there be no increase in swordfish catch or effort as a precautionary measure[1918]. As limits are based on the best year in a given period, they allow for a potential increase in capacity and catches.
	apply limits to the full geographic range of the stock?	0	2, Preamble	The limit is restricted to south of 20°S. No other CMM addresses swordfish north of 20°S but paragraph 3 of CMM2009-03 prohibits CCMs from shifting fishing effort from the southern zone to the north zone[1919]. Exclusivity is thus undermined by the absence of any limits on catch, effort or capacity in tropical[1920] and northern swordfish[1921] fisheries, or indeed in the eastern Pacific[1922].
	ensure limits account for catches of the limited species by all gear types?	3	2	The limit specifies the gear type to which this CMM applies which suggests that no gear types should be excluded. Catch limits appear to be clear that the CMM aims to limit all catches of swordfish by any gear type.
	power to record bycatch of the target species against limits for that species?	3	2	Catch limits appear to be clear that the CMM aims to limit all catches of swordfish, whether as bycatch or as a target species

[1916] CMM2009-03 para 2: "In addition to vessel limits established under paragraph 1, CCMs shall exercise restraint through limiting the amount of swordfish caught by fishing vessels flagged to them in the Convention Area south of 20°S to the amount caught in any one year during the period 2000 – 2006".
[1917] See Australia (2019). Strengthening the Management of South Pacific Broadbill Swordfish (*Xiphias Gladius*). Sixteenth Regular Session of the Western and Central Pacific Fisheries Commission (WCPFC). 5-11 December 2019, Port Moresby, WCPFC. **WCPFC16-2019-DP19**. pp8-9 and Table 2.
[1918] CMM2009-03 Preamble: "Noting that due to the uncertainty in the 2008 stock assessment for south-western Pacific swordfish, the SC recommended that there be no further increase in catch or effort in order to keep the stock above its associated reference points; "Further noting that the Scientific Committee has recommended that there be no increases in fishing mortality for south-central Pacific swordfish as a precautionary measure given the lack of a formal assessment and that constraining fishing mortality to current levels is recommended until there is a better understanding of fishing impacts in the south-central Pacific stock…".
[1919] CMM2009-03 para 3: "CCMs shall not shift their fishing effort for swordfish to the area north of 20°S, as a result of this measure."
[1920] The WCPFC Scientific Committee has noted that Catches of South Pacific swordfish between the equator and 20°S represent around half of total catches of the stock. See WCPFC SC (2017). Summary Report. Thirteenth Regular Session of the WCPFC Scientific Committee (SC13), 9-17 August 2017, Raratonga, Western and Central Pacific Fisheries Commission (WCFPC). para 142.
[1921] WCPFC SC (2019). Summary Report SC14. Fourteenth Regular Session of the Scientific Committee (SC14), 8-16 August 2019, Busan, WCPFC.
[1922] See the description of swordfish stock distribution and structure in, and proposals put forward by, Australia (2019). Strengthening the Management of South Pacific Broadbill Swordfish (*Xiphias Gladius*). Sixteenth Regular Session of the Western and Central Pacific Fisheries Commission (WCPFC). 5-11 December 2019, Port Moresby, WCPFC. **WCPFC16-2019-DP19**.

	Subtotal	**9**		

Exclusive	allocate national scale limits as a share of the regional TAC/TAE?	2	2, Annex 2	National catch limits resemble exclusive national scale shares of a subregional, bottom-up limit. However, exclusivity is undermined by the incomplete record of CCMs bound by both capacity limits[1923] and catch limits[1924].
	new entrants either excluded or able to participate without adding to TAC/TAE?	0	2	There are no provisions for new entrants. Under the current measure, CCMs without a fishing history in the relevant dates are excluded from fishery south of 20°S but are free to enter the fishery north of that latitude. Whether the CMM could be revised to accommodate a new entrant south of 20°S remains to be seen.
	prohibit exemptions to the limit (or exemptions not provided for)?	0	5, 6	As with capacity limits, catch limits are not to "prejudice the legitimate rights and obligations under international law" of SIDS and participating territories in the WCPFC-CA to develop "their own fisheries"[1925]. The meaning of "their own fisheries" is not defined but could include both fishing by any vessel within the coastal CCM's waters and fishing by vessels flying its flag on the high seas. This appears to represent a broad exemption for SIDTs that could undermine exclusivity. The exemption is compounded by chartering provisions permitting coastal CCMs to charter foreign vessels, including as part of a fishery development activity[1926].
	to impose penalties for exceeding national limits?	1	9	Each CCM is required to stay within their nominated catch limit and overages by any flag CCM are to be clawed back the following year[1927]. This is simply an open-ended "bring forward" provision rather than a penalty.
	Subtotal	**3**		

[1923] CMM2009-03 para 1: "[CCMs] shall exercise restraint through limiting the number of their fishing vessels for swordfish in the Convention Area south of 20°S, to the number in any one year between the period 2000- 2005 (listed in Annex 1)".
[1924] WCPFC (2010). Review of CCMs' Implementation of, and Compliance with, Conservation and Management Measures. Technical and Compliance Commiteee Sixth Regular Session. Pohnpei, 30 September to 5 October 2010, Western and Central Pacific Fisheries Commission (WCPFC). **WCPFC-TCC6-2010/22 Rev 1**. Attachment 6.
[1925] CMM2009-03 para 5: "Paragraphs 1 to 4 and paragraph 9 shall not prejudice the legitimate rights and obligations under international law of small island developing State and participating Territory CCMs, in the Convention Area who may wish to pursue a responsible level of development of their own fisheries in the Convention Area."
[1926] CMM2009-03 para 6: "For the purposes of these measures, vessels operated under charter, lease or other similar mechanisms as an integral part of the domestic fleet of a coastal State, shall be considered to be vessels of the host State or Territory. Such charter, lease or other similar mechanism shall be conducted in a manner so as not to charter known IUU vessels".
[1927] CMM2009-03 para 9: "As an interim measure, and without prejudice to future decisions of the Commission relating to monitoring and responding to compliance with conservation and management measures, until the Commission adopts a scheme relating to compliance with CMMs which includes responses when a flag State exceeds any limits assigned to it, if it is determined by the Commission that the catch of vessels flying the flag of a CCM exceeds the total catch specified for them under paragraphs 2 and 4 above, that CCM will be subject to a reduction in their catch limit equal to the exceeded amount. The reduction will apply in the year immediately after it has been determined that the catch limit has been exceeded."

Secure	national limits valid for more than one year?	3		The WCPFC has stipulated that compliance with CMM2009-03 should be assessed every three years[1928].
	national limits valid until Parties agree to amend them? (default = perpetuity)	3		There is no end date for CMM2009-03 and while the CMM contains a provision for review in 2011[1929], the CMM, and the allocations and limits therein, can be assumed to remain in force in perpetuity or until the Commission amends it.
	make national limits binding on Parties?	2		Although the CMM is binding, CCMs have noted the data gaps to ensure compliance with quantitative limits on swordfish under CMM2009-03[1930].
	resolve disputes beyond bilateral negotiation	0		No provisions for the settlement of disputes beyond negotiations between the parties.
	establish a record of national scale limits (e.g. in a regional register or CMM)?	2		A rudimentary record of the limits exists[1931].
	Subtotal	**10**		
Transferable	transfer a national limit in full or in part to another CCM?	0		The CMM contains no provisions permitting or prohibiting national scale allocations to be permanently or temporarily transferred to another CCM in full or in part.
	require new entrants to acquire an allocation through a transfer from a CCM?	0		
	specify a process for effecting a transfer?	0		
	record transfers in a register?	0		
	Subtotal	**0**		

[1928] WCPFC (2016). WCPFC13 Outcomes document. Western and Central Pacific Fisheries Commission 13th Regular Session, Fiji, 5-9 December 2016, WCPFC. para 158 and Attachment I Table 1.

[1929] CMM2009-03 para 11.

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Annex

Flexible	set a TRP the target stock(s)?	0	WCPFC16-2019-09	No TRP has been determined for swordfish[1932]
	establish harvest control rules for the target stock(s)?	0		No plans for the development of a harvest strategy[1933]
	adjust a TAC/TAE on the basis of environmental factors and stock assessments?	0		
	define national limits as a proportional share of the regional TAC/TAE?	0		
	establish clear processes for a TAC/TAE to be adjusted?	0		
	Subtotal	**0**		
TOTAL		**22**		

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