Changing Lives and Livelihoods: Culture, Capitalism and Contestation over Marine Resources in Island Melanesia

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Declaration

Except where other information sources have been cited, this thesis represents original research undertaken by me for the degree of Doctor of Philosophy in Anthropology at the Australian National University.

I testify that the material herein has not been previously submitted in whole or in part, for a degree at this or any other institution.

Jeff Kinch

Supervisory Panel

Prof Nicolas Peterson	Principal Supervisor
Assoc Prof Simon Foale	Co-Supervisor
Dr Robin Hide	Co-Supervisor

Abstract

This thesis is both a contemporary and a longitudinal ethnographic case study of Brooker Islanders. Brooker Islanders are a sea-faring people that inhabit a large marine territory in the West Calvados Chain of the Louisiade Archipelago in Milne Bay Province of Papua New Guinea.

In the late 19th Century, Brooker Islanders began to be incorporated into an emerging global economy through the production of various marine resources that were desired by mainly Australian capitalist interests. The most notable of these commodified marine resources was beche-de-mer. Beche-de-mer is the processed form of several sea cucumber species.

The importance of the sea cucumber fishery for Brooker Islanders waned when World War I started. Following the rise of an increasingly affluent China in the early 1990s, the sea cucumber fishery and beche-de-mer trade once again became an important source of cash income for Brooker Islanders. With an increasing dependency on cash and a subsequent decline in sea cucumber stocks, a number of conflicts emerged across the Louisiade Archipelago due to competition to access areas that still held sea cucumbers stocks. In October 2009, the National Fisheries Authority imposed a moratorium on the sea cucumber fishery and beche-de-mer trade. This moratorium remained in place until April 2017. This moratorium caused major impacts on Brooker Islander livelihoods. Brooker Islanders have limited alternative income opportunities available and also have to contend with regular environmental shocks such as cyclones and El Nino associated droughts. An increasing population and projected impacts of climate change make for a very uncertain future for Brooker Islanders.

This thesis is based on anthropological fieldwork, historical research and continued contact with Brooker Islanders that now spans a 22-year period from 1998 to the present. Using a historical political ecology approach, I argue that the incorporation of Brooker Islanders into the global economy and the unevenness of development has produced profound changes in their livelihoods, local marine tenureship arrangements and social relations with their island neighbours. This thesis provides a case study of the role that capitalism plays in changing livelihoods and institutions over time when market opportunities arise and consumer dependencies become essential to maintaining livelihoods. The contestation over commodified marine resources is also viewed in the context of changing political and legal domains. Issues of governability for the sustainability of sea cucumber stocks are also explored.

Maps

Figures

Tables

Plates

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This thesis project started in 1997 when I was working as an applied Anthropologist with the Aboriginal Areas Protection Authority in the Central Desert of the Northern Territory. On a return visit to the University of Queensland where I had originally obtained my Bachelor and 1st Class Honours Degrees in Anthropology, Prof Bruce Rigsby suggested that I undertake a Doctorate in Philosophy program. Subsequently, I found myself back under the guidance of Dr David Hyndman who had been my Supervisor for my Honour's thesis. My first and foremost appreciation therefore goes to both Bruce and David for setting me on this voyage, unbeknownst at the time that it would be such a long journey.

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Base maps used in this thesis were produced by Elsevier's Illustration Services.

Figure 1 was kindly reproduced by Boris Colas from an original drawing by the author.

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In Australia, ethical clearance to conduct my research was provided by the University of Queensland's Behavioural and Social Sciences Ethical Review Committee through the Office of Research and Postgraduate Studies:

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Publications

The information detailed in this thesis has informed various publications, the most relevant of these are listed below:

Barclay, K.; Fabinyi, M.; Kinch, J. and Foale, S. 2019. Governability of high-value fisheries in low-income countries: a case study of sea cucumbers in Papua New Guinea. *Human Ecology.* https://doi.org/10.1007/s10745-019-00078-8

Hair, C.; Foale, S.; Kinch, J.; Frijlink, S.; Southgate, P. and Lindsay, D. 2019. Socio-economic impacts of a sea cucumber fishery in Papua New Guinea: Is there an opportunity for mariculture? *Coastal and Ocean Management.* 179. https://doi.org/10.1016/j.ocecoaman.2019.104826

Purdy, D.; Hadley, J.; Kenter, J. and Kinch, J. 2017. Sea cucumber moratorium and livelihood diversity in Papua New Guinea. *Coastal Management.* 45 (2): 1-17.

Vieira, S.; Kinch, J.; Yaman, L. and White, W. 2017. Shark fishing in the Louisiade Archipelago, Papua New Guinea: socio-economic characteristics and government policy options. *Ocean and Coastal Management*. 137: 43-56.

Barclay, K.; Kinch, J.; Fabinyi, M.; EDO NSW, Waddell, S.; Smith, G.; Sharma, S.; Kichawen, P.; Foale, S and Hamilton, R. 2016. *Interactive Governance Analysis of the Beche-de-mer 'Fish Chain' from Papua New Guinea to Asian Markets*. Sydney: University of Technology Sydney.

Foale, S.; Dyer, M. and Kinch, J. 2016. The Value of Tropical Biodiversity in Rural Melanesia. *Valuation Studies.* 4 (1): 11-39.

Barclay, K. and Kinch, J. 2013. The Importance of Locally Specific Contexts in Engaging with Capitalism: Coastal Fisheries in Papua New Guinea and the Solomon Islands. In: McCormack, F. and Barclay, K. (eds.). Engaging with Capitalism: Cases from Oceania. *Research in Economic Anthropology*. 33: 107-138.

Kinch, J. 2008. From Prehistoric to Present: Giant Clam (Tridacnidae) use in Papua New Guinea. *British Archaeological Reports International Series.* 1865: 179-188.

Kinch, J.; Purcell, S.; Uthicke, S. and Friedman, K. 2008. Papua New Guinea: A Hot spot of Sea cucumber Fisheries in the Western Pacific. In: Toral-Granda, V.; Lovatelli, A. and Vasconcellos, M. (eds.). *Sea Cucumbers: A Global Review of Fisheries and Trade*. Food and Agriculture Organisation Fisheries Technical Paper, No.: 516. pp: 57-77. Rome: Food and Agriculture Organisation.

Allen, G.; Kinch, J.; McKenna, S. and Seeto, P. 2003. (eds.). *A Rapid Biodiversity Assessment of the Coral Reefs of Milne Bay Province, Papua New Guinea - Survey II (2000).* RAP Bulletin of Biological Assessment No.: 29. Washington, D.C.: Conservation International.

Kinch, J. 2003. Marine Mollusc Use among the Women of Brooker Island, Louisiade Archipelago, Milne Bay Province, Papua New Guinea. *SPC Women in Fisheries Information Bulletin.* 13: 5-14.

Smaalders, M. and Kinch, J. 2003. Canoes, Subsistence and Conservation in Papua New Guinea's Louisiade Archipelago. *SPC Traditional Marine Resource Management and Knowledge Information Bulletin.* 15: 11-21.

Orthography

Brooker Islanders speak an Austronesian language called Misima. The Misima language is the largest language group in Milne Bay Province and is spoken on Misima Island which accounts for approximately 90 per cent of all speakers; the Deboyne Group of Islands; Brooker, Motorina and Kunanak Islands (Henderson and Henderson, 1974; Callister, 1993).

As is common with many Austronesian languages, consonants in the Misima language are pronounced as they are in English, with the exception of 'l', which can also sound like 'r'. Other consonants that share similarities in sound are 'b' and 'v'. Vowels are pronounced as follows:

'a' as in father;
'e' as in pet;
'i' as in seek;
'o' as in corn; and
'u' as in lute.

Throughout this thesis, the spelling and orthography of the Misima language follows the linguistic work of Callister (1993).

Transcription

Words in the Misima language, the names of ships and scientific names are all written in italics. Words in languages other than Misima are underlined.

Nomenclature

The Anglicised version 'beche-de-mer' is used instead of the French version, 'bêche-de-mer' throughout this thesis.

In addition, as the term beche-de-mer refers to the processed form of a formerly live sea cucumber, I use 'sea cucumber' when referring to the live animal or fishery, and 'beche-de-mer' in the context of its processed form or trade.

Currency Exchange Rates

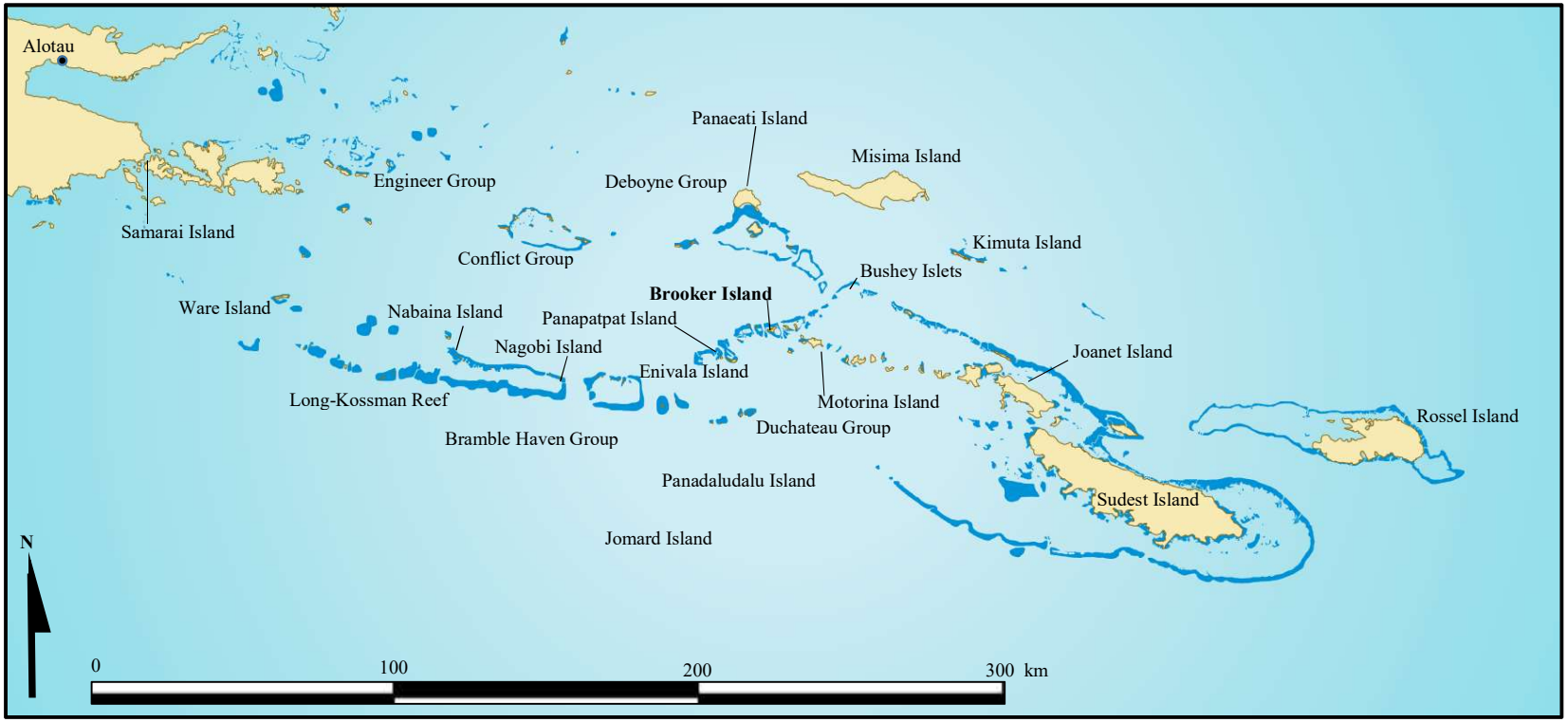
For the main years that are covered by this thesis (1998 to 2019), currency exchange rates are provided below and are expressed as one Papua New Guinea Kina (PGK) to the Australian Dollar (AUD).

All figures for Australian Dollars are the live mid-market rates as of the 31st of December for each specific year and were obtained from:

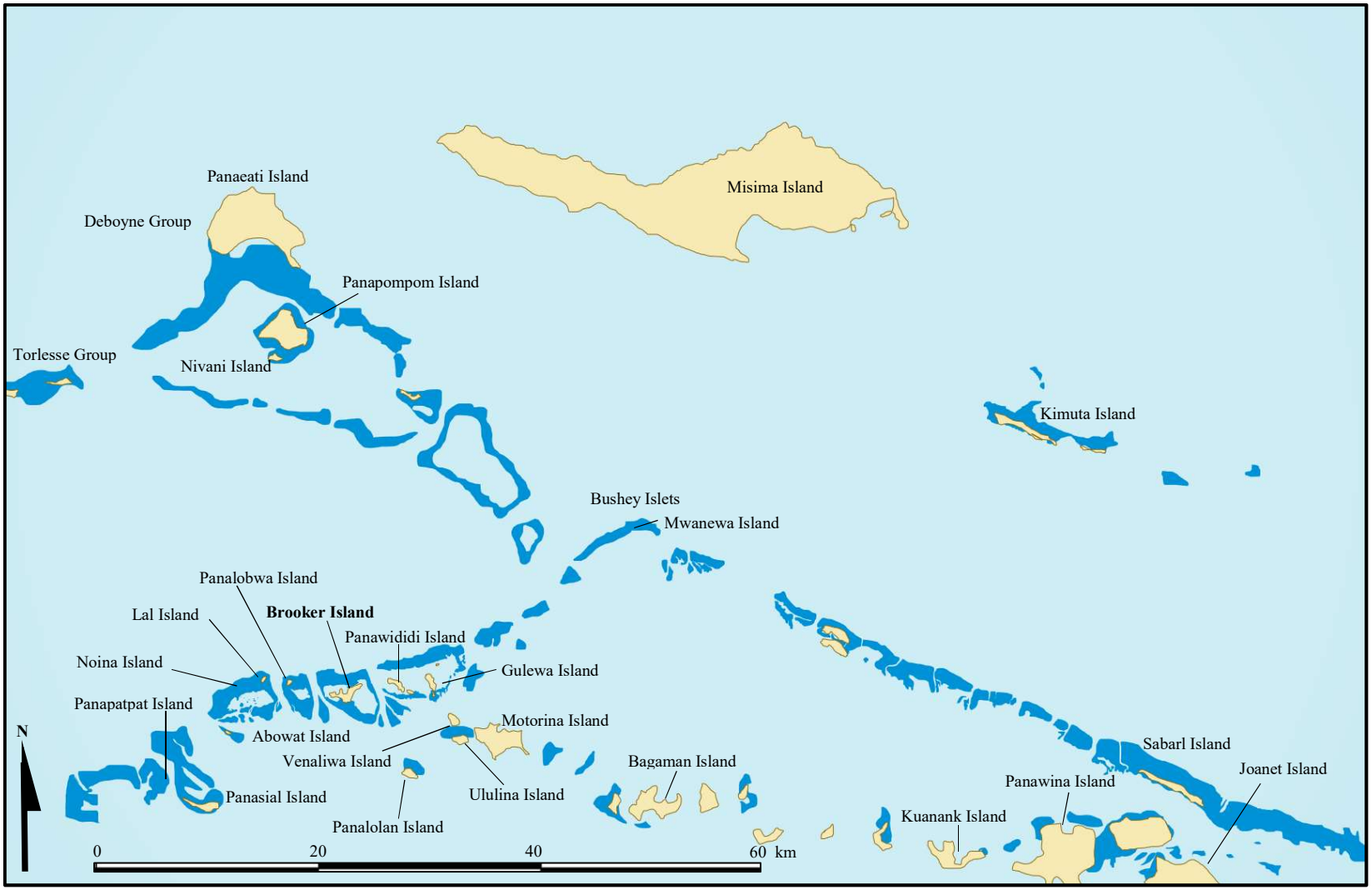
- https://www.xe.com/currencytables/

Year	1 Papua New Guinea Kina (PGK) = Australia Dollar (AUD)
1998	0.7993499505
1999	0.5779863835
2000	0.5977552855
2001	0.5160213723
2002	0.4536722369
2003	0.4073663898
2004	0.4191840128
2005	0.4508687689
2006	0.4325314967
2007	0.4140368096
2008	0.5530545643
2009	0.4082698637
2010	0.3766069067
2011	0.4599559199
2012	0.4656737045
2013	0.4469130792
2014	0.4712114299
2015	0.4556642805
2016	0.4371614398
2017	0.3942415360
2018	0.4366676218

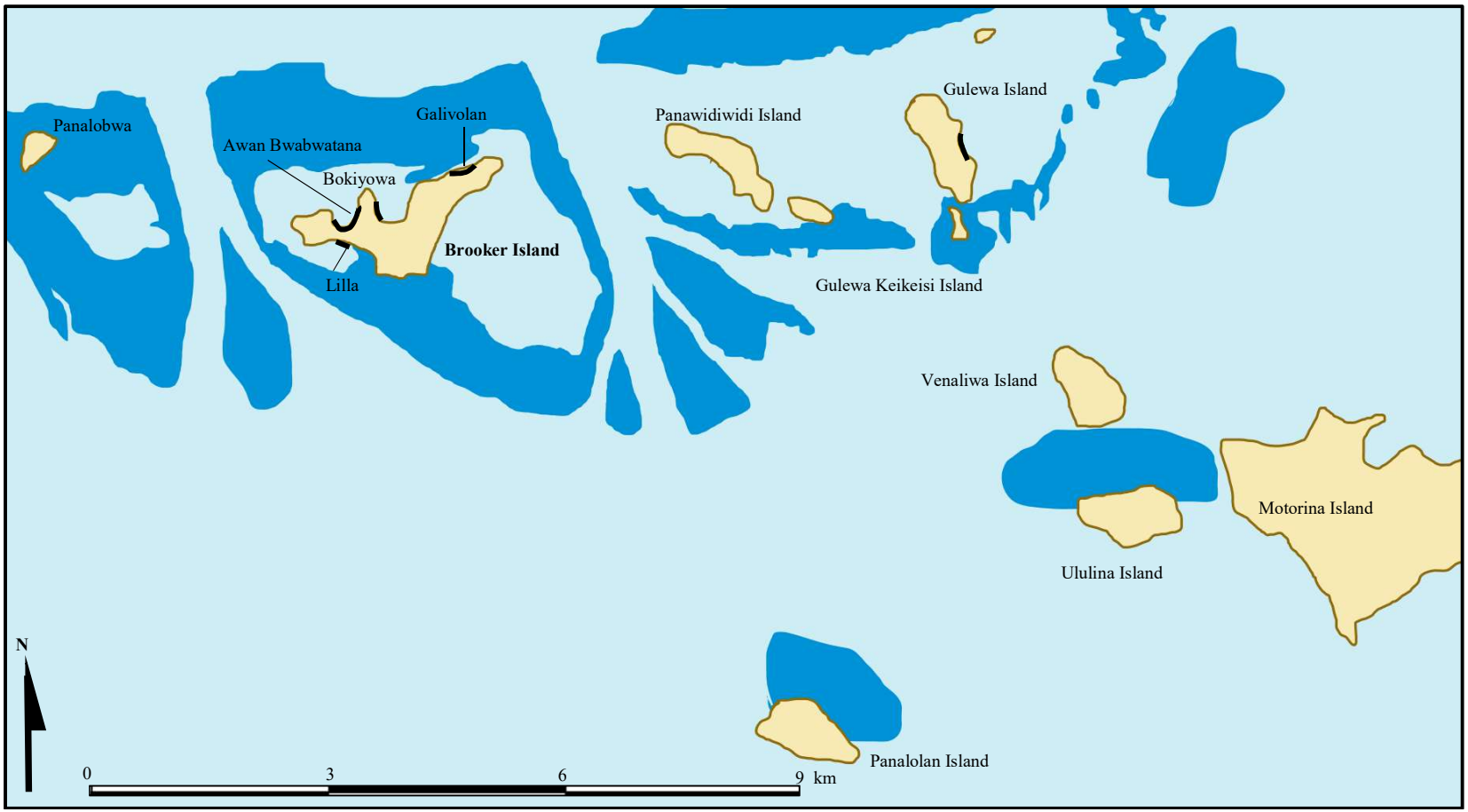
Map 1: Milne Bay Province showing major islands and island groups.



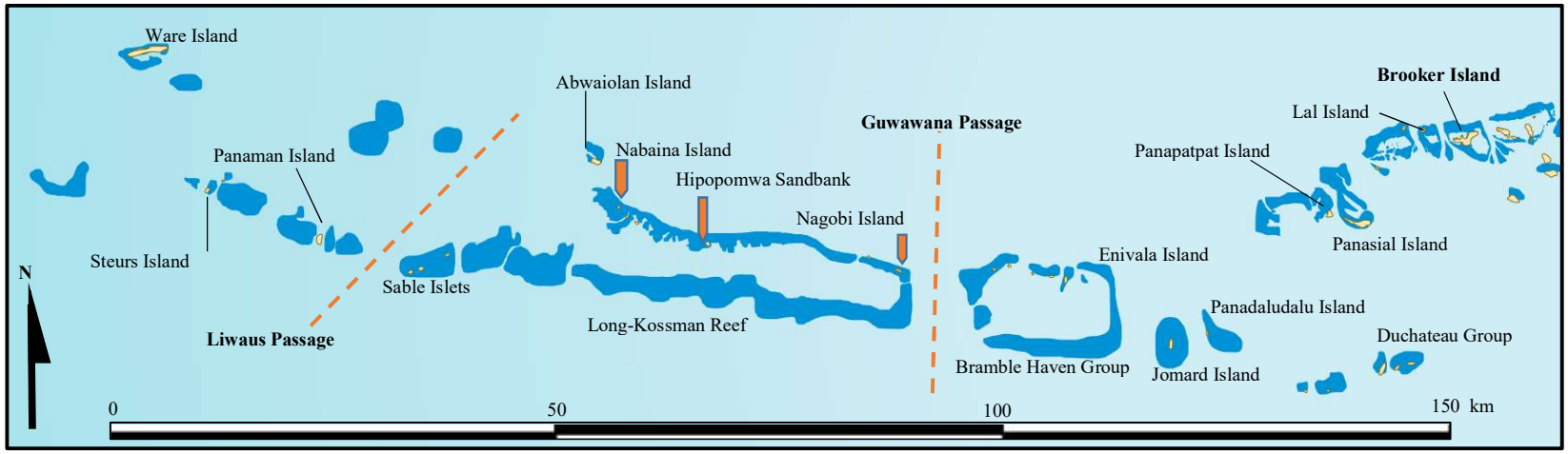
Map 2: Louisiade Archipelago showing major islands and island groups.



Map 3: Brooker Island and surrounding islands and island groups.



Map 4: Brooker Island detailing main village areas and immediate neighbouring islands.



Map 5: Long-Kossman Reef detailing disputed area between Brooker and Ware Islands.

Plate 1: Brooker Island looking west towards Panapatpat and Panasial Islands.
Photograh: Author.

Chapter 1

Introduction

Brooker Island, also known as Utian Island historically and Nogini Island contemporarily[1], is a small, marginal and relatively isolated island located in the West Calvados Chain of the Louisiade Archipelago in Milne Bay Province of the Independent State of Papua New Guinea[2] (see Maps 1-5; Plate 1). The marine territory that Brooker Islanders claim is a source of wealth, fostering a dynamic set of social relations, and exploitation patterns that have been ongoing since Brooker Islanders arrived on the island an estimated 3,500 years Before Present[3] (Shaw, 2019).

The inclusion of Brooker Islanders in an ever-expanding global economy started with whaling in the region in the late 1880s, followed by a more localised trade controlled by mainly Australians as they expanded their colonial maritime industrial frontiers. This trade was focused on harvesting sea cucumbers (Holothuroidea) for the production of beche-de-mer, trochus (*Rochia nilitica*[4]), pearl shell (*Pinctada* spp.), and tortoise shell from the hawksbill turtle (*Eretmochelys imbricata*). Other valued commodities extracted from the Louisiade Archipelago have included gold and copra[5]. The significance of the majority of these commodified resources has waxed and waned as changing market demands and resource declines have occurred.

The gradual incorporation of Brooker Islanders into the global economy since the late 1800s has created consumer dependencies and an increased demand for cash. Cash is now used in exchange, securing livelihoods and for use in ceremonial activities centered on mortuary rituals. The increase in 'value' of marine resources as commodities has also affected local and regional marine tenureship arrangements and occasioned major disputes with neighbouring Islanders, most notably Motorina and Ware Islanders.

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[1] The name Utian is no longer widely used due to the practice called '*tomati´* whereby the name of something if it sounds similar to the name of somebody who has died is no longer used. Nogini is a local colloquialism and is thought to be a corruption of New Guinea.

[2] Papua New Guinea occupies the eastern side of the large island of New Guinea, with the Republic of Indonesia controlling the western half.

[3] 'Before Present' means before 1950 (Currie, 2004). Prehistoric human movement into what is now Milne Bay Province is thought to have followed a variable pattern with the primary distribution of people passing through and westwards along the Papuan Coast initially bypassing the islands of the Louisiade Archipelago (Irwin, 1991; McNiven et al., 2011). Based on linguistic evidence, Wurm et al. (1975) suggest that the Austronesian languages now spoken in the Louisiade Archipelago are part of a second migration wave that followed along the northern coast of mainland New Guinea, before extending to outer island areas.

[4] Trochus was originally called *Trochus nioloticus,* and then *Tectus nilotica* (Dumas et al., 2017). Following genetic analysis, trochus is now determined to be *Rochia nilitica* (Jiang et al., 2019).

[5] Copra is the dried kernel of the coconut palm (*Cocos nucifera*) and was used predominately in the manufacture of soap and candles.

In recent years, there has been a growing recognition amongst researchers that islands offer rich spaces to study the changing articulation between social and ecological systems as economic, political and environmental conditions change (McCall, 1994; Baldacchino, 2007; Christensen and Mertz, 2010). Brooker Islanders as well as all coastal and island people globally, face many challenges to securing suitable livelihoods that contribute meaningfully to their wellbeing. In particular, there is a growing concern over the decline of particular coastal fisheries in many places.

I first started this thesis project in 1997 and conducted my main fieldwork period in 1998 and 1999. Today, I am still in contact with Brooker Islanders, a time frame that now spans 22 years. This depth of time provides a longintudinal case study of a group of Melanesians in a remote area of Papua New Guinea that face continued transition of their livelihoods.

In this thesis, I trace the process of the incorporation of Brooker Islanders into the global economy, their increasing dependency on cash, the impact that this incorporation has had on their livelihoods and on local marine tenureship arrangements. The information presented in this thesis also provides an understanding of issues surrounding the design of effective and contextual management systems for sustainability and governability of commodified marine resources such as sea cucumbers.

In this chapter I will provide details of the theoretical frameworks that will guide the analysis of this thesis to demonstrate the processes that have changed and continue to change the livelihoods of Brooker Islanders.

To begin, there are several important guiding questions that inform this thesis. What happens to livelihoods and governing institutions as they transition from subsistence to commercial economies? Can common ownership of resources be sustained in a market economy? What is (has been) the significance of the marine resources to the community claiming a particular marine territory? Can local marine tenureship arrangements be strengthened or revived to enhance self-development and help control the kinds of management problems that exist today?

To answer these overarching questions, I provide information to the following four specific questions:

1) How have Brooker Islanders made a living from their marine resources historically and into the present?

2) How have the changes in livelihood activities and a growing dependency on commodified marine resources affected Brooker Island relationships within their own community[6] but also externally with other island communities in the Louisiade Archipelago?

3) How have the conflicts arising from access to commodified marine resources influenced local marine tenureship arrangements in the Louisiade Archipelago?

4) How can the analysis of local and government responses to the conflicts that arose from access to valuable and commodified marine resources inform policy and improve local governance for sustainability?

Political Ecology: A Framework for Analysis

To understand what has happened and what is still happening to Brooker Islanders, a historical political ecology approach is used throughout this thesis. While the social and cultural embeddedness of pre-capitalist societies like Brooker Islanders has long been recognised, it is often assumed that as 'traditional' societies move from a largely subsistence, pre-capitalist base towards a market economy, social relations are also progressively commoditised as the economic becomes disembodied from the social and cultural context (Curry, 1999). Polanyi (1944) in particular, detailed how an economy is constituted depends on the way it is embedded in society, thereby allowing for a range of possible social-economic-political formations (also see Granovetter, 2005). By using a political ecology approach, it also allows for the 'local' scale to be analysed at multiple wider scales as local scales are always embedded in and are part of the global scale (Vayda, 1968; Paulson and Gezon, 2005; Sayre, 2015).

Scale can be both fluid and fixed, relational, and socially constructed. It is continuously defined, contested, and reconstructed. It is the focal setting at which spatial boundaries are defined for a specific claim, contest, activity, or behaviour (Silver, 2008). The diverse processes associated with the increasing incorporation of groups like Brooker Islanders into the global economy involves various connections between social-ecological relationships. Understanding these connections also requires an understanding of the history of these connections over time. As Foster (1995) states, to produce ethnographic descriptions of Melanesian people without acknowledging the engagement of these people with colonialism, Christian missionisation and

[6] Community is often seen in one of three ways, a spatial unit, a social structure, and a shared set of norms (Allison and Ellis, 2001). James et al. (2012: 14) define a community as a group or network of persons who are connected objectively to each other by relatively durable social relations that extend beyond immediate genealogical ties and who mutually define that relationship as important to their social identity. Berkes et al. (2001) notes, one needs to be careful not to romanticise the notion of what a community is especially as communities are not homogenous, they coalesce in times of co-operation and boil over in conflict in times of competition. Communities often exist in perpetual and dynamic tension.

capitalist markets is intellectually irresponsible. Echoing Foster (ibid), Biersack (1999) has also noted that there are few places in the world today that have not been significantly affected by global flows, colonial projects, and the penetration of capitalism and ignoring how contemporary locales or regions are impacted by colonialism and market penetration, not to mention nation-states themselves, all but discredits any analysis of a specific place and community.

Blaikie and Brookfield's (1987) 'Land Degradation and Society' defined many key concepts that are now standard in political ecology including cross-scale 'chain of explanation', and a commitment to exploring 'marginalised' communities. Blaikie and Brookfield's (ibid) chain of explanation model provides a pathway to understanding the processes communities like Brooker Island face in the context of their increasing incorporation with the global economy and the impacts that arise from this incorporation. The chain of explanation has a lot in common with Vayda's (1983) earlier notion of 'progressive contextualisation', the process of looking at scale but also looking backward in time to explain local, contemporary social-ecological relations. For Blaikie and Brookfield (1987) this meant looking back to the period when older forms of mercantilism, colonialism and capitalism gave way to more direct forms of colonial control, or post-colonial state interventions.

Following Blaikie and Brookfield's (ibid: 27) chain of explanation we can see Brooker Island at four scales:

1) individuals that make up the Brooker Island community;

2) Brooker Islanders as a community and their relations with each other and other users, notably Motorina and Ware Islanders, as well as groups in the wider society who affect them in any way;

3) the state and its political and legal systems and overarching development policies; and

4) the global economy that seeks commodified marine resources, which for Brooker Islanders, is focused primarily on the sea cucumber fishery and the beche-de-mer trade.

There are four areas that are relevant to the livelihoods of Brooker Islanders from a historical political ecology perspective:

1) Brooker Islanders' livelihood production and reproduction;

2) the impacts of colonialism, Christian missionisation, government, and the global economy on Brooker Islanders as well as the uneven consequences and responses to these impacts (e.g., conflict over resource access);

3) the inter-relationships within the social and natural environments (i.e., a social-ecological system) that Brooker Islander inhabit; and

4) an appreciation of complexity and uncertainty in their social-ecological systems and opportunities for ensuring sustainability and governability of now commodified marine resources.

Located formally at the intersection of geography, anthropology, sociology, and environmental history, political ecology[7] is considered as one of the most conceptually diverse fields of inquiry into social-ecological relations within the social sciences (Perreault et al., 2015). Political ecology's broader perspective on the environment and its emphasis on holistic analysis have shown significant potential for dialogue with the more social and power-centered field of political economy and provides an opportunity to explore across multiple planes of what is happening within a given society. Building on earlier cultural ecology approaches, much ecological anthropology of the 1960s and early 1970s used a systems approach to explain the evolution of specific cultural practices and institutions in terms of adaptations to ecological systems, and to explain how dynamics within and between systems could lead to change and development through time.

One of the most influential cultural ecology works that has come out of Papua New Guinea was Rappaport's (1967) 'Pigs for the Ancestors: Ritual in the Ecology of a New Guinea People'. In this study, Rappaport (ibid) sought to quantify energy flows through the ecosystem and identify the trophic exchanges in which the Tsembaga in the highlands of New Guinea took part. By tracing caloric flows through the ecosystem, Rappaport (ibid) argued that ritual cycles were the principal mechanism that regulated social-ecological affairs for the Tsembaga and their neighbours and the environment in which they lived. Biersack (2006) has called Rappaport's work a study of the intersection of social-ecological arrangements with a focus on human activity, conceptualisation, values, and social relations. Others have noted that the significance of Rappaport's work was due to its interdisciplinary borrowing (Dove, 2006). Rappaport's work however was later criticised due to the inherent difficulties of using caloric measures to quantify monetary decisions in complex market economies that the Tsembaga were also part of (Friedman,

[7] Political ecology is based in several theoretical traditions including environmental history (Worster, 1977, 1988), human geography (Sauer, 1956); cultural geography and cultural ecology (Steward, 1955), human ecology (Park, 1936), ecological anthropology (Netting, 1982, 1986), ethno-ecology (Toledo, 1992; Nazarea, 1999), and Marxist anthropology (Wolf, 1982; Harvey, 1996).

1974; Sahlins, 1976; Moran, 1990; Greenberg and Park, 1994). Rappaport's work was subject to further criticism as anthropology turned away from positivism toward 'interpretation' (Geertz, 1973). As a result, new 'interpretations' included historical and political economic aspects to understand the complex interrelations between local cultures and global forces (Appadurai, 1996; Gupta and Ferguson, 1997).

With Wolf's (1982) 'Europe and the People without History', a greater number of anthropologists began to explore the complex interactions between local peoples and the global economies in which they came to find themselves embedded in. To show the integration of communities into the global economy, Wolf (1982) used a more traditional Marxist definition of capitalism (see Bloch, 1975) which allowed the spread of capitalism to be presented, not as a monolithic system, but one of uneven development.

Following Wolf (1982), world-system theorists began to define this new approach further and opened new ways for exploring local manifestations and impacts (see Wallerstein, 1974). World-system theorists can be seen as the forerunners to the new proponents of the Capitalocene[8] (see below) that state that since the 16th Century, a global market has expanded to include multiple cultural systems of the world's peoples into a single, integrated economic system (Moore, 2016, 2017).

For world-system theorists, the assumption was that once non-capitalist regions had been incorporated into the global economy through the production of commodities from their localised and often peripheral areas. They were defined by this economy and were thought to have subsequently become capitalist because the relations of production that defines the core, now also defined them (Wallerstein, 1974). Problems associated with world-system theory are that too much emphasis was placed on the domination of the core, with little or no real analysis of the social-ecological processes in the periphery. Capital accumulation for the core was seen as the most important aspect by which other modes of production were penetrated, subordinated, transformed, or destroyed as they came into contact with the global economy, a process that was termed 'globalisation'. The processes of globalisation have now been overtaken by a whole and encompassing global economy which is able to exert control over economic activities and policies at multiple levels and scales all over the world (Robbins and Siikla, 2014).

Many environmental scientists are now proclaiming that humans are equivalent to the great forces of nature, resulting in a new epoch called the 'Anthropocene', the 'age of humanity' (Foster et al., 2010; Braun, 2015; Moore, 2016; Keys et al., 2019). This position is supported by the

[8] McBrien (2016) notes that the Capitalocene is also a Necrocene, a system that not only accumulates capital, but also drives extinction (see also Dawson, 2016).

resurgence of warnings related to the magnitude of 'human-induced environmental change' or as it is more commonly termed, 'climate change'. In the Anthropocene there is no longer a nature that stands outside of human impact, it is now seen as 'post-natural' (Braun, 2015). Moore (2017) argues for a centrality of historical thinking in coming to grips with capitalism's planetary crises in the 21st Century and argues against the Anthropocene's shallow historicisation. Moore (ibid) subsequently advocates for the term 'Capitalocene', which he states encompasses more fully the systems of power, profit, production and reproduction in the web of life (i.e., a world-ecology of capital, power, and nature).

For people like Brooker Islanders, capitalist production is composed of the harvesting of marine resources, notably sea cucumbers for the production of beche-de-mer for sale. Intertwined with this is a subsistence mode of production[9]. Under subsistence production, people usually do not produce any significant market surplus and the manner of exploiting the natural environment is usually small-scale because the fundamental goal is simple reproduction of the household and not production of surplus for the market. This mode of production, therefore, has a stronger social-ecological connection due to the need to ensure the resource base stays productive and sustainable. In contrast, under a capitalist mode of production, the forces and means are expropriated from the direct producers and their labour by the socio-economically privileged sector of the society.

By producing the means to satisfy their needs, Brooker Islanders collectively produce their own material life, and in the process produce new human needs whose satisfaction requires further productive activity. This is done by their participation in the sea cucumber fishery and beche-de-mer trade. Prior to their integration into commodity-based systems of production, most people in Papua New Guinea transformed nature into culture. Commodification ensured a process by which things were drained of their social significance and infused with a monetary value and inserted into a wider global economy premised on hierarchies of value (Biersack, 1999; West, 2006). In Volume I of 'Capital', Marx (1867) describes a commodity as a physical or 'sensuous' thing that satisfied human needs and was exchanged for something else. It is only when someone produces values through their labour which is exchanged for something else, that a commodity is manifested, obtaining both a use value and an exchange value. A commodity therefore can be thought of as the embodied form of human labour and its exchange value. Today, new understandings of this value have introduced other levels of social and cultural transformation in local communities across Papua New Guinea (see Smith, 2002).

[9] A mode of subsistence is the appropriation of a given territory and natural and people-altered resources employed by a specific group of people in a specific historical period (Godelier, 1979). A mode of production is the cultural appropriation of nature and the social relations which determine the forms of access to resources, the means of production, the organisation of labour, and the distribution and circulation of the products of social labour (Godelier, ibid.).

The social context of exchange determines whether an exchange of property[10] constitutes a gift[11] or a commodity transaction. There is some significant blurring of this in Papua New Guinea as cash is now widely incorporated as a gift item in local exchanges associated with marriage and mortuary rituals (Gregory, 1982; Bainton and Macintyre, 2016). Commodities transacted in the market place have several characteristics that distinguish them from gifts. These differences usually refer to the transactions being non-social acts between people who are independent of each other with the act of exchange not entailing any future obligations between the parties to the transaction unless there is some client-patron relationship or some debt arrangement that needs to be serviced. The latter is what has occurred in Milne Bay Province between many villagers in their 'trade' relationships with beche-de-mer exporters based in Milne Bay provincial capital of Alotau.

Scholarly discussions of the political ecologies or economies of Papua New Guinea have focused on the impacts of mining (Filer, 1999; Jacka, 2003; Bainton, 2010; Golub, 2014), logging (Filer, 1997; Holzknecht, 1998; Montagu, 2002), conservation (West, 2006), agriculture (Blaikie and Brookfield, 1987; West, 2012) and mortuary rituals and gift exchange (Biersack, 1995; Foster, 1995; LiPuma, 1998, 2000). With the exception of Carrier (1992), there has been little investigation using a political ecology approach for fisheries in Papua New Guinea. Consequently, this thesis provides an important addition to political ecology studies in Papua New Guinea and Melanesia in general.

As the demand for commodified marine resources first expanded in the colonial period, this has meant that market principles have become more pervasive for Brooker Islanders. The penetration of capitalism in communities in Papua New Guinea has taken on many specific forms and shapes, becoming reinterpreted over time. Carrier (1992: 133) writes this for Manus Province as an illustration:

> 'The emerging colonial economy undercut indigenous production and made Manus Province a dependent outlier of the larger Papua New Guinea and Australian economy. Villages ceased to rely on one another to acquire the means of survival, but became orientated instead towards the world outside, dependent on government assistance, on the sale of food, copra, and other commodities in Lorengau . . . . The old articulated system of locality, production, kinship, and circulation was replaced as the location of the significant sources of wealth moved out of the region and out

[10] Property is a universal institution found in all human societies, which represents the entire social system of principals, expectations and coercions that shape the distribution of rights to and actual use of resources. Property is part and parcel of social practice, and its distribution has fundamentally social, political and economic implications. Property is also a term commonly applied to both objects that are said to be owned as well as the rights exercised over such objects (Hallowell, 1943).

[11] Gift exchange is a social act concerned with the maintenance or creation of social relationships between individuals and groups (Gregory, 1982). Gift exchange involves forming identities and inter-personal and group relationships, and defining group boundaries.

> of the control of village societies. As a result, villages shifted their orientation away from one another and toward the outside world . . .'.

When we begin to look at the historical processes of a given community or area such as Brooker Island, we can see that capitalism has transformed social norms. Unfortunately, this transformation often results in conflict. Martinez-Alier (2002) has defined political ecology as the study of 'ecological distribution conflicts'. Conflict can be broadly understood as 'resource disputes' relating to access to and control of valuable natural resources (Ribot and Peluso, 2003; Turner, 2004). These disputes are the product of complex webs of social relations and accumulated notions of rightful access or patterns of control (Peet and Watts, 1996; Neumann, 2005). In the case of Brooker Island, their increasing incorporation into the global economy and the focus on harvesting commodified marine resources reworked their social relations with their island neighbours into conflict over access to declining sea cucumber stocks, a commodity that became the significant source of wealth throughout the Louisiade Archipelago.

Changing Lives and Livelihoods

As noted above, much of political ecology is focussed on dynamic ecologies, history, longitudinal change and social differentiation. At its roots, political ecology has focused on the intersections of political forces and ecological dynamics. The commitment to local-level fieldwork and an understanding embedded in the complex realities of how livelihoods are made, but also linked to more macro-structural issues are all important characteristics of political ecology.

As an extension of political ecology or as a parallel to it, livelihood approaches provide an essential lens of enquiry that are appropriately positioned for understanding the changes brought about by incorporation into the global economy at the local level. Livelihoods perspectives also offer an important lens for looking at complex institutional and governance arrangements and the key relationships between livelihoods, power and politics through the use of cross-disciplinary perspectives which are integrative, locally-embedded, cross-sectoral and informed by a deep field engagement (Scoones, 2009, 2015). Karl Marx in his treatise, 'Grundrisse' (Marx, 1973) advocated key elements of a livelihoods approach, as did many economists, human geographers and anthropologists that were to follow (see Kaag et al., 2004; De Haan and Zoomers, 2005; Sakdapolrak, 2014).

Many scholars attribute the beginning of livelihoods thinking to Chambers and Conway (1992: 6) as they formalised both the definition of livelihood, and the basis upon which a livelihood might be seen as sustainable:

> 'A livelihood comprises the capabilities, assets[12] (including both material and social resources) and activities for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets, while not undermining the natural resource base'.

Carr (2013: 80) has argued that this definition of Chambers and Conway (1992) presumes an economic logic on the part of the resource user, whereby livelihoods should rather be seen as principally being about the maintenance and improvement of the material conditions of life. To modify Scoones (2009: 181), there are three recurrent failings of livelihoods perspectives:

1) lack of engagement with the processes involving the global economy;

2) lack of attention to power and politics at multiple scales; and

3) failure to appropriately engage with ecological stressors (which are expected to be exacerbated for people like Brooker Islanders by projected climate change impacts and continued population growth).

To understand how livelihoods have changed and are changing for Brooker Islanders, there is a requirement to understanding the locales (island-level and regional inter-relatedness), occupations (farming, fishing and inter-island trading), social difference (gendered and age-defined), development transition (including pathways or trajectories), and wider dynamic patterns (environment, politics, markets, etc.) A feature of all communities in Papua New Guinea is their 'groundedness' in a place; a place where people live, and make their livelihoods. Livelihoods essentially are systems of local resources and networks intermittently connected to social, economic, political, and ecological relations at a particular place, but which also cross multiple scales (Ellis, 2000; Hussein, 2002; Valdes-Rodriguez and Perez-Vazquez, 2011; Barclay and Kinch, 2013). By using a livelihoods framework, an understanding of the social-ecological relationships of how people live in particular places can be obtained. It can also provide an assessment of the future sustainability of the resources that people are dependent on (Carr, 2015).

Livelihoods fundamentally rest on the idea that people's resources are not merely means through which they make a living, they also give meaning to the person's world and that this meaning is only one of several influences on how people make decisions about their livelihood strategies. For example, in the case of a Brooker Islander man, he is doing more than just merely harvesting sea cucumbers to process into beche-de-mer to buy food and other necessities; he is also enacting 'men's work'.

[12] Assets are not simply resources that people use in making their livelihood, they are also assets that give them the capability to be and to act on issues surrounding the control, use and transformation of resource (Bebbington, 1999).

Bernstein et al. (1992: 24-25) point out that are four basic questions involved in livelihoods analysis:

(a) Who owns (or has access to) what? This relates to questions of 'property' and ownership of assets and resources.

(b) Who does what? This relates to the division of labour.

(c) Who gets what? This relates to the processes of social and economic differentiation.

(d) What do they do with it? This relates to patterns of consumption, social reproduction, and planning for the future.

In addition, Scoones (2015: 82-83) adds a further two questions:

(a) How do groups interact? This relates to the relationships between inter-and-intra-relationships at the local and regional level as well as the state.

(b) How are political changes shaped by ecologies? This relates to questions of political ecology and how changes in the environment impact and influence livelihoods and access and use of resources.

From the above questions, livelihoods can be seen as efforts by a community to manage their environment, economy, and one another. This effort is brought together through regimes of practices, in this case the practices of making a living in which individuals, households, and communities participate every day. Carr (2015: 338) states that these take shape at the intersection of three spheres:

1) the tools of coercion such as local marine tenureship arrangements that, while limiting the decision-making latitude of all members of the community, have greater impacts on some more than others;

2) discourses of livelihoods that contain the rationales people provide for selecting particular livelihoods activities and the actions they take related to those perceptions, for example, the need to balance market and subsistence production to maximise incomes while guarding against economic or ecological shocks; and

3) the mobilisation of social capital to organise these activities.

The Sustainable Livelihoods Framework (Scoones, 1998) is an established tool to understand the complex dynamics of globalisation and local lives (Table 1). The 'global' and the 'local' are not separated either physically or analytically but intimately intertwined through connections, linkages and relations. At the wider-scale, Brooker Islanders are influenced by factors such as economic and ecological shocks, as well as the local and State structures that influence and govern the use of their marine resources. Within livelihood frameworks, the State, the environment, or the global economy are often listed as 'contexts'. At the local-scale, Brooker Islanders are governed by their access to a combination of capital assets, which include social, human, natural, physical, financial and cultural capital (Table 1; Column A).

Access to both assets and activities is enabled or hindered by the policy and institutional context of livelihoods, including social relations, institutions and organisations (Column B). It is also affected by external factors, the above mentioned contexts, such as the shocks and pressures from the State, the environment, or the global economy that are outside the control of the household (Column C). Assets permit livelihood strategies to be pursued, and these are composed of various activities of which, in the case of Brooker Islanders, the most important being sea cucumber fishing and the beche-de-mer trade (Column E).

By using a Sustainable Livelihoods Framework, one can point to outcomes of a community's livelihood strategies, which can be also be distinguished between livelihood security effects and environmental sustainability effects (Column F). In isolated and marginal communities like Brooker Island, limited access to physical and financial capital means that social and natural capitals, including the interactions between them, play more central roles in people's livelihoods (see Allison and Ellis, 2001; Pretty, 2003).

Vulnerable livelihoods result from a lack of resilience and an absence of adaptive capacities required to respond to variable contexts. Coping strategies are increasingly important in the context of projected climate change impacts (see Adger, 2006). Adaptive capacities and resilience strategies are thought to comprise, chiefly, the assets possessed by people, the activities in which they engage in order to generate an adequate standard of living and to satisfy other goals. These may include such things as risk reduction, the factors that facilitate or inhibit different people from gaining access to areas, assets and activities and the ability to diversify livelihood activities. The ability to diversify livelihoods activities include issues of seasonality, labour demands, access to financial services and physical assets (Ellis, 2000). The concept of a 'livelihood' therefore seeks to bring together the critical factors that affect the vulnerability or strength of individual or family survival strategies.

Table 1: Brooker Island Sustainable Livelihoods Framework.

Assets and Capital	**Access modified by:**	**In the context of:**	**Resulting in livelihood strategies composed of:**	**With effects on:**
Natural • Land, • Marine resource stocks, • Vegetation, and • Wildlife. **Physical** • Things produced, and • Economic activities. **Human** • People, • Education, and • Health. **Financial** • Cash, • Savings, • Formal Credit, • Informal Credit, • Gifts, and • Exchange. **Social** • Kinship, • Church, and • Associations. **Cultural** • Behaviours, • Values, and • Knowledge.	**Social** • Gender, • Position, • Status, • Age, • Relationships, • Language group, • Identity, • Power, • Politics, and • Money.	**Trends** • Population, • Migration, • Technology, • Pricing of marine resources, • Pricing of other commodities, • Value of traded items, • Government development policies, • Interventions, and the • Global economy.	**Activities** • Harvesting sea cucumbers, • Harvesting other valued marine resources (e.g. turtles), • Fishing, • Agriculture and livestock, • Trading for subsistence, • Trading for ceremonial purposes, • Trading for commodities, • Remittances, and • Wage employment.	**Livelihood security** • Incomes, • Stability, • Sustainability, • Resilience, and • Vulnerability.
	Institutions • Rules, • Customs, • Local tenureship arrangements, • Resource access, and • Market access.	**Shocks** • El Nino associated droughts, • Cyclones, • Recruitment failure, • Disease, • Degradation, and • Global economy.		**Ecological sustainability** • Sea cucumber stocks, • Other marine resources stocks, • Marine environment, • Land quality, • Water quality, and • Biodiversity.
	Organisations • Government, • National Fisheries Authority, • Provincial Fisheries Offices, • Non-government organisations, • Academic and Research Institutions, and • Market actors.			

Adapted from: Allison and Ellis (2001: 379).

Expressing Resilience

In Ostrom's (1990) 'Governing the Commons: The Evolution of Institutions for Collective Action', numerous examples of institutionalised natural resource management activities involving communities and other actors are collated and analysed. These examples were used by Ostrom (ibid) to derive design principles and rule systems for enduring regimes of resilience and sustainability over time periods and scales. From this analysis, a social-ecological systems' 'Resilience Framework' was formulated to provide a holistic approach for understanding the connections between the ecosystem, its resources, the users, and governance systems (Westley et al., 2002; Cox et al., 2010; Basurto et al., 2013; McGinnis and Ostrom, 2014).

The Resilience Framework focusses on organised social units, such as agencies, committees, and communities and system structures, particularly institutions rather than wider-scale social-economic-political relationships that influence communities (Hornborg, 2009; Cote and Nightingale, 2012; Fabinyi et al., 2014). Carr (2013) notes that by using a social-ecological systems' resilience framework, a narrowly materialist framing of individual and community motivations produces oddly stilted views of the social relations and processes that shape local livelihood outcomes. The focus on bounding adaptive capacity to homogenous communities or social groupings neglects the different perspectives, beliefs, values and experiences of people involved in and affected by resource use, access and sustainability issues management (Cote and Nightingale, 2012; Coulthard 2012). Fabinyi et al. (2014) identified three main biases in social-ecological-systems resilience frameworks:

1) a tendency to assume that within a social-ecological-system, people's knowledge, values, and livelihoods are concerned primarily with the environment;

2) a tendency to aggregate or homogenise social complexity and thereby assume that people's interests, expectations, and experiences are the same; and

3) the value-laden use of resilience within the social arena.

Social stratifications and relationships within a community like Brooker Island and also with their island neighbours are extremely important features in detailing how ecological change and sustainability issues are administered and experienced. As noted above, the work led by Ostrom (1990) often prioritised consensus and collective action over contestation, whereby people are involved in formulating and perpetuating institutions that direct their own behaviour where in fact governance systems over natural resources are very complex and dynamic.

Securing Rights

Across Melanesia, rights to access and use resources are claimed through systems of lineage-based descent reckoning as well as through residence. There is often boundary permeability between groups, a consequence of friendships, kinship, marriage or other closer associations (Aswani, 1999; Hviding, 1996). In general, boundaries are considered to be less permeable the more distant the 'outsider' group is socially or geographically, but when commercial incentives are present, stronger access controls emerge, even for close neighbours.

The cross-cutting nature of patterns of who has rights has led to highly fluid systems of local tenureship arrangements in Melanesia that allow for multiple and competing interpretations of rights (Aswani, 1999, 2017; Foale and Macintyre, 2000, Macintyre and Foale, 2007). In some places, rights that have been handed down from generation to generation through mythology and genealogy are also used to validate rights (Malinowski, 1922; Harwood, 1976; Fitzpatrick, 1991). In this thesis, local myths, legends and historical accounts are used to help illustrate the way that both Brooker Islanders and their island neighbours attempted to mobilise a contemporary connection to the marine territory that they were disputing over.

Two bundles of rights can be defined with regards to common pool resources. The first deals with access rights or 'excludability' which refers to the right to enter a defined 'sea space or territory'. The second is concerned with withdrawal rights which pertains to the right to obtain resources (Feeny et al., 1990; Schlager and Ostrom, 1993; Ostrom et al., 1999). Both type of rights not only cause competition, but can also impact on the sustainability of the resources that are being extracted from a given space (Bavinck, 2005). It has long been suggested that while profit can be gained from a common property resource, people will continue to enter the system and compete for diminishing goods until all is dissipated. This has been termed, a 'tragedy of the commons[13]' (Hardin, 1968). Where there are simultaneous resource users, the tragedy of the commons implies a lack of incentives for individuals to restrain production when the underlying economic premise is profit maximisation (Gordon, 1954; Scott, 1955). As Scott (ibid) notes, no-one will take the trouble to husband and maintain a resource unless he has a reasonable certainty of receiving some portion of the product of his management. Common property is not the same as everybody's property. Typically, common property involves a right to use something in common with others and a right to be excluded from its use (Ciriacy-Wantrup and Bishop, 1975). Open access on the other hand is a condition where resources have no property rights attached to them at all (Berkes et al., 2001).

[13] The concept of the tragedy of the commons probably goes as far back as Aristotle, who observed, 'what is common to the greatest number has the least care bestowed upon it' (Berkes et al., 2001).

At the community level, the importance of well-defined and enforced bounded space around a group of users and a resource system has been extensively argued for by common-pool resource scholars and fishery economists as a precondition for the successful management of fishery resources (Ostrom, 1990; Feeny et al., 1996; Cinner et al., 2013; Vaccaro and Beltran, 2019). This becomes complicated, when the State has vested management authority. In Papua New Guinea, this authority lies with the National Fisheries Authority. This creates significant institutional pitfalls and various governability challenges, complicating management efforts and posing threats to the sustainability of sea cucumber stocks and for the wellbeing of Brooker Islanders.

The sea cucumber fishery in Papua New Guinea could be seen as a tragedy of the commons. For example, during fishing expeditions that I participated in, Brooker Islander fishers would harvest all the sea cucumbers they encountered because they could not leave them for fear that the next person to swim over that area would take them. Another aspect of this is that they would unlikely be able to find the same spot in the future to harvest the sea cucumbers that they had left bewhind. Complicating matters further, is the inclusion of people from other areas that used kinship-ties to gain access to sea cucumber stocks in Brooker Island's marine territory. Subsequently, it is difficult to see a fishers' incentive to conserve sea cucumber stocks, as opposed to taking as much as possible, as soon as possible. When multiple appropriators are dependent on access to the same given area to extract resources as a source of economic activity, they are jointly affected by almost everything they do. Because other fishers operate with the same rationality, the users in the sea cucumber fishery are caught in an inevitable process that leads to the destruction of the very resource on which they all depend upon. Berkes et al. (2001) would call this a 'socially irrational outcome'.

Before the 1980s, there were few theoretical inquiries made on the formation and functions of property systems and the evolution of fishing rights, tenureship systems and territories. Scholars coined the term 'sea tenure' in the 1970s and 1980s to describe a phenomenon similar to land tenure in agriculture. Sea tenure, according to Cordell (1989), is about 'sea-based property rights', and about the utilisation of marine resources. The term 'customary marine tenure[14]' was first coined by Hviding (1989) when he used it to refer to particular forms of sea tenure practised in the Solomon Islands. In this thesis, I use the term 'local marine tenureship arrangements' to avoid any issues with the term 'customary' which has similar difficulties in definition as the word 'traditional' does (Filer, 2006).

[14] 'Customary' refers to a system founded on traditional roots with links to the past; ' marine' refers to the fact that the system deals with coral reefs, lagoons, coast and open sea, including islands and islets; and 'tenure' refers to the fact that the system deals with access to their marine areas and to the regulation of exploitation (Hviding, 1989).

While local marine tenureship regimes arrangements clearly existed in some areas of Papua New Guinea[15], the strength of these arrangements have been diluted through the process of colonisation, Christian missionisation, pacification and the commodification of marine resources.

A central theme of this thesis is that local marine tenureship arrangements or the solidification of territorial claims is a reaction to capitalism and a response to developing commodity fisheries (Carrier, 1981; Johannes, 1982; Polunin, 1984; Otto, 1998; Cordell, 1989; Williamson, 1989; Otto and Turner, 1990; Hyndman, 1993; South et al., 1994; Akimichi, 1995; Foale et al., 2010). Hviding (1996) has noted that marine tenure rules became more exclusive for both commercial and subsistence activities in the Morovo Lagoon of the Solomon Islands in response to increased prices of particular shells. Huber (1993: 31-32) also notes for the Kiwai people of Western Province of Papua New Guinea that:

> 'Today customary rights are usually enforced when outsiders fish for cash return, not when they fish for subsistence. In some cases, groups may now be claiming rights where customary marine tenureship did not previously exist'.

In some cases, communities implementing local marine tenureship arrangements have done so to create an economic monopoly on marine resources (Carrier, 1987, Carrier and Carrier, 1989a). Another assumption, or possibly misconception, associated with local marine tenureship arrangements is that these arrangements developed as a means of resource management. The rationale being that exclusive rights of access to a fishing ground ensured the owners of a reliable food supply. This is certainly not true in much of Papua New Guinea where many now valuable marine resources were relatively unimportant in the past and not in short supply. It is also clear that concerns over sustainability or even awareness that marine resources could be depleted never existed in many places (Swadling, 1977; Wright, 1985; Johannes and MacFarlane, 1991; Sabetian and Foale, 2006; Fabinyi et al., 2015). Perception of available resources and the nature of exploitative behaviour can have either a positive or negative effect on a specific resource base depending on how use and perception of abundance influences behaviour, values and cognition.

The flexibility of local marine tenureship arrangements in Melanesia routinely produce conflict within communities and with neighbouring communities. As will be shown in this thesis, the boundaries between Brooker Islanders and their island neighbours were transformed, becoming more concrete at different times in different circumstances. Through time and in response to

[15] Local marine tenureship arrangements have been recorded for areas of the south coast (Landtman, 1927; Frusher and Subam, 1981; Eley, 1987; Asafu-Adjaye, 2000), the New Guinea Islands Region (Bell, 1947; Carrier, 1981, 1987; Carrier and Carrier, 1989a; Otto, 1998; Turner, 1994), the northern coast (Lipset, 1985; Pomponio, 1992) and more specifically for Milne Bay waters (Malinowski, 1918, 1922; Williamson, 1989; Tom'tavala, 1990; Levinson, 2008).

economic opportunities, they emerged when and where required, continually evolving and challenged.

Harvesting sea cucumbers for the production of beche-de-mer and their later sale depends upon the ability to access sufficient sea cucumber stocks. In order to locate the mechanisms by which competition takes place, there is also a need to understand what specifically is being competed for. Commodified marine resources such as sea cucumbers are not distributed evenly in the sea but concentrate in favorable locations. Behind the competition over access to sea cucumber stocks, there loomed a struggle for income, securing livelihoods for both Brooker Islanders and their island neighbours. Bennett et al. (2001) state that fisheries conflict is often sparked by the perception that one group is gaining or, in economic terms, maximising their utility at the expense of another. There are also underlying differences with regards to sustainability, economic returns, securing livelihoods and general community welfare. In general, many scholars investigating local marine tenureship arrangements have not elaborated conceptually on what happens when these arrangements clash (Bennett et al., ibid; Bavinck, 2005). As Cordell (1984) notes, local marine tenureship arrangements are at the core of fisher's livelihood and subsequently they are worth fighting over on the water or in court. Fighting and later contest through the courts is exactly what happened with Brooker Islanders and their Ware Island neighbours. By going to court, the dispute between Brooker and Ware Islanders brought in a new layer of governance as the Papua New Guinea State now became involved through its judicial and legal systems.

Governance Opportunities

Governance has been defined in several different ways but generally refers to the whole of public as well as private interactions to solve societal problems and create societal opportunities (Kooiman, 2003; Kooiman and Bavinck, 2005). As such, governance is the broader arena in which institutions operate and the various management-related processes take place. Management is about action taken. Governance is about politics, the sharing of rights and responsibilities, but also includes the objectives of the policy and legislative arena (Kooiman et al., 2005; Jentoft, 2007).

There is no scripted transition however for the changes experienced by communities like Brooker Islanders who have moved from a pre-capitalist economy to a capitalist one or from a 'traditional' to 'modern' life and the shifts that this has brought about in governance structures. Considering how the global economy has led to huge economic inequalities, exploitation and ecological degradation, there is little doubt that societies like Brooker Islanders have been affected in varying ways. Their increased incorporation into the global economy has not necessarily evolved to fulfil their needs or to maintain the social-ecological systems they depend upon. This is especially true

when we consider that a decline in sea cucumber stocks resulted in an extended conflict between Brooker Islanders and their island neighbours.

Where tensions about access and use of marine resources do exist, these depend on a variety of factors which may sometimes cascade from tension into violent conflict. This is what occurred between Brooker and Ware Islanders in the late 1990s and early 2000s. Bavinck et al. (2014) notes that fisheries conflicts are as much about fisheries as they are about the governance frameworks that act upon them. To understand better conflicts and governance issues over fisheries, Bavinck et al. (ibid: 149) detail their Interactive Governance Theory which locates fishing conflicts in three realms:

1) System-to-be-Governed;

2) Governing System; and

3) Governing Interactions.

Systems-to-be-Governed consist of a social-ecological system, in this case, the marine environment and the group fishing for sea cucumbers, processing into beche-de-mer and marketing. Governance is the actions taken to solve societal problems and create societal opportunities and is exercised through both the Governing System and well as Governing Interactions. The nature of the interactions between the Governing Systems and Systems-to-be-Governed co-determine the governability of the system and it is within these interactions that conflict can be acute (Bavinck et al., 2014; Barclay et al., 2019).

During the late 1800s and early 1990s, there were attempts by the colonial government to manage the exploitation of marine resources in the then Territory of Papua. At this time, Brooker Islanders were largely left alone to manage their day-to-day lives. Livelihood activities that were carried out on a regular basis produced the 'basic goods' necessary for subsistence, inter-island trade and sale. During this period, Brooker Islanders would have developed when and where required, their own rules for proper behavior, as well as ways to implement them. In terms of Interactive Governance Theory, this situation would be termed 'self-governance' (Ostrom, 1990). As the sea cucumber fishery once again developed from the early 1990s, management of sea cucumber stocks became more difficult, with stocks declining and conflicts between groups increasing.

As noted above, in the case of Brooker and Ware Islanders, this resulted in their dispute being mediated through a court. With the involvement of the Papua New Guinea State through its judicial and legal processes, the dispute between Booker and Ware Islanders now became a legal

pluralistic matter as Brooker and Ware Islanders used aspects of their local cultural traditions in a Western 'court of law'. Legal pluralism situations often involve different patterns of economic exploitation usually involving common pool resources and where there is an overlap of legal systems (Bavinck, 2005; Bavinck and Gupta, 2014).

Bavinck and Gupta (ibid) note two variants of legal pluralism, one weak and one strong. Weak legal pluralism prevails when the State recognises the validity of customary law in certain domains. The Papua New Guinea State does recognise customary rights in its Constitution[16] and other Acts of Parliament[17]. Under strong legal pluralism there is no mutual recognition (Bavinck and Gupta, ibid). The advent of legal pluralism has meant that conflicts, which were originally understood and addressed through a single legal prism, now have multiple dimensions. As Brooker and Ware Islanders were unable to resolve their dispute amongst themselves, they were forced to seek third-party intervention through the Papua New Guinea State and its legal systems.

The 'race to fish' and access to declining sea cucumber stocks became even more pressing in the lead up to the moratorium on the sea cucumber fishery and the beche-de-mer trade that was declared by the National Fisheries Authority in October 2009. This means there was a failure to govern the sea cucumber fishery and the beche-de-mer trade at all levels, from the community to the Papua New Guinea State.

Knowing the Massim

The Massim[18] region today is an anthropologically defined cultural area that encompasses the eastern tip of the New Guinea mainland and the adjacent offshore islands that now covers all of the present day area of Milne Bay Province[19]. Early ethnological investigations in the Massim included Haddon (1894, 1900), Seligmann and Strong (1906) and Seligmann (1910). Seligman (ibid) divided the Massim into two different halves, the 'northern' Massim[20], and the 'southern'

[16] Under the PNG Constitution (Government of Papua New Guinea, 1975a), custom is defined as the customs and usages of indigenous people inhabiting a particular place at a particular time regardless of whether or not the custom or usage has existed since time immemorial.

[17] In the 1963 Native Customs (Recognition) Act (Government of Territory of Papua and New Guinea, 1963), ownership rights are recognised over marine environments that people have an interest to, and this includes, rights of fishing. The 1996 Lands Act (Government of Papua New Guinea, 1996), defines 'customary land' as land that is regulated by custom and 'customary rights'. Under the 2015 Fisheries Management (Amendment) Act (Government of Papua New Guinea, 2015), the rights of the customary owners of fisheries resources and their 'customary' fishing rights are recognised.

[18] Carlo Salerio, a Marist missionary based on Woodlark Island, is thought to be the first European to use the term Massim in 1862, thought to have been the Woodlark Islanders name for the people of the Louisiade and D'Entrecasteaux Archipelagos (Affleck, 1983).

[19] In the colonial era, the area that is now covered by Milne Bay Province was part of the South-eastern Division.

[20] The northern Massim has been relatively well described ethnographically (see Malinowski, 1922, 1935; Fortune, 1932; Austen, 1945a; Young, 1971; Kahn, 1986; Weiner, 1976, 1988; Munn, 1986; Damon, 1978, 1990, 2017; Kuehling, 2005; Jarillo de la Torre, 2013; Schram, 2018).

Massim[21]. Today, the Massim has became a people, a place, a 'culture area', a region that is synonymous with complex exchange systems and mortuary rituals. The majority of the anthropological work in the Massim has focused on the form and function of exchange, mortuary rituals and notions of personhood. For the most part, these previous works have seen exchange, mortuary rituals and personhood as systems apart from the long history of capitalism and capitalist exchange in the region and there has not been any extensive studies that specifically looks at fisheries or the use of the marine environment.

Conducting Fieldwork

In February 1998, I landed in Port Moresby and visited my affiliated institutions, the University of Papua New Guinea[22] and the Papua New Guinea National Research Institute. After being informed that my research application had not yet been returned from the Milne Bay Provincial Government, I flew to Alotau, the Milne Bay Provincial Capital and met with Solomon Yowaite who was at that time, the 'gate-keeper' for my research permit. On meeting Solomon, I was informed that my research had indeed been approved. This was the last I saw of Solomon for some years as he had been accepted under a scholarship program to do his own Doctor of Philosophy studies in Australia. As for myself, I never returned to Australia and have remained a resident of Papua New Guinea ever since.

After purchasing some supplies, I was now ready to head to the island of Misima, where I had arranged through the Summer Institute of Linguistics to first visit Bill and Sandra Callister who had been re-translating the New Testament into the Misima language. The reason to visit Bill and Sandra was to obtain some linguistic grounding of the Misima language. Whilst there, Bill mentioned that Ebaia Galele, an ex-(native) kiap or District Officer was taking copies of the newly translated New Testament to the outer-islands the next day. I had chosen three locations off a map to visit as potential field sites, these were Panapompom in the Deboyne Group of Islands, as well as Brooker and Motorina Islands. After torrential downpours during the night, I set off for Bwagaoia, the District Headquarters. After a brief introduction and discussion on who I was and what I was after, I was invited aboard and we set off for Panapompom Island, Ebaia's home island to visit his family. After visiting with Ebaia's father, we then departed for Brooker Island. Ebaia had relations there and we

[21] The southern Massim had less focus in pre-Independence times (see Armstrong, 1928; Belshaw, 1954, 1955) but during the 1970s and 1980s, several ethnographic studies were conducted in the the Louisiade Archipelago (see; Battaglia, 1990; Liep, 1983, 2009; Macintyre, 1983; Lepowsky, 1993). Closer to Brooker Island, Berde (1974, 1976, 1979, 1983) conducted fieldwork on Panaeati Island in the Deboyne Group of Islands. On Misima Island, Whiting (1975) and Callister (2000) examined mortuary practices, whilst Byford (1999) studied health issues. More recently, Rollason (2009, 2010a, b) spent time on Panapompom Island in the Deboyne Group of Islands looking at the politics of football and certain social dimensions of the sea cucumber fishery.

[22] I later worked as the Coastal Fisheries Advisor for the University of Papua New Guinea from 2004 to 2006.

made our way to the hamlet of Bokiyowa to visit with Jubilee and Amisen Sam[23]. Later that same day, we also visited neighbouring Motorina Island, my third choice. Amazingly, I had managed to visit all of my three choices in a single day.

After considering the three islands of choice, I decided upon staying at Brooker Island. There were several reasons for choosing Brooker Island. The first was that Brooker Island had been the site of an ex-fisheries station that had been established under the Milne Bay Fisheries Authority (see Chapter 4). The people of Brooker Island also appeared to have access to a large marine territory encompassing various islands and reefs. After some discussion between Ebaia and Jubilee, it was confirmed that I would stay with them, and a Kinch version of Malinowski's 'tent' was erected (Malinowski, 1922). I was then introduced to Jubilee's son, Ado who became my eternally linked brother. I would be 'adopted[24]' by Jubilee and Amisen, and Ado and I would share many adventures and travels over the years. During this six-week initial reconnaissance, I obtained an introduction to life on Brooker Island. I travelled widely with Ado, including the islands of Nagobi and Nabaina Islands, which would later become the epicentre of the dispute between Brooker and Ware Islanders.

After a few months back at the Australian National University, I once again made my way back to Alotau, research permit in hand and ready for an extended period of fieldwork. During my earlier visit, and during my initial stay in Alotau on this visit, I had met numerous local expatriates. One of these 'expats' was Kim Harvey, who had started a pearl farming operation at Samarai Island, the old colonial centre of the South-eastern Division and later abandoned as the provincial capital in 1968 as Alotau grew in importance. One of the areas that Kim was developing pearl cultivation was at Nimoa Island just to the north of Sudest Island and home to a Catholic Mission Station. Kim offered to drop me off at Brooker Island as they passed by. This was an excellent opportunity as it allowed me to carry roofing iron, tools and rations to set up a home.

On my initial visit, I had been told by Jubilee and Amisen that I would be staying in the main village, Awan bwabwatana ('big village'). As it turned out, I did not actually go to live in the 'big village' until about half way through my fieldwork. This was because all of the materials required to build a house had to be brought in from other islands. People were also busy 'living', either away trading or harvesting sea cucumbers to process into beche-de-mer for sale. These activities were important as my arrival back on Brooker Island in September 1998 also coincided with one of the severest El Nino drought events in living memory[25], so understandably people were rather more pre-occupied with

[23] Jubilee and Amisen Sam were to become my guardians. Amisen became my 'mother' and Jubilee because of matrileaniality, became my 'uncle', this arrangement was done just to keep things the 'right' way.
[24] Otto (1998) describes his adoption as a moment of social recognition and a methodological breakthrough, participating in a form of 'role play' as anthropologists cannot fill the role that is given properly to true 'kin'.
[25] The 1997 El Nino was surpassed by the El Nino event in 2013, which I also had the opportunity of experiencing the aftermath of in 2014.

other matters than building the '*dimdim*'s'[26] (foreigner's) house. I quickly settled into the routine of a small hamlet occupied by one extended family living, and then later, residing in the big village.

Due to the requirements of 'life', Brooker Island was really more a 'base of operations' as I actually spent most of my time on the outer islands fishing, diving for sea cucumbers, clams and lobster, and harvesting turtles and their eggs (Plate 2). On other occasions, I spent time sailing to Bwagaoia on Misima Island to sell fish, buy goods, trade, or to other islands to participate in various customary, trade, church or social activities. In all, I would take 146 different sea voyages during my main fieldwork period of 1998 and 1999. Most of these journeys were on sailing canoes, except for the later part of my field time, when Napa obtained the first fibre-glassed dinghy with an outboard motor on Brooker Island; and occasionally on workboats or fishing boats owned by Nako Fisheries.

Plate 2: Life on the Islands (Jubilee Sam is sitting to my right).
Photograph: Author.

During my field work, I slowly became more proficient with the use of 'language'. The most difficult part about learning a new language, especially if you have been born and brought up as an Anglophone in Australia is distinguishing people and place names. Often in bewilderment after I

[26] The term '*dimdim*' is a local word which is used throughout Milne Bay Province to refer to a white person. The origin story I was told concurs with what Battaglia (1990: 19-20) details whereby the term *dimdim* refers to a mythical location found to the east. For Brooker Islanders this mythical location was in the south. It is possible that this mythical location is the embedded remembrance of the direction from which the early explorers reached the Louisiade Archipelago (Rollason, 2010a). Asians are commonly called by the Tok Pisin word, 'kongkong', itself a corruption of the word for Hong Kong, now a Special Autonomous Region of the People's Republic of China.

heard a word used in rapid succession by numerous people, I would ask Ado as an example, "*Makol ana sapu*?" ("What does Makol mean?"), only to have everyone point at an old man who I had not met yet. Whilst I would never profess to ever becoming fluent in the Misima language[27], I did however develop a relatively specialised marine-orientated vocabulary.

When conducting fieldwork, there is a connection between researcher and 'researched' (Macintyre, 1993). This is because as we conduct fieldwork we also become entangled in all sorts of relationships. Rasmussen (2015) who did field work on Mbuke Island in the Manus Province notes the difficulties of roles and social positions when doing fieldwork. Because I was 33 when I started fieldwork at Brooker Island and because I was also an expatriate of European (Australian) descent, I was categorised as a '*tonawak*', a middle-aged man and was afforded the status that this term reflects. Also once I was adopted into the Sam family, I also became part of the Manilobu sub-Clan which Amisen was the matriarch of. Being part of the Sam family meant I was viewed as a representative of that family first and the sub-clan second. This to some degree affected my relationships with other members of the Brooker Island community, but also with other people on other islands as I was slotted into certain kin categories, but also because I was identified as being a Manilobu Clan member. Being associated with the Sam family, I now had obligations. In later journeys throughout the Louisiade Archipelago, I was able to invoke my 'Brooker Islandness' in trading arrangements for ceremonial objects which I used in supporting mortuary feastings obligations at Brooker Island, especially when Jubilee died in 2001[28].

As noted above, historical political ecology can be characterised as a 'field-informed' interpretation of social-ecological relations in the past, but also into the present. Ethnographers use a holistic approach and a varied toolkit of qualitative and quantitative methods distinguished by participant observation, surveys, mapping and bio-physical research, in which the researchers immerse themselves in a social group as an active participant during extended periods of time (Bernard, 2017). Ethnographers attempt to understand social systems from an 'emic' perspective which requires establishing a rapport with the community they become embedded in.

A mixed-methods ethnographic approach guided data collection during my main fieldwork period of 1998 and 1999. Subsequently, a large portion of the analysis presented in this thesis focuses largely on events that took place during that period, but is also informed from later visits and continued encounters and contact. A suite of qualitative methods was applied, including both structured and unstructured interviews, focus group discussions and participatory observations (Bernard, ibid). During my initial period of fieldwork, I conducted a census of every household

[27] I actually ended up being a bit of a novelty or maybe a sense of pride for Brooker Islanders, often called to others "*wala dimdim*" ("our foreigner"), and had on occasion, people from islands near and far come to hear the *dimdim* talk their 'language'.
[28] My youngest son, Samson has Jubilee has his middle names as a memory to Jubilee.

in the Brooker Ward. The questionnaire used for this census focused on demography, education, assets, main income activities and general patterns of livelihoods (see Appendix A). Semi-structured interviews with key informants were also conducted. These were conducted with both men and women and focused on aspects of marine resource exploitation and use, as well as other aspects of Brooker Islander livelihoods. Interviews provided in-depth knowledge at the community and household levels. Information was also elicited from normal conversations conducted in the routine of each day. During my fieldwork, I also documented various locales of social, cultural and economic significance.

Detailed catch surveys were also conducted over the peak diving season from the 5th of January to the 1st of May 1999. During this period, I recorded 121 fishing trips along the Long-Kossman Reef area and the Bramble Haven Group of Island. These trips were divided into three sub-types depending on the use of vessels and main targeted species:

> Trip type 1: A total of 39 trips recorded in this category with fishers operating from sailing canoes and harvesting sea cucumbers as the main target species.
>
> Trip type 2: A total of 37 trips recorded in this category with fishers again operating from sailing canoes and harvesting lobster and giant clam as the main target species.
>
> Trip type 3: A total of 45 trips recorded in this category with fishers using dugout and outrigger canoes launched and picked up by Nako Fisheries vessel and harvesting lobster and giant clam as the main target species.

Information collected from these trips were used for analysis of catch-per-unit-effort for Brooker Islanders targeting specific marine resources (see Chapter 5, Appendix O). Data for fishing episode included trip duration, number of people onboard the vessel, catch of each species in numbers of individuals, the reef fished and a general description of the fishing operation. Average catch-per-unit-effort values were then calculated for each species by trip type or fishing type using person hours and number of species collected or caught.

In preparation for my fieldwork on Brooker Island, I realised that if one is to have an understanding of the marine resources that Brooker Islanders were exploiting, and the marine environment from which these were being extracted from, I needed to know what these marine resources are and an understanding the their biology and ecology. I brought with me a number of identification books as well as papers on the biology and ecology of various marine species which were used for informal interviews and discussions. Looking through fish identification books and interviews with village elders and fishers also yielded many local names of various marine and terrestrial resources along with their etymology (see also Foale, 1998; Allen et al., 2012; Cohen et al., 2014; Moesinger, 2018).

I also undertook extensive archival research in Canberra whilst at the Australian National University and at the government stations in the Louisiade Archipelago, notably Samarai Island, Bwagaoia on Misima Island, Tagula on Sudest Island, and Pambwa and Jinjo on Rossel Island. I also literally waded through the abandoned documents of the Milne Bay Fishing Authority on Samarai Island. A range of secondary sources and records and historical documents have also been used.

Besides the exploratory trip in February and March 1998 and the main fieldwork period from September 1998 to October 1999, I also subsequently visited Brooker Island four times during my employment on the United Nations Development Program funded and Conservation International implemented, Milne Bay Community-based Coastal and Marine Conservation Program from 2000 to 2003. During this program, I went back to Brooker Island for varying lengths of time whilst on 'patrol'. These patrols included participatory rural appraisals and then later focussed on a community entry process to build capacity for Brooker Islanders to develop marine resource management and conservation plans (see Kinch, 2001a, b). In addition, I participated in a marine biodiversity survey of the Louisiade Archipelago in 2000 (Allen et al., 2003a), and conducted a sea cucumber stock assessment of the whole of Milne Bay Province in 2002 (Skewes et al., 2002). In early 2003, I also spent time with Brooker Islanders on Jomard and Panadaludalu Islands whilst conducting sea turtle nesting surveys (Kinch, 2003a). My next visit to Brooker Island was in 2006 when I conducted a reef damage assessment of the grounding of the *MV Zhi Qiang* on the Long-Kossman Reef (Raaymakers et al., 2006). I again revisited Brooker Island in 2014 as part of a shark-finning survey with the Commonwealth Science and Industry Research Organisation (Vieira et al., 2017).

James et al. (2012) note that while it is relatively common it is by no means obligatory for individual researchers to maintain any kind of relationship with a community or individual informants. This is in part because the classical model of information gathering during fieldwork is for many anthropologists just a one-off concentrated exercise. Continuing relationships is also often difficult due to social and logistical issues associated with maintaining long-term relationships over periods of presence and absence. In contrast, this thesis is based on an unusually wide period of time, giving the benefit of a historical perspective between 1998 and the present. This extended time period has allowed for different types of engagement to continue with various members of the Brooker Island community.

When I have resided in Alotau, Brooker Islanders have always visited. When visiting Alotau for any reason when I have been residing in other provinces in Papua New Guinea, I would find on most occasions, Brooker Islanders who had either just arrived to sell their marine resources, or about to depart back to Brooker Island. Additional contact has also been continued with the very

few Brooker Islanders that reside in Port Moresby[29]. Over the years, I have also remained in touch with Ado and other Brooker Islanders by regular telephone communications[30]. During these calls, stories are told of recent events and always end in a request for money. Rasmussen (2015) details the request for money from 'relatives' residing in urban centres of Papua New Guinea reinforces relationships in a 'singaut' economy (see also Connell, 2018a). In the Misima language, such requests are called '*awanun'* and a person who regularly satisfies others' desires through his or her generosity and the successful management of resources is said to have good ways, '*pagan waiwaisana*'. For Ado and other Brooker Islanders, extracting money from me to purchase fuel, fishing gear, etc. continues our relationship. It shows that we continue to value each other (see also Rollason, 2010a). While the knowledge produced in this thesis is marked by my research interest and influenced by what other scholars have written, it is also marked by my own experiences and those shared with Brooker Islanders.

Conclusion

Livelihoods are complex, multi-dimensional, temporally and spatially varied and socially differentiated. Livelihood are conditioned by histories of place and the people that live in those places, as well as their wider interactions with colonialism, state-making and incorporation into the global economy. By taking a historical political ecology approach using a livelihoods framework, I demonstrate through this thesis, the relationships and tensions embedded in the articulation of different social systems and modes of production in specific periods involving Brooker Islanders from their initial migration into the now Milne Bay Province approximately 3,500 years ago, through to the present. As Scoones (2015: 38) notes:

> The myth that isolated, remote places were uninfluenced by colonialism, structural adjustments, changing trade regimes or the state is absurd and dangerous. All livelihood resources, strategies and outcomes are influenced by such processes, as are the institutions and organisations that mediate them.

Bebbington and Batterbury (2001) have emphasised the significance of analytical value of grounding political ecologies in notions of livelihood, scale, place and network. A livelihoods framework informed by political ecology brings attention to the politics of globalised processes mediated at various levels from the national, provincial, island groups, island, clan, sub-clan, family and finally, the individual. These processes determine what livelihoods are possible, how governance is enacted and what policy environment is used. All livelihoods are influenced by

[29] There are very few Brooker Islanders living outside of Brooker Island besides those residing on neighbouring islands due to marriage. One Brooker Island lady, Saileen who has lived in Port Moresby for most of her adult life is married to my wife Sylvia's uncle from Logea Island.

[30] Brooker Island is outside the telecommunications networks of both Digicel and Telikom, and subsequently, social media platforms are not available.

wider market changes and globalised connections. Wider economic drivers change patterns of access and use of marine resources especially when market dynamics are at play which influence the commodification, the demand for and the market access to these marine resources. Shifts in markets have ripple effects that make a wider perspective crucial. The State is also important as are other international management instruments as they affect what people can do, where and when.

Livelihoods analysis therefore exposes the inevitably highly variegated experiences of colonialism and globalisation and the incorporation of the local into the global economy and the implications of this transition and transformation has on livelihood pathways (Scoones, 2009, 2015). People like Brooker Islanders because of their current asset and resource base have limited livelihood options and are likely given future trends, to end up just coping, rather than moving to new livelihood options or getting out completely.

Communities like Brooker Islanders have long experienced significant economic, environmental and social change as they grapple with the challenges and opportunities provided by the global economy. The increased dependency, especially on sea cucumber stocks, has permanently altered the way Brooker Islanders interact with their 'marine world', but also with their island neighbours that want to access this marine world for their own economic benefits.

Using longitudinal studies like this thesis helps to make the connection between local realities and wider processes, demarcating transitions between different livelihood strategies, the changes over time and in the accumulation and use of various assets. Historical analyses of livelihood change also highlights how long-term shifts in livelihood strategies emerge. In long-run livelihood change, specific dynamic drivers, operating over decades (or centuries) are highlighted as important. These include population growth, market demand and climate change. Adaption, sustainability and resilience capabilities of communities like Brooker Islanders are also exposed.

To bring out these details, this thesis uses the following chapter pathway to detail how marine resources utilised by Brooker Islanders have been commoditised and how Brooker Islanders have become increasingly incorporated into the global economy and the changes in their livelihoods brought about by this incorporation.

'Chapter 2: Environment and Ecology' provides details of the environment that Brooker Islanders live in. Brooker Islanders' terrestrial environment is impoverished and so subsistence self-sufficiency in terms of garden production alone is impossible. Brooker Islanders are also increasingly vulnerable to various natural disasters. The risks associated with projected climate

change are real for Brooker Islanders exacerbating their vulnerability and dependency on the global economy to earn much needed cash for survival.

'Chapter 3: The Emergence of Commoditisation: 1800s-1975' details aspects of Brooker Island prehistory, and historical associations with the burgeoning global economy. In the 19th Century, the Massim 'materialised' as a culture area and inhabitants such as Brooker Islanders became participants, often willingly, in new capitalist ventures. This started before colonial rule but increased after World War II when the colonial government of the day sought to bring Brooker Islanders into the capitalist enterprise. Historically, commoditisation of marine resources started with whale oil, pearls, pearl shell, trochus and beche-de-mer. Due to changing technologies, consumer preferences and depletion of these marine resources, the initial 'boom', particularly for beche-de-mer, was over by the beginning of World War I. The introduction of colonial export industries allowed for the extraction of marine resources and access to store foods and goods. For Brooker Islanders, this saw their increasing incorporation with the global economy and the beginning of the importance of cash incomes throughout the Louisiade Archipelago.

'Chapter 4: Development in the Marine Realm: 1975-2019' builds on Chapter 3. After World War II, the first attempts by government to develop a market economy for the people of Papua New Guinea was through the development of co-operatives which saw Brooker Islanders and other groups organised into economic units based around village stores and the harvesting and selling of trochus and the production of copra. These co-operatives eventually failed, but strengthened peoples cash dependency despite the fluctuations in the global economy for these commodities. Following Independence in 1975, local commercial interests became increasingly powerful in the lives of people like Brooker Islanders. Attempts to develop fisheries production in the Louisiade Archipelago first involved the Catholic Church, an international development agency, a mining company and then local private companies. Early attempts to develop fisheries in the Louisiade Archipelago were unsuccessful due to the high costs associated with operating in a remote area and the difficulties in transport and other logistics. From the early 1990s until a moratorium was imposed by the National Fisheries Authority in October 2009, Brooker Islanders became engaged in the harvesting of sea cucumbers and processing them for the beche-de-mer trade. This activity became the predominant economic activity throughout the Louisiade Archipelago and the mainstay of life for Brooker Islanders. This period also saw a dramatic rise in prices and exports of beche-de-mer from Milne Bay Province. The value associated with beche-de-mer also brought outsiders to Brooker Island waters and they have had to contend with the presence of poachers.

'Chapter 5: Making and Earning a Living' presents a deeper look at Brooker Island life. In the context of limited agricultural land, increasing population, the exploitation of commodified marine resources and increasing exposure to the global economy, the focus of this chapter is to provide details of what it is to be a Brooker Islander. Brooker Islanders live not only off the sea, they live in it and move across it. Brooker Islanders are 'true' people of the sea. Inter-island subsistence trade is still important for Brooker Islanders, now using a combination of boats, dinghies with outboard motors and sailing canoes. The survival of trade networks and mortuary activities and inter-island exchange systems into the present, in more or less modified forms, is indicative of their fundamental importance to the maintenance of life on Brooker Island. Cash however has become increasingly important, not only for the purchase of food and goods, but also in trade and mortuary activities. The pursuit of cash by Brooker Islanders has brought them into contest and, on occasion, conflict with the neighbouring islanders.

'Chapter 6: Contestation over Marine Resources' provides background information and examples of disputes that have arisen or are still relevant to Brooker Islanders. In general, local marine tenureship arrangements in the Louisiade Archipelago show a high level of fluidity. When cash earning opportunities developed, and when various commodified marine resources on which peoples' livelihoods depended upon became threatened, disputes arose. The pursuit of the capitalist enterprise broke down previous relationships between groups and in the case of Brooker and Ware Islanders led to in the early 2000s actual physical confrontation and the need for external intervention. The main issue at stake for both Brooker and Ware Islanders was access to valuable but declining sea cucumber stocks to secure their livelihoods. Competition over commodified marine resources was exacerbated due to declining stocks. Over-harvesting was driven by the high prices paid; in some areas, this encouraged the use of new technologies such as hookah gear and the desire for dinghies and outboard motors to access other marine areas. This inevitably resulted in a 'race to fish' and a contest over resources. Contestation over marine resources ended between Brooker and Ware Islanders when the National Fisheries Authority implemented a moratorium on the sea cucumber and beche-de-mer trade in October 2009. The imposition of the moratorium caused much hardship for Brooker Islanders as their main source of cash disappeared.

'Chapter 7: Impacts of the Moratorium' details the impacts of the moratorium on Brooker Island livelihoods. Following the moratorium, Brooker Islanders attempted to offset the lost income from beche-de-mer by focusing on the production of copra and harvesting other marine resources such as trochus and sharks for the production of shark fins. These activities did not endure due to a lack of market accessibility, high cost of freight and the poor prices paid. The moratorium caused a collapse in the local economy and a reduction in the wealth expended on mortuary activities. One outcome of the moratorium was a return to peaceful relations between Brooker and Ware Islanders. This may change in the future however as the National Fisheries

Authority reopened the sea cucumber fishery and beche-de-mer trade in April 2017 and the sea cucumber fishery and beche-de-mer trade has regained its dominance in everyone's lives. If people like Brooker Islanders are to maintain the economic benefits that they again enjoy from the sea cucumber fishery and beche-de-mer trade then the sustainability of sea cucumber stocks needs to be ensured.

The issues of sustainability and governability of sea cucumber stocks and various biodiversity conservation and fisheries management initiatives are detailed in **'Chapter 8: Issues for Sustainability and Governability'**. As shown in Chapter 6, the main dispute between Brooker and Ware Islanders was in part driven by declining sea cucumber stock. This raises issues of the sustainability of commodified marine resources once fishing pressure intensifies. The increased market demand for sea cucumbers and the increasing requirements to earn cash pushed sea cucumber stocks to a point of collapse across not only the Louisiade Archipelago, but all over the coastal waters of Papua New Guinea. As Brooker Islanders have continued to be incorporated into the global economy, there has also been an increasing engagement with external agents promoting marine conservation. Although conservationist discourses have integrated 'social concerns' to some extent, the everyday reality of conservation policies is often marked by an antagonistic interaction between those policies and local people who tend to have a more utilitarian outlook on the use of their resources.

The colonial era saw the introduction of the first attempts to manage the sea cucumber fishery and the beche-de-mer trade. In the post-Independence era, the National Fisheries Authority regulates the sea cucumber fishery and beche-de-mer trade through a National Beche-de-mer Fishery Management Plan. Due in part to the size of Papua New Guinea, the National Fisheries Authority has limited presence in communities like Brooker Islanders. Given the past history of a 'race to fish', the inability of the National Fisheries Authority to effectively manage the sea cucumber fishery and the beche-de-mer trade at any level, it is likely that a 'boom and bust' scenario will be inevitable in the future. To ensure sustainability of sea cucumber stocks and to enhance the stability and resilience of communities like Brooker Islanders, there is a need to strengthen their capacity to manage their resources, but also to mitigate conflict.

'Chapter 9: Conclusion'. The increasing incorporation of Brooker Islanders into the global economy has brought local development and some prosperity to them, but at the same time it has increased their vulnerability to the external forces of fluctuating markets and national and international regulations. Sea cucumber resources have changed from having no real 'value' for Brooker Islanders to now being commodities for sale. Cash needs have come to stay due in part to the increased consumer dependency by Brooker Islanders and their limited alternative income opportunities and the use of cash has been extended to meet a wider range of ends. Brooker

Islanders now ‘work’ for a living and their marine environment is their workplace. Fisheries targeting sea cucumbers have experienced unsustainable pressures, especially where island populations have increased, the introduction of new technologies such as dinghies and outboard motors have proved too efficient, where management is ineffective and there are widespread negative incentives to avoid compliance.

It is inevitable that Brooker Islanders will face ‘limits to growth’ as population pressures increase, but they are also exposed to further risks by the dangers of projected climate change. Understanding how these changes interact with Brooker Islanders’ ability to respond to their already uncertain environment may provide insights useful for fisheries management and ameliorating factors currently causing vulnerability and avoiding future conflict in the Louisiade Archipelago.

Chapter 2

Environment and Ecology

Brooker Islanders inhabit a vast marine territory with multiple islands and marine environments that support their lives through the exploitation of various marine resources for food, inter-island trade, sale and cultural purposes. To move over this large marine territory requires much time and effort. While this sea space is large, the various landmasses available to Brooker Island are quite small. From small atoll islands, to old remnant volcanic islands, and islands made of raised ancient reefs, the available land does not allow suitable agriculture production for Brooker Islanders to sustain themselves. Berde (1976), who lived on Panaeati Island in the Deboyne Group of Islands to the north of Brooker Island, describes Brooker Island as an example of '*taval hot*' (a real island) whereby marine resources are vital, gardening is poor and inter-island trade to import garden food from larger islands is essential. Complicating the lives of Brooker Islanders is their continued vulnerability to cyclones and El Nino associated droughts. The impacts of these events influence the livelihood strategies that Brooker Islanders pursue in a given year.

Life is not easy for Brooker Islanders and a common expression on Brooker Island is "*wala panuwa i pulowan hot*" (our place is a hard place to live). Despite these hardships of island life, Brooker Islanders have a deep attachment to their island and have a rich catalogue of knowledge that supports their continued presence. Changes that mark the points in the annual ecological calendar of Brooker Islanders includes the transition from the wet to the dry season, seasonal changes in wind direction, the seasonal cycle of crops, and observing the behaviour of animals, birds, fish and vegetation. Knowledge of these seasonal climatic variations is vital for not only travelling on and working the marine environment, but also for planning gardening activities, for scheduling inter-island trading expeditions and when to go fishing.

Climatic Conditions

The Louisiade Archipelago where Brooker Islanders live is located on the northern edge of the Coral Sea. The Coral Sea is generally oligotrophic, and has topographic and oceanographic features that supports high biodiversity (Ceccerelli et al., 2013; Ceccerelli, 2019). This biodiversity underpins the livelihoods for Brooker Islanders.

The Louisiade Archipelago climate is considered to be typical of the coastal and lowland areas of Papua New Guinea and is categorised as 'lowland humid' with two main seasons (McAlpine et al*.,* 1983). The first consists of prevailing southeasterly winds, usually lasting eight to nine

months, whereby the winds blow almost continuously and often produce onshore winds up to 30 knots. This period is then followed by the north-westerly monsoon. Doldrums follow at the end of and beginning of each wind shift. This cycle is produced by north-south movements of the Hadley Circulation across the equator in the Inter-Tropical Convergence Zone and the zonal east-west moving Walker Circulation (Sullivan, 1991). The most important driver of inter-annual climate and oceanographic conditions in the Louisiade Archipelago is the El Nino Southern Oscillation which operates in recent years on alternating cycle with La Nina of between three to seven years (Ceccerelli et al., 2013). Depending on prevailing conditions, cyclones are most likely to develop in the Austral summer months. Whilst wind direction has a marked seasonality, which in turn affects the coastal morphology of the islands and reefs of the Louisiade Archipelago, the transition from one system to the other has minimal effect overall on temperature (Hopley and Hamilton, 1973). On Brooker Island, the year is divided by them into the following two seasons coinciding with the shift in wind patterns, these are:

Baliman[1]	March-October
Huwalu	November-February

The period of *huwalu* is an annual cycle that covers the months of the Austral summer and is often exacerbated by El Nino events. '*Huwalu*' is regarded as a 'time of no food' and is the period that people often go hungry while they are waiting for their new gardens to grow.

Sub-seasons are also identified by Brooker Islanders in accordance with periods in between the changing wind patterns and correspond to the equinoxes, these are:

Datu-baliman[2]	June-July
Haptomwa[3]	October-November and February-March

There are four directions of wind identified by Brooker Islanders, and these are:

Aluwab	from the North
Baliman	from the East
Yavana	from the South
Yalas	from the West

Wind speeds during the *baliman* months can be sufficiently strong to not only reinforce the south Pacific swells on the outer barrier reefs of the Louisiade Archipelago, but also to form wind waves of sufficient size that can create considerable erosion and accretion on island coasts (Hopley and

[1] *Baliman* is also known as the wind direction from the east. This shows the prominence of this wind cycle to Brooker Islanders as it is to all people in the Milne Bay Province.
[2] *Datu-baliamn* refers to the period of day time low tides.
[3] *Haptomwa* means to cut halfway, in this instance the period that cuts between the main wind cycle periods.

Hamilton, ibid). Due to these processes, low sandy atoll islands often change their morphology, and in the case of sand banks, appear and disappear on a cyclical basis.

In summer, the South Pacific Convergence Zone reaches its southern most position resulting in greater precipitation. Subsequently, rainfall in the Louisiade Archipelago is generally heavier between the months of January to May, with the 'trade wind' months of June and July bringing dry conditions[4]. Temperatures in the Louisiade Archipelago are relatively stable, though it can get cold in the mid-year when strong cold winds from the south blow up the eastern seaboard of Australia crossing the Coral Sea to reach the outer islands of Milne Bay Province.

The upper ocean layer of the Louisiade Archipelago is kept well mixed and has relatively constant temperature and salinity, and is well oxygenated. The western flow of the South Equatorial Current brings subsurface currents through the Coral Sea to the southern regions of Milne Bay Province. Water temperature along the Long Reef, Bramble Haven and Jomard Islands has been recorded to range from between 27.6° C to 29.3° C (Manser and St John, 1973: 157-158).

Tides are diurnal and the maximum tidal amplitude has been calculated to be 1.18 m for the Misima District (NSR Environmental Consultants, 1987). As noted above, the waters of the Louisiade Archipelago are open to various atmospheric and oceanographic influences including currents. These currents are, as the direction of the winds, very important to Brooker Islanders for moving across their marine territories, but also in determining what livelihood activities they will conduct at a given location at a given time. Brooker Islanders have four main current directions; these are:

Nawa	from the North
Tataha/Tatahek	from the East
Bwaganumunumu	from the South
Tatalau	from the West

[4] I recorded rainfall for Brooker Island over a 12-month period from October 1998-September 1999. During this period, 1,468.5 ml of rain fell over 147 days. In contrast, Misima Mines Limited (Misima Mines Limited) on the south coast of the large island of Misima to the northeast received 3,493.3 ml over 256 days during this same period.

Island Morphology

Papua New Guinea is a large maritime country due to its Exclusive Economic Zone[5] of approximately 3,120,000 km² and total coastline estimated to be approximately 17,110 km in length[6] (Bualia and Sullivan, 1990). Milne Bay Province has a maritime area of roughly 110,000 km² and a coastline of 2,120 km (Kinch, 2001a) and contains approximately 13,000 km² of coral reefs (Allen et al., 2003a) or an estimated 32 per cent of the national total of Papua New Guinea's reef area The Louisiade Archipelago has a land area of 1,333 km² and a total sea area of 13,751 km² and has the largest area of reef in Milne Bay Province, at about 7,980 km² (Skewes et al., 2011).

Within Milne Bay Province, Fairbridge and Manser (1973: 12) denotes three geological types of islands:

1) high islands[7] composed of low-grade regional metamorphic rock, frequently mantled with younger volcanic and limestone rock and rimmed by fringing or barrier coralline and algal reefs (e.g., the D'Entrecasteaux Group of Islands, Misima Island, and the larger islands of the Louisiade Archipelago);

2) volcanic islands which are the upper parts or remnants of volcanic cones on the sea floor with recent or Pleistocene fringing coralline reefs (e.g., the Amphlett Islands in the north, and Ware and Brooker Islands in the south); and

3) reef islands including coral sand cays, uplifted reef limestone and emergent or remnant reefs (e.g., the Trobriand Islands, the Conflict Group, and the barrier islands of the Long-Kossman Reef).

Within the Louisiade Archipelago, a steep drop from 200 to 2,000 m known as the Jomard Fault separates the oceanic plate of the Coral Sea Basin from the continental plate of the Louisiade Archipelago and eastern mainland Papua and its associated Papuan Plateau (Manser, 1973). Additional fault lines running across the western end of the Louisiade Archipelago include the

[5] Formalised by the United Nations Law of the Sea Convention (United Nations, 1982), the division of the ocean into Exclusive Economic Zones has granted all coastal states an exclusive authority to exploit and manage fisheries resources contained within their respective Exclusive Economic Zones, further consolidating a state-based, centralised management ethos.

[6] This coastline encompasses the coastal peripheries of the mainland, and islands both large, as in the islands that make up the New Guinea Islands region and the Autonomous Region of Bougainville and small, such as those like Brooker Island.

[7] These islands are actually the high points of the partly drowned continuation of the Owen Stanley Range (Brass, 1959; Loffler, 1977).

Conflict Syncline and Anticline, and the Kossman Fault (Kaplin, 1994). Further to the east, the Calvados Anticline and the Calvados Fault caused the greater than 1,000 m deep slot between Misima Island and the northern barrier reef of the Louisiade Archipelago (Manser, 1973). Tectonically, the islands of the Louisiade Archipelago are considered to be sinking (Kaplin, 1994; Puzachenko, 1994). This has implications for future sea level rise under various climate change projections.

The Louisiade Archipelago is divided into the northern barrier reef and the southern barrier reef. The souther barrier reef is mostly a discontinuous and partly submerged barrier reef known as the Long-Kossman Reef in the west and ending up as a large fringing reef surrounding Sudest Island in the east. It is the Long-Kossman Reef and the many associated islands in this area of the Louisiade Archipelago which are heavily utilised by Brooker Islanders. Brooker Island itself is enclosed by a secondary barrier reef that is about 2 km in width and has a depth of about 10 to 20 m with only a single pass on the southwest side[8] (Fairbridge, 1973b).

Brooker Island is the partial remains of a volcanic crater rim, with the remainder of the volcano being lost through caldera collapse caused by the differential tectonics of the Kossman Fault which occurred during the Pliocene and Pleistocene[9] (Kaplin, 1994). Following the collapse of the caldera, subsequent explosive destruction or erosion has resulted in the current shoreline after stabilisation of sea levels in the Holocene.

Islands like Brooker and others in the East and West Calvados Chains have mid to low elevation characterised by free surface drainage and there is an absence of pronounced features of excessive moisture (Targulian and Velpatievsky, 1994). On Brooker Island, signs of excessive wetness can only be found at Gutunka Bay on the north side of the island. The islands of the East and West Calvados are generally dry.

Soils on Brooker Island and the neighbouring islands of Venaliwa and Ululina are composed of a mixture of un-metamorphosed Upper-Miocene andesitic agglomerate, breccia, scoria, lava flows and subordinate tuffs (Smith and Pieters, 1969; Manser, 1973; Smith, 1973). Below the layer of shallow vegetation litter, a soil horizon of 10 to 30 cm in depth exists (Targulian and Velpatievsky, 1994). This is the layer in which gardens are made. Following this layer, clay can be found at depths of of 1.5 to 2 m. Clay is important in the manufacture of clay pots, an important livelihood activity for Brooker Island women (see Chapter 5).

[8] The United States Navy blasted this passage in 1942 to aid access to the inner lagoon (United States of America Armed Forces, 1942).

[9] Some volcanic rocks recorded on Brooker Island are believed to be around 11 to 11.4 million years of age which are either middle Miocene or lower upper Miocene and date back to the formation of the Owen Stanley Range (Smith and Pieters, 1969; Smith, 1973).

Due to the change in the alignment of the West Calvados Chain from east to west, the two limestone islands of Panasial and Panapatpat[10] are completely detached from the main island chain of the Louisiade Archipelago (Manser, 1973). Soils on Panasial and Panapatpat Islands are trapped in pockets due to weathering processes and have three main layers. The first is a layer of organic remains and litter at the top to about 20 cm in depth. This layer is enriched by deposits of phosphate from guano deposited by fish-eating sea birds. This layer is followed by a layer of clay to depths of 20-30 cm which is then followed by the underlying coral limestone (Targulian and Velpatievsky, 1994). These two islands are also utilised by Brooker Islanders for gardening. This is not an easy task however given the weathered formations of these two islands and the shallow depths of the soils.

Islands along the northern edge of the Long-Kossman Reef, including those in the Bramble Haven Group of Islands[11], and the Jomard and Duchateau Group of Islands are all low atoll islands and have only formed in the last 6,000 years (Fairbridge, 1973a). The Bramble Haven Group of Islands is approximately 15 km east-west by 10 km north-south in size, with a 30 to 40 m deep lagoon. Between Jomard Island and the Bramble Haven Group of Islands there is a deep channel known as the Jomard Entrance or the Jomard Channel which is a major shipping lane (see Chapter 8). The neighbouring islands to the east make up the Duchateau Group of Islands. Further west, the islands of Nagobi and Nabaina can be found. These islands are also small atoll islands. All of these islands are heavily utilised by Brooker Islanders, and in the case of Nagobi and Nabaina Islands were the centre of a dispute between Brooker and Ware Islanders which will be detailed later in Chapter 6.

Marine and Island Biodiversity

The Louisiade Archipelago is in the epicenter of marine species diversity in Western Melanesia and this is reflected in one of the richest coral reef environments on earth (Allen et al., 2003a). As part of the marine biodiversity surveys conducted by Conservation International, a Reef Condition Index[12] value was calculated for each site surveyed. Of the eight sites surveyed in Brooker Island's marine territory, the Reef Condition Index ranged from 184.45 at Panasial Island, to 244.48 at Enivala Island in the Bramble Haven Group of Islands (see Appendix B). The eight sites that were surveyed in Brooke Island's marine territory also recorded on average, a

[10] These islands consist of lower Miocene reef deposits and are abundant in microfossils from this period (Smith, 1973).
[11] Islands are only found on the lagoon-facing northern rim because accumulative conditions cannot develop on the southern edge due to exposure to ocean swells and prevailing winds (Fairbridge, 1973a).
[12] The hypothetical maximum Reef Condition Index for a pristine reef is 300 (Allen at al., 2003b). Reef condition is a term pertaining to the general 'health' of a particular site as determined by an assessment of natural and human-induced environmental damage and general biodiversity.

quarter of all fish and coral species reported for Milne Bay Province[13]. Essentially, the coral reef systems of the Louisiade Archipelago are healthy, though sustaining stocks of commodified marine resources is problematic. In 1998 and 1999, I collected the vernacular names of various marine species identified by Brooker Islanders and these can be found in Appendices C, D and E.

Despite the high species richness observed in the marine environment, the overall mammalian and avifauna in the Louisiade Archipelago is regarded as rather impoverished though there are high levels of endemism of species that are present in the Louisiade Archipelago (Brass, 1959; Voronov et al., 1994; Richards, 2002; Kraus et al., 2003, 2005; Johns et al., 2009). MacGillivray (1852) in his early expedition through the Louisiade Archipelago noted that the avifauna consists mainly of frugivorous and insectivorous pigeon species which prefer the smaller islets and atolls of West Calvados Chain. Brooker Island people commonly harvest juvenile '*mwamwanitu*' (Nicobar pigeons, *Caloenas nicobarica*), eggs from tern species, and bush fowl (*Megapodius eremita*) when they are out on the atoll islands. This exploitation increases during previous sea cucumber fishing seasons as a greater number of people are inhabiting these atoll islands. This habitation also impacts on timber resources as these are cut to supply fuel wood for processing sea cucumbers into beche-de-mer. Bayliss-Smith and Christensen (2008) have noted that bird populations and tree cover on the atoll islands of Ontong Java in the Solomon Islands have declined over the past century. This change was brought about by the changed mobility patterns of the Ontong Javanese through their incorporation into the wider global economy and targeting commodified marine resources.

Species of mammals include rodents, frugivourous and insectivorous bats, and possums (Hill, 1965; Zeigler, 1982; NSR Environmental Consultants, 1987; Bonaccorso, 1998). Possums are caught more in the months of July to September as people are spending more time in the bush preparing gardens. The distribution of amphibians is largely determined by the availability of fresh water. The cane toad (*Bufo marinus*) is now ubiquitous throughout the Louisiade Archipelago. Lizards of the family Scincidae; '*bonowak*' (Gekkonidae) and '*kumakela*' (goanna, *Varanus* sp.) are also present on the islands of the Louisiade Archipelago (Richards, 2002; Kraus et al., 2003, 2005). Only the latter is hunted as the skin is used to seal the top end of ceremonial drums. In 1998 and 1999, I collected names of various fauna identified by Brooker Islanders and these can be found in Appendices F and G.

[13] Results from the 1997 and 2000 marine biodiversity surveys conducted by Conservation International (Allen et al., 2003a) detail that for Milne Bay Province there are 1,109 fish species from 357 genera and 93 families (Allen, 2003); 430 coral species from 77 genera and 19 families, and 945 mollusc species from 290 genera and 111 families (Wells and Kinch, 2003).

The distribution of flora of the Louisiade Archipelago is highly dependent on island age, geology, topography and lithology. In general, plant communities on the islands of the Louisiade Archipelago differ between the windward and leeward slopes. Vegetation on Brooker Island has now mostly given way to secondary vegetation as a consequence of shifting cultivation over a long period of time over a limited land area. These secondary mixed forests are dominated by such genera as Castanopsis, Terminalia, Hopea and Casurina. Trees found on the low atoll islands consist of *Guettarda speciosa, Casuarina* spp., *Cordia subcordata, Calophyllum inophyllum, Leptosperum* spp., *Leocosyke* spp., *Argusia argentea atoto*, *Pouteria obovata*, *Scaevola taccada*, *Myristica* spp., and *Scaevola taccada* (Mann and Heatwole, 1973).

The most important of these is *Calophyllum inophyllum*, as it is used in the construction of sailing canoes, a vital asset to people of the Louisiade Archipelago (Smaalders and Kinch, 2003). Throughout the islands, grasslands also predominate, with the main genera being *Themeda* and *Imperata*. Along the coast, vegetation includes *Scaevola* spp*., Ipomoae* spp*., Hibisicus* spp. and a number of salt tolerant mangrove species. Coconut and betel-nut (*Areca catechu*) palms are grown on Brooker Island. Due to the dry and marginal conditions, the sago palm (*Metroxylon sagu*) does not grow on Brooker Island, but is widely found on the bigger and higher islands of Misima and Sudest Islands. In 1998 and 1999, I collected botanical specimens with Brooker Islanders[14] (see Appendix H).

Brooker Islanders also identify various areas within their environments and the toponyms for these are detailed in Figure 1.

[14] These specimens were later identified by Roy Banka at the Papua New Guinea National Herbarium in Lae, Morobe Province.

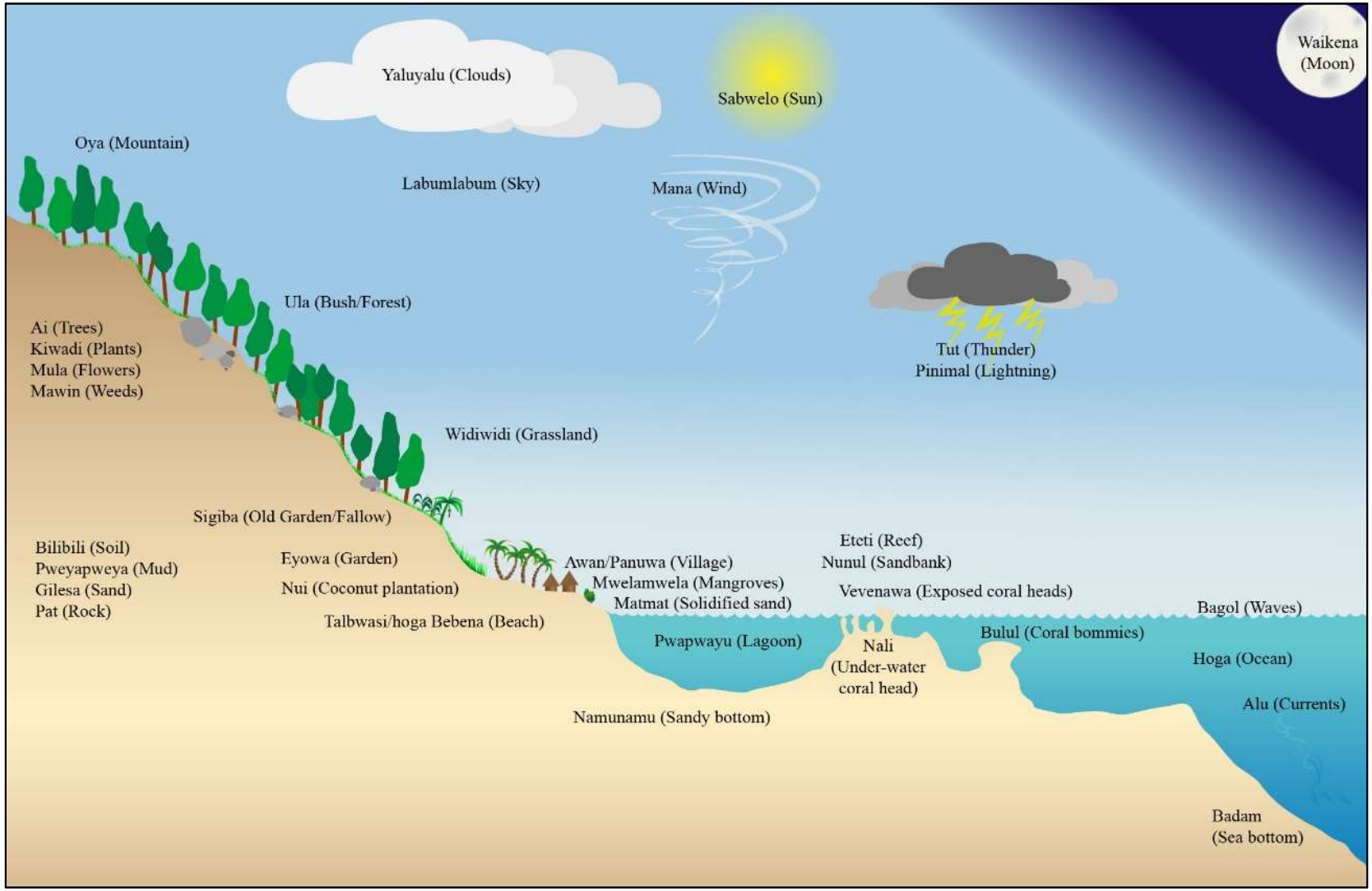

Figure 1: Diagrammatic cross-section showing morphological and ecological zones as recognised by Brooker Islanders.

Weathering Extremes

Brooker Islanders like all people of the Louisiade Archipelago have to contend with a continual cycle of extreme weather events, alternating from cyclones and El Nino associated droughts. While cyclones are relatively infrequent, when they do happen they can be destructive, destroying homes, gardens and plantations. They also impact on coral reefs and shorelines. There are now indications that cyclones will become more intense under current climate change projections (Walsh et al., 2012; Connell, 2013, 2015). This scenario does not bode well for Brooker Islanders in the future.

One of the largest cyclones to hit the Louisiade Archipelago was in 1952. In folk-historical terms, the cyclone of 1952 that ravaged the Louisiade Archipelago is the event by which today's old people ('*tolikiau*') judge their age. On inspection of Brooker Island in the aftermath of this cyclone, it was reported that the island had received the full impact of the cyclone. Trees from the shore to the hill tops were stripped bare and all the coconut plantations were completely destroyed as were the villages (Anonymous, 1952). Matthews (1952) notes at the time however Brooker Islanders were fortunate in that some groups were away at other islands and thus missed the full impact of the cyclone. On their return they were able to catch a fair amount of fish to help feed people. Geelan et al. (1953) who visited Brooker Island five months after the 1952 cyclone also noted that Brooker Islanders were not averse to incorporating emergency supplies provided by the government into their social reproduction activities. Brooker Islanders were rationed from Bwagaoia for about two months, but this issue was discontinued when it was discovered that on receipt of two weeks' rations for a population of 170 people at that time, the Brooker Island community proceeded to hold a day-and-night feast until, in about three days, everything had been eaten.

The next major cyclone to hit Brooker Island was Cyclone Annie in 1967. There was then a hiatus of three decades before Cyclone Justin hit in 1997. The last major cyclone was Cyclone Ita in April 2014. Cyclone Ita destroyed 25 houses on Brooker Island along with other community infrastructure (Plate 3) and all food gardens were severely damaged (Balaria, 2014). During my visit in November 2014, water supply issues were exacerbated by the destruction of tanks and catchments by Cyclone Ita. To compensate, many households had dug wells near their houses. More recently, Brooker Islanders have been provided with a desalination plant by the current Member of Parliament for Samarai-Murua District, Isi Leonard. This desalination plant is powered by wind turbines and solar panels (Baraisi, 2018a, b).

Plate 3: Community Hall and Library on Brooker Island destroyed by Cyclone Ita.
Photograph: Author.

Droughts are particularly life threatening on islands such as Brooker because of their marginality with respect to gardening productivity and water supply. Gomedi (1987) writes of the major drought in 1987 when he visited Brooker Island and noted that all the tree leaves and grass had died off, and people were finding it hard to plant their yam seeds. In the 1997 drought assessment conducted by the Australian National University, Brooker Island was classified as a Category 4 area (Allen, 2000; Allen and Bourke, 2001). This classification meant that Brooker Islanders were facing potentially life-threatening conditions. Brooker Islanders had no food in their gardens, and were subsisting on 'famine' food such as the pith of banana trees (Jonathan, 2001). In the 2013 El Nino event, which again caused severe drought on Brooker Island, Bourke et al. (2016) listed Brooker Island as Category 5, which was the most extreme situation with no food available at all.

During the frequent years of drought or crop failure, communities like Brooker Islanders are forced to extend their inter-island trade efforts. Brooker Islanders are also increasingly dependent on the harvesting of commodified marine resources to buy store foods. In 2014, I was sending large amounts of money to Ado and the Sam family to assist them with 'surviving' through the worst of the drought that had preceded Cyclone Ita. Of note also, is that in 2014, the moratorium on the sea cucumber fishery and beche-de-mer trade which had been implemented by the National Fisheries Authority in September 2009 was still in place, and, thus there was little opportunity to earn income that could be used to buy store foods.

A Changing World

During the Last Glacial Maximum, sea levels were 115 to 134 m below modern levels with the large majority of the Louisiade Archipelago forming the interior of an expansive plain extending over 100 km to the east (Shaw, 2016a, b). At this time, the Louisiade Archipelago comprised approximately 11 islands, with the largest estimated to have been around 8,000 km² in area (Shaw et al., 2020). Today, there are around 220 islands and islets in the Louisiade Archipelago. It has been estimated that the Louisiade Archipelago began to flood some 14,000 years ago as sea levels rose significantly following the Last Glacial Maximum and the plain now forms the lagoon floor of the Louisiade Archipelago. Waters inside the Louisiade Archipelago lagoon are generally 50-60 m in depth.

While climate has changed and varied over the millennia in response to the geophysical influences that initiated ice ages and warmer periods, the human influence on climate is relatively recent and is mostly associated with the development of fossil fuels, agriculture, and deforestation. The greenhouse gases released by these activities are causing the planet to warm. Global warming is regarded by Moore (2016) as capitalism's crowning achievement.

Globally, sea level has risen about 20 cm since the industrial revolution (Hay et al., 2015). By the year 2100, sea level is expected to be up to one metre higher than it is today (Nunn, 2013; Connell, 2015; Bell et al., 2018). Sullivan (1991) looked at sea level rise impacts due to climate change for the Trobriand Group of Islands, and noted that sea level rise of as little as one metre would have severe impact in terms of proportional loss of land area. A rise of one metre would also rob Brooker Islanders of much land especially on many of the small atoll islands that they are highly dependent on for their livelihoods. On low-lying coastal areas, sea-level rise would also likely increase coastal erosion rates (Bell et al., 2011; Connell, 2013, 2018a; Johnson et al., 2018). Climate change and associated rising temperatures and sea level rise will also affect sea turtle (Fuentes et al., 2011; Jensen et al., 2018) and seabird populations (Reynolds et al., 2015).

Higher sea surface temperatures are expected to alter the metabolic rates, growth, reproduction and survival of fish and invertebrates, resulting in changes in their abundance, size and distribution. A consequence of this is the reduction in the resilience of coral reefs and the decline of fisheries potential (Williams et al., 2010; Pratchett et al., 2011; Asch et al., 2018; Johnson et al., 2018). A combination of direct and indirect effects of climate change and ocean acidification are estimated to reduce productivity of fish by up to 20 per cent by 2050, and by 20 to 50 per cent by 2100 (Bell et al., 2011; Asch et al., 2018; Hanich et al., 2018). At present, there is limited evidence of compensatory responses among tropical fish assemblages (Pratchett et al., 2014;

Hughes et al., 2017, 2018). Bell et al. (2011) also suggest that the productivity of invertebrates will decrease by five per cent by 2050, and by 10 per cent by 2100. Plaganyi et al. (2013) have suggested that climate-change could have some benefits certain shallow-water species due to an increase in habitat availability.

Under climate change projections, the strength of the South Equatorial Current entering into the Coral Sea and the Gulf of Papua Current is expected to increase with increased warming expected in the upper 100 m (Durack and Wijffels, 2010; Sen Gupta et al., 2012). These changes will potentially limit recruitment of many marine species, limiting the vertical exchange of nutrients, decreasing subsurface dissolved oxygen concentrations and reducing oceanic acidity due to increased absorption of carbon dioxide (Stramma et al., 2008; Bell et al., 2011, 2018). Increasing rates of ocean acidification through absorption of atmospheric carbon dioxide are reducing the aragonite saturation state, the main form of calcium carbonate used by corals and other marine organisms to build hard skeletons and shells including sea cucumbers (Collard et al., 2014; Bell et al., 2018; Johnson et al., 2018). The supporting framework for sea cucumber bodies is made of calcium spicules (Shirayama and Thornton, 2005; Byrne 2011).

Concerning impacts on the terrestrial environment, particularly on forests and associated gardening practices, climate-change will also have impacts on both the forests and gardening practices in the Louisiade Archipelago (Johns, 1986, 1989; Goulding et al., 2016, 2019). As has been noted above, droughts caused by El Nino events restricts gardening practices and cyclones not only destroy gardens but also impact on forests and coconut plantations. Forest regeneration can take a considerable amount of time, taking between 15-30 years or more to reach a secondary successional stage and over 100 years to reach undisturbed mature forest diversity values, depending on the location and disturbance frequency (Cole et al., 2014; Whitfeld et al., 2014; Goulding et al., 2016, 2019). Climate change will thus continue to cause forest disturbance with long-lasting effects on forest structure and species composition.

Conclusion

Islands present significant technological and ecological challenges for long-term human settlement and the livelihoods that they develop, modify and continue to utilise. Over the last 3,500 years, Brooker Islanders have continued to adapt their livelihood activities.

As noted above, the landmass of the Louisiaide Archipelago began to reduce in size throughout the Holocene and coastlines were largely unstable until near-modern sea levels were reached. Shortly after the arrival of Lapita people on Brooker Island, erosion derived from from garden production on hill slopes occurred changing the foreshore topography and littoral habitats.

Shaw et al. (2020) hypothesise that during periods of climatic stress in prehistory, populations that were inhabiting smaller islands in the Louisiade Archipelago migrated to the larger islands of Sudest, Rossel or Misima. When wetter climatic conditions occurred during the 'Little Ice Age' period[1], permenant settlement of smaller islanders occurred. Increased cyclone frequency from around 500 Before Present also greatly increased beach volumes which helped facilitate the movement of populations onto smaller islands (Shaw et al., 2020). Permanent settlement on Brooker Island allowed for the developmet of local pottery traditions and the onset of inter-island trade networks[2] with islands like Brooker Island forging a place as 'middle-men' trading centres (Macintyre, 1983; Macintyre and Young, 1982; Macintyre and Allen, 1990; also see Chapter 5).

Whilst the new Lapita migrants would have invariably brought new species of food crops, especially the superior varieties of the greater yam, *Discorea alata*[3] (Bourke, 2009), Shaw (2016a) notes that the colonisation of the Louisiade Archipelago would have been into a relatively resource impoverished landscape and that without a fully domesticated food system it would have been difficult to sustain populations on the scattered and small islands like Brooker Island, but much easier on the larger islands of Misima, Sudest and Rossel. On Brooker Island, the newly arrived Lapita population livelihoods utilised a plant-based diet and heaviliy exploited reef fish (notably Scaridae) and sea turtles (Chelonioidea) (Shaw et al., 2020).

Today, Brooker Islanders have secured their livelihoods through gardening, harvesting marine rseources and inter-island trade. Since arrival on Brooker Island, people have faced continued climate variability with cylone and El Nino associated droughts. Brooker Islanders also now face new challenges from climate change, which has the potential to severely impact on livelihoods that are available to them.

Butler et al. (2014) have indicated that island communities in Milne Bay Province are becoming increasingly vulnerable to climate change. When climate change impacts are combined with population growth, there will be increased pressure on both terrestrial and marine ecosystems. The time of *huwalu*, the time of no food is now becoming a norm outside of its seasonal period associated with planting gardens. The inability to produce enough garden produce also exacerbates dependency on the exploitation of marine resources for trade or sale. As a consequence, natural resource security for Brooker Islanders under current livelihood strategies

[1] The Little Ice Ages occurred between 550 to 100 years Before Present (Yan et al., 2011; Griffiths et al., 2016).
[2] The emergence of large-scale exchange networks can be seen as a risk-reduction strategy during periods of climatic stress.
[3] *D. alata* is now common in all coastal areas of Papua New Guinea including Milne Bay Province and is the primary staple, only being surpassed with the later introduction of the lesser yam, *D. esculenta* and sweet potato (*Ipomoea batatas*).

could be exceeded, and food security would not be guaranteed. The projected increases in both air and sea temperature, changes in rainfall patterns, heatwaves, ocean acidification, sea level rise, and the physical damage from more intense cyclones are expected to cause further reductions in the extent and quality of coastal habitats. Overall, projected climate change impacts will impact on marine species targeted by Brooker Islanders with the concomitant need for management strategies capable of sustaining fishing into the future (see Chapter 8).

There is no typical year for Brooker Islanders, every year is different. Many old people such as Panabwa, Guitana and Wewe would all comment that the seasonal markers that guided life on Brooker Island in the past were now becoming more unpredictable[4]. Brooker Islanders have constantly faced radical impacts on their environment and livelihoods. When I went back to Brooker Island in November 2014, it was similar to when I first arrived in February 1998 as the Brooker Island community had just been hit by Cyclone Ita earlier in the year, just like Cyclone Justin had preceded my arrival in 1998. Both cyclones were quickly followed by El Nino events, the one in 1998 and the one in 2013 being the two largest El Nino events in recent decades.

This chapter has provided the environmental setting that Brooker Islanders live in. In the next chapter, I will detail the process of Brooker Islander's gradual incorporation into the wider global economy and the intensification of commodification of specific marine resources in the period preceding Papua New Guinea's Independence in 1975.

[4] Moesinger (2019) also details similar observations for inhabitants of Tuuku Atoll in the Autonomous Region of Bougainville.

Chapter 3
The Emergence of Commoditisation:
1800s-1975

Early European traders entered the Louisiade Archipelago in a quest for various marine resources, such as whales, beche-de-mer, trochus, pearl shell and tortoise shell and people of the area were absorbed into the wider global economy and trading contacts with the outside world. As trade progressed, patterns of mutual dependence emerged. Europeans wanted details of exploitable resources and navigation instructions through the numerous reefs and passages. Local people wanted the new items and technologies which made life easier (e.g., hoop iron, and later iron axes and knives), as well as other items from 'outside' their own cultural realm. It was only after sustained interaction that local people like Brooker Islanders began to understand the value Europeans placed on certain minerals, timbers, marine resources, and to a lesser degree, their 'exotic' artefacts.

After the waves of whalers, traders, labour recruiters and gold miners, Christian missionaries arrived and continued the shift to a money-based economy started by these early groups. The imposition or adoption of Christian beliefs brought demands for new consumption items such as the need for clothes, as well as new ways of wanting to be seen as more than a 'native'. Missionaries also reinforced Western ideals of what a work ethic was and set values on labour.

By the end of the 19th Century, Brooker Islanders were fully integrated into the global economy and absorbed into the British colonial empire. Throughout this period, Europeans and local people had met for trade or for labour, barter had given way to a cash-based economy and the old ways of reciprocal gift-giving were increasingly marginalised in the market place, but remained strong in local social relations. Money became part of a whole new realm of exchange, enabling Brooker Islanders to obtain store foods and goods. As time progressed through the main plantation era and World War II, the demand for money has become an increasingly important requirement for reproducing the livelihoods of Brooker Islanders.

This chapter starts with European discovery and then charts the process of incorporation of Brooker Islanders in the global economy from early contact to Papua New Guinea's Independence in 1975.

A broad chronology of the major non-indigenous activities affecting Brooker Islanders from first contact to Independence are as follows[1]:

- European exploration: 1600s to 1790s – Predominantly Spanish, Portugese, French and English maritime explorers.

- Whaling industry: 1800s to 1880s – Seasonal visits to the region by American, British, French, New Zealand and Australian whalers.

- Traders and Beachcombers: 1860s to 1910 – Mostly Australians who visited on a regular basis or lived in local communities and bartered for various commodified marine resources.

- Christian Missions: 1870s to 1950 – Expansion and establishment of permanent mission stations by various Christian denominations and consolidation of allocated populations.

- Labour recruiting industry: 1880s – Australian recruiters obtained men from the Louisiade Archipelago for labour on Queensland sugar plantations.

- Gold miners: 1880 to 1910s – Gold miners conducted mining activities initially on Sudest Island and later on Misima Island.

- Establishment of the Territory of Papua: 1880 to 1914 – The southern part of the island of New Guinea became a British protectorate administered by Australia.

- Plantation industry: 1890s to 1920s – Copra planters established permanent coastal plantations and employed local people as labourers.

- World War II: 1939 to 1945 – Unlike World War I, World War II brought Japanese, American and Australian armed forces to the Louisiade Archipelago. Events during this period sparked a millenarian movement throughout the Louisiade Archipelago.

- Co-operatives: 1950s to 1990s – Government initiatives that promoted co-operatives that supported copra production and the harvesting of trochus.

A more detail timeline of events can be found in Appendix I.

[1] This chronology was developed from the literature reviewed for this thesis and associated references to this literature is referenced in each section.

European Exploration

Europeans first moved into the Pacific in the second-half of the 18th Century. Up until the early 1800s, the region that has become known as 'Melanesia' was still a construct of early 19th Century cartography[2] (Moore, 2003). In 1833, the navigator Jules Dumont d'Urville distinguished between Polynesia, the many islands; Micronesia, the small islands; and Melanesia, the black islands[3] (Duyker, 2014).

It is known through various travel narratives, that the area now known as Milne Bay Province had been visited by Europeans of Spanish, Portuguese, French and English ethnicity from the early 17th Century onwards. Louis Vaez de Torres is acknowledged as the European discoverer of what is now called the Louisiade Archipelago in 1606 (Brass, 1959). Louis Antoine de Bougainville sailed along the southern fringe of the Louisiade Archipelago in 1768 and named the area, the 'Golfe de la Louisiade' or 'Terre de la Louisiades' (Horner, 1996). Antoine-Raymond-Joseph Bruny d'Entrecasteaux visited in 1793 looking for the lost La Perouse and sailed along the northern edge of the Louisiade Archipelago[4]. Among the islands he discovered and named was St Aignan, which later became known by its local name, Misima (Brass, 1959). In 1804, Louis Charles Ruault Coutance visited the Louisiade Archipelago whilst returning to Mauritius from South America and named Adele Island off Rossel Island (Richards, 2017).

The French Napoleonic wars from 1792 to 1814 halted exploration as ships were needed for battle and not for further surveying in the Pacific Islands Region. Jules Dumont d'Urville arrived in the Louisiade Archipelago in 1833 and conducted the first survey of the Louisiade Archipelago (Duyker, 2014). In 1849, Captain Owen Stanley took *H.M.S. Rattlesnake* and *H.M.S. Bramble* through the Louisiade Archipelago (MacGillivray, 1852; Goodman, 2005). In his expedition, Stanley discovered Bramble Pass on the north of Sudest Island and entered the vast inner-lagoon of the Louisiade Archipelago (Plate 4).

[2] Today Melanesia is characterised as an area of weak or failing states. Countries of Melanesia rank low on the United Nations Human Development Index, but are considered to have the most robust subsistence economies and intact traditional communities in the Pacific Islands region (White, 2007).
[3] d'Urville's Melanesia originally included Australia.
[4] Hitchcock (2017) argues that the final fate of the La Perouse Expedition ended in the Torres Strait Islands in Queensland, Australia.

Plate 4: 'First arrival of white men amongst the islands of the Louisiade Archipelago'.
Painting by Oswald Briely. Photograph: Australian National Library.

During Stanley's explorations, a large number of the islands were named after the crew of *H.M.S. Rattlesnake* and *H.M.S. Bramble* including Brooker Island which was named after Edward Brooker who was on *H.M.S. Rattlesnake*[5] (Goodman, ibid). Shortly after Brooker Island had been named, *H.M.S. Rattlesnake* anchored near three low islands which d'Urville had previously named the 'Isles du Chateau'. At the time of Stanley's visit, the Duchateau Group of Islands were uninhabited, but were frequently visited by canoes from islands in the West Calvados Chain for the purpose of harvesting turtles (Goodman, ibid). On the 27th July 1849, Lieutenant Dayman and Edward Brooker were taking magnetic readings on the middle island within the group when two canoes landed. A few days later, Stanley (reported in Goodman, ibid: 235) wrote of this group:

> 'I tied a coloured handkerchief to a stump on the beach and retired making signs for them to come and take it. After some little hesitation one man came forward and took it – the rest soon followed and in less than five minutes I had the whole tribe around me eagerly asking for iron hoops which they prize beyond anything we can give them'.

The *H.M.S. Rattlesnake*'s expedition and the survey of the Louisiade Archipelago and the south coast of New Guinea was part of a much larger survey of the entire Coral Sea. This larger survey was designed not only to provide safe passage for ships voyaging from the Pacific to the Indian

[5] Edward Brooker was born in 1827 in Sussex. Brooker had previously sailed with Owen Stanley on the *H.M.S. Blazer* and joined the *H.M.S. Rattlesnake* as the Acting Master's Assistant but was promoted to Master's Assistant by the end of the voyage (Goodman, 2005). Brooker was also a very good artist and several of his paintings are held in the National Library of Australia.

Ocean through the Torres Straits[6]; it was also part of the colonial process of integrating commerce of the Pacific Islands region with Australia, China, and India. Captain John Moresby was to follow in 1873 on the *H.M.S. Basilisk* to conduct further exploration and mapping (Moresby, 1873, 1874, 1875, 1876).

The Era of Whaling

The first whaling ship to enter what would be defined today as Papua New Guinea's Exclusive Economic Zone was in 1799[7] (Beale, 1839; Gray, 1999; Moore, 2003). Due to its importance as a lubricant for the industralising West, and as whaling in the Atlantic Ocean became less profitable, American and British whaling ships increased their whaling activity in the Western Pacific.

Abraham Bristow, whaler and adventurer is thought to have been the first whaler to visit the Louisiade Archipelago in 1808 (Richards, 2017). By the 1830s, whalers were hunting around the Trobriand Group of Islands and in the Louisiade Archipelago (Beale, 1839; Jacobs, 1844; Affleck, 1970; Jack-Hinton, 1972; Lepowsky, 1983). The era of whaling peaked in 1840 but remained steady until 1870 and then declined dramatically in the 1880s (Gray, 1999).

Because whalers required large amounts of wood to fire the vats that boiled down whale blubber, particular islands became favourite points for replenishing wood and other provisions. Being all-male crews there were additional local pressures because of their sexual demands on local women. Women were often the most valuable saleable item many coastal communities had to offer at this time (Moore, 2003). As the whaling era progressed, nails, glass bottles and hoop iron from old barrels became important barter items. However, after a few decades of trade, islanders became more discerning, refusing scrap items and demanding manufactured tools (Moore, ibid).

As the whaling industry started to decline in the 1880s, islands without adequate firewood supplies were increasingly bypassed and although sex would have remained available, commercial realities were hard to ignore and firewood was the necessary ingredient for profit. As whale oil became less essential and profitable especially as petroleum resources were opening up, whalers began to fade out and new commodities became the focus of work in the Louisiade Archipelago. This brought traders hungry for beche-de-mer, trochus, pearl shell and tortoise shell.

[6] The trade route through China Strait, between Samarai and the south coast of the now Milne Bay Province and north through the D'Entrecasteaux Group of Islands was not safely charted until the explorations of John Moresby in the early 1870s (Affleck, 1970; Jack-Hinton, 1972).
[7] Many whalers were actually convict transporters who entered the fishery after they had discharged their human cargo at Botany Bay in New South Wales, Australia (Moore, 2003).

Traders and New Marine Commodities

Moore (2003) notes that many Australians viewed the Coral Sea as a 'Queensland Lake', central to the colony of Queensland's economic and political development. Remote regions such as the Louisiade Archipelago were seen as ripe for the production and expansion of capital. As a consequence of the two expeditions led by Captains Owen Stanley and John Moresby, the Louisiade Archipelago was now known to Australian capitalism and 'open for business'.

The expansion of traders and beachcombers into the Louisiade Archipelago was an expansion originating from the Torres Strait Islands in Queensland, Australia (Lepowsky, 1983; Liep, 1983; Moore, 2003). This expansion was accelerated in part to the significant decline of sea cucumbers and pearl shell stocks on the reefs of the Torres Strait resulting in increasing regulation by Queensland authorities. Investigative voyages to the Louisiade Archipelago were thus initially driven in the search for fresh fields.

When rich fields were discovered, beche-de-mer traders would try to keep their discoveries secret for economic reasons so they would be in a position to work unexhausted reefs and gain labour at the lowest possible rates of payment (Russell, 1970). Once a new 'field' was found, chains of native-managed beche-de-mer stations were established (Bevan, 1890). As a beche-de-mer trader moved into a new area, he negotiated with the villagers regarding payment for the collection of sea cucumbers, the erection of a smoke house and store shed, the gathering of firewood, and of course, labour (Russell, 1970). Beche-de-mer traders initially brought experienced workers with them until local islanders had grown accustomed to the workings of the industry. By the 1880s, very few beche-de-mer traders sailed with any assistants as suitable labour was now available throughout the Louisiade Archipelago. Bevan (1890: 147) describes how the process went:

> " . . . the tin box containing a supply of trade was handed over to the native of my choice, who proudly assumed the badge of authority as paymaster with the key worn round his neck. I went on my way accompanied by the will-o-the-wisp of anticipation, until my next visit demonstrated the failure or success of the station."

Marine products taken form the Louisiade Archipelago were sent to the Queensland ports of Cooktown, Townsville and Mackay[8]. The period 1873 to 1885 is considered the main period of the beche-de-mer trade from the Louisiade Archipelago[9] (Fort, 1886; Bevan, 1890; Saville-Kent,

[8] Beche-de-mer shipped from the Louisiade Archipelago was generally referred to as 'Barrier Fish' because it was sourced from the Long-Kossman Reef and the southern barrier reef that stretches around to encompass the eastern end of Sudest Island. Barrier fish had a very good reputation resulting in better prices than other localities in the world supplying beche-de-mer to the Chinese market at that time (Saville-Kent, 1893).

[9] The peak recorded year was 1883 when almost 100 tons were exported through Samarai and Port Moresby. Between 1875 and 1892, beche-de-mer represented 70 per cent by value of total declared exports from

1893; Moore, 2003; see Appendix J). From 1885, there was a noticeable decline in available sea cucumber stocks due to over-fishing[10] and an exodus of traders followed. As competition increased and stocks declined, beche-de-mer traders entered into various credit relationships with local people[11] to keep a lien on their loyalty and labour.

William Whitten, pioneer planter and beche-de-mer trader in the Trobriand Group of Islands discovered in 1885 that pearls of a fair quality existed in a small oyster that was a staple food for local people (Monckton, 1921; Connelly, 2016). Whitten managed to keep this a secret and was able to purchase large quantities of pearls for almost nothing until the sale of his haul in Australia let the secret out. This brought another boom of traders to the Louisiade Archipelago in search of wealth. In 1887 and 1888, a large majority of the pearl fleet of the Torres Strait Islands had moved to the Louisiade Archipelago and an estimated 50 t of pearl shell was exported in 1887 (Romilly, 1887). From 1893 to 1899, whilst beche-de-mer still featured in exports from the then Territory of Papua, it was no longer regarded as an important export[12] (Russell, 1970). Pearl shell also declined in this period[13].

Even though local people had already been exposed to European goods, beche-de-mer traders and pearlers consolidated the desire for new foods[14] and goods as pay for labour. As with whalers, the popularity of manufactured goods represented further development of a greater sophistication in dealing with Europeans and also a better appreciation of what goods could be obtained. The opportunity to participate in the material wealth of the traders was the main reason for people like Brooker Islanders agreeing to work for traders. As time went on, the people in the Louisiade Archipelago became tired of the arduous work involved in diving for sea cucumbers and pearl shell, and the associated processing required. As a result, many disagreements arose over payment for work (Russell, ibid). These disagreements could be interpreted as a greater

British New Guinea, and until 1885 had actually represented 95 per cent by value of total exports (Russell, 1970: 24). This amount is probably underestimated as throughout the 1880s, beche-de-mer was taken direct from the Louisiade Archipelago to various Queensland ports.

[10] In 1884, Captain Fryer passed the opinion that the eastern end of the Louisiade Archipelago was the best field for sea cucumbers but did not think it would remain a permanent industry unless closed seasons were periodically enforced (Bevan, 1890).

[11] For example, Trobriand Islanders would pawn their stone axes with traders for an advance between seasons. A trader knew they would want their valuables back and thus would sell their marine resources to him in the next season (Austen, 1945b).

[12] From 1879, the average price paid for all varieties of beche-de-mer shipped through Queensland ports was between £ 90-115 per ton (Russell, 1970: 28). In the late 1880s, prices ranged from £ 140-150 per ton for black teat fish (*Holothuria whitmaei*) down to £ 20-30 per ton for sandfish (*H. scabra*) (Saville-Kent, 1893).

[13] The pearl shell fishery in the Louisiade Archipelago did not last because the shell was regarded as inferior to those found in Torres Strait. Another issue was that much of the pearl shell found in the Louisiade Archipelago was located too deep for safe diving and many pearl divers got decompression sickness and several died (Pitcairn, 1891; Bevan, 1890; Romilly, 1893).

[14] Culinary imperialism occurs when a dominant group's cuisine spreads into the cultures of colonised peoples (Flexner, 2015; Flexner et al., 2019). Across the Pacific Islands region, this is evident in the ubiquity of rice, biscuits, instant noodles and tinned fish and meat.

appreciation and acknowledgment of the value of their own labour in this capitalist-driven enterprise. The over-supply of trade goods[15] and subsequent inflation also became an issue.

Through increasing contact, mutual dependency and the desire on both sides for various commodities, local people throughout the Louisiade Archipelago became armed with rifles that were traded to them[16]. Many weapons were also captured following surprise attacks on outsiders[17], resulting in an 'arms race' throughout the Louisiade Archipelago. Moore (1992) writes that in 1878, John McOrt, a beche-de-mer trader, landed on Brooker Island with a party of four Europeans, nine Solomon Islanders, and ten people from the Torres Strait Islands. McOrt sent two of the Solomon Islanders to obtain firewood from the Brooker Islanders. Whilst onshore, the Solomon islanders made friends with the Brooker Islanders. Later McOrt went ashore with other Europeans, and McOrt was cut down with an axe whilst sitting under a tree. The other Europeans and the Torres Straits Islanders with the exception of one of the two women were then put to death and the boat was subsequently sunk[18]. The Solomon Islanders remained on Brooker Island, and became part of the Brooker Islander community.

Following this incident, William Ingham, a failed sugar planter from the Herbert River region in Queensland went to Port Moresby in February 1878 to look after the interests of the miners prospecting and digging on the Sudest Island gold fields. Finding the gold rush a failure and hearing of the death of McOrt, Ingham left Port Moresby on the *Voura* and came to Brooker Island to make enquiries (Moore, ibid). The Brooker Islanders planned to kill Ingham's party as well, deciding on an initial show of co-operation to allay any fears. A feast was staged in his honour before he was allowed to collect the firearms and the beche-de-mer equipment that the Brooker Islanders had taken from McOrt's vessel. On the third day of Ingham's stay at Brooker Island, the Brooker Islanders struck and Ingham and his colleagues were killed (Murray, 1912; Gibbney, 1972; Moore 1992). Ingham and his crew were promptly roasted in stone ovens and eaten. Their skulls later entered into the ceremonial exchange system[19] of the region (Moore, ibid). Chester (1893: 47-48) who visited Brooker Island later notes:

> 'While ashore on Utian, I asked the natives about the murders of Messrs McOrt and Ingham, and the only reason given was that they wanted their trade. They rather laughed at attempts to punish them . . . .'

[15] Trade goods at this time consisted mostly of figs, sago, tobacco, tomahawks, knives, calico and beads. By creating a desire for tobacco, early traders were assured of eager barterers and by the late 1890s, tobacco was the chief article of barter (Nelson, 1976; Lepowsky, 1982).
[16] The sale of firearms was in direct contravention of the 1888 Arms, Liquor, and Opium Prohibition Ordinance (Government of Territory of Papua, 1888) which prohibited the sale of firearms to Papuans.
[17] Between 1878 and 1887, Chinese, Malays, Queensland Aborigines, Torres Strait Islanders, Pacific Islanders, Australians, Americans, Englishmen, Frenchmen, an Indian, an African and a Greek were murdered (Moore, 2003).
[18] The flywheel from McOrt's vessel now resides on the shore of the main village, Awan bwabwatana.
[19] Ingham's skull was later retrieved from Alhoga Village on Misima Island (Chester, 1893).

Violence continued to spread throughout the Louisiade Archipelago. In 1886, Captain J. C. Craig and his crew of three Europeans and five Malays were murdered and his pearling boat, the *Emily*, was looted by Joanet and Sudest Islanders. The Craig 'massacre', as it became known was the seventeenth incident in ten years in which foreigners had been killed in the Louisiade Archipelago, and traders' cried for reprisals (Nelson, 1976). The *H.M.S. Diamond* was subsequently dispatched and called at Joanet Island but could not carry out any reprisals as the islanders had fled inland. To action retribution, the colonial administration hired Nicholas Minister[20] who collected a force of forty-five men mostly from Ware and Brooker Islands on his cutter, the *Lizzie*, and sailed for Joanet Island. Minister led this 'mercenary' force ashore with each man wearing a red badge to distinguish them from Joanet islanders. This incident motivated Brooker Islanders to raid further, something they had already been known for before European presence. Taking advantage of the confusion and loss that had been inflicted by Minister's punitive expedition, Brooker Islanders launched further attacks on Sudest and Joanet Islanders[21] (Nelson, ibid). For many years after these events, the area from Samarai Island in the west to Sudest Island in the east was regarded as being under siege by armed Brooker Islanders (Douglas, 1888-1889; Bevan, 1890; Murray, 1912; Gibbney, 1972; Lepowsky, 1993).

Labour Recruitment

For Queenslanders who already saw the Coral Sea as their own domain, the inhabitants of the Louisiade Archipelago were seen as a suitable place to source labour for the further development of the Australian tropical north (Sankoff, 1985; Moore, 2003). In April, 1883, the first recruiting vessel, the *Stanley* visited the Louisiade Archipelago to recruit labour. The practice of labour recruitment quickly became known as 'black-birding'. Labour recruiters were supposed to only recruit labourers under indenture agreements. Under these agreements, labourers were obligated for a specific number of years at a set wage rate and associated conditions, along with provisions to be repatriated back to their place of recruitment. The Captain and the Queensland government agent of the *Stanley* did not abide by the regulations and were subsequently convicted of offences under the 1884 Native Labourers Protection Act (Loos, 1980; Lewis, 1996).

[20] Minister was himself a beche-de-mer trader and was regarded as a 'scoundrel' who had a reputation for coercing men for work and women for pleasure (Lett, 1944; Nelson, 1976; Lepowsky, 1993). Minister worked the Louisiade Archipelago with curing stations on all the major islands, such as Sudest, Misima and Joannet and on many of the smaller islands of the Calvados Chain (Bevan, 1890; Wawn, 1893).

[21] By the time gold miners came to dig in the Louisiade Archipelago there were only a few people, ill-fed and miserable in appearance on Joanet Island (Nelson, 1976). On my visits to Joanet Island with Brooker Islanders, I was always told to be respectful and reverent as the memories of these actions were still said to be in everyone's consciousness.

Whilst some labour recruiters were less than honest in their dealings, some local men signed on for 'adventure' (Moore, 2003). Moore (1993) notes that in the Massim travel for inter-island trade was already a way of life, and that men recruited from the Louisiade Archipelago would have incorporated travel associated with recruitment into patterns of this constant mobility. Also, having been exposed to the ways of the beche-de-mer traders[22], many men from the Louisiade Archipelago went on board believing they would be 'sailing about' for just a few months (Nelson, 1976). Many recruits would have also signed on through peer-influence, especially when trade goods were left behind as compensation to their kin (Moore, 2003). Also, by going away and returning with valuable possessions to distribute, returning labourers could progress socially much faster within the home village or region. The returning labourer by being away was also more worldly wise having experienced new places, new technologies and the language of Europeans. A negative impact of labour recruitment was that women who were left behind had to take on extra work to compensate for the time their menfolk were away, noting that many never returned at all (Moore, 1985).

Due to these incidents in the Louisiade Archipelago and elsewhere, a Royal Commission into recruitment practice was held in December 1884. As a result of this Royal Commission, labourers were to be sent back to their home areas (Corris, 1968; Jamison, 1990). Of a total of 648 people 'recruited' in the Louisiade Archipelago, 404 were returned in June and July of 1885, fifty saw out their contracts in Queensland for another year or two, and the balance of 150 remain unaccounted for either having died in service or absconding (Price and Baker, 1976; Lewis, 1996; Nelson, 1976). Many of these labourers returning from Queensland were given large quantities of tobacco and hoop iron as compensation for the relatives of those who died on their way to Queensland as well as those who died whilst working or waiting to be returned home. Moore (2003) notes that following the return of these labourers, there were several reports of ex-Queensland labourers from the Louisiade Archipelago behaving violently towards foreigners, which Moore (ibid) suggests could be interpreted as payback for past wrongs.

Gold Mining

Gold in the Louisiade Archipelago was found on Joanet Island by David Whyte who had worked previously as a captain of a pearling vessel in the Louisiade Archipelago. In May 1888, Whyte and nine prospectors left Cooktown, Queensland for Joanet Island (Nelson, 1976). On arrival, what was thought to be gold turned out to be quartz. After this initial disappointment, Whyte's

[22] Many of the beche-de-mer traders were against the labour trade and claimed that the activities of recruiters made it difficult, if not impossible in some areas to obtain labour for their own activities. This was not through the labour recruiters removing the potential labour force, but was rather due to a common practice of the recruiters claiming that labourers were only going on a two to three-month sea cucumber fishing trip (Bevan, 1890).

party then crossed to neighbouring Sudest Island where they discovered alluvial gold in the Runcie River and a gold rush began. By the end of October 1888, 200 miners were on Sudest Island[23], bringing with them new prejudices[24], skills and ways of making a living (Nelson, ibid).

When the miners first came to Sudest Island, the Sudest Islanders welcomed them because their presence now gave them protection from marauding Brooker Islanders. The arrival of miners also triggered the formal annexation of British New Guinea as a colony of the British Empire (see below). Many people from the Louisiade Archipelago had worked for beche-de-mer traders and pearlers before and, seeing new ways to earn cash, eagerly adopted the ways of these newcomers. Local Sudest Islanders became proficient at mining, and by 1895, Sudest Islanders were obtaining most of the island's declining gold yields (Nelson, ibid). For these Sudest Islanders, mining gave them greater independence and increased access to Western foods and goods which had only been available before from beche-de-mer traders and pearlers.

By 1899, Sudest Islanders were the only miners left on Sudest Island and found themselves in an economic trap as the Australian miners moved to Misima Island to the north-west. By March 1889, 80 miners on Misima Island with another 500 following shortly after. A year later, only 50 or so remained on Misima Island (Nelson, ibid). The Misima Island fields were more difficult to work than those on Sudest Island and the Misima Islanders had less need to mine than the Sudest Islanders. By 1890, however, more Misima Islanders were mining and participating in the new 'gold' economy (Nelson, ibid). It is unknown if Brooker Islanders participated in the Misima Island gold diggings, but Chester (1893) notes that besides the main workings, prospectors and miners had also investigated ore-bearing potential throughout the East and West Calvados Chains. Within Brooker Island's marine territory, the islands of Gulewa and Panawidiwidi were explored for gold bearing deposits (Chester, ibid).

In 1914, the Misima Gold Mine, a subsidiary of Broken Hill Proprietary Limited, began extensive development works and eventually took over all the leases (Nelson, ibid). The Misima Gold Mine was to become the Territory of Papua's most valuable mine. Misima Gold Mine ceased operations in World War II and lay dormant until the early 1990s when Placer Dome from Canada opened a large open-cut mine in 1996 (see next chapter).

[23] Most of these miners had worked the Palmer, Hodgkinson, Etheridge, and Croydon fields of north Queensland (Nelson, 1976).
[24] Many miners believed that local women were available for their sexual pleasure, a practice adopted from the northern Australian goldfields where Aboriginal women were commonly exploited (McGrath, 1987).

The Arrival of Missionaries

Early efforts to evangelise Melanesians were based on the genuine belief that 'Christian nations' could be cultivated on a model of pastoral communities applying the gospel in their daily lives (Hassall, 2012). Missionaries were driven by the primacy of the Bible, superiority of the Christian (Western) culture and the virtues of strict morality. Conversion and spiritual rebirth was the driving force to bring about the salvation of all nations in order to prepare for the eventual coming of Christ's kingdom (Thornley, 1993). The Louisiade Archipelago like the rest of the Territory of Papua was ripe for the arrival of Christian missions and in 1877, Reverend James Chalmers established a mission station at Suau on the Milne Bay south coast. A year later, the conversion of Ware Islanders was complete (Gill, 1874, 1876; Chalmers and Gill, 1885; Nelson, 1976).

In 1889, Sir William McGregor, the then Governor of the Territory of Papua, visited Australia and encouraged the Methodist Church to begin mission work throughout the territory. At the General Conference of the Australasian Methodist Church in 1890 delegates decided to send the General Secretary for Overseas Missions, Reverend George Brown to survey the South-eastern Division. Following his tour, Reverend Brown and representatives of other 'faiths' met in Port Moresby.

The outcome of this meeting was that the Methodist Church was allocated all the islands of the Trobriand and D'Entrecasteaux Group of Island, and all islands in the Louisiade Archipelago[25] (Rynkewiech, 1998). The modus operandi of the church was that the clergy sent out to new fields were to give priority to learning the local languages so the Bible could be translated. Schools and medical facilities were also to be established, and an emphasis placed on skills training for both men in carpentry and other trades, and women in cooking, sewing and domestic care[26]. In essence, missionaries attempted to make their settlements and stations, a model of European civilising influences.

In August 1891, the Reverends Samuel Fellows and James Watson sailed to Panaeati Island to establish a church and a base of operations for expansion of their 'mission' throughout the Misima speaking area of the Louisiade Archipelago (Burton, 1926; Langmore, 1989). Fellows quickly learnt the local Misima language and produced the first religious texts[27] (Williams, 1972; Nelson, 1976). In his sermons, Fellows instructed the people to give up fighting, cannibalism and

[25] The London Missionary Society was allocated the south coast of Milne Bay down to Samarai Island, and the Anglicans were given the north coast from East Cape to the border with Oro Province.
[26] The wives of missionaries often acted as role models for local women by teaching in schools, working as nursing sisters and developing sewing clubs as well as leading various church activities.
[27] In 1939, Superintendent Reverend Bartlett Bartlett announced the completion of the translation of the New Testament into the Misima language (Rynkewiech, 1998).

polygamy. He pleaded for reverence during services, an end to 'Sabbath breaking' and the unrestrained sexual connection of the young people. Nelson (1976) notes that for a time, Fellow's devotion was tested by several women of Panaeati Island who would lay on their backs during his sermons and pull aside their grass skirts exposing themselves and calling him to come to them.

The missionaries relied on a metaphor of light and darkness to mediate the tension between individual conversion and a new community to replace the old order (Schram, 2018). Missionaries also put great emphasis on the importance of the nuclear family, with the husband being the provider whilst the wife was responsible for domestic duties. The promotion of the nuclear family broke traditional taboos defining marital relations resulting in resumption of sexual contact after the wife had given birth resulting in an increase in family size. With the advent and acceptance of Christianity, women in the Louisiade Archipelago who had traditionally experienced high levels of equality now had their lives more circumscribed.

The Church with its new faith and beliefs officially arrived on Brooker Islander in the early 1920s. Metuisela Fafita, a Fijian Missionary, while working at Liak Village on Misima Island married Asena, a Brooker Island woman[28] and with another Fijian Missionary, Semi Valata was dispatched to Brooker Island. Semi later died from eating turtle meat[29]. In remembrance, the Church Circuit which the Brooker Island community belong to derives its name from this man. Later in 1930, Petelo Evalval came from Bwagabwaga Village on Misima Island to Brooker Island to preach and in 1931, a Church was built on Brooker Island[30] (Fowler, 1931). In 1968, the Methodist Church became part of the Papuan Islands Region of the United Church, which by 1980 was an entirely localised, autonomous institution (Mackay, 1992, 1999).

In collaboration with the colonial administration and the plantation sector, the church brought many changes in behaviour, especially a new ideology of peace. An example of this is given for Brooker Island by District Officer Rentoul (1932-33):

> 'The inhabitants of Brooker Island were in the old days looked upon as the most desperate and daring raiders in the district, even the people of west Sudest Island regarding them with great dread. We have changed all that however. No-one observing the collection of people assembled at to-day's tax collection would have imagined that their fathers had possesed a bloodlust. The tax collection was a solemn affair, and late that evening the local Methodist teacher called all hands to the local chapel, and about 9 0'clock at night I could hear the strains of 'Jesus Lover of My

[28] Metuisela and Asena had a daughter Olive who later returned to Fiji. The Sam family which I was adopted into is part of this lineage.
[29] Death caused by eating turtle meat is called Chelonitoxism which is a type of food poisoning (Aguirre et al., 2006; Fussy et al., 2010; Pavlin et al., 2010).
[30] The Methodist Mission was established on a quarter acre at the far eastern end of Awan bwabwatana. This area was bought from a man called Tararuan (Fowler, 1931).

> Soul', wonderfully well chanted, coming across the water. I could imagine those old warriors buried in the village cemetery turning in their graves.'

Belshaw (1955) who resided at Ware Island in 1954 states that mission teaching in the Louisiade Archipelago destroyed most of the customs with such completeness that he found few informants who remember anything about them. I also noted a similar thing for Brooker Island. Belshaw (ibid) does note however that people said that adopting the Christian faith was a deliberate choice of their own to do away with 'inferior' Papuan ways and to adopt 'superior' European ways and ideologies. Conversion was a way for local people to access new wealth, but also as a way to strive for equality with Europeans. These types of statements were also heard from Brooker Islanders. Religious interaction promoted the abandonment of traditional structures and the selective assimilation of European ideas and ways of living. Attending church has become a social requirement even for nominal believers, as has having a stated belief in God, contributing to '*mulolu*', the 'gift-offering' competition held each year[31], and at least publically denouncing the belief in witchcraft[32].

Christianity opened the path not only to a wider economic, but also spiritual world. It opened paths between communities by facilitating the intermingling of people from different areas and the reconciliation of former enemies. The church now dominates many aspects of life for contemporary Brooker Islanders, including most social activities at the community level[33]. Activities run by the church include outreach, Crusades[34], women's fellowship, Sunday schools, church offering, and other days of observance and worship throughout the Judeo-Christian calendar.

When I revisited Brooker Island in November 2014, there had been an influx of 'new' Pentecostal churches on Brooker Island vying for membership. As a result, new ways of being 'Christian' are pursued by several groups within the Brooker Island community, causing tension amongst the old guard of the United Church and members of these new faiths (also see Hassall, 2012; Schram, 2018).

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[31] The Semi Valata District Church which Brooker Island is a part of is reliant on its parishioners for its support and each year *mulolu* is held. During my main period of fieldwork of 1998-1999, Brooker Islanders always topped the West Calvados Chain in contributions. In 1998, the Brooker Island community raised PGK 2,077.50 (~ AUD 1,659.90 in 1998) and in 1999 in the lead up to the Christmas Camp and Year 2000 Celebrations, the total amount raised was PGK 3,666.05 (~ AUD 2,115.30 in 1999).

[32] Many people within the District retain a belief in malevolent spiritual powers and while people have repudiated many of their former pagan customs, beliefs in the traditional supernatural world co-exist with the Christian faith. Although Christian beliefs have been transformative, they have not entirely displaced traditional ideas and values, epistemologies and practices.

[33] The church also has significant influence on development policy in Papua New Guinea, particularly in areas of health and education (Hassall, 2012).

[34] Crusades are religious 'revival' gatherings usually associated with Charismatic, neo-Charismatics and Pentecostal churches. In Milne Bay Province, rvivals have also become popular within the United Church.

The Rise of Plantations

To support necessary commercial development to fund the new colony, the British set about a vigorous policy of pacification supported by the Christian missions and coconut planters. Throughout the Territory of Papua, villagers were assisted to participate in the cash economy as smallholder cash croppers growing coconut palms for the production of copra and under the 1925-1934 Native Plantations Ordinance (Government of Territory of Papua, 1925-1934), many plantations were developed in the Louisiade Archipelago (Lewis, 1996).

The main government coconut plantation in the Louisiade Archipelago was at Nivani Island in the Deboyne Group of Islands. This plantation was started in 1893 using prison labour when Nivani Island was briefly the headquarters of the then South-eastern Division. In 1909, this plantation was given to George Munt (Lewis, ibid). Munt expanded his plantation to neighbouring Panapompom Island[35] but failed to gain any other holdings. This was due to government policy which disallowed any further applications for the alienation of small uninhabited islands in the Louisiade Archipelago as they did not want to disrupting further local people's utilisation of these places for fishing activities.

Commercial plantations involving Brooker Islanders were established in the Bramble Haven Group of Islands[36]. Lal Island to the immediate north of Brooker Island was planted by George Burfitt in the early 1920s (Brown, 1923) and Bob Bunting planted out the Duchateau Group of Islands (Matthews, 1952). In developing the Duchateau Group of Islands, Bob Bunting also utilised labourers from Ware and Motorina Islands as well as men from the D'Entrecasteaux Group of Islands. This decision would later complicate claims of ownership when 40 years later, Brooker and Ware Islanders began to dispute ownership and access to the Long-Kossman Reef area (see Chapter 6). The importance of plantations was reinforced immediately after World War II but collapsed in the early 1990s (see below).

War in the Louisiade Archipelago

During World War II, the Australian New Guinea Administrative Unit[37] paid regular visits to the islands of the Louisiade Archipelago as did several ships from the United States Navy. Reconnaissance and anti-submarine patrols of the Louisiade Archipelago were also regular

[35] Rollason (2010a) notes that in 1992, a major land dispute concerning customary claims to the plantation area closed copra production down. The people who had instigated the dispute were widely disparaged for undermining development efforts through their selfishness.
[36] On Enivala Island in the Bramble Haven Group of Islands, the foundations of the plantation house and some smaller buildings are still visible, and the old well is still used by Brooker Islanders.
[37] Australian New Guinea Administrative Unit took over the role of civilian government in Papua New Guinea during World War II and in the immediate years following the cessation of hostilities with Japan.

activities. As the Japanese invasion of New Guinea accelerated southwards, the town of Rabaul in East New Britain was captured in January 1942. Two days later, Australian Government Officers, and about 150 other expatriates on Misima Island fled to Samarai Island[38] (Mackay, 1992). Whilst the Japanese did not arrive on Misima or Samarai Islands, they did however establish a seaplane base on Nivani Island in the Deboyne Group of Islands in early May of 1942[39] in preparation for their forthcoming operation to capture Port Moresby (Bullard, 2007). In what was to become known as the Battle of the Coral Sea, Japanese Occupation Forces first set sail from Truk Island[40] to rendezvous with the Attack Force from Rabaul and then head south towards the Deboyne Group of Islands and then on through the Jomard Island Passage to Port Moresby (Bullard, 2007; Pfennigwerth, 2008). In the ensuing Battle of the Coral Sea, the Japanese were subsequently denied entry and passage through the Jomard Island Passage and the invasion of Port Moresby failed (Thomas, 1978).

The Battle of the Coral Sea involved no actual physical confrontation with troops on the ground as it was fought by both air and naval assets. For Brooker Islanders and other people of the Louisiade Archipelago, the Battle of the Coral Sea was played out in the skies overhead from the 4th to 8th of May 1942 (see Lepowsky, 1989). Hau'ofa (no date: 5) who was a missionary helper on Misima Island writes:

> 'The village people hid themselves everywhere, many of them crying. We were certain that day that the fighting would come to Misima Island before nightfall. We did not see any boats, but people on the northern side of the island saw transports and warships. That is all we knew or heard then about the awful noise of the fighting, which we later heard on the radio was the Battle of the Coral Sea.'

The Battle of the Coral Sea was regarded as an Allied victory. From the 2nd to 6th of August 1942, the Japanese launched another offensive along the Kokoda Trail. The Japanese also landed troops at Ahioma on the northern side of Milne Bay in what has become known as the Battle of Milne Bay (Robinson, 1981). The Battle of Milne Bay, like the Battle of the Coral Sea was also regarded as a major victory as it was the first land defeat of the Japanese Imperial Army of World War II.

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[38] In the rush to flee, an estimated 800 indentured workers in the mines and plantations of Misima Island were left behind. This prompted one of the largest evacuations in wartime Milne Bay when Ernest Whitehouse, a government official, and Laurie Henderson, a planter, used two vessels to run the gauntlet of the Japanese and returned all of the indenture labourers to their homes in the Northern District, now the Oro Province and the D'Entrecasteaux Islands (Mackay, 1992).

[39] This unit was commanded by Lieutenant Hideo Minematsu, under orders from Rear Admiral Kuninori Marumo and consisted of units that had come from Rabaul in East New Britain Province and from Shortland Island in the Solomon Islands. Assets included twelve seaplanes and a seaplane tender, two light cruisers, two gunboats and two minesweepers (James, 1999; Bullard, 2007).

[40] Truk Island is now called Chuuk Island. At the time of World War II, this island was a possession of Japan. After World War II, Chuuk Island and other islands became Protectorates of the United States of America. Today, Chuuk Island is part of the Federated States of Micronesia, which is a collection of islands that are still freely associated with the United States of America.

A Millenarian Movement

Even though the forces of World War II did not directly involve the main population of the Louisiade Archipelago, a millenarian movement with its origins on Misima Island caused a major disturbance resulting in several deaths. The instigator of this millenarian movement was a man called Buliga who was from Siagara Village on the north coast of Misima Island. Many millenarian movements are the result of local people's attempts to understand the juxtaposition of Christian beliefs and European power. These movements are often glossed as 'cargo' cults[41] (see Lawrence, 1967; Worsley, 1968; Lindstrom, 1993; Lattas, 1998; Jebens, 2010).

As noted above, with the encroachment of the Japanese, the expatriate population fled Misima Island in January 1942. Buliga began preaching shortly after of a new world order in which black men would become white, and that they would have all the food and goods that they needed. He spoke about a visit to his house by Saint Paul, Saint James and Ezekiel who told him that Adolf Hitler wanted him to clean up the legendary grave of their forefathers at a place called Nenakanari, an area which is inland from Eiaus Village on the south-east coast of Misima Island (Hess, 1982; Mackay, 1999).

Following further promises made by Buliga over the next few months that failed to materialise, people became disillusioned with him and he was forced to flee to Ebora Village at the western tip of Misima Island. Lieutenant R. Mader of the Australian New Guinea Administrative Unit was dispatched to Misima Island in November 1942 to restore law and order and to arrest Buliga. When Lieutenant Mader went to Ebora Village to arrest Buliga, Buliga fled by canoe to Motorina Island, the neighbouring island to the east of Brooker Island. Many of Buliga's followers had already gathered there and by the time Buliga arrived they had decided that they would kill any representatives of the returning government.

When Lieutenant Mader arrived at Motorina Island, Buliga's followers went over to the village of Pakitan on the south coast. Whilst at Pakitan Village, Lieutenant Mader was overwhelmed and killed[42]. The murderers then went to the government launch and killed George Burfitt but spared the crew (James, 1999). In response, Australian New Guinea Administrative Unit Officers and Police led by Lieutenant Sydney Smith were dispatched through the islands of the Louisiade Archipelago in February 1943. In the pursuit, they destroyed houses and canoes, killed five

[41] Cargo cults are the result of people searching within their culture for tools of transformation and metamorphosis that allows them to use ritual representations to control and direct the changes around them (Lattas, 1998). 'Cargo' is the Pidgin English term for trade goods (Tabani, 2018).

[42] This incident prompted another murder when men from the East Calvados Chain killed a mix-race Filipino named Golea Lareog and his crew just off Panawina Island when they apprehended his boat (Lepowsky, 1989).

people and arrested 151 people, of which 18 were sentenced to jail for periods of 3 to 10 years. Nine people including Buliga were to be hanged (Nelson, 1976; James, 1999). However, of the nine sentenced, only eight were hanged as Buliga privately hung himself in his cell (Nelson, 1976). Rollason (2014a) suggests that Buliga's hanging himself was a political statement focused on the destruction of his 'black' self in the face of the 'white' future that he had proffered to his followers. Major McMullen, who was the District Officer, considered the murders and subsequent violence as evidence of the speed with which 'natives' were capable of reverting to type, demonstrating how tenuous the influence of the colonial and military administration had over the people of the Louisiade Archipelago (Smith, 1943; Rollason, 2014a).

In the late 1950s, millenarian activity was reported again at Misima Island and also at Panaeati Island in the Deboyne Group of Islands. These millenarian movements were said to have arisen due to frustration by people at the lack of development in their area, despite new interventions by the colonial government (Williams, 1972). These millenarian activities also prompted immediate action by the church authorities to halt their spread.

During the turn of the millennium in 1999, there were many people in the Louisiade Archipelago including Brooker Islanders that were concerned with the arrival of the forthcoming millennium (see Eves, 2000). This was in part from the misinformation that was being disseminated amongst communities in regards to the Devil and his agents of 666[43], and in particular Y2K, the Millennium Bug. Stories that were commonly being told on Brooker Island and believed were that the world would go dark because white people had built a huge computer and when it was switched on, it would black out the world.

Formalising a Nation

As noted above, Queenslanders had viewed the Louisiade Archipelago and the southern region of New Guinea as an extension of their economic domain. In 1874, Queenslanders began raising concerns over this area because of their interests in gold mining, and the beche-de-mer and the pearl trade (Todd, 1894). Three years later in 1877, a limited form of authority was asserted over the southern region of New Guinea by the British through the various 1843 to 1875 Foreign Jurisdiction Acts (Parliament of the United Kingdom of Great Britain and Northern Ireland, 1843-1875; Pennell, 2010), as well as the 1872 Pacific Islanders Protection Acts (Parliament of the United Kingdom of Great Britain and Northern Ireland, 1872; Parnaby, 1957). A particular impetus for this action was due to black birding activities in the Louisiade Archipelago (see

[43] One Brooker Islander actually threw into the sea all his belongings that were manufactured by companies that were said to be associated with the Devil.

above). There was also fear that the region might come under the control of a foreign power, notably Germany or France.

On the 4th of April 1883, Queensland, tried to annex this region but was over-ruled by the British (Lett, 1944; Overlack, 1978-1979; Moore, 1984). Continued agitation on the part of the Queensland colony resulted in the region becoming a British Protectorate on the 6th of November, 1884[44] (Lyne, 1885) and on the 4th of September 1888, it became a formal colony called British New Guinea (Newbury, 1973; Mayo, 1969, 1975). With the establishment of British New Guinea, native welfare was to be paramount (Latukefu, 1989; Edmonds, 2006). Also important was the regulation of economic development, particularly the exploitation of natural resources.

To raise the profile of the newly constituted British New Guinea, Captain Cyprian Bridge arrived at Brierly Island in the southern end of Louisiade Archipelago in 1885 to tell them that they were now British subjects of the Queen, and that they must stop fighting amongst themselves, cease to be cannibals and on no account to injure any white men that came amongst them (Nelson, 1976). As evidence that they had joined the British Empire, many people in the Louisiade Archipelago received flags, copies of the proclamation, and medals.

With Australian Federation in 1901, the Australian Commonwealth government took over control of British New Guinea in 1902. The 1905 Papua Act (Government of Australia, 1905) formally defined the boundaries of the colony to include the southern and south-eastern shores of New Guinea together with the islands of the Trobriands, Woodlark, the D'Entrecasteaux Group, and the Louisiade Archipelago. On the 1st of September 1906, British New Guinea was renamed the Territory of Papua (Gibbney, 1966).

Shortly after the outbreak of the World War I in 1914, the German colony of New Guinea in the north was captured by the Australian Naval Military and Expeditionary Force (Mackenzie, 1941). The German colony remained under Australian military administration until 1921 when, following Germany's renunciation of her rights under the Treaty of Versailles, Australia was granted a mandate over the area by the League of Nations (Gibbs, 1945). The former German New Guinea and the Territory of Papua were administered separately by Australia until the Japanese invasion in 1942 which resulted in the suspension of the civilian government. Civil government was restored after World War II and pursuant to the 1945 Papua-New Guinea Provisional Administration Act (Government of Australia, 1945), the two territories were administered as the Territory of Papua-New Guinea. These provisional arrangements ceased with

[44] Germany's annexure of the north-eastern portion of New Guinea (known at that time as Kaiser Wilhelmland) and the Bismarck Archipelago in early 1884 was also a particular catalysts for the British to finally take control of the southern New Guinea region.

the commencement of the 1949 Papua and New Guinea Act (Government of Australia, 1949) which provided for an administrative union of the two territories as the Territory of Papua and New Guinea.

In 1973, the Territory of Papua and New Guinea became self-governing. Under the terms of the 1975 Papua New Guinea Independence Act, Australia relinquished any claim to sovereignty. On the 16th of September 1975, the Independent State of Papua New Guinea came into being.

The Co-operative Push

Prior to the 1950s, the copra industry was almost exclusively in the hands of expatriate planters (see above). However, by 1951, the colonial administration was working to increase the proportion of the copra produced by locals and to convert what had been the backbone of the plantation economy into the basis for a local cash economy[45] ready for eventual independence (Turner, 1986).

The period immediately after World War II was very favourable for copra production as the United Kingdom was starved of fats for cooking. In 1946, the United Kingdom signed an agreement with the Australian Government to purchase all of the copra Australia produced at a protected rate for nine years. This agreement greatly benefitted the Territory of Papua and New Guinea. When the agreement expired in 1957, the colonial administration agreed to continue to stabilise prices through a purchasing monopoly, the Copra Marketing Board (Jackman, 1988).

Within Milne Bay Province, co-operatives started in 1949 with many of the early co-operatives in the Louisiade Archipelago being established around the production of copra and the harvesting of trochus shell (McLeod, 1955). Price fluctuations for both copra and trochus shell in the global economy however played havoc with the co-operatives, causing extreme duress to their members. McLeod (ibid) writes:

> 'Co-operatives have been in operation tor two years over the whole area . . . . The members have not lost their pristine keenness, but the island groups are worried about the recent failure of the market for trochus shell. The fall in the price of trochus shell is a sad blow to the infant Co-operative Movement; however it need be far from fatal. The maritime members have been warned by me over the last two years that they were concentrating too much on the one product, especially in view of the fact that they have more coconut per capita than the agriculturalists of Misima Island. During my time in this sub-district, the market has fallen disastrously on three occasions; twice when it could not be sold at all. Each time it has recovered to a greater price per ton than before. It is ridiculous to state as did the Department of Primary

[45] By 1955, local smallholder copra production steadily increased relative to expatriate production, reaching 20 per cent of the total in 1953 and 1954 (Commonwealth of Australia, 1954 30) and 30 per cent in 1955 and 1956 (Commonwealth of Australia, 1956: 29).

> Industries that the cause is the development of plastics - the real cause is periodic market glut. The locals will be well advised to fish and store it until recovery. Apart from other species, such as green snail, black-lip pearlshell, etc., the possibilities of beche-de-mer could be explored.'

On Ware Island in the extreme east of the Louisiade Archipelago, Belshaw (1955: 37) writes of peoples' appreciation of conditions influencing prices and their participation in that specific activity:

> 'The price of green snail (about £ 2 10s a bag) was held to be too small to be worthwhile. The trochus price (£ 2 a bag) was just enough to secure an occasional response, since trochus was more plentiful. Copra (about £ 5 a bag) was much easier to work. The informants said they would not change to trochus unless copra dropped to 10 shillings a bag with trochus steady. If trochus rose to three pounds a bag, with copra steady, they would work more trochus, and if it rose to four or five pounds a bag they would work still more trochus, deserting copra.

By the time of Independence in 1975, a large majority of co-operatives in the Louisiade Archipelago had failed. In 1973, there were still twelve co-operative societies in the Misima District with 2,716 members (W.D. Scott and Co, 1973), but by 1982 this number had dwindled to just two (Gerritsen and Macintyre, 1986). Today, there are none.

By the early 1990s, copra production had collapsed throughout the Louisiade Archipelago (Gerritsen and Macintyre, ibid; Hide et al., 1994; Rollason, 2014b). As replacement income, the harvesting of commodified marine resource, especially sea cucumbers grew to dominate the economy of the Louisiade Archipelago. The notable difference with participation in the sea cucumber fishery and beche-de-mer trade is that it lacks the state support that was provided in the copra industry and the associated efforts to integrate local producers as stakeholders into the industry.

Conclusion

The rise of external government, new mytholodgies and ways of working influenced how Brooker Islanders began to transition from livelihoods that were conducted for subsistence and ceremonial purposes to livelihoods that involved working for cash and exchanging cash earnt for Western foods and goods. As shown, from the middle of the 19th Century, the people of the Louisiade Archipelago began to be increasingly and more fully incorporated into the global economy. Until the 1870s, all non-indigenous activities, including whaling, trading and labour recruiting, had been sea-based. Europeans moved to establishing trading posts, mining camps and finally government and mission stations bringing them into much closer contact with local people like Brooker Islanders. This close contact also hastened the uptake of new livelihood activities in

mining and the harvesting of now commodified marine resources such as sea cucumbers, trochus, pearl shell and tortoiseshell.

The entry of Australian-based capitalism in the second half of the 19th Century brought new demands on natural resources and human labour in the Louisiade Archipelago. The introduction of colonial export industries allowed for the extraction of resources to promote colonial territorial expansion and development. For Brooker Islanders, this period saw their growing articulation with capitalism, changes in their livelihood activities and a greater dependence on cash. With the Christian missionisation process and increasing dominance of the colonial government, and as new capitalists extended their operations into both the territory and the lives of Brooker Islanders, they become incorporated into new world systems, new belief systems, new governance systems and new livelihoods. Following the end of World War II, there was a shift in the post-war colonial administrations development policies and there was a greater emphasis on governing the people of the Louisiade Archipelago (Berde, 1974; Rollason, 2010a).

Over time, Brooker Islanders became more nuanced in their understanding of the ways of capitalism, including the value that they attached to their own labour but also to the commodities that they were producing. Now that they had been incorporated into the global economy, there was no going back to an entirely independent subsistence economy. Unfortunately, for Brooker Islanders, the extent of their integration into the global economy made them much more vulnerable to changing market demands, especially as their livelihood strategies transitioned to becoming dependent on a few comodified marine resources. The harvesting of sea cucumbers to be sold as beche-de-mer and the work involved waned after the World War I with new livelihoods emerging with the plantation era and diving for trochus. These activities collapsed highlighting the vulnerability and lack of livelihood diversification opportunities available to them.

This chapter has focused on the pre-contact to Independence period, the emergence of inititial foreign capitalist interests, and the development of a burgeoning economy of a new colonial state. This economy was further supported by the presence of churches that also installed new ways of thinking and being.

The next chapter details Brooker Islanders continued incorporation into the global economy from Independence to the present day, with a particular emphasis on the development of the marine realm to supply marine resources to various internal and external markets.

Chapter 4
Development in the Marine Realm: 1975-2019

The previous chapter detailed how Brooker Islanders became increasingly incorporated into the global economy from initial contact with Europeans up to the time of Independence in 1975. Following Independence, profit-driven commercial interests took over the reins of the cash economy from the government and the church, and a stronger market economy was promoted.

Attempts to develop fisheries production in the Louisiade Archipelago first involved a collaboration between the Catholic Church, an international development agency, a mining company, and then by private companies. Later, small adventures in tourism have been attempted, but have had no permanency. Since the 1990s, Brooker Islanders have become solely dependent on the exploitation of their marine resources, and in particular the sale of beche-de-mer as their main cash earning activity. Over exploitation led to the National Fishing Authority implementing a moratorium on the sea cucumber fishery and beche-de-mer trade from October 2009 to April 2017 (see Chapter 7). There has also been attempts to exploit other benefits from the marine environment through tourism activities.

A broad chronology of the activities that have continued Brooker Islanders incorporation into the global economy from Independence to present are[1]:

- Louisiade Fisheries: 1970s – Catholic Church promotes development for villagers in the Louisiade Archipelago.

- Milne Bay Fishing Authority: 1980 to 1990 – Province-wide fisheries project supported by foreign aid and government support established.

- Coral Sea Fisheries: 1990s – An initiative of Misima Mines Ltd to assist outer-islanders with income opportunities.

- Other Commercial Interests: 1990s to 2010s – Following the collapse of Coral Sea Fisheries, other commercial interests expressed interest in fishing in the Louisiade Archipelago, although none of these became active.

[1] This chronology was developed from the literature reviewed for this thesis and associated references to this literature is referenced in each section.

- Home Grown Companies: 1990s-Present – Nako Fisheries and Kiwali Exports were established and dominate the fisheries sector of Milne Bay Province.

- Outside Intrusions: 1960s to 2018 – Intrusions by Mailu people from the southern coast of Central Province looking for shells for ceremonial purposes. Taiwanese followed in the 1960s and 1970s in search of giant clam adductor muscle. In the late 2010s, Vietnamese Blue Boats arrived targeting the high-value teatfish sea cucumber species.

- Tourism Attempts: 1980s to 2010s – Pacific Adventures started sailing tours to Brooker Island in the 1980s. The Louisiade Yacht Rally followed in the 2000s. In the late 2010s, there has been interest in sports fishing and wind-surfing charters.

As in the last chapter, a detailed timeline of events is located in Appendix I.

Fisheries Development in the Louisiade Archipelago

Louisiade Fisheries

In 1968, the Catholic Mission at Nimoa Island located on the northern end of Sudest Island developed a fisheries project in the Louisiade Archipelago called Louisiade Fisheries. Louisiade Fisheries was to be a joint venture between the Catholic Mission and the Louisiade Local Governing Council[2] (Becke, 1968). The objectives of Louisiade Fisheries were to promote the economic and social welbeing of the people of the Misima District by organising communities to catch fish which they would market[3] (Nash, 1970). As part of the development of Louisiade Fisheries, a smokehouse and storage facility was planned for Brooker Island, but these were never constructed (Louisiade Fisheries, 1972).

Louisiade Fisheries was unable to make a profit because of the high cost of fuel. Village fishers also did not supply fish in the quantities demanded in part because of the low prices paid to them. In August of 1977, the Milne Bay Department of Primary Industry stepped in and took over the operations of Louisiade Fisheries (W.D. Scott and Co., 1973). The remnant operations of Louisiade Fisheries, was later subsumed into the Milne Bay Fishing Authority.

[2] The Catholic Mission was to provide AUD 5,000 (equivalent to ~ AUD 62,358.35 in 2019) and the Louisiade Local Governing Council to contribute a further AUD 2,500 (equivalent to ~ AUD 31,179.20 in 2019) (Becke, 1968).
[3] It was anticipated that approximately 4.5 mt of fish per month would be caught (W.D. Scott and Co., 1973).

Milne Bay Fishing Authority

In the lead up to Independence, an economic development pilot study was conducted for Milne Bay Province to identify areas for further commodity production (W.D. Scott and Co., ibid). Because of this study, and because of Milne Bay Province's vast maritime area, it was decided that economic growth lay in the exploitation and sale of marine resources. W.D. Scott and Co. (ibid) subsequently recommended that small freezer facilities should be located at various sub-district centres with a larger freezer situated at Alotau. The sub-district centres would then act as collection points for nearby fishers to bring their catches to.

In 1976, fisheries development in the now post-Independence Milne Bay Province attracted aid from New Zealand, and the Milne Bay Fishing Authority's basic operational structure was established (Maurice Pratley and Associates, 1989; Opnai and Aitsi, 1995). Following the concept developed originally by W.D. Scott and Co. (1973), the operations of the Milne Bay Fishing Authority began. This involved the development of four outstations, one of which was established at Brooker Island[4]. These outstations were supplied with operating infrastructure[5] and were supported by several vessels for fishing and transportation between the outstations and the main base which was established at Samarai Island (Department of Milne Bay Province, 1981). The Milne Bay Fishing Authority also provided training to local people in various fishing technologies, boat building, maintenance and other related skills required for fishing (ANZDEC Limited, 1995).

The outstation at Brooker Island operated from 1984 to 1989 and closed a year before the Milne Bay Fishing Authority formally closed in 1990. Issues affecting the operations of the Brooker Island outstation included low pricing, absenteeism of Milne Bay Fishing Authority staff and a land dispute over the out-station area, which was the main reason for the closure (see Chapter 6). During its operational period, Brooker Island supplied nearly 100 mt of marine resources, namely fish and lobster over a six-year period (Table 2).

[4] The other outstations were established at Vakuta in the Trobriand Group of Islands, Kaulametu on Woodlark Island, and at Tagula on Sudest Island. The Milne Bay Fishing Authority also set up a two mt per day blast freezer, a 10 mt cold store, a five mt per day ice machine and a 20 mt ice storage facility at Bwagaoia on Misima Island (ANZDEC Limited, 1995).

[5] Infrastructure at the Brooker Island outstation in 1982 included five storage freezers, two Lister generators, a generator house, a staff house, a freezer house, and a beche-de-mer smoke house. The Milne Bay Fishing Authority vessel, *Dipana* was also based at Brooker Island (Department of Milne Bay Province, 1981). In 1990 when the Milne Bay Fishing Authority closed, infrastructure at Brooker Island consisted of a semi-permanent house, several buildings for freezers and generators, six storage freezers, and the two Lister generators (Kumah Enterprises, 1991). In 1998-1999, I resided in a section of the old storage shed, the semi-permanent house having been pulled down several years before and two of the large freezers were on the beach and used as storage by the Sam family.

Table 2: Milne Bay Fishing Authority Fish Collection by mt for Outstations: 1984 to 1990.

Year	Vakuta	Kaulametu	Brooker	Tagula	Samarai	Total
1984	26.1	-	21.2	12.1	175.4	**234.8**
1985	11.9	-	6.0	14.1	186.3	**218.3**
1986	19.2	-	19.4	12.4	166.2	**217.2**
1987	17.2	6.5	27.1	10.8	161.2	**222.8**
1988	12.4	17.0	15.3	13.5	96.8	**155.0**
1989	12.4	24.2	10.8	11.7	16.2	**75.3**
1990	1.8	12.6	Closed	8.2	22.1	**44.7**
Total	**101.0**	**60.3**	**99.8**	**82.8**	**824.2**	**1,168.1**

Source: National Fisheries Authority.

In the beginning, projections of production for the Milne Bay Fishing Authority had fishers fishing an average of 200 to 250 days per year per fisher, earning an income of around PGK 175[6] per annum (Department of Milne Bay Province, 1981). Fishers complained that buying prices were too low and that they wanted to be paid more for their marine resources (Kaumas, 1982). The Milne Bay Fishing Authority did increase prices in its final year of operation, but was unable to sustain itself profitably. The bulk of the fisheries product comprised low-value reef fish which when sold, failed to generate enough income to cover purchasing, transportation, processing and marketing costs. Resource rights also increasingly became a problem (see Chapter 6). High staff wages, misappropriation of funds, over-capitalisation in plant and equipment, and a final breakdown in organisational structure all contributed to the demise of the Milne Bay Fishing Authority (ANZDEC Limited, 1995). Added to all this was competition from companies based in Alotau, the Provincial capital of Milne Bay Province (Maurice Pratley and Associates, 1989). When the Milne Bay Fishing Authority finally closed, approximately AUD 15,517,910[7] had been spent on its operations (ANZDEC Limited, 1995).

Coral Sea Fisheries

After much exploration in the 1980s, gold mining on Misima Island entered a new phase when Placer Dome from Canada started a large open cut mine in 1989. As part of its 'social responsibility' program, Placer Dome funded a fishing venture called Coral Sea Fisheries. Coral Sea Fisheries objectives were similar to those of Louisiade Fisheries and the Milne Bay Fishing Authority, which were to encourage economic development for local people through the sale and marketing of their marine resources by becoming shareholders in Coral Sea Fisheries. In the hope of being more successful than the past initiatives of Louisiade Fisheries and the Milne Bay Fishing Authority, Coral Seas Fisheries embarked upon a series of consultations with local communities in the late 1980s and early 1990s. During these consultations, communities like Brooker Island

[6] Equivalent to ~ AUD 235.90 in 1980.
[7] Equivalent to ~ AUD 30,965,490.15 in 2019.

expressed wide support for Coral Sea Fisheries because the demise of Milne Bay Fishing Authority had left people with limited opportunities to earn cash[8] (Stevens, 1989).

Coral Sea Fisheries brought the *MV Tologi*, which was refitted with filleting, packing and freezing facilities, as well as an onboard store selling various fishing equipment, food and goods. Commercial operations formally commenced in March 1994. Coral Sea Fisheries soon faced similar problems to the Milne Bay Fishing Authority including an ever-increasing debt (Mounsey, 1996). Contention over resource rights (see Chapter 6), inclement weather, pricing, and the use of destructive fishing methods by fishers in the Louisiade Archipelago were all issues that affected the commercial success of Coral Sea Fisheries. Due to the high cost of operations and the debt that Coral Sea Fisheries was accumulating, Coral Sea Fisheries reduced their fish buying prices to local people to such a degree that it was not worthwhile for them to go fishing. It was estimated that Coral Sea Fisheries at the time of its closure was AUD 1,038,300.00[9] in debt (Mounsey, ibid).

Other Interests

In the aftermath of Coral Sea Fisheries, and despite the continued failure of other projects and companies, there was still interest in developing fishing ventures in the Louisiade Archipelago. The first of these was Elfin Enterprises which was to be a joint venture with a group of Misima Islanders who had access to mining royalties and a private Australian company (Elfin Pty Limited, 1997). The second attempt was through a consortium called Horizon Resources Pty Limited which was an incorporated and registered Papua New Guinea company with Australian shareholders who were also considering a joint venture with the Yele Trading Company Propriety Limited (Horizon Resources, 1998). Both these companies had similar commercial concepts. Despite the construction of some infrastructure on Misima Island, neither of these companies ever began commercial operations. In 2011, a company called Wildfish Limited, a Papua New Guinea registered business but with Australian management proposed a fishing enterprise using a similar model to Coral Sea Fisheries with a dedicated fish filleting and lobster tailing and packaging support vessel. Wildfish Limited also never started operations.

Local Companies

Masurina Limited was founded just before Independence in 1974 and over the years, it grew into a broad-based trading company which had business interests in hospitality, forestry, construction and fisheries. In 2001, Masurina Limited split its business interests with the now Milne Bay

[8] Copra at this time was seen as too much hard work for very little economic return.
[9] Equivalent to ~ AUD 2,374,434.70 in 2019.

Provincial Governor, Sir Jon Luc Critten taking ownership of Nako Fisheries and Kiwali Exports, while Chris Abel[10] took over the hospitality, forestry and construction enterprises.

When the Milne Bay Fishing Authority was operating between 1980 and 1990, Masurina Limited had been its main competitor. After the collapse of the Milne Bay Fishing Authority, Nako Fisheries obtained all of the Milne Bay Fishing Authority's assets and staff, including the Milne Bay Fishing Authority Manager, Neil Stanton. The only difference now between the two entities was that Nako Fisheries had a greater emphasis on profitability. Whilst Nako Fisheries was involved in fresh fish, catching prawns and for a short while, long-lining for tuna, Kiwali Exports operations focused on the buying and export of beche-de-mer, trochus, black lip pearl shell and shark fins.

In 1998 and 1999, Nako Fisheries vessels, *FV Dune* and *FV 434*, were regularly at Brooker Island, and on many occasions assisted Brooker Islanders to get to the outer islands such as Nabaina and Nagobi Islands to harvest marine resources for sale. Nako Fisheries became less profitable over time and has been for sale in recent years. Kiwali Exports sold off its vessels when the moratorium on the sea cucumber fishery and beche-de-mer trade was introduced by the National Fisheries Authority in October 2009. The moratorium and loss of transport through Nako Fisheries and Kiwali Export vessels severely impacted on the livelihood strategies of Brooker Islanders.

Asiapac Limited started operations in 1992 and is only other home-grown company to have endured in Milne Bay Province.

Outside Intrusions and Illegal Harvests

Ceremonial to Commercial

Historically, the Mailu people from the southern coast of Central Province traded with people of Milne Bay Province (Malinowski, 1915). In the 1950s, Mailu canoes were reported fishing for shell in the West Calvados Chain, in particular, the large cone shells (*Conus litteratus*) called 'toea' that they use in their ceremonies and rituals (McLeod, 1956). By 1977 however, Heveve (1977) notes that the Mailu had moved on from just fishing for shells for ceremonial purposes, but were now fishing for commodified marine resources products such as trochus shells, giant clams, and sea cucumbers. In 1985, both the Bwanabwana and Louisiade Local Level Governments passed a resolution to restrict access by the Mailu people and in 1986 the

[10] Chris Abel is the grandson of the missionary Sir Charles Abel who founded the Kwato Island Mission opposite Samarai Island. Chris was knighted in 2017.

Bwanabwana Local Level Government placed a complete ban on Mailu people entering the marine territory of the Bwanabwana Local Level Government (Maso, 1986; Elimo, 1986).

Whilst trading still goes on along the south coast of Papua New Guinea as evidenced by the Mailu canoes still seen from time to time at Ela Beach in Port Moresby, it appears that trips to Milne Bay Province are now very infrequent. A contributing factor to the decline in visits is the reopening of the sea cucumber fishery and beche-de-mer trade by the National Fisheries Authority in April 2017. In 2017 and 2018, there was increased incidences of 'piracy[11]', which has made it dangerous for travel in many areas of Milne Bay Province (National Fisheries Authority, 2017).

Foreign Fishing Vessels

The peak period for illegal fishing by foreign fishers in the Louisiade Archipelago lasted from the mid-1960s to the early 1980s[12] (Bartlett, 1975; Fairhall, 1975; Standing, 1975; Dawson and Filipinos, 1989; Lucas, 1994). The main target item at this time, was giant clam adductor muscle and local people like Brooker Islanders were willing assistants in these enterprises only making complaints to government authorities when terrestrial resources were taken from islands that they claimed ownership over (Bartlett, 1975; Bourne, 1976a). Standing (1975) writes that Brooker Island people accepted the arrival of Taiwanese fishers openly because they brought rice, whisky, tobacco and other commodities. Part of the support for these Taiwanese fishers was the perception that they were more reliable in providing services to remote communities like Brooker Islands than the Milne Bay Provincial Government. Ironically, these same Taiwanese fishermen are now blamed by Brooker islanders for their depleted giant clam stocks.

Closer to home, in the late 1990s and early 2000s, illegal entry by Papua New Guinea registered long-liners targeting sharks for shark-fin was common along the Long-Kossman Reef resulting in several of these vessels running aground in Brooker Islanders' marine territory. In total, four long-liners ran aground in Brooker Island waters in the early 2000s (Kinch, 2001a). Whilst complaints about their presence were reported to government authorities, local people would again trade with them, exchanging trochus shell for food and other goods.

[11] This is not a new phenomenon however; in previous years when the sea cucumber fishery and beche-de-mer trade was open, incidences of piracy occurred.

[12] There was an earlier history of commercial fishing vessels poaching within the waters of the Louisiade Archipelago. Zimmer (1924) a District Officer on Misima Island reports Japanese fishing boats fishing around Brooker Island in 1924.

Vietnamese Blue Boats

In recent years, poaching fleets of small-to-medium-sized Vietnamese fishing boats, commonly called 'blue boats[13]' or more recently, 'reef robbers' have targeted commodified marine resources such as sea cucumber species[14] (Song et al., 2019). Many of the Vietnamese Blue Boats that entered Papua New Guinean waters targeted the reefs of the Louisiade Archipelago. For example, the *FV Hoang Dung* was apprehended at the Jomard Island Passage entrance in March 2016 (Anonymous, 2016a). This particular fishing vessel had on-board 18 drums full of the high value white and black teatfish[15]. This vessel was escorted back to Alotau and the crew were charged by the National Fisheries Authority with fishing within the waters of Papua New Guinea without a licence, and engaging in the harvesting of sea cucumbers during the moratorium. In December 2016, another three Vietnamese fishing vessels were captured off Budibudi Island to the east of Woodlark Island by the Papua New Guinea Defence Force's Naval Arm. The crew of these three vessels totalled 50 people and onboard were 77 drums of white and black teatfish (Anonymous, 2016b).

At the local level, the poaching of high valued sea cucumbers directly competes with the needs of local people like Brooker Islanders and is another source of fishing pressure. By the time the moratorium on the sea cucumber fishery and beche-de-mer trade was finally lifted in April 2017, the Vietnamese Blue Boats had already collected substantial amounts of teatfish sea cucumbers. The poaching by these Vietnamese Blue Boats also undermined the management efforts by the National Fisheries Authority and recovery of sea cucumber stocks. Their presence also exposed the difficulty that the Papua New Guinean government has with monitoring and patrolling their Exclusive Economic Zone and protecting commodified marine resources (see McNulty, 2013).

[13] These Vietnamese fishing boats are called blue boats simply because that is the colour they are painted. They are relatively small boats, usually being between 10-15 metres in length and can carry up to 10-17 crew on-board (Blaha, 2016; Song et al., 2019).

[14] Vietnamese Blue boats have been sighted and apprehended in the waters of Palau, the Federated States of Micronesia, Solomon Islands, Vanuatu, New Caledonia, and Australia (Blaha, 2016; Freeman, 2017; Song et al., 2019). They are also a problem for the Philippines, Indonesia, Malaysia and Thailand (Song et al., ibid). In Papua New Guinea, Vietnamese Blue Boats have been caught in the East Sepik, New Ireland and Milne Bay Provinces. The presence of these Vietnamese Blue Boats across the Pacific Islands region can be seen as a response to the depletion of marine resources stocks in waters nearer to Vietnam (Pomeroy et al., 2009). Another issue for Vietnamese fishers is the increasing Chinese political pressure and para-military presence, particularly in the disputed Spratly Islands area (Nguyen, 2012; Zhang and Bateman, 2017).

[15] These two teatfish species have now been listed on Appendix II of the Convention in Trade of Endangered Species in August 2019 (Food and Agriculture Organisation, 2019) (also see Chapter 8).

Tourism Adventures

Immediately after Independence in 1975 and again in pursuit of economic activities to fund Milne Bay Province, the then Department of Environment and Conservation and the Milne Bay Provincial Government requested the Misima District Officer to visit Brooker Island to determine the feasibility of small-scale tourism resorts in the outer islands of their marine territory. Jomard Island and Enivala in the Bramble Haven Group of Islands were thought to have particular appeal (Bourne, 1976b). Unfortunately, both are a long way from Alotau, the Milne Bay Provincial capital or Bwagaoia, the District headquarters on Misima Island. Poor anchorages, the high exposure to prevailing south-easterlies winds as well as the impacts of regular cyclones and droughts does not makes the option for tourism development feasible for this area of the Louisiade Archipelago. Interestingly, Bourne (ibid) notes that every Brooker Island he spoke to expressed enthusiasm for a tourism industry in the area.

Several years later, Pacific Adventures began offering a host of activities for the adventure tourist from 1982 to 1988. One of their activities besides trekking in various parts of the Papua New Guinean mainland was 'Sailing the canoes of Misima' (Tennenbaum, 1984). The tour length was for ten days with a day spent in both Port Moresby and at Bwagaioa on Misima Island, leaving eight days for the sailing adventure. Brooker Island canoes were notified that a tour was being prepared by news sent over the Milne Bay Radio and were told to wait at Bwagaioa for arrival of the guests. The itinerary was from Bwagaioa to Brooker Island to the Deboyne Group of Islands and then along the south coast of Misima Island. During the six-year period that Pacific Adventures conducted sailing tours with Brooker Islanders, it organised approximately five trips a year. Pacific Adventures finally folded due to rising violence, law and order problems and increased prices in hotel accommodation for their mainland activities[16].

The yachting community are regular visitors to the Louisiade Archipelago every year, with some years between 70 to 100 yachts entering Bwagaioa on Misima Island to clear customs. In 2006, Guy Chester of EcoSustainAbility based in Cairns, Queensland visited the Louisiade Archipelago and with support of the Papua New Guinea Tourism Promotion Authority started the Louisiade Yacht Rally in 2008, with over 30 yachts participating. The Louisiade Yacht Rally is not a race, and while there were competitions, the main purpose of the Louisiade Yacht Rally was to provide benefits to local communities in the Louisiade Archipelago. These benefits came from payments to villagers and communities for the organisation of specific events, the donation of goods and materials, and from the supply of medicines and medical equipment to health facilities. While

[16] In discussions I had in the early 2000s with the manager of these tours, David Choulai, he suggested that this type of activity could be viable if the Alotau or Misima Airports were able to accept direct international flights from Cairns. I organised several sailing trips to Brooker Island in 2002 and 2003 with my wife Sylvia, but the time, cost and logistics were just too much to make it worthwhile.

the Louisiade Yacht Rally did provide some community benefits, it was rather paternalistic in nature. As Adams (2016) writes:

> 'The most rewarding aspect of this rally was the total acceptance and sense of community which developed between affluent yachties and underprivileged islanders, who in no way can they be called 'poor' for their life is rich in community spirit, excellent food and tribal lore. They are rediscovering their traditional culture now that the missionary zealots are no longer dominant and enjoying life as best they can.'

Brooker Islanders and their island neighbours viewed the Louisiade Yacht Rally as another opportunity to earn cash, but also to enter into similar relationships that their forbears had when the first sailing ships had arrived on a regular basis some 150 years before. To obtain this cash and goods, Brooker Islanders and their island neighbours still worked, supplying lobster and fish and putting on various tourism activities. For example, Brooker Islanders took yachts people on tours of their ancestral skull caves at Panasial Island. Other island communities at Panapompom Island in the Deboyne Group of Islanders put on canoe races and cultural performances. On Misima Island, and along the East Calvados Chain, other activities were conducted, including a river trip via local 'banana boats' on Nimoa Island.

In 2009, 16 yachts participated and in 2010, 26 yachts participated. In 2010, the main support focus of the Louisiade Archipelago was the Panaeati Island sub-health station, which also services Brooker Islanders, and the hospital at Nimoa Island. Water tanks were also given to various communities in the Louisiade Archipelago. In 2011, 15 yachts participated. The 2012 Louisiade Yacht Rally was the last time that this rally would be run by Guy Chester with 17 yachts participating. On this trip, over 100 solar lighting units were provided to various communities in the Louisiade Archipelago as well as substantial cash donations to the Panaeati Island sub-health station and the hospital at Nimowa Island. On this last trip, Wallace (2012) provides an interesting account of her interaction with Brooker Islanders:

> We negotiated the reef at the Duchateau Group of Islands and took anchor inside the lagoon. We were the second yacht in, and over the next 36 hours, the rest of the fleet arrived. We dinghied ashore to explore and snorkelled the reef. There are no permanent villages in the Duchateau Group of Islands, and locals arrive there by sailing canoes to fish. They bring whole families with them, including quite young babies, and the arrival of the rally fleet signalled an opportunity for trading and celebration. For the first two nights, the Brooker Island locals speared copious quantities of painted lobster, which they shelled and cooked on a BBQ plate on the beach. This feast was supplemented by Spanish mackerel that crews had caught enroute. John and Allan decided to 'gift' a diving mask to the person who had caught the least number of lobsters which the natives were very quick to point out who that was! We were very soon shown how hierarchical the culture is however, as the village elder indicated that he was the one the gift should go to.

> Ida became quite friendly with one young mother, Nancy, whose daughter remained on Brooker Island with her grandmother. She was 22 and her daughter was three, and she had just divorced two weeks earlier. Before we departed for our next anchorage to Panasial Island, she asked if she could sail across with us, as the sailaus were 'very wet', each has one crew member whose sole task is to bail water continuously! Her father handed Allan a well-written note requesting a donation of a Stihl 706 chainsaw, very specific to be sent if possible to him on our return to Australia!

I met with Guy Chester on several occasions in November 2013 when he was anchored in Kavieng Harbour in the New Ireland Province on his way to Indonesia. I asked him why the Louisiade Yacht Rally was no longer running and he replied that it had become too difficult to organise because of Papua New Guinea Immigration and Customs formalities. Another reason that was proffered was simply that the people of the Louisiade Archipelago had become too demanding in their 'wants'.

Whilst Guy Chester is no longer involved, the Multihull Cruising Yacht Club in Townsville, Queensland is planning a revitalised Louisiade Yacht Rally in September 2020. The first destination is the Duchateau Group of Islands and Panasial Island before commencing a program of activities reminiscent of previous Louisiade Yacht Rallys. It will be interesting to observe if the similar demands and issues also resurface.

In a different approach to tourism development in the Lousiade Archipelago in recent years, several sports fishing (Ashley, 2016; Tam, 2017; Mundy, 2018) and wind-surfing charters have been conducted in the Louisiade Archipelago[17]. This type of tourism is vessel-based and subsequently provides little income opportunities for people like Brooker Islanders besides the provision of seafood and fresh garden produce. These activities remain ad hoc.

Conclusion

Following the initial incorporation in pre-colonial times, Europeans had introduced changes in the exploitation patterns through export-driven fisheries of beche-de-mer, trochus, pearl shell and tortoiseshell. This process integrated local marine resources into global markets and gradually introduced the perception of resources as commodities to Brooker Islanders. Following Independence, this pattern of incorporation into the global economy continued, and continued to disrupt social networks, increasing the dependency on Western foods and goods, and to a varying degrees, promoting social inequality.

[17] My wife Sylvia, has done several of these trips as the Chef of the *MV PNG Explorer*.

With the introduction of the cash economy, now supported by domestic capitalistic operations like Nako Fisheries, Kiwali Exports and Asiapac, new ways of harvesting and new technologies would eventually lead to a collapse of the sea cucumber fishery and see the rise of disputes as people became increasingly desperate to obtain cash whilst sea cucumber stocks were declining (see Chapter 6). The desire to earn cash was also important especially because of the series of cyclones and El Nino related droughts.

Attempts to develop fisheries in the Louisiade Archipelago have been unsuccessful due to the high costs associated with operating in a remote area, the difficulties in transport and other logistics (see also Barclay and Kinch, 2013). Subsequently there is and has been a focus on marine resources that are storable until transport is available; the most notable of these are beche-de-mer, trochus, pearl shell and shark-fin. The presence of poachers is also a sign of the wealth to be captured from the marine environment of the Louisiade Archipelago. Tourism has been less successful, and it is yet to be seen what benefits tourism activities can provide in remote areas of the Louisiade Archipelago.

From the early 1990s right up until October 2009 when the moratorium was imposed by the National Fisheries Authority, Brooker Islanders became fully engaged in the harvesting of sea cucumbers and processing them for the beche-de-mer trade. This activity has now become the predominant economic activity throughout the Louisiade Archipelago and the mainstay of life for Brooker Islanders in recent times. There are questions however, over its long-term viability as a livelihood activity for Brooker Islanders.

The contemporary economy of Brooker Islanders is the result of more than 150 years of articulation with the global economy which intensified after Independence in 1975 through church, government and private capital initiatives. For a time, the increase in the harvesting of sea cucumbers for the production of beche-de-mer provided high cash incomes for Brooker Islanders and led to poverty alleviation and improved food security. By the mid-2000s however, trouble was emerging with an increase in disputes over ever-decreasing sea cucumber stocks and associated vulnerability to income earning opportunities (see Chapters 6 and 7).

In the next Chapter, I will detail what it is to be a Brooker Islander, their community, their livelihoods.

Chapter 5
Making and Earning a Living

In the previous chapters, I detailed how Brooker Islanders have become increasingly incorporated into the global economy with a present day focus on the exploitation of commodified marine resources, namely the harvesting of sea cucumbers for the production and accumulation of beche-de-mer for sale. Historically, the economy of the Brooker Islanders was based on a combination of gardening, fishing and participation in inter-island trade. These activities still persist today to greater and lesser degrees with the exception that commodity production has also become a major part of the livelihood strategies of Brooker Islanders. Gardening and fishing is of course still important for subsistence, but also for obtaining much needed cash to support Brooker Island living. Inter-island trade also remains important and is facilitated by connections and relationships between Brooker Islanders and their island neighbours across the Louisiade Archipelago. These connections have been established through friendships, marriages[1] or having a shared ancestral clan link establishing obligations and alliances (see below). These same relations with neighbouring islands also raise issues about who has and does not have the right to use and access marine resources in the territorial waters claimed by Brooker Islanders (see next chapter).

When I arrived on Brooker Island in 1998, obtaining cash was dictated largely by the environment and the technology at hand. Especially important was the need for sailing canoes, which gave way to fiberglass dinghies and outboard motors as people began to compete against each other to access remaining sea cucumber stocks. Over time, Brooker Islander's requirements for cash has increased especially with the arrival of new telecommunications, technologies and solar power (see Chapter 7). With an increasing need for cash, there are also associated changes in the ways that livelihoods are enacted and in the use of cash from these livelihood activities. A common phrase heard on Brooker Island is '*wala mani taan*' (we eat our money). This means that the cash obtained is often spent on store-bought foods (see Hair et al., 2019; Barclay et al., 2019). Cash has also become of greater importance with hosting and funding all activities that bring people together, be they ceremonial, school, church, sports or politics. While the pursuit and use of cash has been both adaptive and transformative it has also changed the way that the Islanders earnt their livelihoods.

[1] Berde (1974, 1979) notes particularly, that many Panaeati Islanders married into families on the west and south coast of Misima Island and on Brooker Island. Battaglia (1983) also notes that within ten years of the Catholic Mission opening its school at Nimoa, inter-marriage between people of the East Calvados Chain and Sudest Island, who had formerly regarded each other warily, had increased by 30 percent.

In this chapter I provide details of the social system on Brooker Island in relation to clan and sub-clan affiliations and the associated rights that membership brings. I also provide details of Brooker Islander's land and sea economy including the importance of inter-island trade. Brooker Island households construct a diverse portfolio of activities and social support capabilities for survival and in order to improve their standard of living making the diversity of livelihoods is an important feature to their continued wellbeing. Overlaying these activities is the requirement to earn cash to support the livelihoods of Brooker Islanders.

Clans and Access to Resources

When I arrived at Brooker Island for the first time in February 1998, there were four main villages located on Brooker Island itself. These were Lilla, Awan bwabwatana (meaning big village), Bokiyowa, and Galivolan[2]. The main village of Awan bwabwatana was further divided into seven hamlets. Two neighbouring islands, Venaliwa and Gulewa were also the home of people that identified as Brooker Islanders. The island of Panapatpat also had Brooker Islanders residing on it intermittently. In recent years, several additional hamlets have been established on the south coast of Brooker Island. One family had also moved to Enivala Island in the Bramble Haven Group of Islands.

The expansion of the four main villages as well as the establishment of new hamlets is reflective of the increasing population on Brooker Island since first contact[3]. For example, in 1944, Brooker Island had a population of 144 people[4]. In April 1999, when I conducted a census, I recorded 399 Brooker Islanders with only five people away living in the national capital of Port Moresby[5]. At

[2] During World War II, Brooker Islanders residing on other islands within their marine territory were moved back to Brooker Island under Australian New Guinea Administrative Unit and were centralised at Awan bwabwatana (see also Lepowsky, 1989). The smaller villages of Lilla, Bokiyowa and Galivolan date from after this period.

[3] In the pre-contact period, the population in Brooker Island would have been small due to a combination of high infant mortality, persistent endemic diseases, high maternal deaths in childbirth, raiding, and relatively low garden yields. Depopulation in many areas occurred throughout the 19th Century as contact with outsiders intensified who brought new diseases such as dysentery, measles, smallpox, chickenpox, influenza, tuberculosis, pneumonia, typhoid, meningitis and venereal diseases (Chalmers, 1887; Williams, 1933; Liep, 1983; Gray, 1999).

[4] During the 1940s and 1950s, several epidemics were reported in the Louisiade Archipelago. The first and most serious of these was a dysentery outbreak in 1944, which was quickly followed by an outbreak of meningitis. In 1950, a polio epidemic spread through the Louisiade Archipelago, and in 1953 influenza struck (McLeod, 1955).

[5] Migration to urban centres is not a household strategy that is strongly utilised by Brooker Islanders to diversify sources of incomes. Whilst Brooker Islanders living in urban centres do send remittances, these are also limited as most Brooker Islanders work in the service sector where the minimum wage applies. In contrast, neighbouring Ware Island does have a strong remittance economy. In 1991, Hayes (1993) determined that remittances made up one third of the income received by Ware Island households and was their largest single source of income at that time. Hayes (ibid) also determined that just under half of all household heads interviewed had spent some period of their lives working away from Ware Island. Hayes (ibid) estimated that in the late 1980s, a reasonable estimate of Ware Islanders living outside of Ware Island would be approximately 300 people, a large contrast to Brooker Island.

a current population growth rate of 3.1 per cent per annum (National Statistical Office, 2014), Brooker Island will have an expected population of 725 people by the end of 2019 (Table 3), an increase of nearly 46 per cent[6].

Table 3: Brooker Island Population: 1944 to 2019.

Date	Deaths	Births	Migration In	Migration Out	Total
1945	?	?	?	?	**144**
1946	4	6	5	5	**147**
1950	0	10	7	0	**155**
1951	1	4	0	3	**158**
1954	7	6	10	1	**165**
1955	2	3	3	0	**160**
1956	5	7	7	10	**168**
1957	0	1	6	8	**126**
1961	0	0	0	4	**163**
1962	0	7	3	39	**177**
1963	1	7	2	0	**184**
1965	6	10	4	0	**189**
1966	2	10	2	2	**199**
1967	2	14	2	2	**208**
1970	1	33	1	2	**235**
1971	3	9	9	1	**235**
1972	?	?	?	?	**237**
1980	?	?	?	?	**246**
1990	?	?	?	?	**313**
1992	5	9	1	7	**333**
1994	0	15	3	15	**361**
1995	1	12	0	0	**369**
1996	0	11	0	0	**381**
1998	8	10	1	0	**389**
1999	4	12	1	0	**399**
2002	?	?	?	?	**381**
2000	?	?	?	?	**427**
2011	?	?	?	?	**604**
2019	?	?	?	?	**~ 725**

Sources: Misima and Louisiade Government Patrol Reports, Census Books, Church Records, Provincial and National Censuses.

To live on Brooker Island and the islands that Brooker Islanders claim within their marine territory, one must acquire rights of residence and also rights to access and use resources. These rights are linked to historical presence, clan and sub-clan membership and mortuary feasting. Most significant is clan and sub-clan membership as this determines one's place in the social organisation of Brooker Island and the wider inter-island context. Brooker Island social organisation is essentially the same as described elsewhere in the Massim (e.g., Fortune, 1932;

[6] This rate of increase is a much faster growth rate than during the 20-year period from 1981-2000 when Brooker Island's population increased by 38.5 per cent. The population on Brooker Island has continued to increase significantly since Independence due to a combination of better health care and sanitation practices, and the abandonment of traditional practices that controlled fertility (see Byford, 1999).

Macintyre, 1983; Lepowsky, 1993). The '*tini*' (meaning womb or abdomen) is the smallest social unit and comprises all people born to one woman. People retain their mother's clan identity, called '*un*' throughout his or her life[7]. The clan consists of a number of matrilineages that presume a common origin[8] and is the largest matrilineally defined group identified as having rights over land and natural resources. The spouses of a matri-clan member have use and residence rights contingent on their marriage.

There are ten clan groups identified in the Misima language area though not all of them are found on Brooker Island. In 1973, Wallent (1973), a District Officer at the time, recorded seven of these clans residing on Brooker Island[9]. By the time I arrived in 1998, another clan group had come to reside on Brooker Island. These clans and their associated sub-clans are detailed as follows:

Ewau with six different sub-clan groups:

(i) Sivega group;
(ii) Bwesa group;
(iii) Dalabiu group;
(iv) Habula group;
(v) Beleti and children; and
(vi) Judith and children.

Gamatal with two sub-clan groups:

(i) Sakusa's wife; and
(ii) Lemeki's wife and children.

Guwau with two sub-clan groups:

(i) Pantaval group; and
(ii) Lemaiyo group.

Lailoga with only the one sub-clan group, the Gelenuwa.

Linawia with four different sub-clan groups:

(i) Ogisu group;
(ii) Bobuge group;
(iii) Talikubwakubwa group; and
(iv) Asena group.

Manilobu with four different sub-clan groups:

(i) Amisen and children (this is the group that I became part of);

[7] People of a specific clan or sub-clan are forbidden to marry with any other member of that same group, as well as the sub-clan of their father (Whiting, 1975).

[8] Origin is associated with a person or a small group of people who physically or mythically migrated from a named ancestral home. According to Peter (1976) who recorded myths on Misima Island, everyone living on earth today is said to be descended from the same clan called Manilobu. During the time of the ancestors, all people of this clan are said to have lived at a place called Mwaonola. One day, the head of the clan called a meeting, and while this meeting was being conducted, a child excreted in the compound. The head of the clan became furious and cut the feces into ten parts and gave each piece a name and allocated a place to each name. These ten names are the name of the ten clans identified in the Misima language area. Berde (1974) records that the earliest settlers on Brooker Island came from Panaeati Island. In 1999, 43 per cent of Brooker Island people that responded to a question on their origins claimed ancestral attachment to Panaeati Island.

[9] These were the Ewau clan which was the largest clan, followed by Linawiya, Manilobu, Laeloga, Mwao (Bwaiobwaio), Meisoga, and Guwau Clans.

(ii) Samson;
(iii) Sinali's wife and children; and
(iv) Peddi's wife and children.

Meisoga with two sub-clan groups:
(i) Babati and children; and
(ii) Delma and children.

Mwaowa, also called Bwaiobwaio, with two sub-clan groups:
(i) Yagidu group; and
(ii) Meliya and children.

As various clan groups moved about the Louisiade Archipelago, there were numerous incidents of both clashes and alliances built though marriage or simple necessity. Clan groups moved from various islands to other islands, with settlement duration ranging from short intermittent periods to long term occupation. Land ownership is therefore a complicated affair across the Louisiade Archipelago.

The Guwau Clan is said to be the original coloniser of Brooker Island. A legend that was told to me involves a be-spelled white cowrie shell that was buried in the main village area of that time causing several deaths. Surviving members of this Guwau clan fled to Kwairawa Island in the Engineer Group and as far as Normanby Island in the D'Entrecasteaux Group never to return. The two Guwau sub-clan groups that now reside on Brooker Island arrived after this incident. The Pantaval group is from Liak on Misima Island and the Lemaiyo group is from Ebora, also on Misima Island. The Lailoga group was brought to Brooker Island from Motorina Island when the pre-existing Lailoga clan died out. It is common for clan groups to import other groups from the same clan to continue the occupancy and use rights of that specific clan group. Meisoga Babati's sub-clan group trace their origins to Ebora Village on Misima Island as payment for a wrongful death. Delma's sub-clan group was brought to Brooker Island when the last surviving member of the original Meisoga clan who was male had no sisters and thus no one to pass land rights to. The Mwaoa sub-clan groups currently residing on Brooker Island have their origins at Motorina and Bwagaman Islands to the east of Brooker Island. The Ewau clan is now the largest clan on Brooker Island and first settled on neighbouring Panawidiwid Island but overtook the existing clans that were already resident on Brooker Island.

Each of the ten clans identified in the Misima language area have totems (Table 4). These totems act as an emblem and identifier for that particular clan. One of the benefits of clan membership and the identifying totem is that wherever one travels in Milne Bay Province, one will often find someone with the same totem. Totems link people together as it suggests that they share a common historical ancestor, often mythical. This connection helps with building relationships and connection for inter-island trade (see below). As noted in Chapter 3, with pacification, freedom of movement enabled trading networks to expand.

Table 4: Clan Names and Associated Totems.

Clan Name	Totem Bird	English equivalent	Totem Fish	English equivalent
Ewau	*Magesubu*	Eagle species	*Nabwalele*	Sweetlip
Gamatal	*Weigali*	Unidentified	*Unidentified*	Unidentified
Gamwaola	*Mwagamwaoia*	Eagle species	*Yui*	Dugong
Guwau	*Boi*	Heron	*Tupatupa/Getula*	Trevally
Laeloga	*Gegel*	Black-capped lorikeet	*Tamiyala*	Turtle (generic)
Linawiya	*Apwaiowa/ Atakena*	Sulphur-crested cockatoo	*Enipola*	Red bass
Manilobu	*Lawat*	Frigate bird	*Gamatawalayan*	Napoleon maori wrasse
Meisoga	*Manak*	Osprey	*Pilihul*	Goatfish
Mutuna	*Mansikosiko*	Fly catcher	*Waloya*	Mullet
Mwaowa (Bwaiobwaio)	*Okok*	Crow	*Baewa*	Shark (generic)

Source: Author.

Rights to use land, and to access, use and exploit natural resources come primarily from the mother's lineage. These rights are theoretically inalienable. Usufruct rights can be obtained also from the father's lineage and remain for the duration of the heirs' life. Land can also be obtained through hosting various feasts, which involve the transaction of various ceremonial valuables, such as '*bagi*[10]', '*giam*[11]', pigs and canoes. Also important is the successful completion of and contributions to mortuary activities. The successful hosting of funerary activities is instrumental in gaining rights to land previously held by another lineage (Plate 5). In 1999, I obtained the details of land ownership from Joseph Beteul who was acting at the time as the keeper of Brooker Island history of the islands identified by Brooker Island as being within their marine territory (Table 5).

[10] *Bagi* is a string of 'money' made from the lip of shell (*Spondylus* spp.). The raw material of *bagi* is made on Rossel Island (Liep, 1981, 1995; Shaw and Langley, 2017).
[11] 'A *giam* is a specific stone axe used for ceremonial exchange.

Plate 5: Preparations for a mortuary feast on Brooker Island.
Photograph: Author.

The southern Massim is not traditionally noted for having ranked clans or chiefs[12] and have generally been regarded as being more egalitarian in nature (Lepowsky, 1993). There are however, differences in the status amongst individuals and clans due to holding greater rights to land and thus access to greater volumes of natural resources, and the ability to mobilise kin and resources for ceremonial activities, and inter-island trade.

[12] Historically, leadership in the Misima language area distinguished three types. The first category were warrior leaders, called '*asiala*', which means big or strong. Other leaders were called '*towasawasa*' or '*toguyau*'. *Towasawasa* were essentially 'big men' who had considerable organisational skills plus a forceful personality to encourage people to contribute and work towards various ceremonial activities. *Towasawasa* helped to sponsor feasts and acted as political negotiators. They were also renowned as strong controllers of alliances and marriage.

Table 5: Brooker Island Clan and sub-Clan ownership of Islands.

Island	Clan Ownership
Abowat	Owned by the sub-clans that claim Panapatpat Island.
Nitabutabu	Owned by an Ewau sub-clan. Given by the father to the present owners.
Brooker	Separate blocks owned by different clans and sub-clans. Manilobu and Ewau clans are the largest land owning groups.
Ehiki	Owned by the sub-clans that claim Panapatpat Island.
Enivala	Owned by a Meisoga sub-clan. Given by a Manilobu sub-clan.
Gulewa	Owned by a Mwaowa sub-clan. Given by a Guwau sub-clan.
Gulewa Kekeisi	Owned by a Manilobu sub-clan. Given by the Mwaowa sub-clan.
Kokoluba	Owned by an Ewau sub-clan.
Lal	Owned by a Manilobu sub-clan.
Noina	Owned by a Linawiya sub-clan. Given by the father to the present owners who were from a Manilobu sub-clan.
Panadaludalu	Owned by the Laeloga clan, though this is unclear
Panakoubwa	Owned by a Mwaowa sub-clan who live at Gulewa Island.
Panalobwa	Owned by an Ewau sub-clan. Given by the Manilobu clan to the present owner's mother.
Pananimunimu	No ownership as the island is a mosquito infested swamp.
Pana'apwa	Owned by an Ewau sub-clan. Given by the father to the present owners who were from a Manilobu sub-clan.
Panapatpat	Owned by a Meisoga sub-clan. Given by a Manilobu sub-clan.
Panasial	Owned by various Manilobu, Laeloga, Meisoga, and Mwaowa sub-clans.
Panauabwaubwa	Owned by the Ewau clan.
Panawidiwidi	The western half is owned by an Ewau sub-clan. The eastern half is owned by a Mwaowa sub-clan.
Panalolan	Owned by an Ewau sub-clan.
Panubwabwaoina	Owned by a Manilobu sub-clan.
Jomard	Disputed by various sub-clans at Brooker Island.
Talikubwakubwa	Owned by the Meisoga sub-clan who own Enivala Island.
Panualuwaluwala	Owned by the Ewau sub-clan who own Kokulouba Island.
Siva	Owned by a group from the Suau coast on the southern mainland of Milne Bay. Given by the Manilobu clan.
Tobwayam	Owned by a Mwaowa sub-clan. Given by ancestors along with the eastern half of Panawidiwidi Island.
Yotavi	Owned by an Ewau sub-clan.

Source: Joseph Beteul.

Primary Production Activities

The social organisation of work reinforces the collective identity of the *un*. While clan, sub-clan and family membership are immutable, work groups or '*boda*'[13] composition can and does vary. Men typically do tasks that require strength and sustained exertion such as felling trees, building houses, cutting gardens, netting fish, and operating and maintaining various vessels, from sailing canoes to dinghies with outboard motors and workboats. Men also do all butchering of livestock and turtles. Tasks performed by women are generally those associated with nurture. These activities include planting, weeding, harvesting, cooking, making clay pots, feeding children and livestock. Women however can be seen occasionally sailing canoes and also diving and fishing just as men do.

[13] Each *boda* is usually a group of siblings who are co-resident and their respective spouses and children.

As noted in Chapter 3, the Louisiade Archipelago before pacification was a place of fear due to the extensive raiding that was present. In addition, people feared supernatural forces. As a consequence, garden production historically was smaller than it is today. In general, people planted only one garden per year and men accompanied their women to their garden for security purposes. Along with poor mobility and poor labour co-operation during these times, gardeners were also restricted in how much land they could clear for gardening due to only having the use of stone axes. With the introduction of steel, agricultural practices changed considerably. The introduction of steel axes allowed for the expansion of gardens into new areas that had been previously unsuited due to the difficulty of felling large trees. It has also been argued that the introduction of steel axes increased the leisure time available for men, and was therefore a major factor in the expansion of ceremonial exchange (Young, 1971), and later capitalist production (Macintyre and Young, 1982).

Missionaries from other Pacific Islands such as Samoa, Tonga, Niue and Fiji brought new varieties of banana, breadfruit, pumpkins, leafy green vegetables, pineapples, sweet potatoes and the Polynesian chestnut (Macintyre, 1987). Other new cultigens arrived with men who had been 'black-birded' (Lepowsky, 1985, 1991). The increase in agricultural production had subsequent flow on effects such as an increase in the frequency and size of ceremonial gatherings and work parties (Berde, 1983). An increase in inter-island trade also helped secure food. Of importance for Brooker Islanders is the import of sago from Sudest and Joanett Islands, as well as yams and plantains from Misima Island. Historically, a variety of wild foods also supplemented food security, such as the harvesting of the wild tuber, *Pueraria lobata*, as well as the consumption of the pith of banana trees in times of drought.

In the late 1990s, Brooker Islanders were utilising five main islands for gardening. These were Brooker Island itself, Panawidiwidi, Panapatpat, Gulewa and Venaliwa Islands. Several families also had small gardens on some of the neighbouring sand cay islands, but these were simple supplementary gardens when based there for fishing purposes (see also Hide et al., 1994). In the millennial gardening season of 1999 and 2000, Brooker Islanders had 126 new gardens under production[14]. New gardens are the gardens that are made in the current season ('*eyowa vavaluna*') and are planted with prestige crops such as yams (both *D. esculenta* and *D. alata*). New gardens are usually planted between October and January.

[14] Gardens on Brooker Island are generally made by a single household or divided into sections for different members of the family. Clearing and burning is usually done in the months from July to October. These activities are done by the male head of the family unit with the help of male relatives to hoe and mark out the land for planting. Logs from the clearing process are used for fencing or for rudimentary terracing. Following burning, the gardens are cleared of any remaining branches in preparation for planting. At this stage the garden will be divided up into sections and men will prepare holes. Women will then come to plant and take over the maintenance of the garden.

Each group also has older gardens ('*sigaba*') from the preceding gardening seasons. Crops in these gardens are devoted towards feeding the household. Gardens are planted with tapioca, sweet potato and banana. Other crops will be planted in separate sections or at edges such as pineapple, sugar cane, tulip (*Gnetum gnemon*), aibika (*Hibiscus manihot*), watermelon, corn and pumpkin.

The average size for new gardens for the 1999 and 2000 gardening season on Brooker and Panawidiwidi Islands was 375 m², which is comparable to garden sizes observed elsewhere in the Louisiade Archipelago (Rayner and Rayner, 1989; Voronov et al., 1994). On Panapatpat Island, garden sizes averaged around 230 m² due to the limited availability of suitable arable land. The estimated total area of gardens for the 1999 and 2000 season was 4.4 ha. During later visits in 2006 and 2014, I observed large swathes of Brooker and Panawidiwidi Islands were cleared for gardening production in response to the increasing population. After 2009, with greater time available due to the moratorium imposed by the National Fisheries Authority on the sea cucumber fishery and beche-de-mer trade in October 2009 there was a further increase in gardening.

When gardens are ready to be harvested, women harvest in stages depending on demand and yam size. The yams are sorted into two groups. Yams will be harvested for food and use in mortuary feasts, and for seed yams which are placed in small yam houses located in or near the garden. Generally, one third to a half of the harvest will be set aside for seed. Selection depends often on the type and size of the yam, the number of adventitious roots or the length of the stolon.

Soil fertility is a problem for Brooker islanders and there is no improvement done to the soil through the use of legumes, composting or animal manure. Fallow times on Brooker Island during my main fieldwork period were around four to five years, with some gardens on Brooker Island still having past crops growing in them when they were being cut again for new gardens. During my visit in November 2014, an invasive weed (*Stachytarpheta cayennensis*) was evident. The problem with this invasive weed is that it restricts secondary re-growth in fallow gardens and subsequently will affect future garden productivity.

Besides chickens, pigs are the main animal domesticated, utilised in feasts or as exchange items for other valuables like shell money, axes and canoes. The number of pigs at any one time on Brooker Island will fluctuate during the year depending on the needs and demands of mortuary feasting obligations. Pigs are usually fed on coconuts and leftovers from meals. Pigs are a serious threat to gardens requiring people to build large fences. In 1999, Brooker Island people took the initiative to fence their pigs, and dogs and hunters were brought in from Bagaman Island to clear the bush of wild pigs. Since this time, the village areas on Brooker Island remain clean and hygienic.

Mobility across Marine Territories

To access, use and exploit the marine environment, to conduct inter-island trade and to participate in mortuary activities, Brooker Islanders need sea transport. Historically, Panaeati Island in the Deboyne Group of Islands was the main sailing canoe manufacturing centre producing '*waga hot*' or 'true canoe', the traditional sailing craft of the Louisiade Archipelago (Berde, 1976). The *waga hot* 'sail design was changed after a Brooker Islander called Doho who had been black-birded to Townsville in northern Queensland returned to Brooker Island in the late 1880s (Murray, 1912). Whilst in Townsville, Doho had noticed the advantages that boats used there had over the 'traditional' '*waga hot*'[15]. On his return to Brooker Island, Doho and his son experimented with new sail shapes and hit upon a four-sided canvas sail that had a large surface area. This is now the sail type used right throughout the Massim region. This new variety of canoe is called a '*sailau*'[16].

Owning a sea-going vessel requires the support of clan, sub-clan and family members to acquire the commodities for exchange, as well as cash for purchasing materials to build the canoe, or to purchase the canoe itself. Canoes can be given as '*muliwaga*' or bride-wealth, built under contract, '*enlologabum*[17]' or acquired by outright purchase, '*lehau*' (see Appendix K). As people throughout the Louisiade Archipelago have become increasingly involved in the global economy, they have also acquired the means to own their own canoes. Since Independence, there has been a significant rise in the number of sea-going vessel ownership. For example, in 1971, Berde (1974) recorded only eleven sailing canoes, two cutters[18] and a whaleboat on Brooker Island[19]. In 1999, I recorded fifty sailing canoes in use on Brooker Island and other vessels with many households owning at least one or more sailing canoes. At this time, there was one watercraft available for every six people. In the same year, with money made from the sale of beche-de-mer, profits from a family-owned trade store and with support from relatives working in Port

[15] A *waga hot* possessed an oval sail made from pandanus leaves and had a complicated rigging system that required four men to change direction. Doho noted that canvas was superior in every way to pandanus; that using a square-style sail would be superior to the oval one; and finally, he also noted that if one placed the mast closer to the centre of the hull the tacking advantages would be considerable (Murray, 1912).
[16] The term *sailau* is possibly derived from the old sailor's shout when sighting another vessel, 'Sail, ho'.
[17] As an example of *enlologabum*, in late December 1998, my brother Ado took possession of a new canoe that his brother Thomas had ordered from Panaeati Island in the Deboyne Group of Islands. The handover transaction was quite emotional with everyone crying as relationships had been reinforced through the construction period between the Sam family and Weda, the canoe builder and his family. Weda's father Dola and Thomas's father Jubilee are both from the Ewau Clan and their relationship has been moved down to Weda and Thomas. The final presentation of goods included *bagi*, money and a small bundle of clothes. Thomas and his wife Milika sobbed as we departed Brooker Island to take Weda and his family back home to Panaeati Island. A flash of mirrors could be seen for a long time as a final gesture of saying goodbye and thank you.
[18] A cutter is a small-to-medium-sized decked sailing boat of European design with a length of around 10 m.
[19] The population on Brooker Island in 1971 was 235 people making one watercraft available for every 16 people.

Moresby, Napa acquired the first fibreglass dinghy with outboard motor which arrived on Brooker Island in February 1999[20].

When this fiberglass dinghy arrived on Brooker Island, people saw the economic advantage of it, especially with accessing new fishing grounds which still had abundant sea cucumber stocks[21] and the profits that were to be made. Subsequently, other groups sought to obtain their own fiberglass dinghy with outboard motor (Plate 6). From 1999 up until the National Fisheries Authority implemented the moratorium on the sea cucumber fishery and beche-de-mer trade in October 2009, most families on Brooker Island invested heavily in obtaining fiberglass dinghies and outboard motors[22]. On a return visit in 2006, 15 dinghies with outboard motors were now in use by Brooker Islanders. In November 2014, at the height of the moratorium, there were very few dinghies observed[23] (see Chapter 7).

Plate 6: Brooker Islanders and new fibreglass dinghies with outboard motors at Enivala Island. Photograph: Author.

[20] The arrival of this dinghy on Brooker Island caused some consternation, and a younger brother of the owner was later attacked by a shark whilst diving for sea cucumbers, resulting in the loss of the use of his left arm and accusations of witchcraft abounded.
[21] The use of fibreglass dinghies with outboard motors allowed the vessel to stay on site whilst divers were in the water, especially in fast flowing channels. Sailing canoes are affected by currents and wind conditions and cannot hold station.
[22] Some of these were bought with the profits from selling beche-de-mer, but many were bought on credit with either of the two main beche-de-mer buyers and exporters based in the Milne Bay Provincial capital of Alotau.
[23] Many of these dinghies had either been repossessed by the beche-de-mer exporting companies or sold for cash.

In 1999, Brooker Islanders had one workboat named *Esowal*[24] which had been beached on Brooker Island for some years. This vessel had been provided by a former Member of Parliament for the Samarai-Murua District, William Ebanosi. When Gordon Wesley won the Samarai-Murua District Member of Parliament seat in 2007, he took *Esowal* to Alotau to repair it. This unfortunately did not eventuate, and six years later, in 2013, Brooker Islanders received a fiberglass dory workboat from Gordon. Brooker Islanders named this workboat, *Kunem*[25]. *Kunem* greatly assisted Brooker Islanders in alleviating the impact of the moratorium on sea cucumber fishing and the beche-de-mer trade as they were able to transport fish and lobster for sale in Alotau (see Viera et al., 2017). Unfortunately, in 2018, *Kunem* was sitting idle in Alotau's Sanderson Bay awaiting repair of several mechanical. Following its repair, *Kunem* was then re-allocated to another island community. Subsequently, Brooker Islanders are once again isolated from markets (see Chapter 7).

Exploiting the Marine Environment

Historically, Brooker Islanders practiced various fishing methods. Trolling lures were made of pearl and cone shell, and fish hooks were made from shell and mangroves (Rapson, 1973; Blau and Maaz, 2012; Shaw and Langley, 2017). Spears were of two types, a multi-pronged spear ('*ginabola*') and a single-pronged spear ('*pena*'). Fishing line ('*yawon*') and nets ('*vineya*' or '*gubena*') were made from hibiscus fibre. In 1998 and 1999, there were still five 'traditional' nets still in use on Brooker Island (Plate 7). These nets are made of twine, shaped into a large V and have a floor sewn into the apex of the 'V'. Some of these nets were half a century old and were still being used extensively in the months of June and July during the day-time low-tides when fish are targeted in large schools on reef flats. Due to the access of new fishing technologies, these nets are no longer made having been replaced by modern monofilament nets. The use of nylon fishing lines and steel fish hooks has also replaced more traditional materials.

[24] *Esowal* means 'you are late'.
[25] *Kunem* means 'you all come'.

Plate 7: Traditional fishing net on Brooker Island.
Photograph: Author.

Today, Brooker Islanders harvest their marine environment by spearing ('*itawa*'), netting ('*loagi*'), trolling ('*nunul*'), and hand-lining ('*palupalu*', '*papakukulau*', '*papajenu*', and '*alialihin*'). A variation on hand-lining called 'taiwan-style' is a form of drop-lining whereby a stone is wrapped in coconut fronds and the hook attached, it is then dropped over board, and once it hits bottom, the hook and line is yanked from the leaf and trolled upwards. Chasing fish into shallows and hitting them with a paddle or stick ('*lepalepa*') is another less practiced method. Derris root, a vine that is used as a fish poison does not grow on Brooker Island and is therefore not readily available to Brooker Islanders.

Fishing for sharks historically played a lesser role in providing income-earning opportunities for Brooker Islanders through the preparation of dried shark fins[26]. In 1998 and 1999, there were only two specialist shark hunters on Brooker Island[27]. At this time, Brooker Islanders were using demersal longlines which varied between high quality tuna long-lines, consisting of a rope mainline, wire traces and stainless steel clips, and lower quality nylon monofilament long-lines. The higher quality long-line gear had been obtained from tuna longline vessels which had

[26] Shark-fins contain proteinaceous fibres of elastin and collagen, called fin needles which are highly prized in Asian markets, primarily for their use in the production of shark-fin soup.
[27] Common shark species taken include black-tip reef sharks (*Carcharhinus melantropterus*), lemon sharks (*Negaprion acutidens*), white-tip reef shark (*Triaenodon obesus*), grey reef sharks (*Carcharhinus amblyrhychos*), tiger sharks (*Galeocerdo cuvieri*) and hammerhead species (*Sphyrna* spp.) (see also Vieira et al., 2017; Appleyard et al., 2018).

grounded on nearby reefs in 2000 and 2001. In 2014, surface longlines, and to a lesser extent hand-lines, were now being used (Vieira et al., 2017). Common baits for catching sharks include turtle flippers, moray eels, stingrays and fish frames. After the moratorium on harvesting sea cucumbers and the beche-de-mer trade, many Brooker Islanders were engaged in fishing for sharks (see Vieira et al., ibid).

Lobster species (*Panulirus* spp.) are regularly taken by Brooker Islanders for subsistence and for sale. The double-spined ornate lobster (*Panulirus pencillatus*) and the spiny lobster (*P. ornatus*) are the most commonly exploited species with the painted coral lobster (*P. versicolor*). Lobsters are caught by spearing while free-diving on the reef-slope and crest. Despite the use of underwater torches being illegal under the 2002 Prohibitions on Collecting Sedentary Resources (Government of Papua New Guinea, 2002), diving at night is more effective for spearing lobsters than during the day when lobsters reside in crevices in the reef. During 1998 and 1999, Nako Fisheries was actively present in Brooker Island territorial waters and assisted Brooker Islanders with accessing the Long-Kossman Reef area[28]. Once the moratorium was implemented in October 2009, Nako Fisheries sold their vessels and Brooker Islanders had no way to sell their lobster as they now were unable to transport them fresh to the Milne Bay Provincial capital, Alotau. When Brooker Islanders received their new boat, *Kunem* in 2013, they were once again able to sell lobster in Alotau to Nako Fisheries, the Huhu Local Level Government Fish Market, supermarkets and restaurants. As noted above, *Kunem* was no longer operational in 2018 and was later re-allocated to another island community.

As with lobster, a number of shellfish species are also used for subsistence and for sale with women and girls being the predominant collectors with occasional assistance from men (Kinch, 2003b, 2008a). '*Sineketa*' (*Strombus luhanas*) is harvested by gleaning sandy reef flats and is often used as a trade item. The meat of commercially harvested species such as black-lip pearl shell and trochus is also regularly consumed. Many other shells also have utilitarian uses. For example, Bailer shells (*Melo melo*) are used as bailers, and as scoops in serving cooked broth or making ceremonial sago soup ('*moni*'). Triton shells (*Charonia triton*) are used as trumpets ('*bwagigi*'). Various bivalves were historically made into cutting implements and several shell species are still used for smoothing or scraping tools in the manufacture of clay pots. Egg cowries (*Ovula ovum*) are used decoratively on canoes, and as personal ornaments worn on the arms and legs.

[28] From January 1998-September1999, Nako Fisheries brought 1,421.5 kg of lobster tails and paid PGK 11,372 (equivalent to ~ AUD 6,561.65) to Brooker Island fishers, equating to approximately 7,105 lobsters harvested from Brooker Island waters during this period.

In 1983, the Milne Bay Fishing Authority began and an export fishery for giant clam adductor muscle and clam shells from Milne Bay Province commenced (Lokani and Ada, 1998; Munro, 1989). It was estimated that in the five years that the Milne Bay Fishing Authority was exporting giant clam adductor muscle that an average of 14.3 mt was taken each year (Munro, ibid; Kinch, 2002). After the closure of the Milne Bay Fishing Authority, Nako Fisheries also bought giant clam adductor muscle as well as clam shell. Brooker Islanders identify seven species of giant clams[29]. As with lobster, Nako Fisheries were also buying large volumes of giant clam adductor muscle in 1998-1999[30].

The fishery for giant clams was finally closed in 2000[31]. Giant clams are still harvested by Brooker Islanders for subsistence and trade, but they are no longer fished for commercial sale. Fishing methods for giant clams are very simple. The flesh is simply excised from the shells by slipping a knife along the inner surface of the shell to cut one end of the adductor muscle. Smaller giant clams may be collected opportunistically during reef gleaning activities, while larger ones are collected by free diving.

Marine turtles are heavily utilised by Brooker Islanders as a source of food, for feasts, trading, and to a limited extent for sale in local markets. There are four main species of turtles that are observed in Brooker Island waters. These are '*atatun*', hawksbill turtle (*Eretmochelys imbricate*); '*gabuteliai*', green turtle (*Chelonia mydas*); '*ponawana*', loggerhead turtle (*Caretta caretta*); and '*wenonu*', leatherback turtle (*Dermochelys coriacea*). Of these four species, Brooker Islanders heavily utilise green and hawksbill turtles[32]. Traditionally people used turtle shell for needles, lime spatulas[33] and ear-rings (Kinch and Burgess, 2008).

[29] There are now 12 giant clam species identified (Neo et al., 2017). *Tridacna maxima* has now also been split into two distinct species, *T. maxima* and *T. noae* (Su et al., 2014; Militz et al., 2015).
[30] During this period, 697 kg of giant clam adductor muscle, mostly *T. gigas* and *T. derasa* were purchased from Brooker Islanders. The adductor muscle accounts for about 10 per cent of the clam's soft tissue weight (Lucas, 1994). The total purchases from January-September were broken down into 551 kg (or 1970 clams) of specimens under 400 g earning PGK 3,306 (equivalent to ~ AUD 5,729.65), and 146 kg (or 170 clams) earning PGK 1,460 (equivalent to ~ AUD 842.40) (Kinch, 2002a, 2003b, 2008a).
[31] The purchase and export of giant clam shell and adductor muscle was stopped in May 1988 by a ruling from the then Department of Environment and Conservation, due to issues of compliance with the Convention on Trade in Endangered Species of Wild Flora and Fauna (United Nations, 1976; Government of Papua New Guinea, 1979). The ban on exporting giant clams was lifted in 1995 by the Minister for Environment and Conservation on the understanding that there was a management plan in place. A Milne Bay Province Giant Clam Fishery Management Plan (Government of Papua New Guinea, 1998b) was drawn up by the National Fisheries Authority in 1998 but was never gazetted due to inter-agency rivalry and outside political pressure.
[32] Historically, the hawksbill turtle was heavily exploited for the tortoise shell or '<u>bekko</u>' trade (Kinch and Burgess, 2008).
[33] These are usually ornately carved and are used to spoon coral lime to the person's mouth when chewing betel nut.

The turtle nesting season in Brooker Island territorial waters begins around the same time as *huwalu* in October, and finishes in May. To understand the level of take of turtle resources, I recorded all turtles and their eggs taken by Brooker Islanders from September 1998 to May 1999. During that season, 190 turtles were taken and 549 nests had all viable eggs harvested. Most turtles are harvested by waiting for nesting female turtles to come up at night to nest. Once the turtles are on the upper reaches of the beach, they are flipped over on their backs to either await later butchering or to be loaded on canoes for transport back to the village or on-traded to other islands. All of the turtle is eaten except for the lungs and other offal and there is a strong taste preference for the meat and fat of the mature female green turtles. On butchering, an adult green egg laying female will produce approximately 45 kg of edible meat including flesh, stomach, unshelled eggs and other edible parts like the liver. During the 1998 and 1999 season, 42 green turtles, and 14 hawksbill turtles were exchanged for mostly agricultural food from Misima Island (Plate 8).

Plate 8: Brooker Islanders loading green sea turtles at Enivala Island.
Photograph: Author.

Before the moratorium was imposed in October 2009, the turtle harvesting season also coincided with the start of the open season for sea cucumber fishing. With the changes in the more recent National Beche-de-mer Management Plans (Government of Papua New Guinea, 2016a, 2018), the timing of the opening of the sea cucumber fishery is now after the main turtle nesting period. This means that Brooker Islanders are now not as prevalent on the outer islands where turtles are

harvested. In the 1998 and 1999 season, the preferred place for collecting turtles for Brooker Islanders was Jomard Island, accounting for 22 per cent of all turtles captured in the survey period of September 1998 to May 1999. When I visited Brooker Island in November 2014, Brooker Islanders were again busy harvesting turtles. Turtles are, and remain, an important marine resource for Brooker Islanders. As Napa once said to me, "you will not stop us from eating turtle".

As noted in Chapter 3, beche-de-mer exports from what was to become Papua New Guinea started in the latter part of the 19th Century and stopped at the beginning of World War I. Interest in the sea cucumber fishery and the beche-de-mer trade in Milne Bay Province began again in the late 1960s and early 1970s (Sachithananthan, 1971). At this time, copra prices were reasonable, and consequently, there was little interest from people in the Louisiade Archipelago to harvest sea cucumbers[34] (McDonald, 1967; Potter, 1972). As copra prices declined, beche-de-mer prices increased.

Another reason behind this boom in exploitation was the removal of trade barriers to the Peoples Republic of China during the late 1980s and China's increase in wealth and purchasing power especially for 'luxury' seafood and other marine products (Anderson et al., 2011; Fabinyi, 2012; Fabinyi et al., 2012, 2016a). By the mid-2000s, the Louisiade Archipelago was supplying nearly one-quarter of all beche-de-mer exports from Papua New Guinea. At this time, Papua New Guinea was supplying about ten percent of the global trade[35] (Kinch et al., 2008a; Barclay et al., 2016; exports from Milne Bay Province are detailed in Appendix L, and Papua New Guinea in Appendix M). Before the moratorium was imposed in October 2009, the prices for beche-de-mer in Milne Bay Province had increased significantly (Kinch, 2004a, see Appendix N).

In 1998 and 1999, as part of a monitoring program that I conducted on what marine resources were used by Brooker Islanders', I recorded not only the catch, but also the composition of crews that made up each fishing expedition. As a general rule, fishing crews were from the same '*boda*' (family group) and were associated with a specific sailing canoe. Some teenagers and younger men also made up their own groups. In a number of cases, some men that did not have their own sailing canoes were incorporated into larger groups that they had some affiliation with. Rollason (2009) describes for Panapompom Island in the Deboyne Group of Islands a growing group of men who chose to dive alone rather than in groups of kin, a practice that people of Panapompom

[34] The main buyer at this time was Dusty Miller who operated from Nivani Island in the Deboyne Group of Islands during the 1970s up until the early 1980s. Though his main focus was copra he did purchase certain marine products particularly the more valuable beche-de-mer species. He finally wound up business just as Milne Bay Fishing Authority was beginning to make its presence in the area.

[35] Up until the moratorium imposed by the National Fisheries Authority in October 2009, Papua New Guinea was in the top five supply countries including Indonesia, the Philippines, Fiji and Japan accounting for more than 50 per cent of all dried beche-de-mer imported into Hong Kong (To and Shea, 2012; To et al., 2018). After the moratorium, Papua New Guinea fell outside the top ten.

Island called diving 'one man[36]' (also see Bayliss-Smith et al., 2010). Whilst certain men on Brooker Island would dive singularly, usually because they were using dugout canoes, this phenomenon was not a characteristic of Brooker Island groups harvesting marine resources. Older men, young boys, women and teenage girls also accompany groups to the outer islands to assist with processing and smoking of beche-de-mer, and in the case of the women, to cook and to care for the group. During diving sessions, women would also look after the canoe at anchor while the men dived.

Dive trips were and are communal affairs. Some fishing expeditions from Brooker Island would essentially involve the whole Brooker Island community migrating to the outer islands. On occasion, an armada sometimes involving more than 20 sailing canoes would be spread across the ocean sailing for the same destination. In more recent years before the moratorium, many sailing canoes were replaced with fiberglass dinghies with outboard engines. When out diving for the day, sailing canoes or fiberglass dinghies with outboard engines would depart early in the morning and return late in the afternoon with actual time spent diving in the water being between three to four hours each day. During 1998 and 1999, I would accompany a specific canoe and document their actual time diving and record what was harvested or caught. I would alternate this activity and the following day, I would remain on the 'base' island and monitor all canoes that went out that particular day and record all of their catch when they returned in the late afternoon.

The areas that people would go diving depended partly on the currents and wind direction. As an example of decision making, in early March 1999 we were based at Panapatpat Island and I asked everyone how they decided on where to harvest. Their reply was that they dive simply where they think they will find things and where sea conditions will be favourable for diving. For example, places of strong currents are avoided as well as where there will be currents that make the sea turbid ('*magamaga i nak*'). Past experiences also play a part in deciding where to go.

Due to the repetitiveness of diving over their marine territory, Brooker Islanders know what species of sea cucumbers will be found outside, inside and on top of the barrier reef. Later on this same trip, but now based at Nagobi Island, myself, Ado, Munt, Hedric and Dividen were sitting around telling stories. Ado was describing a day the previous year when he was with Moabe and others and had 'won' the day. On this particular day, Ado and his colleagues collected 104 prickly redfish, 22 white teatfish, 12 black teatfish and one elephant trunkfish. As the conversation progressed, Ado also talked about the weather conditions on that day, the wind direction and the

[36] This notion of diving 'one man' could be seen as an example of 'possessive individualism' whereby an individual is the proprietor of his own person or capacities, owing nothing to the wider society (Macpherson, 1962; Martin, 2007).

current. It was a fortunate and perfect day that inspired thoughts of what tomorrow's diving might bring.

After arrival at a potential site for diving, one man will hang off the side of the sailing canoe or dinghy with outboard motor and wearing dive goggles or mask will scan the sea floor for sea cucumbers. Once sea cucumbers have been located, the sail will be dropped or in the case of a group using a dinghy with an outboard motor, the engine stopped and everyone will enter the water. One person will stay on the boat to keep it under control as it and the people drift with the prevailing currents and wind direction. Women will sometimes act as spotters being supported by floats and searching for sea cucumbers.

Sea cucumber harvesting is done by hand-collection or free-diving and requires little or no capital investment. If a sea cucumber is seen in shallow enough water, a man will dive down and spear it with a lengthened spear. This means attaching a length of wood or another spear to the existing spear to double its length. In deeper waters people use lead weights with small harpoons attached. This device is called a 'bomb'. When a sea cucumber is sighted in deeper water, the bomb is dropped by divers swimming on or just under the surface. The sea cucumber is speared by the small harpoon and the diver then pulls up the bomb to the surface and removes the sea cucumber which is then stored in the canoe or dinghy.

When returning to the island base, processing of the sea cucumbers into beche-de-mer commences and the women begin preparing the evening meal (Plate 9). At least one man will stay awake during the night to make sure that the beche-de-mer is being dried and smoked properly. Processing sea cucumbers into beche-de-mer requires a large supply of firewood, which is not available in large quantities on small islands and has lead at times to severe deforestation on small atoll islands in the Louisiade Archipelago. Deforestation destabilises the islands' foreshore and increases erosion. Beche-de-mer is usually boiled for a period of 2-3 hours. After boiling, the stomach is removed and then placed on racks for drying.

Plate 9: Brooker Islanders processing sea cucumbers at Nagobi Island.
Photograph: Author.

Once a fisher group has sold its product, the proceeds are then divided amongst the group. Very young boys and women who accompanied the group to the islands usually do not receive full shares. As an example of the precarious nature of the economic returns from harvesting sea cucumbers, on one particular expedition I accompanied, the trip lasted 18 days with nine of those being dive days with the remaining down time associated with travel, bad weather and observing Sundays, when typically no work is done. The crew on this canoe were four men, one woman, one young teenage boy and myself. The total amount of money earned from this trip was PGK 655.90[37], with PGK 20.00 deducted for freighting the beche-de-mer to Alotau. Costs associated with this trip had been PGK 104.20 for rations, leaving a total return of PGK 531.70[38]. Each of the men got PGK 80.00, the woman got PGK 50.00 and the teenage boy got PGK 10.00, leaving PGK 71.70 to put towards preparations for the next trip.

As noted above, I conducted detailed catch surveys over the peak diving season from the 5th of January to the 1st of May 1999. During this period, I recorded 121 fishing trips along the Long-Kossman Reef area and the Bramble Haven Group of Island. These trips were divided into three sub-types depending on the use of vessels and main targeted species:

[37] Equivalent to approximately AUD 384.20 in 1999.
[38] Equivalent to approximately AUD 306.80 in 1999.

Trip type 1: A total of 39 trips recorded in this category with fishers operating from sailing canoes and harvesting sea cucumbers as the main target species.

Trip type 2: A total of 37 trips recorded in this category with fishers again operating from sailing canoes and harvesting lobster and giant clam as the main target species.

Trip type 3: A total of 45 trips recorded in this category with fishers using dugout and outrigger canoes launched and picked up by Nako Fisheries vessel and harvesting lobster and giant clam as the main target species.

In general, catch-per-unit-efforts for Brooker Island fishers were very low, averaging < 0.5 sea cucumbers per hour when compared with data for individual species from other parts of Milne Bay Province (Sabetian and Foale, 2006), Papua New Guinea (Shelley, 1981), and Melanesia in general (Crean, 1977; Gentle, 1979; Bayliss-smith, 1986; Conand, 1988; Adams et al., 1992; Appendix P). A breakdown of catch-per-unit-effort for the main harvesting areas, the Bramble Haven Group of Islands, the western and eastern halves of Long-Kossman Reef show that sea cucumbers were already severely depleted in the the Bramble Haven Group of Islands. Sea cucumber stocks in the Long-Kossman Reef were also showing depletion but with some stocks available to be harvested, particularly when sea cucmbers were being targeted specifically as in Trip Type 1 (see Appendix O). Sabetian and Foale (2006) report catch-per-unit-effort for white teatfish in Ware Island's side of the Long-Kossman Reef and their analysis shows little difference to the catch-per-unit-effort I had recorded. This suggests that stocks were already in a depleted state in the late 1990s and that new technologies and harvesting intensity was keeping catch-per-unit-efforts at a similar level.

From the 15th of September 1998 to the 8th of September of 1999 I also collected catch data for different fishing methods. This information was from observing Brooker Island fishers returning from fishing trips, or documenting catches as we were fishing. During this period, I recorded 104 fishing trips. Of these trips, 33 involved trolling trips, 39 involved netting trips, 25 involved hand lining trips, and six involved spearing trips covering 870 hours of fishing time. Catch-per-unit-effort rates for each method was 1.4 kg per hour[39] for hand lining, 1.9 kg per hour for netting, 0.6 kg per hour for spearing and 4.2 kg per hour for trolling. The catch-per-unit-effort figures are similar for hand-lining, spear-fishing and netting for other parts of Papua New Guinea (Frijlink, 2018), and Melanesia (Bayliss-Smith, 1990; Cohen and Alexander, 2013; Albert et al., 2015; Roeger et al., 2016; Rhodes et al., 2019; see Appendix Q). Brooker Islanders however had a greater catch-per-unit-effort for trolling owing to the capture of larger bodied, generally pelagic fish including tunas and mackerels when moving across the sea from one island to another.

[39] For fishing, catch-per-unit-effort is commonly expressed as the biomass of fish caught per person per hour of fishing.

Connectivity and Inter-Island Trade

The configurations of trading activities have historically depended upon a wide range of variables including island location, local ecology, marriage patterns and trade relationships[40] (Macintyre and Allen, 1990). The exchange of agricultural produce, marine resources and ceremonial valuables continues to assist in solidifying relationships and connections between Brooker Islanders and their island neighbours across the Louisiade Archipelago. For people like Brooker Islanders, inter-island trade expands their productive abilities far beyond what they regard as their own territorial domain. Inter-island trade can aslo be seen as a risk reduction strategy in times of stress. The increase in inter-island trade also facilitated the flow of ideas and the diffusion of customs and innovations. Traditional beliefs about giving were reinforced through inter-island trade and by the adoption of Christian beliefs.

Brooker Islanders have strong affiliation to their resource-poor island and to continue to live there, they must also import food in exchange for their clay pots[41] (MacGregor, 1897; Murray, 1912; Tindale and Bartlett, 1937; May and Tuckson, 1982), along with other marine resources, pigs and canoes. Berde (1974: 96) writes of Brooker Islanders:

> 'Brooker Island people, however, have different economic requirements and their trading patterns reflect these differences. Unlike Panaeatians, Brooker Island people need garden food, betel ingredients, and sago regularly. Because of this, Brooker Island traders must reciprocate with their trade partners (who include relatives) by exporting pots. It is not surprising that they have become the major pottery exporters in the region. Brooker Island men sail night and day delivering pots and returning with needed food and betel ingredients'.

Lepowsky (1983: 469) also notes this of Brooker Islanders:

> 'The people of drought-ridden Brooker Island in the West Calvados Chain regularly sail to Misima Island to trade various types and sizes of Brooker Island made clay cooking pots for bundles of sago and baskets of yams. They also trade their pots for the large Misima Island carved wooden platters which are much in demand on Sudest Island and which may be traded there for the sago which is more available on Sudest Island than on Misima Island. Whole Brooker Island families sail every year after the yam harvest to Sudest Island and set up house as guests of a Sudest Island trade friend for several weeks while the hosts make sago for them'.

[40] Swadling (2016) has suggested that regional exchange networks were established in the Massim during the mid-Holocene and a Louisiade Archipelago exchange network is argued by Shaw et al. (2016b) to have been in operation at least from 1,340 to 1,290 Before Present.

[41] Even though women in other parts of the Louisiade Archipelago also make clay pots, the women of Brooker Island have a monopoly on their manufacture and distribution. A point in Brooker Island's favour is that its clay is superior to that Panaeati Island clay and subsequently, the pots last longer (Seligmann, 1910; Berde, 1974).

The requirements of inter-island trade and thus clay pot making by Brooker Island women follows seasons and needs (Plate 10). For example, in 1970 and 1971, Berde (1974) reported that almost every Brooker Island woman and girl was making pottery[42]. In contrast, just five years later in 1976, May and Tuckson (1982) found little pot making on Brooker Island. In 1994, Hide et al. (1994) observed that pot making was once again a vigorous activity on Brooker Island. In 1998-1999, I observed several peaks in pot making depending on seasonal conditions[43]. For example, in late March 1999, many women were busy making clay pots. This increased activity was because the gardens at Misima Island were yielding yams and Brooker Islanders needed clay pots to exchange for these yams. I noted at the time that it had been fairly quiet on the trading front for the previous two months as everyone had been busy on the outer islands diving for sea cucumbers. In August to September 1999, women were again busy making clay pots to contribute to the purchase of goods in preparation for the upcoming cycle of mortuary feasting.

Plate 10: Pot making on Brooker Island.
Photograph: Author.

[42] White and Hamilton (1973) recorded the manufacture of seven different types of pots at Brooker Island in 1969.

[43] In 1998-1999, five varieties of clay pots were being made in large numbers. There were *ulun moni,* a large pot used more for making sago soup; *ulun ligaliga,* a pot used ubiquitously for cooking; *sagedi,* a pot to hold water; *devaliga*, a flattish pot used like a frypan to make sago cakes; and *ulun mula*, a flowerpot. In 2014, there was an innovation of clay pot making whereby a new pot with a flat bottom that was open was being made. This pot was used by placing an aluminum cooking pot in it. The clay pot stopped the aluminum pot from blackening from the fire and soot and was thus easier to clean, thus reducing time for women in this laborious activity of scrubbing blackened aluminum cooking pots.

Clay pots have also invariably become a cash commodity and are often sold. Besides pots, other utilitarian items made by Brooker Island women for trade include pandanus mats and baskets, and baskets used for gardening. Brooker Islanders also trade fish, turtles, turtle eggs, giant clam meat, Nicobar pigeons, and shellfish in exchange for yams, sago, bananas, taro, betelnut and mustard[44], tobacco[45] and money. In return, Brooker Islanders obtain agricultural produce, plus store-bought foods and goods. Examples of trade exchanges made in 1999 are listed below in Table 6.

Table 6: Items traded from Brooker Island in 1999.

Group	Exported	Imported
Group 1 traded at Panaeati Island	10 clay pots, 4 bags of smoked fish, and 2 bags of smoked clam.	5 bunches of bananas, 2 baskets of tapioca, and 4 baskets of yams.
Group 2 traded at Eiaus Village (Misima Island)	6 bags of smoked fish, and 5 bags of smoked clam.	18 packets of rice, 6 packets of sugar, 5 sticks of tobacco, 3 tins of meat, 3 tins of fish, 5 packets of flour, and 2 bottles of baby oil.
Group 3 traded at Narian Village (Misima Island)	11 clay pots, 2 bags of smoked fish, and 1 bags of smoked clam.	3 baskets of yams, 1 rice bale, 1 sugar bale, 1 flour bale, 16 bunches of bananas, and 1 bag of betel nut.
Group 4 traded at Ebora Village (Misima Island)	1 fish, 1 turtle, and 3 clay pots.	2 baskets of yams, 1 bag of betel nut, 1 bag of mustard, and 4 bunches of bananas.
Group 5 traded at Bagalina Village (Misima Island)	13 clay pots.	10 baskets of yams, 3 bags of betel nut, 1 bag of mustard, and 1 bunch of bananas.
Group 6 traded at Bagalina Village (Misima Island)	1 pig, 6 clay pots, and 1 fish (caught enroute).	4 baskets of yams, PGK 10, 1 bag of betel nut, 1 bag of mustard, and 1 bunch of bananas.
Group 7 traded at Alhoga Village (Misima Island)	4 clay pots.	4 baskets of yams, 3 bags of betel nut, 2 bags of mustard, and 1 bunch of bananas.

Source: Author.

[44] A combination of betel nut (*Areca catechu*) and mustard (*Piper* sp.) chewed with lime powder made from either coral or sometimes shells acts as a mildly euphoric stimulant (Farnworth, 1986; Frewer, 1990; Ali and Khuwaja, 2011). The sharing of betel nut is an important cultural and social gesture. It is also an important past-time indulged when telling stories. Betel nut is also considered a hunger depressant.

[45] Tobacco (*Nicotiana* sp.) diffused throughout New Guinea over several centuries, but did not reach the south-eastern part of New Guinea by the time of first sustained contact with foreigners in the 1870s (Hays, 1991, 2003; Bourke, 2009). Tobacco is still a much utilised trade commodity, especially the old black twist tobacco that was available in the 1990s as it was easily divisible into small units. Tobacco is now either home grown ('brus') or factory made cigarettes.

Island Commercial Enterprises

In an economic development study of Milne Bay Province in 1991, it was noted that small island commercial enterprises in the way of trade stores were sprouting up all over Milne Bay Province (Kumah Enterprises, 1991). The rise of these trade stores coincided with the collapse of the copra co-operatives and the rise of the sea cucumber fishery which also began to expand in the early 1990s. Curry (1999) states that the trade store in rural Papua New Guinea is a physical expression of modernity in the heart of the village and is symbolic of the new economic and social formations associated with increased incorporation into the global economy. Trade stores provide service to fellow villagers by providing an opportunity to sell commodities that they have produced, such as their beche-de-mer, trochus shell, shark-fin or black-lip pearlshell for immediate needs such a rice, flour, sugar, tea, and tobacco. Rice[46] and flour are major staples on Brooker especially in the time of '*huwalu*' and when conducting fishing or diving expeditions.

In 1975, there was only one trade store in operation at Brooker Island (Bartlett, 1975). In April 1981, Lagasae (1981) reports three trade stores on Brooker Island, all operated by the '*toguyau*' of that time (see above), these were Joseph Betuel's father, Panabwa Sam[47] and Lote Guitana[48]. In 1998 and 1999, there were five trade stores in operation. The majority of trade stores on Brooker Island have not been financial successes, partly because they are embedded in local moralities of reciprocity and the associated expectation that 'credit' should be extended to kin (see also Carrier and Carrier, 1989b; Robbins and Akin, 1999; Minnegal and Dwyer, 2007; Schram, 2018). Many trade stores close when the sea cucumber fishery is closed and reopen once capital becomes available again through beche-de-mer sales (see Chapter 7).

Government Services

On Brooker Island, there is no 'bureaucratic economy', outside of the wages that are provided to the Councillor and the Village Recorder and there is no other public service salaried employment as there are no formal schools or health posts present on Brooker Island. Due to the increased population on Brooker Island, a community school is expected to be built within the next couple of years.

Before the National Government introduced 'fee free tuition' in 2015, Brooker Islanders had to pay for school fees so their children could attend school. In 1998 and 1999, many Brooker Island families were selling beche-de-mer so they could pay for their children to attend the community

[46] Rice consumption levels for Papua New Guinea has been estimated to be 30 kg per person per year (Bourke et al., 2009).
[47] Jubilee's brother.
[48] Jubillee's wife Amisen's brother.

school at neighbouring Motorina Island[49] to the east, or the Misima High School on Misima Island to the north. Due to having to attend school on other islands, a large proportion of Brooker Island children receive little formal education beyond sixth grade.

In general, health services are minimal in the Louisiade Archipelago with people requiring health care forced to travel to Bwagaoia on Misima Island to attend the hospital, to Panaeati Island in the Deboyne Group of Islands to attend the sub-health station, or to Motorina Island to attend the aid post. In 1998-1999, the Bwagaoia Hospital operational budget was not received and user fees were introduced to maintain essential services. Even though the hospital stressed that no one in need of medical attention would be denied treatment on the grounds of inability to pay, many people stopped going due to the costs involved. In 2015, the national government introduced free health care, but the Bwagaoia Hospital remains understaffed and under-supported since the closure of Misima Mines Limited in 2004.

In 1998 and 1999, there were two permanent buildings on Brooker Island. These were the Community Hall built under the Tax Credit Scheme of Misima Mines Limited and the Church. These were both damaged by Cyclone Justin in 1997 and Cyclone Ita in 2014.

A microwave radio phone was placed on Brooker Island in 1997 which only allowed Brooker Islanders to ring neighbouring islands[50]. Brooker Island people used this microwave telephone to arrange trading expeditions and other business prior to sailing. They could also contact kin in other areas at times of death or emergency especially when canoes had encountered bad weather. Communications at this time also allowed for the ordering of commodified marine resources such as sea turtles for trade, school functions and Christian-related activities. With the introduction of the Pacific Islands Region leading telecommunications provider Digicel, people now have a greater ability to communicate. Unfortunately, 'the Bigger Better Network' has not yet reached Brooker Island and they can only get reception if they travel to Panaeati or Misima Islands[51]. Subsequently, very few Brooker Islanders are on social media.

Brooker Island has always had a scarce water supply. In 1974, a large ferro-cement tank was constructed at Brooker and one water well (Bourne, 1976c). In 1998 and 1999, there were three serviceable water tanks located on Brooker Island[52], three wells, and two rock pools that

[49] Many Brooker Island children did not like staying with relatives or friends at Motorina Island and there were high levels of truancy as children would return to Brooker Island to be with their parents.
[50] The microwave telephone would only work when there were clear weather conditions.
[51] The other issue is of course keeping batteries charged, though this is done at Bwagaoia or from the ever and increasingly ubiquitous solar power technology.
[52] In 2000, I assisted with the supply of water tanks for Brooker and Panapatpat Islands through assistance from Boroko Rotary in Port Moresby. Shortly after this support, Brooker Islanders were also the recipient of water aid projects through the Milne Bay Provincial and the Local Level Government Administrations, as well as the Misima Mines Limited's Tax Credit Scheme.

accumulated water only when it rained. During my visit in November 2014, water supply was again a problem due to the El Nino. Exacerbating this situation, Cyclone Ita had also destroyed several water tanks and catchments. To compensate for this, many households had dug wells near their houses, though this water was not used for drinking. As noted in Chapter 2, a small desalination plant was installed at Brooker Island in May 2018 under a program by the current Member of Parliament for Samarai Murua, Isi Leonard (Baraisi, 2018a, b).

Conclusion

Livelihoods are not just what people do in order to make a living, they are also the resources that provide them with the capability to build a satisfactory living, the risk factors that they must consider in managing these resources, and the institutional and policy context that either helps or hinders them in their pursuit of a viable or improving living. In going about their day-to-day lives, Brooker Islanders are governed by their access to a combination of capital assets, which include social, human, natural, physical, financial and cultural capital. For example, the most important asset that a Brooker Island male can have is owning or having access to a sailing canoe or a fiberglass dinghy and outboard motor. Without this asset, the ability to move to gardening sites on neighbouring islands, fishing and harvesting marine resources and participating in inter-island trade and other ceremonial activities is severely restricted. Owning some form of sea transport is an important component of being a man on Brooker Island. In a similar frame, having access to suitable gardening land and clay pits are important assets for women on Brooker Island. These assets are the physical expression of who Brooker Islanders are. They are seafarers and pot makers. They are traders and gardeners. They are fishers and marine resource sellers.

Access to both assets and activities is enabled or hindered by the policy and institutional context of livelihoods, including social relations, institutions and organisations. This aspect of institutions will be highlighted in the next chapter which details several disputes between Brooker Islanders and their island neighbours. Livelihood activities are also affected by external factors, such as the imposition of a moratorium by the National Fisheries Authority on sea cucumber fishing and the beche-de-mer trade in October 2009 (see Chapters 7 and 8).

For Brooker Islanders, the environment and the global economy are outside the control of their household. Natural disasters such as cyclones and El Nino associated droughts and changing market demands increases their vulnerability especially their ability to earn cash. In isolated and marginal communities like Brooker Island, limited access to physical and financial capital means that social and natural capital, including the interactions between them, play more central roles in people's livelihoods. Vulnerable livelihoods result from a lack of resilience and an absence of

adaptive capacities required to respond to variable contexts. For Brooker Islanders there are limited livelihood alternatives.

In this Chapter, I have detailed how Brooker Islands live and how they make and earn a living based on gardening, exploiting the marine environment, and conducting inter-island trade[53]. In the next Chapter, I detail the several conflicts that have arisen due the demand for cash to meet livelihood requirements and the associated decline in commodified marine resources, notably sea cucumber stocks.

[53] The survival of trading networks and ceremonial exchange is indicative of their fundamental importance to the maintenance of Brooker Island society and of their resilience in the face of the impacts of the global economy (Macintyre and Young, 1982; Bainton and Macintyre, 2016).

Chapter 6

Contestation over Marine Resources

The effect of increasing incorporation in the global economy has been greater dependence on cash to support the livelihoods of Brooker Islanders. This greater dependence on cash has resulted in various disputes between Brooker Islanders and their island neighbours over access to areas in the marine environment.

Local marine tenureship arrangements in the Louisiade Archipelago have in the past shown a high level of fluidity. Disputes arise and then dissipate. What is common in these disputes is that they become stronger when there are commercial incentives at stake. When a particular resource has become commoditised, its value is also changed. Control over these resources becomes a driving force for people like Brooker Islanders and their island neighbours to protect access and subsequent exploitation, and thus the economic benefits derived from the sale of these resources. 'Fishing for profit' therefore causes marine boundaries to strengthen with resulting disputes over access to various marine environments which are home to commodified marine resources. When the economic incentive is removed, so generally, does the dispute. This is common and widely reported across Melanesia (see Pernetta and Hill, 1981; Wright, 1985; Carrier, 1981; Johannes, 1982; Polunin, 1984; Akimichi, 1995; Hviding, 1996; Pollnac and Johnson, 2005; Macintyre and Foale, 2007; Aswani, 2017).

In this Chapter, I provide examples that have involved Brooker Islanders and their island neighbours. Of particular focus will be the dispute between Brooker and Ware Islanders over access to the the rich sea cucumber grounds along the Long-Kossman Reef (see Appendix R for a timeline of this particular dispute).

Local Tenureship Arrangements in the Massim

As noted above, historically, local marine tenureship arrangements in Milne Bay Province have shown a high level of fluidity. For example, Malinowski (1918, 1922) noted that whilst local marine tenureship arrangements in the Trobriand Group of Islands were shown to exist[1], contestation over marine space was not about access to marine resources but rather, securing marine resources for participation in the gift economy, notably shell valuables for 'kula'

[1] Tom'tavala (1992) writes that as a general rule for the Trobriand Group of Islands, all beaches are vested in lineages whose lands front the foreshore, however, the beach in a particular coastal village is regarded as belonging to the whole village and are therefore regarded as common grounds.

exchange[2]. On neighbouring Woodlark Island to the east, District Officer Vivian (1931) noted a complaint by villagers at Suloga Harbour that Tom Tanaka, a Japanese trochus and beche-de-mer trader based at Taupota on the north coast of Milne Bay was using his own workers to remove trochus shell from adjacent shore reefs. Vivian (ibid) noted in order to resolve these intrusions by outsiders, that the villagers should develop tenure rights to their reefs.

As noted in Chapter 4, several commercial enterprises were started in Milne Bay Province during the post-Independence era. These activities raised questions of access and local marine tenureship arrangements. In the initial development phase of the Milne Bay Fishing Authority, the Fisheries Extension Officer, Moses Gada (1981) noted that it was not desirable to discuss with village fishers in the Louisiade Archipelago about 'traditional' fishing boundaries because they did not exist and asking about them would create tension.

Gerritsen and Macintyre (1986) during their investigations for the development of Misima Mines Limited noted that people on Misima Island thought the idea of territoriality extending to the sea was alien and therefore ludicrous[3] (see also Alu and Mee, 1979). In a similar frame, Stevens (1994) noted during his investigations for the development of Coral Sea Fisheries that whilst areas of reefs in the Louisiade Archipelago belonged to particular islands, all who resided on those islands, could fish the same areas. At the other end of the Louisiade Archipelago, Hayes (1993) reports that for Ware Islanders, home reefs and reefs surrounding the neighbouring islands that were part of Ware Island's marine territory were owned collectively by the whole community and not by any individual or clan. In the Engineer Group of Islands, Foale (2005) has also noted that the basic unit of local tenureship arrangements were understood to be at the level of the island. This meant that anyone that was a legitimate resident of a particular island could freely harvest or fish for marine resources, either commercially or for subsistence purposes. To the immediate east of the Engineer Group of Islands, Rollason (2010a) during his fieldwork on Panapompom Island in the Deboyne Group of Islands noted that reefs and coral cays were not 'owned' by particular people or groups and that the concept of one person 'owning' the sea was scoffed at.

The start-up of the Coral Sea Fisheries provides an interesting example of the concerns over disputes when new economic opportunities materialise. Coral Sea Fisheries conducted extensive consultation before starting their operations so that they would have a better understanding of the social environment that they would be conducting their business in. This understanding was

[2] The kula trade is an exchange cycle which involves trading partners exchanging armlets of white shells (mwali) and necklaces of red shells (souvlava) (Malinowski, 1922; Leach and Leach, 1983; Damon and Wagner, 1989).

[3] Callister (2006) does note however that on Misima Island, that along the narrow coastal fringe in some places there were rights called '*hawi*'. *Hawi* refers to natural breaks in the foreshore reef. These gaps were places where nets were often set and were owned by members of the community that are geographically closest to those gaps.

important for two reasons. The first was to understand the reasons for the failure of the Milne Bay Fishing Authority, and and the second to collect suitable information to make a business case for financing by Misima Mines Limites. As the following discussion recorded by Stevens (1994: 1-3) highlights, the social environment in the West Calvados Chain, the main area of interest for Coral Sea Fisheries' operations, was already crowded with concerns over issues of resource access and disputes:

> Maurice Belita [Bagaman Islander]: "When the Tologi[4] comes to Motorina Island area should everyone go fishing only in their specific island boundaries or should a wider area be opened up for everyone to fish in?"
>
> Jack Arimaina [Motorina Islander]: "There should be no boundaries and everyone from the surrounding area should be allowed to fish."
>
> Dawana [Brooker Islander]: "It is my opinion that the boat should fish a general area and that it buys from all canoes at the same time. However, if Motorina Island people want to fish in Brooker Island waters then they should pay a license fee to fish each year, payable to the Brooker Island Ward."
>
> Nuewamai Arimaina [Motorina Islander]: "If I am a Motorina Island person and I have traditional rights[5] to fish the islands of Brooker and Bwagaman Island wards, will I have to pay this license to fish?"
>
> Victor Ame [Misima District Government Officer]: "Be careful about making rules. Don't make rules that are difficult to follow or police."
>
> Nuewamai Arimaina [Motorina Islander]: "The people should only be separated by the Louisiade and Yeleamba Council boundaries. Within those boundaries the people of each area, East and West Calvados Chain should be able to fish anywhere."
>
> Unrecorded Speaker [Motorina Islander]: "It is important that we should all be able to fish anywhere."
>
> Bernard George [Bagaman Islander]: "This is our fishing company not some foreign company. It is up to us to make it work and make it strong so that we benefit. If we fight and argue and get jealous of each other it will fail."
>
> Apolo [Brooker Islander]: "Brooker Island people had a meeting yesterday and they did not agree with the idea from Motorina Island that people should fish everywhere. Brooker Islanders don't want other people fishing in their area."
>
> Nuewamai Arimaina [Motorina Islander]: "If Brooker Islanders want to ban outsiders from fishing in their area, what about people like me who have rights to fish in the Brooker Island area?"
>
> Apolo [Brooker Islander]: "The people from close by who have rights are permitted, but we don't want people from a long way to fish in our area."
>
> Joseph Beteul [Brooker Islander]: "Brooker Island people do not want outsiders in their area. . . . Brooker Island people can invite friends and relatives from other

[4] The *FV Tologi* was the buying and processing vessel of Coral Sea Fisheries (see Chapter 4).
[5] These traditional rights may involve either previous residence on Brooker Island or through marriage to a Brooker Islander.

> islands. However, they cannot just come without permission. . . . in the past when the Milne Bay Fishing Authority was operating, people from well outside the District used to come and fish to the boat. People came from the Engineer Group of Islands and also Ware Island, and overfishing was a real danger."
>
> Anoiya Tewala [Unknown]: "If Brooker Islanders have made up their mind so be it. However, for the rest of us, from Motorina to Kuanak Islands, we can all fish anywhere."
>
> Joseph Betuel [Brooker Islander]: "Brooker Island people are afraid of the Misima Islanders who have plenty of dinghies. There will be fleets of them everywhere and nobody will know how or be able to control them. This is commercial fishing we are talking about, and in a very short time, fish will be difficult to find."
>
> Jubilee Sam [Brooker Islander]: "Companies come and companies go, but we have to live here forever, so we have to protect our marine resources."
>
> Sesa Laisiesa [Motorina Islander]: "The Brooker Island people have put a blockade on their waters but we are all saying that everyone can fish in our waters. We should follow the Brooker Island lead and blockade our waters to protect them."
>
> Joseph Betuel [Brooker Islander]: "It is only the commercial fishing we are attempting to control, because of the potential depletion of resources. Brooker Island people made their decision, not for selfish reasons, but because they know from experience how disputes arise. It is based on common sense. . . . if Bagaman and Motorina Islanders have open slather then they will be invaded by Misima Islanders. People will then start to talk and ill feeling will be created. The Brooker Island people are realistic enough to foresee that and try and prevent this . . ."
>
> Nuewamai Arimaina [Motorina Islander]: "Some Misima Islanders have rights, through marriage to fish on the barrier reef and we must respect those rights. However, we must not allow all Misiman Islanders to fish there just because they have shares in Coral Sea Fisheries."

As can be seen from the above, there are differences in the interpretations of when boundaries are instituted. Of particular interest is the statement by Nuewamai Arimaina, a Motorina Islander in stating that the only boundary that should be used should be the one that divides the Louisiade and Yeleamba Council areas. This notion of using administrative boundaries also surfaced in the later dispute between Brooker and Ware Islanders (see below). The notion of using administrative boundaries may have been a mechanism for defusing potential conflict as these boundaries had been externally demarcated by the national government and thus avoided the requirement for communities to discuss and negotiate boundaries that were not 'concrete' but rather fluid in the context that they would or could be activated. Of course, disputes did arise when one group perceived another group of gaining more benefits then them from fishing activities.

As noted in Chapter 4, the Coral Sea Fisheries project ran from 1994 to 1996. Many of the issues about boundaries that were raised during the operations of Coral Sea Fisheries also became the same issues raised when the sea cucumber fishery and beche-de-mer trade rose to greater prominence in the late 1990s. The issues of boundaries and rights of access became a pressing

topic at that time. In 1998, the Louisiade Local Level Government Council met and the following was recorded in their minutes (Louisiade Local Level Government Council, 1998):

> North Motorina Island Councillor: "My people have raised concerns over people poaching on our reefs and selling their catch for money. My Village Development Committee met recently and discussed that this must be discouraged as it puts the people in an awkward financial position. A general consensus was reached that my people are to catch fish for sale to other buyers or consumers at PGK 2.00 per kg. Any outside person wanting to fish within our fishing ground must consult the Village Development Committee. Anybody found illegally fishing within our grounds will be fined PGK 500.00."
>
> Balamatana Councillor [Misima Island]: "Constant poaching by outsiders at Balamatana Ward has resulted in certain species of fish and turtle diminishing. I therefore give my total support for the legislation of Council rules to restrict or minimise unnecessary poaching of our local reefs."
>
> Kimuta Island Councillor: "My people have come across evidence of poachers wasting turtle meat. My Village Development Committee has decided to impose the following rules: PGK 20.00 to be paid to the Village Development Committee before fishing; and PGK 100.00 fine for poaching."
>
> Hinaota Councillor [Misima Island]: "How do we identify or determine boundaries of these fishing grounds or reefs? How are we to say who owns what?"
>
> East Panaeati Island Councillor: "It is best for this Council to refer this issue back to the Wards for the people to have their professional input as they would be in a better position to deliberate on resource ownership and other matters relating to boundaries."
>
> Alhoga Councillor [Misima Island]: "Ownership of the small islands must be determined, as well as the relationships of the islands and mainland people. I'll bet the end result of this study would be interesting one."

From the above dialogues, while some concern was raised on the issue of sustainability, this concern also appears to be just as fluid as the local marine tenureship arrangements that operate in the Louisiade Archipelago. Despite the concerns raised by Brooker Islanders and their Island neighbours in the example provided by Steven (1994), the perceived economic benefits from Coral Sea Fisheries outweighed these concerns of sustainability and the rise of disputes. Coral Sea Fisheries was seen as an important opportunity to once again earn cash especially because the closure of the Milne Bay Fishing Authority caused a loss of income opportunities when the outstation on Brooker Island was closed in 1989[6]. The other example by the Louisiade Local

[6] As noted in Chapter 4, the Milne Bay Fishing Authority established an outstation at Bokiyowa on Brooker Island. This substation was established on Manilobu sub-clan land which belonged to the family of Amisen Sam and an agreement was made with Amisen's brother, Lote Guitana, for this purpose (Bonubonu, 1990). At the time of construction, demands began for an annual rental fee (Fifita, 1983). In response, Amisen and Lote were told that after the successful operations of the outstation, they would be compensated with a fishing dory, an ice box and various fishing gears. When the Milne Bay Fishing Authority finally ceased operations in 1990, none of these items were received as Milne Bay Provincial Government awarded all of the Milne Bay Fishing Authority assets to the whole of the Brooker Island community (Tauliso, 1990). In

Level Government Council Meeting was in response to the rising economic importance of the sea cucumber fishery and the beche-de-mer trade in the Louisiade Archipelago.

The Rise of Exclusivity in the Southern Massim

Before the moratorium on the sea cucumber fishery and beche-de-mer trade was implemented in October 2009, the fishery would reopen in mid-January, coinciding with the peak turtle nesting season. In the Louisiade Archipelago, the combination of harvesting both turtles and sea cucumbers set off the first dispute I was to witness that involved Brooker Islands and their island neighbours.

The catalyst for this dispute began when Brooker Islanders blamed Motorina Islanders for wantonly killing turtles and spoiling the beaches on the islands in the Duchateau Group[7] whilst processing sea cucumbers into beche-de-mer. During discussions held at Salo's house one afternoon on Brooker Island in late January of 1999, I asked Ado, Napa and Salo about people coming down from Motorina, Bagaman and Panamarla Islands and if this was acceptable. The reply was that it was not, "*Tavala hi apapanakan"* ("They spoil the islands").

At a meeting in mid-February of 1999, Apolo brought up the problem of poaching in Brooker Island's marine territory and this prompted a long discussion. Losema, Moabe and Iuda all talked about recent incidents when turtles had been caught nesting, turned over and left to die. Bobi stood up and harangued the assembled crowd that they should be taking greater responsibility for caring for their marine resources, and argued that Motorina Islanders should not be going to the Duchateau Grooups of Islands or Jomard Island. This prompted Joseph Betuel[8] to stand up and state that what was required was that, "we need to determine ownership". Robinson then stood up and said that Motorina Islanders should ask permission and stated, "it is like when we trade our clay pots for bananas, we do not just go into their gardens and take their bananas, we ask". Later when talking with Starford and Ado about the issues, Starford said the problem was simply, "money".

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frustration, these assets were promptly confiscated by the Manilobu sub-clan at Bokiyowa, much to chagrin of the wider Brooker Island community (Elliot, 1990).

[7] Motorina, Bagaman and Kuanak Islanders all claim a long association with these islands including the neighbouring Jomard and Panadaludalu Islands. Some of these claims may stem from historical migration and periods of residency. It is more likely, that claims of ownership are because many of their grandparents had worked on the coconut plantations that were established on these islands (see Chapter 3). For example, some people from Motorina Island claim access rights through a man who once lived on the main island of Panubwabwaoina in the Duchateau Group of Islands, and later settled on Brooker Island, and they use this association to claim rights of access.

[8] As mentioned in Chapter 5, Joseph Betuel was the historian of Brooker Island and had been recording clan migration stories and thus ownership of islands in the marine territory claimed by Brooker Islanders.

At another meeting held in mid-March of 1999, Brooker Islanders decided to close off their marine territory altogether. Interestingly at this meeting Brooker Islanders suggested that Motorina Islanders could be allowed to go to Nabaina and Nagobi Islands because they are on the 'barrier reef' with all other islands to be left alone. This was a very interesting suggestion by Brooker Islanders who knew full well that both Nabaina and Nagobi Island were now becoming the centre of a major dispute involving themselves and Ware Islanders.

The announcement by Brooker Islanders that they were closing their marine territory to Motorina Islanders resulted in anger and resentment from Motorina Islanders. In retaliation, Motorina Islanders threatened to exclude Brooker Island school children from the Community School that is located on the north side of Motorina Island[9]. I later talked with Councillor Semi about this especially with regards to Brooker Island children attending school at Motorina Island. Semi replied, "sea cucumbers are one thing, school and kin are different". Subsequently, it was argued by Brooker Islanders that this was not a school issue but rather an issue about access rights to areas that Brooker Islanders were claiming as theirs.

In another meeting two weeks later, Guitana[10] stated that his children who were married to Motorina Island had rights to access Brooker Island waters. In response, Guitana was told that his children now belonged to Motorina Island as they had settled there. "Their rights to Brooker Island are valid because their ancestors planted things to claim, but they did not plant things in the sea" stated Jubilee. Guitana's son went on to say that all things were made by God and that everyone had a right to use them[11]. Jubilee got up and replied, "yes, God made all creatures and men. Man has control over all things and therefore we need to care for them[12]". As had been raised in the days of Coral Sea Fisheries, it was resolved again by Brooker Islanders to charge Motorina Islanders an access fee if they wanted to fish in Brooker Island's marine territory. This fee was to be paid to the Brooker Island Ward Development Committee and all Motorina Islanders were to be escorted by a Brooker Islander who would observe their activities.

This problem rested for several months until July 1999, when a letter with an accompanying sketch map was sent to Brooker Island by the North Motorina Ward Development Committee detailing North Motorina's claim to islands and sea space in what Brooker Islanders would claim as their marine territory (Gisabiuego et al., 1999). This letter outlined the rules for accessing what

[9] To attend this school, Brooker Island children have to also board with relatives or friends on Motorina Island so some level of harmonious relationships is required.
[10] This is a different Guitana to Guitana Lote mentioned above in the Milne Bay Fishing Authority dispute with the Manilobu sub-clan.
[11] Genesis 1: 26 of the Bible states: Then God said, "Let us make mankind in our image, in our likeness, so that they may rule over the fish in the sea and the birds in the sky, over the livestock and all the wild animals, and over all the creatures that move along the ground."
[12] Again from the Bible, Proverbs 27: 23 states: "Know well the condition of your flocks, and give attention to your herds."

was now being asserted by Motorina Islanders as their marine territorial waters, with the similar caveat that Brooker Islanders needed to seek permission from the North Motorina Island Ward Development Committee. Brooker Islanders were instructed to pay a 10 per cent levy on all marine resources that they sold. A response was quickly sent back by the Brooker Island Ward Councillor informing his countrepart that the sketch map was illegal and that this dispute should be channeled through the appropriate government offices (Iadila, 1999). No further meetings were held in 1999 as people began preparing for the Christian Crusade Camp that was to be held at Brooker Island that Christmas, as well as planning their mortuary feasting requirements, school graduations and general Christmas preparations. This dispute appeared to fade away with the Christian fervor of the Crusade and nothing was pushed further by either Brooker or Motorina Islanders. Another factor at play here may have been the issue of the forthcoming concerns raised by the so-called Millenium Bug (Eves, 2000). With impending doom and Christian goodwill, the dispute had become less important for the time being, sleeping until another incident brought it forward into consciousness and then of relevance again.

Concurrent to this dispute, a smaller but longer running dispute was also rising to the surface. This dispute involved an Ewau sub-clan from Brooker Island and a Mwaowa sub-clan located at the far western end of Motorina Island. The cause of the dispute was the ownership of Venaliwa Island which lies between Brooker and Motorina Island and which is also part of the Brooker Island Ward. This dispute has its origins dating back to the turn of the 20th Century, when a Brooker Island canoe was fired upon by Europeans and a Brooker Island woman was killed. In the aftermath of this incident, Motorina Island people took it upon themselves to compensate her family by giving them the island of Venaliwa and Brooker Islanders have thus utilised this island ever since.

Issues arose in early 1998 when youths from Motorina Island were caught at Venaliwa Island by Brooker Islanders taking coconuts and also diving for sea cucumbers. This incident resulted in the Mwaowa sub-clan from Motorina Island asserting that Venaliwa Island was rightfully theirs and that it should be returned to them. Two meetings were subsequently held. During the second meeting, the Mwaowa sub-clan claimed that a feast that had been given in 1941 had fully and finally compensated the Ewau sib-clan for the death of their relative. The Brooker Island Ewau sub-clan countered that they have established considerable improvements to the land, building houses and planting food trees. It was ventured that if the Mwaowa sub-clan from Motorina Island would compensate the Brooker Island Ewau sub-clan for their improvements than Venaliwa Island could be returned to them. Nothing was forthcoming and members of the Brooker Island Ewau sub-clan continue to reside on Venaliwa Island to this day.

Tensions between Brooker and Motorina Islanders continue to ebb and flow, rising up and then settling again as new issues or 'opportunities' emerge. For example, in January 2002, Brooker and Motorina Islanders began a new dispute, this time over Motorina Islander concerns over Brooker Islanders harvesting sea cucumbers from the reefs surrounding Panalolan and Ululina Islands, two high limestone islands on the southern barrier reef. Both Brooker and Motorina Islanders use these two islands.

In 2005, ownership issues arose over Jomard Island because the National Maritime Safety Authority were replacing the old lighthouse with a new one[13]. This dispute was over who would be awarded the funds that were to be paid for the ground where the new lighthouse would be established. These disputes were eventually mediated, but Brooker Islanders were still worried about the legality of the mediation outcomes and if they would continue to obtain the annual 'rental' benefits offered by the National Maritime Safety Authority[14].

As noted above in the discussion of Coral Sea Fisheries, concerns over Misima Islanders coming down to the Louisiade Archipelago in their dinghies powered by outboard motors turned out to be real. With the closure of Misima Mines Limited in 2004, disputes began to emerge between south coast villages of Misima Island, the Deboyne Group of Islands and Motorina Islands over small islands in the northern part of the Louisiade Archipelago[15]. In response, communities in the Louisiade Archipelago began tightening up on who could come and access their marine territories.

The most permanent and longstanding claim of ownership by a Misima Islander is by Tabei Labeli, a Manilobu sub-clan member from Alhoga Village on the south coast of Misima Islands who laid claim to the Bushey Islets. The Bushey Islets are located on the north-western edge of the northern barrier reef of the Louisiade Archipelago. To justify his claim, Labeli stated that his ancestors had migrated from Alhoga Village to Brooker Island. Ownership challenges initially took the form of complaint letters from members of Alhoga Village and communities on the northern side of Motorina Island. Brooker Islanders in general did not dispute Labeli's claim as he was the brother

[13] There are several shipwrecks on the southern end of Jomard Island that are testament to the dangers of using the channel between Jomard Island and the Bramble Haven Group of Islands. A lighthouse has been established on Jomard Island since 1972. The area where the original lighthouse stood was first purchased after the area had been chain and compass surveyed by Anahaval Pepenapa, a member of a Manilobu sub-clan from Brooker Island who was residing at Panapatpat Island in 1972 (Potter, 1972; Bourne, 1976b).

[14] The National Maritime Safety Authority lighthouse program has in general caused numerous conflicts amongst communities (see Kinch, 2008b, 2015). Disputes arise because the location of a lighthouse either existing or to be established involves the community being provided a lease fee. This has caused conflicting claims of ownership amongst various groups within a community.

[15] Elimo (2001a) reports complaints from people from the eastern side of Panaeati Island against people from Ebora, Awaibi and Bwagabwaga Village from the west and south of Misima Islands diving for sea cucumbers at Holavi, Mat, Lal and Holuga Islands without their consent. The island of Leu which is claimed by people of east Panaeati Island became upset when a family from Awaibi Village on Misima Island settled there. Around the same time, groups from Narian Village began laying claims to islands along the northern barrier reef of the Louisiade Archipelago.

of Amisen Sam and Guitana Lote. Subsequently, having Labeli at the Bushey Islets expanded Brooker Island marine territory to the north.

Further to the east, disputes arose across the Engineer Groups of Islands and also at Ware Island because of the use of hookah gear[16] in the early-to-mid 2000s. The use of hookah gear was not an issue for Brooker Islanders as they did not have access to this technology though it did become a major concern for Ware Islanders. In the Engineer Group of Islands and elsewhere the use of hookah gear caused disputes and jealousy as the use of this gear gave access to depths where valuable sea cucumbers[17] were still available. The issue with using hookah gear was that it was considered unfair by those that did not have access to this gear[18] (Foale, 2005; Fabinyi et al., 2015). Fabinyi et al. (ibid) noted that the majority of people they surveyed in the Engineer Group of Islands wanted their own hookah gear, despite people acknowledging that using hookah gear would reduce sea cucumber stocks rapidly. Fabinyi et al. (ibid) also found that many communities were complicit in allowing sea cucumber divers to use hookah gear when the money they obtained from it was used in the construction of churches.

Disputes and Declining Stocks: Brooker and Ware Islands

Brooker and Ware Islanders have a long historical relationships going back before early contact (see Chapter 3). This long association has resulted in a level of inter-relatedness. This long association was not enough however to stop Brooker and Ware Islanders clashing during encounters at Nabaina Island, the island that now became the centre of a contest over its ownership, and access to the Long-Kossman Reef and the sea cucumbers stocks that were to be found there. The dispute between Brooker and Ware Islanders started in early 1998, just before I arrived on my reconnaissance trip in February to March 1998. A timeline of this dispute is provided in Appendix R.

The Brooker and Ware Island dispute entered into the first stage of impending conflict when on the 5th of February 1998, a letter of complaint over ownership of Nagobi and Nabaina Islands was sent by the then Councillor of Ware Island, William Benjamin, to his counterpart at Brooker Island, Semi Iadila. In this letter, Benjamin (1998) wrote:

[16] Hookah gear is a surface supplied breathing equipment which utilises a compressor that is on a vessel and supplies air to a diver below by long air lines.
[17] The main target species was white teatfish (*Holothuria fuscogilva*).
[18] The use of hookah gear was associated mainly with one family from Skelton Island in the Engineer Group of Islands which has close ties with the largest beche-de-mer export company in Milne Bay Province, Kiwali Exports, and whose patriarch would later become the Samarai-Murua District Member of Parliament, Gordon Wesley (Klembassa, 2005).

> 'My fishermen have brought to my attention that many of your people always come across the boundary which is Guwawana Passage to fish and dive between Nagobi and Nabaina Islands in which is supposed to be the fishing grounds for Ware Island people. Tell your people, that we have relations at Brooker Island and you have relations here at Ware Island, but let's be fair to each other and also respect the law and respect each other.'

Guwawana Passage whilst having mythological significance to Brooker Islanders is also the administrative boundary that separates the Louisiade Local Level Government which Brooker Island is part of and the Bwanabwana Local Level Government which Ware Islanders are members of. Ware Islanders initially used this government administrative boundary to state that Brooker Islanders were trespassing, and thus poachers[19]. On the 16th of March 1998, Semi Iadila (1998: 1) replied:

> ' . . . I do not know who owns the fishing ground and where is the boundary that divides Brooker and Ware Islands' fishing grounds until we come together and tell each other. If there is a boundary now that divides Brooker and Ware Islands we must also know who put it there and for what purpose. My belief is that the traditional fishing boundary and ground have nothing to do with the present Local Level Government boundary. Because of this belief, my people continuously go over that boundary and if you dispute my people going over that boundary, we should all come together to talk about the problem.'

Just over a month later on the 20th of April 1998, seven Brooker Island canoes were at Nabaina Island when Police from Samarai Island arrived accompanied by several Ware Islanders[20]. The seven Brooker Island canoes were in the process of preparing to set sail the next day[21]. On arrival, the Ware Islanders and the Police inspected the smokehouses and informed the people that they had no right to be there and the Ware Island Councillor, William Benjamin demanded the confiscation of the processed beche-de-mer, which the Police agreed to[22]. Ware Islanders also confiscated the engine handle off one of Nako Fisheries' fishing vessels[23] that was assisting the Brooker Islanders.

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[19] In discussions I had with people from the Engineer Group of Islands during community engagement patrols in 2001 under the Milne Bay Community-based Coastal and Marine Conservation Program, they believed that neither Ware nor Brooker Islanders had any rightful ownership over the disputed area, and that the Long-Kossman Reef had always been a public place. This response was probably motivated to a degree by self-interest as they also wanted to dive in the disputed area. On two occasions, Ware Islanders chased people from the Engineer Group of Islands away from Nabaina Islands as they had done earlier with Brooker Islanders.

[20] I was not at Nabaina Island at the time of this incident as I had left the day before for Enivala Island.

[21] Eleven Brooker Island canoes had just left that morning for Nagobi Island to the east.

[22] In total, 304.05 kg of beche-de-mer was taken and was later sold to Asiapac, one of the main exporting company based in Alotau for PGK 2,405.15 (equivalent to ~ AUD 1,387.75 in 1998). This money was put into the account of Sioni Peter, a Ware Islander, which then subsequently disappeared. This further complicated the situation when Brooker Islanders tried to get the money back from Sioni.

[23] This vessel was the *FV Dune* which helped transport Brooker Islanders to Nabaina Island so Nako Fisheries could purchase giant clam adductor muscle and lobster tails from Brooker Island fishers.

The next day a community meeting was held at Enivala Island when all the Brooker Island canoes had arrived from Nabaina and Nagobi Islands. During this meeting, there was much discussion about what had just happened. There was substantial talk about going to Ware Island, but after the violent altercation that had just occurred, no one really seemed to have the heart for that level of expedition. It was said by many at the time that Ware Islanders were no longer behaving as good Christians[24].

Later, when back on Brooker Island, I asked Sivi and Soma why Brooker Islanders wanted to dive at Nabaina and Nagobi Islands. Soma replied, "*Panawa iwaisi kaiwena sauge na gaisogo, na win, na win*" ("The place is great for diving because we win"). I then asked about diving at the Bramble Haven and Duchateau Group of Islands, as well as at Panapatpat Island. Soma again replied stating, "*I nak. Tabaim u gaisoga Panapatpat, lan maisena u pwawa five pisi*" ("It is bad. For example, suppose you go diving at Panapatpat Island, in one day you will only find five sea cucumbers"). Access to sea cucumbers stocks was important, not only for Brooker Islanders, but also Ware Islanders.

After this incident at Nabaina Island and with the complaints by Nako Fisheries, the Milne Bay Provincial Government held a meeting in Alotau on the 12th of May 1999. Following this meeting, the Milne Bay Provincial Government advised the court to put a restraining order restricting both Brooker and Ware Islanders from harvesting sea cucumbers and other marine resources in the disputed area of Nabaina Island. Unfortunately, this was not implemented and the dispute continued. Complicating things even further at this time was the internal dispute within the Ware Island community whereby the Kameteko, Nabudiga and Duya sub-clans began contesting ownership of Nabaina and Nagobi Islands[25].

Another violent confrontation occurred on the 4th of August 2000 between Ware and Brooker Islanders at Nabaina Island resulting in damage to Brooker Island canoes and other properties. As a result, the Misima Police Station Commander placed a boundary at Hippopomwa Sandbank which is located between Nabaina and Nagobi Islands. Both Brooker and Ware Islanders appealed for immediate action from the Milne Bay Provincial Government to resolve the dispute between them (Aia, 2000).

[24] When Brooker Islanders refer to being a good Christian they are talking about the behavior of those who have accepted, by faith, Jesus Christ as their Savior and thus are indwelt with His Holy Spirit. In particular, this means following the 'Golden Rule' of Matthew 7: 12-13 which details that we should treat others the way you would like to be treated.

[25] These sub-clans had registered their claims with the Samarai-Murua District Lands Dispute Register at Samarai Island (Giyolibulibu, 1999; Sailoia, 2001, 2002).

On the 20th of January 2001, Ware Islanders again confronted Brooker Island people at Nabaina Island and seven Ware Islanders were arrested by Police for assaulting several Brooker Islanders. This incident prompted Semi Iadila (2001: 2) to write to his counterpart, William Benjamin at Ware Island, stating the following:

> 'The people of Brooker Island continuously go to Nagobi and Nabaina Islands and the nearby islands to fish and/or dive for sea cucumbers with the full confidence that the area belongs to them. There was never a meeting by Brooker and Ware Islanders in the past that would have decided that Ware Island people own these islands and the surrounding reefs and that the Brooker Island people should be prohibited from penetrating the area. Their presence in the said area has never been authenticated by any legal procedures but a right through traditional understandings and that right will remain unchanged.'

Because of the escalating violence, the Milne Bay Provincial Government finally got serious about mediating the dispute. The first round of mediation began at Ware Island with government officials acting as mediators. In support of ownership claims by Ware Islanders, stories were told of a man known as Sibwakala or Boss Marigili and who had worked for Bob Bunting establishing coconut plantations on the atoll islands of Louisiade Archipelago including the two islands in dispute, Nagobi and Nabaina[26].

Brooker Islanders dismissed these claims by Ware Islanders stating that these events occurred only in relatively recent times because the majority of islands along the Long-Kosmann Reef and other parts of the Louisiade Archipelago had only been planted with coconuts since the end of World War II. Brooker Islanders also claimed that Boss Marigili had to obtain permission from them before his plantation workers could dive for sea cucumbers and other marine resources (Tauliso, 2001a).

Following this first mediation at Ware Island, Brooker Islanders hired Amenoni Izod, a former Police Inspector as a sort of lawyer in early March of 2001. Because Ware Islanders had put forward historical stories in the first mediation (see Appendix S), Izod (2001) recorded stories from the oldest people of Brooker Island to counter these stories (see Appendix T).

[26] Belshaw (1955) notes that Ware Islands had coconut plantations on Ware Island itself and on Panaman, Tarikubwakubwa, Mwalalitabi, Mwelali and Stuers Islands along the far eastern end of the Long-Kossman Reef, at Motorina Island and also in the Engineer Group of Islands. Belshaw (ibid) also notes that many other Islanders also had rights to these plantations and workers who were associated with these plantations also dived the nearby reefs. As noted in Chapter 3, this time period was the time the colonial government was establishing co-operatives throughout the Louisiade Archipelago to purchase copra and marine products. McDonald (1967) notes that sea cucumbers were being harvested from the Long-Kossman Reef islands and sold to the co-operative store at Ware Island. By the mid-1960s, McDonald (ibid) reports that Ware Islanders were no longer working any of the coconut plantations on the Long-Kossman Reef islands or at Motorina Island, working only those at Ware Island.

During the first mediation process, both Brooker and Ware Islanders also referred to a number of mythological associations to support ownership[27]. Brooker Islanders detailed two myths to assist them. The first myth tells a story of a Meisoga clan woman from Ebora on the far western tip of Misima Island who gave birth to a son named named Manaknagobi. Manaknagobi was a bird and who went to live at Enivala Island in the Bramble Haven Group of Islands before finally settling at Nabaina Island[28]. The second myth detailed the history and movement of another woman called Wainega who also resided at Enivala Island. Many reefs and passages in the Long-Kossman Reef are named after Wainega. Both of these myths are detailed in Appendix U.

Mythological stories provided by Ware Islanders included the totem bird, '*magesubu*' which had flown east from Ware Island to Nagobi Island and is said to have occupied the same tree that Manaknagobi used. Another story that Ware Islanders employed was of a sailing canoe crossing the Guwawana Passage where it was held by a monster ('*silapa*') and the people had to throw a small child overboard to appease it. Ware Island people claimed that this canoe was sailing from Anagusa Island to Misima Island, and as Anagusa Island people are originally from Ware Island, then this story also belonged to them. In the Misima language area, this story is also told, though in the Misiman version, the canoe comes from Woodlark Island and is sailing westward when it encounters the monster at Guwawana Passage. Despite hearing these mythological stories, the Land Mediators stated that myths did not have a role to play in resolving the dispute between Ware and Brooker Islanders even though several government officials supported the use of these mythological associations[29] (see Tauliso, 2001a).

As the mediation process dragged on, other people began to venture down to Nabaina Island to dive for sea cucumbers. On the 21st January 2002, 17 Ware Islanders arrived at Nabaina Island and chased away people from the Engineer Group of Islands[30]. In March 2002, I visited Enivala

[27] Rollason (2010a, 2014a) notes that Panapompom Islanders in the Deboyne Group of Islands to the north of Brooker Island claim land on the basis of connections to places through ancestors, in stories which shade rapidly into legend and myth.

[28] This story is very widely known and is told throughout Milne Bay Province. People from Misima Island have variations that include Manaknagobi fighting with a snake at Siagara Village on the north coast of Misima Island and also a big pig at Ware Island called Buyuagalagala. People from Ewena and Ebora villages on Misima Island have also used this myth to back up their claim to the island of Walemata Island, an island north of the Torlesse Group of Islands which is also claimed by people from Panaeati Island. Woodlark Islanders also have a version in which, Manaknagobi is called Bunibwan who fought with a snake called Mwatatawag. Battaglia (1990) records a version of this storyin which the pieces of the octopus's tentacles made the chain of islands in the eastern end of the Louisiade Archipelago as they fell into the sea.

[29] Several anthropologists have also noted the historical context of ownership of areas that exist in mythical stories, especially when features in the environment are named after events and mythical characters, providing people with a constant, visible historical anchor (Hogbin, 1939, 1951; Malinowski, 1954; Levinson, 2008).

[30] These people said that they were forced by Nako Fisheries to go to Nabaina Island so they could earn money to repay their loans used to acquire their fibreglass dinghies and outboard motors that Nako Fisheries sister company Kiwali Exports had provided them.

Island in the Bramble Haven Group, and there were many people from Kwaraiwa Island staying there, who the then Brooker Island Councillor, Iuda Nason, had 'invited' as he was related to these people by marriage. The Kwaraiwa Islanders were paying a fee to be there[31]. Many Brooker Islanders who were there were not happy and when I questioned them about this, one old man responded by saying that, "they have finished all the sea cucumbers in their own waters and they say they need money". People from Bwagabwaga Village from the south coast of Misima Island were also camped on the northern end of Enivala Island and had also paid a fee to construct temporary houses.

A restraining order was finally handed down by the Misima District Court at Bwagaoia on the 31st of October 2002 to the newly elected Brooker Island Councillor, Nason Wawaga[32], and the newly elected Ware Island Councillor, David Lebasi. The content of this restraining order stopped all fishing by everyone until such time as the dispute between Brooker and Ware Islanders was settled through mediation.

With this court order in place, mediation recommenced and four Land Mediators[33] were formally appointed under the procedures of the 1975 Lands Disputes Settlement Act (Government of Papua New Guinea, 1975b). In this second round of mediation, the Mediators were told by the Milne Bay Provincial Government to identify a 'traditional owner' of the area under dispute[34]. Because of this directive by the Milne Bay Provincial Government, several clans and sub-clans mobilised themselves to be represented as the 'traditional owner'. Sailoia (2002), the District Administrator at Samarai Island, details that through internal negotiations in the Brooker and Ware Island community, involving a process of elimination, only a Meisoga sub-clan of both Brooker and Ware Islands was seen as the possible traditional owner.

This Meisoga sub-clan was presented by John Mwasi on Brooker Island, while David Lebasi, Ware Island's Councillor and John's 'uncle', represented the Meisoga sub-clan of Ware Island. Sailoia (ibid) notes that according to the evidence given, the Meisoga sub-clan that both John and David belonged to was the result of historical migration from Narian village on Misima Island. This group that had migrated from Narian village had consisted of several males and several females who were sisters. This group travelled westward through Brooker Island, the Bramble Haven Group of Islands, from Nagobi and Nabaina Islands to finally reach Ware Island. David's

[31] Kwaraiwa Islanders were also in residence at Panadaludalu Island near Jomard Island, again with permission from Iuda.
[32] Nason is Iuda's father.
[33] Two mediators were from Misima Island to represent the Louisiade Local Level Government area and the other two came from Logea and Sidea Islands respectively to represent the Bwanabwana Local Level Government area.
[34] During the first mediation there was also no formal instruction on the process and this marred the first meeting at Ware Island as the meeting there became controlled by certain individuals who did not have the power and authority to do so.

female ancestor had settled on Ware Island and subsequently David had lesser rights to ownership of the area under dispute. For him to qualify as the major traditional owner, his female ancestor should have returned to Brooker Island and lived there. John's female ancestor who was the younger sister of David's female ancestor did return to Brooker Island, and subsequently John was awarded the title of traditional owner by the mediators on the 5th of March 2003. On the very next day, the Misima District Court Magistrate, John Lagari formally awarded John Mwasi this title and the restraining order was uplifted (Elimo, 2003). Many people from both Brooker and Ware Islands were not happy with this because they felt that the area under dispute was and should be collectively owned by everyone.

Now that a traditional owner had been determined by the mediation process, both John and David were told to identify a boundary within the disputed area[35]. John had stated during the final mediation that he would open the disputed area for use by both parties so that all the people could benefit financially in a peaceful manner (Igara, 2003). After the Misima District Court Notice, John set the boundary at Hipopomwa Sandbank as part of the terms and conditions of the agreement. Of note is that the Hipopomwa Sandbank lies between Nabaina and Nagobi Islands and is also where the the Misima Police Station Commander had put the boundary some three years before.

Some members of the Ware Island community, in particular, Lassam Philip, the then Ware Island Village Court Clerk, as well as Court Circuit Clerk and Nabudiga sub-clan member[36] filed a Notice of Appeal on the 4th of June 2003 with the Milne Bay Provincial Land Court[37] (Philip, 2003a, b). The basis of Philip's appeal was that he felt that his sub-clan had not been given a fair and ample opportunity by the mediators to present their ownership claim and that the Misima District Court had wrongfully awarded ownership to John Mwasi. Philips's appeal also stated that due legal process had not been followed under the 1975 Lands Disputes Settlement Act[38] because the final decision had been given by the Magistrate of the District Court and not the Local

[35] Sailoia (2002) details that because of the return of the islands of Marigili, Panaman and Mwelali to Ware Islanders in July 1973 under the 1962-1971 Land Ordnance (Government of Territory of Papua and New Guinea, 1971) that the boundary between Brooker and Ware Islanders is Liwaus Passage.
[36] The Nabudiga sub-clan had tried to register the area under dispute as their own in 1999.
[37] Under the 1975 Lands Dispute Settlement Act, a person who is aggrieved by a decision of a Local Land Court may appeal within three months after the date of the decision and the Provincial Land Court has jurisdiction to hear and determine if an appeal is warranted.
[38] Under the 1975 Lands Dispute Settlement Act, if the mediation process had failed, then the Local Land Court Magistrate and two new mediators would then make a decision. In this case, the mediation was regarded as successful as an agreement was reached. The Local Land Court cannot adjudicate over a dispute if the mediators have not been able to have the disputing parties reach an agreement, though a District Court Magistrate can direct the Local Land Court to hear a dispute if there is no reasonable likelihood of the dispute being settled without a court hearing. The District Court has no power itself to determine a customary land matter.

Land Court and should be considered to be not legally binding[39]. The appeal by Philip did not progress further and the result of the mediation has remained in place to this day.

On the 4th of February 2005, nearly two years after the mediation had finished, Lassam Philip lodged a complaint with the National Fisheries Authority against divers from the Engineer Group of Island who were being led by David Lebasi and using hookah gear to dive for sea cucumbers at Abaiwolan Island, just west of Nabaina Island. Steven Klembassa, a former Milne Bay Provincial Fisheries Officer and now an officer with the National Fisheries Authority's Monitoring, Control and Surveillance Business Unit was sent to investigate. Klembassa (2005) details in his investigation report that David's fellow Ware Islanders did not believe that he was the sole owner of the islands and reefs in the previously disputed area and that he was disrespecting the people of Ware Island by bringing outsiders to dive for sea cucumbers. In his defense, David stated that whilst he is aware of the law banning hookah gear, he felt that he, being one of the designated 'traditional owners', had the right to use this equipment wherever he liked[40].

In April of 2006, John Mwasi went to Nabaina Island with a Police contingent from Misima Island to meet Ware Islanders who were camped there. Reminiscent of events of seven years before, the Police confiscated beche-de-mer and also assaulted two Ware Island men. After telling the Ware Islanders at Nabaina Island that they should go back to Ware Island, the Police and John then went across to neighbouring Abaiwolan Island. When Police attempted to confiscate beche-de-mer from the Ware Islanders who were there, an argument erupted and this resulted in John being assaulted by Ware Islanders.

The reason that conflict arose at this time was that Ware Islanders were now coming across the boundary line at Hipopomwa Sandbank and diving in what had been determined through the mediation process as Brooker Island's marine territory. After this incident, informal mediation was started again with meetings occurring between Brooker and Ware Island leaders. It appears nothing further happened and in October 2009, the National Fisheries Authority imposed a moratorium on sea cucumber fishing and the beche-de-mer trade due to sea cucumbers being over-harvested and subsequently, there was nothing to fight over anymore.

[39] The Local Land Court is part of the District Court, so in this case, the Misima District Magistrate was acting in both capacities. The main mandate of District Court Magistrates is to deal with summary offences, but also have powers and responsibilities under the 1989 Village Courts act. In addition, District Court Magistrates also have powers and responsibilities under the 1975 Land Dispute Settlement Act, as well as a range of other Acts.

[40] When this matter went to court, the judge allegedly found in favour of David Lebasi and his colleagues from the Engineer Group of Islands.

In recent years, people from Brooker and Motorina Island have also expressed their disagreement with the mediators' decision that John Mwasi is the rightful owner of the previously disputed area. One reason for this is that John's great great grandmother Kakasi was provided as compensation due to the wrongful killing of Tanukele who was of the Meisoga sub-clan from Panasial Island at Ebora on Misima Island. Under customary law Kakasi and her descendants have no entitlements to land and this was put forward as invalidating the ruling by the both mediators and the Misima District Court. There has also a more recent push from Manilobu clan members stating that they have rightful ownership over the islands in the disputed area. As noted in the previous chapter, the Manilobu clan is the largest of all the clans in the Misima language area.

In April 2017, the National Fisheries Authority reopened the sea cucumber fishery and beche-de-mer trade after seven and a half years of moratorium. Since the reopening of the sea cucumber fishery and the beche-de-mer trade, Brooker Islanders have remained camped at Nagobi Island and Ware Islanders have been based at Nabaina Island with the Hipopomwa Sandbank being respected as the boundary between the two groups.

During the 2017 and 2018 open season for sea cucumber harvesting, everything was quiet. My brother Ado, however has complained that in the 2018 sea cucumber fishery season there were too many people diving and that the southeasterly winds were to strong. In the 2018 sea cucumber fishery season, the National Fisheries Authority did not open the season until the beginning of August. This is at the end of the period of '*baliman*', the easterly winds from the east-south-east. This then turns to '*yavana*', the winds from the south. These wind conditions make it difficult for Brooker Islanders and neighbouring Ware Islanders to dive along the Long-Kossman Reef as they are exposed to these winds.

Conclusion

As I had departed Brooker Island in October 1999, I was really only an external witness to the mediation process though I was responsible for funding the Milne Bay Provincial Government through the mediation process when I was working with Conservation International. Because of my association with Brooker Islanders where I had been living for the past year, I was invariably looked upon as being a Brooker Island sympathiser. I must admit, that whilst I was at Brooker Island when queried by Brooker Islanders about the emerging disputeand what to do, and because of my previous work experiences with the Aboriginal Areas Protection Authority working in the Central Desert area of the Northern Territory of Australia documenting and protecting Aboriginal sacred sites, I suggested that they turn to the mythological stories to back up their claims.

So what was the outcome of the dispute between Brooker and Ware Islanders? With the imposition of the boundary dividing the Long-Kossman Reef at Hipopomwa Sandbank, both Brooker and Ware Islanders had to take stock of what resources were now available to them. Placing control of this areas into the two 'traditional owners', John Mwasi from Brooker Island and David Lebasi from Ware Island also continued to create under-lying discontent within both communities resulting in challenges to their authority emerging from time-to-time.

The main issue at stake for both Brooker and Ware Islanders was their access to valuable but declining sea cucumber stocks to secure their livelihoods. At the height of the dispute, Elimo (2001b), the then Samarai-Murua District Administrator, blamed the high prices for beche-de-mer for the dispute between Brooker and Ware Islanders. Tauliso (2001b), the then Deputy Provincial Administrator stated that the dispute was caused by greed. Over-harvesting of sea cucumbers was incentivised by the high prices paid, the use of new technologies such as hookah gear and the desire for dinghies and outboard motors to access other marine territories. This inevitably resulted in a 'race to fish' and a contest over resources and the pursuit of cash broke down previous relationships between groups and led to confrontation.

The ability to exclude others from a fishing ground is a fundamental local tenureship right but requires the establishment of clearly defined boundaries and policing. Both Ware and Brooker Islanders tried to exclude each other from accessing marine resources in what they believed to be their own marine territory. In the case of the dispute between Brooker and Ware Islanders, the situation became so volatile that in the early 2000s, there was a need to seek recourse from the Papua New Guinea State process of mediation and affirmation by the courts.

As greater incomes were made, competition increased as people desired cash for life's necessities, and for raising their status in mortuary activities. The rise in disputes was also complicated by cultural loss, the loss of historical knowledge and a breakdown in leadership and communal respect. Further complications were due to poor or little understanding of the legal frameworks in the mediation process, as well as a lack of understanding of the limit of resources (see Chapter 8). Once disputes have started, processes need to be established for mediation. If a consensus cannot be reached, some compromise needs to be established. This is what happened between Brooker and Ware Islanders.

This chapter has demonstrated levels of fluidity of local marine tenureship arrangements involving Brooker Islanders and their island neighbours. Before commercial activities emerged, 'community ownership[41]' and an open access regime were common throughout the Louisiade

[41] Community ownership is made up of multiple groups that have shared permanent residence which bonds them together rather than kinship or clan or sub-clan affiliation. People of the Louisiade Archipelago have

Archipelago. However, when cash earning opportunities developed, and when sea cucumber stocks started to decline and which peoples' livelihoods depended upon, disputes arose. In the next Chapter, I will discuss the impacts of the moratorium that was imposed by the National Fisheries Authority in October 2009 on the sea cucumber fishery and beche-de-mer trade.

also had to contend with 'non-community membership, as exampled by the incursions of Vietnamese Blue Boats (see Chapter 4), but can also include local 'poachers' from other parts of the Louisiade Archipelago.

Chapter 7
Impacts of the Moratorium

Sea cucumbers have been described as 'marine gold' (Christensen, 2011). They have also been dscribed as 'lootable' resources (see Lujala and Rustad, 2011; Eriksson et al., 2015). In the years preceding the moratorium imposed by the National Fisheries Authority in October 2009, the sea cucumber fishery and beche-de-mer trade had become the main livelihood activity. As noted in the previous chapter, with rising prices and declining stocks, harvesting pressure for sea cucumbers intensified, resulting in an increase in disputes of access to areas with remaining sea cucumber stocks.

The decision by the National Fisheries Authority to implement the moratorium was made in part by information derived from stock assessments that they had been conducting in eight of Papua New Guinea's maritime provinces in the two previous years. Additional factors that influenced the National Fisheries Authority's decision included the declining size of beche-de-mer (i.e. individual pieces were smaller) that were being exported as well as the total allowable catches designated for each maritime province being continuously exceeded[1]. In Milne Bay Province, the sea cucumber fishery and the beche-de-mer trade has always closed early because its allocated total allowable catch had been exceeded, and on many occasions, quite excessively[2] (Table 7).

After nearly 50 years of specialisation in sea cucumber fishing and beche-de-mer processing, the moratorium forced an economic collapse within the Brooker Island community (see also Koczberski et al., 2006; Schwarz et al., 2009; Bayliss-Smith et al., 2010; Christensen, 2011 for other examples). The rhythm of daily life and diet of Brooker Islanders was dramatically transformed.

[1] In best practice fisheries management, a total allowable catch establishes sustainable catch limits or controls the amount of effort for a species, set of species or stock within a set timeframe.

[2] In the 1998 Milne Bay Provincial Beche-de-mer Fishery Management Plan, a total allowable catch had been set at 80 mt. In the 2001 National Beche-de-mer Fishery Management Plan, the total allowable catch for Milne Bay Province was set at 140 mt. This increase was due to two reasons, the first was poor extrapolation of data obtained from the Conservation International's survey in 2000, and secondly, pressure from the Managing Director of Kiwali Exports, the now Milne Bay Provincial Governor, Sir Jon Luc Critten. Following a comprehensive stock assessment that I co-ordinated with the Commonwealth Science and Industry Research Organisation in 2001, the maximum sustainable yield for the sea cucumber fishery in Milne Bay Province was estimated to be 108 mt, so the figure of 80 mt that was listed in the 1998 Milne Bay Provincial Beche-de-mer Fishery Management Plan was appropriate to ensure a sustainable fishery.

Table 7: Opening and Closure Dates, and Total Allowable Catch in the Milne Bay Province.

Year	Date of Opening	Gazetted Date of Closure	Actual Date of Closure	Total Allowable Catch (t)	Total Amount of Beche-de-mer Exported (t)	Amount Exceeded (t)
1998	1st December	30th November		80	108.7	38.5
1999	1st December	30th November		80	52.2	
2000	15th December	30th September		80	138.6	58.6
2001	15th January	30th September	8th June	140	210.1	70.1
2002	15th January	30th September	14th June	140	186.7	46.7
2003	15th January	30th September	31st May	140	210.9	71.0
2004	15th January	30th September	15th June	140	177.5	37.5
2005	15th January	30th September	6th June	140	189.1	49.1
2006	15th January	30th September	23rd June	140	188.4	48.4
2007	15th January	30th September	20th July	140	171.0	31.0
2008	15th January	30th September	31st July	140	149.2	9.2
2009	15th January	30th September	14th July	140	161.0	21.0
2010-2016	**Moratorium**					
2017	1st April	30th September	9th June	118	191.1	73.1
2018[3]	1st August	31st October	26th October	200	270.3	70.3
2019	Still pending decision by the National Fisheries Authority					

Source: National Fisheries Authority.

Brooker Islanders responded to this livelihood crisis by reducing household expenditures, focusing on new income streams, and concentrating more on gardening, as well as intensifying trade. With less cash, there was also a reduction in social and cultural obligations, particularly those associated with mortuary activities. The loss of cash income not only affected their livelihood options, but also their quality of life.

Reaction to the Moratorium

As noted in Chapters 3 and 4, Brooker Islanders have been participating in the global economy since the late 19th Century. Following World War II, stronger efforts were made by the colonial government to expand commodity production with a particular emphasis on co-operatives and a focus on copra and trochus (see Chapter 4). Following the collapse of copra in the early 1990s, Brooker Islanders expanded their productive base to focus on the harvesting of sea cucumbers for the production of beche-de-mer for sale. Brooker Islanders have serially moved from one economic opportunity to another to continue to have cash incomes to support their livelihoods.

[3] Under the 2018 Management Plan, the opening was supposed to be the 1st of July, but due to a variety of issues related to National Fisheries Authority's preparation, the opening did not happen until the 1st of August. The 2018 season was also extended by the National Fisheries Authority to allow for villagers from outer-islands to provincial capital centres.

During my main fieldwork period of 1998 and 1999, I estimated that annual income per household for Brooker Islanders from the sale of marine resources was PGK 805.80[4] with beche-de-mer being the dominant income source, making up 47 per cent of annual income followed by trochus shell, crayfish, and fish (Kinch, 2001a; Vieira et al., 2017). This figure at that time represented 'real' income as Brooker Islanders had no other income sources. Whilst other communities have a greater reliance on remittances, such as Ware Islanders[5], out migration for Brooker Islanders to urban centres where wage employment is available is extremely low. There are some remittances from those Brooker Islanders living in Alotau and Port Moresby, but these are minimal especially with the increasing costs of food and goods, and the declining state of the overall Papua New Guinea economy. This situation is similar to many other communities in the Louisiade Archipelago (Foale, 2005; Friedman et al., 2009; Rollason, 2010b, 2014b).

Rollason (2010b) has noted that in the case of Panapompom Islanders in the Deboyne Group of Islands directly to the north of Brooker, that the sea cucumber fishery and beche-de-mer trade was more artisanal in nature and not as important as a capitalist enterprise as they had adequate gardening land. This contrasts to the situation for Brooker Islanders where income from diving for sea cucumbers and the fishing of other marine resources has played a much more important part in sustaining Brooker Islander livelihoods.

From figures obtained by beche-de-mer exporters based in Alotau, the sale of beche-de-mer for Brooker Islanders accounted for 61 per cent of all annual income from the sale of commodified marine resources in 2007 to those exporters. In 2008, beche-de-mer accounted for 68 per cent of annual income, and in 2009, the last season before the moratorium, 83 per cent of annual income was from beche-de-mer (Vieira et al., 2017). The large increase in income from beche-de-mer in 2009 was because Brooker Islanders harvested as much sea cucumbers as they could find before the closure. The next year after the moratorium had been implemented, the overall total annual income for Brooker Islanders dropped by 92 per cent (Vieira et al., ibid). Total household income is estimated to have averaged PGK 653[6] between 2007 and 2014, with a peak of PGK 1,945[7] in 2009 (Vieira et al., ibid).

[4] Equivalent to ~ AUD 465.45 in 1999. In 1993, Hayes (1993) estimated that for Brooker Island's neighbour to the east, Ware Island, that the average annual income overall for Ware Island households was around PGK 600.00, with the sale of marine resources contributing a third to this amount.
[5] Hayes (1993) previously estimated that approximately a third of Ware Island's population was living away in other urban centres, and that the main source of income for those residing on Ware Island was from remittances.
[6] Equivalent to ~ AUD 291.45 using 2011 conversion rates as a mid-way point.
[7] Equivalent to ~ AUD 916.10 in 2014.

When the sea cucumber fishery had been open, cash was readily used for the purchase of store foods as well other goods including dive torches, dive masks and fins, fishing gear, homewares, hardware and tools. With recent innovations in solar power and telecommunications, solar power cells and lights[8], mobile phones and other electronic equipment were also obtainable. Brooker Islanders also spent large amounts on fuel, fiberglass dinghies and outboard motors in the pursuit of sea cucumbers (see also Foale, 2005). Reminiscent of the annual closed season for sea cucumber fishing when there is no money to buy fuel, following the moratorium, most dinghies on Brooker Island were turned upside down on the beach with their outboard motors hung on racks away from the weather. Many were also repossessed by the major beche-de-mer exporting companies based in Alotau. Following the moratorium, there was a resurgence in the use of sailing canoes.

As a result of the moratorium, the consumption of rice and canned protein by Brooker Islanders invariably decreased, and the consumption of tubers, plantains and sago increased. These foods became more readily obtainable as Brooker Islanders began to make more gardens and intensified inter-island trading. The production of new gardens was also assisted by the simple fact that Brooker Island men were now largely island-bound, and subsequently available to assist women in the task of preparing gardens. Although there is considerable variation and debate over the ways fisheries trade can contribute to food security (see Bene et al., 2016), the relationship between fishing for sea cucumbers and selling them as beche-de-mer for cash and securing enough food has additional complexities. When the sea cucumber fishery was open, Brooker Islanders fished more, bought more store food and reduced their garden labour. Subsequently, improved food security through a stronger ability to buy food coexists with decreased food security through reduced capacity to produce food.

Whilst negative social effects including binge drinking and socially unacceptable sexual liaisons have been observed in other parts of Melanesia when there has been excess cash entering a community (Kinch et al., 2006, 2007; Christensen and Mertz, 2010; Christensen, 2011; Barclay et al., 2019) this was not really an issue on Brooker Island. Rasmussen (2015) has suggested that the wealth obtained from sea cucumber fishing and the sale of beche-de-mer in Manus Province was disproportionately held by young men resulting in few long-term benefits to the community causing resentment between older senior men and younger men. I never observed this type of social friction on Brooker Island as families and extended kin worked together in their economic activities for the good of the group. It is possible that as the moratorium came closer, that internal conflicts became greater as people did ‘race-to-fish’. One positive impact of the moratorium is

[8] In Ontong Java, in nearby Solomon Islands, fishers also bought solar panels with beche-de-mer money, thus improving power to their communities (Christensen, 2011; Christensen and Mertz, 2010).

that there was an immediate improvement in inter-and-intra-community cohesion as well as greater family interaction.

As noted in Chapter 5, a large part of Brooker Island life is tied up with other important activities that are not directly related to earning cash income, however these activities were reliant on cash for their fulfilment. Before the moratorium, the timing and logistics of all important social activities, from gardening to mortuary feasts, were governed not only by the seasonal calendar for gardening, but more importantly by the annual open and closed season for sea cucumber fishing and the beche-de-mer trade. When the sea cucumber fishery opened each year, the obligation to use wealth in socially significant ways meant that mortuary rituals became more lavish. More pigs and store foods were purchased. In 1999, because of this 'inflation in ritual', there was talk on Brooker Island of dropping some stages in the mortuary cycle due to the cost of hosting such events and collapsing the extended sequence of five feasts into a single event, and to just the last phase of *lobek*, the cementing of the grave (see also Bainton and Macintyre, 2016; Schram, 2018).

Following the moratorium, it became very difficult to conduct customary obligations due to limited cash availability and the prioritisation of immediate needs. In 2017, as a result of increased availability of cash with the end of the moratorium, my brother Ado chose to honour his obligations to his father, the late Jubilee Sam. It had been 20 years since Jubilee passed away and now with the reopening of the sea cucumber fishery and the beche-de-mer trade, there was money once again circulating in and around Brooker Island. Gardens had also rebounded from the 2013 El Nino event and Cyclone Ita in 2014. Subsequently, more 'customary' obligations were able to be conducted.

When the moratorium was implemented in October 2009, Brooker Islanders had already had some experience with a downturn in the local economy of the Louisiade Archipelago when in April 2004, Misima Mines Limited closed (Byford, 2002). Misima Mines Limited was in operation for just over 10 years in duration, but it had a major economic impact not only for Misima Islanders, but also the people of the Louisiade Archipelago. During its operations, Misima Mines Limited had provided money by way of wages to mostly Misima Islanders[9], compensation, royalties and business opportunities (Macintyre and Foale, 2007). The presence of cash also caused inflation in both ceremonial and subsistence economies. On one evening, I asked Starford if people thought that there had been any benefits for Brooker Islanders from the presence of Misima Mines Limited. He answered, "No!". I then asked what about trading as Ado had just returned with two

[9] Many Misima Islanders who worked in either technical or professional roles at Misima Mines Limited secured work at other mining projects throughout Papua New Guinea.

sheets of black builder's plastic for making sails. Starford's reply was, "They still make us pay for it".

When previous mining operations ceased on Misima Island after World War II, people simply reverted to former practices. However by 2004 the dependency on cash and waged employment meant that with the closure of Misima Mines Limited, Misima Islanders were left with no comparable economic activities. The most common option for many Misima Islanders was to join the sea cucumber fishery and beche-de-mer trade but this increased disputes over access to the declining sea cucumber stocks (see previous Chapter).

Another observable impact of the moratorium was that all of the trade stores on Brooker Island initially closed. During the sea cucumber fishing season, many trade stores throughout the Louisiade Archipelago had acted as agents for the main beche-de-mer exporters based in Alotau. In the intervening years, only two trade stores endured through the moratorium period, one on Brooker Island, and another on nearby Venaliwa Island.

Income Alternatives

Allison and Ellis (2001) have noted that diversification of livelihood activities is one strategy that fishers can use to buffer uncertainty in their lives. As has already been mentioned, by the early 1990s, copra production had collapsed throughout the Louisiade Archipelago[10]. Prior to the moratorium, many of the coconut plantations owned by Brooker Islanders were overgrown from neglect with many coconut palms approaching senility or already senile[11]. In the first year after the moratorium, Brooker Islanders began cleaning their coconut plantations and did conduct some new plantings. The copra price has never been high, generally being subsidised to entice production and subsequently copra has not been a major contributor to the livelihoods of Brooker Islanders since its early heydays. Due to poor market accessibility and the high cost of transport and freight, producing copra was not considered as a viable cash income option by Brooker Islanders.

In response to the moratorium and the poor prospects of copra, Brooker Islanders intensified fishing, harvesting trochus in larger quantities, as well as targeting sharks for the production of shark-fins (see also Schwarz et al., 2009; Foale et al., 2010; Purdy et al., 2017). With the closure

[10] In 1994, Hide et al. (1994) reports that copra was still being produced on Motorina Island, but no longer on Brooker Island. During my time on Brooker Island in 1998 and 1999, no one on Brooker Island produced copra.

[11] A senile coconut palm is one that has passed its productive age and does not bear coconuts any longer. Coconut palms have a lifespan of approximately sixty years, and must be replaced regularly to maintain the productivity of a plantation.

of the sea cucumber fishery, shark fishing became of greater importance. Participation was however not available to all as it requires having access to the right gear. In the past, Brooker Islanders had gained access to the right type of fishing gear from tuna long-liner vessels that had run aground within their marine territory (see Chapter 4).

Whilst more Brooker Islanders were involved in shark fishing than in the past, purchasing data by some of the major marine resources exporters based in Alotau indicated that shark-fin production for Brooker Islanders was actually higher when the sea cucumber fishery was open (Vieira et al., ibid). This was because Brooker Islanders spent significant amounts of time on the outer islands while diving for sea cucumbers with substantial time to also target shark. There was also greater market access for Brooker Islanders when the sea cucumber fishery was operating because buying vessels from Kiwali Exports and Asiapac would visit. Following the moratorium, annual shark-fin income for Brooker Islander actually fell by 75 per cent[12], being intensified by falling prices for shark-fin as marine resource exporters reduced prices to increase profits (Vieira et al., ibid).

In 2014, the Brooker Island community obtained a small workboat from the then Member of Parliament for the Samarai Murua District, Hon. Gordon Wesley. With the arrival of this vessel, Brooker Islanders once again had market access to Alotau and shark-fin production increased. Brooker Islanders also began transporting fish and lobster to Alotau. Unfortunately as noted previously, as of 2018, this workboat was no longer operating as it was awaiting mechanical repairs and later re-allocated to another island community.

The Re-opening

The moratorium lasted a total of seven and one half years, and results from stock assessments conducted by the National Fisheries Authority showed that sea cucumber stocks were only partially restored. Unfortunately, despite recommendations that the sea cucumber fishery and beche-de-mer trade remain closed, the re-opening of the sea cucumber fishery and beche-de-mer trade coincided with the Papua New Guinea national elections. Because of this, the National Fisheries Authority received significant political pressure to reopen the sea cucumber fishery and beche-de-mer trade. As an example, it was initially proposed that Milne Bay Province would open the sea cucumber fishery and beche-de-mer trade for a for a one-month trial in January 2017. This would have made Milne Bay Province the only province to open in Papua New Guinea before the official opening as per the 2016 National Beche-de-mer Management Plan of the 1st of April. In response, the then Milne Bay Provincial Governor, Hon. Titus Philemon, took out a

[12] Similarly, Glaus et al (2019) observed a fall in shark-fin production after the closure of the sea cucumber fishery in Fiji.

court injunction against the National Fisheries Authority to halt the early opening (Setepano, 2017).

On the 1st of April 2017, the National Fisheries Authority did reopen the sea cucumber fishery but did not issue any licenses for the companies involved in the beche-de-mer trade until the 20th April 2017, the same day that the writs were issued for the Papua New Guinean national election. More problems emerged as 13 exporter license applications for Milne Bay Province had been received by the National Fisheries Authority, but undue influence with the National Fisheries Authority Board meant that only the two largest and oldest exporting companies, Kiwali Exports and Asiapac were licensed. In response to this situation, the National Fisheries Authority had to call an emergency board meeting to license further exporters (Anonymous, 2017). In the end, seven licenses were approved for the 2017 season in Milne Bay Province.

In April 2018, the sea cucumber fishery and beche-de-mer trade was delayed in opening until the 1st of August. This was one month after the new designated date of the 1st of July. The newly installed and previous Milne Bay Provincial Governor, Hon. Sir Jon Luc Critten and owner of Kiwali Exports tried to stop the Milne Bay Provincial business arm, the Milne Bay Sustainable Development Corporation from obtaining an export licence for beche-de-mer to protect his own export company (Anonymous, 2018). Three other companies, Milne Bay Sustainable Development Corporation, Milne Bay Seafood Exporter Limited, and Muyuw Limited also sought a court injunction to stop the opening of the sea cucumber fishery as their licenses had been denied by the National Fisheries Authority Board (Anonymous, ibid.). Again the National Fisheries Authority had to call a special board meeting, and another 10 exporter licenses were issued, bringing the total to 13 export companies licensed to operate in Milne Bay Province in 2018.

A negative outcome of the reopening in 2017 was that significant amounts of undersize sea cucumbers were harvested resulting in much of the beche-de-mer being rejected. This high level of undersized beche-de-mer was due in part to the increased number of people fishing for sea cucumbers because of this 'windfall' opportunity[13], but also because people had lost their expertise in processing. Younger people that were in early adolescence when the moratorium was implemented were now adults who could dive for sea cucumbers, but had no history of processing. Subsequently, people received lower prices for their beche-de-mer or had them rejected outright, thus lowering returns for fishers.

[13] Hair et al. (2019) noted for the Tigak and Tsoi Islands in the north of New Ireland Province that when the sea cucumber fishery was reopened, the sale of other marine resources decreased and that the production of copra ceased altogether.

Nonetheless, in 2017, 200 mt of beche-de-mer was exported from Milne Bay Province earning PGK 21,831,784[14] in cash. Of this amount, Brooker Islanders made PGK 160,443[15]. In 2018, 270 mt of beche-de-mer was exported from Milne Bay Province earning PGK 26,575,700[16], of which Brooker Islanders made PGK 131,072[17].

The opening of the sea cucumber fishery and beche-de-mer trade has not happened in 2019 as the National Fisheries Authority has deferred the opening until further notice citing concerns over sea cucumber stock status (Anonymous, 2019). This delay angered the Papua New Guinea Fishing Industry Association who openly criticised the National Fisheries Authority for failing to effectively manage the sea cucumber fishery and beche-de-mer trade since its reopening in April 2017 (Moi, 2019).

Conclusion

When the sea cucumber fishery was open, Brooker Islanders enjoyed the benefits it brought to their lives. The financial difficulties experienced by Brooker Islanders once the moratorium was implemented stemmed from their now cash dependent lives. When the moratorium came into force, the reduced income to meet the cost of store foods, coupled with low garden production meant that food was difficult to find. In recent years, natural disasters such as cyclones and El Nino associated droughts, combined with population growth have also made livelihood circumstances for Brooker Islanders even more difficult. Shark-finning and the harvesting of trochus shell helped to fill the void to some degree. Unfortunately Brooker Islanders are without other income alternatives. They are also stuck where they are, they cannot move to new areas, nor can they access other fishing grounds without coming in to conflict with other users (see Chapter 6). Subsequently the development of alternative livelihoods for Brooker Islander is very difficult and will continue to be.

After the long wait through the moratorium, it appears that the sea cucumber fishery and beche-de-mer trade may go 'bust' again, following a classic boom-and-bust cycle. Poor management is complicated by the undue political influence on the National Fisheries Authority. For example, the total allowable catch allocated to Milne Bay Province in the 2016 National Beche-de-mer Fishery Management Plan for the 2017 season was 118 mt, and later changed to 142 mt for the 2018 season under the revised 2018 National Beche-de-mer Fishery Management Plan. In July 2018, the National Fisheries Authority Board arbitrarily increased the total allowable catch from 142 mt to 200 mt for the 2018 season, an increase of nearly 41 per cent. Actions such as this, not

[14] Equivalent to ~ AUD 55,410,618.50 in 2017.
[15] Equivalent to ~ AUD 407,215.60 in 2017.
[16] Equivalent to ~ AUD 60,869,674.75 in 2018.
[17] Equivalent to ~ AUD 300,211.50 in 2018.

only impact on the long-term sustainability of the sea cucumber fishery and beche-de-mer trade, but also the economic benefits that are derived from it for communities like Brooker Islanders. The subsequent lobbying by powerful exporting companies and undue political interference within the National Fisheries Authority Board have created a situation where sustainable management of the sea cucumber fishery is increasingly becoming difficult.

In the next chapter, I will look at issues of sustainability and governability for the sea cucumber fishery and beche-de-mer trade, as well as various conservation initiatives that have been attempted in the Louisiade Archipelago and subsequent responses to these initiatives.

Chapter 8
Sustainability and Governability

In much of Melanesia, decisions over resource use tend to be formulated according to a number of factors relevant to daily life, and do not appear to be adequately explained in terms of a conservation ethic (Pernetta and Hill, 1981, 1982; Bulmer, 1982; Polunin, 1984; Hviding, 1996; Aswani, 1999, 2017; Foale et al., 2016). A conservation ethic is said to be present when there is an awareness that natural resource depletion can occur as a result of human activity, coupled with a commitment to reduce or eliminate the problem (Berkes, 1999). In the case of the sea cucumber fishery and beche-de-mer trade, local level management has certainly not been evident. The failure of fisheries management arrangements at multiple levels contributes greatly to governability problems to ensure sustainability. These problems can be described as being 'wicked[1]' (Coyne, 2005; Jentoft, 2007; Jentoft and Chuenpagdee, 2009; Khan and Neis, 2010; Barclay et al., 2016, 2019). To resolve this wicked problem, understanding the diverse and complex social-ecological relationships as well as the legal mandates of both government and communities is required (Jentoft, 2000; Fabinyi et al., 2015; Jentoft and Chuenpagdee, 2015; Dutra et al., 2019).

Maintaining healthy stocks of sea cucumbers is important not only for the economic benefits that the sale of beche-de-mer provides, but also to ensure healthy marine environments (Purcell et al., 2017; Lee et al., 2018a). Sea cucumbers unfortunately are easily overexploited due to their low mobility, density-dependent reproduction and low recruitment rates[2], their ease of capture and their high value (Kinch et al., 2008b; Anderson et al, 2011; Purcell et al., 2013). Once sea cucumber stocks have been depleted, even with harvesting closures, sea cucumber stocks require decades to recover (Uthicke and Benzie, 2003; Uthicke and Purcell, 2004; Uthicke et al., 2005; Anderson et al., 2011). Healthy sea cucumber populations help to bioturbate reef sediments, significantly reducing micro-algae and releasing nutrients that would otherwise remain trapped in the sediment (Uthicke, 1999; Lane and Limbong, 2013; Conand, 2018). As sea cucumbers ingest large quantities of carbonate sands, they also influence the calcium carbonate budget on coral reefs (Schneider et al., 2011; Bell et al., 2018). Holothurians are also important prey in coral reef

[1] A problem is wicked when it is difficult to define and delineate from other and bigger problems (Jentoft, 2007). Wicked problems pose a constant challenge, partly because it is difficult to know for sure when or if they are solved.

[2] When sea cucumber stocks are at low population densities, their method of reproduction by broadcast spawning may also induce an Allee effect resulting in population collapse and thus inhibiting recovery (Allee 1938; Bell et al., 2008). The Allee effect is the decline in individual fitness of a species when their population densities reach a threshold below which they can no longer reproduce and sustain themselves.

food webs where they are consumed particularly by fish, sea stars and crustaceans (Francour, 1997; Anderson et al., 2011; Purcell et al., 2016).

As has been noted previously, there are significant issues to be addressed if communities like Brooker Islanders and the National Fisheries Authority are to ensure both biological sustainability of sea cucumber stocks as well sustainable economic returns from the sea cucumber fishery and beche-de-mer trade. The outcomes of management interventions depend to a large extent on compliance with rules and fishers' compliance entails consideration of the risks and benefits of non-compliance (Sutinen and Kuperan, 1999; Jentoft, 2000; Hauck, 2008; van Tatenhove, 2011, 2013; Rohe et al., 2017).

This chapter explores legislative instruments and previous management actions for the sea cucumber fishery and the beche-de-mer trade, as well as previous marine conservation initiatives in Milne Bay Province. In detailing the issue of governability for sustainability for the sea cucumber fishery and beache-de-mer trade, I examine different theoretical approaches including legal pluralism, interactive governance theory, and the governance of fisheries value chains. These approaches are interrelated to each other and are becoming a much stronger element in anthropological analysis particularly when trying to understand the complexities of governance over natural resources. These approaches will be used to show what could be done and by whom, by the sharing of roles and responsibilities that would ensure that Brooker Islanders have viable livelihoods into the future.

Government Management Arrangements

From 1891-1934, the management of commodified marine resources was through the various Pearl-Shell and Beche-de-mer Fisheries Ordinances of the Territory of Papua's Government (Government of Territory of Papua, 1910, 1934) and the Australian government (Government of Australia, 1953, 1970). These Ordinances were implemented for the management of foreign operators, vessel owners and divers. The Ordinances also controlled designated ports of operations and exports[3]. Size limits were set for trochus and pearl shell, but not for live sea cucumbers or beche-de-mer. Although these Ordinances did not specifically affect 'native' fishing, the Lieutenant-Governor in Council could grant leases[4] to any reef, foreshore area of any

[3] In 1923, there were six ports in the Territory of Papua with four of these six being in what is now Milne Bay Province. Each of these ports had a corresponding number, A was for Port Moresby, B was for Samarai Island, C was for Daru, D was for Bwagaoia on Misima Island, E was for Losuia in the Trobriand Group of Islands, and F was for Kulumadau on Woodlark Island (Russell, 1970).

[4] These leases could be granted to expatriate operators for the collection, storage, cultivation or propagation of pearl shell oysters, sea cucumbers, sponges or any other marine products.

island or any Crown land that was below the high-water mark in the waters of the then Territory of Papua. The Lieutenant-Governor in Council could also designate closed seasons and areas.

In the late 1990s, the National Fisheries Authority was formalised as a non-commercial statutory authority established under the 1998 Fisheries Management Act[5] (Government of Papua New Guinea, 1998a). One of the functions of the National Fisheries Authority is to develop, implement and enforce specific species management plans.

In 1998, the Milne Bay Provincial Beche-de-mer Fishery Management Plan (Government of Papua New Guinea, 2000) was gazetted. The objectives of this plan were to ensure sustainability of sea cucumber stocks through the promotion of good fisheries management practices, and community self-regulation through sustainable 'traditional' management practices[6]. This plan was superseded when the National Fisheries Authority implemented the 2001 National Beche-de-mer Fishery Management Plan[7] (Government of Papua New Guinea, 2001). In response to the introduction of this new plan, the then Milne Bay Provincial Governor, Hon Titus Philemon was reported as saying that thousands of people now have access to the cash economy for the first time since the collapse of copra and that it was unrealistic of the National Fisheries Authority to impose limits on catch especially when the people of Milne Bay Province are regarded as marine gardeners carefully preserving their resources (Anonymous, 2000). During the moratorium, this plan was revised in 2016 and again after the first season in 2017 (see Appendix V for details of the various management plans).

Besides the issues mentioned in the previous chapter, the National Fisheries Authority lacks the capacity to monitor and enforce rules. More recent issues also include financial constraints, especially due to the implementation of the 2017 Public Monies Management Regularisation Act (Government of Papua New Guinea, 2017a). The implementation of this act, saw the National Fisheries Authority, along with all other government statutory authorities, have 90 per cent of all revenue held by them transferred to the National Department of Finance. Coupled to this are the economic circumstances that confront many fishers like Brooker Islanders, causing them to

[5] The 1998 Fisheries Management Act was amended in 2014.

[6] These traditional management measures were to be published in the National Gazette as an official record of 'traditional management systems' for a specified area. In 1991, the Milne Bay Provincial Government proposed demarcating and registering traditional fishing rights over areas that they claimed. It was thought that by doing this, 'traditional' owners would exploit the marine resources within their sustainable limits (Omeri, 1991). No areas were ever put forward. Also, in recognition of the possibilities of disputes, under Section 10 (a), Local Level Governments were to establish measures to settle disputes which could arise over the ownership or poaching of sea cucumber stocks.

[7] In addition, in April 2002, three Prohibitions were published in the National Gazette in support of the management regulations in the 2001 National Beche-de-mer Fishery Management Plan. These reinforced the prohibitions listed in the 2001 National Beche-de-mer Fishery Management Plan of taking sea cucumbers using underwater breathing devices and the use of underwater lights or surface lights at night. These Prohibitions also set size limits.

respond to declines in ways that expand and reinforce unsustainable rates of harvest. This latter point is also exacerbated by the increase in the prices that have been paid for beche-de-mer. Prices paid to fishers have increased over the last three decades, with some species of previously low-value beche-de-mer showing increases in prices of approximately 3,000 per cent (See Appendix N).

Besides the use of total allowable catches and an annual closed season, the main management measures for the sea cucumber fishery and beche-de-mer trade in Papua New Guinea are the use of size limits for individual sea cucumbers species (see Appendix W). The taking of undersize sea cucumbers results in a loss of potential income and depletion of future stocks through the indiscriminate collection and subsequent rejection by exporters of undersized beche-de-mer[8]. As noted in the previous chapter, with the reopening of the sea cucumber fishery and beche-de-mer trade in April 2017, a large proportion of beche-de-mer was rejected for being undersize or because of incomplete processing. In 2018, the National Fisheries Authority tried to alleviate this problem by providing processing training for interested companies in various Provincial capitals[9].

Overall, because the sea cucumber fishery and the beche-de-mer trade is dispersed over a large maritime area with little government presence, most management measures are not applied. Brooker Islanders along with the majority of coastal and island communities across Papua New Guinea are left to manage their sea cucumber stocks themselves. In all the three previous management plans, there has been a section on 'traditional management practices' which means that community management of their sea cucumber fishery will be recognised as long as it does not conflict with the management plan. To date, no community in Papua New Guinea has utilised this provision of the management plan or other legislative instruments to manage sea cucumber stocks (see below).

At the national level, the National Fisheries Authority has also developed a 2017-2026 Roadmap for Coastal Fisheries and Marine Aquaculture which has sections for the better management of the sea cucumber fishery and beche-de-mer trade (Government of Papua New Guinea, 2017b). To date the roadmap has not been implemented.

[8] In a study conducted by Lee et al. (2018b), they modelled the economic benefits of imposing and strictly enforcing minimum size limits for several sea cucumber species. From this study, it was determined that if minimum legal size limits were enforced, the entire long-term harvest of some species could increase by up to 91 per cent of biomass and generate up to 144 per cent more revenue.

[9] In the 2018 National Beche-de-mer Fishery Management Plan there is now provisions for companies to also provide training.

Sea cucumber Stocks in the Louisiade Archipelago

The first marine resource stock assessment conducted in the Louisiade Archipelago was in 1980. This stock assessment was requested by the Milne Bay Fishing Authority and was conducted along portions of the Long-Kossman Reef stretching from Ware Island to the Bramble Haven Group of Islands. Chesher (1980) determined that the average number of the commercial sea cucumber species[10] to be 48 to 106 animals per linear km of reef along the Long-Kossman Reef area. This area was thought to be only lightly fished at this time, though Chesher (ibid.) noted that the reefs around Ware Island were already depleted.

In 2000 a Marine Rapid Appraisal survey was conducted by Conservation International in the D'Entrecasteaux Group of Islands and the Louisiade Archipelago (Allen et al., 2003a). This taxonomic survey of fish, corals and molluscs also attempted to do a simple stock assessment, though no abundance assessments were made. As noted in the previous chapter, the National Fisheries Authority used the results of this survey to raise the total allowable catch from the previous 80 mt to 140 mt for Milne Bay Province. Following this survey and at the request of the Milne Bay Provincial Fisheries Management Committee in March 2001, I led a thorough stock assessment across the whole of Milne Bay Province[11] in October-November 2001. The results of this stock assessment showed that the overall density of 21 sea cucumbers per ha (Skewes et al., 2002) was significantly lower than densities reported for a comparable fishery in the Torres Straits of Queensland of 160 sea cucumbers per ha (Long et al., 1996), and was similar to heavily depleted fisheries such as Timor Box in Western Australia with densities of 27 sea cucumbers per ha (Skewes et al., 1999). Sea cucumber densities across the Bwanabwana and Louisiade Local Level Government areas were very low.

Local Notions of Sustainability

It is commonly stated that indigenous communities have historically deep relationships with the environments that they live in and this has often led to an intimate knowledge of ecosystem components and interactions (Agrawal, 1995; Ellen et al., 2000; Horowitz, 2015). This understanding falls under the labels of 'indigenous knowledge', or 'traditional ecological

[10] These being prickly redfish (*Thelenota ananas*), black teatfish (*Holothuria whitmaei*) and white teatfish (*H. fuscogilva*).
[11] In total, 1,126 sites were surveyed in Milne Bay Province (Skewes et al., 2002).

knowledge[12]'. In this thesis, I use the term 'local ecological knowledge' in part because the term 'traditional' can be a problematic word for anthropologists[13]'.

In workshops that I ran with Brooker Islanders in 1999, I queried Brooker Islanders on the reproduction processes for the various marine resources that they exploited. Whilst Brooker Islanders described elements of their seasonal calendar (see Orlove, 2003; Mondragon, 2004), they had no comprehension of how sea cucumbers, giant clams and trochus reproduced (see also Foale, 2005; Macintyre and Foale, 2007; Fabinyi et al., 2015). Brooker Islanders were also able to provide some knowledge of where certain fish aggregated and at what time of the year they could be found there, but they did not know why they aggregated. In the consultative phase of the Milne Bay Fishing Authority, Gada (1981) noted that people in the Louisiade Archipelago had no real knowledge of fish aggregations and that success in fishing was often attributed to magic rather than specific local ecological knowledge (also see Malinowski, 1922). As an example of this, Makol who was acknowledged by the whole Brooker Island community to be the 'best' fisher on the island, his success was never attributed by other Brooker Islanders to his knowledge of fish habits or habitat, but to his knowledge of magic for catching fish[14], or to just plain luck.

In a similar survey, 65 per cent of all Brooker Island household heads acknowledged that their marine resources had become depleted on reef areas on islands that were either close to Brooker Island and on islands that were used extensively or visited by them. Whilst people recognised that some marine resources were harder to find, they did not attribute the decline to themselves, that is they did not see themselves as the agent of that change. Despite recent experiences in the sea cucumber fishery, many Brooker Islanders still thought that declines were short-term and location specific[15] (see also Foale, 2005; Fabinyi et al., 2015).

In early January 1999, Iuda and I were walking around Jomard Island looking for turtles and their nests and as we approached the south-west end of the island where there are several shipwrecks, Iuda said that in the past there used to be plenty of lobsters to be found on the reefs there. Iuda

[12] Both terms follow what Berkes (1999) defines as the cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings including humans with one another and with their environment.
[13] A local ecological knowledge system might be 'traditional' by virtue of its long and deep roots and origin in a specific culture and a local ecological system, but it is not static. Whilst there is much local ecological knowledge inherited from 'elders', local ecological knowledge is also acquired by living in one place for a considerable length of time whereby one can build up a 'database' of locally observed knowledge of species and other environmental phenomena as a component of practice.
[14] Due to Judeo-Christian beliefs, it was very difficult to obtain details of magic, though I did eventually obtain various incantations for fishing and seafaring practices.
[15] For many societies in Papua New Guinea, it has been documented that there was little concern for the sustainability of the natural resources that these societies exploited (see Pernetta and Hill, 1981, 1982). Polunin (1984) states that if there has been a conservation ethic amongst Papua New Guineans, it is simply because of their inability to take more.

then went on to say, the previous presence of the Milne Bay Fishing Authority and Coral Sea Fisheries and now with the demands of Nako Fisheries has meant that harvesting pressure for lobsters has remained heavy. Part of this problem of scarcity however is that Brooker Islanders took all lobsters indiscriminately even if they were 'berried' females[16]. A few days later when we were all again camped at Nabaina Island, Inosi came to sell some large female lobsters that were berried to Nako Fisheries' vessel *FV 434.* People were also selling undersize lobsters. Whilst I was recording purchases, Captain Dyson said "*Ya ba, ya baik elialil. Nige hi atena. Ebo ulabo keikeisil hi ahe, sauge ni nem nige nihi papwawa*" ("I talk, I talk, I talk. These people just do not understand. If they take the small ones, they will not find them in the future"). Captain Dyson told me that he had been telling people for years not to take undersize, but gave up because people complained he would not buy their lobster and they wanted money.

Again, with the closure of the sea cucumber fishery and beche-de-mer trade in October 2009, Brooker Islanders moved initially to producing some copra but also intensify harvesting trochus shell and fishing for sharks. When I visited Brooker Island in November 2014, many Brooker Islanders stated that catch rates for sharks and shark size were in decline[17] (see Vieira et al., 2017). Brooker Islander's awareness of what these observations implied however in terms of shark stock status were mixed.

Prior to colonisation and the influence of the missions, the marine territory claimed by Brooker Islanders had many features within the marine environment that are related to mythical events. Associated with some of these myths is the notion of taboo areas where evil spirits ('*silapa*') are thought to reside. Subsequently many of these area previously acted as exclusion zones. These areas today have largely lost their importance due to changing ideals and greater influence from Christianity, and the demands of earning cash. For example, on one particular trip that I made to Jomard Island in early 1999 to collect timber for the construction of my house, I had been told that in the channel running along the inside of the reef there was a *silapa* shark and that people 'traditionally' had to be quiet so as not arouse it. When we landed, the group that I was with was behaving in a very raucous manner, happy to be let free of the confines of the sailing canoe. I said to them, "Aren't we supposed to be quiet, because of the shark?" In response, a chorus yelled out, "Because the church has come, these things are finished". The influence of Christianity now pervades notions of sustainability and resource abundance. I once asked a group of Brooker Island men, "what would happen if all the sea cucumbers were seen to have finished?" The

[16] Berried female lobsters are loaded with eggs. It was common practice by Brooker Islanders to simply cut the flippers of female berried lobsters so that they were indistinguishable from male lobsters when selling them.
[17] An exporter based in Alotau also stated at the time that they were now receiving fewer large shark fins (Vieira et al., 2017).

response I was given was that, 'God would make more[18]' (see also Foale, 2005; Sabetian and Foale, 2006; Foale et al., 2010).

Conservation Efforts

As seen in Chapter 4, in 1975, the then Department of Environment and Conservation requested the Misima District Officer to visit Brooker Island for consultations to assess tourism potential in Brooker Island territorial waters. They were also requested to look at the possibilities of establishing Wildlife Management Areas[19] under the 1966 Flora and Fauna Act (Government of Territory of Papua and New Guinea, 1966). In consultation with Brooker Islanders, Bourne (1976b, d) reports that Anahaval Pepenapa[20] suggested that Enivala and Panapwa Islands in the Bramble Haven Group of Islands and Jomard Island could become all year-round-reserves, whilst the other islands in the area would remain open for harvesting and fishing.

Nothing actually progressed formally, though a Wildlife Management Committee was established consisting of elders from Brooker, Motorina and Bagaman Islands[21]. In the end, the Wildlife Management Area was never formalised by the government, and athough the notion that the area was a conservation zone persisted, management of resources was not practiced. As an example, when Stevens (1993: 4) visited the Jomard and Bramble Haven Group of Islands as part of his awareness on the Coral Sea Fisheries project he noted the following:

> 'The islands are mainly used for seasonal fishing and the gathering of beche-de-mer, trochus and turtle eggs. It is believed by some islanders that the area is now a wildlife reserve, especially for the preservation of turtles and pigeons.

[18] The belief in the power of God is also associated with the weather. On one occasion I was sailing with Jubilee Sam, Joseph Beteul and Semi Iadila from Bwagaoia on Misima Island back to Brooker Island. On our departure from Bwagaoia late in the afternoon we were hit by a fierce storm and forced ashore on the southern end of Kimuta Island around midnight that evening. The next day we set sail again, only to be becalmed this time. We paddled for hours to keep from drifting out into the open ocean. Prior to this trip, I had just finished reading Malinowski's (1922) '*Argonauts of the Western Pacific*' as Joseph had an old hard cover copy in his house. I said to my three companions, "why don't we sing some spells to bring the wind up" as I had observed little rituals before being performed when sailing on other canoes. My three companions said, "We do not follow those practices anymore because we are Christians, we can sing hymns so God will hear us and send the wind". So my three colleagues sang hymns and the wind came up and we finally made landfall at Brooker Island later that evening. Christian ideas and practices now supplement or substitute ritual acts as hymns are considered to be perfectly equivalent to chanting magical spells (see also Schram, 2018).

[19] Following Chesher's (1980) stock assessments along the Long-Kossman Reef in 1980 there was some consideration of having Nabaina Island registered as a National Park. At the same time, Department of Environment and Conservation Officers visited Ware Island to determine what islands could also be designated as a National Park. Babo and Genolagani (1981) noted that there was resistance to this idea and nothing eventuated.

[20] As noted in Chapter 6, Anahaval was the same man that sold the portion of Jomard Island to the Department of Transport for the erection of the first lighthouse on Jomard Island.

[21] As noted in Chapter 6, there have been competing claims of ownership over the Duchateau Groups of Islands. As the Wildlife Management Committee did not pose any risks to exploitation and as this period predates the sea cucumber fishery, there were more harmonious relationships between island communities.

> Some people said that they were allowed to 'harvest' the eggs of both species for one month and then leave the islands for one month. However, people go down whenever the weather is suitable and take everything that they can find. We tried to encourage them to take only half the eggs from each nesting site and leave the rest. For our troubles we were viewed as something incredibly stupid.
>
> There were several canoes from Motorina Island. One canoe was concentrating on diving for sea cucumbers and one was predominately collecting turtle eggs, they had five 50 kg bags full, which would have amounted to several thousand eggs.'

Over the years, interest in conserving parts of the Louisiade Archipelago has been ongoing. In 1989, the World Bank developed a list of 28 areas for conservation and protection in Papua New Guinea with six of these areas being proposed for World Heritage listing under the 1972 Convention on the Protection of the World Cultural and Natural Heritage (United Nations, 1972). One of these area was to be the Louisiade National Marine and Terrestrial Park (World Bank, 1990). This was an interesting development, because at this time Papua New Guinea was not a signatory to this convention at the time. Papua New Guinea did become a 'party' in 1997 and the notion of world heritage listing[22] for the Louisiade Archipelago has continued (Government of Papua New Guinea, 2014; Hitchcock and Gabriel, 2015).

A serious attempt to conserve the marine environment of Milne Bay Province ramped up when the Milne Bay Community-based Coastal and Marine Conservation Program was initiated in 1999. This program was funded by the United Nations Development Program's Global Environment Facility with Conservation International as the executing agency[23]. The main goal of the Milne Bay Community-based Coastal and Marine Conservation Program was to secure a representative sample of globally significant marine biodiversity[24]. This was to be achieved by establishing an enabling environment within local government for conservation and resource management by supporting communities with environmental education program and conservation awareness activities.

[22] Papua New Guinea now has one world heritage site, the Kuk Early Agricultural Site in the Western Highlands Province (Strathern and Stewart, 1998; Muke et al., 2007).

[23] The Milne Bay Community-based Coastal and Marine Conservation Program represented a third attempt by the Global Environment Facility to inject a large amount of conservation money into Papua New Guinea. The first attempt was the Lak Integrated Conservation and Development Project in the New Ireland Province. This project failed dramatically because local people wanted development rather than conservation (Ellis, 1997; McCallum and Sekhran, 1997). Lessons from this failure were directly applied to the design of the second attempt, the Bismarck-Ramu Project (see van Helden, 1998, 2001), and later to the Milne Bay Community-based Coastal and Marine Conservation Program (Kinch, 2001a; van Helden, 2004, 2009). Conservation International became the first non-government organisation ever to be the executing agency of a Global Environment Facility grant.

[24] At the time, results of Conservation International's Rapid Appraisal Program indicated that Milne Bay Province was the most marine biodiverse area on the planet, a 'biodiversity hotspot' (Allen et al., 2003a).

Despite these intentions, the primary focus of the Milne Bay Community-based Coastal and Marine Conservation Program quickly distilled down to the establishment of marine protected areas[25]. This focus became entangled in various issues. By definition and practice, marine protected areas establish jurisdictions and borders that aim to exclude people. In their efforts to establish marine protected areas, Conservation International inherently were supporting a process of 'territorialisation', a process to spatially demarcate areas for the purposes of controlling and regulating people and nature (see Whitehead et al., 2007; White et al., 2014).

Support for marine protected areas rests heavily on people's perceptions of how management affects their well-being[26] (Jentoft et al., 2007; Mascia et al., 2010; Foale et al., 2016; Bennett et al., 2017; Cohen et al., 2019). These issues also make biodiversity conservation a 'wicked' problem (Game et al., 2014; De Fries and Nagendra, 2017). As West (2016) notes, there are often challenges for conservation practitioners over who has rights over the area in question and who has the right to choose its futures. This also raises issues of sovereignty, an issue that is concerned with territories, the enforcement of conservation and resource management goals, and problems of adjusting governance by institutions to achieve better management (Berkes, 2006; Fabinyi et al., 2014; Leenhardt et al., 2015; Bennett et al. 2017; Mawyer and Jacka, 2018). For Conservation International, the perceived goal was to 'protect' biodiversity for a 'global good'. However, for Brooker Islanders, a conservation or resource management goal has other requirements, namely maintaining livelihoods and the maintenance of other values and practices.

Once I had completed my fieldwork on Brooker Island, I was initially employed under the Milne Bay Community-based Coastal and Marine Conservation Program as the Social Evaluation Expert, and later as the Chief Technical Advisor for Implementation. My main role was to determine the social and cultural opportunities for marine conservation and resource management. Whilst the 'social' is important for successful outcomes, Conservation International focused on biological values in the first instance[27] (van Helden, 2004, 2009; Baines et al., 2006; Dowie, 2009; Balboa, 2013, 2018). Once the program had been approved, I established Village Engagement Teams to be the conduit between the program and communities. These groups consulted with local communities on the aims of the project and created action agendas based on community needs. This process was to help the management of Conservation International understand local

[25] While the benefits for enhancing biodiversity conservation through the use of marine protected areas has been well established, the use of marine protected areas for fisheries management or resilience has shown mixed results (Jones et al., 2007; Bruno et al., 2019; Hamilton et al., 2019).

[26] Non-government organisations often point out to communities that marine protected areas act as 'insurance policies' that ensure food security, prosperity, and enhanced social and ecological resilience.

[27] Conservation International is powerful enough to produce or valorise certain forms of knowledge about nature and to influence nature conservation policies at the highest levels of government. This process is known as 'neoliberal conservation'. Neoliberal conservation creates negative social impacts and highlights social, economic, and political inequalities (McCarthy and Prudham, 2004; Igoe and Brockington, 2007; Buscher et al., 2012; Holmes and Cavanagh, 2016).

resource use and ideas of conservation and development while training the community on Conservation International's ideas of resource use, conservation and development. Unfortunately, this process was derailed when in 2000, the then Chief Executive Officer for Conservation International, Peter Seligman under the auspices of attracting additional funding visited Kwaraiwa Island in the Engineer Group of Islands and promised the community 'cargo' in exchange for their establishment of a marine protected area (Dowie, 2009). This was done despite briefings by myself and the Engineer Village Engagement Team for that area. The problem with cargo conservation, as I warned the management of Conservation International, is that the local incentives to conserve marine resources shifts from restoring sustainability of stocks and food security to obtaining cargo. So when promised goods are not delivered, the conservation motive disappears. Such scenarios can even lead to "conservation blackmail", whereby communities threaten to destroy a resource of high biodiversity value if they are not compensated.

On one of my visits to Brooker Island as part of the Misima Village Engagement Team in 2002 to discuss the possible establishment of a marine protected area in their marine territory, I recorded the following conversation:

> Solomon: If we are to close off areas, how much and what is the measure we will use? Jeff says that it is up to the community.
>
> Weke: This way we will be able to restrict fishing vessels[28], and also the government will know that the Brooker Island community has control over, and is restricting the use of its marine resources.
>
> Solomon: I support this thought because it means that it will yield good things in the future.
>
> Iuda: I say yes to there being rules over the reefs. The rest of the people also say yes to there being rules over the reefs and they agree that Conservation International should come and do training.
>
> Sala: Reef areas were closed off in the past in the time of the ancestors then there was burning of pigs feasting to mark this. But these days it will be the rules which control or help the use of marine resources. Rules will be the things, which allow or govern the closure of areas.
>
> Waiaki: We want to try it at the island of Noina.
>
> Joseph: We want to control and look after our marine resources by the legitimacy of good and proper rules not through the legitimacy of feasting. The important thing here is that we look after our marine resources properly.
>
> Weke: There should not be closure of areas until there has been education and training around conservation. After this then we can make rules and regulations about our islands.

[28] A hark back to the conversations that were had around the Milne Bay Fishing Authority and Coral Sea Fisheries (see Chapter 6).

What Brooker Islanders were considering was a modified version of a *tawakaus.* In the past, across the Louisiade Archipelago it has been a common practice to declare a portion of reef closed when someone of importance dies (also see Polunin, 1984; Carrier and Carrier, 1989a, b; Macintyre and Foale, 2007; Foale et al., 2010). In the Misima language area, this practice is called '*tawakaus*[29]' (spear closed). Whilst people recognise that restricting fishing pressure to an area of reef will lead to a noticeable build-up of stocks for later mortuary feasting requirements, there is no understanding of the ecological mechanisms by which stocks increase.

In early 2004, the community at Panapompom Island in the Deboyne Group of Islands established a marine protected area (Callister, 2006). This marine protected area collapsed in early 2006 when fishers from neighbouring Panaeati Island began poaching sea cucumber stocks. Once Panaeati Islanders began harvesting, members of the Panapompom Island community also joined them. This response, and the underlying 'powerlessness' to act, Callister (ibid) suggests, was due to kinship ties and the reluctance to strain these. Subsequently, sea cucumber stocks crashed (see also Bayliss-Smith et al., 2010; Christensen, 2011; Cohen and Steenbergen, 2015; Rasmussen, 2015).

Just before the premature closure of the Milne Bay Community-based Coastal and Marine Conservation Program in 2006[30], Conservation International reverted back to a 'cargo for conservation' process in an attempt to entice communities to establish marine protected areas through offering what were termed 'conservation incentive agreements[31]. The target of these conservation incentive agreements were two communities, one at Mwanewa in the Bushy Islets between Brooker and Misima Islands, and the other at Wialoki Island, to the south of the Engineer Group of Islands.

In Chapter 6, I provided a brief discussion about ownership claims by Tabei Labeli over the Bushey Islets. As noted in that chapter, Tabei Labeli is of the same Manilobu sub-clan from Brooker Islander as his sister is Amisen Sam. Tabei was also recognised as the 'owner' by Conservation International. Mwanewa Island in the Bushey Islets is a major stopping point for

[29] The term *tawakaus* comes from the practice of marking a particular tree to be closed to cutting or harvesting, the process being where '*silam*', 'magic' is used.. The tree in question is marked by putting long stakes into the ground around it with leaves or betel nut bark placed on the top of the stake, i.e. 'spear closed'. Another practice is to tie coconut or betel nut branches around the base of the tree. This is called '*ampahi*' or to 'tie up'.

[30] The Milne Bay Community-based Coastal and Marine Conservation Program did not carry on to a second phase as was originally intended and failed to develop any marine protected areas. Conservation International eventually pulled out of the Milne Bay Province in June 2016 and the remnant staff have now formed a local non-government organisation called Eco-Custodian Advocates.

[31] Conservation Incentive Agreements have had several difficulties when direct payments are linked to legally binding contracts (see Ferraro and Kiss, 2002).

communities from Brooker Island and the wider West Calvados Chain when they are sailing back and forth from their home islands to Misima Island.

Under the conservation incentive agreement proposed by Conservation International through a memorandum of understanding[32], Tabei had to demarcate a marine protected area[33] which Conservation International assisted through a complicated marine spatial process using global information system mapping[34]. The conservation incentive agreement between Conservation International and Tabei was to be for a period of ten years and was to employ Tabei as a Protected Area Manager, and his family as Wardens. Conservation International was also to provide an outboard motor with a monthly fuel allowance, radios, a water supply system and toilets. Conservation International also assisted Tabei to develop a formal management plan[35] which Tabei was to lodge with the Louisiade Local Level Government using the 1997 Organic Law on Provincial and Local Level Governments. By having the management plan formalised, Tabei would have had the legal means to exclude others and to avoid his social obligations to allow people to harvest resources in the Bushy Islets[36]. In the end, Conservation International did not supply anything it had promised Tabei under the conservation incentive agreement and a decade and a half later, whilst Tabei still resides at Mwanewa Island in the Bushy Islets he has not had the management plan formalised.

At the same time that the Milne Bay Community-based Coastal and Marine Conservation Program was closing down in 2006, the *MV Zhi Qiang* ran aground on the Long-Kossman Reef (Plate 11) in April due to human error as it was negotiating the entrance to the Jomard Island Passage. In July of that year and accompanied by another of my brothers, Starford, I conducted

[32] As Baines et al. (2006) and Balboa (2013, 2018) note, that these Memoranda of Understandings were associated with great ceremony by Conservation International, but the administrative and political ideas behind them confused communities and were not actually legally binding document. As Balboa (ibid.) states, the Memorandum of Understandings were an example of the disconnect between global conservation and local cultural concepts of commitment.

[33] This marine protected area consisted of customary, artisanal, rehabilitation, no-take, and recreational zones (Callister, 2005).

[34] The emphasis by big international non-government organisations on marine biodiversity surveys, marine-spatial planning and mapping can be seen as a power-laden exercise in extending their authority over a now territorialised marine area (Hazen and Harris, 2007).

[35] Rules included a ban on using nets, diving on specific days to catch octopus or for shark fishing, using dive masks to spear fish, using poisons, and the taking of any sea cucumbers, giant clams and trochus shells for five years.

[36] In 2004, I evaluated an Australian Centre for International Agriculture Research project that was to manage sea cucumber stocks at Obalaku Village on Kiriwina Island in the Trobriand Group of Islands (Kinch, 2004b). On Fathers' Day in September 2002, the Paramount Chief, Daniel Pulayasi from Omarakana Village sent fishers to the Obalaku Village to harvest marine resources. A court case subsequently followed in which the District Magistrate ruled in favour of the Paramount Chief. The District Magistrate made this ruling, citing that because the management plan had not been formalised by the Kiriwina Local Level Government, it therefore had no legal basis. If the Obalaku community had had their management plan formalised, then he would have ruled in favour of them as this would now be 'government law'. Without this recognition, he subsequently ruled in favour of the Paramount Chief as 'customary' law took precedent in the absence of government law.

a reef damage assessment of the area impacted by the grounding (see Raaymakers et al., 2006). Following this assessment, John Mwasi, the Meisoga sub-Clan member who had been awarded the ownership of the disputed area between Ware and Brooker Islands (see Chapter 6) wanted to close parts of the Long-Kossman Reef for a period of three to five years to enable shellfish, lobster and sea cucumbers to regenerate. This closure did not occur as it meant a significant part of the Long-Kosmann Reef would be closed to harvesting commodified marine resources.

Plate 11: Grounding of the *MV Zhi Quang* on the Long-Kossman Reef.
Photograph: Brian White and Associates.

Because of the *MV Zhi Qiang* grounding, from 2008 to 2011, a transit piloting service was instituted and all vessels travelling through the Jomard Island Passage had to have pilots on-board. In 2015, the International Maritime Organisation working with the National Maritime Safety Authority designated a two-way shipping route through the Jomard Island Passage. A year later, the Jomard Island Passage and the Bramble Haven Group of Islands were designated as a Particularly Sensitive Sea Area[37] by the International Maritime Organisation.

Following this designation and official launch at Brooker Island in late 2016, there was a lot of publicity over the economic advantages that would accrue to Brooker Islanders and their Island neighbours from this designation (Anonymous, 2016c, d). These economic developments were

[37] A Particularly Sensitive Sea Area is an area of the marine environment that merits special protection (International Maritime Organisation, 2006).

to include marine conservation projects, a transit piloting service, on-shore refuelling facilities and various tourism related projects. None of these things have materialised.

It is expected that more attention to the Louisiade Archipelago will continue, especially as Papua New Guinea has made the commitment to have 10 per cent of all territorial waters designated as marine protected areas by 2025 (Government of Papua New Guinea, 2014; Conservation and Environment Protection Authority, 2015).

International Management Arrangements

Whilst there are difficulties at both the local and national level to ensure sustainability of sea cucumber stocks, there has been growing international attention around the harvesting of sea cucumbers worldwide and the sustainability of the trade in beche-de-mer. This growing concern has risen in conjunction with an increasingly affluent China (Anderson et al., 2011; Fabinyi, 2012; Fabinyi and Liu, 2014; Fabinyi et al., 2016b; Purcell et al., 2018).

In 2013, the International Union for the Conservation of Nature conducted an assessment of more than 370 species of sea cucumbers for its Red List of Threatened Species[38], and listed seven species as endangered, four of which are found in Papua New Guinea waters[39]; and nine species which were considered vulnerable, five of which are also found in Papua New Guinea waters[40] (Conand et al., 2014). In 2015 the United States of America proposed listing 36 sea cucumbers species for inclusion in the Convention for the International Trade of Endangered Species' Appendix II[41]. In 2017, the European Union s proposed listing three species of the teatfish family[42] on Appendix II (Food and Agriculture Organisation, 2019). The listing of these three teatfish species was approved in August 2019 at the 18th Conference of the Parties to the Convention[43]. As a result of this listing, these species can no longer be harvested or traded in

[38] The International Union for the Conservation of Nature Red List assessments is commonly used as a surrogate measure of extinction risk. The Red List places species into one of three threatened categories, Critically Endangered, Endangered or Vulnerable; or classifies them as Near Threatened, Least Concern or Data Deficient. In the worst case, species are listed as Extinct or Extinct in the Wild (International Union for Conservation of Nature, 2014).
[39] These are sandfish (*Holothuria scabra*), golden sandfish (*H. lessoni*), black teatfish (*H. whitmae*), and prickly redfish (*Thelenota ananas*) (Conand et al., 2014).
[40] These are deepwater redfish (*Actinopyga echinites*), surf redfish (*A. mauritiana*), blackfish (*A. miliaris*), white teatfish (*H. fuscogilva*), and lastly, curryfish (*Stichopus hermanni*) (Conand et al., ibid).
[41] To date, only one sea cucumber species is listed on Convention for the International Trade of Endangered Species. This species is *Isostichopus fuscus* from Ecuador.
[42] Specifically, the Indian Ocean black teatfish (*Holothuria nobilis*), the Pacific Ocean black teatfish (*H. whitmaei*), and the white teatfish (*H. fuscogilva*).
[43] In February 2019, I was a member of the Food and Agriculture Organisation's Expert Panel to assess the proposal to list the three teatfish species. The Expert Panel subsequently concluded that the available data for white teatfish did not meet the Appendix II listing criteria, that there was insufficient evidence to make a determination for the Indian Ocean black teatfish, but that Pacific Ocean black teatfish did meet the Appendix II listing criteria (Food and Agriculture Organisation, 2019).

Papua New Guinea until non-detrimental findings[44] have been conducted to allow for exports to recommence.

Papua New Guinea has been a member of the Convention for the International Trade of Endangered Species since 1976. Despite Papua New Guinea already having a tainted record of compliance with this convention in regards to the trade of giant clams (Kinch, 2002) and tortoiseshell (Kinch and Burgess, 2008), it is possible that the convention could help encourage better management of this important fishery [45]. For this to be successful however, several implementation issues would need to be considered particularly the roles and responsibilities of the Conservation and Environment Protection Authority as the designated 'Management Authority' and the National Fisheries Authority as the 'Scientific Authority'. As the Scientific Authority, the National Fisheries Authority would be responsible for advising the Management Authority on whether the export of specimens will be detrimental to the survival of these sea cucumber species in the wild. This would be very difficult given that the management of the sea cucumber fishery and the beche-de-mer trade in the past and present has been less than successful.

Another possible impact for people like Brooker Islanders is the continued listing of more shark species on the Convention on the International Trade in Endangered Species (Dulvy et al., 2017; Friedman et al., 2017; Sadovy de Mitcheson et al., 2018; Food and Agriculture Organisation, 2019). As has been noted, the shark fin trade[46] is also invariably linked to sea cucumber fishing and the beche-de-mer trade (Kinch, 2001a; Vieira et al., 2017). Understanding how the Convention for the International Trade of Endangered Species could be useful for management requires a fuller understanding of how the market and value chain operates, as well as the governability of the trade in these commodified marine resources (Bjorndal et al., 2014; Barclay et al., 2016, 2019; Steenbergen et al., 2019).

At a different level, the Convention on Biological Diversity and its Cartagena and Nagoya Protocols are the principal global instruments for the conservation of biodiversity and in 2010, the Aichi Biodiversity Targets[47] were adopted. Several of these Aichi Biodiversity Targets are relevant to fisheries. Target 6 states that by 2020 all marine resources should be managed and

[44] A non-detriment finding is a science-based risk assessment where the vulnerability of a species is considered in relation to how well it is managed (Rosser and Haywood, 2002).
[45] There is considerable debate however over the benefits of listing marine species using the Convention for the International Trade of Endangered Species (see Challender et al., 2015; Cochrane, 2015; Guggisberg, 2016; Friedman et al., 2017).
[46] In an assessment conducted in Milne Bay Province, one-fifth of all fins examined were from sharks listed on the International Union for Nature Conservation's Red List with the vast majority of the sharks being from immature animals (Appleyard et al., 2018).
[47] These targets aim to directly address the underlying causes of biodiversity loss (Friedman et al., 2018). The Aichi Targets are also linked to the United Nation's Sustainable Development Goal 14 which promotes the conservation and sustainable use of all marine resources (Brooks et al., 2015; United Nations, 2015).

harvested sustainably, whilst Target 11 mandates the prevention of species' extinctions and the sustained improvement of threatened species through the use of area-based conservation measures (Dulvy and Kindsvater, 2017; Friedman et al., 2018). These are of course quite ambitious targets and hard to see being achieved in Papua New Guinea, let alone in the Louisiade Archipelago where Brooker Islanders reside.

In addition, there are other various policy frameworks that are relevant to sustaining marine resources in Papua New Guinea including the Food and Agriculture Organisation of the United Nations' Code of Conduct for Responsible Fisheries (Food and Agriculture Organisation, 1995), the Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security (Food and Agriculture Organisation, 2012) and the Voluntary Guidelines on Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication (Food and Agriculture Organisation, 2015). These guidelines call for an equitable distribution of fishing rights and for governments to grant preferential access to small-scale fishers for waters under national jurisdiction to achieve equitable outcomes. At a more regional level there is the Melanesian Spearhead Group Secretariat's 2015-2024 'Roadmap for Inshore Fisheries Management and Sustainable Development' (Melanesian Spearhead Group Secretariat, 2015), as well as the Pacific Community's 'Noumea Strategy' (Pacific Community, 2015). Both these instruments call for various actions by member countries to ensure the sustainability of coastal fisheries and associated marine resources.

Governability of the Sea cucumber Fishery and the Beche-de-mer Trade

As noted above, there are significant issues to be addressed if community and government are to ensure sustainable economic returns from the sea cucumber fishery and beche-de-mer trade. An immediate complication is that across Papua New Guinea, a dual system of governance and legality exists (see Chapter 6). One branch is based on 'custom[48]', which is used to regulate a complex system of social units and their social reproduction along with access to resources. The other branch is that of the government, which is manifested at the various levels of government. Demian (2003) states that customary law in Papua New Guinea is a composite of the indigenous and the introduced and is pre-eminently a result of colonialism (see also Keesing, 1989; Foster, 1992, 1995; Jolly, 1994). In this dual system of governance, legal pluralism[49] occurs that

[48] Under the 1975 Constitution of the Independent State of Papua New Guinea, custom is seen as the underlying source of law in Papua New Guinea. Filer (2006) suggests that 'custom' is something that varies markedly in different contexts, from the 'custom' of customary law to the 'custom' of 'traditional culture' and argues that the 'ideology of landownership', cultivated by the political economy of extractive industries has influenced understandings of custom so that it can be manipulated by 'customary' landowners and change forms, depending upon its context.

[49] Some authors regard law primarily as a normative order whereby that order is determined to be a law if it is externally guaranteed by the probability that coercion will bring about conformity in a group of people

encompasses the 'written' or 'imposed' law, and that of the 'oral', 'indigenous' or 'customary' law (see also Scaglion, 2009; Jentoft, 2011; Bavinck and Gupta, 2014; Bavinck et al., 2014). Bavinck et al. (ibid) have developed a typology that distinguishes four types of legal pluralism areas[50] (Table 8) which can be used to illustrate the different layers of governability for Brooker Islanders.

Table 8: Types of Legal Pluralism.

Type	Characteristics
Indifference	Where there is a lack of operational overlap between the dual governance systems because national legal regulations are not implemented and so customary rules largely operate.
Competition	Relationships between the dual governance systems are strong but contend for power to rule over the same situation.
Accommodation	The dual governance systems are reciprocally adapted to each other but there is little integration in terms of institutions or jurisdiction.
Mutual support	The dual governance systems act in partnership, such as co-management arrangements.

Source: Bavinck et al. (2014).

As has been noted, in the Louisiade Archipelago the physical distance between government and communities makes it difficult for the government authorities to engage with communities in the implementation and enforcement of national fisheries regulations or for support in conservation activities. Overall, the interactions between the national and customary systems governing coastal fisheries can be characterised as rather weak, largely operating in different spheres. This appears to most closely fit the legal pluralist relationship of indifference as proposed by Bavinck et al. (2014). An emphasis on supporting co-management arrangements as part of a national strategy would make interactions between government and Brooker Islanders more affirmative and stronger, which would lead to a legal pattern of accommodation, or mutual support.

Under the 1997 Organic Law for Provincial and Local Level Governments (Government of Papua New Guinea, 1997), several law-making powers may be devolved to Provincial and Local Level Governments, and communities[51]. Sections 42 and 44[52] provide room to draw up local-level conservation and resource management laws as long as they are consistent with other legislative instruments[53]. While Provincial and Local Level Governments have the authority to create

(Dworkin, 1977; von Benda-Beckmann, 1997), while other scholars emphasise the connection with organising entities or authorities (Pospisil 1971; Bavinck, 2005).

[50] Elements of all types may coexist in a given setting as legal plural patterns demonstrate a high degree of variation.

[51] Prior to the implementation of the Organic Law, the Manus Provincial Government passed marine resource protection legislation in the late 1980s (Manus Provincial Government. 1989a, b).

[52] Sections 42 (t) relates to 'renewable and non-renewable natural resources', Sections 44 (i) deals with 'dispute settlement', 44 (p) the 'local environment', and 44 (ab) the 'imposition of fines for breaches of any of its laws'.

[53] Local Level Governments that have utilised Section 44 to develop various marine management regulations include the Talasea Local Level Government (2004), Bialla Local Level Government (2004), and Hoskins Local Level Government (2004) in East New Britian Province; the Nali Sopat Penabu Local-

regulatory laws and policies, they do not have the authority to collect fees or taxes for enforcement and compliance purposes. This means that provinces are unable to generate their own source of revenue or income and thus remain financially dependent on national government funding (Benson, 2012; Zheng, 2018).

Compliance with regulations is key to successful resource management of conservation actions. Following Becker's (1968) economic theory of crime, compliance depends on people's assessing their financial gains or losses incurred by complying or not with a given rule or regulation. If the mismatch between expectations of compliance and what is delivered is too extreme, support is unlikely to be forthcoming (Shah et al., 2012; Mullainathan and Shafir, 2013; Battista et al., 2018). For Brooker Islanders, the problem is the need to prioritise short-term and immediate needs over the possible long-term benefits. Belief in the legitimacy of regulations either by the National Fisheries Authority or other legal mechanisms is also a key factor in compliance. Increasing the perceived legitimacy of regulations is one of the most powerful means for increasing compliance (Honneland, 1999; Arias, 2015; Finkbeiner and Basurto, 2015; Turner et al., 2016; Battista et al., 2018). For compliance to be successful, there also needs to be an assurance that others will also comply.

To help understand better the issues surrounding the management of the sea cucumber fishery and the beche-de-mer trade, it is possible to highlight the main governance components by using Interactive Governance Theory. Within Interactive Governance Theory, wicked problems are seen as a 'governability' issue in that there are limits to how systematic, effective and rational a governing system can be in solving them (Kooiman, 1993; Kooiman et al., 2005; Jentoft, 2007; Johnsen, 2013; Jentoft and Bavinck, 2014; Jentoft and Chuenpagdee, 2015; Song et al., 2018).

The three components of Interactive Governance Theory are the:

- 'system-to-be-governed';
- 'governing systems'; and
- 'governance interactions'.

The system to be governed involves the social-ecological systems associated with a particular fishery that requires control, management and regulation. The system-to-be-governed usually consists of a defined marine territory as well as the resources that are found and exploited within it. It also includes the systems that regulate access and resource users. Another aspect to be considered in the system-to-be-governed is the general health of the marine environment.

level Government (2009) in Manus Province; and more recently the Lavongai Local Level Government (2013) in New Ireland Province.

Systems-to-be-governed are subsequently diverse[54], complex[55] and dynamic[56] and interact at various scales[57] (Jentoft, 2007; Barclay et al., 2019). Inherent in the system-to-be-governed is a mismatch between the geographic scale of ecosystem functioning, the spatial extent of the governance arrangements managing a system-to-be-governed, but also the spatial range of fishing activities. In general, what make systems-to-be-governed easier to govern are boundaries as boundaries determine the scale of which the systems-is-to-be-governed (Ostrom, 1990; Jentoft and Chuenpagdee, 2009; Duraiappah et al., 2014; Scholtens and Bavinck, 2014). For Brooker Islanders, the system-to-be-governed is detailed in Table 9.

Table 9: Properties of the system-to-be-governed.

Properties	**Social**	**Ecological**
Diversity	Fishery type: harvesting at the local level, Product variation: 20+ commercial species that have different processing requirements, Exporters: Alotau-based with many local exporters having relationships with Asian financiers, and Main Export Market: predominantly Asian.	Habitats: predominately reef, and Species: 20+ commercial species with different habitat requirements, varying sizes of sexual maturity, and conversion rates when processed into beche-de-mer.
Complexity	Tenureship: flexible and dynamic, and Accessibility: disputes arising when fishing pressure intensifies and sea cucumber stocks decline.	Availability: white teatfish (*H. fuscogilva*) protected from overfishing by depth range, other species are easily exploited.
Dynamics	Livelihoods: high need for cash and few alternative sources of cash, Labour: diverted from food gardening to fishing during open season, Management: limited presence by National Fisheries Authority; political influences also impacts on management activities, and Trade: high prices and high demand incentivises intensified harvesting.	Over-fishing: stocks easily depleted ecological impacts: changing substrate characteristics and water quality, and Climate change: loss of habitats.
Scale	Fishery location: remote areas, Trading: exporters based in Alotau, and Management interventions: limited ability for fishers in remote locations but greater feasibility at the export gate.	Connectivity: limited by low population densities.

Adapted from: Barclay et al. (2019).

[54] Diversity relates to spatial variability as well as the species targeted and the number and characteristic of users. These components often give rise to competition and disputes (Kooiman and Bavinck, 2005; Jentoft, 2007).

[55] Complexity refers to the fact that the elements of a system-to-be-governed are interactive, often having overlapping and interdependent components, and therefore often in conflict. For example, targeted marine resources are part of the broader food-web and together comprise a food chain. Adding to this, humans sit at the top resulting in a system-to-be-governed that is inherently difficult to control and predict (Kooiman and Bavinck, 2005; Jentoft, 2007; Corrin, 2009; Scaglion, 2009).

[56] Dynamics are concerned with the fluctuation and change that occur as a consequence of the tension within and between systems-to-be-governed. Incidents in one part of the system-to-be-governed may trigger processes that spread and magnify. Extreme events may radically change the situation of the system-to-be-governed from one day to the next (Kooiman and Bavinck, 2005; Jentoft, 2007).

[57] Vulnerability could also be added as systems-to-be-governed. Vulnerability would be less of a problem if the governing system was fully informed of how the system-to-be-governed functioned, but all things interact in ways that are not always, and can never be, fully understood (Grafton, 2010). External interferences can be very quick and sudden, and therefore can be often difficult to predict.

The governing system involves the various institutions such as the National Fisheries Authority, and other Papua New Guinean regulatory agencies, their operations and their organisational values. The governing system exerts influences over the system to be governed. Within governing systems, Steenbergen et al. (2019) note that government, the private sector, non-government organisations promoting management, and the culture and social relations of the local community all can have a role to play in bringing about sustainability in fisheries. In the case of Brooker Islanders, the roles of each actor are presented in Table 10.

Table 10: Actors in the Governing System.

Actor	Entity	Issues
Government	National Fisheries Authority	• Limited ability to interact with remote communities which affects the effectiveness of management regulations, • Legitimacy is affected by political influence, and • Impact of the implementation of the 2017 Public Money Management Regularisation Act on their operations.
Private Sector	Kiwali Exports, Asiapac and other Alotau-based Exporters	• Pricing affects the incentives for involvement and likelihood of change in fishing behaviour, • Political influences have attempted to limit the number of exporters, and • Influence over remote communities through their buying program, the supply of goods, and credit and debt arrangements.
External Agencies	Previously Conservation International, currently no capacity	• Different goals and values of biodiversity conservation and livelihood needs, • Difficulties in being the conduit between communities and government agencies as well as other external agencies, • Ability to mobilise funds, and • Ability to provide suitable communication structures.
Community	Brooker Islanders	• Norms and relationships that influence practice and decision-making, • Egalitarian nature of southern Massim societies, • Flexible and dynamic local marine tenureship arrangements, and • Livelihood dependency on the exploitation of commodified marine resources.

Adapted from: Steenbergen et al. (2019).

The conventional management approach for fisheries has been dominated by the assumption that every fishery is characterised by intense competition, which will eventually lead to overexploitation and the 'tragedy of the commons'. It also relies almost exclusively on scientific information and methods, and has led managers to tighter government controls.

The failure of centralised fisheries management regimes has led to the recognition of the need for active involvement of user groups. It should be noted however, that 'traditional' management systems and local marine tenureship arrangements also have limitations in the face of continually changing economic and environmental pressures, and therefore there is a requirement for co-

operative management or co-management with government. There are a number of complexities however that that need to be considered for co-management to be achieved. These include understanding the complexities of the State, of the community, of the dynamic and iterative nature of the system, of the conditions available to support the system, of the ability of co-management to be an effective governance system, of the process of adaptive learning and problem solving, and finally of the ecosystem that provides the resources that are being managed (Carlsson and Berkes, 2005).

Fisheries co-management differs from community-based fisheries management which refers to the process wherein resource management and conservation responsibility lies with communities. Co-management is defined as an arrangement where responsibility for resource management is shared between the government and user groups and is increasingly promoted as a way forward to identify socially acceptable and locally implementable controls on marine resource use (Pinkerton, 1989; Pomeroy, 1994; Ruddle, 1994; Sen and Nielsen, 1996; Pomeroy and Berkes, 1997; Berkes et al., 2001; Pomeroy and Rivera-Guieb, 2006; Evans et al., 2011). Co-management sits in the middle between full government-based management, such as powers invested in the National Fisheries Authority and community-based fisheries management. It also takes into consideration, other stakeholders including private commercial interests, non-government organisations, civil society institutions and academic institutions (Figure 2).

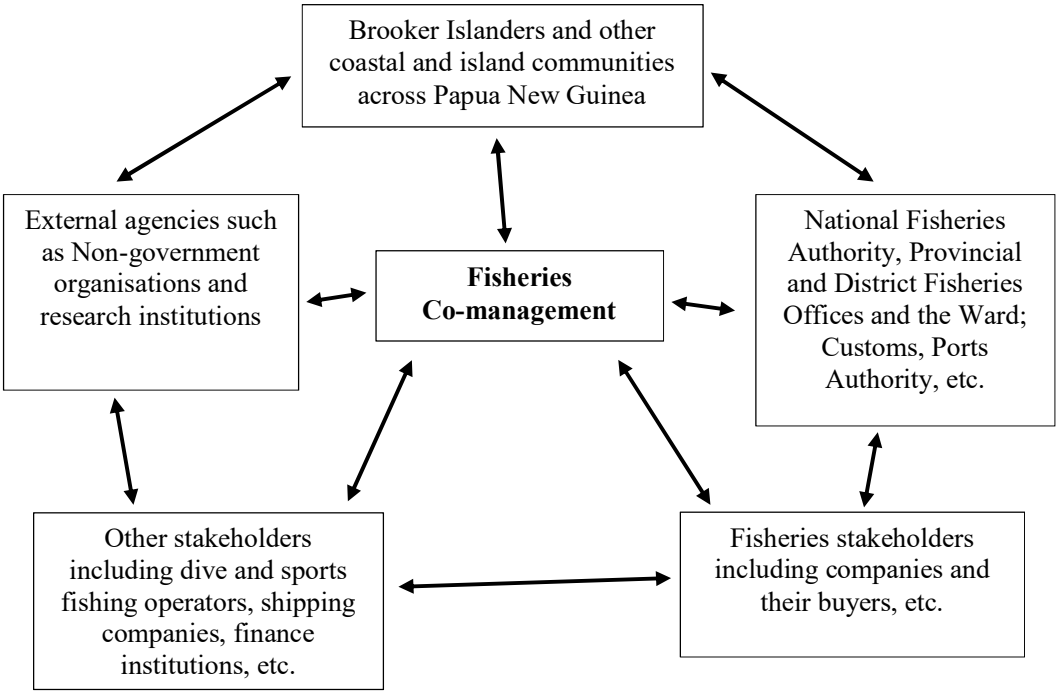

Figure 2: Co-management partnerships.
Adapted from: Pomeroy and Rivera-Guieb (2006: 8)

Discussion on the potential roles and activities of fisheries agencies and other stakeholders have led to the development of a spectrum of participation in co-management arrangements (Figure 3). Co-management can be classified into various levels of participation according to the roles government and fishers play, these range from weakly participatory to high levels of participation or agency of the stakeholders. Co-management requires some group of stakeholders to be involved in making decisions about the resources in question in some capacity, and thus requires significant and sustained participation.

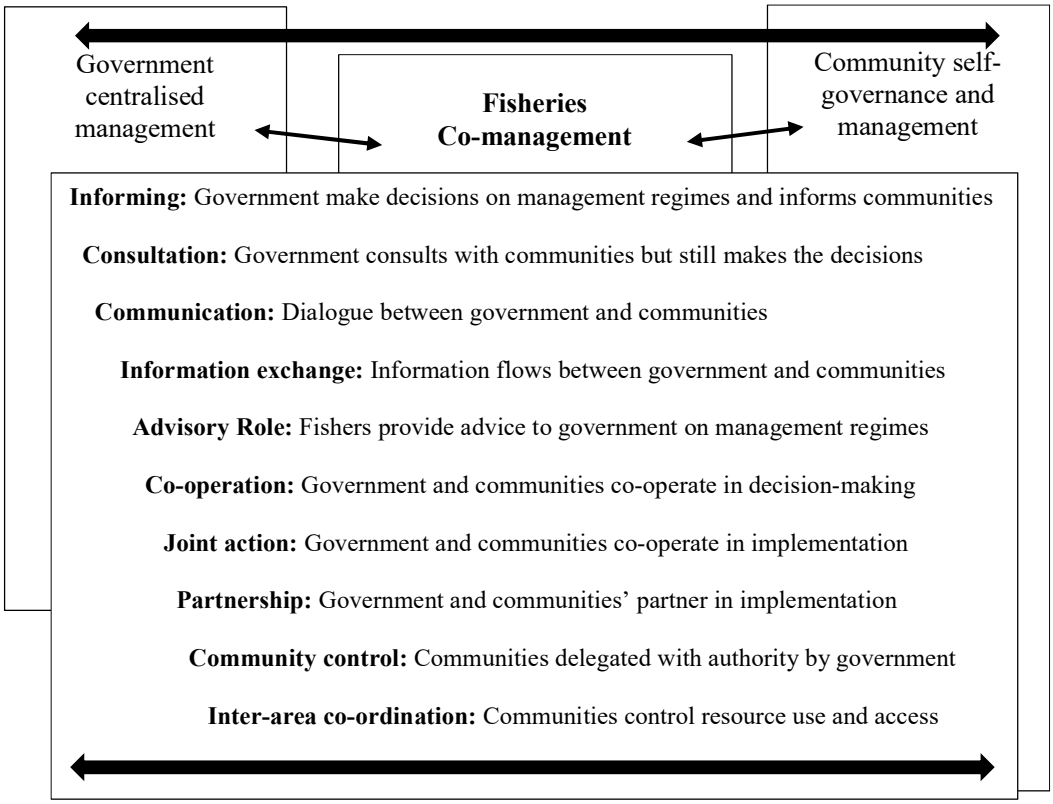

Figure 3: Hierarchy of participation in co-management arrangements.
Adapted from: Sen and Nielsen (1996: 407); Pomeroy and Berkes (1997: 466); Pomeroy and Rivera-Guieb (2006: 9)

Overall, co-management covers a broad spectrum of possible collaborative activities for the management of a particular fishery or fisheries[58]. Informing is the least participatory and is characterised by only minimal exchange of information between government and users, with one-way flows of information from the government to resource users, whereas consultative management, the next step on the spectrum, allows for two-way flows of information. There is a significant step up to co-operative management whereby government and resource users co-operate together as equal partners in decision-making and then to joint action, partnershiop with

[58] Participation may refer to a broad range of activities, from attending meetings where community members are informed about the management activities, to sitting on an advisory council (e.g., Arnstein, 1969; Cornwall, 2008).

the ultimate goal being community control and inter-area co-ordination. The latter levels require government devolving responsibility for management to the resource users.

While co-management necessitates the participation of stakeholders, it does not mean all stakeholders are participating in management, or that co-management represents the views and interests of all stakeholders (Smith, 2012). Effective participation is essential in the management of a fishery because a manager needs to understand the dynamics of a particular fishery or fisheries, as well as the stakeholders involved. Appropriate participation is therefore important for the purposes of consultation, co-operation, consensus-building, and conflict resolution. For example, in the dispute between Brooker and Ware Islanders, mediation was required. In a co-management arrangement, this could have been mediated and a consensus-built around a negotiated agreement, essentially a management plan that detailed appropriate access and use and the rules that could be applied as well as roles and responsibilities of each stakeholder group. Co-management recognises that marine resources can frequently be more effectively managed when stakeholders, or those with an interest in the resource, are directly involved in management.

One needs to be careful however to avoid situations whereby stakeholders who are involved in co-managing a resource may not represent the views of the community at large. Communities are not cohesive units and within a given community there are likely to be multiple interests and actors, political forces, and power struggles (Agrawal and Gibson, 1999; Carlsson and Berkes, 2005). Smith (2012) found that an analysis of occupations, certain socioeconomic variables, years of residence in a community and age were factors predicting participation in management activities, as well as whether stakeholders felt their interests were represented within the management process.

Co-management arrangements can only really be effective if they can mitigate between the need for cash by Brooker Islanders and management transaction costs for ensuring not only the sustainability of sea cucumber stocks, but also the legitimacy to manage those stocks. Davis and Ruddle (2012) and Ruddle and Davis (2013) have argued that conventional co-management arrangements often apply a generic or ideological approach that ignores the need for, the requirements of, and the methods by which to empower groups to achieve real and substantial resource governance. Understanding how co-management can work in any given situation requires close analysis of the power differentials and capacities of key stakeholders (Evans et al., 2011; Steenbergen and Visser, 2016; Bennett et al., 2017; Catalona et al., 2019; Ross et al., 2019; Steenbergen et al., 2019). In general, for co-management arrangements to succeed, there is a requirement of strong leadership[59] and social cohesion at all levels of governance, from the

[59] Having strong leadership does not always lead to positive outcomes however if that leader does not share the same concerns as the rest of the community (Evans et al., 2015; Diedrich et al., 2017).

community to the co-management agency (Ostrom, 1990; Pretty, 2003; Gutierrez et al., 2011). There is also a need to empower and build capacity at the community level (Berkes et al., 2001; Armitage, 2007; Mills et al., 2013; Fabinyi et al., 2014; Steenbergen and Visser, 2016).

The promotion of co-management arrangements assumes that if communities like Brooker Islanders are involved in management activities, the benefits they receive creates incentives for them to become good stewards of the resource (Allison et al., 2011; Garcia et al., 2014). As there is not a strongly developed understanding around reproductive capacity of commodified marine resources by Brooker Islanders, co-management arrangements would need to support the development of a conservation and resource management ethic through targeted education programmes (Foale et al., 2010). Key ecological features identified for ensuring sustainable fisheries include knowledge on life history traits, such as reproductive rates. Having this knowledge plays an important role in determining susceptibility of species to harvesting pressure.

An additional problem that would need to be addressed is the requirement to define the boundaries of marine territories or more specifically, 'management areas' that a community would be responsible for. One needs to be careful however, as clarifying local tenure claims can work in opposition to objectives of enhanced community cohesiveness, and instead lead to protracted negotiations and disputes (McDougall, 2005; Macintyre and Foale, 2007). Co-management arrangements must also ensure equitable and representative participation of those user-groups and stakeholders in a partnership with government authorities. This partnership would have the aim of harmonising legal disparities in a way that is relevant to the management task at hand and is socially just from the perspective of the participant community.

To assist with management, Steenbergen et al. (2019) have called for a more nuanced understanding of the various contexts in which both fishing communities like Brooker Islanders and national government agencies function in relation to different sections of the market chain[60] (see also Jacinto and Pomeroy, 2011; Eriksson et al., 2015; Kittinger et al., 2015; Barclay et al., 2016; Crona et al., 2016; Purcell et al., 2017; Rosales et al., 2017; Fabinyi et al., 2018). To understand this better, Steenbergen et al. (2019) detail four sections of a market chain. These sections consist of 'supply', 'domestic trade and consumption', 'international trade', and 'international end consumer market' sections.

In this scheme, the 'supply' section is the harvesting of sea cucumbers which Brooker Islanders are involved in. In this section, Brooker Islanders are regarded as 'price takers' because they have no other substantial alternatives to earn income from other activities (Rosales et al., 2017). This

[60] The sea cucumber fishery and beche-de-mer trade aligns with the 'captive value chain' type proposed by Gereffi et al. (2005) where small suppliers are dependent on exporters.

section requires governance over the sea cucumber fishery, the social organisation around them, and also stock management. Under the 2018 National Beche-de-mer Management Plan, this would be done using the total allowable catches, restrictive measures on gear, and a defined open season. At the Brooker Island level, culturally defined rules around access are required, but would be difficult to ensure compliance (see Chapter 6). The National Fisheries Authority is also not in a position to assist with regulating the sea cucumber fishery and the beche-de-mer trade at the community level. There are opportunities however for the National Fisheries Authority to affect management which could benefit Brooker Islanders. This requires the National Fisheries Authority to apply management and enforcement actions by targeting the 'pinch point' or 'bottle neck' of the export gate within the domestic trade and international trade and consumption sections. The domestic trade and consumption section involve the economic transactions taking place from the point of first trade between fishers such as Brooker Islanders, and exporters and their buyers.

In Papua New Guinea, it is commonly thought that export companies extract the largest portions of financial value in fisheries commodity chains (see also Purcell et al., 2017). This claim is more often than not espoused by local fishers. In previous assessments it has been noted that fishers can extract between 65 to 75 per cent of the export prices in Papua New Guinea (Kinch et al., 2008b; Barclay et al., 2016). Exporters also assist with providing credit to fishers where other forms of credit from the government or private banking institutions are often inaccessible because of stringent lending requirements, or are only offered at very high interest rates. They also act as informal banks. As one Brooker Island fisher noted, "I have a lot of money from diving and I don't spend all the money but I have an account with Nako Fisheries and Kiwali Exports and that's where I bank my money. When they see that I have big money they ask me what I would like to buy. Do I want a dinghy or roofing iron for a permanent house?" It is these relationships that are often be seen as exploitative, forming patron client relationships[61]. Under the 2018 National Beche-de-mer Management Plan this part of the chain is managed by licensing requirements and other provisions on the types of products that can be bought and sold. The international trade section involves economic transactions across international borders as part of transit import and export trade. Governance focus therefore centres around remittance advice to the Internal Revenue Commission. For the teatfish sea cucumber species, there is also now the requirement to comply with the Convention on the International Trade in Endangered Species.

[61] The existence of patron-client relations, are usually features of the local supply system but also incorporate structures of the broader international supply chains (Barclay et al., 2016; Steeenbergen et al., 2019). Patron-client relations evolve in many cases due to ensure loyalty and the desire to secure access to resources, particularly as resources start to decline in response to the over-exploitation.

Barclay et al. (2016), Hamilton-Hart and Stringer (2016) and Bennett and Basurto (2018) have advocated that returns to fishers might be improved through the development of fisher co-operatives or auction systems. The belief is that under a co-operative model there will be an emphasis on local monitoring and enforcement by communities and that the vertical integration of harvesting, processing and export may help incentivise adherence to harder-to-monitor regulations such as no-take zones and gear restrictions. It is assumed that co-operatives can help reinforce the collective action required to maintain the co-operative. As shown in Chapter 4, the history of co-operatives in Milne Bay Province and Papua New Guinea has not shown much success. Whilst the non-perishable nature of dried sea cucumbers could favour such a system, the immediate cash needs of many fishers means that it would be difficult for fishers to support such a systems as many would not be able to wait for delayed income. Logistic and co-ordination issues of operating such systems would also require sound planning and an understanding of the variation in pricing among species (Purcell et al., 2017). National pricing standards could help to achieve more consistent prices to fishers and help safeguard some fishers from receiving unreasonably low prices from certain exporters, however this could backfire by companies only paying the minimum price to fishers. It could also reduce economic returns to fishers through the so called 'Jevons' Paradox[62]'. As has been noted, higher prices cause an increase in fishing effort or more fishers entering the fishery.

Barclay et al. (2016) and Steenbergen et al. (2019) have both recognised that relationships are a crucial determinant of trade connections between local fishers and exporters as well as between exporters and importers which could possibly open up avenues for unique governance innovations. Narrowing of the value chain from fishers to having just a few exporters would also provide an opportunity for integrating regulations at multiple nodes of the value chain. Licensing control over exporters coupled with other management strategies, has immense potential to influence harvesting practices (Bennet and Basurto, 2018; Baker-Medard and Ohl, 2019).

Conclusion

Dealing with ecological change and overall resource sustainability arguably requires adaptive governance which can develop and strengthen leadership and trust, support the dissemination and acquisition of knowledge, support adaptation and co-operation, and minimise associated negative impacts to communities. In short, effective governance requires understanding the dynamics of the social-ecological system in which a fishery operates.

[62] The Jevons Paradox states that an increase in efficiency in resource use will generate an increase in resource consumption rather than a decrease (Alcott, 2005; York and McGee, 2016).

There is broad consensus that fisheries in the developing world are failing to fulfil their potential as engines of social and economic development (Andrew et al., 2007; Bene et al., 2016). A common explanation for this has been a 'failure of fisheries management'. In the context of Papua New Guinea, this could be considered true even when one takes into consideration the broader political, institutional and economic drivers of both global and local economies. The National Fisheries Authority currently regulates the sea cucumber fishery and beche-de-mer trade through the 2018 National Beche-de-mer Fishery Management Plan, but has limited presence and communities like Brooker Islanders are left to deal with management issues at their own level. At present, the only mechanism that appears to be effective for managing the sea cucumber fishery and beche-de-mer trade in Papua New Guinea is the annual closed season and the imposition of moratoria. Utilising other management mechanisms such as those available under the 1997 Organic Law on Local Level and Provincial Governments have had very limited uptake by communities like Brooker Islanders.

Improving the governance of the sea cucumber fishery means reframing the problem, from sustainable development of the fishery to sustainable development from the fishery (Barclay et al., 2019). This means, in addition to preventing overfishing, the need to provide appropriate government infrastructure and services. It is also important to consider food security needs, addressing inter-generational tensions around the distribution and use of cash incomes, and balancing the use of cash incomes between consumables and durable improvements to standards of living (see Hair et al., 2019).

Restricting access using a 'rights-based approach' to fisheries management is difficult at the level of Brooker Islanders as this approach is based on increasing economic efficiency (Allison et al., 2012). This approach argues that to become sustainable and to be profitable, fishers must move towards management that allows restriction on who can have access to the fishery, how much fishing effort individual participants are allowed, or how much catch each can take (Townsend, 1998; Edwards, 2003; Hilborn, 2007). Clarifying and enforcing rights to ownership and access to fisheries resources is therefore viewed as the chief measure required to stem fisheries decline. Investment in strengthening fishing rights often fails however if it is not combined with measures to address causes of livelihood insecurity. More fundamental still, however, is the common failure to appreciate the full range of factors that influence the vulnerability of groups like Brooker Islanders.

Due to the introduction of the cash economy and an increasing population, livelihoods have been modified. For Brooker Islanders, there are subsequent challenges with securing livelihoods, providing livelihood alternatives as well as sustaining the replenishment rates of sea cucumber stocks. What is required is careful attention to communication, co-operation, sharing information

at appropriate scales, and gathering and presenting knowledge in ways that fit the needs of both Brooker Islanders and the National Fisheries Authority.

To assist communities like Brooker Islanders, both fisheries managers and conservationists need to be more receptive to the fact that socio-ecological systems cannot be understood or managed independently, and that governance mechanisms have political, social, and ecological consequences especially when livelihoods are impacted by the management regulations and conservation efforts (West, 2006; Waylen et al., 2010; Lauer, 2016; Sterling et al., 2017; Lau et al., 2019). This is difficult given the remoteness of Brooker Island, the absence of government and the limited understanding of resource decline. Local ecological knowledge of the key life history attributes that pertain to population replacement processes is largely lacking raising the issue of how to integrate Western scientific management with local knowledge and management (see Foale, 2005; Sabetian and Foale, 2006; Foale et al., 2016).

The next and last chapter of this thesis provides a summary of issues relating to the future of Brooker Islanders and their livelihoods.

Chapter 9
Conclusion

When Brooker Islanders first arrived at the island that has now been their home for some 3,500 years Before Present, they found themselves in an area with access to a large and rich marine territory. The downside was that the islands that they now inhabit and utilise are marginal in the sense that it is difficult to produce enough garden food to complete their diet due to various environmental factors (see Chapter 2). To overcome this problem of food security, Brooker Islanders have raided other groups in the Louisiade Archipelago in historical times (see Chapter 3) and continue to conduct inter-island trading to secure agricultural foods and other goods into the present (see Chapter 5). Whilst the days of raiding are distant memories, inter-island trade remains important for securing Brooker Islanders' livelihoods. Of greater importance today however is the dependency of Brooker Islanders on the harvesting of sea cucumbers to sell as beche-de-mer.

Since contact, Brooker Islanders have been introduced to new languages, educational opportunities (albeit limited), work skills, cultural understandings, social hierarchies, religious ideologies, and most importantly new store foods and goods. During the early post-contact period up to World War II, the introduction of a monetised economy and the sale of marine resources seemed to offer a pathway for Brooker Islanders to emulate the lifestyle of Europeans that had come to buy, to evangelise, and to govern. The major export industries that flourished at this time were the trade in pearls, pearl shell, turtle shell, trochus and beche-de-mer (see Chapter 3).

After World War II, the colonial government tried to show greater presence throughout the Louisiade Archipelago with its attempts to introduce a stronger economic base built on the establishment of copra plantations, and the purchasing of trochus through co-operatives. Belshaw (1955) noted that in the mid-1950s Ware Islanders were already well entrenched in new ways of making a living, such that if they had to go back to traditional patterns of consumption they would do so with much discontent. This is the same for Brooker Islanders today. Since independence in 1975, the deterioration in the public sector and the delivery of services as well as the continual charges of government mismanagement and corruption has stymied broad-based progressive improvement in the lives of many people like Brooker Islanders (Barclay et al., 2019). Brooker Islanders have had to fund their own progress and development.

As the demand for commodified marine resources has increased, market principles have also become all the more pervasive in the lives of Brooker Islanders. The further entrenchment of Brooker Islanders into the global econmy resulted in an increased demand for cash and greater consumer dependencies. To obtain cash, Brooker Islanders have moved from one economic opportunity to another, and have eagerly taken them up (see Chapter 4). Brooker Islanders now 'work' for a living in the sense that they are dependent on producing commodities for self-support and the marine environment they claim in their territorial waters has become their 'workplace'. Today, the sea cucumber fishery and beche-de-mer trade has now become a necessary part of life.

In seeking to understand the trajectory of Brooker Islanders' lives and the transition of their livelihoods, I proposed specific questions in the Introduction. The four questions that were posited are:

1) How have Brooker Islanders made a living from their marine resources historically and into the present?

2) How have the changes in livelihood activities and a growing dependency on commodified marine resources affected Brooker Island relationships within their own community but also externally with other island communities in the Louisiade Archipelago?

3) How have the conflicts arising from access to commodified marine resources influenced local marine tenureship arrangements in the Louisiade Archipelago?

4) How can the analysis of local and government responses to the conflicts that arose from access to valuable and commodified marine resources inform policy and improve local governance for sustainability?

In attempting to answer these questions, I have utilised a historical political ecology approach informed by a livelihoods framework to analyse the 'local' scale that Brooker Islanders inhabit in relation to the wider global economy and the world system. When we begin to look at the historical processes of a given community or area such as Brooker Island, we can see that capitalism has introduced new social norms or appropriated or transformed existing social norms. These wider-scale processes manifest themselves as shocks and pressures that Brooker Islanders must continue to adapt to or mitigate. These shocks and pressures stem from the State, the environment and the global economy. The State causes these shocks and pressures through its inability to provide adequate services, as well as the impacts of its management of natural resources. Environmental shocks stem from natural disasters, such as cyclones and El Nino associated droughts, as well as the changes to coral reefs brought about by the removal of sea

cucumbers, and in the future, the projected impacts of climate change. The global economy delivers shocks and pressures by changing its demands and prices for beche-de-mer. Together these factors have had a negative effect on relationships on Brooker Islanders and their island neighbours islanders and created conflict (see Chapter 6).

Before the 1980s, there were few theoretical inquiries made on the formation and functions of local marine tenureship arrangements and the evolution of fishing rights. A central theme of this thesis has been that local marine tenureship arrangements and the solidification of territorial claims is a reaction to capitalism and the increasing incorporation of Brooker Islanders into the global economy. As a result, previous informal access arrangements to marine territories in the Louisiade Archipelago have become more formalised. Boundaries between Brooker Islanders and their island neighbours have been transformed, becoming more concrete at different times in different circumstances. The complexity of use and access rights have been and continue to evolve and to be challenged at different times as people respond to new economic opportunities.

As Cordell (1984) notes, local marine tenureship arrangements are at the core of fishers' livelihoods and consequently they are worth fighting over either on the water or in court. Fighting and then later contestation through the courts is exactly what happened between Brooker and Ware Islanders. Their dispute was over access to areas of the Long-Kossman Reef that at the time still held adequate sea cucumber stocks. Both Brooker and Ware Islanders required access to this area to secure their livelihoods.

With the involvement of the Papua New Guinea State through its judicial and legal processes, the dispute between Booker and Ware Islanders became a legal pluralistic matter as Brooker and Ware Islanders used aspects of their local cultural traditions in a Western 'court of law' (see Chapter 6). As part of the formal legal process for dispute resolution, there was a requirement by the state to delineate 'ownership' between Brooker and Ware Islanders through the defining of a boundary, and the identification of a 'traditional' owner. This drawing of a line and the identification of who 'owns' a particular area however does not capture the dynamism of local marine tenureship arrangements in the Louisiade Archipelago or the social and historical sensitivities. The sense of competition for an increasingly limited quantity of commodified marine resources and frustration over intrusion by 'unauthorised' users fostered a more exclusive attitude toward marine territories. During the operations of the Milne Bay Fishing Authority, Coral Sea Fisheries, and more recently with the sea cucumber fishery and beche-de-mer trade, communities in the Louisiade Archipelago have demarcated their own versions of 'Exclusive Economic Zones'.

Whilst Brooker Islanders and their island neighbours may feel that they have rights to certain marine territories, the Papua New Guinea state also has competing primacy claims. For example, under the 2015 Maritime Zones Act (Government of Papua New Guinea, 2016b) which replaced the 1977 National Seas Act (Government of Papua New Guinea, 1977), the Papua New Guinea State owns all seas from the low tide mark. Under the 1992 Mining Act, the Papua New Guinea State owns the foreshore from the mean high water tide-mark as well as the seabed (Government of Papua New Guinea, 1992). From a legal point, there is a need to further clarify and support what rights Brooker Islanders actually have to their marine territories. Under the recently developed National Oceans Policy (Government of Papua New Guinea, 2019), this policy reaffirms the recognition of coastal and island communities and their ownership regimes over their marine territories. The National Oceans Policy also promotes the integrated management of the marine environment between communities and government to ensure sustainable livelihoods and better fisheries management. How this will be actioned however remains ambiguous.

The decline of sea cucumbers stocks eventually resulted in the National Fisheries Authority imposing a moratorium on the sea cucumber fishery and beche-de-mer trade from October 2009 to April 2017. This moratorium caused significant stress to Brooker Islanders as their primary income-making opportunity essentially ceased overnight (see Chapter 7). Brooker Islanders responded to this loss of income in numerous ways, by initially switching to making copra and then for those that had suitable assets, to catching sharks so as to sell their fins. The moratorium caused a major reduction in cash incomes, affecting diets and also caused a reduction in the fulfillment of customary exchanges as money was no longer available to support such activities.

Many scholars have used small-scale fisheries as model systems to refute the inevitability of Hardin's (1968) tragedy of the commons referencing the capacity of fishing communities to self-govern in respect of their marine resources (McCay and Acheson, 1987; Ostrom, 1990; Berkes and Folke, 1998; Dietz et al., 2003). Research in this area has been criticised for its failure to incorporate insights derived from anthropology and political ecology to address issues concerning power and politics (Cote and Nightingale, 2012; Fabinyi et al., 2014, 2016a, 2018). This thesis provides another example of these issues by highlighting the crucial role that capitalism plays in changing livelihoods and institutions over time when market opportunities arise and consumer dependency becomes essential to maintaining livelihoods.

This thesis has also highlighted problems of fisheries management in Papua New Guinea at multiple scales (see Chapter 8). The failure of the Papua New Guinea State to manage fisheries for the benefit of communities like Brooker Islanders has led to widespread policy support for the principle of de-centralised management or co-management. The success of these arrangements however is dependent on the strength and appropriateness of the rules governing usage and the

opportunity costs of exploiting commodified marine resources. The reality is more problematic however, when people like Brooker Islanders have no alternative sources of equivalent cash income. This means that they will continue to exploit what they have until everything is exhausted. People will continue to pursue species that yield high returns, regardless of their vulnerability to depletion, and respond to declines by increasing effort (see Aswani, 1999, 2017). Incentives for Brooker Islanders to invest in resource sustainability will increase only after vulnerabilities that they rank higher have been addressed, and the perceived risk of fishery decline comes to the fore. Viable marine resource stocks require viable fishing communities.

For Brooker Islanders, shifting power from the National Fisheries Authority to a more equitable power-sharing relationship with them would not be feasible without significant investment by government to ensure a physical presence and appropriate communication. The Milne Bay Community-based Coastal and Marine Conservation Program could have been an attempt to build co-management arrangements with communities in the Milne Bay Province to manage their marine resources. Unfortunately, for Conservation International, the focus was on biodiversity conservation and the establishment of marine protected areas and later conservation incentive agreements. Even with large pools of funding and technical support, conservation and management outcomes were difficult to achieve due to different objectives of Conservation International and the relationships they had with local people (see Chapter 8). Cohen and Steenbergen (2015) have noted that as more critical studies and evaluations emerge, conservation and fisheries managers will be better placed to design and implement appropriate co-management arrangements for a specific area or for a specific fishery. In a country like Papua New Guinea, this would be a considerable task and the political and institutional costs of improved management would be significant.

It is commonly noted that communities that are able to diversify their livelihoods are better able to adapt to extenuating circumstance and avoid 'poverty traps' (Cinner, 2011; Haider et al., 2018). Due to the high dependence on commodified marine resources by Brooker Islanders, ensuring the sustainability of these stocks would play a significant role in delaying an inevitable need for emigration from Brooker Island. Achieving this outcome however is already a difficult and 'wicked' problem as reducing fishing effort is not feasible given the large number of fishers dependent on the exploitation of these stocks (see Chapter 7).

For the last two years, Brooker Islanders have once again benefitted from the money made from selling beche-de-mer. These benefits have been short-lived however, and whilst the rise of disputes over the access of declining sea cucumber stocks that were prevalent before did not occur, the National Fisheries Authority has not reopened the sea cucumber fishery and beche-de-mer trade for 2019 due to concerns over stocks already being depleted again. It is not

unreasonable however to expect that more moratoria will continue to be put in place by the National Fisheries Authority given the economic dependence on the sea cucumber fishery, the past history of 'racing to fish', and the failure to manage the sea cucumber fishery and the beche-de-mer trade at any level. If a scenario of rolling moratoriums in a 'boom-and-bust' cycle is to become the norm for the sea cucumber fishery, there will be serious impacts for Brooker Islanders.

Butler et al. (2014) analysed drivers of ecosystem degradation for Milne Bay Province and found that up until 2030, population growth, rather than climate change, will be the greatest risk to human wellbeing. Butler et al. (ibid) also suggested that there is a 20 to 30 year 'adaptation window' to address population growth. After this 'window of opportunity', climate change will then be the major source of impacts for the peoples of Milne Bay Province. The expected impacts of climate change are one that will require a major shift in the way Brooker Islanders make their living, and it remains unclear how they and the government will respond. Whilst the term 'climate-change refugee' (Connell, 2015) is not yet applicable to Brooker Islanders, sometime in the future, it is probable that Brooker Islanders may come to face their limits of growth in the context of the effects of future climate change and have to relocate to the larger islands of Misima and Sudest, or move to the Milne Bay mainland. It is understandable that when a location can no longer provide the necessities of life for its inhabitants, some kind of relocation will become necessary. Migrating however poses many other problems as has been witnessed in Papua New Guinea by people from the Carteret Islands in the Autonomous Region of Bougainville (Connell, 2016, 2018b; Luetz and Havea, 2018), and Manam Islands in Madang Province (Connell and Lutkehaus, 2016, 2017).

Globally, there is an increasing sense of urgency and a widespread call to action to address the projected impacts of climate change (Laffoley et al., 2019). More research should therefore be conducted on assessing the vulnerabilities of communities like Brooker Islanders so as to further understand what effects there will be on their island life-support systems, and what adaptation opportunities there might be. How Brooker Islanders respond and adapt will ultimately be dependent on their level of social cohesion, their relationships with neighbouring island groups, and the ability of the government to provide adequate services and manage the sea cucumber fishery and beche-de-mer trade appropriately.

As Aswani (2017) has stated, there is a need to conduct long-term studies to better understand the complex social-ecological relationships that manifest in the context of a changing natural and socio-economic environment. In 1998 and 1999, I experienced what life was like as a Brooker Islander during my main fieldwork period. Since that time, I have visited Brooker Island on numerous occasions and I have remained a part of the Brooker Island community.

It is hoped that the information presented in this thesis can assist with designing effective and contextual management systems for sustainability and governability of commodified marine resources such as sea cucumbers. It is also hoped that the information presented in this thesis will provide insights useful for not only Brooker Islanders, but also government and other external agencies to help deal with and hopefully ameliorate many of the challenges that Brooker Islanders currently face and will continue to face into the future. There is further work to be done, not only to assist Brooker Islanders, but also other vulnerable coastal and island communities around the world that are similarly living with uncertain futures.

References

Adams, R. 2016. *Louisiades Lassitude and Dim Dims*. https://greataustralianstory.com.au/story/louisiades-lassitude-dim-dims

Adams, T.; Leqata, J.; Ramohia, P.; Amos, M. and Lokani, P. 1992. *Pilot Survey on the Status of Trochus and Beche-de-mer Resources in the Western Province of the Solomon Islands with Options for Management*. Noumea: South Pacific Commission.

Affleck, D. 1970. *Murua or Woodlark Island: A Study or European-Muruan Contact to 1942.* Unpublished BA Honours Thesis, Australian National University, Canberra, Australian Capital Territory, Australia.

Affleck, D. 1983. Manuscript XVII. Information on customs and practices of the people of Woodlark Island: a translation of 'Ragguagli sugli usi e costumi del popolo Woodlarkese' by the Reverend Father Carlo Salerio, P.I.M.E., with notes by David Lithgow. *The Journal of Pacific History*. 18 (1-2): 57-72.

Agrawal, A. 1995. Dismantling the divide between indigenous and scientific knowledge. *Development and Change.* 26 (3): 413-439.

Agrawal, A., and Gibson, C. 1999. Enchantment and disenchantment: The role of community in natural resource conservation. *World Development.* 27: 629-649.

Aguirre, A.; Gardner, S.; Marsh, J.; Delgado, S.; Limpus, C. and Nichols. W. 2006. Hazards Associated with the Consumption of Sea Turtle Meat and Eggs: A Review for Health Care Workers and the General Public. *EcoHealth*. 3: 141-153.

Akimichi. T. 1995. Indigenous Resource Management and Sustainable Development: Case Studies from Papua New Guinea and Indonesia. *Anthropological Science.* 103: 321-327.

Albert, S.; Aswani, S.; Fisher, P. and Albert, J. 2015. Keeping Food on the Table: Human Responses and Changing Coastal Fisheries in Solomon Islands. *PLoS ONE*. 10 (7): e0130800. doi:10.1371/journal.pone.0130800

Alcott, B. 2005. Jevons' paradox. *Ecology and Economy*. 54 (1): 9-21.

Ali, N. and Khuwaja, A. 2011. Betel Nut (*Areca catechu*) Usage and Its Effects on Health. In: Preedy, V.; Watson, R. and Patel, P. (eds.). *Nuts and Seeds in Health and Disease Prevention*. pp: 197-204. San Diego: Academic Press Ltd.

Allee, W. 1938. A Field Study in Animal Behavior. *Ecology.* 19 (2): 311-312.

Allen, B. 2000. The 1997-98 Papua New Guinea drought: perceptions of disaster. In: Grove, R. and Chappell, J. (eds.). *El Nino, history and crisis: Studies from the Asia-Pacific Region.* pp: 109-122. Cambridge: The White Horse Press.

Allen, B. and Bourke, R. 2001. The 1997 drought and frost in PNG: overview and policy implications. In: Bourke, R.; Allen, G.; and Salisbury, J. (eds.). *Food Security for Papua New Guinea: Proceedings of the Papua New Guinea Food and Nutrition 2000 Conference, Lae, Papua New Guinea*. pp: 155-163. Canberra: Australian Centre for International Agricultural Research.

Allen, G. 2003. Reef Fishes of Milne Bay Province, Papua New Guinea. In: Allen, G.; Kinch, J.; McKenna, S. and Seeto, P. (eds.). *A Rapid Biodiversity Assessment of the Coral Reefs of Milne Bay Province, Papua New Guinea - Survey II (2000).* RAP Bulletin of Biological Assessment, No.: 29. pp: 46-55. Washington, D.C.: Conservation International.

Allen, G.; Kinch, J.; McKenna, S. and Seeto, P. 2003a. (eds.). *A Rapid Biodiversity Assessment of the Coral Reefs of Milne Bay Province, Papua New Guinea - Survey II (2000).* RAP Bulletin of Biological Assessment, No.: 29. Washington, D.C.: Conservation International.

Allen, G.; Seeto, P. and McGarry, T. 2003b. Condition of coral reefs in Milne Bay Province, Papua New Guinea. In: Allen, G.; Kinch, J.; McKenna, S. and Seeto, P. (eds.). *A Rapid Biodiversity Assessment of the Coral Reefs of Milne Bay Province, Papua New Guinea - Survey II (2000).* RAP Bulletin of Biological Assessment, No.: 29. pp: 27-38. Washington, D.C.: Conservation International.

Allen, G.; Steene, S.; Humann, P. and Deloach N. 2012. *Reef fish identification*. Jacksonville: New World Publications.

Allison, E. and Ellis, F. 2001. The livelihoods approach and management of small- scale fisheries. *Marine Policy*. 25 (5): 377-388.

Allison, E.; Bene, C. and Andrew N. 2011. Poverty reduction as a means to enhance resilience in small-scale fisheries. In: Pomeroy, R. and Andrew, N. (eds.). *Small-scale Fisheries Management: Frameworks and Approaches for the Developing World*. pp: 216-237. Cambridge: CABI International.

Allison, E.; Ratner, B.; Asgard, B.; Willmann, R.; Pomeroy, R. and Kurien, J. 2012. Rights-based fisheries governance: from fishing rights to human rights. *Fish and Fisheries*. 13: 14-29.

Anderson, S.; Mills-Flemming, J.; Watson, R. and Lotze, H. 2011. Serial exploitation of global sea cucumber fisheries. *Fish and Fisheries.* 12 (3): 317-339.

Andrew, N.; Bene, C.; Hall, S.; Allison, E.; Heck, S. and Ratner, B. 2007. Diagnosis and management of small-scale fisheries in developing countries. *Fish and Fisheries.* 8 (3): 227-240.

ANZDEC Limited. 1995. *Fisheries Management Project Marine Fisheries Sector Plan and Provincial Fisheries Profiles, Appendix: Milne Bay Province Fisheries Profile.* Report prepared for the Asian Development Bank, Bangkok, Thailand.

Appadurai, A. 1996. *Modernity at Large: Cultural Dimensions of Globalization*. Minneapolis: University of Minnesota Press.

Appleyard, S.; White, W.; Vieira, S. and Sabub, B. 2018. Artisanal shark fshing in Milne Bay Province, Papua New Guinea: biomass estimation from genetically identifed shark and ray fns. *Scientific Reports*. 8: 6693. doi:10.1038/s41598-018-25101-8

Arias, A. 2015. Understanding and managing compliance in the nature conservation context. *Journal of Environmental Management.* 153: 134-143.

Armitage, D. 2007. Building Resilient Livelihoods through Adaptive Co-management: The role of adaptive capacity. In: Armitage, D.; Berkes, F. and Doubleday, N. (eds.). *Adaptive Co-Management: Collaboration, Learning, and Multi-Level Governance.* pp: 62-82. Vancouver: University of British Columbia Press.

Armstrong, W. 1928. *Rossel Island: An Ethnological Study*. Cambridge: Cambridge University Press.

Arnstein, *S.* 1969. A Ladder of Citizen '*Participation'. Journal of the American Planning Association.* 35 (4): 216-224.

Asafu-Adjaye, J. 2000. Customary marine tenure systems and sustainable fisheries management in Papua New Guinea. *International Journal of Social Economics*. 27 (7-10). 917-927.

Asch, R.; Cheung, W. and Reygondeau, G. 2018. Future marine ecosystem drivers, biodiversity, and fisheries maximum catch potential in Pacific Island countries and territories under climate change. *Marine Policy*. 88: 285-294.

Ashley, J. 2016. The Big Blue Marlin of Rossel Island. *Niugini Blue.* 31: 30-35.

Aswani, S. 1999. Common Property Models of Sea Tenure: A Case Study from the Roviana and Vonavona Lagoons, New Georgia, Solomon Islands. *Human Ecology.* 27 (3): 417-453.

Aswani, S. 2017. Customary Management as TURFs: Social Challenges and Opportunities. *Bulletin of Marine Science*. 93 (1): 3-12.

Austen, L. 1945a. Cultural Changes in Kiriwina. *Oceania*. 16: 15-60.

Austen, L. 1945b. Native Handicrafts in the Trobriand Islands. *Mankind*. 3 (7): 193-198.

Baines, G.; Duguman, J. and Johnston, P. 2006. *Milne Bay Community-based Marine and Coastal Conservation Project: Terminal Evaluation of Phase 1, July 2006*. Report prepared for the United Nations Development Program, Port Moresby, Papua New Guinea.

Bainton, N. 2010. *The Lihir Destiny: Cultural Responses to Mining in Melanesia*. Asia-Pacific Environment Monograph, No.: 5. Canberra: Australian National University.

Bainton, N. and Macintyre, M. 2016. Mortuary Ritual and Mining Riches in Island Melanesia. In: Lipset, D. and Silverman, E. (eds.). *Mortuary dialogies: Death ritual and the reproduction of moral community in Pacific modernities*. pp: 111-132. New York: Berghan Books.

Baker-Medard, M. and Ohl, K. 2019. Sea cucumber management strategies: challenges and opportunities in a developing country context. *Environmental Conservation*. doi: 10.1017/S0376892919000183

Balboa, C. 2013. How Successful Transnational Non-governmental Organizations Set Themselves up for Failure on the Ground. *World Development*. 54: 273-287.

Balboa, C. 2018. *The Paradox of Scale: How NGOs Build, Maintain, and Lose Authority in Environmental Governance*. Cambridge: Massachusetts Institute of Technology Press.

Baldacchino, G. 2007. (ed). *A World of Islands*. Charlottetown: University of Prince Edward Island.

Barclay, K. and Kinch, J. 2013. The Importance of Locally Specific Contexts in Engaging with Capitalism: Coastal Fisheries in Papua New Guinea and the Solomon Islands. In: McCormack, F. and Barclay, K. (eds.). Engaging with Capitalism: Cases from Oceania. *Research in Economic Anthropology*. 33: 107-138.

Barclay, K.; Kinch, J.; Fabinyi, M.; EDO NSW, Waddell, S.; Smith, G.; Sharma, S.; Kichawen, P.; Foale, S and Hamilton, R. 2016. *Interactive Governance Analysis of the Beche-de-mer 'Fish Chain' from Papua New Guinea to Asian Markets*. Sydney: University of Technology Sydney.

Barclay, K.; Fabinyi, M.; Kinch, J. and Foale, S. 2019. Governability of high-value fisheries in low-income countries: a case study of sea cucumbers in Papua New Guinea. *Human Ecology.* https://doi.org/10.1007/s10745-019-00078-8

Basurto, X.; Gelcich, S. and Ostrom, E. 2013. The social-ecological system framework as a knowledge classificatory system for benthic small-scale fisheries. *Global Environmental Change.* 23 (6): 1366-1380.

Battaglia, D. 1983. Syndromes of Ceremonial Exchange in the Eastern Calvados: The View from Sabarl Island. In: Leach, J. and Leach, E. (eds.). *The Kula: New Perspectives on Massim Exchange*. pp: 445-465. Cambridge: Cambridge University Press.

Battaglia, D. 1990. *On the Bones of the Serpent: Persons, Memory and Mortality in Sabarl Society.* Chicago: University of California Press.

Battista, W.; Romero-Canyas, R.; Smith, S.; Fraire, J.; Effron, M.; Larson-Konar, D. and Fujita, R. 2018. Behavior Change Interventions to Reduce Illegal Fishing. *Frontiers in Marine Science*. 5: 403. doi: 10.3389/fmars.2018.00403

Bavinck, M. 2005. Understanding fisheries conflicts in the South: A legal pluralist perspective. *Society and Natural Resources*. 18 (9): 805-820.

Bavinck, M. and Gupta, J. 2014. Legal pluralism in aquatic regimes: A challenge for governance. *Current Opinion in Environmental Sustainability*. 11: 78-85.

Bavinck, M.; Sowman, M. and Menon, A. 2014. Theorising participatory governance in contexts of legal pluralism: a conceptual reconnaissance of fishing conflicts and their resolution. In: Bavinck, M.; Pellegrini, L. and Mostert, E. (eds.). *Conflicts over natural resources in the Global South: conceptual approaches*. pp: 147-172. Leiden: CRC Press/Balkema.

Bayliss-Smith, T. 1986. *Ontong Java Atoll: Population, Economy and Society, 1970-1986.* Occasional Paper, No.: 9. Fiji: South Pacific Smallholder Project.

Bayliss-Smith, T. 1990. Atoll production systems: fish and fishing on Ontong JavaAtoll, Solomon Islands. In: Yen, D. and Mummery, J. (eds.). *Pacific Production Systems: Approaches to Economic Prehistory.* pp: 57-69. Canberra: Australian NationalUniversity.

Bayliss-Smith, T. and Christensen, A. 2008. Birds and people on Ontong Java atoll, 1906-2008: Continuity and change. *Atoll Research Bulletin.* 562: 1-36.

Bayliss-Smith, T.; Gough, K.; Christensen, A. and Kristensen, S. 2010. Managing Ontong Java: Social institutions for production and governance of atoll resources in Solomon Islands. *Singapore Journal of Tropical Geography.* 31: 55-69.

Beale, T. 1839. *The Natural History of the Sperm Whale: To which is added a Sketch of a South Sea Whaling Voyage.* London: John van Voorst.

Bebbington, A. and Batterbury, S. 2001. Transnational livelihoods and landscapes: political ecologies of globalisation. *Ecumene*. 8 (4): 369-464.

Becker, G. 1968. Crime and Punishment: An Economic Approach. *The Journal of Political Economy*. 76 (2): 169-217.

Bell, F. 1947. The Place of Food in the Social Life of the Tanga. Part II: The Art of Fishing. *Oceania*. 17: 310-326.

Bell, J.; Purcell, S. and Nash, W. 2008. Restoring small-scale fisheries for tropical sea cucumbers. *Ocean and Coastal Management*. 51 (8-9): 589-593.

Bell, J.; Johnson, J. and Hobday, H. 2011. (eds.). *Vulnerability of Fisheries and Aquaculture in the Pacific to Climate Change*. Noumea: Secretariat of the Pacific Community.

Bell, J.; Allain, V.; Sen Gupta, A.; Johnson, J.; Hampton, J.; Hobday, A.; Lehodey, P.; Lenton, A.; Moore, B.; Pratchett, M.; Senina, I.; Smith, N. and Williams, P. 2018. Climate change impacts, vulnerabilities and adaptations: Western and Central Pacific Ocean marine fisheries. In: Barange, M.; Bahri, T.; Beveridge, M.; Cochrane, K.; Funge-Smith, S. and Poulain, F. (eds.). *Impacts of climate change on fisheries and aquaculture: synthesis of current knowledge, adaptation and mitigation options*. pp: 305-324. Food and Agriculture Organisation Fisheries and Aquaculture Technical Paper, No.: 627. Rome: Food and Agriculture Organisation.

Belshaw, C. 1954. *Changing Melanesia*. Melbourne: Oxford University Press.

Belshaw, C. 1955. In Search of Wealth: A Study of the Emergence of Commercial Operations in the Melanesian Society of Southeastern Papua. *American Anthropological Association.* 57: 1-84.

Bene, C.; Arthur, R.; Norbury, H.; Allison, E.; Beveridge, M.; Bush, S.; Campling, L.; Leschen, W.; Little, D.; Squires, D.; Thilsted, S.; Troell, M. and Williams, M. 2016. Contribution of fisheries and aquaculture to food security and poverty reduction: assessing the current evidence. *World Devopment.* 79: 177-196

Bennett, A. and Basurto, X. 2018. Local institutional responses to global market pressures: the sea cucumber trade in Yucatán, Mexico. *World Development.* 102: 57-70.

Bennett, E.; Neiland, A.; Anang, E.; Bannerman, P.; Rahman, A.; Huq, S.; Bhuiya, S.; Day, M.; Fulford-Gardiner, M. and W. Clerveaux. 2001. Towards a better understanding of conflict management in tropical fisheries: Evidence from Ghana, Bangladesh and the Caribbean. *Marine Policy.* 25 (5): 365-376.

Bennett, N.; Roth, R.; Klain, S.;Chan, K.; Christie, P.; Clark, D.; Cullman, G.; Curran, D.; Durbin, T.; Epstein, G.; Greenberg, A.; Nelson, M.; Sandlos, J.; Stedman, R.; Teel, T.; Thomas, R.; Verissimo, D. and Wybor, C. 2017. Conservation social science: Understanding and integrating human dimensions to improve conservation. *Biological Conservation*. 205: 93-108.

Benson, C. 2012. Shifting accountabilities? Understanding the connections between national and provincial fisheries in Papua New Guinea. *Marine Policy.* 36 (4): 859-866.

Berde, S. 1974. *Melanesians as Methodists: Economy and Marriage on a Papua New Guinea Island.* Pennsylvania: Unpublished PhD Thesis, University of Philadelphia, Philadelphia, Pennsylvania, United States of America.

Berde, S. 1976. Political Education in the Rural Sector: A Comparison of Two Papua New Guinea Island Communities. *Journal of the Polynesian Society*. 85 (1): 87-98.

Berde, S. 1979. The Impact of Christianity on a Melanesian Economy. *Research in Economic Anthropology.* 2: 169-178.

Berde, S. 1983. The Impact of Colonialism on the Economy of Panaeati. In: Leach, J. and Leach, E. (eds.). *The Kula: New Perspectives on Massim Exchange.* pp: 431-443. Cambridge: Cambridge University Press.

Berkes, F. 1999. *Sacred ecology: Traditional ecological knowledge and resource management*. Philadelphia: Taylor and Francis.

Berkes, F. 2006. From community-based resource management to complex systems. *Ecology and Society.* 11 (1): 45. http://www.ecologyandsociety.org/vol11/iss1/art45/

Berkes, F., and Folke, C. 1998. (eds.). *Linking social and ecological systems: management practices and social mechanisms for building resilience.* Cambridge: Cambridge University Press.

Berkes, F.; Mahon, R.; McConney, P.; Pollnac, R. and Pomeroy, R. 2001. *Managing Small-scale Fisheries: Alternative Directions and Methods*. Ottawa: International Development Centre.

Bernard, H. 2017. *Research Methods in Anthropology: Qualitative and Quantitative Approaches*. Lanham: Rowman and Littlefeld.

Bernstein, H.; Crow, B. and Hazel, J. 1992. (eds.) *Rural Livelihoods: Crises and Responses.* Oxford: Oxford University Press.

Bevan, T. 1890. *Toil, Travel, and Discovery in British New Guinea.* London: Kegan Paul, Trench, Trubner.

Biersack, A. 1995. (ed). *Papua Borderlands.* Ann Arbor: University of Michigan Press.

Biersack, A. 1999. Introduction: from the 'new ecology' to the new ecologies. *American Anthropologist.* 101 (1): 5-18.

Biersack, A. 2006. Reimagining Political Ecology: Culture/PowerlHistory Nature. In: Biersack, A. and Greeberg, J. (ed). *Reclaiming Political Ecology.* London: Duke University Press.

Bjorndal, T.; Child, A. and Lem, A. 2014. (eds.). *Value Chain Dynamics and the Small-scale Sector: Policy Recommendations for Small-scale Fisheries and Aquaculture Trade.* Rome: Food and Agriculture Organisation.

Blaha, F. 2016. Illegal fishing in the central and South Pacific. *SPC Fisheries Newsletter.* 151: 21-23.

Blaikie, P. and Brookfield, H. 1987. *Land Degradation and Society.* London: Methuen.

Blau, D. and Maaz, K. 2012. (eds.). *Fish Hooks of the Pacific Islands: A Pictorial Guide to the Fish Hooks of the Peoples of the Pacific Islands.* Munich: Hirmer Publishers.

Bloch, M. 1975. (ed). *Marxist Analyses and Social Anthropology.* London: Malaby Press.

Bonaccorso, F. 1998. *Bats of Papua New Guinea*. Washington, D.C.: Conservation International.

Bourke, R. 2009. History of agriculture in Papua New Guinea. In: Bourke, R. and Harwood, T. (eds.). *Food and agriculture in Papua New Guinea*. pp: 10-26. Canberra: Australian National University.

Bourke, R.; Gibson, J.; Quartermain, A.; Barclay, K.; Allen, B. and Kennedy, J. 2009. Food Production, Consumption and Imports. In: Bourke, R. and Harwood, T. (eds.). *Food and agriculture in Papua New Guinea*. pp: 129-192. Canberra: Australian National University.

Bourke, R.; Allen, B. and Lowe, M. 2016. *Estimated impact of drought and frost on food supply in rural PNG in 2015*. Development Policy Centre Policy Brief, No.: 11. Canberra: Australian National University.

Brass, L. 1959. Results of the Archibold Expeditions, No.: 79: Summary of the Fifth Archibold Expedition to New Guinea (1956-1957). *Bulletin of the American Museum of Natural History.* 118 (1): 5-69.

Braun, B. 2015. From critique to experiment? Rethinking political ecology for the Anthropocene. In: Perreault, T.; Bridge, G. and McCarthy, J. (eds.). *The Routledge Handbook of Political Ecology.* pp: 102-114. London: Routledge.

Brooks, T.; Butchart, S.; Cox, N.; Heath, M.; Hilton-Taylor, C.; Hoffmann, M.; Kingston, N.; Rodriguez, J.; Stuart, S. and Smart, J. 2015. Harnessing biodiversity and conservation knowledge products to track the Aichi targets and sustainable development goals. *Biodiversity*. 16: 157-174.

Bruno, J.; Cote, I. and Toth, L. 2019. Climate Change, Coral Loss, and the Curious Case of the Parrotfish Paradigm: Why Don't Marine Protected Areas Improve Reef Resilience? *Annual Review of Marine Science.* 11: 307-334.

Bualia, L. and Sullivan, M. 1990. The Impacts of Possible Global Warming Generated Sea Level Rise on Selected Coastal Environments in Papua New Guinea. In: Pernetta, J. and Hughes, P. (eds.). *Implications of Expected Climatic Changes in the South Pacific Regions: An Overview.* pp: 193-199. UNEP Regional Seas Report and Studies, No.: 128. Nairobi: United Nations Environment Program.

Bullard, S. 2007. *Japanese army operations in the South Pacific area: NewBritain and Papua campaigns, 1942-1943.* Canberra: Australian War Museum.

Bulmer R. 1982. Traditional conservation practices in Papua New Guinea. In: Morauta, L.; Pernetta, M. and Heaney, W. (eds.). *Traditional Conservation in Papua New Guinea: Implications for Today.* pp. 59-77. Port Moresby: Institute for Applied Social and Economic Research.

Burton, J. 1926. *Papua for Christ*. London: Epworth Press.

Buscher, B.; Sullivan, S.; Neves, K.; Igoe, J. and Brockington, D. 2012. Towards a synthesised critique of neoliberal biodiversity conservation. *Capitalism Nature Socialism.* 23 (2): 4-30.

Butler, J.; Skewes, T.; Mitchell, D.; Pontio, M. and Hills, T. 2014. Stakeholder perceptions of ecosystem service declines in Milne Bay, Papua New Guinea: Is human population a more critical driver than climate change? *Marine Policy.* 46: 1-13.

Byford, J. 1999. *Dealing with death, beginning with birth: Women's health and childbirth on Misima Island, Papua New Guinea*. Unpublished PhD Thesis, Australian National University, Canberra, Australian Capital District, Australia.

Byford, J. 2002. One day rich; community perceptions of the impact of the Placer Dome Gold Mine, Misima Island, Papua New Guinea. In: Macdonald, I. and Rowland, C. (eds.). *Tunnel vision: Women, mining and communities.* pp: 30-33. Melbourne: Oxfam Community Aid Abroad.

Byrne, M. 2011. Impact of ocean warming and ocean acidification marine invertebrate life history stages: Vulnerabilities and potential for persistence in a changing ocean. *Oceanography and Marine Biology: An Annual Review.* 49: 1-42.

Callister, B. 1993. Misiman Phonology. *Phonologies of Austronesian Languages.* 40: 1-24.

Callister, G. 2005. *Patrol Report No. 3*. Report prepared for Conservation International, Alotau, Milne Bay Province, Papua New Guinea.

Callister, G. 2006. *An Analysis of Tenure Claims and Disputes over Marine Resources; Milne Bay Province, PNG*. Paper submitted to the Master of Applied Anthropology and Participatory Development Program, Australian National University, Canberra, Australian Capital District, Australia.

Callister, S. 2000. *A Cord of Three Strands is not Easily Broken.* Unpublished MA Thesis, Macquarie University, Sydney, New South Wales, Australia.

Carlsson, L. and Berkes, F. 2005. Co-management: Concepts and methodological implications. *Journal of Environmental Management*. 75: 65-76.

Carr, E. 2013. Livelihoods as intimate government: Reframing the logic of livelihoods for development. *Third World Quarterly.* 34 (1): 77-108.

Carr, E. 2015. Political ecology and livelihoods. In: Perreault, T.; Bridge, G. and McCarthy, J. (eds.). *The Routledge Handbook of Political Ecology.* pp: 332-342. London: Routledge.

Carrier, J. 1981. Ownership of Productive Resources on Ponam Island, Manus Province. *Journal de la Societes des Oceanistes.* 37: 205-217.

Carrier, J. 1987. Marine Tenure and Conservation in Papua New Guinea: Problems in Interpretation. In: McCay, B. and Acheson, J. (eds.). *The Question of the Commons: The Culture and Ecology of Communal Resources*. pp: 142-167. Tucson: The University of Arizona Press.

Carrier, J. 1992. (ed). *History and Tradition in Melanesian Anthropology*. Berkeley: University of California Press.

Carrier, J. and Carrier, A. 1989a. Marine Tenure and Economic Reward on Ponam Island, Manus Province. In: Cordell, J. (ed). *A Sea of Small Boats.* pp.: 94-121. Cambridge: Cultural Survival.

Carrier, J. and Carrier, A. 1989b. *Wage, Trade, and Exchange in Melanesia: A Manus Society in the Modern State*. Berkeley: University of California Press.

Catalona, A.; Lyons-White, J.; Mills, M. and Knight, A. 2019. Learning from published project failures in conservation. *Biological Conservation*. 238: 108223. https://doi.org/10.1016/j.biocon.2019.108223

Ceccarelli, D. 2019. The Coral Sea. In: Sheppard, C. (ed). *World Seas: An Environmental Evaluation, 2nd Edition - Volume II: The Indian Ocean to the Pacific*. pp: 679-698. Cambridge: Academic Press. https://doi.org/10.1016/B978-0-08-100853-9.00040-3.

Ceccarelli, D.; McKinnon, D.; Andrefouet, S.; Allain, V.; Young, J.; Gledhill, D.; Flynn, A.; Bax, N.; Beaman, R.; Borsa, P.; Brinkman, R.; Bustamante, R.; Campbell, R.; Cappo, M.; Cravatte, S.; D'Agata, S.; Dichmont, C.; Dunstan, P.; Dupouy, C.; Edgar, G.; Farman, R.; Furnas, M.; Garrigue, C.; Hutton, T.; Kulbicki, M.; Letourneur, Y.; Lindsay, D.; Menkes, C.; Mouillot, D.; Parravicini, V.; Payri, C.; Pelletier, B.; Richer de Forges, B.; Ridgway, K.; Rodier, M.; Samadi, S.; Schoeman, D.; Skewes, T.; Swearer, S.; Vigliola, L.; Wantiez, L.; Williams, A.; Williams, A. and Richardson, A. 2013. The Coral Sea: Physical Environment, Ecosystem Status and Biodiversity Assets. *Advances in Marine Biology*. 66: 213-290.

Challender, D.; Harrop, S.; and MacMillan, D. 2015. Understanding markets to conserve trade-threatened species in CITES. *Biological Conservation.* 187: 249-259.

Chalmers, J. 1887. *Pioneering in New Guinea*. London: Religious Tract Society.

Chalmers, J. and Gill, W. 1885. *Work and adventure in New Guinea 1877 to 1885*. London: Religious Tract Society.

Chambers, R. and Conway, R. 1992. *Sustainable rural livelihoods: Practical concepts for the 21st Century*. Institute of Development Studies Discussion Paper, No.: 296. Falmer: Institute of Development Studies.

Chester, H. 1893. Report of the Resident Magistrate for the Louisiades. *Annual Report on British New Guinea: 1892-1893*. Appendix I: 47-50. Brisbane: Government Printer.

Christensen, A. 2011. Marine gold and atoll livelihoods: The rise and fall of the beche-de-mer trade on Ontong Java, Solomon Islands. *Natural Resources Forum.* 35 (1): 9-20.

Christensen, C. and Mertz, O. 2010. Researching Pacific island livelihoods: Mobility, natural resource management and nissology. *Asia Pacific Viewpoint*. 51 (3): 278-287.

Cinner, J. 2011. Social-ecological traps in reef fisheries. *Global Environmental Change*. 21 (3): 835-839.

Cinner, J.; MacNeil, M.; Basurto, X. and Gelcich, S. 2013. Looking beyond the fisheries crisis: cumulative learning from small-scale fisheries through diagnostic approaches. *Global Environmental Change*. 23 (6): 1359-1365.

Ciriacy-Wantrup S.V. and Bishop R.C. 1975. 'Common property' as a concept in natural resources policy. *Natural Resources Journal*. 15 (4): 713-727.

Cochrane, K. 2015. The use and misuse of CITES as a management tool for commercially-exploited aquatic species. *Marine Policy.* 59: 16-31.

Cohen, P. and Alexander, T. 2013. Catch Rates, Composition and Fish Size from Reefs Managed with Periodically-Harvested Closures. *PLoS ONE.* 8 (9). e73383. doi:10.1371/journal.pone.0073383

Cohen, P. and Steenbergen, D. 2015. Social dimensions of local fisheries co-management in the Coral Triangle. *Environmental Conservation.* 42 (3): 278-288.

Cohen, P.; Tapala, S.; Rikio, A.; Kukiti, E.; Sori, F.; Hilly, Z.; Alexander, T. and Foale, S. 2014. Developing a common understanding of taxonomy for fisheries management in north Vella Lavella, Solomon Islands. *SPC Traditional Marine Resource Management and Knowledge Information Bulletin*. 33: 3-11.

Cohen, P.; Allison, E.; Andrew, N.; Cinner, J.; Evans, L.; Fabinyi, M.; Garces, L.; Hall, S.; Hicks, C.; Hughes, T.; Jentoft, S.; Mills, D.; Masu, R.; Mbaru, E. and Ratner, B. 2019. Securing a Just Space for Small-Scale Fisheries in the Blue Economy. *Fronteirs in Marine Science*. 6: 171. doi: 10.3389/fmars.2019.00171

Cole, L.; Bhagwat, S. and Willis, K. 2014. Recovery and resilience of tropical forests after disturbance. *Nature Communications*. 5: 3906. doi:10.1038/NCOMMS4906

Collard, C.; Eeckhaut, I.; Dehairs, F. and Dubois, P. 2014. Acid-base physiology response to ocean acidification of two ecologically and economically important holothuroids from contrasting habitats, *Holothuria scabra* and *Holothuria parva*. *Environmental Science and Pollution Research.* 21 (23): 13602-13614.

Conand, C. 1988. *Beche-de-mer in New Caledonia: Biology and Fishing*. Paper prepared for the South Pacific Commission's Workshop on Pacific Inshore Fishery Resources, 14th-25th March, 1988, Noumea, New Caledonia.

Conand, C. 2018. Tropical sea cucumber fisheries: changes during the last decade. *Marine Pollution Bulletin*. 133: 590-594.

Conand, C.; Polidoro, B.; Mercier, A.; Gamboa, R.; Hamel, J-F. and Purcell, S. 2014. The IUCN Red List assessment of aspidochirotid sea cucumbers and its implications. *SPC Beche-de-mer Information Bulletin*. 34: 3-7.

Connell, J. 2013. *Islands at Risk? Environments, Economies and Contemporary Change.* Cheltenham: Edward Elgar Publishing Limited.

Connell, J. 2015. Vulnerable Islands: Climate change, tectonic change, and changing livelihoods in the Western Pacific. *The Contemporary Pacific.* 27 (1): 1-36.

Connell, J. 2016. Last days in the Carteret Islands? Climate change, livelihoods and migration on coral atolls. *Asia Pacific Viewpoint*. 57 (1): 3-15.

Connell, J. 2018a. Islands: Balancing development and sustainability? *Environmental Conservation.* 1-14. http://dx.doi.org/10.1017/S0376892918000036

Connell, J. 2018b. Nothing there atoll: Farewell to the Carteret Islands. In: Crook, T. and Rudiak-Gould, P. (eds). *Pacific Climate Cultures. Living Climate Change in Oceania.* pp: 73-87. Berlin: De Gruyter.

Connell, J. and Lutkehaus, N. 2016. *Another Manam? The forced migration of the population of Manam Island, Papua New Guinea, due to volcanic eruptions 2004–2005.* Geneva: International Organization for Migration.

Connell, J. and Lutkehaus, N. 2017. Environmental Refugees? A tale of two resettlement projects in coastal Papua New Guinea. *Australian Geographer.* 48 (1): 79-95.

Connelly, A. 2016. Local agency and William MacGregor's exploration of the Trobriand Islands. In: Shellam, T.; Nugent, M.; Konishi S. and Cadzow, A. (eds.). *Brokers and Boundaries: Colonial Exploration in Indigenous Territory*. pp: 161-185. Canberra: Australian National University Press.

Cordell, J. 1984. Defending Customary Inshore Sea Rights. In: Ruddle, K. and Akimichi, T. (eds.). *Maritime Institutions in the Western Pacific.* pp.: 301-325. Senri Ethnological Studies, No.: 17. Osaka: National Museum of Ethnology.

Cordell, J. 1989. (ed). *A Sea of Small Boats.* Cultural Survival Report, No.: 26. Cambridge: Cultural Survival Inc.

Cornwall, A. 2008. Unpacking 'Participation': Models, meanings and practices. *Community Development Journal*. 43 (3): 269-283.

Corrin, J. 2009. Moving Beyond the Hierarchical Approach to Legal Pluralism in the South Pacific. *The Journal of Legal Pluralism and Unofficial Law.* 41 (59): 29-48.

Corris, P. 1968. 'Blackbirding' in New Guinea waters, 1883-84: an episode in the Queensland Labour Trade. *Journal of Pacific History*. 3: 85-105.

Cote, M., and Nightingale, A. 2012. Resilience thinking meets social theory: Situating social change in socio–ecological systems research. *Progress in Human Geography.* 36 (4): 475-489.

Coulthard, S. 2012. Can we be both resilient and well, and what choices do people have? Incorporating agency into the resilience debate from a fisheries perspective. *Ecology and Society.* 17 (1): http://dx.doi.org/10.5751/ES-04483-170104

Cox, M.; Arnold, G. and Villamayor Tomas, S. 2010. A Review of Design Principles for Community-based Natural Resource Management. *Ecology and Society.* 15 (4): 38. http://www.ecologyandsociety.org/vol15/iss4/art38/

Coyne, R. 2005. Wicked problems revisited. *Design Studies.* 26 (1): 5-17.

Crean, K. 1977. Some Aspects of the Beche-de-mer Industry in Ongtong Java, Solomon Islands. *SPC Fisheries Newsletter.* 15: 36-48.

Crona, B.; Basurto, X.; Squires, D.; Gelcich, S.; Daw, T.; Khan, A.; Havince, E.; Chomo, V.; Troell, M.; Buchary, E. and Allison, E. 2016. Towards a typology of interactions between small-scale fisheries and global seafood trade. *Marine Policy*. 65: 1-10

Currie, L. 2004. The Remarkable Metrological History of Radiocarbon Dating. *Journal of Research of the National Institute of Standards and Technology*. 109 (2): 185-217.

Curry, G. 1999. Markets, social embeddedness and pre-capitalist societies: the case of village tradestores in Papua New Guinea. *Geoforum.* 30 (3): 285-298.

Damon, F. 1978. *Modes of Production and the Circulation of Value on the Other Side of the Kula ring: Woodlark Island, Muyuw*. Princeton: Princeton University.

Damon, F. 1990. *From Muyuw to the Trobriands: Transformations along the Northern Side of the Kula Ring.* Tuscon: University of Arizona Press.

Damon, F. 2017. *Trees, Knots, and Outriggers: Environmental Knowledge in the Northeast Kula Ring.* New York: Berghann Books.

Damon, F. and Wagner, R. 1989. (eds.). *Death Rituals and Life in the Societies of the Kula Rin*g. DeKalb: Northern Illinois University Press.

Davis, A. and Ruddle, K. 2012. Massaging the misery: Recent approaches to fisheries governance and the betrayal of small-scale fisheries. *Human Organization.* 71 (3): 244-254.

Dawson, A. 2016. *Extinction*. New York: OR Books.

Dawson, R. and Philipson, P. 1989. The Market for Giant Clams in Japan, Taiwan, Hong Kong, and Singapore. In: Philipson, P. (ed). *The Marketing of Marine Resources from the South Pacific.* pp: 90-123. Suva: University of the South Pacific.

De Fries, R. and Nagendra, H. 2017. Ecosystem management as a wicked problem. *Science.* 356: 265-270.

De Haan, L. and Zoomers. 2005. Exploring the Frontier of Livelihoods Research. *Development and Change.* 36: 27-47.

Demian, M. 2003. Custom in the courtroom, law in the village: legal transformations in Papua New Guinea. *Journal of the Royal Anthropological Institute*. 9 (1): 97-115.

Diedrich, A.; Stoeckl, N.; Gurney, G.; Esparon, M. and Pollnac, R. 2017. Social Capital as a key determinant of perceived benefits of community-based marine protected areas. *Conservation Biology*. 31 (2): 311-321.

Dietz, T.; Ostrom, E. and Stern, P. 2003. The struggle to govern the commons. *Science*. 302: 1907-1912.

Douglas, J. 1888-1889. Sudest Island and the Louisiade Archipelago. Proceedings of the Queensland Branch Fourth Session. *Royal Geographical Society of Australasia*. 2-16.

Dove, M. 2006. Equilibrium Theory and Interdisciplinary Borrowing: A Comparison of Old and New Ecological Anthropologies. In: Biersack, A. and Greenberg, J. (eds.). *Reimagining Political Ecology*. pp: 43-69. Durham: Duke University Press.

Dowie, M. 2009. *Conservation Refugees: The Hundred-Year Conflict between Global Conservation and Native People*. Cambridge: Massachusetts Institute of Technology Press.

Dulvy, N. and Kindsvater, H. 2017. The Future Species of Anthropocene Seas. In: Levin, P. and Poe, S. (eds.). *Conservation for the Anthropocene Ocean: Interdisciplinary Science in Support of Nature and People*. pp: 39-64. London: Academic Press.

Dulvy, N.; Simpfendorfer, C.; Davidson, L.; Fordham, S.; Brautigam, A.; Sant, G. and Welch, D. 2017. Challenges and priorities in shark and ray conservation. *Current Biology*. 27 (11): 565-572.

Dumas, P.; Ham, J.; Kaku, R.; William, A.; Kaltavara, J.; Gereva, S. and Leopolod, M. 2017. *Tectus (Trochus) niloticus* search for suitable habitats can cause equivocal benefits of protection in village-based marine reserves. *PLoS ONE*. 12 (5): e0176922. https://doi.org/10.1371/journal.pone.0176922

Durack, P. and Wijffels, S. 2010. Fifty-Year Trends in Global Ocean Salinities and their Relationship to Broad-scale Warming. *Journal of Climate Change.* 23 (16): 4342-4362.

Duraiappah, A.; Asah, S.; Brondizio, E.; Kosoy, N.; O'Farrell, P.; Prieur-Richard, A-H.; Subramanian, S. and Takeuchi, K. 2014. Managing the mismatches to provide ecosystem services for human well-being: a conceptual framework for understanding the New Commons. *Current Opinion in Environmental Sustainability*. 7: 94-100.

Dutra, L.; Sporne, I.; Haward, M.; Aswani, S.; Cochrane, K.; Frusher, S.; Gasalla, M.; Gianesella, S.; Grant, T.; Hobday, A.; Jennings, S.; Plaganyi, E.; Pecl, G.; Salim, S.; Sauer, W.; Taboada, M. and van Putten, I. 2019. Governance mapping: A framework for assessing the adaptive capacity of marine resource governance to environmental change. *Marine Policy.* 106: 103392. https://doi.org/10.1016/j.marpol.2018.12.011

Duyker, E. 2014. *Dumont d'Urville: Explorer and Polymath.* Otago: Otago University Press.

Dworkin, R. 1977. *Taking Rights Seriously*. Cambridge: Harvard University Press.

Edmonds, P. 2006. Dual Mandate, Double work: Land, Labour, and the Transformation of a 'Native' Subjectivity in Papua, 1908-1940. In: Grimshaw, P. and McGregor, R. (eds.). *Collisions of Culture and Identities: Settlers and Indigenous Peoples.* pp: 163-186. Melbourne: RMIT Publishing.

Edwards, S. 2003. Property rights to multi-attribute fishery resources. *Ecological Economics*. 44: 309-323.

Eley, T. 1987. *Hunters of the Reef: The Marine Geography of the Kiwai, Papua New Guinea*. Unpublished PhD Thesis, University of California, Berkeley, California, United States of America.

Elfin Pty Limited. 1997. *Feasibility Study: Fishing Misima Island.* Report Prepared for Misima Mines Limited, Bwagaoia, Misima, Milne Bay Province, Papua New Guinea.

Ellen, R.; Parkes, P. and Bicker, A. 2000. (eds.). *Indigenous environmental knowledge and its transformations: Critical anthropological perspectives*. Amsterdam: Overseas Publishers Association.

Ellis, F. 2000. *Rural livelihoods and diversity in developing countries*. Oxford: Oxford University Press.

Ellis, J-A. 1997. *Race for the Rainforest II: Applying Lessons Learned from Lak to the Bismarck-Ramu Integrated Conservation and Development Initiative in Papua New Guinea.* Port Moresby: United Nations Development Program.

Eriksson, H.; Osterblom, H.; Crona, B.; Troell, M.; Wilen, J.; Andrew, N. and Folke, C. 2015. Contagious exploitation of marine resources. *Frontiers in Ecology and the Environment.* 13 (8): 435-440.

Evans, L.; Cherrett, N. and Pemsl, D. 2011. Assessing the impact of fisheries co-management interventions in developing countries: a meta-analysis. *Journal of Environmental Management.* 92 (8): 1938-1949.

Evans, L.; Hicks, C.; Cohen, P.; Case, P.; Prideaux, M. and Mills, D. 2015. Understanding leadership in the environmental sciences. *Ecology and Society*. 20 (1): 50. doi: 10.5751/ES-07268-200150

Eves, R. 2000. Waiting for the Day: Globalisation and Apocalypticism in Central New Ireland, Papua New Guinea. *Oceania.* 72 (2): 73-91.

Fabinyi, M. 2012. Historical, cultural and social perspectives on luxury seafood consumption in China. *Environmental Conservation.* 39 (1): 83-92.

Fabinyi, M. and Liu, N. 2014. Seafood banquets in Beijing: consumer perspectives and implications for environmental sustainability. *Conservation and Society.* 12 (2): 218-222.

Fabinyi, M.; Pido, M.; Harani, B.; Caceres, J.; Uyami-Bitara, A.; De las Alas, A.; Buenconsejo, J. and Ponce de Leon, E. 2012. Luxury seafood consumption in China and the intensification of coastal livelihoods in Southeast Asia: The live reef fish for food trade in Balabac, Philippines. *Asia Pacific Viewpoint*. 53 (2): 118-132.

Fabinyi, M., L. Evans, and S. J. Foale. 2014. Social-ecological systems, social diversity, and power: insights from anthropology and political ecology. *Ecology and Society* 19(4): 28. http://dx.doi.org/10.5751/ES-07029-190428

Fabinyi, M.; Foale, S. and Macintyre, M. 2015. Managing inequality or managing stocks? An ethnographic perspective on the governance of small-scale fisheries. *Fish and Fisheries*. 16 (3): 471-485.

Fabinyi, M.; Liu, N.; Song, Q. and Li, R. 2016a. Aquatic product consumption patterns and perceptions among the Chinese middle class. *Regional Studies in Marine Science*. 7: 1-9.

Fabinyi, M.; Dressler, W. and Pido, M. 2016b. Do fish scales matter? Diversification and differentiation in seafood commodity chains. *Ocean and Coastal Management*. 134: 103-111.

Fabinyi, M.; Dressler, W. and Pido, M. 2018. Moving beyond financial value in seafood commodity chains. *Marine Policy.* 94: 89-92.

Fairbridge, R. 1973a. Geomorpholgy of the Reef Islands. In: Manser, W. (ed). *New Guinea Barrier Reefs: Preliminary Results of the 1969 Coral Reef Expedition to the Trobriand Islands and the Louisiade Archipelago, Papua New Guinea*. pp: 129-146. Geology Department Occasional Papers, No.: 1. Port Moresby: University of Papua New Guinea.

Fairbridge, R. 1973b. Morphology of the Reefs. In: Manser, W. (ed). *New Guinea Barrier Reefs: Preliminary Results of the 1969 Coral Reef Expedition to the Trobriand Islands and the Louisiade Archipelago, Papua New Guinea*. pp: 163-194. Geology Department Occasional Papers, No.: 1. Port Moresby: University of Papua New Guinea.

Fairbridge, R. and Manser, W. 1973. Introduction and Narrative. In: Manser, W. (ed). *New Guinea Barrier Reefs: Preliminary Results of the 1969 Coral Reef Expedition to the Trobriand Islands and the Louisiade Archipelago, Papua New Guinea*. pp: 9-36. Geology Department Occasional Papers, No.: 1. Port Moresby: University of Papua New Guinea.

Farnworth, E. 1976. Betel nut: its composition, chemistry and uses. *Science in New Guinea.* 4 (2): 85-90.

Feeny, D.; Berkes, F.; McCay, B. and Acheson, J. 1990. The Tragedy of the Commons: Twenty-two Years Later. *Human Ecology*. 18 (1): 1-19.

Feeny, D. Hanna, S. and McEvoy, A. 1996. Questioning the Assumptions of the Tragedy of the Commons' Model of Fisheries. *Land Economics.* 72 (2): 187-205.

Ferraro, P. and Kiss, A. 2002. Direct Payments to Conserve Biodiversity. *Science*. 298: 1718-1719.

Filer, C. 1997. (ed). *The Political Economy of Forest Management in Papua New Guinea*. London and Boroko: International Institute for Environment and Development and PNG National Research Institute.

Filer, C. 1999. (ed). *Dilemmas of Development: The Social and Economic Impact of the Porgera Gold Mine 1989-1994*. Canberra: Asia Pacific Press.

Filer, C. 2006. Custom, Law and Ideology in Papua New Guinea. *The Asia Pacific Journal of Anthropology.* 7 (1): 65-84.

Finkbeiner, E. and Basurto, X. 2015. Re-defining co-management to facilitate small-scale fisheries reform: An illustration from northwest Mexico. *Marine Policy.* 51: 433-441.

Fitzpatrick, J. 1991. Maza: A Legend about Culture and the Sea. In: Lawrence, D. and Canfield-Smith, T. (eds.). *Proceedings: Torres Strait Baseline Study Conference.* pp: 335-347. Townsville: Great Barrier Reef Marine Park Authority.

Flexner, J. 2015. Food appropriation and culinary imperialism. In: Metheny, K. and Beaudry, M. (eds.). *Archaeology of food: An encyclopedia*. pp: 201-203. Lanham: Rowman and Littlefeld.

Flexner, J.; Willie, E. and Horrocks, M. 2019. Sustenance and sustainability: Food remains and contact sites in Vanuatu. *In:* Leclerc, M. and Flexner, J. (eds.). *Archaeologies of Island Melanesia: Current approaches to landscapes, exchange and practice*. pp: 135-147. Canberra: Australian National University.

Foale, S. 1998. *The Role of Customary Marine Tenure and Local Knowledge in Fishery Management at West Nggela, Solomon Islands.* Unpublished PhD Thesis, University of Melbourne, Melbourne, Victoria, Australia.

Foale S. 2005. *Sharks, sea slugs and skirmishes: managing marine and agricultural resources on small, overpopulated islands in Milne Bay, Papua New Guinea*. Canberra: The Australian National University.

Foale, S., and M. Macintyre. 2000. Dynamic and flexible aspects of property tenure at West Nggela, Solomon Islands: implications for marine resource management. *Oceania.* 71 (1): 30-45.

Foale, S.; Cohen, P.; Januchowski-Hartley, S.; Wenger, A. and Macintyre, M. 2010. Tenure and taboos: origins and implications for fisheries in the Pacific. *Fish and Fisheries*. 12 (4): 357-369.

Foale, S.; Dyer, M. and Kinch, J. 2016. The Value of Tropical Biodiversity in Rural Melanesia. *Valuation Studies.* 4 (1): 11-39.

Food and Agriculture Organsiation. 2019. *Report of the sixth Food and Agriculture Organisation Expert Advisory Panel for the Assessment of Proposals to Amend Appendices I and II of Convention on the International Trade of Endangered Species Concerning Commercially-exploited Aquatic Species, Rome, 21st-25th January 2019.* Food and Agriculture Organisation Fisheries and Aquaculture Report, No.: 1255. Rome: Food and Agriculture Organsiation.

Fort, G. 1886. Report on British New Guinea. *QVP.* 2: 953.

Fortune, R. 1932. *Sorcerers of Dobu*. London: Routledge and Keagan Paul.

Foster, J.; Clark, B. and York, R. 2010. *The Ecological Rift: Capitalism's War on the Earth.* New York: Monthly Review Press.

Foster, R. 1992. Commoditsation and the emergence of *kastam* as a cultural category: A New Ireland case in comparative perspective. *Oceania.* 62 (4): 284-294.

Foster, R. 1995. *Social Reproduction and History in Melanesia: Mortuary Ritual, Gift Exchange and Custom in the Tanga Islands.* Cambridge: Cambridge University Press.

Francour, P. 1997. Predation on Holothurians: A Literature Review. *Invertebrate Biology.* 116 (1): 52-60.

Freeman, I. 2017. 'Blue boats' are a problem! *SPC Fisheries Newsletter.* 153: 10.

Frewer, L. 1990. The effect of betel nut on human performance. *Papua New Guinea Medical Journal*. 33 (2): 143-145.

Friedman, J. 1974. Marxism, Structuralism, and Vulgar Materialism. *Man.* 9 (3): 444-469.

Friedman, K.; Garcia, S. and Rice, J. 2018. Mainstreaming biodiversity in fisheries. *Marine Policy.* 95: 209-220.

Friedman, K.; Kronen, M.; Pinca, S.; Magron, F.; Boblin, P.; Pakoa, K.; Awiva, R. and Chapman, L. 2009. *Papua New Guinea country report: Profiles and results from survey work at Andra, Tsoilaunung, Sideia, and Panapompom (June to November 2006).* Noumea: Secretariat of the Pacific Community.

Friedman, K.; Gabriel, S.; Abe, O.; Adnan Nuruddin, A.; Ali, A.; Bidin Raja, ; Hassan, R.; Cadrin, S.; Cornish, A.; De Meulenaer, T.; Dharmadi; Fahmi; Huu Tuan Anh, L.; Kachelriess, D.; Kissol Jr. L.; Krajangdara, T.; Rahman, A.; Wahab; Tanoue, W.; Tharith, C.; Torres Jr. F.; Wanchana, W.; Win, S.; Yokawa, K. and Ye1, Y. 2017. Examining the impact of CITES listing of sharks and rays in Southeast Asian fisheries. *Fish and Fisheries.* 19 (4): 662-676.

Frijlink, S. 2018. *Fishing Catch and Effort in the Tigak and Tsoi Islands, New Ireland Province, Papua New Guinea.* Report prepared for the Wildlife Conservation Society, Kavieng, New Ireland Province, Papua New Guinea.

Frusher, S. and Subam, S. 1981. Traditional Fishing Methods and Practices in the Northern Gulf of Papua. *Harvest.* 7: 15-158.

Fuentes, M.; Limpus, C. and Hamann, M. 2011. Vulnerability of sea turtle nesting grounds to climate change. *Global Change Biology.* 17 (1): 140-153.

Fussy, A.; Pommier, P.; Lumbroso, C. and De Haro, L. 2007. Chelonitoxism: New case reports in French Polynesia and review of the literature. *Journal of the International Society on Toxinology*. 49 (6): 827-832.

Game, E.; Meijaard, E.; Sheil, D. and McDonald-Madden, E. 2014. Conservation in a wicked complex world: Challenges and solutions. *Conservation Letters*. 7 (3): 271-277.

Garcia, S.; Rice, J. and Charles, A. 2014. (eds.). *Governance of marine fisheries and biodiversity conservation: Interaction and co-evolution.* Chichester: Wiley-Blackwell.

Geertz, C. 1973. *The Interpretation of Cultures: Selected Essays*. New York: Basic Books.

Gentle, M. 1979. Population Ecology of Commercial Beche-de-mer (Echinodermata: Holothuridea) in Fiji. *SPC Fisheries Newsletter,* 18: 13-15.

Gereffi, G.; Humphrey, J. and Sturgeon, T. 2005. The governance of global value chains. *Review in International Political Economy.* 12 (1): 78-104.

Gerritsen, R. and Macintyre, M. 1986. *Social Impact Study of the Misima Gold Mine: An IASER Report, 2 Volumes.* Report prepared for the Departments of National Planning and Energy, Port Moresby, National Capital District, Papua New Guinea.

Gibbney, H. 1966. The Interregnum in the Government of Papua, 1901-1906. *Australian Journal of Politics and History.* 12 (3): 341-359.

Gibbney, H. 1972. The New Guinea Gold Rush of 1878. *Journal of the Royal Australian Historical Society.* 58 (4): 284-296.

Gibbs, H. 1945. *The Laws of the Territory of New Guinea: Their Constitutional Sources and Basic Content.* Unpublished LLM Thesis, University of Queensland, Brisbane, Queensland, Australia.

Gill, W. 1874. Three Visits to New Guinea. *Royal Geographical Society Proceedings*. 44: 15-31.

Gill, W. 1876. *Life in the Southern Isles: Or Scenes and Incidents in the South Pacific and New Guinea.* London: Religious Tract Society.

Glaus, K.; Adrian-Kalchhauser, I.; Piovano, S.; Appleyard, S.; Brunnschweiler, J. and Rico, C. 2019. Fishing for proft or food? Socio-economic drivers and fshers' attitudes towards sharks in Fiji. *Marine Policy.* 100: 249-257.

Godelier, M. 1979. The Appropriation of Nature. *Critique of Anthropology.* 4 (3-4): 17-27.

Golub, A. 2014. *Leviathans at the Gold Mine: Creating Indigenous and Corporate Actors in Papua New Guinea*. Durham: Duke University Press.

Goodman, J. 2005. *The Rattlesnake: A Voyage of Discovery to the Coral Sea.* London: Faber and Faber.

Gordon, R. 1954. The Economic Theory of a Common Property Resource. *Journal of Political Economy*. 75: 124-142.

Goulding, W.; Moss, P. and McAlpine, C. 2016. Cascading effects of cyclones on the biodiversity of Southwest Pacific islands. *Biological Conservation*. 193: 143-152.

Goulding, W.; Perez, A.; Moss, P. and McAlpine, C. 2019. Subsistence lifestyles and insular forest loss in the Louisiade Archipelago of Papua New Guinea: an endemic hotspot. *Pacific Conservation Biology.* 25 (2): 151-163.

Grafton, R. 2010. Adaptation to climate change in marine capture fisheries. *Marine Policy*. 34 (3): 606-615.

Granovetter, M. 2005. The Impact of Social Structure on Economic Outcomes. *The Journal of Economic Perspectives*. 19 (1): 33-50.

Gray, A. 1999. Trading Contacts in the Bismarck Archipelago during the Whaling Era, 1799-1884. *Journal of Pacific History.* 34 (1): 23-43.

Greenberg, J. and Park, T. 1994. Political Ecology. *Journal of Political Ecology.* 1 (1): 1-12.

Gregory, C. 1982. *Gifts and Commodities*. London: Academic Press.

Griffiths, M.; Kimbrough, A.; Gagan, M.; Drysdale, R.; Cole, J.; Johnson, K.; Zhao, J-X.; Cook, B.; Hellstrom, J. and Hantoro, W. 2016. Western Pacific hydroclimate linked to global climate variability over the past two millennia. *Nature Communications.* 7: 11719. doi: 10.1038/ncomms11719

Guggisberg, S. 2016. *The use of CITES for commercially-exploited fish species: A solution to overexploitation and illegal, unreported and unregulated fishing?* Hamburg: Springer.

Gupta, A. and Ferguson, J. 1997. *Culture, Power, Place: Explorations in Critical Anthropology*. Durham: Duke University Press.

Gutierrez, N.; Hilborn, R. and Defeo, O. 2011. Leadership, social capital and incentives promote successful fisheries. *Nature.* 470: 386-389.

Haddon, A. 1894. *The decorative art of British New Guinea*. Cunningham Memoirs, No.: 10. Dublin: Royal Irish Academy.

Haddon, A. 1900. Studies in the anthropogeography of British New Guinea. *The Geographical Journal.* 16: 414-440.

Haider, l.; Boonstra, W.; Peterson, G. and Schluter, M. 2018. Traps and Sustainable Development in Rural Areas: A Review. *World Development.* 101: 311-321.

Hair, C.; Foale, S.; Kinch, J.; Frijlink, S.; Southgate, P. and Lindsay, D. 2019. Socio-economic impacts of a sea cucumber fishery in Papua New Guinea: Is there an opportunity for mariculture? *Coastal and Ocean Management.* 179: 104826**.** *doi.org/10.1016/j.ocecoaman.2019.104826*

Hallowell, I. 1943. The Nature and Function of Property as a Social Institution. *Journal of Legal and Political Sociology.* 1: 115-138.

Hamilton, R.; Hughes, A.; Brown, C.; Leve, T. and Kama, W. 2019. Community-based management fails to halt declines of bumphead parrotfish and humphead wrasse in Roviana Lagoon, Solomon Islands. *Coral Reefs*. 38 (3):455-465.

Hamilton-Hart, N and Stringer, C. 2016. Upgrading and exploitation in the fishing industry: contributions of value chain analysis. *Marine Policy.* 63: 166-171.

Hanich, Q.; Wabnitz, C.; Otac, Y.; Amos, M.; Donato-Hunt, C. and Hunt, A. 2018. Small-scale fisheries under climate change in the Pacific Islands region. *Marine Policy*. 88: 279-284.

Hardin, G. 1968. The Tragedy of the Commons. *Science.* 162: 1243-1248.

Harvey, D. 1996. *Justice, Nature and the Geography of Difference.* Oxford: Blackwell Publishers.

Harwood, F. 1976. Myth, Memory, and the Oral Tradition: Cicero in the Trobriands. *American Anthropologist.* 78 (4): 783-796.

Hassall, G. 2012. Faith-based organisations and social policy in Melanesia. *Australian Journal of Social Issues*. 47 (3): 389-406.

Hau'ofa, I. no date. *Notes made by Isikeli Hau'ofa -1942 to 1945.* Unpublished Manuscript.

Hauck, M. 2008. Rethinking small-scale fisheries compliance. *Marine Policy.* 32 (4): 635-642.

Hay, C.; Morrow, E.; Kopp, R. and Mitrovica, J. 2015. Probabilistic reanalysis of 20th century sea-level rise. *Nature*. 517: 481-484.

Hayes, G. 1993. 'MIRAB' Processes and Development on Small Pacific Islands: A Case Study from the Southern Massim, Papua New Guinea. *Pacific Viewpoint*. 34 (2): 153-178.

Hays, T. 1991. "No Tobacco, No Hallelujah": Missions and the Early History of Tobacco in Eastern Papua. *Pacific Studies.* 14 (4): 91-112.

Hays, T. 2003. "They Are Beginning to Learn the Use of Tobacco": Cultural Context and the Creation of a Passion in Colonial Papua New Guinea. In: Jankowiak, W. and Bradburd, D. (eds.). *Drugs, Labor, and Colonial Expansion.* pp: 59-72. Tucson: University of Arizona Press.

Hazen, H. and Harris, L. 2007. Limits of territorially-focused conservation: a critical assessment based on cartographic and geographic approaches. *Environmental Conservation.* 34 (4): 280-290.

Henderson, J. and Henderson, A. 1974. Languages of the Louisiade Archipelago and Environs. In: Healey, A. (ed). *Three Studies in Languages of Eastern Papua*. 3: 39-62. Ukarumpa: Summer Institute of Linguistics.

Hess, M. 1982. Misima 1942: An anti-colonial religious movement. *Bikmaus*. 3 (1): 48-56.

Hide, R.; Bourke, R.; Allen, B.; Betitis, T.; Fritsch, D.; Grau, R.; Kurika, L.; Lowes, E.; Mitchell, D.; Rangai, S.; Sakiasi, M.; Sem G. and Suma, B. 1994. *Milne Bay Province: Text Summaries, Maps, Code Lists and Village Identification. Agricultural Systems of Papua New Guinea.* Agricultural Systems of Papua New Guinea Working Paper, No.: 6. Canberra: Australian National University.

Hilborn, R. 2007. Defining success in fisheries and conflicts in objectives. *Marine Policy*. 31: 153-158.

Hill, J. 1965. Asiatic Bats of the Genus Kerivoula. *Mammalia.* 29 (4): 524-556.

Hitchcock, G. 2017. Manuscript XXXII The Final Fate of the La Perouse Expedition? The 1818 Account of Shaik Jumaul, a Lascar Castaway in Torres Strait. *The Journal of Pacific History*. 52 (2): 517-535.

Hitchcock, P. and Gabriel, J. 2015. *World Heritage Tentative Listed Sites in Papua New Guinea: Report on a Review of the Sites*. Report prepared for the Conservation and Environment Protection Authority, Port Moresby, National Capital District, Papua New Guinea.

Hogbin, I. 1939. *Experiments in Civilization: The Effects of European Culture on a Native Community of the Solomon Islands.* George Routledge, London.

Hogbin, I. 1951. *Transformation Scene: The Changing Culture of a New Guinea Village*. London: Routledge.

Holmes, G. and Cavanagh, C. 2016. A review of the social impacts of neoliberal conservation: Formations, inequalities, contestations. *Geoforum.*75: 199-209.

Holzknecht, H. 1998. Problems of Articulation and Representation in Resource Development: The Case of Forestry in Papua New Guinea. *Anthropological Forum.* 7 (4): 549-573.

Honneland, G. 1999. A model of compliance in fisheries: theoretical foundations and practical application. *Ocean and Coastal Management*. 42: 699-716.

Hopley, D. and Hamilton, D. 1973. Geomorphology of the High Islands. In: Manser, W. (ed). *New Guinea Barrier Reefs: Preliminary Results of the 1969 Coral Reef Expedition to the Trobriand Islands and the Louisiade Archipelago, Papua New Guinea*. pp: 95-128. Geology Department Occasional Papers, No.: 1. Port Moresby: University of Papua New Guinea.

Horizon Resources. 1998. *An Information Summary for Horizon Resources Pty Limited on the Proposed Fishing, Catching, Processing and Trading of Seafood, Shell and Aquaculture Products for Local and Export Markets.* Report prepared for the Government of Papua New Guinea, Port Moresby, National Capital District, Papua New Guinea.

Hornborg, A. 2009. Zero-sum world: Challenges in conceptualising environmental load displacement and ecologically unequal exchange in the world-system. *International Journal of Comparative Sociology.* 50 (3): 237-262.

Horner, F. 1996. *Looking for La Perouse: D'Entrecasteaux in Australia and the South Pacific, 1792-1793.* Melbourne: Melbourne University Press.

Horowitz, L. 2015. Local environmental knowledge. In: Perreault, T.; Bridge, G. and McCarthy, J. (eds.). *The Routledge Handbook of Political Ecology.* pp: 235-248. London: Routledge.

Huber, M. 1993. *Issues and Options for Sustainable Development and Management of Coastal Resources in Papua New Guinea*. Discussion Paper prepared for the Towards Sustainable Coastal Resource Development in Papua New Guinea Conference, 1st-4th December 1993, Port Moresby, National Capital District, Papua New Guinea.

Hughes, T.; Barnes, M.; Bellwood, D.; Cinner, J.; Cumming, G.; Jackson, G.; Kleypas, J.; van de Leemput, I.; Lough, J.; Morrison, T.; Palumbi, S.; van Nes, E. and Scheffer, M. 2017. Coral reefs in the Anthropocene. *Nature*. 546: 82-90.

Hughes, T.; Kerry, J.; Baird, A.; Connolly, S.; Dietzel, A.; Eakin, C.; Heron, S.; Hoey, A.; Hoogenboom, M.; Liu, G.; McWilliam, M.; Pears, R.; Pratchett, M.; Skirving, W.; Stella, J. and Torda, G. 2018. Global warming transforms coral reef assemblages. *Nature.* 556: 492-496.

Hussein, K. 2002. *Livelihoods Approaches Compared: A Multi-Agency Review of Current Practice*. London: Department for International Development.

Hviding, E. 1989. *All Things in our Sea: The Dynamics of Customary Marine Tenure, Marovo Lagoon, Solomon Islands.* Special Publication, No.: 13. Port Moresby: *Institute of Applied Social and Economic Research.*

Hviding, E. 1996. *Guardians of Marovo Lagoon: Practice, Place, and Politics in Maritime Melanesia.* Pacific Islands Monograph, No.: 14. Honolulu: University of Hawaii Press.

Hyndman, D. 1993. Sea Tenure and the Management of Living Marine Resources in Papua New Guinea. *Pacific Studies.* 16 (4): 99-114.

Igoe, J. and Brockington, D. 2007. Neoliberal conservation: a brief introduction. *Conservation and Society.* 5 (4): 432-449.

Irwin, G. 1991. Themes in the Prehistory of Coastal Papua and the Massim. In: Pawley, A. (ed). *Man and a Half: Essays in Pacific Anthropology and Ethnobiology in Honour of Ralph Bulmer*. pp: 503-510. Auckland: The Polynesian Society.

Izod, A. 2001. *Nabaina and Nagobi Islands and the Long/Kosmann Reefs Claim by Brooker Islands Against Ware Islanders: Customary Ownership of the Islands.* Report prepared for the Brooker Island Community, Milne Bay Province, Papua New Guinea.

Jacinto, E. and Pomeroy, R. 2011. Developing markets for small-scale fisheries: utilising the value chain approach. In: Pomeroy, R. and Andrew, N. (eds.). *Small-scale Fisheries Management: Frameworks and Approaches for the Developing World*. pp: 160-177. Cambridge: CABI International.

Jacka, J. 2003. *God, Gold and the Ground: Place-based Political Ecology in a New Guinea Boderland.* Unpublished PhD Thesis, University of Oregon, Eugene, Oregon, United States of America.

Jack-Hinton, C. 1972. Discovery. In: Ryan, P. (ed). *Encyclopedia of Papua and New Guinea.* pp: 246-267. Melbourne: Melbourne University Press.

Jackman, H. 1988. *Copra Marketing and Price Stabilization in Papua New Guinea: A History to 1975*. Canberra: Australian National University.

Jacobs, T. 1844. *Scenes, Incidents and Adventures in the Pacific Ocean, or the Islands of the Australasian Sea, etc.* New York: Harper and Brothers.

James, C. 1999. *ANGAU: One Man Law*. Loftus: Australian Military History Publications.

James, P.; Nadarajah, Y.; Haive, K. and Stead, V. 2012. *Sustainable Communities, Sustainable Development: Other Paths for Papua New Guinea.* Honolulu: University of Hawaii.

Jamison, B. 1990. *Blackbirding in New Guinea Waters? The 1884 Voyage of the Hopeful and the Queensland Labour Trade.* Unpublished BA Honours Thesis, University of Queensland, Brisbane, Queensland, Australia.

Jarillo de la Torre, S. 2013. *Carving the spirits of the wood: an enquiry into Trobriand materialisations*. Unpublished PhD Thesis, University of Cambridge, Cambridge, United Kingdom.

Jebens, H. 2010. *After the Cult: Perceptions of Other and Self in West New Britain (Papua New Guinea)*. New York: Berghahn.

Jensen, M.; Allen, C.; Eguchi, T.; Bell, I.; LaCasella, E.; Hilton, W.; Hof, C. and Dutton, P. 2018. Environmental warming and feminization of one of the largest sea turtle populations in the world. *Current Biology.* 28 (1): 154-159.

Jentoft, S. 2000. The Community: A Missing Link of Fisheries Management. *Marine Policy*. 24 (1): 53-59.

Jentoft, S. 2007. Limits of governability? Institutional implications for fisheries and coastal governance. *Marine Policy.* 31 (4): 360-370.

Jentoft, S. 2011. Legal pluralism and the governability of fisheries and coastal systems. *Journal of Legal Pluralism and Unofficial Law*. 43 (64): 149-172.

Jentoft, S. and Bavinck, M. 2014. Interactive governance for sustainable fisheries: dealing with legal pluralism. *Current Opinion in Environmental Sustainability*. 11:71-77.

Jentoft, S. and Chuenpagdee R. 2009. Fisheries and coastal governance as a wicked problem. *Marine Policy*. 33: 553-560.

Jentoft, S. and Chuenpagdee, R. 2015. (eds.). *Interactive governance for small-scale fisheries: Global reflections.* London: Springer.

Jentoft, S.; Bavinck, M.; Johnson, D.; and Thomson, K. 2009. Fisheries Co-Management and Legal Pluralism: How an Analytical Problem Becomes an Institutional One. *Human Organization*. 68 (1): 27-38.

Jiang, D.; Liu, Z.; Zeng, X.; Tang, X.; Yang, S. and Zhen, X. 2019. The complete mitochondrial genome of *Rochia nilotica* (Gastropoda: Tegulidae). *Mitochondrial DNA Part B.* 4 (1): 1121-1122.

Johannes, R. 1982. Implications of Traditional Marine Resource Use in Coastal Fisheries in Papua New Guinea. In: Mourata, L.; Pernetta, J. and Heaney, W. (eds.). *Traditional Conservation in Papua New Guinea: Implications for Today.* pp: 239-249. Monograph, No.: 16. Boroko: Institute of Applied Social and Economic Research.

Johannes, R. and Macfarlane, J. 1991. *Traditional Fishing in the Torres Strait Islands*. Hobart: Commonwealth Scientific and Industrial Research Organisation.

Johns, R. 1986. The instability of tropical ecosystems in New Guinea. *Blumea.* 31: 341-371.

Johns, R. 1989. The influence of drought on tropical rainforest vegetation in Papua New Guinea. *Mountain Research and Development.* 9 (3): 248-251.

Johns, R.; Gideon, O.; Simaga, J.; Kuria, T. and Bagoera, G. 2009. An introduction to the flora of the Milne Bay Archipelago. *Blumea*. 54: 251-254.

Johnsen, J. 2013. Is fisheries governance possible? *Fish and Fisheries*. 15 (3): 428-444.

Johnson, J.; Bertram, I.; Chin,A.; Moore, B.; Pratchett, M.; Welch, D.; Williams, A.; Bell, J. and Govan, H. 2018. *Effects of Climate Change on Fish and Shellfish Relevant to Pacific Islands, and the Coastal Fisheries they Support.* London: Commonwealth Marine Economies Program.

Jolly, M. 1994. *Women of the place: kastom*, *colonialism and gender in Vanuatu.* Chur: Harwood Academic Publishers.

Jonathan, A. 2001. The El Niño drought: an overview of the Milne Bay experience. In: Bourke, R.; Allen, G.; and Salisbury, J. (eds.). *Food Security for Papua New Guinea: Proceedings of the Papua New Guinea Food and Nutrition 2000 Conference, Lae, Papua New Guinea*. pp. 209-213. Canberra: Australian Centre for International Agricultural Research.

Jones, G.; Srinivasan, M. and Almany, G. 2007. Population connectivity and conservation of marine biodiversity. *Oceanography.* 20 (3): 100-111.

Kaag, M.; van Berkel, R.; Brons, J.; de Bruijn, M.; van Dijk, H.; de Haan, L.; Nooteboom, G. and Zoomers, A. 2004. Ways forward in livelihood research. In: In: Kalb, D.; Panters, W. and Siebers, H. (eds.). *Globalization and development. Themes and concepts in current research*. pp: 49-74. Dordrecht: Kluwer Academic Press.

Kahn, M. 1986. *Always Hungry, Never Greedy: Food and the Expression of Gender in a Melanesian Society*. Cambridge: Cambridge University Press.

Kaplin, P. 1994. Geomorphology, Geological Structure and Genetic Types of Islands in the Southwest Pacific. In: Pernetta, J. and Manner, H. 1994. (eds.). *The Ecosystems of Small Islands in the Southwest Pacific (The Sixth Expedition of the SS 'Calisto').* pp: 9-28. UNEP Regional Seas Reports and Studies, No.: 151; SPREP Reports and Studies, No.: 63. Apia: UNEP and SPREP.

Keesing, R. 1989. Creating the past: custom and identity in the contemporary Pacific. *The Contemporary Pacific.* 1 (1-2): 19-42.

Keys, P.; Galaz, P.; Dyer, M.; Matthews, N.; Folke, C.; Nystrom, M. and Cornell, S. 2019. Anthropocene risk. *Nature Sustainability.* 2: 667-673.

Khan, A. and Neis, B. 2010. The rebuilding imperative in fisheries: clumsy solutions for a wicked problem? *Progress in Oceanography.* 87 (1-4): 347-356.

Kinch, J. 2001a. *Social Evaluation Study for the Milne Bay Community-Based Coastal and Marine Conservation Program.* Report prepared for the United Nations Development Program (PNG/99/G41), Port Moresby, National Capital District, Papua New Guinea.

Kinch, J. 2001b. *Stakeholder Participation Plan for the Milne Bay Community-Based Coastal and Marine Conservation Program.* Report prepared for the United Nations Development Program (PNG/99/G41), Port Moresby, National Capital District, Papua New Guinea.

Kinch, J. 2002. Giant Clams: Their Status and Trade in the Milne Bay Province, Papua New Guinea. *Traffic Bulletin.* 19 (2): 67-75.

Kinch, J. 2003a. *Sea Turtle Resources in the Milne Bay Province, Papua New Guinea: Results of a Nesting Survey (21-27/01/03) at Panuayayapona and Panadaludalu Islands (Jomard Islands), with Additional Notes.* Report prepared for the South Pacific Regional Environment Program, Apia, Samoa; the Department of Environment and Conservation, Port Moresby, Papua New Guinea; and Environment Australia, Brisbane, Queensland, Australia.

Kinch, J. 2003b. Marine Mollusc Use among the Women of Brooker Island, Louisiade Archipelago, Milne Bay Province, Papua New Guinea. *SPC Women in Fisheries Information Bulletin.* 13: 5-14.

Kinch, J. 2004a. *A Review of the Beche-de-mer Fishery and its Management in Papua New Guinea*. A Report prepared for the National Fisheries Authority, Port Moresby, National Capital District, Papua New Guinea.

Kinch, J. 2004b. *Project Review of ACIAR Project (FIS/1999/038): Sustainable Artisanal Beche-de-mer Fisheries through the Incorporation of Socio-economic Considerations in the Development of Community-based Fisheries Management Plans in the Trobriand Islands, Papua New Guinea.* A Report prepared for the Australian Centre for International Agricultural Research, Sydney, New South Wales, Australia.

Kinch, J. 2008a. From Prehistoric to Present: Giant Clam (Tridacnidae) use in Papua New Guinea. In: Antczak, A. and Caprini, R. (eds.). Early Human Impact on Megamolluscs. *British Archaeological Reports International Series.* 1865: 179-188.

Kinch, J. 2008b. *The Grounding of the Consort Vessel, MV Nui Ailan Coast on Taudovo Reef, Milne Bay Province, Papua New Guinea: A Preliminary Assessment of Reef Damage.* Report prepared for Brian White and Associates, Cairns, Queensland, Australia.

Kinch, J. 2015. *Reef Damage Assessment of the MV Helene Rikmers Grounding Site, Badila Dabobona Reef, Milne Bay Province, Papua New Guinea*. Report prepared for Brian White and Associates, Cairns, Queensland, Australia.

Kinch, J. and Burgess, E. 2009. Assessment of the Trade in Hawksbill Turtles in Papua New Guinea. *TRAFFIC Bulletin.* 22 (2): 62-72.

Kinch, J.; Mesia, P.; Kere, N.; Manioli, J. and Bulehite, K. 2006. *Socio-economic Baseline Assessment for the Eastern Marovo Lagoon, Western Province, the Solomon Islands*. International Waters Program Pacific Technical Report, No.: 35. Apia: Secretariat of the Pacific Regional Environment Program.

Kinch, J.; James, M.; Thomas, E.; Lauhi, P. and Gabiobu, R. 2007. *Socio-economic Assessment of the Beche-de-mer Fisheries in the Western, Central and Manus Provinces, Papua New Guinea*. Report prepared for the National Fisheries Authority, Port Moresby, National Capital District, Papua New Guinea.

Kinch, J.; Purcell, S.; Uthicke, S. and Friedman, K. 2008a. Papua New Guinea: A Hot spot of Sea cucumber Fisheries in the Western Pacific. In: Toral-Granda, V.; Lovatelli, A. and Vasconcellos, M. (eds.). *Sea Cucumbers: A Global Review of Fisheries and Trade*. Food and Agriculture Organisation Fisheries Technical Paper, No.: 516. pp: 57-77. Rome: Food and Agriculture Organisation of the United Nations.

Kinch, J.; Purcell, S.; Uthicke, S. and Friedman, K. 2008b. Population Status, Fisheries and Trade of Sea Cucumbers in the Western Pacific. In: Toral-Granda, V.; Lovatelli, A. and Vasconcellos, M. (eds.). *Sea Cucumbers: A Global Review of Fisheries and Trade*. Food and Agriculture Organisation Fisheries Technical Paper, No.: 516. pp: 7-55. Rome: Food and Agriculture Organisation of the United Nations.

Kittinger, J.; Teneva, L.; Koike, H.; Stamoulis, K.; Kittinger, D.; Oleson, K.; Conklin, E.; Gomes, G.; Wilcox, B. and Friedlander, A. 2015. From reef to table: Social and ecological factors affecting coral reef fisheries, artisanal seafood supply chains, and seafood security. *PLoS ONE*. 10 (8): e0123856. https://doi.org/10.1371/journal.pone.0123856

Koczberski, G.; Curry, G.; Warku, J. and Kwam, C. 2006. *Village-based marine resource use and rural livelihoods, Kimbe Bay, West New Britain, Papua New Guinea.* TNC Pacific Island Countries Report, No.: 5. Brisbane: The Nature Conservancy.

Kooiman, J. 1993. Governance and governability: Using complexity, dynamics and diversity. In: Kooiman, J. (ed). *Modern governance, New Government: Society Interactions*. pp: 35-48. London: Sage Publications.

Kooiman J. 2003. *Governing as Governance.* London: Sage Publications.

Kooiman, J. and Bavinck, M. 2005. The governance perspective. In: Kooiman, J.; Bavinck, M.; Jentoft, S. and Pullin, R. (eds.). *Fish for Life: Interactive Governance for Fisheries.* pp: 11-24. Amsterdam: Amsterdam University Press.

Kooiman. J.; Bavinck, M.; Jentoft, S. and Pullin, R. 2005. (eds). *Fish for life: Interactive governance for fisheries*. Amsterdam: University of Amsterdam Press.

Kraus, F.; Allison, A.; Pratt, T.; Polhemus, D.; Slapcinsky, J. and Helgen, K. 2003. *Wildlife Resources Survey and Analysis of Milne Bay Province*. Report prepared for the National Department of Environment and Conservation, Port Moresby, National Capital District, Papua New Guinea.

Kraus, F.; Pratt, T. and Slapcinsky, J. 2005. *Wildlife Resources Survey of Rossel and Sudest Islands, Louisiade Archipelago, Milne Bay Province*. Report prepared for Conservation International, Alotau, Milne Bay Province, Papua New Guinea.

Kuehling, S. 2005. *Dobu: Ethics of Exchnage on a Massim Island*. Honolulu: University of Hawai'i Press.

Kumah Enterprises. 1991. *Village Impact Study: Milne Bay Fisheries Component of the IFAD Artisanal Fisheries Project.* Report prepared for the Papuan New Guinean Government, Port Moresby, National Capital District, Papua New Guinea.

Laffoley, J.; Baxter, J.; Amon, D.; Currie, D.; Downs, C.; Hall-Spencer, J.; Harden-Davies, H.; Page, R.; Reid, C.; Roberts, C.; Rogers, A.; Thiele, T.; Sheppard, C.; Sumaila, R. and Woodall, L. 2019. Eight urgent, fundamental and simultaneous steps needed to restore ocean health, and the consequences for humanity and the planet of inaction or delay. *Aquatic Conservation: Marine and Freshwater Ecosystems*. https://doi.org/10.1002/aqc.3182

Landtman, G. 1927. *The Kiwai Papuans of British New Guinea: A Nature-born Instance of Rousseau's Ideal Community.* London: MacMillan and Co.

Lane, D. and Limbong, D. 2013. Catastrophic depletion of reef-associated sea cucumbers: resource management/reef resilience issues for an Indonesian marine park and the wider Indo-Pacific. *Aquatic Conservation: Marine and Freshwater Ecosystems*. 25 (4): 505-517.

Langmore, D. 1989. *Missionary Lives: Papua, 1874-1914*. Pacific Islands Monograph Series, No.: 6. Honolulu: University of Hawaii Press.

Lattas, A. 1998. *Cultures of Secrecy: Reinventing Race in Bush Kaliai Cargo Cults*. Madison: University of Wisconsin Press.

Latukefu, S. 1989. (ed). *Papua New Guinea: A Century of Colonial Impact: 1884-1984*. Port Moresby: National Research Institute.

Lau, J.; Hicks, C.; Gurney, G. and Cinner, J. 2019. What matters to whom and why? Understanding the importance of coastal ecosystem services in developing coastal communities. *Ecosystem Services*. 35: 219-230.

Lauer, M. 2016. Governing Uncertainty: Resilience, Dwelling, and Flexible Resource Management in Oceania. *Conservation and Society.* 14 (1): 34-47.

Lawrence: 1967. *Road Belong Cargo: A Study of the Cargo Movement in the Southern Madang District, New Guinea*. Manchester: Manchester University Press

Leach, J. and Leach, E. 1983. (eds.). *The Kula: New Perspectives on Massim exchange*. Cambridge: Cambridge University Press.

Lee, S.; Ford, A.; Mangubhai, S.; Wild, C. and Ferse, S. 2018a. Effects of sandfish (*Holothuria scabra*) removal on shallow-water sediments in Fiji. *PeerJ*. 6:e4773. doi: 10.7717/peerj.4773

Lee, S.; Govan, H.; Wolff, M. and Purcell, S. 2018b. Economic and other benefits of enforcing size limits in Melanesian sea cucumber fisheries. *SPC Fisheries Newsletter.* 155: 29-36.

Leenhardt, P.; Teneva, L.; Kininmonth, S.; Darling, E.; Cooley, S. and Claudet, J. 2015. Challenges, insights and perspectives associated with using social–ecological science for marine conservation. *Ocean Coastal Management.* 115: 49-60.

Lepowsky, M. 1982. A Comparison of Alcohol and Betelnut Use of Vanatinai (Sudest Island). In: Marshall, M. (ed). *Through a Glass Darkly: Beer and Modernization in Papua New Guinea*. pp: 325-482. Boroko: Institute of Applied Social and Economic Research.

Lepowsky, M. 1983. Sudest Island and the Lousiade Archipelago in Massim Exchange. In: Leach, J. and Leach, E. (eds.). *The Kula: New Perspectives in Massim Exchange.* pp: 467-501. Cambridge: Cambridge University Press.

Lepowsky, M. 1985. Food Taboos, Malaria and Dietary Change: Infant Feeding and Cultural Adaptation on a Papua New Guinea Island. *Ecology of Food and Nutrition.* 16: 105-126.

Lepowsky, M. 1989. Soldiers and Spirits: The Impact of World War II on a Coral Sea Island. In: White, G. and Lindstrom, L. (eds.). *The Pacific Theatre: Island Representations of World War II.* pp: 205-230. Hawaii: University of Hawaii Press.

Lepowsky, M. 1991. The Way of the Ancestors: Custom, Innovation, and Resistance. *Ethnology.* 30 (3): 217-235.

Lepowsky, M. 1993. *Fruit of the Motherland: Gender in an Egalitarian Society.* New York: Columbia University Press.

Lett, L. 1944. *Papua: Its People and its Promise, Past and Future.* Melbourne: F. W. Cheshire.

Levinson, S. 2003. *Space in Language and Cognition: Explorations in Cognitive Diversity*. Cambridge: Cambridge University Press.

Levinson, S. 2008. Landscape, seascape and the ontology of places on Rossel Island, Papua New Guinea. *Language Sciences.* 30 (2-3): 256-290.

Lewis, D. 1996. *The plantation dream: Developing British New Guinea and Papua 1884-1942*. Canberra: Austalian National University.

Liep, J. 1981. The Workshop of the Kula: Production and Trade of Shell Necklaces in the Louisiade Archipelago, Papua New Guinea. *Folk.* 23 (3): 197-309.

Liep, J. 1983. This Civilising Influence: The Colonial Transformation of Rossel Island Society. *The Journal of Pacific History.* 18 (2-3): 113-133.

Liep, J. 1995. Rossel Island Valuables Revisited. *The Journal of the Polynesian Society*. 104 (2): 159-180.

Liep, J. 2009. *A Papuan plutocracy: Ranked exchange on Rossel Island*. Aarhus: Aarhus University Press.

Lindstrom, L. 1993. *Cargo Cult: Strange Stories of Desire from Melanesia and Beyond*. Honolulu: University of Hawaii Press.

Lipset, D. 1985. Seafaring Sepiks: Ecology, Warfare, and Prestige in Murik Trade. *Research in Economic Anthropology.* 7: 67-94.

LiPuma, E. 1998. *The gift of kinship: Structure and practice in Maring social organisation.* Cambridge: Cambridge University Press.

LiPuma, E. 2000. *Encompassing Others: The Magic of Modernity in Melanesia.* Ann Arbor: University of Michigan Press.

Loffler, E. 1977. *Geomorphology of Papua New Guinea*. Canberra: Australian National University.

Long, B.; Skewes, T.; Dennis; D.; Poiner, I.; Pitcher, R.; Toranto, T.; Manson, T.; Polon, P.; Karre, B.; Evans, C. and Milton, D. 1996. *Distribution and abundance of beche-de-mer on Torres Strait Reefs*. Brisbane: Commonwealth Science and Industry Research Organisation.

Loos, N. 1980. Queensland's Kidnapping Act: The Native Labourers Protection Act of 1884. *Aboriginal History*. 4: 150-173.

Louisiade Fisheries. 1972. *Meeting Minutes.* Minutes recorded by Louisiade Fisheries, 08/11/1972 at Sawata, Milne Bay Province, Papua New Guinea.

Lucas, J. 1994. The biology, exploitation, and mariculture of giant clams (Tridacnidae). *Reviews in Fisheries Science*. 2 (3):181-223.

Luetz, J. and Havea, P. 2018. "We're not Refugees, We'll Stay Here Until We Die!": Climate Change Adaptation and Migration Experiences Gathered from the Tulun and Nissan Atolls of Bougainville, Papua New Guinea. In: Leal Fihlo, W. (ed). *Climate Change Impacts and Adaptation Strategies for Coastal Communities*. pp: 3-29. Basel: Springer International Publishing.

Lujala, P. and Rustad, S. 2011. High value natural resources: A blessing or a curse for peace? *Sustainable Development Law and Policy*. 12 (1): 19-22.

Lyne, C. 1885. *New Guinea: An Account of the Establishment of the British Protectorate over the Southern Shores of New Guinea*. London: Sampson Low, Marston, Searle and Rivington.

MacGillivray, J. 1852. *Narrative of the voyage of H.M.S. Rattlesnake, commanded by the late Captain Owen Stanley, R.N., F.R.S. during the years 1846-50, including discoveries and surveys in New Guinea, the Louisiade Archipelago, etc.* Adelaide: Libraries Board of South Australia.

Macintyre, M. 1983. *Changing Paths: A Historical Ethnography of the Traders of Tubetube.* Unpublished PhD Thesis, Australian National University, Canberra, Australian Capital Territory, Australia.

Macintyre, M. 1987. Nurturance and Nutrition: Change and Continuity in Concepts of Food and Feasting in a Southern Massim Community. *Journal de la Societes des Oceanistes*. 84 (1): 51-59.

Macintyre, M. 1993. Fictive kinship or mistaken identity? Fieldwork on Tubetube Island, Papua New Guinea. In: D. Bell, P. Caplan and W. Karim. (eds.). *Gendered Fields: women, men and ethnography*. pp. 1-18. London: Routledge2007.

Macintyre, M. and Allen, J. 1990. Trading for Subsistence: The Case from the Southern Massim. In: Yen, D. and Mummery, J. (eds.). *Pacific Productions Systems: Approaches to Economic Prehistory.* pp: 120-136. Canberra: Australian National University.

Macintrye, M. and Young, M. 1982. The Persistence of Traditional Trade and Ceremonial Exchange in the Massim. In: May, R. and Nelson, H. (eds.). *Melanesia: Beyond Diversity*. pp: 207-222. Canberra: Australian National University.

Macintyre, M. and Foale, D. 2007. Land and marine tenure, ownership and new forms of entitlement on Lihir: changing notions of property in the context of a gold mining project. *Human Organization.* 66 (1): 49-59.

Mackay, R. 1992. The war years: Methodists in Papua 1942-1945. *The Journal of Pacific History*. 27 (1): 29-43.

Mackay, R. 1999 *Catholic and Methodist Missionaries in the Milne Bay Province of Papua New Guinea, 1930-80*. Unpublished PhD Thesis, Australian National University, Canberra, Australian Capital District, Australia.

Mackenzie, S. 1941. *Official History of Australia in the War of 1914–1918, Volume X – The Australians at Rabaul: The Capture and Administration of the German Possessions in the Southern Pacific*. Sydney: Halstead Press Pty Ltd.

Macpherson, C. 1962. *The political theory of possessive individualism: Hobbes to Locke*. Oxford: Oxford University Press.

Malinowski, B. 1915. The Natives of Mailu: Preliminary Results of Robert Mond Research Work in British New Guinea. *Transactions of the Royal Society of South Australia.* 39: 494-706.

Malinowski, B. 1918. Fishing and Fishing Magic in the Trobriand Islands. *Man.* 18:87-92.

Malinowski, B. 1922. *Argonauts of the Western Pacific: An Account of Native Enterprise and Adventure in the Archipelagos of Melanesian New Guinea.* London: Routledge and Keagan Paul.

Malinowski, B. 1935. *Coral Gardens and Their Magic: Soil Tilling and Agricultural Rites in the Trobriand Islands*. London: George Allen and Unwin.

Malinowski, B. 1954. *Magic, Science and Religion and Other Essays.* New York: Doubleday Anchor.

Mann, E. and Heatwole, H. 1973. Ecology of the Islands. In: Manser, W. (ed). *New Guinea Barrier Reefs: Preliminary Results of the 1969 Coral Reef Expedition to the Trobriand Islands and the Louisiade Archipelago, Papua New Guinea*. pp: 249-274. Geology Department Occasional Papers, No.: 1. Port Moresby: University of Papua New Guinea.

Manser, W. 1973. Geological Setting and Geology of the Islands. In: Manser, W. (ed). *New Guinea Barrier Reefs.* pp: 45-93. Geology Department Occasional Paper, No.:1. Port Moresby: University of Papua New Guinea.

Manser, W. and St John, B. 1973. Oceanography. In: Manser, W. (ed). *New Guinea Barrier Reefs: Preliminary Results of the 1969 Coral Reef Expedition to the Trobriand Islands and the Louisiade Archipelago, Papua New Guinea*. pp: 147-162. Geology Department Occasional Papers, No.: 1. Port Moresby: University of Papua New Guinea.

Martin, K. 2007. Your Own Buai You Must Buy: The Ideology of Possessive Individualism in Papua New Guinea. *Anthropological Forum*. 17 (3): 285-298.

Martinez-Alier, J. 2002. *The environmentalism of the poor: A study of ecological conflicts and valuation*, Cheltenham: Edward Elgar Publishing.

Marx, K. 1867. *Capital.* Volume I. London: Penguin Classics.

Marx, K. 1973. *Grundrisse: Foundations of the Critique of Political Economy.* Vintage: New York.

Mascia, M.; Claus, C. and Naidoo, R. 2010. Impacts of marine protected areas on fishing communities. *Conservation Biology.* 24 (5): 1424-1429.

Mawyer, A. and Jacka, J. 2018. Sovereignty, conservation and island ecological futures. *Environmental Conservation.* 45 (3): 238-251.

May, P. and Tuckson, M. 1982. *The Traditional Pottery of Papua New Guinea*. Sydney: Bay Books.

Mayo, J. 1969. The Protectorate of British New Guinea, 1884-1888: An Oddity of Empire. In: Inglis, K. (ed). *The History of Melanesia.* pp: 17-31. Canberra: Australian National University.

Mayo, J. 1975. From Protectorate to Possession: British New Guinea, 1884-1888. *Australian Journal of Politics and History.* 21 (3): 54-59.

McAlpine, J.; Keig, G. and Falls, R. 1983. *Climate of Papua New Guinea*. Canberra: Australian National University Press.

McBrien, J. 2016. Accumulating extinction. In: Moore, J. (ed). *Anthropocene or Capitalocene?* pp: 116–37. Oakland: PM Press.

McCall, G. 1994. Nissology: A proposal for consideration. *Journal of the Pacific Society.* 17 (2-3): 93-106.

McCallum, R. and Sekhran, N. 1997. *Race for the Rainforest: Evaluation Lessons from an Integrated Conservation and Development 'Experiment' in New Ireland, Papua New Guinea.* Port Moresby: United Nations Development Program.

McCarthy, J. and Prudham, S. 2004. Neoliberal nature and the nature of neoliberalism. *Geoforum.* 35 (3): 275-283.

McCay, B. and Acheson, J. 1987. (eds.). *The Question of the Commons.* Tuscon: University of Arizona Press.

McDougall, D. 2005. The Unintended Consequences of Clarification: Development, Disputing, and the Dynamics of Community in Ranongga, Solomon Islands. *Ethnohistory*. 52 (1): 81-109.

McGinnis, M. and Ostrom, E. 2014. Social-ecological system framework: initial changes and continuing challenges. *Ecology and Society.* 19 (2): 30. http://dx.doi.org/10.5751/ES-06387-190230

McGrath, A. 1987. *Born on the Cattle: Aborigines in cattle country.* Sydney: Allen and Unwin.

MacGregor, W. 1897. Dispatch Reporting Visit of Inspection to the Louisiades and Neighbouring Groups, Appendix G. *Annual Report on British New Guinea*. Brisbane: Government Printer.

McNiven, I.; David, B.; Richards,T.; Aplin, K.; Asmussen, B.; Mialanes, J.; Leavesley, M.; Faulkner, P. and Ulm, S. 2011. New direction in human colonisation of the Pacifc: Lapita settlement of South Coast New Guinea. *Australian Archaeology.* 72 (1): 1-6.

McNulty, J. 2013. Western and Central Pacific Ocean fisheries and the opportunities for transnational organised crime: Monitoring, Control and Surveillance (MCS) Operation Kurukuru. *Australian Journal of Maritime and Ocean Affairs*. 5 (4): 145-152.

Militz, T.; Kinch, J. and Southgate, P. 2015. Population demographics of *Tridacna noae* (Roding 1798) in New Ireland, Papua New Guinea. *Journal of Shellfish Research.* 34 (2): 329-335.

Mills, M.; Pressey, R.; Ban, N.; Foale, S.; Aswani, S. and Knight, A. 2013. Understanding Characteristics that Define the Feasibility of Conservation Actions in a Common Pool Marine Resource Governance System. *Conservation Letters.* 6 (6): 418-429.

Minnegal, M. and Dwyer, P. 2007. *Money, Meaning and Materialism: A Papua New Guinean Case History.* Working Papers in Development, No.: 2. Melbourne: University of Melbourne.

Moesinger. A. 2018. Catching names: Folk taxonomy of marine fauna on Takuu Atoll, Papua New Guinea. *SPC Traditional Marine Resource Management and Knowledge Information Bulletin*. 39: 2-14.

Moesinger, A. 2019. Modifications to natural resource use in response to perceptions of changing weather conditions on Takuu Atoll, Papua New Guinea. *SPC Traditional Marine Resource Management and Knowledge Information Bulletin*. 40: 2-17.

Monckton, C. 1921. *Some experiences of a New Guinea Resident Magistrate*. London: John Lane.

Mondragon, C. 2004. Of Winds, Worms and Mana: The Traditional Calendar of the Torres Islands, Vanuatu. *Oceania.* 74 (4): 289-308.

Montagu, A. 2002. Forest Planning and Management in Papua New Guinea, 1884 to 1995: A Political Ecological Analysis. *Planning Perspectives.* 17 (1): 21-40.

Moore, C. 1984. Queensland's Annexation of New Guinea in 1883. *Journal of the Royal Queensland Historical Society.* 12 (1): 26-50.

Moore, C. 1985. *Kanaka: A History of Melanesian Mackay.* Port Moresby: University of Papua New Guinea.

Moore, C. 1992. The Life and Death of William Barstow Ingham: Papua New Guinea in the 1870s. *Journal of the Royal Historical Society of Queensland.* 14 (10): 414-432.

Moore, C. 1993. Labour Recruiting and Indenture. In: Quanchi, M. and Adams, R. (eds.). *Culure Contact in the Pacific: Essays on Contact, Encouner and Response.* pp: 87-99. Cambridge: Cambridge University Press.

Moore, C. 2003. *New Guinea: Crossing Boundaries and History.* Honolulu: University of Hawaii Press.

Moore, J. 2016. (ed). *Anthropocene or Capitalocene? Nature, History, and the Crisis of Capitalism.* Oakland: PM Press.

Moore, J. 2017. The Capitalocene, Part I: on the nature and origins of our ecological crisis. *The Journal of Peasant Studies*. 44 (3): 594-630.

Moran, E. 1990. *The Ecosystem Approach in Anthropology: From Concept to Practice*. Ann Arbor: University of Michigan.

Moresby, J. 1873. Recent discoveries in the south eastern part of New Guinea. *Proceedings of the Royal Geographical Society*. 18: 22-31.

Moresby, J. 1874. Discoveries in the Louisiade Archipelago and eastern New Guinea. *Missionary Magazine and Chronicle* (London Missionary Society). 51-54.

Moresby, J. 1875. Recent discoveries at the eastern end of New Guinea. *Journal of the Royal Geographical Society*. 44: 1-14.

Moresby, J. 1876. *New Guinea and Polynesia. Discoveries and surveys in New Guinea and the D'Entrecasteaux Islands; a cruise in Polynesia and visits to the pearl-shelling stations in Torres Straits of H. M. S. Basilisk.* London: John Murray.

Mounsey, R. 1996. *Consultancy Report on Coral Sea Fisheries.* Report Prepared for Misima Mines Limited, Bwagaoia, Misima, Milne Bay Province, Papua New Guinea.

Muke, J.; Denham, T. and Genorupa,V. 2007. Nominating and managing a World Heritage Site in the highlands of Papua New Guinea. *World Archaeology.* 39 (3): 324-338.

Mullainathan, S. and Shafir, E. 2013. *Scarcity: Why Having Too Little Means So Much*. Basingstoke: Macmillan.

Mundy, C. 2018. Fish Fever at Long Reef, Milne Bay. *Niugini Blue.* 35: 40-44.

Munn, N. 1986. *The Fame of Gawa: A Symbolic Study of Value Transformation in a Massim (Papua New Guinea) Society.* Cambridge: Cambridge University Press.

Murray, J. 1912. *Papua or British New Guinea.* London: Adelphi Terrace.

National Statistical Office. 2014. *2011 National Population and Housing Census of Papua New Guinea: Final Figures*. Port Moresby: National Statistics Office.

Nazarea, V. 1999. (ed). *Ethnoecology: Situated Lives-Located Lives.* Tucson: University of Arizona Press.

Nelson, H. 1976. *Black, White and Gold; Goldmining in Papua New Guinea: 1878-1930*. Canberra: Australian National University Press.

Neo, M.; Wabnitz, C.; Braley, R.; Heslinga, G.; Fauvelot, C.; van Wynsberge, S.; Andrefouet, S.; Waters, C.; Tan, A.; Gomez, E.; Costello, M. and Todd, P. 2017. Giant clams (Bivalvia: Cardiidae: Tridacninae): a comprehensive update of species and their distribution, current threats and conservation status. *Oceanography and Marine Biology: An Annual Review*. 55: 87-388.

Netting, R. 1982. Territory, Property and Tenure. In: Adams, R.; Smelser, N. and Treiman, D. (eds.). *Behavioural and Social Science Research: A Natural Resource.* pp: 446-501. Washington, D. C.: National Academy Press.

Netting, R. 1986. *Cultural Ecology.* Prospect Heights: Waveland Press.

Neumann, R. 2005. *Making Political Ecology*. New York: Hodder Arnold.

Newbury, C. 1973. 'Treaty, Grant, Usage and Suffrage': The Origins of British Colonial Protectorates. In: Wood, E. and O'Connor, P. (eds.). *A Tribute: Essays in Modern and Early Modern History Presented to William Parker Morrell.* pp: 69-84. Dunedin: University of Otago Press.

Nguyen, H. 2012. Vietnam's Position on the Sovereignty over the Paracels and the Spratlys: Its Maritime Claim. *Journal of East Asia International Law*. http://dx.doi.org/10.2139/ssrn.2123861.

NSR Environmental Consultants. 1987. *Misima Project Environmental Plan; Volume B: Main Report.* Report prepared for Placer Pacific Limited, Sydney, New South Wales, Australia.

Nunn, P. 2013. The end of the Pacific? Effects of sea level rise on Pacific Island livelihoods. *Singapore Journal of Tropical Geography*. 34 (2): 143-171.

Opnai, J. and Aitsi, L. 1995. *Papua New Guinea Country Statement: Summary of Coastal Fisheries Development and Management Problems in Papua New Guinea and Priorities for Action*. Paper presented at the Joint Forum Fisheries Agency and South Pacific Commission Workshop on the Management of South Pacific Inshore Fisheries, 26th June-7th July 1995, Noumea, New Caledonia.

Orlove, B. 2003. How people name seasons. In: Strauss, S. and Orlove, B. (eds.). *Weather, climate, culture.* pp: 121-140. Oxford: Berg.

Ostrom, E. 1990. *Governing the Commons: The Evolution of Institutions for Collective Action.* Cambridge: Cambridge University Press.

Ostrom, E.; Burger, J.; Field, C.; Norgaard, R. and Policansky, D. 1999. Revisiting the Commons: Local Lessons, Global Challenges. *Science.* 284: 278-282.

Otto, T. 1998. Resource Management in Lavongai and Tigak Islands: Changing Practices. In: Wassmann, J. (ed). *Changing Identities. Pacific Answers to Western Hegemony.* pp: 229-252. Oxford: Berg.

Otto, T. and Turner, J. 1990. *The Sociology of Baitfish Royalties in Papua New Guinea.* Occasional Paper No.: 6. Port Moresby: University of Papua New Guinea.

Overlack, P. 1978-1979. Queensland's Annexation of Papua: A Background to Anglo-German Friction. *Journal of the Royal Historical Society of Queensland.* 10 (4): 123-138.

Park, R. 1936. Human Ecology. *American Journal of Sociology.* 42: 1-15.

Parnaby, O. 1957. Aspects of British Policy in the Pacific: The 1872 Pacific Islanders Protection Act. *Historical Studies: Australia and New Zealand*. 8 (29): 54-65.

Paulson, S. and Gezon, L. 2005. (eds.). *Political Ecology across Spaces, Scales, and Social Groups*. New Brunswick: Rutgers University Press.

Pavlin, B.; Musto, J.; Petrick, M.; Sarofalpiy, J.; Sappa, P.; Shapucy, S. and Kool, J. 2010. Mass poisoning after consumption of a hawksbill turtle, Federated States of Micronesia. *Western Pacific Surveillance Response Journal*. 6 (1): 25-32.

Peet, R. and Watts, M. 1996. Liberation Ecology: Development, Sustainability and Environment in an Age of Market Triumphalism. In: Peet, R. and Watts, M. (eds.). *Liberation Ecologies: Environment, Development, Social Movements.* pp: 1-45. London: Routledge.

Pennell, C. 2010. The origins of the Foreign Jurisdiction Act and the extension of British sovereignty. *Historical Research.* 83 (221): 465-485.

Pernetta, J. and Hill, L. 1981. A Review of Marine Resource Use in Coastal Papua. *Journal de la Societes des Oceanistes.* 37: 175-191.

Pernatta, J. and Hill, L. 1982. International Pressure on Internal Resource Management in Papua New Guinea. In: Mourata, L.; Pernetta, J. and Heaney, W. (eds.). *Traditional Conservation in Papua New Guinea: Implications for Today.* pp: 319-332. Monograph 16. Boroko: Institute of Applied Social and Economic Research.

Perreault, T.; Bridge, G. and McCarthy, J. 2015. (eds.). *The Routledge Handbook of Political Ecology*. London: Routledge.

Peter, O. 1976. The Myths of Misima. *Oral History*. 4 (2): 16-52.

Pfennigwerth, I. 2008. *Missing Pieces: The Intelligence Jigsaw and RAN Operations from 1939-1971*. Papers in Australian Maritime Affairs, No.: 25. Canberra: Department of Defence.

Pinkerton, E. 1989. (ed). *Co-operative management of local fisheries: New directions for improved management and community development.* Vancouver: University of British Columbia Press.

Pitcairn, W. 1891. *Two years among the savages of New Guinea: with introductory notes on North Queensland.* London: Ward and Downey.

Plaganyi, E.; Skewes, T.; Dowling, N. and Haddon, M. 2013. Risk management tools for sustainable fisheries management under changing climate: a sea cucumber example. *Climatic Change*. 119: 181-197.

Polanyi, K. 1944. *The Great Transformation*. New York: Farrar and Rinehart.

Pollnac, R. and Johnson, J. 2005. Folk Management and Conservation of Marine Resources: Towards a Theoretical and Methodological Assessment. In: Kishigami, N. and Savelle, J. (eds.). *Indigenous Use and Management of Marine Resources.* pp: 33-50. Senri Ethnological Studies, No.: 67. Osaka: National Museum of Ethnology.

Polunin, N. 1984. Do traditional marine 'reserves' conserve? A view of Indonesian and New Guinean evidence. In: Ruddle, K. and Akimichi, T. (eds.). *Maritime Institutions in the Western Pacific*. pp: 267-283. Osaka: National Museum of Ethnology.

Pomeroy, R. 1994. (ed). *Community Management and Common Property of Coastal Fisheries in Asia and the Pacific: Concepts, Methods and Experiences.* Manila: International Centre for Living Aquatic Resources Management.

Pomeroy, R. and Berkes, F. 1997. Two to tango: the role of government in fisheries co-management. *Marine Policy*. 21 (5): 465-480.

Pomeroy, R. and Rivera-Guieb, R. 2006. *Fishery Co-management: A Practical Handbook*. Cambridge: CABI International.

Pomeroy, R.; Nguyen, K. and Thong, H. 2009. Small-scale marine fisheries policy in Vietnam. *Marine Policy.* 33 (2): 419-428.

Pomponio, A. 1992. *Seagulls Don't Fly in the Bush: Cultural Identity and Development in Melanesia.* Belmont: Wadsworth.

Pospisil, L. 1971. *Anthropology of Law. A Comparative Theory.* New York: Harper and Row.

Pratchett, M.; Hoey, A. and Wilson, S. 2014. Reef degradation and the loss of critical ecosystem goods and services provided by coral reef fishes. *Current Opinion in Environmental Sustainability.* 7: 37-43.

Pratchett, M.; Hoey, A.; Wilson, S.; Messmer, V. and Graham, N. 2011. Changes in biodiversity and functioning of reef fish assemblages following coral bleaching and coral loss. *Diversity.* 3 (3): 424-452.

Pretty, J. 2003. Social capital and the collective management of resources. *Science*. 302: 1912-1914.

Price, C. with Baker, E. 1976. Origins of Pacific Island Labourers in Queensland, 1863-1904: A Research Note. *Journal of Pacific History.* 11 (1-2): 106-121.

Purcell, S.; Conand, C.; Uthicke, S. and Byrne, M. 2016. Ecological Roles of Exploited Sea Cucumbers. *Oceanography and Marine Biology: An Annual Review.* 54: 367-386.

Purcell, S.; Crona, B.; Lalavanua, W. and Eriksson, H. 2017. Distribution of economic returns in small-scale fisheries for international markets: A value-chain analysis. *Marine Policy.* 86: 9-16.

Purcell, S.; Williamson, D. and Ngaluafe, P. 2018. Chinese market prices of beche-de-mer: Implications for fisheries and aquaculture. *Marine Policy.* 91: 58-65.

Purcell, S.; Mercier, A.; Conand, C.; Hamel, J.-F.; Toral-Granda, M.; Lovatelli, A. and Uthicke, S. 2013. Sea cucumber fisheries: global analysis of stocks, management measures and drivers of overfishing. *Fish and Fisheries*. 14 (1): 34-59.

Purdy, D.; Hadley, J.; Kenter, J. and Kinch, J. 2017. Sea cucumber moratorium and livelihood diversity in Papua New Guinea. *Coastal Management.* 45 (2): 1-17.

Puzachenko, Y. 1994. Conclusion. In: Pernetta, J. and Manner, H. 1994. (eds.). *The Ecosystems of Small Islands in the Southwest Pacific (The Sixth Expedition of the SS 'Calisto').* pp: 194-197. UNEP Regional Seas Reports and Studies, No.: 151; SPREP Reports and Studies, No.: 63. Apia: UNEP and SPREP.

Raaymakers, S.; Lindsay, S. and Kinch, J. 2006. *Grounding of the M.V. Zhi Qiang, Long Reef, Louisiade Archipelago, Papua New Guinea, July 2006: Marine Resource Damage Assessment - Main Report.* Report prepared for Brian White and Associates, Cairns, Queensland, Australia.

Rappaport, R. 1967. *Pigs for the Ancestors.* New Haven: Yale University Press.

Rapson, A. 1973. Fisheries. In: Manser, W. (ed). *New Guinea Barrier Reefs: Preliminary Results of the 1969 Coral Reef Expedition to the Trobriand Islands and the Louisiade Archipelago, Papua New Guinea*. Pp: 231-248. Geology Department Occasional Papers, No.: 1. Port Moresby: University of Papua New Guinea.

Rasmussen, A. 2015. *In the Absence of the Gift: New Forms of Value and Personhood in a Papua New Guinea Community.* New York: Berghahn Books.

Reynolds, M.; Courtot, K.; Berkowitz, P.; Storlazzi, C.; Moore, J. and Flint, E. 2015. Will the Effects of Sea-Level Rise Create Ecological Traps for Pacific Island Seabirds? *PLoS ONE*. 10 (9): e0136773. doi:10.1371/journal.pone.0136773

Rhodes, K.; Tua, P.; Sulu, R.; Pitakaka, P.; Kekete, P.; Uti, M.; Funu, F. and Masu, R. 2019. Gear-based characterization of the Gizo, Solomon Islands, inshore commercial finfish fishery. *Regional Studies in Marine Science*. 32: 100807. https://doi.org/10.1016/j.rsma.2019.100807

Ribot, J. and Peluso, N. 2003. A theory of access. *Rural Sociology.* 68 (2): 153–181.

Richards, R. 2017. Abraham Bristow: Whaling Master and Trans-Pacific Explorer. In: Richards, R. *Bold Captains: Trans-Pacific Explorations and Trade: 1780-1830.* Volume II. pp: 313-331. Paremata: Paremata Press.

Richards, S. 2002. *Herpetofauna species list for Misima Mine Site: Results of a survey October-November 2002.* Report prepared for Misima Mines Limited, Bwagoia, Misima, Milne Bay Province, Papua New Guinea.

Robbins, J. and Akin, D. 1999. An introduction to Melanesian currencies: Agency, identity, and social reproduction. In: Akin, D. and Robbins, J. (eds.). *Money and Modernity: State and Local Currencies in Melanesia.* pp: 1-40. Pittsburg: University of Pittsburgh Press.

Robinson, N. 1981. *Villagers at war: Some Papua New Guinean experiences in World War II*. Pacific Research Monograph, No.: 2. Canberra: Australian National University.

Roeger, J.; Foale, S. and Sheaves, M. 2016. When 'fishing down the food chain' results in improved food security: Evidence from a small pelagic fishery in Solomon Islands. *Fisheries Research.* 174: 250-259.

Rohe, J.; Aswani, S.; Schluter, A. and Ferse, S. 2017. Multiple Drivers of Local (Non-) Compliance in Community-Based Marine Resource Management: Case Studies from the South Pacific. *Frontiers in Marine Science*. 4: 172. doi: 10.3389/fmars.2017.00172

Rollason, W. 2009. Diving One Man: disconnection and re-contextualisation among Panapompom beche-de-mer divers. *Cambridge Anthropology.* 28 (2): 45-62.

Rollason, W. 2010a. *We Are Playing Football: Sport and Postcolonial Subjectivity, Panapompom, Papua New Guinea*. Cambridge: Cambridge Scholars Publishing.

Rollason, W. 2010b. Working out abjection in the Panapompom beche-de-mer fishery: Race, economic change and the future in Papua New Guinea. *The Australian Journal of Anthropology.* 21 (2): 149-170.

Rollason, W. 2014a. The Hanging of Buliga: A History of the Future in the Louisiade Archipelago, PNG. In: Rollason, W. *Pacific Futures: Projects, Politics, and Interests.* pp: 48-70. New York: Berghan Books.

Rollason, W. 2014b. Coconuts and the landscape of underdevelopment on Panapompom, Papua New Guinea. In: Hermann, E.; Kempf, W. and van Meijl, T. (eds.). *Belonging in Oceania: Movement, Place-Making and Multiple Identifications.* pp: 71-93. New York: Berghahn Books.

Romilly, H. 1887. Report from H. H. Romilly. *QVP.* 3: 33-34.

Romilly, H. 1893. *Letters from the Western Pacific and Mashonaland, 1878-1891.* London: David Nutt.

Rosales, R.; Pomeroy, R.; Calabio, I.; Batong, M.; Cedo, K.; Escara, N.; Facunla, V.; Gulayan, A.; Narvadez, M.; Sarahadil, M. and Sobrevega, M. 2017. Value chain analysis and small-scale fisheries management. *Marine Policy.* 83: 11-21.

Ross, H.; Adhuri, D.; Abdurrahim, A. and Pheland, A. 2019. Opportunities in community-government co-operation to maintain marine ecosystem services in the Asia-Pacific and Oceania. *Ecosystem Services.* 38**:** 100969. https://doi.org/10.1016/j.ecoser.2019.100969

Rosser, A. and Haywood, M. 2002. (comps.). *Guidance for CITES Scientifc Authorities: Checklist to assist in making non-detriment fndings for Appendix II exports*. The Gland: International Union for Conservation of Nature.

Ruddle, K. 1994. Changing the Focus of Coastal Fisheries Management. In Pomeroy, R. (ed). *Community Management and Common Property of Coastal Fisheries in Asia and the Pacific: Concepts, Methods and Experiences.* pp: 63-86. Manila: International Centre for Living Aquatic Resources Management.

Ruddle, K. and Davis, A. 2013. Human rights and neo-liberalism in small-scale fisheries: Conjoined priorities and processes. *Marine Policy.* 39: 87-93.

Russell, P. 1970. *The Papuan beche-de-mer trade to 1900*. Unpublished MA Thesis, University of Papua New Guinea, Port Moresby, Territory of Papua and New Guinea.

Rynkewiech, M. 1998. *A Brief History of Mission in the Louisiade Archipelago.* Goroka: Melanesian Institute.

Sabetian, A. and Foale, S. 2006. Evolution of the Artisanal fisher; case-studies from Solomon Islands and Papua New Guinea. *SPC Traditional Marine Resource Management and Knowledge Information Bulletin.* 20: 3-10.

Sachithananthan, K. 1971. *Beche-de-mer Industry in the South Pacific Islands: Territory of Papua New Guinea*. Rome: Food and Agriculture Organisation.

Sadovy de Mitcheson, Y.; Andersson, A.; Hofford, A.; Law, C.; Hau, L. and Pauly, D. 2018. Out of control means off the menu: The case for ceasing consumption of luxury products from highly vulnerable species when international trade cannot be adequately controlled; shark fin as a case study. *Marine Policy.* https://doi.org/10.1016/j.marpol.2018.08.012.

Sahlins, M. 1976. *Culture and Practical Reason*. Chicago: University of Chicago Press.

Sakdapolrak, P. 2014. Livelihoods as social practices: Re-energising livelihoods research with Bourdieu's theory of practice. *Geography Helvetica*. 69: 19-28.

Sankoff, G. 1985. Touching Pen, Marking Paper: Queensland Labour Contracts in the 1880's. In: Gewertz, D. and Schiefflin, E. (eds.). History and Ethnohistory in Papua New Guinea. *Oceania Monograph.* 28: 100-126.

Sauer, C. 1956. The Agency of Man on Earth. In: Thomas, W. Jr. (ed). *Man's Role in Changing the Face of the Earth, Volume 1*. pp: 49-69. Chicago: Chicago University Press.

Saville-Kent, W. 1893. *The Great Barrier Reef of Australia: Its Products and Potentialities*. London: W. H. Allen.

Sayre, N. 2015. Scales and polities. In: Perreault, T.; Bridge, G. and McCarthy, J. (eds.). *The Routledge Handbook of Political Ecology.* pp: 504-516. London: Routledge.

Scaglion, R. 2009. Legal Pluralism in Pacific Island Societies. In: Tung, T-C. (ed). *Sea of Islands: Anthropological Studies of Oceania.* pp: 314-342. Taipei: The Commercial Press.

Schlager, E. and Ostrom, E. 1993. Property-rights regimes and natural resources: a conceptual analysis. In: Anderson, T. and Simmons, R. (eds). *The Political Economy of Customs and Culture: Informal Solutions to the Commons Problem.* pp: 13-41. Lanham: Rowman and Littlefield Publishers.

Schneider, K.; Silverman, J.; Woolsey, E.; Eriksson, H.; Byrne, M. and Caldiera, K. 2011. Potential influence of aspidochirotid sea cucumbers on coral reef CaCO3 budget: a case study at One Tree Reef. *Journal of Geophysical Resources*. 116 (4). doi:10.1029/ 2011JG001755.

Scholtens, J. and Bavinck, M. 2014. Lessons for legal pluralism: investigating the challenges of transboundary fisheries governance. *Current Opinion in Environmental Sustainability.* 11:10-18.

Schram, R. 2018. *Harvests, Feasts and Graves: Postcultural Consciousness in Contemporary Papua New Guinea.* Ithaca: Cornell University Press.

Schwarz, A.; Boso, D.; Ramofafia, C.; Andrew, N. and Nash, W. 2009. *Improving sustainability and profitability of village sea cucumber fisheries in Solomon Islands.* Canberra: Australian Centre for International Agriculture Research.

Scoones, I. 1998. *Sustainable Rural Livelihoods: A Framework for Analysis.* Institute of Development Studies Working Paper, No.: 72. Falmer: Institute of Development Studies.

Scoones, I. 2009. Livelihoods perspectives and rural development. *Journal of Peasant Studies*. 36 (1): 171-196.

Scoones, I. 2015. *Sustainable Livelihoods and Rural Development.* Fernwood Pubishing: Blackpoint.

Scott, A. 1955. The Fishery: The Objectives of Sole Ownership. *Journal of Political Economy.* 63 (2): 116-124.

Seligmann, C. 1910. *The Melanesians of British New Guinea*. Cambridge: Cambridge University Press.

Seligmann, C. and Strong, W. 1906. Anthropogeographical Investigations in British New Guinea. *The Geographical Journal*. 27 (3-4): 226-242, 347-369.

Sen, S. and Nielsen, J. 1996. Fisheries co-management: a comparative analysis. *Marine Policy.* 20 (5): 405-418.

Sen Gupta, A.; Ganachaud, A.; McGregor, S.; Brown, J. and Muir, L. 2012. Drivers of the projected changes to the Pacific Ocean equatorial circulation. *Geophysical Research Letters*. 39 (9): L09605. doi:10.1029/2012GL051447

Shah, A.; Mullainathan, S. and Shafir, E. 2012. Some consequences of having too little. *Science* 338: 682-685.

Shaw, B. 2014. *The archaeology of Rossel Island, Massim, Papua New Guinea: Towards a prehistory of the Louisiade Archipelago*. Unpublished PhD Thesis, Australian National University, Canberra, Australian Capital Territory, Australia.

Shaw, B. 2016a. The Massim Region of Papua New Guinea: A review and proposed chronology. *Journal of Pacific Archaeology.* 7 (1): 106-125.

Shaw, B. 2016b. The late prehistoric introduction of pottery to Rossel Island, Louisiade Archipelago, Papua New Guinea: Insights into local social organisation and regional exchange in the Massim. *Archaeology in Oceania*. 51 (1): 61-72.

Shaw, B. 2019. Archaeology of the Massim Island Region, Papua New Guinea. In: Smith, C. (ed). *Encyclopedia of Global Archaeology.* pp: 1-15. New York: Springer.

Shaw, B. and Langley, M. 2017. Investigating the development of prehistoric cultural practices in the Massim region of eastern Papua New Guinea: Insights from the manufacture and use of shell objects in the Louisiade Archipelago. *Journal of Anthropological Archaeology*. 48: 149-165.

Shaw, B., S. Coxe, V. Kewibu, J. Haro, E. Hull, and S. Hawkins. 2020. 2500-year cultural sequence in the Louisiade Archipelago (Massim region) of eastern Papua New Guinea reflects adaptive strategies to remote islands since Lapita settlement. The Holocene. 1-15. doi/10.1177/0959683620908641

Shelley, C. 1981. *Aspects of the Distribution, Reproduction, Growth and Fishery Potential of Holothurians (Beche-de-mer) in the Papuan Coastal Lagoon*. Unpublished MSc Thesis, University of Papua New Guinea, Port Moresby, Papua New Guinea.

Shirayama, Y. and Thornton, H. 2005. Effect of Increased Atmospheric CO^2 on Shallow Water Marine Benthos. *Journal of Geophysical Research*. 110 (9). doi: 10.1029/2004JC002618.

Silver, J. 2008. Weighing in on Scale: Synthesising Disciplinary Approaches to Scale in the Context of Building Interdisciplinary Resource Management. *Society and Natural Resources*. 21 (10): 921-929.

Skewes T.; Dennis, D.; Jacobs, S.; Gordon, T.; Taranto, T.; Haywood, M; Pitcher, C.; Smith, G.; Milton, D. and Poiner, I. 1999. *Survey and stock size estimates of the shallow reef (0-15 m deep) and shoal area (15 - 50 m deep) marine resources and habitat mapping within the MOU74 box. Volume 1: Stock estimates and Stock status.* Report prepared for the Fisheries Environment Australia, Canberra, Australian Capital District, Australia.

Skewes, T.; Kinch, J.; Polon, P.; Dennis, D.; Seeto, P.; Taranto, T.; Lokani, P.; Wassenberg, T.; Koutsoukos, A. and Sarke, J. 2002. *Research for the Sustainable Use of Beche-de-mer Resources in the Milne Bay Province, Papua New Guinea*. Report prepared for the National Fisheries Authority, Port Moresby, Papua New Guinea; and the Australian Centre for International Agricultural Research, Sydney, New South Wales, Australia.

Skewes, T.; Lyne, V.; Butler, J.; Mitchell, D.; Poloczanska, E.; Williams, K. Brewer, D.; McLeod, I.; Rochester, W.; Sun, C.; and Long, B. 2011. *Melanesian coastal and marine ecosystem assets: assessment framework and Milne Bay case study.* Brisbane: Commonwealth Science and Industry Research Organisation.

Smaalders, M. and Kinch, J. 2003. Canoes, Subsistence and Conservation in Papua New Guinea's Louisiade Archipelago. *SPC Traditional Marine Resource Management and Knowledge Information Bulletin.* 15: 11-21.

Smith, I. 1973. The Geology of the Calvados Chain, South-eastern Papua. *Bureau of Mineral Resources Australia Bulletin*. 139: 59-65.

Smith, I. and Pieters, P. 1969. *The Geology of the Louisiade Archipelago, Territory of Papua New Guinea, Excluding Misima Island.* Canberra: Bureau of Mineral Resources Australia.

Smith, M. 2002. *Village on the edge: Changing times in Papua New Guinea.* Honolulu: University of Hawai'i Press.

Smith, S. 2012. Toward Inclusive Co-Management: Factors Influencing Stakeholder Participation. *Coastal Management*. 40 (3): 327-337.

Song, A.; Hoang, V.; Cohen, P.; Aqorau, T. and Morrison, T. 2019. Blue boats' and 'reef robbers': a new maritime security threat for the Asia-Pacific? *Asia Pacific Viewpoint.* doi: 10.1111/apv.12240.

Song, A.; Johnsen, J. and Morrison, T. 2018. Reconstructing governability: How fisheries are made governable. *Fish and Fisheries*. 19 (2): 377-389.

South, G.; Goulet, D.; Tuqiri, S. and Church, M. 1994. (eds.). *Traditional Marine Tenure and Sustainable Development and Sustainable Management of Marine Resources in Asia and the Pacific.* Suva: University of the South Pacific.

Steenbergen, D. and Visser, L. 2016. Caught Between Mediation and Local Dependence: Understanding the Role of Non-government Organisations in Comanagement of Coastal Resources in Eastern Indonesia. *Anthropological Forum*. 26 (2): 115-137.

Steenbergen, D.; Fabinyi, M.; Barclay, K.; Song, A.; Cohen, P.; Eriksson, H. and Mills, D. 2019. Governance interactions in small-scale fisheries market chains: Examples from the Asia-Pacific. *Fish and Fisheries*. 20 (4): 697-714.

Sterling, E.; Ticktin, T.; Kipa Kepa Morgan, T.; Cullman, G.; Alvira, D.; Andrade, P.; Bergamini, N.; Betley, N.; Burrows, K.; Caillon, S.; Claudet, J.; Dacks, R.; Eyzaguirre, P.; Filardi, C.; Gazit, N.; Giardina, C.; Jupiter, S.; Kinney, K.; McCarter, J.; Mejia, M.; Morishige, K.; Newell, J.; Noori, L.; Parks, J.; Pascua, P.; Ravikumar, A.; Tanguay, J.; Sigouin, A.; Stege, T.; Stege, M. and Wali, A. 2017. Culturally grounded indicators of resilience in social-ecological systems. *Environment and Society: Advances in Research*. 8: 63-95.

Stevens, A. 1989. *Report on the 'Patrol' to the East and West Calvados to Discuss a Joint Venture Fishing Project.* Report to the Superintendent, Community and Employee Relations, Misima Mines Pty. Ltd, Misima Island, Milne Bay Province, Papua New Guinea.

Stevens, A. 1993. *File Note: Visit to West Calvados, Re- Coral Sea Fisheries Limited* File Note (16/12/93) to the Superintendent, Community and Employee Relations, Misima Mines Limited, Misima Island, Milne Bay Province, Papua New Guinea.

Stevens, A. 1994. *File Note: Fishing.* File Note (04/02/94) to the Superintendent, Community and Employee Relations, Misima Mines Pty. Ltd, Misima Island, Milne Bay Province, Papua New Guinea.

Steward, J. 1955. *Theory of Culture Change: The Methodology of Multilinear Evolution.* Urbana: University of Illinois Press.

Stramma, L.; Johnson, G.; Sprintall, J. and Mohrholz, V. 2008. Expanding oxygenminimum zones in tropical oceans. *Science.* 320: 655–658.

Strathern, A. and Stewart, P. 1998. (eds.). *Kuk Heritage: Issues and debates in Papua New Guinea*. Townsvile: James Cook University.

Su, Y., Hung, J-H., Kubo, H. and Liu, L-L. 2014. Tridacna noae (Roding, 1798): a valid giant clam species separated from T. maxima (Roding, 1798) by morphological and genetic data. *Raffles Bulletin of Zoology.* 62: 124-135.

Sullivan, M. 1991. The Impacts of Projected Climate Change on Coastal Land Use in Papua New Guinea. In: Lawrence, D. and Canfield-Smith, T. (eds.). 1991. *Proceedings: Torres Strait Baseline Study Conference.* pp: 33-58. Townsville: Great Barrier Reef Marine Park Authority.

Sutinen, J. and Kuperan, K. 1999. A socio-economic theory of regulatory compliance. *International Journal of Social Economics*. 26 (1/2/3): 174-193.

Swadling, P. 1977. Depletion of Shellfish in the Traditional Gathering Beds of Pari. In: Winslow, J. (ed*). The Melanesian Environment.* pp: 182-187. Canberra: Australian National University.

Swadling, P. 2016. Mid-Holocene Social Networks in Far Eastern New Guinea. *Journal of Pacific Archaeology. 7* (1): 7-19.

Tabani, M. 2018. What's the Matter with Cargo Cults Today? In: Abong, M. and Tabani, M. (eds.). *Kago, Kastom and Kalja: The Study of Indigenous Movements in Melanesia Today.* Pp: 7-27. Marseilles: Pacific-credo Publications.

Tam, M. 2017. "Like casting into Jurassic Park". *Niugini Blue.* 33: 38-43.

Targulian, V. and Velpatievsky, P. 1994. Soils and Soil Formation on Pacific Islands. In: Pernetta, J. and Manner, H. 1994. (eds.). *The Ecosystems of Small Islands in the Southwest Pacific (The Sixth Expedition of the SS 'Calisto').* pp: 29-45. UNEP Regional Seas Reports and Studies, No.: 151; SPREP Reports and Studies, No.: 63. Apia: UNEP and SPREP.

Tennenbaum, D. 1984. Riding the Wagas. *Paradise.* 49: 17-22.

Thomas, D. 1978. *Japan's War at Sea: Pearl Harbor to the Coral Sea.* London: Andre Deutsch.

Thornley, A. 1993. Religious Interaction. In: Quanchi, M. and Adams, R. (eds.). *Culure Contact in the Pacific: Essays on Contact, Encouner and Response.* pp: 73-86. Cambridge: Cambridge University Press.

Tindale, N. and Bartlet, H. 1937. Notes on some clay pots from Panaeati Island, South-East of New Guinea. *Transactions of the Royal Society of South Australia*. 61: 159-162.

To, A.and Shea, S. 2012. Patterns and dynamics of the beche-de-mer trade in Hong Kong and mainland China: implications for monitoring and management. *TRAFFIC Bulletin*. 24: 65-75.

To A.; Shea S. and Conand, C. 2018. Trade patterns of beche-de-mer at the global hub for trade and consumption: An update for Hong Kong. *SPC Beche-de-mer Information Bulletin*. 38: 64-67.

Tochilin, C.; Dickinson, W.; Felgate, M.; Pecha, M.; Sheppard, P.; Damon, F.; Bickler, S. and Gehrels, G. 2012. Sourcing Temper Sands in ancient ceramics with U-Pb ages of detrital zircons: a southwest Pacific test case. *Journal of Archaeological Science*. 39 (7): 2583-2991.

Todd, A. 1894. *Parliamentary Government in the British Colonies.* London: Longmans, Green and Co.

Toledo, V. 1992. What is Ethnoecology? Origins, Scope and Implications of a Rising Discipline. *Ethnoecologica.* 1 (1): 5-21.

Tom'tavala, D. 1990. *National Law, International Law and Traditional Marine Claims: A Case Study of the Trobriand Islands, Papua New Guinea.* Unpublished MA Thesis, Dalhousie University, Halifax, Nova Scotia, Canada.

Tom'tavala, D. 1992. *Yam Houses in the Sea: Marine Claims of the Trobriand Islanders of Papua New Guinea.* Paper presented to the Congress of the Commission on Folk Law and Legal Pluralism, 27-30 August, Wellington, New Zealand.

Townsend, R. 1998. Beyond ITQs: property rights as a management tool. *Fisheries Research*. 37: 203-210.

Turner, M. 1986. Plantations, politics and policy-making in Papua New Guinea: 1965-1986. *Journal de la Societe des Oceanistes.* 82-83: 129-238.

Turner, J. 1994. Sea Change: Adapting Customary Marine Tenure to Commercial Fishing. The case of Papua New Guinea's bait fishery. In: South, G.; Goulet, D.; Tuqiri, S. and Church, M. (eds.). *Traditional Marine Tenure and Sustainable Management of Marine Resources in Asia and the Pacific.* pp. 141-154. Suva: University of the South Pacific.

Turner, M. 2004. Political ecology and the moral dimensions of 'resource conflicts': the case of farmer-herder conflicts in the Sahel. *Political Geography.* 23 (7): 863-889.

Turner, R.; Addison, J.; Arias, A.; Bergseth, B.; Marshall, N.; Morrison, T. and Tobin, R. 2016. Trust, confidence, and equity affect the legitimacy of natural resource governance. *Ecology and Society.* 21 (3): 18. doi: 10.5751/ES-08542-210318

United States of America Armed Forces. 1942. *Terrain Study No.: 34, Area Study of Louisiade Archipelago.* Report prepared for the Allied Geographic Section, Southwest Pacific Area, Brisbane, Queensland, Australia.

Uthicke, S. 1999. Sediment bioturbation and impact of feeding activity of *Holothuria* (Halodeima) *atra* and *Stichopus chloronotus*, two sediment feeding holothurians, at Lizard Island, Great Barrier Reef. *Biological Marine Science*. 64 (1): 129-141.

Uthicke, S. and Benzie, J. 2003. Gene flow and population history in high dispersal marine invertebrates: mitochondrial DNA analysis of *Holothuria nobilis* (Echinodermata: Holothuroidea) populations from the Indo-Pacific. *Molecular Ecolology.* 12 (10): 2635-2648.

Uthicke, S. and Purcell, S. 2004. Preservation of genetic diversity in restocking of the sea cucumber Holothuria scabra investigated by allozyme electrophoresis. *Canadian Journal of Fisheries and Aquactic Science.* 61 (4): 519-528.

Uthicke, S.; Purcell, S. and Blockmans, B. 2005. Natural hybridization does not dissolve species boundaries in commercially important sea cucumbers. *Biological Journal of the Linnean Society.* 85 (3): 261-270.

Vaccaro, I. and Beltran, O. 2019. What Do We Mean by 'the Commons'?: An Examination of Conceptual Blurring Over Time. *Human Ecology*. 47: 331-340.

Valdes-Rodriguez, O. and Perez-Vazquez, A. 2011. Sustainable livelihoods: An analysis of the methodology. *Tropical and Subtropical Agroecosystems*. 14 (1): 91-99.

van Helden, F. 1998. *Between Cash and Conviction: The Social Context of the Bismarck-Ramu Integrated Conservation and Development Project.* NRI Monograph, No.: 33. Port Moresby: The National Research Institute/UNDP.

van Helden, F. 2001. *Through the Thicket: Disentangling the Social Dynamics of an Integrated Conservation and Development Project on Mainland Papua New Guinea*. Wageningen: Wageningen University.

van Helden, F. 2004. 'Making Do': Integrating Ecological and Societal Considerations for Marine Conservation in a Situation of Indigenous Resource Tenure. In: Visser, L. (ed). *Challenging Coasts: Transdisciplinary Excursions into Integrated Coastal Zone Development*. pp 93-118. Amsterdam: Amsterdam University Press.

van Helden, F. 2009. 'The Report Was Written for Money to Come': Constructing and Reconstructing the Case for Conservation in Papua New Guinea. In: Carrier, J. and West, P. (eds.). *Virtualism, Governance and Practice: Vision and Execution in Environmental Conservation*. pp: 155-176. New York: Berghahn Books.

van Tatenhove, J. 2011. Integrated marine governance: questions of legitimacy. *MAST*. 10: 87-113.

van Tatenhove, J. 2013. How to turn the tide: developing legitimate marine governance arrangements at the level of the regional seas. *Ocean and Coastal Management*. 71: 296-304.

Vayda, A. 1968. (ed). *Peoples and Cultures of the Pacific: An Anthropological Reader*. New York: The Natural History Press.

Vayda, A. 1983. Progressive Contextualisation: Methods for Research in Human Ecology. *Human Ecology.* 11 (3): 265-281.

Vieira, S.; Kinch, J.; Yaman, L. and White, W. 2017. Shark fishing in the Louisiade Archipelago, Papua New Guinea: socio-economic characteristics and government policy options. *Ocean and Coastal Management*. 137: 43-56.

von Benda-Beckmann, F. 1997. Citizens, Strangers, and Indigenous Peoples: Conceptual Politics and Legal Pluralism. In*:* Kuppe, R. and Potz, R. (eds.). *International Yearbook for Legal Anthropology*. Pp: 1-42. The Hague: Martinus Nijhoff Publishers.

Voronov, A.; Puzachenko, Y.; Sozinov, V.; Ignatiev, G. and Skulkin, V. 1994. General Characteristics of the Islands and their Vegetation. In: Pernetta, J. and Manner, H. 1994. (eds.). *The Ecosystems of Small Islands in the Southwest Pacific (The Sixth Expedition of the SS 'Calisto').* pp: 46-106. UNEP Regional Seas Reports and Studies, No.: 151; SPREP Reports and Studies, No.: 63. Apia: Secretariat of the Pacific Regional Environment Program.

Wallace, P. 2012. *2012 Yacht Rally*. http://www.louisiades.com/yacht-rally/2012-yacht-rally/

Wallerstein, I. 1974. *The Modern World System: Capitalist Agriculture and the Origins of the European World-Economy in the Sixteenth Century.* New York: Academic Press

Walsh, K.; McInnes, K. and McBride, J. 2012. Climate Change Impacts on Tropical Cyclones and Extreme Sea Levels in the South Pacific: A Regional Assessment. *Global and Planetary Change.* 80-81: 149-164.

Warren, B. 1995. Comments on an Article by Arun Agrawal. *Indigenous Knowledge and Development Monitor.* 4 (1): 13.

Wawn, W. 1893. *The South Seas Islanders and the Queensland Labour Trade.* London: Swan Sonnenschein and Co.

Waylen, K.; Fischer, A.; Mcgowan, P.; Thirgood, S. and Milner-Gulland, E. 2010. Effect of local cultural context on the success of community-based conservation interventions. *Conservation Biology.* 24 (4): 1119-1129.

Weiner, A. 1976. *Women of Value, Men of Renown: New Perspectives on Trobriand Exchange*. Brisbane: University of Queensland.

Weiner, A. 1988. *The Trobrianders of Papua New Guinea*. New York: Holt, Rinehart and Winston.

Wells, F. and Kinch, J. 2003. Molluscs of Milne Bay Province, Papua New Guinea. In: Allen, G.; Kinch, J.; McKenna, S. and Seeto, P. (eds.). *A Rapid Biodiversity Assessment of the Coral Reefs of Milne Bay Province, Papua New Guinea - Survey II (2000).* RAP Bulletin of Biological Assessment No.: 29. pp: 39-45. Washington, D.C.: Conservation International.

West, P. 2006. *Conservation is Our Government Now: The Politics of Ecology in Papua New Guinea.* Durham: Duke University Press.

West, P. 2012. *From Modern Production to Imagined Primitive: The Social World of Coffee from Papua New Guinea*. Durham: Duke University Press.

West, P. 2016. *Dispossession and the Environment: Rhetoric and Inequality in Papua New Guinea.* New York: Columbia University Press.

Westley, F.; Carpenter, S.; Brock, W.; Holling, C. and Gunderson, L. 2002. Why systems of people and nature are not just social and ecological systems. In: Gunderson, L. and Holling, C. (eds.). *Panarchy: understanding transformations in human and natural systems.* pp: 103–119. Washington, DC: Island Press.

White, A.; Alino, P.; Cros, A.; Fatan, N.; Green, A.; Teoh, S.; Laroya, L.; Peterson, N.; Tan, S.; Tighe, S.; VenegasLi, R.; Walton, A. and Wen, W. 2014. Marine Protected Areas in the Coral Triangle: Progress, Issues, and Options. *Coastal Management.* 42 (2): 87-106.

White, G. 2007. *Indigenous Governance in Melanesia*. State Society and Governance in Melanesia Discussion Paper, No.: 5. Canberra: Australian National University.

White, J. and Hamilton, D. 1973. Anthropology. In: Manser, W. (ed). *New Guinea Barrier Reefs: Preliminary Results of the 1969 Coral Reef Expedition to the Trobriand Islands and the Louisiade Archipelago, Papua New Guinea*. pp: 275-314. Geology Department Occasional Papers, No.: 1. Port Moresby: University of Papua New Guinea.

Whitehead, M.; Jones, R. and Jones, M. 2007. *The Nature of the State: Excavating the Political Ecologies of the Modern State*. Oxford: Oxford University Press.

Whitfeld, T.; Lasky, J.; Damas, K.; Sosanika, G.; Molem, K. and Montgomery, R. 2014. Species richness, forest structure, and functional diversity during succession in the New Guinea lowlands. *Biotropica.* 46 (5): 538-548.

Whiting, S. 1975. *Death and Leadership on Misima: An Anthropological History of a Massim Village*. Unpublished MA Thesis, Monash University, Melbourne, Victoria, Australia.

Williams, G.; Knapp, I.; Maragos, J. and Davy, S. 2010. Modeling Patterns of Coral Bleaching at a Remote Central Pacific Atoll. *Marine Pollution Bulletin.* 60 (9): 1467-1476.

Williams, R. 1972. *The United Church in Papua New Guinea, and the Solomon Islands: The Story of the Development of an Indigenous Church on the Occasion of the Centenary of the L.M.S. in Papua, 1872-1972.* Rabaul: Trinity Press.

Williamson, H. 1989. Conflicting Claims to the Gardens of the Sea: The Traditional Ownership of Resources in the Trobriand Islands of Papua New Guinea. *Melanesian Law Journal.* 17: 26-42.

Wolf, E. 1982. *Europe and the People without History.* Berkeley: University of California Press.

World Bank. 1990. *Papua New Guinea, the Forestry Sector: A Tropical Forestry Action Plan Review.* Washington D.C.: World Bank.

Worsley: 1968. *The Trumpet Shall Sound: A Study of 'Cargo' Cults in Melanesia*. London: MacGibbon and Kee.

Worster, D. 1977. *Nature's Economy: A History of Ecological Ideas.* Cambridge: Cambridge University Press.

Worster, D. 1988. (ed). *The Ends of the Earth: Perspectives on Modern Environmental History.* Cambridge: Cambridge University Press.

Wright, A. 1985. Marine Resource Use in Papua New Guinea: Can Traditional Concepts and Contemporary Development are Integrated? In: Ruddle, K. and Johannes, R. (eds.). *The Traditional Knowledge and Management of Coastal Systems in Asia and the Pacific.* pp.:79-100. Jakarta: *United Nations Educational, Scientific and Cultural Organisation*.

Wurm, S.; Laycock, D.; Voorhoeve, C. and Dutton, T. 1975. Papuan Linguistic Prehistory, and Past Language Migrations in the New Guinea Area. In: Wurm, S. (ed). *New Guinea Languages and Language Study, Volume 1, Papuan Languages and the New Guinea Linguistic Scene.* Serices C, No.: 38. pp: 935-960. Canberra: Australian National University.

Yan, H.; Sun, L.; Wang, Y.; Huang, W.; Qiu, S. and Yang, C. 2011. A record of the Southern Oscillation Index for the past 2,000 years from precipitation proxies. *Nature Geoscience.* 4: 611-614.

York, R. and McGee, J. 2016. Understanding the Jevons paradox. *Environmental Sociology.* 2 (1): 77-87.

Young, M. 1971. *Fighting with Food: Leadership, Values and Social Control in a Massim Society.* Cambridge: Cambridge University Press.

Zeigler, A. 1982. An Ecological Checklist of New Guinea Recent Mammals. In: Gressit, J. (ed). *Biogeography and Ecology of New Guinea.* Biological Monograph, No.: 42. The Hague: Junk.

Zhang, H. and Bateman, S. 2017. Fishing militia, the securitization of fishery and the South China Sea dispute. *Contemporary Southeast Asia.* 39 (2): 288-314.

Zheng, G. 2018. Strengthening participatory approaches to coastal fisheries governance in Papua New Guinea: the role of local-level government legislation. *Pacific Conservation Biology.* 24 (2): 198-202.

Government Reports: Pre-Independence

Becke, R. 1968. *Misima Patrol Report, No.: 3/1968-1969.* Report prepared for the District Commissioner, Milne Bay District, Samarai, Territory of Papua.

Brown, L. 1923. *Patrol Report, No.: 2/1923-1924 for Panapompom, Panaeati, Utian and Panavaravarava for the Purpose of General Patrol and Tax Collection.* Report prepared for the Government Secretary, Milne Bay District, Samarai, British Territory of Papua.

Commonwealth of Australia. 1954. *Territory of Papua Annual Report: 1953-1954*. Canberra: Australian Government Printer.

Commonwealth of Australia. 1956. *Territory of Papua Annual Report: 1955-1956*. Canberra: Australian Government Printer.

Fowler, J. 1931. *Patrol Report, No.: 5/1930-1931 for the Calvados Chain, Sudest and Rossel Islands for the Purpose of General Inspection.* Report prepared for the Government Secretary, Milne Bay District, Samarai, Territory of Papua.

Geelan, R.; Esdale, F. and Sullivan, D. 1953. *Annual Report, Misima Sub-District, Milne Bay District: 1952-1953.* Report prepared for the District Commissioner, Milne Bay District, Samarai, Territory of Papua.

Matthews, R. 1952. *Misima Patrol Report, No.: 1/1951-1952.* Report prepared for the District Commissioner, Milne Bay District, Samarai, Territory of Papua.

McDonald, A. 1967. *Patrol Report, No.: 9/1966-1967: Engineer Group.* Report prepared for the Department of Agriculture, Stock and Fisheries, Port Moresby, Territory of Papua and New Guinea.

McLeod, J. 1955. *Patrol Report, No.: 3/1954-1955: Calvados and Deboyne Sub-Divisions, Selections Misima and Sudest Islands.* Report prepared for the District Commissioner, Milne Bay District, Samarai, Territory of Papua.

McLeod, J. 1956. *Patrol Report, No.: 1/1956-1957 Misima.* Report prepared for the District Commissioner, Milne Bay District, Samarai, Territory of Papua.

Nash, K. 1970. *Misima Patrol Report, No.: 4/1970-1971.* Report prepared for the District Commissioner, Milne Bay District, Samarai, Territory of Papua.

Potter, A. 1972. *Misima Patrol Report, No.: 2 of 1972/73.* Report prepared for the District Commissioner, Milne Bay District, Samarai, Territory of Papua.

Rentoul, A. 1933. *Misima Patrol Report, No.: 20/1932-1933 for Deboyne Island, Calvados Chain and Reynard Group for the Purpose of General Inspection, Plantation Inspection and Distribution of Commonwaelth Census Papers.* Report prepared for the Government Secretary, Milne Bay District, Samarai, Territory of Papua.

Smith, S. 1943. *Misima Patrol Report No.: 3/1942-1943*. Report prepared for the District Commissioner, Milne Bay District, Samarai, Territory of Papua.

Standing, J. 1975. *Foreign Fishing Vessels in PNG Waters, Situation Report, No.: 1/1975-1976*. Report prepared for the Louisiade Local Level Government Council, Bwagaoia, Misima, Milne Bay District, Papua and New Guinea.

Vivian, R. 1931. *Patrol Report No.: 12/1930-1931 for the Kulumadau, Losuia, Torlesse and Panapompom for the Purpose of Holding Licensing Courts, Inspections and Routine*. Report prepared for the Government Secretary, Milne Bay District, Samarai, Territory of Papua.

Wallent, R. 1973. *Misima Patrol Report, No.: 4 of 1972/73*. Report prepared for the District Commissioner, Milne Bay District, Samarai, Territory of Papua.

Zimmer, G. 1924. *Patrol Report No.: 2/1923-1924 for the Calvados Chain and Sudest for investigating the alleged poaching of Japanese Fishing Boats, and to Issue Seed Rice to the Native Plantation.* Report prepared for the Government Secretary, Milne Bay District, Samarai, British Territory of Papua.

Government Reports and Correspondence: Post-Independence

Aia, C. 2000. *Disputes between People of Brooker and Ware over Fishing Grounds.* Letter (17/08/2000) from the Police Station Commander, Bwagaoia, Misima to the District Administrator, Alotau Milne Bay Province, Papua New Guinea.

Alu, R. and Mee, C. 1979. *Trip to Misima Island.* Report prepared for the Fisheries Division, National Department of Primary Industry, Port Moresby, National Capital District, Papua New Guinea.

Babo, S. and Genolagani, J. 1981. *Report on a Preliminary Survey of Resource Areas in the Milne Bay Province, May 4th-19th, 1981.* Report prepared for the Resources Investigations Division of the National Parks Service, Port Moresby, National Capital District, Papua New Guinea.

Balaria, E. 2014. *Milne Bay Disaster Situation Report, No.: 01/2014.* Report prepared Milne Bay Provincial Disaster Committee, Alotau, Milne Bay Province, Papua New Guinea.

Bartlett, J. 1975 *Taiwanese Fishing Boats: Situation Report, No.: 4/1974-1975*. Report prepared for the District Officer, Misima District Office, Bwagaoia, Milne Bay Province, Papua New Guinea.

Benjamin, W. 1998. *Fishing Boundaries and Fishing Grounds.* Letter (05/02/1998) from the Ware Island Councillor to the Brooker Island Councillor, Milne Bay Province, Papua New Guinea.

Bonubonu, J. 1990. *Project Report: Brooker Fisheries Centre.* Letter (23/02/1990) from the District Rural Development Officer, Division of Agriculture and Livestock, Bwagaoia, Misima to the Manager, Milne Bay Fishing Authority, Samarai, Milne Bay Province, Papua New Guinea.

Bourne, P. 1976a. *Patrol Report No.: 1/1976-1977.* Report prepared for the District Officer, Misima District Office, Bwagaoia, Milne Bay Province, Papua New Guinea.

Bourne, P. 1976b. *Tourist Industry Potential: Jomard Passage Islands.* Letter (09/11/1976) from the Assistant District Officer, Bwagaoia, Misima to the Provincial Commissioner, Samarai, Milne Bay Province, Papua New Guinea.

Bourne, P. 1976c. *Water Supply: Jomard Passage Islands.* Letter (09/11/1976) from the Assistant District Officer, Bwagaoia, Misima to the President, Louisiade Local Government Council, Bwagaoia, Misima, Milne Bay Province, Papua New Guinea.

Bourne, P. 1976d. *Preservation of Wildlife: Panaiapona Island.* Letter (09/11/1976) from the Assistant District Officer, Bwagaoia, Misima to the Provincial Commissioner, Samarai, Milne Bay Province, Papua New Guinea.

Chesher, R. 1980. *Stock Assessment: Commercial Invertebrates of Milne Bay Coral Reefs*. Report prepared for the Fisheries Division, Department of Primary Industries, Port Moresby, National Capital District, Papua New Guinea.

Conservation and Environment Protection Authority. 2015. *National Marine Conservation Assessment for Papua New Guinea*. Port Moresby: Conservation and Environment Protection Authority.

Department of Milne Bay Province. 1981. *Milne Bay Development Program. Volume 3. Background Papers*. Alotau: Department of Milne Bay Province.

Elimo, G. 1986. *Diving Expeditions: Mailu Islanders.* Letter (01/05/1986) from District Coordinator, Bwagaoia, Misima, Milne Bay Province to the Officer-in-Charge, Margarida, Central Province, Papua New Guinea.

Elimo, G. 2001a. *Illegal Harvesting of Beche-de-mer.* Letter (20/04/2001) from the District Administrator, Misima to the Awaibi, Bwagabwaga and Ebora Councillors, Louisiade Local Level Government, Milne Bay Province, Papua New Guinea.

Elimo, G. 2001b. *Conflict between Brooker and Ware Islanders.* Letter (30/01/2001) from the District Administrator, Misima to the Provincial Administrator, Milne Bay Provincial Government, Alotau, Milne Bay Province, Papua New Guinea.

Elimo, G. 2003. *Decision of District Court over Ware/Brooker Islands Dispute, Reference: 35-22-3 (c)*. Letter (07/03/2003) from the District Administrator, Misima to the Louisiade and Bwanabwana Local Level Government Area Managers, Bwagaoia and Samarai, Milne Bay Province, Papua New Guinea.

Elliot, K. 1990. *Compensation over Bokiyowa Fishing Station: Brooker Island*. Letter (20/10/1990) from the Milne Bay Provincial Premier to William Sam, Brooker Island, Milne Bay Province, Papua New Guinea.

Fairhall, R. 1975. *Foreign Fishing Vessels.* Letter (19/09/1975) ftom Sub-District Officer, Bwagaioa to Officer-in-Charge, Tagula, Sudest, Milne Bay Province, Papua New Guinea.

Fifita, J. 1983. [*Letter*]. Letter (13/09/1983) from the Manilobu Clan Leader, Brooker Island to the Provincial Minister, Division of Primary Industry, Milne Bay Provincial Government, Alotau, Milne Bay Province, Papua New Guinea.

Gada, M. 1981. *Traditional Fishing Knowledge Questionnaire: Ware Island.* Report prepared fro the Reef Fisheries Research Project, Samarai, Milne Bay Province, Papua New Guinea.

Gisabiuego, O.; Elijah, M. and Jackson, R. 1999. [*Letter*]. Letter (14/07/99) from the Motorina Island Councillor to the Brooker Island Councillor, Milne Bay Province, Papua New Guinea.

Giyolibulibu, D. 1999. *Land Dispute Register, Reference No.: 35-2-1.* Letter (31/05/1999) from the Acting Area Manager, Samarai to the Deputy Administrator (Advisory), Milne Bay Provincial Government, Alotau, Milne Bay Province, Papua New Guinea.

Gomedi, W. 1987. *Drought Situation Report: Deboyne, Renard Islands and West Calvados Chain.* Report prepared for the Division of Economic Services, Alotau, Milne Bay Province, Papua New Guinea.

Heveve, M. 1977. *Complaint: Fishing Rights.* Letter (undated) from Provincial Wildlife Officer, Misima to the Provincial Commissioner, Alotau, Milne Bay Province, Papua New Guinea.

Iadila, S. 1998. *Fishing Boundaries and Fishing Grounds.* Letter (16/03/1998) from the Brooker Island Councillor to the Ware Island Councillor, Milne Bay Province, Papua New Guinea.

Iadila, S. 1999. *North Motorina/Brooker Boundary.* Letter (24/08/1999) from the Brooker Island Councillor to the North Motorina Councillor, Milne Bay Province, Papua New Guinea.

Iadila, S. 2001. *Dispute over Ownership of Nabaina and Nearby Islands.* Letter (18/04/2001) from the Brooker Island Councillor to the Ware Island Councillor, Milne Bay Province, Papua New Guinea.

Igara, K. 2003. *Patrol Report: Ware/Brooker Land Mediation (Brooker Island: 16th-20th December 2002).* Report prepared for the Provincial Administrator, Milne Bay Provincial Government, Alotau, Milne Bay Province, Papua New Guinea.

Kailola, P. with P. Lokani. no date. *Sea cucumbers*. Report prepared for the National Fisheries Authority, Port Moresby, National Capital District, Papua New Guinea.

Kaumas, S. 1982. *Sale of Fish and Other Marine Catch Prices: Milne Bay Fisheries Based at Brooker.* Letter (08/03/82) from District Officer-in-Charge, Misima to the Premier, Milne Bay Provincial Government, Alotau, Milne Bay Province, Papua New Guinea.

Klembassa, S. 2005. *Investigation Report on Hookah Gear*. Report prepared for the National Fisheries Authority, Port Moresby, National Capital District, Papua New Guinea.

Lagasae, S. 1981. *Trade Store Survey: Louisiade Local Governemnt Council Area: West Calvados Chain, Deboyne and Renard Islands.* Report prepared for the Louisiade Local Government Council, Bwagaoia, Milne Bay Province, Papua New Guinea.

Lindholm, R. 1978. *Beche-de-mer Fishery.* Report prepared for the Department of Primary Industry, Port Moresby, National Capital District, Papua New Guinea.

Lokani, P. and Ada, K. 1998. *Milne Bay Province: Product Exports: 1997.* Report to the National Fisheries Authority, Port Moresby, National Capital District, Papua New Guinea.

Lokani, P. and Kubohojam, G. 1993. *Beche-de-mer Processing and Marketing in Papua New Guinea.* Report prepared for the Department of Fisheries and Marine Resources, Kavieng, New Ireland Province, Papua New Guinea.

Louisiade Local Level Government Council. 1998. *Louisiade Local Level Government Council Meeting Minutes.* Report prepared for the Louisiade Local Government Council, Bwagaoia, Milne Bay Province, Papua New Guinea

Maso, P. 1986. *Diving Expeditions: Mailu Islanders.* Letter (19/05/1986) from Acting District Co-ordinator, Samarai, Milne Bay Province to Officer-in-Charge, Margarida, Central Province, Papua New Guinea.

Maurice Pratley and Associates. 1989. *Final Report on the Investigations and Special Audit Inspections of the Business Areas and of other Organisations associated with the Milne Bay Provincial Government.* Report prepared for the Milne Bay Provincial Government, Alotau, Milne Bay Province, Papua New Guinea.

Munro, J., 1989. *Development of a Giant Clam Management Strategy for Milne Bay Province.* Report prepared for the National Department of Fisheries and Marine Resources, Port Moresby, National Capital District, Papua New Guinea.

Myint, T. 1996. Beche-de-mer Exports. *Papua New Guinea National Fisheries Authority Newsletter.* 2 (1): 20-21.

National Fisheries Authority. 2017. *The Milne Bay Piracy Challenge: Impact on the Sea cucumber Fishery and Strategy to Reduce Piracy.* Report prepared for the National Fisheries Authority, Port Moresby, National Capital District, Papua New Guinea.

Omeri, N. 1991. *Fisheries and Marine Policy for Milne Bay Province.* Report Prepared for the National Department of Fisheries and Marine Resources, Port Moresby, National Capital District, Papua New Guinea.

Philip, L. 2003a. [*Notice of Appeal*]. Appeal No.: 01/03. Court Appeal lodged in the Provincial Land Court of Justice, Bwagaoia, Misima, Milne Bay Province, Papua New Guinea.

Philip, L. 2003b. [*Affidavit*]. Appeal No.: 01/03. Court Appeal lodged in the Provincial Land Court of Justice, Bwagaoia, Misima, Milne Bay Province, Papua New Guinea.

Rayner, J. and Rayner, M. 1989. *A Report on Subsistence Agriculture, Nutrition and Health in the East Calvados Islands, Milne Bay Province*. Report prepared for the Department of Milne Bay Province, Alotau, Milne Bay Province, Papua New Guinea.

Sailoia, P. 2001. *Second Meeting Relating to the Un-resolved Dispute between Brooker and Ware Islanders (27th August 2001).* Report prepared for the Deputy Administrator, Milne Bay Provincial Government, Alotau, Milne Bay Province, Papua New Guinea.

Sailoia, P. 2002. *Patrol Report No.: 01/2002 (Second Land Dispute Mediation) (Brooker Vs Ware) at Brooker Island (16th-19th December 2002).* Report prepared for the District Administrator, Bwagaoia, Alotau, Milne Bay Province, Papua New Guinea.

Tauliso, G. 1990. *Brooker Islands Fisheries Centre.* Letter (01/03/1990) from Assistant Secretary, Division of District Admninsitration, Alotau to the District Officer, Misima, Milne Bay Province, Papua New Guinea.

Tauliso, G. 2001a. *Situation Report on Ware Brooker Dispute over Reefs and Islands – Calvados Chain.* Letter (07/09/2001) from the Deputy Administrator to the Provincial Administrator, Milne Bay Provincial Government, Alotau, Milne Bay Province, Papua New Guinea.

Tauliso, G. 2001b. *Conflict between Brooker and Ware Islanders.* Letter (24/04/2001) from the Deputy Administrator to the Provincial Administrator, Milne Bay Provincial Government, Alotau, Milne Bay Province, Papua New Guinea.

W.D. Scott and Co. 1973. *A Framework for Regional Development: A Pilot Study of the Milne Bay District*. Report prepared for the Milne Bay District Government, Alotau, Milne Bay Province, Papua New Guinea.

Newspaper Articles

Anonymous. 1952. Cyclone Damage Staggering. Newspaper Article (30/05/1952). *South Pacific Post.*

Anonymous. 2000. Philemon calls for rethink on beche-de-mer moratorium. Newspaper Article (31/08/2000). *Independent.*

Anonymous. 2016a. Poachers captured by Papua New Guinea, Australian Navy. Newspaper Article (30/12/2016). *Post Courier.*

Anonymous. 2016b. Leave items on ship. Newspaper Article (04/10/2016). *The National.*

Anonymous. 2016c. International Maritime Organisation backs Province. Newspaper Article (07/12/2016). *The National*.

Anonymous. 2016d. Jomard holds Milne Bay's future. Newspaper Article (30/12/2016). *Post Courier*.

Anonymous. 2017. National Fisheries Authority decision upsets Philemon. Newspaper Article (03/04/2017). *The National.*

Anonymous. 2018. Court cites Critten for having conflict of interest in beche-de-mer case. Newspaper Article (10/08/2018). *The National.*

Anonymous. 2019. Beche-de-mer fishery opening deferred. Newspaper Article (01/07/2019). *The National.*

Baraisi, A. 2018a. Is this Brooker Island? Japanese technology transforms life on a faraway Milne Bay Island. Newspaper Article (25/05/2018). *Post Courier*.

Baraisi, A. 2018b. Making briny water sweet again. Newspaper Article (29/03/2018). *Post Courier*.

Moi, C. 2019. Association slams NFA's role in managing beche-de-mer sector. Newspaper Article (11/07/2019). *The National.*

Setepano, N. 2017. Sea cucumber awareness vital. Newspaper Article (13/01/17). *Post Courier.*

Legislative Documents and Policies

Bialla Local Level Government. 2004. *Marine Environment Law*. Bialla: Bialla Local Level Government.

Government of Australia. 1905. *Papua Act*. Canberra: Government of Australia.

Government of Australia. 1945. *Papua-New Guinea Provisional Administration Act*. Canberra: Government of Australia.

Government of Australia. 1949. *Papua and New Guinea Act*. Canberra: Government of Australia.

Government of Australia. 1953. *Pearl-Shell and Beche-de-mer Ordinance: 1952-1953.* Canberra: Government of Australia.

Government of Australia. 1970. *Australian Continental Shelf (Living Natural Resources) Act.* Canberra: Government of Australia.

Government of Papua New Guinea. 1975a. *Constitution of the Independent State of Papua New Guinea.* Port Moresby: Government of Papua New Guinea.

Government of Papua New Guinea. 1975b. *Land Disputes Settlement Act*. Port Moresby: Government of Papua New Guinea.

Government of Papua New Guinea. 1977. *National Seas Act.* Port Moresby: Government of Papua New Guinea.

Government of Papua New Guinea. 1979. *International Trade (Flora and Fauna) Act.* Port Moresby: Government of Papua New Guinea.

Government of Papua New Guinea. 1992. *Mining Act.* Port Moresby: Government of Papua New Guinea.

Government of Papua New Guinea. 1996. *Lands Act.* Port Moresby: Government of Papua New Guinea.

Government of Papua New Guinea. 1997. *Organic Law on Provincial and Local Level Governments.* Port Moresby: Government of Papua New Guinea.

Government of Papua New Guinea. 1998a. *National Fisheries Management Act.* Port Moresby: Government of Papua New Guinea.

Government of Papua New Guinea. 1998b. *Milne Bay Province Giant Clam Fishery Management Plan*. Government of Papua New Guinea.

Government of Papua New Guinea. 2000. *Milne Bay Provincial Beche-de-mer Fishery Management Plan.* Port Moresby: Government of Papua New Guinea.

Government of Papua New Guinea. 2001. *National Beche-de-mer Fishery Management Plan.* Port Moresby: Government of Papua New Guinea.

Government of Papua New Guinea. 2002. *Notice of Prohibition of Taking Sedentary Resources.* Port Moresby: Government of Papua New Guinea.

Government of Papua New Guinea. 2014. *Papua New Guinea Policy on Protected Areas*. Port Moresby: Conservation and Environment Protection Authority.

Government of Papua New Guinea. 2015. *Fisheries Management (Amendment) Act.* Port Moresby: Government of Papua New Guinea.

Government of Papua New Guinea. 2016a. *National Beche-de-mer Fishery Management Plan.* Port Moresby: Government of Papua New Guinea.

Government of Papua New Guinea. 2016b. Maritime Zones Act. Port Moresby: Government of Papua New Guinea.

Government of Papua New Guinea. 2017a. *Public Monies Management Regularisation Act*. Port Moresby: Government of Papua New Guinea.

Government of Papua New Guinea. 2017b. *Roadmap for Coastal Fisheries and Marine Aquaculture in Papua New Guinea: 2017-2026.* Port Moresby: Government of Papua New Guinea.

Government of Papua New Guinea. 2018. *National Beche-de-mer Fishery Management Plan.* Port Moresby: Government of Papua New Guinea.

Government of Papua New Guinea. 2019. *National Oceans Policy.* Port Moresby: Government of Papua New Guinea.

Government of Territory of Papua. 1888. Arms, Liquor, and Opium *Prohibition Ordinance.* Port Moresby: Territory of Papua.

Government of Territory of Papua. 1910. *Pearl Shell and Beche-de-mer Fishery Ordinance: 1891-1910*. Port Moresby: Government of Territory of Papua.

Government of Territory of Papua. 1925-1934. *Native Plantation Ordinance*. Port Moresby: Territory of Papua.

Government of Territory of Papua. 1934. *Pearl, Pearl-shell and Beche-de-mer Ordinance: 1911-1934*. Port Moresby: Government of Territory of Papua.

Government of Territory of Papua and New Guinea. 1963. Native Customs (Recognition) Act. Port Moresby: Government of Territory of Papua and New Guinea.

Government of Territory of Papua and New Guinea. 1966. *Fauna (Protection and Control Act).* Port Moresby: Government of Territory of Papua and New Guinea.

Government of Territory of Papua and New Guinea. 1971. *Land Ordnance: 1962-1971*. Port Moresby: Government of Territory of Papua and New Guinea.

Hoskins Local Level Government. 2004. *Marine Environment Law*. Hoskins: Talasea Local Level Government.

Lavongai Local Level Government. 2013. *Marine Evironment Management Act.* Kavieng: Lavongai Local Level Government

Manus Provincial Government. 1989a. *Manus Marine Resources Protection Act*. Lorengau: Manus Provincial Government.

Manus Provincial Government. 1989b. *Manus Marine Resources Protection Regulation*. Lorengau: Manus Provincial Government.

Nali Sopat Penabu Local-level Government. 2009. *Pere Environment and Conservation Area Management Plan*. Lorengau: Nali Sopat Penabu Local-level Government.

Parliament of the United Kingdom of Great Britain and Northern Ireland. 1843-1875. *Foreign Jurisdiction Acts.* London: Parliament of the United Kingdom of Great Britain and Northern Ireland.

Parliament of the United Kingdom of Great Britain and Northern Ireland. 1872. *Pacific Islanders Protection Act.* London: Parliament of the United Kingdom of Great Britain and Northern Ireland.

Talasea Local Level Government. 2004. *Marine Environment Law*. Kimbe: Talasea Local Level Government.

International Instruments and Guidelines

Food and Agriculture Organisation of the United Nations. 1995. *Code of Conduct for Responsible Fisheries*. Rome: United Nations Food and Agriculture Organisation.

Food and Agriculture Organisation of the United Nations. 2012. *Voluntary guidelines for securing sustainable small-scale fisheries guidelines for securing sustainable small-scale fisheries in the context of food security and poverty eradication.* Rome: United Nations Food and Agriculture Organisation..

Food and Agriculture Organisation of the United Nations. 2015. *Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security.* Rome: United Nations Food and Agriculture Organisation.

International Maritime Organisation. 2006. *Particularly Sensitive Sea Area Guidelines*. Geneva: International Maritime Organisation.

International Union for Conservation of Nature. 2014. *Guidelines for Using the IUCN Red List Categories and Criteria.* The Gland: International Union for Conservation of Nature.

Melanesian Spearhead Group Secretariat. 2015. *Roadmap for inshore fisheries management and sustainable development 2014-2023.* Port Vila: Melanesian Spearhead Group Secretariat.

Pacific Community. 2015. *Pathways to change: The Noumea strategy*. Noumea: Pacific Community.

United Nations. 1972. *Convention on the Protection of the World Cultural and Natural Heritage*. New York: United Nations.

United Nations. 1976. *Convention for the International Trade in Endangered Species of Wild Flora and Fauna*. New York: United Nations.

United Nations. 1982. *Convention for the Law of the Sea*. New York: United Nations.

United Nations. 2015. *Transforming our World: The 2030 Agenda for Sustainable Development.* New York: United Nations.

Appendices

Appendix A: Household Questionnaire.

HIGHLY CONFIDENTIAL

Name of Village: _____

Name of Household: _____

Date: _____

Interviews will be conducted in the Misima and English language. All interviewees will have the right to participate or not in interviews and given the assurance that they may end or interrupt the interview at any time.

List all members of your household.

Name	Father's Name	Sex	Relationship	Clan	Year of Birth	Education (Grade Completed)	Literacy (Proficiency in English and Misima)	Comments

Has anyone listed in your household ever had a job?

Name	Type of job	Where did you Work?	How many years were you employed	What was your salary?	When did you leave this job?	Did you bring/send money back to the village?

Does your household use cash for any of the following? Tick where applicable.

Item	Yes / No	Once every day	Once every week	Occasionally
Tea				
Sugar				
Tobacco				
Rice				
Cooking oil				
Flour				
Tin fish				
Tin meat				
Biscuits				
Twisties/Chips				
Noodles				
Curry				
Wash powder				
Soap				
Batteries				
Kerosene				
Betelnut				
Health care				
Transport				
School fees				
Church				
Fishing gear				
Clothing				

How many of the following items are owned by your household?

Item	Quantity	Price	Where and how obtained?
Bed			
Mattress			
Radio			
Tape Player			
Camera			
Pressure Lantern			
Wick Lantern			
Suitcase			
Patrol Box			
Sewing Machine			
Torch			
Clock			
Thermos Flask			
Water Cooler			
Bible			

From what sources do you obtain your drinking water?

What fishing gear does you and members of your household own?

Item	**Quantity**	**Age of item**	**Comments (Name of canoes, How did you obtain it?)**
Dugout (*gepo*)			
Wood canoe (*guladau*)			
Wood canoe (dory)			
Wood canoe (*sailau*)			
Other boat			
Work boat			
Banana boat/Dinghy			
Outboard motor			
Nets			
U/W torch			
Ice box			
Esky			

How important is fishing for subsistence to your household?

How important is fishing for cash in your household?

How important is fishing for trade in your household?

How often do you go fishing?

When was the last time you went fishing?

Where did you go?

What months do you do more fishing and why?

What are the main fishing methods used by the members of the household?

What fish species are mostly consumed in the household?

What shell species are mostly consumed in the household?

When was the last time you ate dugong?

How important is diving for subsistence to your household?

How important is diving for cash in your household?

How important is diving for trade in your household?

How often do you dive for marine products?

When was the last time you went diving?

Where did you go?

What months do you do more diving and why?

What marine products do you collect/use for cash?

What area do you most often visit for diving?

Which area did you dive most last year?

Which area do you plan to dive next year?

Who do you sell your marine resources to?

Do you feel that you get a good price for your resources?

What are your perceptions on your marine resources?

Resource name	**How often to you harvest:** 1. All the time 2. Sometimes 3. Not very often 4. Never	**Why do you harvest:** 1. Food 2. Cash 3. Trade 4. Ceremonial	**Status:** 1. Many 2. Some 3. Finished
Beche de mer			
Trochus			
Clam muscle and meat			
Clam shell			
Black lip			
Green lip			
Brown lip			
Shark fin			
Turtle Shell			
Corals			
Turtle			
Crayfish			
Reef fish			
Tuna			
Kingfish/Mackerel			
Others			

Are there areas where your household is not allowed to fish or dive? If yes, why?

Are there any laws or practices in kastom which conserve resources?

Are there any taboos placed on marine resources?

Are there any government restrictions on resource harvesting?

Do people respect these rules?

Do you see changes in the environment (both land and sea)?

Do you think that marine resources can be depleted? How and why?

Do you know of any areas where resources have been depleted? What area and what resource?

What do you think can be done to conserve resources?

What do you think of the fishing companies that have come here in the past and present?

How important is trade for your household?

How often do you go trading?

Which place do you trade with most and why?

When was the last time you went trading?

Where did you go?

Was the person you traded with a friend, relative or in-law (include clan)?

What items did you give?

Item	**Quantity**

What items did you receive?

Item	**Quantity**

Where are your current gardens and how many do you have? Include all gardens belonging to the household.

Which Island?	No. of New Garden	No. of Last Year's Garden	No. of Older Gardens	Other	Who owns this land?	What crops are planted in each garden?

Do you own any coconut groves? Does your household keep or raise any animals?

Which island?	Approximately how many trees?	Who owns this land?		Animal	Quantity

If you do not have your own plantation, whose plantation do you use?

Do you plan to make any copra this year?

Write all daily food eaten during the last 24 hours. If you eat fish, clam or shellfish, please name what species.

Breakfast	Lunch	Dinner

Appendix B: Results of marine biodiversity surveys in Brooker Island's marine territory.

Place	Description	No. of Fish Species	No. of Coral Species	Reef Condition (out of 300)
Tawal Reef 11°02.61'S 152°21.28'E	Exposed barrier type reef with moderate slope to deep water.	232	78	206.49
Ululina Island 11°04.67'S 152°31.40'E	Moderately exposed lagoon type reef with moderate slope to deep water and wide sand gullies parallel to slope.	201	78	204.51
Keikeia Reef 11°06.36'S 152°15.67'E	Exposed barrier type reef with moderate slope to deep water with wide sand channels parallel to.	211	108	235.71
Horrara Gowan Reef 11°00.75'S 152°18.55'E	Exposed barrier type reef with gentle slope to deep water with scattered coral bommies in the shallows and then vast areas of rubble overgrown with coralline algae on the slope.	206	84	215.46
Panasial Island 11°00.85'S 152°19.92'E	Sheltered fringing reef with gentle slope to deep water and with sandy substrate and coral bommies on the slope.	192	62	184.45
Panadaludalu Island 11°14.38'S 152°10.29'E	Exposed barrier type reef with vertical slope to deep water.	187	69	201.68
Jomard Island 11°14.38'S 152°10.29'E	Exposed fringing reef with very steep slope to deep water with caves and gullies leading to reef flat.	198	91	222.35
Enivala Island 11°11.43'S 152°01.54'E	Moderately exposed fringing/lagoon type reef with gentle slope to deep water with sand and coral bommies in the shallows and coral ridges running horizontally across the slope.	225	107	244.48

Source: Allen et al. (2003b).

Appendix C: Fish species identified by Brooker Islanders.

The Misima names of species were recorded as they were encountered. Species were then identified by Brooker Islanders during specific sessions with various fish identification books. Names were recorded when there was a consensus from a minimum of 10 different people.

Misima Name	**Common Name**	**Latin Name**

The etymology of species names is supplied below the relevant species.

A

Ahiat	Yellowlip Emporer	*Lethrinus erythracanthus*
Alawa	Yellowfin Parrotfish	*Scarus flavipectoralis*

Name derived from the word *alawana* - a term for colours incorporating green, yellow and blue; refers to the colour of this species skin.

Anuwal	Giant Seapike	*Sphyraena jello*
	Military Seapike	*Sphyraena qenie*
	Striped Seapike	*Sphyraena obtusata*
	Chevron Barracuda	*Sphyraena putnamiae*
Atuni lou	Ox-eye Scad	*Sela boops*
Atuni mayala	Smooth-tailed Trevally	*Salaroides leptolepis*
Awaawa	Thick-lipped Wrasse	*Hemigymnus melapterus*

Name refers to the sound this species makes whilst feeding.

Awanak	Stripe-face Unicornfish	*Naso literatus*

Name is derived from the words *awan* - mouth, *nak* - bad; refers to the shape of this species mouth.

B

Baewa	Generic term for Sharks	*Carcharinus* spp. and others
Benei	Long-finned Batfish	*Platax pinnatus*
	Teira Batfish	*Platax teira*
	Orbicular Batfish	*Platax orbicularis*
Betut	Whale Shark	*Rhibcodon typus*
Buhumanawi	Long-nosed Emporer	*Lethrinus olivaceus*

Name is derived from the word *buhun* - nose; refers to the shape of its nose.

Bwagilum	Black Marlin	*Makaira indica*
	Indo-pacific Blue Marlin	*Makaira mazara*
	Short Bill Spearfish	*Tetrapturus angustirostris*
	Striped Marlin	*Tetrapturus audux*
	Indo-pacific Sailfish	*Istiophorus platypterus*
	Swordfish	*Xiphias gladius*

Misima Name	Common Name	Latin Name

The etymology of species names is supplied below the relevant species.

Bwalagila	Pearl-streaked Monocle Bream	*Scolopsis xenochrous*
Bwaleloga	Anchor Trunkfish	*Choerodon anchorago*
Bwanayan	Black-tipped Cod	*Epinephelus fuscoguttatus*

D

Dayaya	Long-jawed Mackeral	*Rastrelliger kanagurta*

Name is derived from the word *yaiya* - rippling of surface water; refers to the action of this species when feeding on the surface of the sea.

Dadayasi	Narrow-barred Spanish Mackeral	*Scomberomorous commerson*
Daludalu	Generic term for Dolphins and Porpoises	Delphinidae and Phocoenidae
Digodigo	Scarlet Soldierfish	*Myripristis violacea*
Dogigi	Crescent Perch Three-lined Grunter	*Terapon jarpura* *Decapterus russelli*

E

Enipola *Sikusiku* (juvenile)	Red Bass	*Lutjanus bohar*

G

Gab	Six-banded Parrotfish	*Scarus frenatus*

Name derived from the word *gab* = fire; refers to the colour of this species.

Gagata	Gold-spotted Trevally	*Carangoides fulvoguttatus*
Gaihaman	Dash-dot Goatfish	*Parupeneus barberinus*

Name derived from the word *gaiha* - to board a boat; refers to the action of the spearfisher putting his catch onto the canoe.

Galgal	Endracht Hardyhead	*Atherinomerus endrachtensis*
Galokilaha	Red-Speckled Parrotfish Blue-barred Parrotfish	*Cetoscarus bicolor* *Scarus ghobban*

Name derived from the word *kilaha* - to cut across; refers to the markings on this species flank just behind the head.

Misima Name	Common Name	Latin Name

The etymology of species names is supplied below the relevant species.

Gamategawaliya	Double-headed Maori Wrasse	*Cheilinus undulates*

Name derived from the words *gamagal* - person*, tawalita* - another name for the Manilobu Clan; this is the totem fish for this clan.

Ganagana	Blue-lined Emporer	*Lethrinus* sp.
Garsawa	Thumbprint Emporer	*Lethrinus erythracanthus*
Gawagawa	Russell's Mackeral Scad	*Decapterus russelli*
Gibala	Smooth Flutemouth	*Fistularia commersorii*
Gidola	Unidentified Surgeonfish	

Name derived from the words *gidola* - long; refers to the characteristics of this specie's nose.

Giwaiyan	Generic term for Fuseliers	*Caesio* spp. *Pletocaesio* spp. *Gymnocaesio* spp.
Guyowok	Black-spot Seaperch Ehrenbergs Seaperch	*Lutjanus rivulatus* *Lutjanus ehrenbergi*

H

Havani	Blackstreak Surgeonfish	*Acanthurus nigricauda*
Hopahopa	Many-spotted Sweetlips	*Plectorhinchus chaetodontoides*

Name derived from the word *hopahopa* - lips; refers to the nature of this species lips.

I

Isudau	White-spotted Shovelnose Ray	*Aptycotrema* sp.

Name derived from the Suau language area, isu - nose, dau - long; refers to the shape of this species head.

Itoito	Sleek Unicornfish	*Naso hexacanthus*

K

Kabela	Orange-socket Surgeonfish	*Acanthurus auranticavus*
Kaboiya	Striped Catfish	*Plotosus lineatus*

Name derived from the word *kaboiya* - to leak; refers to the belief that if you eat this species it will make your ears leak pus.

Misima Name	Common Name	Latin Name

The etymology of species names is supplied below the relevant species.

Kaisep	Generic term for certain Triggerfish species including:	
	Starry Triggerfish	*Abalistes stellatus*
	Blue-finned Triggerfish	*Balistoodes viridescens*
	Yellow-spotted Triggerfish	*Pseudobalistes fuscus*
	Yellowmargin Triggerfish	*Pseudobalistes flavimarginatus*
Kaisep umauma	Redtooth Triggerfish	*Odonus niger*
Kag	Flyingfish	*Cypselurus* sp.
Kakabela	Pale-lipped Surgeonfish	*Acanthurus leucocheilus*
Kakawola	Honeycomb Cod	*Epinephelus merra*
	Long-finned Rockcod	*Epinephelus quoyanus*
Kalomlom	Manta Ray	*Manta birostris*
Kanivala	Barracuda	*Spryaena barracuda*
Kasusa	Generic term for Blennies	*Entomacrodus* spp. and others
Kawakolukolu	Black-finned Treadfin	*Polydactylus nigripinnis*
Kibkib	Generic term for certain Triggerfish species including:	
	Black Triggerfish	*Sufflamen chrysopterus*
	Red-lined Triggerfish	*Balistapus undulates*

Name refers to the sound this species makes whilst feeding.

Kibukibu	Wahoo	*Acanthocybium solandri*
Kimakimaga	Indo-pacific Bluetang	*Paracanthurus hepatus*
Kiton	Spotted Spinefoot	*Siganus punctatus*
	Golden-lined Spinefoot	*Siganus lineatus*
Koil	Blue-lined Surgeonfish	*Acanthurus lineatus*

Named derived from *kokoil* - a special coloured stone axe blade; refers to the markings of this species which resembles the markings of the axe blade.

Koka	Generic term for Morays	*Gymnothorax* spp. and others
Koka aule	Black-spotted Moray	*Gymnothorax favageneus*

Misima Name	Common Name	Latin Name

The etymology of species names is supplied below the relevant species.

Koka matmat	Painted Moray	*Siderea picta*

Name derived from the word *matmat* - solidified beach rock, refers to this species habitat.

Koka netom	Yellowedged Moray	*Gymnothorax flavimarginatus*
Kokok	Snub-nosed Dart	*Trachinotus blochii*
Kolabilabi	Common Dolphinfish	*Coryphaena hippurus*

Name derived from the word *labi* - side; refers to the shape of this species.

Kosa	Generic term for certain coloured Parrotfish species including:	
	Saddled Parrotfish	*Scarus dimidiatus*
	Blue Parrotfish	*Scarus oviceps*
Kukumanali	Banded Sergeant	*Abudefduf septemfasciatus*
	Blackspot Sergeant Major	*Abudefduf sordidus*
	Sergeant Major	*Abudefduf vaigiensis*
	Narrow-banded Sergeant Major	*Abudefduf bengalensis*
	Scissortail Sergeant	*Abudefduf sexfasciatus*

Name derived from the word *nali* - coral; refers to this species habitat.

Kunikei	Humphead Unicornfish	*Naso unicornus*
Kumkum	Generic term for Damselfishes	*Chromis* spp. and others

L

Labeta	Spangled Emporer	*Lethrinus nebulosus*
Lablab	Slender Suckerfish	*Echenis nucrates*
	Remora	*Remora remora*

Name derived from the word *labi* - side; refers to the habits of this species.

Lamwavalval / Weilala	Convict Surgeonfish	*Acanthrus triostegus*

Name derived from the word *lamwan* - forehead; refers to the belief that if you eat this species you will be afflicted with headaches.

Legallegal / Sabweli	Southern Drummer	*Kyphosus bigibbus*
	Topsail Drummer	*Kyphosus cinerascens*
Lepalepa	Finny Scad	*Megalaspis cordyle*

Misima Name	Common Name	Latin Name

The etymology of species names is supplied below the relevant species.

Leu	Generic term for Longtoms and Garfishes	*Tylosurus* spp. and others
Leu limwan	Barred Longtom	*Ablennes hians*
	Stout Longtom	*Tylosurus gavialoides*

Name derived from the word *limwan* - deep sea; refers to this species habitat.

Leu sula	Barred Garfish	*Hemiramphus far*
	Robust Garfish	*Hemiramphus robustus*
	Tropical Garfish	*Hyporhamphus affinis*
	Quoy's Garfish	*Euleptorhampus quoyi*
	Long-finned Garfish	*Euleptorhampus viridis*
Lilla	Potato Cod	*Epinephelus tukula*

M

Matabobu	Midnight Snapper	*Macolor macularis*
Mailauesi	White-lined Rockcod	*Anyperondon leucogrammicus*
Maimua	Shark Mackeral	*Grammatorcynus bilineatus*
Makimaki	Scarlet-Breasted Maori Wrasse	*Cheilinus fasciatus*
	Tripletail Maori Wrasse	*Cheilinus trilobatus*
Malawi	Ornate Sturgeonfish	*Acanthrus dussuneiri*
	Yellowfin Sturgeonfish	*Acanthrus xanthopterus*
Mayali	Ruby Snapper	*Etelis carbunculus*
Mwagoga	Pennantfish	*Alectis ciliaris*
Mwalimwaliligan	Generic term for Flatheads	*Platycephalus arenarius* and others

Name derived from the word *mwalilwaliligan* - to suffer symptoms similar to vertigo; refers to the belief that if you eat this fish you will become dizzy.

Mayamul	Humpnose Big-eye Bream	*Monotaxis grandoculis*
Mwananuya	Generic term for certain coloured Cod species including:	
	Barramundi Cod	*Crompilieptes activelis*
	Flowery Cod	*Epinephelus heniochus*
	Small-tooth Cod	*Epinephelus polyphekadion*
	Tomato Rockcod	*Cephalopolis sonnerati*
	Hexagon Rockcod	*Epinephelus hexagonatus*
	Large-spotted Rockcod	*Epinephelus mascrospilos*
	Reef Cod	*Epinephelus tauvina*

Misima Name	Common Name	Latin Name

The etymology of species names is supplied below the relevant species.

Mumuya	Smudgepot Spinefoot	*Siganus canaliculatus*
Mwakalalaki	Unidentified fish species	

Name derived from the Ware Island language mwaka - teeth, lalaki - big; refers to the characteristics of the species teeth.

N

Nabwalele	Generic term for certain coloured Sweetlip species including:	
	Striped Sweetlips	*Plectorhinchus lessoni*
	Oriental Sweetlips	*Plectorhinchus obscurum*
	Diagonal-banded Sweetlips	*Plectorhinchus lineatus*
	Diagonal-banded Sweetlips	*Plectorhinchus goldmanii*
Nawiyan	Yellow Striped Goatfish	*Parupeneus chrysolpleuron*
Nelom	Giant Trevally	*Caranx ignoblis*
Niuniu	Striped Goatfish	*Upeneus vittatus*
Nou	Generic term for Lionfishes, Firefishes and Stonefishes	*Pterois* spp. *Dendrochirus* spp.

P

Pepeka	Generic Term for Scats, Butterflyfishes and certain Anglefishes	*Chaetodon* spp. *Heniochus* spp. *Pomacanthus* spp. *Centropyge* spp. and others
Pilihul	Generic term for Goatfishes	*Mulloidichthys* spp. *Parupeneus* spp. *Upeneus* spp.
Puyoyon	Generic term for Cowfishes, Boxfishes and Turretfishes	*Lactoria* spp. *Ostracion* spp. *Rhynchostrachion* spp. *Tetrasomus* spp.
Pwayuwek / Sosoge	Generic term for Pufferfishes and Toadfishes	*Aronthon* spp. and others

S

Samama	Generic term for Hardyheads	*Atherinomerus* spp. and others

Misima Name	Common Name	Latin Name

The etymology of species names is supplied below the relevant species.

Salasala	Generic term for certain coloured Parrotfish species including:	
	Surf Parrotfish	*Scarus rivulatus*
	Globe-headed Parrotfish	*Scarus ghobban*
Seiseiyala	Generic term for Tangs	*Zebrasoma* spp.
Sigoita	Generic Term for Catsharks and Wobbygongs	*Hemiscllium* spp. *Orectolobus spp*. *Euchrossorhinus* spp. and others
Sigoita lovalova	Whaleshark	*Rhincodon typus*
Sipapa	Generic term for Flounders and Soles	*Pseudorhompus* spp. and others
Siusiu	Ringtailed Unicornfish	*Naso brachycentron*
Sol	Generic term for Soldierfishes and certain Squirrelfishes	*Myripristis spp*. *Sargocentron spp*. and others
Suwa	Rainbow Runner	*Elegatis bipunnulata*

T

Tabibina	Red Emporer	*Lutjanus sebae*
Taipehepehe	Humpback Unicornfish	*Naso brachycentron*
Talayan	Spiny Squirrelfish	*Sargocentron spineferum*
	Bluestripe Squirrelfish	*Sargocentron tiere*

Name derived from the word *liya* - the colour of scar tissue; refers to the colour of this species.

Tanian	Unidentified Hardyhead Species	
Tatan	Blue-striped Seaperch	*Lutjanus kasmira*
	Five-lined Seaperch	*Lutjanus quinquelineatus*
Tawiya	Generic term for certain Trout and Cod species including:	
	Coral Trout	*Plectropomus leopardus/maculatus*
	Polkadot Cod	*Plectropomus areolatus*
	Verimicular Cod	*Plectropomus oligocanthus*
	Chinese Footballer	*Plectropomus laevis*

Name derived from the word *tawiya* - swollen groin; refers to the belief that if you eat this fish you will be afflicted with painful swollen groin.

Misima Name	Common Name	Latin Name

The etymology of species names is supplied below the relevant species.

Tayaka	Generic term for Cardinalfishes	*Cheilodipterus* spp. *Apogon* spp.
Tayan	Ornate Surgeonfish	*Acanthurus dussumieri*
Tobwagabwaga	Steephead Parrotfish	*Scarus microhinos*

Name derived from the words *to* - one who, *bwagabwaga* - useless; refers to the action of this species has it moves around searching for food.

Togoba	Double-headed Parrotfish	*Bolbometopon muricatum*
Togoleli	Striped-faced Unicornfish	*Naso lituratus*

Name derived from the words *to* = one who, *goleli* = to cut open; refers to a mythological story involving this species.

Tokeli/Tukeli	Spotcheek Emporer Black-blotched Emporer	*Lethrinus rubrioperculatus* *Lethrinus semicintus*

Name derived from the words *to* = one wh, *keli* - cough; refers to the sound this species makes.

Tolobil	Six-banded Wrasse	*Thalassoma hardwickei*
Tomalemale	Chinaman Fish	*Symphorus nematophorus*
Totoli	Generic term for Angelfishes	*Centropyge* spp. *Chaetodontoplus* spp. *Pomacanthus* spp. and others

Name derived from the words *to* - one who, *tol* - fart; refers to the sound this species makes.

Tuna	The traditional term is *Lalami/Valami* with the English term Tuna is now used. Literal translations are made to differentiate Tuna species, for example:	
Tetena Keketina	Yellowfin Tuna	*Thunnus albacares*

Name derived from the words *tetena* - fin, *ket* - yellow; refers to the colour of this species fins.

Matana Bwabwatana	Big Eye Tuna	*Thunna obsesus*

Name derived from the words *matana* - eye, *bwabwatana* - big; refers to the size of this species eyes.

Saliana Babalona	Mackeral Tuna	*Euthynnus affinis*

Name derived from the words *saliana* - blood, *babalona* - thick; refers to the richness of the blood when butchering.

Misima Name	Common Name	Latin Name

The etymology of species names is supplied below the relevant species.

Tupatupa	Generic Term for Trevallys	
	Including:	
	Black Trevally	*Caranx lugubris*
	Bluefin Trevally	*Caranx melampygus*
	Brassy Trevally	*Caranx papuensis*
	Bigeye Trevally	*Caranx sexfasciatus*
	Silver Trevally	*Pseudocaranx dentex*

Name derived from the word *tupa* - to bump or come up against; refers to the action of this species when feeding on small hardyheads and scads.

Tuttut	Blue Maori Cod	*Epinephelus cynapodus*

U

Ulaulas	Generic term for Whales	Cetacea
Ulibelila	Coral Cod	*Cephalopholis miniata*
Ulihela	Coronation Trout	*Variola louti*

Name derived from the words *ulina* - tail, *hela* – a species of tree whose leaves turn red; refers to the colour of this species.

Ulisiai	*Sweetlip Emporer*	*Lethrinus miniatus*
Uliyapuyapu	Generic term for certain Sweetlip species including:	
	Painted Sweetlips	*Diagramma labiosum*

Name derived from the words *ulina* - tail, *yapu* - long; refers to the characteristics of this species tail.

Unanatokite	Bridled Monocle Bream	*Scolopsis bilineatus*

Name derived from the words *un* - knot, *ana* - used to denote relationships between things, *to* - one who, *kite* - see; refers to the action of this species.

Utul	Green Jobfish	*Aprion virescens*

V

Veya	Queensland Groper	*Epinephelus lanceolatus*
	Flowery Cod	*Epinephelus fuscoguttatus*
Vanavana	Long-finned Silver Biddy	*Pentaprion longimanus*
Vetowa	Generic term for Stingrays	*Dasyatis* spp. and others
Videvide	Blue-lined Spinefoot	*Siganus puellus*

Misima Name	Common Name	Latin Name

The etymology of species names is supplied below the relevant species.

Vilu	Golden Trevally	*Gnathanodon speciosus*
Vivilal	Silver Spinefoot	*Unidentified*
W		
Waloya	Generic term for Mullet species including: Blue-tail Mullet Diamond-scale Mullet Sea Mullet	 *Valamugil buchanani* *Liza vaigiensis* *Mugil cephalus*
Wanin	Pastel Ringwrasse Moon Wrasse	*Hologymnosus doliatus* *Thalassoma lunare*
Weu	Unidentified fish species	
Y		
Yabwau	Paddletail	*Lutjanus gibbus*
Yalyal / Bwalenak	Double-lined Mackeral	*Grammatorcynus bilineatus*
Yatela	Brown Unicornfish	*Naso unicornis*
Yesamoli	Humphead Unicornfish	*Naso tuberosus*

Name derived from the WareIsland and Suau languages yesi - fish, moli - true; this fish is considered to be the real/true fish along with other species such as *vivilal* and *malawi* who run straight into the net whilst netting rather than scattering like the mullets and scads.

Appendix D: Shellfish identified by Brooker Islanders.

The Misima names of species were recorded as they were encountered or caught. Species were then identified by Brooker Island womens during specific sessions with various shell identification books. Names were recorded when there was a consensus from a minimum of 10 different people.

Misima Name	Family	Latin Name	Etymology
A			
Alitau	Tridacninae	*Tridacna gigas*	*ali* - cut, *tau* - man.
B			
Baliseya	Tridacninae	*Tridacna derasa*	
Boboli	cypraeidae	*Cypraea mauritana*	
Bubuna	Trochidae	*Trochus lacintus*	*bubunama* - to be shiny.
Bunloga	Cypraeidae	*Ovula costellata*	
Bwagigi talmwalawa	Cymatiidae	*Cassis cornuta*	*mwalawa* - whistle.
Bwagigi tautauyoga	Cassidae	*Charonia tritonis*	*yoga* - call; *tau* - man.
Bwanolal	Bursidae	*Tutofa bubo*	
D			
Datudatu	Volutidae	*Cymbiola rutila* *Aulica flavicans* *Voluyoconus bednalli*	*datu* - low tide.
Dumosi	Strombidae	*Stombus urceus*	
Dunal	Ovulidae	*Ovula ovum*	
E			
Ebunol	Gaaleodidae	*Syrinx aruanus*	
G			
Gabali	Tonnidae	*Tonna galea* *Tonna dolium* Tonna luteostomo *Tonna allium* *Tonna cepa* *Tonna perdix*	
Gigig	Unidentified		

Misima Name	Family	Latin Name	Etymology
Gigiyoyu	Camaenidae	*Pauina taumantias* *Megalacron alfredi* *Megalacron boivini* *Megalacron lambei*	corruption of the word, gilolu - a slimy substance, spittle.
Gimbul	Cerithiidae	*Cerithium nodulosor*	
Guna	Cypraeidae	*Cyprae testundinar*	
Gunyapu/Kival	Trochidae	*Rochia nilotica*	*gunina* – bottom, *yapu* - long.
H			
Halhal	Muricidae	*Thais armigera*	*halhal* - rough or hard surface.
K			
Kaboboma	Haliotidae	*Haliotis asisnina* *Haliotis ovina* *Haliotis varia*	
Kakanilu	Unidentified		
Kalomi	Turbindae	*Turbo marmooratus* *Turbo carassus* *Turbo setosus* *Turbo spaverius* *Turbo petholatus*	
Kalomi mata yanuyanu	Turbindae	*Turbo chrysostomus*	*matana* - eye; *yanuyanu* – white.
*Kanene*l	Cyraeidae	*Cyraea caputserpen*	
Kawaloya	Cyraeidae	*Cyraea caputserpen*	
Kokoyou	Conidae	*Conus leopardus* *Conus litteratus* *Conus betulinus*	
L			
Lotupa	Potamidadae	*Cerithdea largeillitieri* *Telescopium telescopium* *Terebralia sulcata* *Cerithdea anticipata*	*tupa* - blocked.
M			
Malina	Tridacninae	*Tridacna squamosa*	
Matahup	Turindae	*Tubo cinereus*	*matana* - eye; *hup* - go inside.
N			
Nevanak	Unidentified		*nevanak* - women.

Misima Name	Family	Latin Name	Etymology
O			
Onon	Trochidae	*Trochus maculates*	*onon* - white.
P			
Pinyapu	Terebridae	*Tereba* spp *Dupicaria* spp. *Hastula* spp. *Impages hecitca*	*pinin* - bottom, the end of something; *yapu* - long.
Potokipa	Conidae	*Conus maromoreus*	*potokipa* - disease like piles.
Puapual/Pat lagona	Tridacninae	*Tridacna maxima* *Tridacna crocea*	*pat* - stone, *lagona* - wife
Pwepwet gonugonu	Unidentified		*pwet* - to turn over, *gunugunu* - black.
Pwahapwaha	Tridacninae	*Hippopus hippopus* *Hippopus porcellinus*	
S			
Siki	Strombidae	*Lambis crocata* *Lambis lambis* *Lambis scorpius* *Lambis truncat seabae* *Lambis millepeda*	
Siki bala	Strombidae	*Lambis chiragra*	*bala* - corruption of the word *sala* meaning tusk
Siniketa	Strombidae	*Strombus luhunus*	
Siyam	Unidentified		
T			
Tamwatamwailu	Cypraeidae	*Cypraea arabica*	*tamatamwailu* - easily freed.
Tanapat	Trochidae	*Trochus lineatus*	*ta* – we, *na* - go, *pat* - rock.
U			
Uduudu	Trubindae	*Turbo marmoratus*	
V			
Veveloga	Nautiladae	*Nautilus pompilius* *Nautilus macrompha* *Nautilus scrobiculatus*	*veve* - flap.

Misima Name	Family	Latin Name	Etymology
Y			
Yaluman	Volutidae	*Melo broderipi*	*yaluman* - refers to the act of bailing.
Yaluman bodiman	Volutidae	*Melo unbilicatus*	*bodiman* - refers to any object used for bailing.

Appendix E: Crustaceans and other marine resources identified by Brooker Islanders.

The Misima names of species were recorded as they were encountered. Names were recorded when there was a consensus from a minimum of 10 different people.

Misima Name	**Common Name**
Alman	Mudcrab
Gogoman	Hermit crab
Gugumeli	Land crab
Kakilisu	Ghost crab
Komesal	Unidentified crab
Laum	Generic term for crabs
Matalit	Unidentified crab
Balou	Sponge
Bwai	Jellyfish/Translucent jelly
Damasi	Sea worms
Giliboda / Guyoway	Octopus
Kal	Phospherent strings
Lumulumun	Sea weed (Type 1)
Mugul	Sea weed (Type 2)
Nimut	Algae
Pwawai	Coconut crab
Sa	Sea urchin
Tamieala	Turtle
Tuwai	Squid
Yui	Dugong

Appendix F: Bird species identified by Brooker Islanders.

The Misima names of species were recorded as they were encountered. Names were recorded when there was a consensus from a minimum of 10 different people.

Misima Name	Common Name	Etymology/Notes
Apwaiyowa/Atakena	Sulphur Crested Cockatoo	Totem bird for the Linawiya Clan.
Awawa	Unidentified	Name refers to the sound this species makes, its cry is thought to signal the coming of rain or relatives.
Bilalona	Unidentified	Lives in mangroves.
Boi / Logaloga	Heron	Totem bird for the Guwau Clan. Its cry is thought to signal the coming of visitors.
Bulana	Similar to the bushfowl	Name derived from the word *ula* – bush.
Buyol	Starling	
Dawasi / Lawat	Tern species	Totem bird for Manilobu Clan.
Gegel / Lelelo	Black-capped parrot	Totem bird for Laeloga Clan.
Kainaboli/Lumlum	Pidgeon species	The second name is derived from the call it makes.
Kisakisa	Kite species	Is referred to in magical spells for fishing due to it habit of diving for fish.
Kiyokiyo	Kingfisher	Name derived from the sound it makes.
Kove	Unidentified	
Magesubu	Eagle species	Totem bird for the Ewau Clan.
Manak	Osprey	Name derived from the words *man* – bird, *nak* - bad; refers to the belief that if you hear its cry someone will die. Totem bird for the Meisoga Clan.
Mangamaoia	Eagle species	Name derived from the words *man* – bird, *gagama* - belongs to, *oya* – mountain. Totem bird for the Gamwaola Clan.
Mankakinawi	Brown Booby	
Mankelakela/Manyoniyoni	Tern species	Name derived from the words *man* - bird, *kelakela/yoniyoni* - beach.

Manmwelamwela	Unidentified	Name derived from the word *man* - bird, *mwelamwela* - mangroves.
Misima Name	**Common Name**	**Etymology/Notes**
Mansikosiko	Flycatcher	
Mansiwiliwili	Similar to a starling	
Mwamwanitu	Nicobar pidgeon	
Okok / Ovak	Crow/Raven	Name derived from the sound it makes. Totem bird for the Mwaowa Clan.
Pinpin	Unidentified	Name derived from the sound it makes. Its cry is thought to signal the coming of visitors.
Pwaol	Bushfowl	
Sili	Unidentified	Its cry is thought to signal the death of somebody.
Siwisiwi / Isego	Sandpiper	
Tolutoluwaga	Owl species	
Weigali	Unidentified	Totem bird for Gamatal Clan.

Appendix G: Other animals identified by Brooker Islanders.

The Misima names of species were recorded as they were encountered. Names were recorded when there was a consensus from a minimum of 10 different people.

Reptiles

Misima Name	**Common Name**	**Etymology/Notes**
Alalat	Unidentified snake	Has red and black colouring.
Bakus / Bwakosi	Skink species	It is green in colour.
Bonowok	Gecko species	
Kumakela	Goanna	Name derived from the Tubetube Island language kum - you, kela - never miss.
Laumlaumpou	Gecko species	Name derived from the word *pou* - the ridge line of a house.
Lelewaga	Crocodile	Nil meaning
Loloelanu	Gecko species	It is said to look after gardens for people.
Mwalimwaliwaga	Gecko species	Name derived from the word *waga* - boat.
Mwata	Generic term for snakes	
Papapun	Unidentified snake	
Sikakai	Skink species	It is black in colour.
Siwanoi / Sigola	Skink species	It is either brown or black in colour.
Tohotoho	Sea snake	
Unal	Unidentified snake	

Mammals

Misima Name	**Common Name**
Kadoiya	Possum
Kuyab	Flying fox/Bat
Siletu	Sugar glider
Siyok	Rat

Misima Name	**Common Name**
Bilibili ana toet	Earthworm
Gogoibi	Brown ants
Hanan	Unknown insect that infests coconut trunks
Kapilu / Gumu	Wasp
Koima	Red ants
Kolakolabili	Mud wasp
Neneni	Small black ants
Pitpit	Big black ants
Sapwasapwa	Sand flies

Appendix H: Vegetation types identified by Brooker Islanders.

The Misima names of species were recorded as they were encountered. Names were recorded when there was a consensus from a minimum of 10 different people.

Botantical specimens were pressed and arranged with voucher numbers and later sent to the Papua New Guinea National Herbarium in Lae, Morobe Province for formal identification.

Trees, Shrubs and Herbaceous Plants

Misima Name	**Family**	**Latin Name**
Aikakaku	Unknown	Unknown
Ailalana	Euphorbiaceae	*Euphorbia heterophylla*
Awituntun	Euphorbiaceae	*Excoecaria agallocha*
Babalia	Combretaceae	*Terminalia samoensis*
Bibiu	Hernandiaceae	*Hernanadia nymphaeifolia*
Bokalukalu	Verbenaceae	*Premna obtusifolia*
Bokuku	Apocynaceae	*Plumeria obtusa*
Bulesi	Rubiaceae	*Guettarda speciosa*
Ebal	Euphorbiaceae	*Macaranga tanarius*
Ebwabeakena	Ebenaceae	*Diospyros ferrea*
Egiyalegiyal	Unknown	Unknown
Enawaya	Euphorbiaceae	*Ricinus communis*
Eyabuni	Sapindaceae	*Allophylus cobbe*
Eyalu	Casuarinaceae	*Casurina equisetifolia*
Eyanbuni	Rutaceae	*Micromelum minatum*
Gagabu	Unknown	Unknown
Gagatulepa	Boraginaceae	*Cordia dichotoma*
Ganawan	Boraginaceae	*Cordia subcordata*
Kakamwa	Guttiferae	*Calophyllum inophyllum*
Kakawola ana puhu	Unknown	Unknown
Kalakalawai	Aquifoliaceae	*Ilex cf.forbesii*
Kamakamasui	Boraginaceae	*Argusia argentea atoto*

Misima Name	Family	Latin Name
Kankandidi	Fabaceae	*Erythrina variegata*
Kasaliga	Unknown	*Schleinitzia nov-guieenis*
Keipok	Unknown	*Bombax ceibar*
Kekesi	Malvaceae	*Urena lobata*
Kililiyou	Fabaceae	*Tephrosia candida*
Kunika	Rubiceae	*Morinda citrifolia*
Lagalagal	Unknown	Unknown
Lagitu	Agavaceae	*Cordyline terminalis*
Laleli	Convolvulaceae	*Impomoea pes-carpe*
Liulele	Loganiaceae	*Fagraea racemosa*
Liyawah	Pandanceae	*Pandanus conodieus*
Maen	Fabaceae	*Canavalia papuana*
Malimali	Amaryllidaceae	*Crinum asiaticum*
Manasagenal	Steruliceae	*Klienhovia hospita*
Mansis	Euphorbiaceae	*Euphorbia* sp.
Masimasi	Sapotaceae	*Pouteria obovata*
Mekumeku	Clusiaceae	*Calophyllum inophyllum*
Muum	Rhamnaceae	*Colubrina asiatica*
Mwaneni	Moraceae	*Ficus trachypison*
Nilanila	Lythraceae	*Pemphis acidula*
Ninihalum	Aizoaceae	*Sensuvium portulacastrum*
Pakimul	Unknown	Unknown
Pawat	Apocynaceae	*Cerbera manghas*
Pedidi	Lamiaceae	*Ocimum basilicum*
Saube	Unknown	Unknown
Sis	Acanthaceae	*Graphtophyllum pictum*
Taniyela	Rhamnaceae	*Colubrina asiatica*

Tauihi	Unknown	Unknown
Tautauhoga	Unknown	Unknown
Tokomwa wali elum	Apocynaceae	*Tabernaemontana coronaria*
Totopwehe	Fabaceae	*Crotalaria spectabilis*
Utautan	Barringtoniaceae	*Barringtonia asiatica*
Vagavagan	Goodeniaceae	*Scaevola taccada*
Wiwi	Unknown	Unknown
Name not recorded	Tulliaceae	*Truimfetta* sp.
No name	Apocynaceae	*Allemanda cathanica*
No name	Apocynaceae	*Nerium indicum*
No name	Fabaceae	*Clitorea ternata*
No name	Solanaceae	*Solanum torvum*
No name	Verbanaceae	*Clerodendron cf. Splendens*
No name	Verbenaceae	*Clerodendron disparifolium*
No name	Verbenaceae	*Stachytarpheta cf. Splendens*

Mangroves

Misima Name	**Family**	**Latin Name**
Aipwanpwan	Sonneratiaceae	*Sonneratia alba*
Mwelamwela (Type 1)	Rhizophoraceae	*Bruguiera gymnothiza*
Mwelamwela (Type 2)	Rhizophoraceae	*Ceriops tagal*
Nawoiya	Steruliaceae	*Heritiera littoralis*

Seaweed

Misima Name	**Family**	**Latin Name**
Mugul	Chlorophyta	*Halimedia* spp.

Food Plants

Misima Name	**Common Name**	**Latin Name**
Aupe	Edible green	*Amaranthus dubius*
Bin	Snake bean	*Vigna sesquipedalis*
Boge	Pawpaw	*Carica papaya*
Bonubonu	Pumpkin	*Cucurbita moschata*
Dausia		*Terminalia* sp.
Giaha (edible green)	Unknown	Unknown
Guava	Guava	*Psidium guajva*
Hela	Okari nut	*Terminalia arenicola*
Kalolu	Aibika	*Hibiscus Manihot*
Kelehe (Type 1)	Mango	*Mangifera indica*
Kelehe (Type 2)	Mango	*Mangifera minor*
Kiki	Sugarcane	*Saccharum officinarum*
La	Greater yam	*Discorea alata*
Lele	Custard Apple	*Annona reticulata*
Moiyok	Tapioca	*Manihot esculenta*
Momole	Malaysian apple	*Syzigium* sp.
Mun	Watermelon	*Citrullus lanatus*
Niu	Coconut	*Cocos nucifera*
Painap	Pineapple	*Ananus comosus*
Pegapega	Corn	*Zea mays*
Potati	Sweet potato	*Ipomea batatus*
Sibwa	Chinese laural	*Antidesma sarcocarpum*
Sikaya	Lesser yam	*Discorea esculenta*
Siyaya	Chestnut	*Inocarpus fagifera*
Suwa	Banana	*Musa* spp.
Wakai	Breadfruit	*Antocarpis communis*
Yaku (edible fruit)	Unknown	Unknown

Appendix I: Historical timeline for the Louisiade Archipelago.

Year	Activity
This timeline is compiled from information provided in various chapters of this thesis, noytably, Chapters 3, 4 and 6. References can be found in the appropriate sections of these chapters.	
>14,000-10,000 Before Present?	Initial colonisation of the Southern Massim Islands
10,000-3,000 Before Present	Sea level rise
3,000-2,500 Before Present	Arrival of Lapita people
1606	Louis Vaez de Torres visits the Louisiade Archipelago
1768	Louis Antoine de Bougainville visits the Louisiade Archipelago
1793	Antoine-Raymond-Joseph Bruny d'Entrecasteaux visits the Louisiade Archipelago
1804	Captain Louis Charles Ruault Coutance visits the Louisiade Archipelago
1849	Owen Stanley maps the Louisiade Archipelago and Brooker Island is named
1873	John Moresby maps the Louisiade Archipelago
1808	Abraham Bristow visits the Louisiade Archipelago
~ 1835	Whaling commences
~ 1840	Traders arrive
1873	Beche-de-mer trade commences
1877	Reverend James Chalmers establishes a mission station at Suau on the Milne Bay south coast
1878	First missionary contact begins in the Louisiade Archipelago at Ware Island
	Beche-de-mer Trader John McOrt and William Ingham murdered on Brooker Island
1883	Queensland tries to annex the south coast of New Guinea
1883	Labour trade commences
1884	Southern New Guinea became a British Protectorate
1885	Captain Cyprian Bridge arrives at Brierley Island in the Louisiade Archipelago to inform the people that they are now British Subjects

Year	Activity
1886	Captain J. C. Craig and his crew of the *Emily* are massacred and a punitive Force of Brooker and Ware Islanders led by Nicolas Minister raised against Joanett Islanders
1887-1888	Torres Strait pearl fleet moves to the Louisiade Archipelago
1888	Gold is found at Sudest Island and the Louisiade Archipelago and a gold rush begins
	Southern New Guinea becomes a British possession and called British New Guinea
1890	Methodist Church granted missionary jurisdiction over the Louisiade Archipelago
1891	Reverends Samuel Fellows and James Watson establish mission station at Panaeati Island in the Deboyne Group of Islands
1893	Government coconut plantation established at Nivani Island in the Deboyne Group of Islands
1899	Gold rush on Sudest Island is finished and mining moves to Misima Island
1901	Australia's Federation
1902	British New Guinea comes under Australian jurisdiction
1906	British New Guinea is renamed the Territory of Papua
1909	Government coconut plantation at Nivani Island is leased to George Munt
1914	Broken Hill Proprietary Limited begins intensive mining on Misima Island
	Australia invades the German Protectorate of New Guinea
~ 1920	Fijian Missionary, Metuisela Fafita marries Asena, a Brooker Island women
	Fijian Missionary, Semi Valata arrives on Brooker Island
1921	League of Nations makes the German Protectorate a Mandate of Australia
1924	Japanese poachers fishing in the Louisiade Archipelago
1930	Petelo Evalval comes from Bwagabwaga on Misima Island to Brooker Island in 1930 to preach
	Buliga from Siagara Village on Misima Island starts a cargo cult
1931	Church at Brooker Island is formally established

Year	Activity
1939	Superintendent Reverend Bartlett announces the completion of the New Testament in the Misima language
1942	Expatriates leave Misima Island due to World War II hostilities
	Japanese established a seaplane base at Nivani Island in the Deboyne Group of Islands
	Battle of the Coral Sea
	Buliga's cargo cult flares up and Buliga flees to Motorina where Lieutenant R. G. Mader is murdered
	Buliga later hangs himself in prison
1944	Dysentery outbreak followed by meningitis epidemic spreads through the Louisiade Archipelago
1949	Co-operative movement in the area of Milne Bay starts
1950	Polio epidemic spreads through the Louisiade Archipelago
1953	Influenza spreads through the Louisiade Archipelago
1958	Louisiade Local Government Council formally begins
~ 1960s	Peak of illegal fishing and Taiwanese Poachers in the Louisiade Archipelago
1968	Louisiade Fisheries starts as a joint venture between the Catholic Mission at Nimoa Island and the Louisiade Local Governing Council
	Co-operative Wholesale Organisation established
1973	Self-government is granted for Papua and New Guinea
1974	Masurina Limited founded in the Milne Bay Provincial Capital, Alotau
1975	Independence is granted to Papua New Guinea
1976	Milne Bay Fishing Authority concept initiated
	Tourism potential investigated at Jomard Island and the Bramble Haven Group of Islands
1977	Louisiade Fisheries taken over by the Milne Bay Department of Primary Industry
1980	Milne Bay Development Authority Act enacted
1982-1988	Sailing canoe adventure tours conducted in the West Calvados Chain
1984	Milne Bay Fishing Authority fish buying station established at Brooker Island
1989	Milne Bay Fishing Authority fish buying station closes at Brooker Island

Year	Activity
1989	Misima Mines Limited begins consultations with communities in the Louisiade Archipelago on the establishment of Coral Sea Fisheries
1990	Milne Bay Fishing Authority ceases operations
1992	Coral Sea Fisheries concept is approved by the Milne Bay Provincial Executive Council
1992	Asiapac Limited begins operations based in Alotau
1992-2000	Titus Philemon is the Member of Parliament for the Samarai-Murua District
1993	Coral Sea Fisheries formally operationalised through a Mining Development Agreement with the national government and Misima Mines Limited
1994	Corals Sea Fisheries begins operations
1996	Cora Sea Fisheries ceases operations
	Misima Mines starts operations
1997	Organic Law on Provincial and Local Level Governments introduced
	Cyclone Justin
	Elfin Enterprises Ltd expresses interest to develop a fisheries business in the Louisiade Archipelago
1997-2000	Dame Josephine Abaijah is Governor of the Milne Bay Province until she was toppled in vote of no confidence
1998	Horizon Resources Pty Limited expresses interest to develop a fisheries business in the Louisiade Archipelago
2000-2002	Titus Philemon is Governor of the Milne Bay Province
2000-2017	Gordon Wesley is the Member of Parliament for the Samarai-Murua District
2001	Masurina Limited splits its business interests with the now Sir Jon Luc Critten taking ownership of Nako Fisheries and Kiwali Exports
2002-2007	Tim Neville is Governor of the Milne Bay Province
2007-2012	The now Sir Jon Luc Critten is Governor of the Milne Bay Province
2004	Misima Mines Limited closes
2008	Louisiade Yacht Rally begins trips to the Louisiade Archipelago
2009	National Fisheries Authority imposes a moratorium on the sea cucumber fishery and the beche-de-mer trade

Year	Activity
2011	Wildfish Limited expresses interest to develop a fisheries business in the Louisiade Archipelago
2012	Louisiade Yacht Rally stops visiting the Louisiade Archipelago
2012-2017	Titus Philemon is Governor of the Milne Bay Province
2014	Cyclone Ita devastates the Louisiade Archipelago
2016	Vietnamese Blue Boats apprehended in Milne Bay waters illegally harvesting sea cucumbers
	Sports fishing tours started in the West Calvados Chain
2017	National Fisheries Authority lifts the moratorium on the sea cucumber fishery and the beche-de-mer trade
2017-Present	Sir Jon Luc Critten is Governor of the Milne Bay Province
2017-Present	Isi Leonard is the Member of Parliament for the Samarai-Murua District
2019	National Fisheries Authority does not open the sea cucumber fishery and beche-de-mer trade

Appendix J: Beche-de-mer exports (t) from British New Guinea: 1889-1990.

Year	Port Moresby (t)	Samarai (t)	Total (t)	Total (£)
1889-1890	16.5	55.8	72.3	4,682
1890-1891	3.4	61.0	64.4	5,030
1891-1892	16.0	33.0	49.0	3,401
1892-1893	8.6	13.0	21.6	1,573
1893-1894	14.1	14.0	28.1	1,711
1894-1895	8.0	10.7	18.7	913
1895-1896	7.9	7.5	15.4	792
1896-1897	1.6	10.5	12.1	931
1897-1898	0.0	25.3	15.3	2,292
1898-1899	2.5	19.3	21.8	1,594
1899-1990	1.2	18.9	20.1	1,105

Source: Russell (1970).

Appendix K: Water craft on Brooker Island in 1999.

Sailing Canoes	**Exchange Route**	**How Acquired**
14	Built at Brooker	Bridewealth (muliwaga)
Alowaya	Built at Brooker	Contract
Andy	From Panaeati	Contract
Awa	Built at Brooker	Contract
Awabya	Built at Brooker	Contract
Badi	Built at Brooker	Owner-Builder
Badi	Built at Brooker	Owner-Builder
Badi		Found on Barrier Island
Badi	Built at Brooker	Contract
Badi		Found on open sea
Brothers	Built at Brooker	Contract
Galivolan	Hull from Panaeati, built at Brooker	Owner-Builder
Gesa	Hull from Panaeati, built at Brooker	Contract
Guliam	From Panaeati	Contract
Heliam	Hull from Panaeati, built at	Bridewealth
Hitowai	From Panaeati	Contract
Inuway	From Panaeati	Lineage mate gift
Iwaisi	From Panaeati	Lineage mate gift
Iyate 7	Hull from Panaeati, built at Brooker	Lineage mate gift
J Misem Ya	Bought from Panaeati	
Jayjay	From Panapompom	Contract
Katigu	From Ware	From clan brother
Kunem	From Panaeati	Contract
Kwasa	Built at Brooker	Owner-Builder
Medu	Bought from Panaeati	
Mist	Hull from Panaeati, built at Brooker	Owner-Builder
Moki	From Panapompom	Contract
Mwawas	From Panaeati	Contract
Naa	From Panaeati	Contract
Nae Niegon	Built at Brooker	Owner-Builder
Naita	From Panaeati	Bridewealth
Naya	From Panaeati	Contract
Nian	From Panaeati	Contract
Niyola	From Panaeati	Contract
No name	Bought from Panaeati	
No name	From Motorina	Lineage mate gift
No name	From Panapompom	Contract
No name	From Panaeati	From clan brother
No name	Built at Brooker	Owner-Builder
Nuwalian	Built at Brooker	Contract
Picnic	Built at Brooker	Contract
Pwalawa	Built at Brooker	Contract
Sejo	From Panaeati	Contract
Sibombom	Built at Brooker	Owner-Builder
Sigolu	Bought from Grass Island	
Tuhiga	From Misima	Lineage mate gift
Vinaka	From Panaeati	Contract
Yagubela	From Panaeati	Lineage mate gift
Yanowai	From Panaeati	Contract
Zero + 1	Built at Brooker	Gift

Outrigger Paddle Canoes	Exchange Route	How Acquired
No name		Found on Barrier Island
No name	From Panaeati	
No name	Built at Brooker	Owner-Builder
No name		Found on Barrier Island
No name		Found on Barrier Island
No name	From Kuanak	From clan father
No name		Found on Barrier Island
No name	Built at Brooker	Owner-Builder
No name	Bought from Motorina	
No name	Bought from Panumala	
Sinuwadoni		Found at Brooker
Ukuyameu	Built at Panawidwidi	Owner-Builder

Dugout Paddle Canoes	Exchange Route	How Acquired
No name	From Panaeati	From clan uncle
No name	Built at Brooker	Owner-Builder
No name		Found on Brooker
Red Star	Bought from Bwagabwaga	
Stapisi	Bought from Bwagabwaga	
Woudo	Bought from Bwagabwaga	

Source: Author.

Appendix L: Beche-de-mer exports (kg) by Species from Milne Bay Province: 1994-2018.

Species	Scientific Name	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Stonefish	*Actinopyga lecanora*	3,614	5,337	4,500	1,516	8,385	2,635	10,157	12,153	22,418	23,816
Surf redfish	*A. mauritiana*	3,268	4,478	5,412	2,438	6,034	2,659	4,646	7,045	4,801	5,143
Blackfish	*A. miliaris*	231	1,379	1,116	302	1,724	541	1,165	2,692	5,129	4,221
Tigerfish	*Bohasdchia argus*	2,604	3,734	8,121	4,763	13,111	5,201	12,509	18,442	16,226	16,784
Chalkfish	*B. similis*	0	0	0	0	0	0	11,880	21,395	12,267	16,526
Brown sandfish	*B. vitiensis*	947	695	5,482	7,629	10,656	15,417	36,061	21,059	15,629	14,447
Lollyfish	*Holothuria atra*	1,692	7,289	7,329	4,110	11,364	3,822	11,802	27,931	13,384	40,609
Snakefish	*H. coluber*	0	0	0	82	0	215	70	1,717	572	1,772
Pinkfish	*H. edulis*	0	0	0	0	0	0	0	61	0	194
White teatfish	*H. fuscogilva*	1,954	5,869	3,952	1,930	10,239	1,997	4,148	13,520	24,393	18,243
Elephant trunkfish	*H. fuscopuntata*	1,984	2,984	6,146	3,176	10,321	4,390	8,137	15,554	14,581	12,346
Sandfish	*H. scabra*	2,659	7,760	1,047	727	2,570	320	2,351	3,614	3,198	3,803
Black teatfish	*H. whitmaei*	1,704	4,647	4,449	2,080	5,950	2,443	3,561	8,970	5,461	5,775
Flowerfish	*Pearsonothuria graffei*	0	0	0	0	0	0	400	0	0	0
Greenfish	*Stichopus chloronotus*	1,689	3,107	4,433	1,892	4,661	2,256	6,909	10,479	7,021	5,735
Curryfish	*S. hermanni*	1,466	2,829	6,907	4,391	6,269	2,516	6,367	11,251	10,169	12,055
Prickly redfish	*Thelenota ananas*	2,279	5,339	5,318	3,045	8,190	3,767	8,472	12,901	15,522	11,904
Amberfish	*T. anax*	1,703	1,122	1,241	2,077	9,195	3,972	10,003	21,426	15,936	17,311
Unspecified		0	0	0	0	0	0	0	0	1	283
Total		**27,794**	**56,569**	**65,453**	**40,158**	**108,669**	**52,151**	**138,638**	**210,210**	**186,708**	**210,967**

Source: National Fisheries Authority.

Species	Scientific Name	2004	2005	2006	2007	2008	2009		2017	2018
Stonefish	*Actinopyga lecanora*	19,214	20,142	0	9,974	19,986	14,033		8,195	17,731
Surf redfish	*A. mauritiana*	4,464	4,139	5,784	3,732	3,142	2,244		9,384	10,680
Hairy Blackfish	*A. miliaris*	3,408	2,346	4,04	4,306	2,317	4,403		2,843	3071
Tigerfish	*Bohasdchia argus*	12,287	9,512	11,306	11,112	10,348	7,572		14,613	17,908
Chalkfish	*B. similis*	10,576	13,825	0	0	1	0		2,151	19,066
Brown sandfish	*B. vitiensis*	9,903	10,947	7,584	6,895	6,034	5,266		15,112	19,792
Lollyfish	*Holothuria atra*	40,417	41,169	37,444	22,392	18,740	9,951		12,956	18,448
Snakefish	*H. coluber*	2,139	2,379	985	1,058	1,592	610		100	1,818
Pinkfish	*H. edulis*	1,799	1,360	1,611	2,302	4,427	1,810		0	95
White teatfish	*H. fuscogilva*	16,678	17,322	44,343	30,507	20,232	31,757		17,773	30,085
Elephant trunkfish	*H. fuscopuntata*	10,280	9,282	11,323	9,280	6,837	12,669		13,320	15,716
Sandfish	*H. scabra*	4,264	14,498	6,792	8,473	8,296	11,4936		50,019	38,239
Black teatfish	*H. whitmaei*	3,509	3,993	4,844	3,274	3,063	1,549		9,542	6,281
Flowerfish	*Pearsonothuria graffei*	0	1	0	505	2,036	856		50	970
Greenfish	*Stichopus chloronotus*	4,290	3,252	4,665	3,700	3,964	2,624		6,560	4,390
Curryfish	*S. hermanni*	10,336	11,561	20,993	25,979	17,990	20,836		15,330	33,831
Prickly redfish	*Thelenota ananas*	7,044	7,003	8,890	7,563	5,423	8,246		9,054	13,229
Amberfish	*T. anax*	16,899	16,336	17,797	19,158	14,513	24,287		8,885	18,446
Unspecified		0	0	0	808	236	756		210	0
Total		**177,507**	**189,067**	**184,361**	**171,018**	**149,177**	**264,405**		**196,097**	**269,796**

Moratorium

Source: National Fisheries Authority.

Appendix M: Beche-de-mer exports (mt) from Papua New Guinea: 1960-2018.

Year	Volume (mt)	Reference (for volume reported)
1960	1.6	Lindholm, 1978
1961	2.4	Lindohlm, 1978
1962	4.4	Lindohlm, 1978
1963	12.8	Lindohlm, 1978
1964	6.3	Lindohlm, 1978
1965	4.1	Lindohlm, 1978
1966	4.4	Lindohlm, 1978
1967	10.5	Lindohlm, 1978
1968	11.2	Lindohlm, 1978
1969	12.4	Lindohlm, 1978
1970-71	6.5	Lindohlm, 1978
1971-72	3.9	Lindohlm, 1978
1972-73	9.9	Lindohlm, 1978
1973-74	4.1	Lindohlm, 1978
1974-75	1.2	Lindohlm, 1978
1975-76	1.7	Lindohlm, 1978
1977	5.3	Lindohlm, 1978
1978	5.9	Lindohlm, 1978
1979	1.3	Kailola and Lokani, no date
1980	2.4	Kailola and Lokani, no date
1981	11.1	Kailola and Lokani, no date
1982	23.0	Kailola and Lokani, no date
1983	7.6	Lokani and Kubohojam, 1993
1984	4.7	Lokani and Kubohojam, 1993
1985	19.5	Lokani and Kubohojam, 1993
1986	119.4	Lokani and Kubohojam, 1993
1987	192.1	Lokani and Kubohojam, 1993
1988	202.8	Lokani and Kubohojam, 1993
1989	194.9	Lokani and Kubohojam, 1993
1990	238.9	Lokani and Kubohojam, 1993
1991	626.0	Lokani and Kubohojam, 1993
1992	655.5	Myint, 1996
1993	499.5	Myint, 1996
1994	208.8	National Fisheries Authority database
1995	444.6	National Fisheries Authority database
1996	596.2	National Fisheries Authority database
1997	505.4	National Fisheries Authority database
1998	678.8	National Fisheries Authority database
1999	394.7	National Fisheries Authority database
2000	561.8	National Fisheries Authority database
2001	503.3	National Fisheries Authority database
2002	397.8	National Fisheries Authority database
2003	492.0	National Fisheries Authority database
2004	483.9	National Fisheries Authority database
2005	612.0	National Fisheries Authority database
2006	666.4	National Fisheries Authority database
2007	789.6	National Fisheries Authority database
2008	521.5	National Fisheries Authority database
2009	533.8	National Fisheries Authority database
2010-2016	**Moratorium**	
2017	791.0	National Fisheries Authority database
2018	1,108.6	National Fisheries Authority database

Appendix N: Beche-de-mer buying prices for the Milne Bay Province: 1981-2018. (Note: Species are listed from highest to lowest value)

Species	Scientific Name	Grade	1981 (MBFA)	1983 (MBFA)	1990 (MBFA)	1991 (Kiwali)	1993 (Kiwali)	1998 (Kiwali)	1999 (Kiwali)	2000 (Kiwali)	
Sandfish	*Holothuria scabra*	Large			5.00	16.20	5.50-18.50	13.00-28.00	14.00-35.00	80.00	50.00
		Medium				12.60	4.59-14.50	10.00-22.00	12.00-25.00	60.00	40.00
		Small				10.80	3.50-12.00	9.00-20.00	10.00-23.00	50.00	30.00
		Grade 2									
White teatfish	*H. fuscogilva*	Super Large	0.24	0.26	2.00	7.20					
		Large	0.18-0.22	0.20-0.24			8.50	15.00	22.00	38.00	
		Medium	0.07-0.15	0.09-0.16			3.00	11.00	14.00	33.00	
		Small	0.04	0.06				8.00	12.00	30.00	
		Grade 2									
Black teatfish	*H. whitmaei*	Super Large	0.24	0.26	2.00	7.20					
		Large	0.18-0.22	0.20-0.24			5.50	12.00	16.00	26.00	
		Medium	0.07-0.15	0.09-0.16			3.00	10.00	12.00	24.00	
		Small	0.04	0.06				8.00	10.00	22.00	
		Grade 2									
Prickly redfish	*Thelenota ananus*	Large			3.00	4.50	6.50	10.00	12.00	26.00	
		Medium						9.00			
		Small					3.00		10.00	24.00	
		Grade 2									
Surf redfish	*Actinopyga mauritiana*	Large					3.00	7.50	8.00	24.00	
		Medium						5.00	6.00	20.00	
		Grade 2									
Blackfish	*A. miliaris*	Large	0.04-0.06	0.04-0.06	1.00	2.70	6.00	7.00	6.00	23.00	
		Small	0.01-0.03	0.01-0.03							
		Grade 2									
Greenfish	*Stichopus chloronotus*	Large				3.60	4.00	9.00	10.00	34.00	
		Small					2.00	7.00	8.00	30.00	
		Grade 2									
Curryfish	*S. hermanni/ variegates*	Smooth				1.17	3.00	5.00	8.00	22.00	
		Rough					2.00	6.00	7.00	22.00	
		Grade 2									
Stonefish	*A. lecanora*	Large					4.00	7.00	8.00	24.00	
		Medium					3.00	6.00	7.00	20.00	
		Small						5.00	6.00	18.00	
		Grade 2									
Tigerfish	*Bohadschia argus*	Large					1.50	4.00	5.00	15.00	
		Small									
		Grade 2									
Amberfish	*T. anax*	Large					1.00	2.00	4.00	10.00	
		Small									
		Grade 2									

Species	Scientific Name	Grade	1981 (MBFA)	1983 (MBFA)	1990 (MBFA)	1991 (Kiwali)	1993 (Kiwali)	1998 (Kiwali)	1999 (Kiwali)	2000 (Kiwali)
Lollyfish	*H. atra*	Large	0.04-0.06	0.04-0.06	1.50	3.60	1.00	4.50	4.00	8.00
		Medium	0.01-0.03	0.01-0.03			0.50			
		Small					0.30	2.50	4.00	6.00
		Grade 2								
Brown sandfish	*B. vitiensis/ marmorata*	Large				2.70	3.00	2.50	4.00	12.50
		Medium								
		Small								
		Grade 2								
Chalkfish	*B. similies*	Large								9.00
		Grade 2								
Elephant trunkfish	*H. fuscopuntata*	Large					0.30	2.50	4.00	12.00
		Small								
		Grade 2								
Pinkfish	*H. edulis*									
Snakefish	*H. coluber*	Large								
		Grade 2								

Species	Scientific Name	Grade	2001 (Kiwali)		2003 (Kiwali)		2004 (Kiwali)		2006 (Asiapac)		2007 (Asiapac)		2009 (Asiapac)		2017 (Kiwali)	2018 (Asiapac)
Sandfish	*Holothuria scabra*	Large	120.00	60.00	120.00	60.00	120.00	60.00	155.00-160.00	155.00-160.00	160.00-200.00	90.00	170.00-200.00	130.00	110.00	
		Medium	80.00	40.00	80.00	40.00	80.00	40.00	110.00	110.00	120.00	70.00	140.00	80.00	80..00	
		Small	60.00	30.00	60.00	30.00	60.00	30.00	90.00	90.00	100.00	55.00	140.00	80.00	40.00	
		Grade 2							60.00	60.00	60.00	30.00	60.00	30.00	20.00	
White teatfish	*H. fuscogilva*	Super Large			100.00		100.00		120.00		130.00		140.00			220.00
		Large	60.00		80.00		80.00		98.00		100.0		120.00		120.00	170.00
		Medium	40.0		60.00		60.00						100.00		90.00	130.00
		Small	35.00		50.00		50.00		65.00		68.00		80.00		45.00	100.00
		Grade 2									45.00		40.00			40.00
Black teatfish	*H. whitmaei*	Super Large														
		Large	50.00		60.00		60.00		68.00		72.00		85.00		75.00	210.00
		Medium	40.00		40.00		40.00		65.00						55.00	
		Small	30.00		30.00		30.00		45.00		40.00		50.00		40.00	140.00
		Grade 2									25.00		25.00			65.00
Prickly redfish	*Thelenota ananus*	Large	40.00		50.00		50.00		78.00		80.00		95.00			
		Medium							45.00						60.00	110.00
		Small	30.00		35.00		35.00		40.00		45.00		95.00		35.00	
		Grade 2							30.00		30.00		45.00			60.00
Surf redfish	*Actinopyga mauritiana*	Large	35.00		45.00		45.00				68.00		65.00		65.00	85.00
		Medium	25.00		30.00		30.00				38.00		65.00		40.00	
		Grade 2			-		-				26.00		30.00		20.00	65.00
Blackfish	*A. miliaris*	Large	40.00		45.00		45.00		62.00		70.00		75.00		70.00	80.00
		Small			25.00		25.00									
		Grade 2							30.00		32.00		35.00			35.00
Greenfish	*Stichopus chloronotus*	Large	45.00		50.00		50.00		78.00		80.00					105.00
		Small	35.00		35.00		35.00		40.00		45.00				48.00	
		Grade 2							30.00		30.00					
Curryfish	*S. hermanni/ variegates*	Smooth	35.00		37.00		37.00		46.00		46.00		65.00		80.00	70.00
		Rough	35.00		30.00		30.00		46.00		46.00		65.00		40.00	70.00
		Grade 2							26.00		26.00		30.00			30.00
Stonefish	*A. lecanora*	Large	40.00		40.00		40.00		65.00		68.00		70.00		80.00	90.00
		Medium	30.00		30.00		30.00				40.00		50.00		50.00	
		Small	20.00		20.00		20.00		40.00						30.00	65.00
		Grade 2							30.00		26.00		30.00			35.00
Tigerfish	*Bohadschia argus*	Large	16.00		18.00		18.00		48.00		26.00		32.00		30.00	40.00
		Small					9.00		36.00		15.00		20.00			25.00
		Grade 2							26.00		10.00		10.00			15.00
Amberfish	*T. anax*	Large	8.00		10.00		10.00		12.00		12.00		20.00			20.00
		Small					5.00									
		Grade 2									6.00		16.00			10.00
Lollyfish	*H. atra*	Large	5.00		7.50		7.50		9.00		9.00		8.00			20.00
		Medium	4.00		5.00		5.00									
		Small	4.00		6.00		6.00		6.00		6.00		6.00			10.00
		Grade 2							4.00		4.00		3.00			3.00

Species	Scientific Name	Grade	2001 (Kiwali)	2003 (Kiwali)	2004 (Kiwali)	2006 (Asiapac)	2007 (Asiapac)	2009 (Asiapac)	2017 (Kiwali)	2018 (Asiapac)
Brown sandfish	*B. vitiensis/ marmorata*	Large	15.00	18.00	18.00	30.00	26.00	30.00	30.00	35.00
		Medium			9.00					
		Small				26.00	15.00	25.00	20.00	20.00
		Grade 2				10.00	10.00	10.00		10.00
Chalkfish	*B. similies*	Large	6.00	9.00	6.00	14.00	14.00			10.00
		Grade 2				5.00	5.00			
Elephant trunkfish	*H. fuscopuntata*	Large	7.00	8.00	8.00	10.00	10.00	15.00		
		Small			4.00	5.00				5.00
		Grade 2					5.00	5.00		
Pinkfish	*H. edulis*				3.00					
Snakefish	*H. coluber*	Large			3.00		10.00	10.00		
		Grade 2					5.00			

Source: Kiwali Exports and Asiapac Limited.

Appendix O: Catch-per-unit-effort by species by trip type for Brooker Islanders: 1999.

Trip Type 1: Sea cucumbers

English Name	Scientific Name	Total		Bramble Haven		East Long-Kossman Reef		East Long-Kossman Reef	
		No. harvested	CPUE (No. per hour)	No. harvested	CPUE (No. per hour)	No. harvested	CPUE (No. per hour)	No. harvested	CPUE (No. per hour)
Amberfish	*Thelenota anax*	103	0.1	0	0.0	57	0.1	46	0.1
Black teatfish	*Holothuria whitmae*	133	0.2	20	1.3	27	0.1	86	0.1
Blackfish	*Actinopyga miliaris*	20	< 0.05	0	0.0	5	0.0	15	0.0
Brown sandfish	*Bohadschia vitiensis*	2	< 0.05	0	0.0	2	0.0	0	0.0
Curryfish	*Stichopus variegates*	97	0.1	0	0.0	26	0.1	71	0.2
Elephant trunkfish	*Holothuria fuscopunctata*	148	0.2	0	0.0	47	0.2	101	0.2
Greenfish	*Stichopus chloronotus*	164	0.3	0	0.0	90	0.5	74	0.2
Lollyfish	*Holothuria atra*	257	0.3	22	1.4	46	0.2	189	0.3
Prickly redfish	*Thelenota ananas*	214	0.2	0	0.0	26	0.1	188	0.3
Stonefish	*Actinopyga lecanora*	0	0.0	0	0.0	0	0.0	0	0.0
Surf redfish	*Actinopyga mauritiana*	6	< 0.05	6	0.5	0	0.0	0	0.0
Tigerfish	*Bohadschia argus*	186	0.4	36	2.3	143	0.7	7	0.0
White teatfish	*Holothuria fuscogilva*	156	0.2	0	0.0	54	0.2	102	0.2

Trip Type 2: Sea cucumbers

English Name	Scientific Name	Total		Bramble Haven		East Long-Kossman Reef		East Long-Kossman Reef	
		No. harvested	CPUE (No. per hour)	No. harvested	CPUE (No. per hour)	No. harvested	CPUE (No. per hour)	No. harvested	CPUE (No. per hour)
Amberfish	*Thelenota anax*	0	0.0	0	0.0	0	0.0	0	0.0
Black teatfish	*Holothuria whitmae*	225	0.1	60	0.1	89	0.1	76	0.1
Blackfish	*Actinopyga miliaris*	10	< 0.05	1	0.0	7	0.0	2	0.0
Brown sandfish	*Bohadschia vitiensis*	25	< 0.05	2	0.0	21	0.0	2	0.0
Curryfish	*Stichopus variegates*	0	0.0	0	0.0	0	0.0	0	0.0
Elephant trunkfish	*Holothuria fuscopunctata*	0	0.0	0	0.0	0	0.0	0	0.0
Greenfish	*Stichopus chloronotus*	47	< 0.05	0	0.0	47	0.1	0	0.0
Lollyfish	*Holothuria atra*	438	< 0.02	57	0.1	248	0.4	133	0.2
Prickly redfish	*Thelenota ananas*	66	< 0.05	9	0.0	33	0.0	24	0.0
Stonefish	*Actinopyga lecanora*	5	< 0.05	1	0.0	1	0.0	3	0.0
Surf redfish	*Actinopyga mauritiana*	0	0.0	0	0.0	0	0.0	0	0.0
Tigerfish	*Bohadschia argus*	104	< 0.05	16	0.0	53	0.1	35	0.1
White teatfish	*Holothuria fuscogilva*	3	< 0.05	1	0.0	1	0.0	1	0.0

Trip Type 3: Sea cucumbers

English Name	Scientific Name	Total		Bramble Haven		East Long-Kossman Reef		East Long-Kossman Reef	
		No. harvested	CPUE (No. per hour)	No. harvested	CPUE (No. per hour)	No. harvested	CPUE (No. per hour)	No. harvested	CPUE (No. per hour)
Amberfish	*Thelenota anax*	0	0.0	0	0.0	0	0.0	0	0.0
Black teatfish	*Holothuria whitmae*	43	0.2	3	0.0	34	0.2	6	0.2
Blackfish	*Actinopyga miliaris*	3	< 0.05	0	0.0	2	0.0	1	0.0
Brown sandfish	*Bohadschia vitiensis*	4	< 0.05	2	0.1	2	0.0	0	0.0
Curryfish	*Stichopus variegates*	0	0.0	0	0.0	0	0.0	0	0.0
Elephant trunkfish	*Holothuria fuscopunctata*	0	0.0	0	0.0	0	0.0	0	0.0
Greenfish	*Stichopus chloronotus*	0	0.0	0	0.0	0	0.0	0	0.0
Lollyfish	*Holothuria atra*	0	0.0	0	0.0	0	0.0	0	0.0
Prickly redfish	*Thelenota ananas*	30	< 0.05	6	0.1	15	0.1	9	0.2
Stonefish	*Actinopyga lecanora*	0	0.0	0	0.0	0	0.0	0	0.0
Surf redfish	*Actinopyga mauritiana*	0	0.0	0	0.0	0	0.0	0	0.0
Tigerfish	*Bohadschia argus*	0	0.0	0	0.0	0	0.0	0	0.0
White teatfish	*Holothuria fuscogilva*	16	< 0.05	0	0.0	7	0.0	9	0.2

Molluscs and Invertebrates

English Name	Scientific Name	Trip Type 1		Trip Type 2		Trip Type 3	
		No. harvested	CPUE (No. per hour)	No. harvested	CPUE (No. per hour)	No. harvested	CPUE (No. per hour)
Giant clams	*Tridacna gigas*	9	0.01	2	0.00	39	0.16
	Tridacna derasa	64	0.07	10	0.01	85	0.31
	Tridacna squamosa/maxima/noao	4	0.00	3	0.00	3	0.01
	Hippopus hippopus	78	0.07	99	0.09	14	0.04
	Unidentified (*mostly H, hippopus*)	0	0.00	781	0.49	4	0.00
Trochus	*Rochia nilotica*	14	0.04	169	0.15	5	0.01
Black lip pearl shell	*Pinctada margaritifera*	9	0.02	81	0.04	18	0.08
Spider conch	*Lambis* spp.	0	0.00	2	0.00	2	0.00
Triton shell	*Charonia tritonis*	0	0.00	5	0.00	1	0.00
Lobster	*Panulirus* spp.	5	0.0	661	0.3	407	2.0

Source: Author.

Catch-per-unit-effort by species by trip type for Brooker Islanders for the Bramble Haven area: 1999.

Bramble Haven

English Name	Scientific Name	Trip Type 1		Trip Type 2		Trip Type 3	
		No. harvested	CPUE (No. per hour)	No. harvested	CPUE (No. per hour)	No. harvested	CPUE (No. per hour)
Amberfish	*Thelenota anax*	0	0.0	0	0.0	0	0.0
Black teatfish	*Holothuria whitmae*	20	1.3	60	0.1	3	0.0
Blackfish	*Actinopyga miliaris*	0	0.0	1	0.0	0	0.0
Brown sandfish	*Bohadschia vitiensis*	0	0.0	2	0.0	2	0.1
Curryfish	*Stichopus variegates*	0	0.0	0	0.0	0	0.0
Elephant trunkfish	*Holothuria fuscopunctata*	0	0.0	0	0.0	0	0.0
Greenfish	*Stichopus chloronotus*	0	0.0	0	0.0	0	0.0
Lollyfish	*Holothuria atra*	22	1.4	57	0.1	0	0.0
Prickly redfish	*Thelenota ananas*	0	0.0	9	0.0	6	0.1
Stonefish	*Actinopyga lecanora*	0	0.0	1	0.0	0	0.0
Surf redfish	*Actinopyga mauritiana*	6	0.5	0	0.0	0	0.0
Tigerfish	*Bohadschia argus*	36	2.3	16	0.0	0	0.0
White teatfish	*Holothuria fuscogilva*	0	0.0	1	0.0	0	0.0

East Long-Kossman Reef

English Name	Scientific Name	Trip Type 1		Trip Type 2		Trip Type 3	
		No. harvested	CPUE (No. per hour)	No. harvested	CPUE (No. per hour)	No. harvested	CPUE (No. per hour)
Amberfish	*Thelenota anax*	57	0.1	0	0.0	0	0.0
Black teatfish	*Holothuria whitmae*	27	0.1	89	0.1	34	0.2
Blackfish	*Actinopyga miliaris*	5	0.0	7	0.0	2	0.0
Brown sandfish	*Bohadschia vitiensis*	2	0.0	21	0.0	2	0.0
Curryfish	*Stichopus variegates*	26	0.1	0	0.0	0	0.0
Elephant trunkfish	*Holothuria fuscopunctata*	47	0.2	0	0.0	0	0.0
Greenfish	*Stichopus chloronotus*	90	0.5	47	0.1	0	0.0
Lollyfish	*Holothuria atra*	46	0.2	248	0.4	0	0.0
Prickly redfish	*Thelenota ananas*	26	0.1	33	0.0	15	0.1
Stonefish	*Actinopyga lecanora*	0	0.0	1	0.0	0	0.0
Surf redfish	*Actinopyga mauritiana*	0	0.0	0	0.0	0	0.0
Tigerfish	*Bohadschia argus*	143	0.7	53	0.1	0	0.0
White teatfish	*Holothuria fuscogilva*	54	0.2	1	0.0	7	0.0

West Long-Kossman Reef

English Name	Scientific Name	Trip Type 1		Trip Type 2		Trip Type 3	
		No. harvested	CPUE (No. per hour)	No. harvested	CPUE (No. per hour)	No. harvested	CPUE (No. per hour)
Amberfish	*Thelenota anax*	46	0.1	0	0.0	0	0.0
Black teatfish	*Holothuria whitmae*	86	0.1	76	0.1	6	0.2
Blackfish	*Actinopyga miliaris*	15	0.0	2	0.0	1	0.0
Brown sandfish	*Bohadschia vitiensis*	0	0.0	2	0.0	0	0.0
Curryfish	*Stichopus variegates*	71	0.2	0	0.0	0	0.0
Elephant trunkfish	*Holothuria fuscopunctata*	101	0.2	0	0.0	0	0.0
Greenfish	*Stichopus chloronotus*	74	0.2	0	0.0	0	0.0
Lollyfish	*Holothuria atra*	189	0.3	133	0.2	0	0.0
Prickly redfish	*Thelenota ananas*	188	0.3	24	0.0	9	0.2
Stonefish	*Actinopyga lecanora*	0	0.0	3	0.0	0	0.0
Surf redfish	*Actinopyga mauritiana*	0	0.0	0	0.0	0	0.0
Tigerfish	*Bohadschia argus*	7	0.0	35	0.1	0	0.0
White teatfish	*Holothuria fuscogilva*	102	0.2	1	0.0	9	0.2

Appendix P: Catch-per-unit efforts for sea cucumber species in Melanesia.

Name	Location	No./diver/hr	Reference (for value reported)
Black teatfish (*Holothuria whitmaei*)	Brooker Island	0.1-0.2	
	Central Province (Papua New Guinea)	15.1	Shelley, 1981
	Ontong Java (Solomon Islands)	11.1	Crean, 1977
	Ontong Java (Solomon Islands)	3.5	Bayliss-smith, 1986
	New Caledonia	31.0	Conand, 1989
Lollyfish (*H. atra*)	Brooker Island	< 0.02-0.3	
	Western Province (Solomon Islands)	<519.0	Adams et al., 1992
Prickly redfish (*Thelenota ananas*)	Brooker Island	< 0.05-0.2	
	Central Province (Papua New Guinea)	10.0	Shelley, 1981
	New Caledonia	42.0	Conand, 1989
White teatfish (*H. fuscogilva*)	Brooker Island	< 0.05-0.2	
	Ware Island (Papua New Guinea)	0.4	Sabetian and Foale, 2006
	Central Province (Papua New Guinea)	4.5	Shelley, 1981
	Fiji	~13.0	Conand, 1989
	Fiji	16.0	Gentle, 1979

Appendix Q: Catch-per-unit efforts for various fishing methods in Melanesia.

Type	Location	kg/fisher/hr	Reference (for value reported)
Handlining	Brooker Island	1.4	
	Tigak Islands (Papua New Guinea)	0.7-1.4	Frijlink, 2018
	Western Province (Solomon Islands)	4.0*	Rhodes et al., 2019
	Western Province (Solomon Islands)	2.1 (1995) 1.2 (2011)	Albert et al., 2015
	Ontong Java (Solomon Islands)	1.1-1.7	Bayliss-Smith, 1990
	Western Province (Solomon Islands)	0.7*	Cohen and Alexander, 2013
Trolling	Brooker Island	4.2	
	Tigak Islands (Papua New Guinea)	2.5	Frijlink, 2018
	Western Province (Solomon Islands)	2.6	Rhodes et al., 2019
	Ontong Java (Solomon Islands)	2.1	Bayliss-Smith, 1990
Spearfishing	Brooker Islands	0.6	
	Tigak Islands (Papua New Guinea)	1.1-2.1	Frijlink, 2018
	Western Province (Solomon Islands)	2.2	Rhodes et al., 2019
	Western Province (Solomon Islands)	1.4**	Cohen and Alexander, 2013
	Ontong Java (Solomon Islands)	0.8	Bayliss-Smith, 1990
Netting	Brooker Island	1.9	
	Langalanga Lagoon (Solomon Islands)	6.4	Roeger et al., 2016
	Western Province (Solomon Islands)	2.9	Rhodes et al., 2019
	Ontong Java (Solomon Islands)	0.8-1.7	Bayliss-Smith, 1990

* This figure is the average from three different types of line fishing.
** Cohen and Alexander (2013) looked at both opened and closed reefs areas, the figures used here are for continuously open reefs so that they can be used comparatively against Brooker Islander catch-per-unit effort data.

Appendix R: Timeline of the dispute between Brooker and Ware Islands.

Date	Event
5th February 1998	Initial letter of complaint sent by the Ware Island Councillor to the Brooker Island Councillor
15th February 1998	Community meeting held at Brooker Island to discuss the issue
16th March 1998	Brooker Island Councillor responds to the Ware Island Councillor
19th March 1999	Ware Islanders confront Brooker Islanders camped at Nabaina Island
20th April 1999	Ware Islanders again confront Brooker Islanders at Nabaina Island and confiscate nine bags of beche-de-mer as well as the engine handle off the Nako Fisheries vessel, the *FV Dune*
11th May 1999	Nako Fisheries suspends buying operations with Ware and Brooker Islanders until the *FV Dune* engine handle is returned
12th May 1999	Meeting with Ware Islanders and Milne Bay Provincial Government staff
June 1999	Court Order is issued restricting both Brooker and Ware Islanders from entering the disputed area
4th August 2000	Ware Islanders again confront Brooker Islanders at Nabaina Island and damage Brooker Island canoes and other properties
August 2000	Temporary boundary placed by Police at Hipopomwa Sandbank
20th January 2001	Ware Islanders again confront Brooker Islanders at Nabaina Island
7th February 2001	Seven Ware Islanders arrested by the Police
10th April 2001	First mediation held at Ware Island by the Milne Bay Provincial Government
27th August 2001	First mediation held at Brooker Island by the Milne Bay Provincial Government
21st January 2002	Ware Islanders at Nabaina Island issue a challenge to Brooker Islanders to come to Nabaina Island and fight them
24th January 2002	Divers from Anagusa Island and the Engineer Group of Islands are chased away from Nabaina Island by Ware Islanders

Date	Event
February 2002	Ware Islanders again confront Brooker Islanders at Nabaina Island
27th March 2002	First Restraining Order by Brooker Islanders issued against Ware Islanders
31st October 2002	Second Restraining Order by Brooker Islanders issued against Ware Islanders
5th-6th December 2002	Second mediation held at Ware Island by the Milne Bay Provincial Government
19th-20th December 2002	Second mediation held at Brooker Island by the Milne Bay Provincial Government
6th March 2003	Court decision handed down ruling in favour of John Mwasi of the Meisoga sub-Clan of Brooker Island as the senior traditional owner of the disputed area, with David Lebasi of the Meisoga sub-Clan at Ware Island as a junior owner
6th February 2005	Philip Lassam with a group of fellow Ware Islanders detain David Lebasi and people from Anagusa and the Engineer Group of Islands that were based at Abaiwolan Island and using hookah gear to dive for sea cucumbers
April 2006	Confrontation again between Ware and Brooker Islanders at Nabaina Island
1st October 2009	NFA implements a moratorium on the sea cucumber fishery and beche-de-mer trade
1st April 2017	NFA reopens the sea cucumber fishery and beche-de-mer trade

Appendix S: Ware Island claimants' stories for mediation purposes.

These stories were recorded from documents preseneted in the mediation process.

Nabudiga sub-Clan's Story

Kasakawawana owned a traditional sailing canoe called *Disilale* which he used to travel for *kula* trades as far as Woodlark Island. His nephew, Sale Sibwakala and others were the men he travelled with on these trading voyages. Kasakawawana in his old age said he could not sail anymore, so his nephew, Sale took over the ownership of his sailing canoe. From that time on, he and his men took trips along barrier reef in search of arm shells and egg cowries for traditional uses.

In those times, coconuts were a staple ration, even for emergency cases because manufactured goods were not introduced yet. In search of these shells, Sale ended up on the 'virgin island' of Nagobi. Because he found the island was virgin, there being no footprints and no sign of life at all, he took some coconuts from the canoe and planted them in the centre of the island to mark his claim of ownership. From then on he used the island as his centre to continue his shell collections. When he and his men returned to Ware Island, he was filled with the idea of residing on the island he had found and claimed. He then, using *Disilale* and transported all the materials to Nagobi Island and built a family house which he then moved his family into along with some other relatives.

Some years later, one of the early traders caught up with him and asked him to go to Woodlark Island as a guide. After agreeing to act as a guide, Sale returned his family to Ware Island and then left for Woodlark Island with the traders. While on Woodlark Island, Sale assisted the traders to build canoes for local divers to use for collecting marine resources. After sometime, he asked the traders to return him to Ware Island with his canoe, *Disilale*.

From there, he and his men again returned to Nagobi Island to dive for marine resource to sell to the traders. With timber, copper nails and canvas for sails, Sale built a reasonable size boat. As it was his first attempt, the boat was not constructed properly and so Sale called it *Pwanoli,* and with this boat and *Disilale*, Sale and his family and other clan men returned to Nagobi Island to dive for marine resources to sell. With these marine resources, the traders supplied him with manufactured goods and subsequently developed a trade store on Nagobi Island and also back on Ware Island. When the trader, Bob Bunting arrived, Sale sold all his produce to him and with the money he raised, he purchased materials and constructed a bigger workboat which he built at Nagobi Island and called *Oumi*. Sale spent most of the life on Nagobi Island and only returned to Ware Island in his old age.

Duya sub-Clan's Story

Bonuwenuwe and his fellow sub-clansman, Dibwedibwe and others were great fishers. They paddled from reef to reef on rafts to go fishing with nets and fish traps. In those times, there was no Western culture or products introduced on Ware Island, and no commercial trading. One day, Bonuwenuwe and his fellow sub-clansman prepared two rafts and set out on their rafts for the Steurs Islands to spend some days fishing so as to bring back home some smoked fish. On this fishing expedition, Bonuwenuwe and his fellow sub-clansman were the first Ware Islanders to land on the Steurs Islands and they planted coconuts to indicate their landing and ownership. The land and extended reef from Steurs Island caught the view and interest of Bonuwenuwe so he commanded his men to prepare and continue their expedition along the extended reef.

Setting out the next morning, they didn't make a stop at Marigili Island but continued polling their rafts along the reef and paddling across the passages. By the afternoon Bonuwenuwe and his fellow sub-clansman sighted Abaiwolan Island. Bonuwenuwe then commanded his men to direct the rafts for the island to set up for the night. Disregarding the call of Bonuwenuwe, the other

men of the other raft continued along the long reef until reaching Panapatpat, and then moved on to Motorina, Misima and Sudest Islands.

Next morning Bonuwenuwe and his men harvested marine resources at Abaiwolan and its surrounding reefs, as well as those of Nabaina Island. Whilst there, they planted some coconuts on islands to indicate their landing and ownership. After sometime on the island of Abaiwolan, Bonuwenuwe and his men prepared to paddle back to Ware Island.

A few years later, the Duya clan travelled back to these islands on a canoe and landed on the west side of the island, and Dibwedibwe named the land and the camp area, Pwaneyamwana, the name of the second village of the Duya clan of Ware Island. On this trip, Bonuwenuwe did not accompany them as he was now too old to travel

Some years later again, the Duya clan travelled back to the island with Dibwedibwe who was now also in his old age. When they departed, Dibwedibwe collected a pine tree which he brought back with him to Ware Island which he planted at Kameteko, the first village of the Duya clan, in memory of their discovery, this tree still stands today on the beach.

Kameteko sub-Clan's Story

This is how it started from our ancestors to our great, great, grandfather named Kamnaloa. His ancestors paddled along the west coast of Milne Bay towards East Cape to look for a place to build their new home, this happened some hundreds of years ago. This man Kamnaloa is a great man of the clan, and the village called Kameteko that is on Ware Island is named after him.

Kamnaloa's ancestor travelled by canoe and arrived by night on an island called Mwelali, which is situated six to seven km south of Ware Island. When morning came, they had discovered the big island on the north side of Ware Island, so they decided to paddle there. They arrived on the island of Ware and settled at a place they named Kameteko.

After settling on the island of Ware, the family clan decided to go trading with shell money and stone axes. They selected one of the family men within the clan to carry out the trade along with his wife, daughter, son and two of his brother-in laws.

The family prepared their belongings and other gifts and set sail for the east. They arrived on the island, which was Abaiwolan Island, which is some 40 km from Ware Island where they rested and decided to stay overnight and then continue sailing the next day.

The beauty of the island captured the heart of one of the brother-in-law who decided to stay on the island while the others continued their journey eastwards. While the brother-in-law was on the Abaiwolan Island, he planted coconuts, traditionally marked fishing grounds and then later returned to Ware Island and told the rest of his family and clan members about the others going eastward and what he had done on the island.

That was Kamnaloa's father's great grandfather. That is why Kamnaloa left Ware Island with his family and sails across to Abaiwolan Island and stays for more than a week or so, replanting coconuts and fishing and also to recall his grandfathers' fishing grounds and reefs.

The reason Kamnaloa and his family clan own this island is that his great, great grandfather first arrived there and lived there planting coconuts ad marking traditional fishing grounds.

The family clan still exists now and owns Abaiwolan as through the history told by Samoa Sale's mother named Kailelesi. Kailelesi is the daughter of Bogeigei who is the daughter of Kaesagaga who was the niece of Kamnaloa.

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Appendix T: Brooker Islanders' stories for mediation purposes.

These stories were recorded by Amenoni Izod (Izod, 2001) and presented in the mediation process.

Mwasi Kiawema's Story

Before the Christian Mission came to Ware Island, my father's sister Sepauli from Brooker Island went to Ware Island and got married. My father, also from Brooker Island went to Ware Island to visit Sepauli and met my mother Omkesega and married her. Both my father and my mother left Ware Island and returned to Brooker Island. There were six of us born on Brooker Island including two sisters, and I am the last born in the family.

Before World War II in 1942, I got married to Babati Wawaga who is from Brooker Island. During the War, I left my wife at Brooker Island and went to Alotau to work as a labourer in the War. I returned to Ware Island after the War and later came back to Brooker Island to join my family.

Over the past many years on Brooker Island, my family members have been traveling up and down the islands between Ware and Brooker Islands visiting our relatives. When the problem happened over the dispute of Nabaina Island, this affected the relationships between Ware and Brooker Islanders and I became very sad. I have been writing to my grandchildren who live at Ware Island that this problem caused big sadness to me and now makes me unable to visit them because of fear of being killed.

All these years of living here on Panapatpat Island and travelling up and down the islands, I have never heard of any Ware or Brooker Islander claiming the ownership of these islands and reefs under dispute.

I saw when Boss Marigili and other people from Brooker, Normanby, Fergusson and Ware Islanders started planting coconuts on the islands. Boss Marigili was employed by Bob Bunting, a European businessman on Samarai Island. He employed lots of people who helped in diving for beche-de-mer and trochus and planting coconuts right up to Sudest.

Aleti Betuel Tanaka's Story

When my mother Sigilibu from Panaeati Island was only a small girl, a Ware Island man named Bunelala came to Panaeati Island and took her to Ware Island as his adopted child.

Bunelala was later to be called Boss Marigili because he was employed by Bob Bunting to be the boss for the labourers from Normanby, Ferguson, Brooker and Ware Islands. The labourers were diving beche-de-mer and also planting coconuts on Marigili Island and other surrounding islands right up to Sudest Island.

There were lots of people from Brooker Island present including my father, Tanaka who was employed as a whale boat captain. Tanaka's wife Beiyo who was from Brooker Island then left him and got married to Boss Marigili. Mr. Bunting was not happy with Boss Marigili getting married to Tanaka's wife, so Boss Marigili gave my mother Sigilibu to marry Tanaka. I was born on Marigili Island and I was named after Bob Bunting's boat '*Alert*' and grew up on the island when my father traveled around with other employees planting coconuts, and diving for trochus and beche-de-mer.

Boss Marigili also adopted another girl named Poli who also grew up together with my mother and who gave birth to Mesigai Ken from Ware Island. Both Mesigai and I grew up together on the islands during the years of our childhood.

Boss Marigili organised the plantings of coconuts at Abaiwolan, Nabaina, Nagobi, Nitabutabu, Enivala, as well at Gutunka and Bokiyowa on Brooker Island. I was already a big boy when I saw my father and other Brooker Island men named Kasabutuna, Kekekoya and some Ware and Normanby Island men doing this work.

These men were diving for beche-de-mer and trochus and at the same time planting coconuts. From the years of my childhood until now, I have never heard of any Ware or Brooker Islanders claiming Nabaina Island as theirs and also I have never experienced any disputes between Ware and Brooker Island people. If Mesigai Ken is claiming any islands because of Boss Marigili's adoption of his mother Poli, I must also claim the island because my mother was also adopted by Boss Marigili. Both Mesigai and I are cousins.

Appendix U: Brooker Island myths used for mediation purposes.

These mythological stories were provided by Jubilee Sam and recorded by Ado Sam.

The Myth of Manaknagobi

A pregnant woman who once lived at the village of Ebora on Misima Island. One day she went to her garden and when she was coming back to the village she was caught in a huge downpour of rain. This caused the river to flood and she was washed away and she eventually drifted up on the island of Nagobi. Here she lived and eventually gave birth to a son who was a bird. Even though he was a bird, the mother looked after her son well and named him Manaknagobi.

When the child had grown up, his mother told him the story of how she had come to the island of Nagobi. She also told him that they were originally from Ebora. Manaknagobi then asked his mother where Ebora was. His mother replied that if he flew up into the air, he would see a large island which was very long. She told him he would see two points on the island, one in the east and one in the west; Ebora was the point on the west.

One day, Manaknagobi mother then told him that it was okay for him living on the island because he was a bird, but she found several things difficult about living there. Firstly, she did not have a house, secondly she did not have any good food to eat, and thirdly, there was no water on the island. Manaknagobi told his mother to stay there while he flew to Ebora. He then flew from Nagobi to Ebora where he saw some women coming back from their gardens with baskets of food on their heads. Manaknagobi then flew down and lifted the baskets from their heads and flew back to Nagobi where he gave the food to his mother. On another day he flew to Ebora and saw some women going to collect water. As they were on their way back, carrying pots of water on their head, Manaknagobi swooped down and carried the water pots off to his mother. Then on another day he flew to Ebora where he swooped down and picked up a house and flew it back to his mother.

Now because of these actions the men of Ebora sat down together and started thinking about why this bird kept coming and carrying things off and they remembered the lady who had been washed away by a flood. They saw that the bird came from the direction of Nagobi Island and wondered if this bird was the son of this lady. They all then decided that they would go to Nagobi Island to find out and so they prepared their sailing canoes and set sail.

While they were still sailing towards Nagobi Island, Manaknagobi, who was sitting on his tree, saw them and called out to his mother telling her that there were sailing canoes coming in the distance. His mother told Manaknagobi to keep an eye on them and to tell her where they went. As the canoes came closer and it was obvious they were coming to Nagobi Island, and Manaknagobi told his mother. She told him that it might be his uncles from Ebora. When the men landed at Nagobi Island and Manaknagobi mother saw the men, she realised that they were her brothers and she went out to them and hugged and cried over them. She told them how she had been washed away and drifted up onto Nagobi Island and how she had given birth to Manaknagobi.

The men then realised that Manaknagobi was the bird who had come and taken the food, water and house from Ebora. The next day Manaknagobi mother asked him to go out and catch some fish for his uncles. The day after that, as the sun was coming up, he left and flew west to a place called Nuaveveyua. He went fishing and caught many fish and was getting ready to return home when he looked west and saw Nabaina Island. He thought of going there but then decided not to, and instead flew back to Nagobi Island.

On the way back he was not able to fly very high because he was loaded down with fish. When he arrived at Nagobi Island he was very tired and so he gave the fish to his uncles for them to gut. As his uncles where gutting the fish, the tide came in and started washing the fish away. Manaknagobi's mother shouted up to him and scolded him saying, "hat kind of manners do you

have letting your uncle's fish be washed away by the tide". So Manaknagobi flew off and gathered many stones and made a fence on some flat land, into which his uncles could put their fish so they would not be washed away by the tide.

Later, Manaknagobi told his mother that he wanted to go explore to the east. His mother warned him saying, "My son, if you head east and come to the very last island, then be careful because there is a giant octopus there". Manaknagobi flew off and when he came to the last island, which he discovered was Rossel Island; he discovered that the octopus lived on the far eastern most point of Rossel Island. Manaknagobi decided to test his strength and swooped down and grabbed the octopus, but the octopus said to him, "My friend, you have surprised me. Let me go, and fly away but one day come back again when I am ready for you, and then test your strength with me again. Then we will see who is the strong".

So Manaknagobi let the octopus go and flew back to his mother on Nagobi Island. When he arrived back he cooked up some body ointment. He gave the ointment to his mother and told her, "Look after this ointment. If you see that it increases in volume and overspills the brim then you will know that I have killed the octopus. But if you see that the ointment has dried up then you will know that the octopus has killed me".

They slept that night and then the next morning Manaknagobi flew off to Rossel Island again and saw the octopus floating in the ocean. Manaknagobi swooped down and grabbed the octopus and started to lift it out of the water. At first he was successful and was winning, lifting the octopus out of the water, but then the octopus reached down into the ocean with four of its legs and grabbed onto the rocks at the bottom. The other four legs it wrapped around Manaknagobi and slowly pulled him into the sea until he drowned. Back on Nagobi Island, Manaknagobi mother saw that the ointment had dried up and she knew that her son had been killed by the octopus.

One day she was on the beach when she saw that a feather from her son had washed up. She took the feather and went and poured magic water on it then put it in the leaves of her roof. During the night the feather turned into a bird, and when she woke up she took the bird and put it on the tree. However, when the bird grew up it was not like her son used to be. Today the descendants of this bird are called Magesubu (the sea eagle) and that is why there are many sea eagles on Nagobi today. Manaknagobi mother eventually died on Nagobi Island.

The Myth of Wainega

A lady called Wainega along with her brothers and her son lived at a place called Enivala Island. One day, her son and his uncle, Wainega's brother was tying the outrigger onto a sailing canoe. The boy was not skilled enough yet and did not know how to do things properly. When he made a mistake, his uncle swore at him by insulting his mother. Wainega was sweeping around the house when this happened and she heard the insult and became very sad. She decided to leave Enivala Island and never come back. When she left she carried three things with her. These were the leaf covering from her cooking pot, the container her water was in, and her sleeping mat.

Wainega then left Enivala Island by swimming. As she swam away from Enivala Island across the passage to Siva Island, the leaf she used for covering her cooking pot washed away and the passage became known as 'Lepamati' (the Misiman word for the leaves used to cover the cooking pots). She then swam east to Pananimunimu Island. At a bay there she threw away the water pot. Today this place is called Natulubia**.** She then continued swimming east till she came to the reef offshore from Panapwa Island. Here she left her sleeping mat. That is why today this reef is called Etatabwak. She then continued on to Guwawana Passage. When she arrived there she wanted to rest. But then she looked back and saw that she could still see the island of Enivala Island.

She then left Guwawana Passage and came across Maniheiman Reef. When she passed over the reef, she pulled out her tongue and put it there. That is why that section of the reef is called '*memena imoasi*' (her tongue is finished). Then she left Maniheiman Reef and swam ducking and diving past Awahei and that is why there are many points and bays in the Long Kossman Reef. Wainega then continued east until she came to Liwaus Passage. When she arrived at Liwaus Passage she looked back and she could not see Enivala Island at all, so she was happy and thought, "This is where I will stay". This is the story of how Wainega left Enivala Island and came to reside at Liwaus Passage, far away from her brother.

Appendix V: Regulations of the 2001, 2016 and 2018 National Beche-de-mer Fishery Management Plans.

Regulation	2001	2016	2018
Management	National Management Advisory Committee as overall responsibility to provide advice to the National Fisheries Authority's Managing Director. Provincial Management and Advisory Committees can be established to advise the National Management Advisory Committee on Provincial-specific management arrangements.	National Management Advisory Committee as overall responsibility to provide advice to the National Fisheries Authority's Managing Director. Provincial and Local Level Government Management and Advisory Committees can be established to advise the National Management Advisory Committee on Provincial-specific management arrangements.	National Management Advisory Committee as overall responsibility to provide advice to the National Fisheries Authority's Managing Director. Provincial and Local Level Government Management and Advisory Committees can be established to advise the National Management Advisory Committee on Provincial-specific management arrangements.
Licensing	Papua New Guinean citizens only to participate in the sea cucumber fishery and the beche-de-mer trade. Licence required for storing and export with no limit on the number of export licenses. Monthly reporting requirements attached to licenses.	Papua New Guinean citizens only to participate in the sea cucumber fishery and the beche-de-mer trade. Licence required for storing, buying and export with buyers' licensees employed by an exporter and a cap on the number of export licenses that have to comply with a specific licensing criteria checklist to be eligible for a license. Additional licenses required for collector vessels; processing for downstream of value-adding activities; and for aquaculture activities including hatchery production, pond farming or sea ranching. Weekly reporting requirements attached to licenses.	Papua New Guinean citizens only to participate in the sea cucumber fishery and the beche-de-mer trade. Licence required for storing, buying and export with buyers' licensees employed by an exporter and a cap on the number of export licenses that have to comply with a specific licensing criteria checklist to be eligible for a license. Exporter and storage licenses will be valid from the 1st of July to the 31st of December. Buyers licenses will be valid from the 1st of July to the 31st of October. Additional licenses required for collector vessels; processing for downstream of value-adding activities; and for aquaculture activities including hatchery production, pond farming or sea ranching. Weekly reporting requirements attached to licenses.
Harvest Areas	The National Fisheries Authority reserves the right to close any area of the fishery for conservation or regeneration purposes if it is considered necessary to do so for the sustainable management of the fishery.	Provincial or Local Level Government or communities may specify no harvesting areas if these have been endorsed by the respective Management Advisory Committees or are gazetted by some other legislations.	Provincial or Local Level Government or communities may specify no harvesting areas if these have been endorsed by the respective Management Advisory Committees or are gazetted by some other legislations.

Regulation	2001	2016	2018
Prohibitions	Use of underwater breathing devices is prohibited. Use of underwater lights and surface lights at night is prohibited. The taking of sea cucumbers, and buying and selling of beche-de-mer is prohibited during the closed season or when a specific Provincial total allowable catches is reached. Customary open seasons that are inconsistent with the closed seasons are prohibited.	Use of underwater breathing devices is prohibited. Use of underwater lights and surface lights at night is prohibited. The taking of sea cucumbers, and buying and selling of beche-de-mer is prohibited during the closed season or when a specific Provincial total allowable catches is reached, or in a prohibited area of harvest. Customary open seasons that are inconsistent with the closed seasons are prohibited.	Use of underwater breathing devices is prohibited. Use of underwater lights and surface lights at night is prohibited. The taking of sea cucumbers, and buying and selling of beche-de-mer is prohibited during the closed season or when a specific Provincial total allowable catches is reached, or in a prohibited area of harvest. Customary open seasons that are inconsistent with the closed seasons are prohibited.
Harvest Season	Open from the 16th of January to the 30th of September. The taking of sea cucumbers, and the buying, selling and export of beche-de-mer will cease when the TAC is reached before the closure date of the 30th of September.	Open from the 1st of April to the 30th of September. The taking of specific sea cucumber species, and the buying, selling and export of beche-de-mer made from that species will cease when that specific species total allowable catches is reached before the closure date of the 30th of September. The taking of all sea cucumbers, and the buying, selling and export of all beche-de-mer will cease when the total allowable catches is reached before the closure date of the 30th of September. The National Fisheries Authority will advertise the closure date of the sea cucumber fishery for a specific province when that province has reached 70 per cent of its total allowable catches.	Open from the 1st of July to the 31st of October. The taking of specific sea cucumber species, and the buying, selling and export of beche-de-mer made from that species will cease when that specific species total allowable catches is reached before the closure date of the 31st of October. The taking of all sea cucumbers, and the buying, selling and export of all beche-de-mer will cease when the total allowable catches is reached before the closure date of the 31st of October.
Customary Rights	Customary management measures which are consistent with the plan, and are recognised by the National Fisheries Authority and a specific Provincial Management and Advisory Committee are encouraged to notify the National Fisheries Authority of such measures so that these can be incorporated into specific Provincial schedules.	Customary management measures which are consistent with the plan are encouraged to notify the National Fisheries Authority and the respective Provincial Fisheries Officer of such measures so that these can be incorporated into the respective Provincial or Local Level Government management strategy.	Customary management measures which are consistent with the plan are encouraged to notify the National Fisheries Authority and the respective Provincial Fisheries Officer of such measures so that these can be incorporated into the respective Provincial or Local Level Government management strategy.

Regulation	2001	2016	2018
Total Allowable Catches	Total allowable catch for each Province. Total allowable catch divided into high and low value groups. If the allocated total allowable catch for a Province is reached and exceeded by more than 5 t, that excess amount will be taken off the next season's total allowable catch.	Total allowable catch for each Province. Total allowable catches for each individual species.	Total allowable catch for each Province. Total allowable catches for each individual species. If the allocated total allowable catch for a Province is reached and exceeded than that excess amount will be taken off the next season's total allowable catch.
Size limits	Minimum sizes limits for most live and dried species.	Minimum sizes limits for all live and dried species.	Minimum sizes limits for all live and dried species.
Intra-Provincial Transfers	Allowed with written permission from the National Fisheries Authority's Managing Director.	Prohibited, but allowed unders certain circumstances with written permission from the National Fisheries Authority's Managing Director.	Prohibited, but allowed unders certain circumstances with written permission from the National Fisheries Authority's Managing Director.
Export	No undersize or broken pieces. Packed by species and clearly labelled with grade, quantity, name and license number of exporter. Export license holders must declare all holdings of beche-de-mer on the closure date; the National Fisheries Authority will specify a date by which all holdings of beche-de-mer must be exported, or impose other measures for holding of product during the closed season.	No undersize or broken pieces. Packed by species and clearly labelled with grade, quantity, name and license number of exporter, and the name of importer. All declared holdings of beche-de-mer held by an export license holder after the closure date must be exported within three weeks of the closure.	No undersize or broken pieces. Packed by species and clearly labelled with grade, quantity, name and license number of exporter, and the name of importer. All declared holdings of beche-de-mer held by an export license holder after the closure date must be exported by the 31st of December.
Samples	Two pieces of each species at any one time with a 2 kg limit per person.	Two pieces allowed with written permission from the National Fisheries Authority's Managing Director.	Two pieces allowed with written permission from the National Fisheries Authority's Managing Director.
Restaurants		Must buy from a licensed export. Reporting requirements.	
Training			10 kg of sea cucmbers may be harvested with written permission from the National Fisheries Authority's Managing Director for training purposes during the closed season by Exporters.

Source: National Fisheries Authority.

Appendix V: Size Limits for marine resources in Papua New Guinea.

English Name	Scientific Name	2001 National Beche-de-mer Fishery Management Plan		2016 and 2018 National Beche-de-mer Fishery Management Plan	
		Live Length (cm)	Dry Length (cm)	Live Length (cm)	Dry Length (cm)
Deepwater redfish	*Actinopyga echinites*	(25)	(15)	25	15
Stonefish	*A. lecanora*	15	10	15	10
Surf redfish	*A. mauritiana*	(20)	(8)	20	8
Hairy Blackfish	*A. miliaris*	15	10	15	10
Blackfish	*A. palauensis*			20	10
Chalkfish	*Bohadschia similis*	(25)	(7)	20	10
Tigerfish	*B. argus*	20	10	20	10
Brown sandfish	*B. vitiensis*	20	10	20	10
Lollyfish	*Holothuria atra*	(30)	(15)	30	15
Snakefish	*H. coluber*			30	15
Pinkfish	*H. edulis*	(25)	(10)	25	10
Red snakefish	*H. flavomaculata*			30	15
Labuyo	*H. foscinarea*			30	15
White teatfish	*H. fuscogilva*	35	15	35	15
Elephant trunkfish	*H. fuscopuntata*	(45)	(15)	45	15
	H. hilla			25	10
Golden sandfish	*H. lessoni*			22	10
White threadfish	*H. leucospilota*			25	10
Sandfish	*H. scabra*	22	10	22	10
Black teatfish	*H. whitmae*	22	10	22	10
Flowerfish	*Pearsonothuria graeffei*			25	10
Greenfish	*Stichopus chloronotus*	20	10	20	10
Curryfish	*S. hermanni*	25	10	25	10
Dragonfish	*S. horrens*			20	10
Pink curryfish	*S. naso*			25	10
Ocelllated curryfish	*S. occelalatus*			25	10
Brown curryfish	*S. vastus*			25	10
Prickly redfish	*Thelenota ananas*	25	15	25	10
Amberfish	*T. anax*	20	10	20	10
Candy cane	*T. rubralineata*			25	10

Note: Figures in brackets were provisional estimates.
Source: National Fisheries Authority.