



# The Intersection Between Illegal Fishing, Crimes at Sea, and Social Well-Being

Mary Mackay<sup>1,2\*</sup>, Britta Denise Hardesty<sup>1,2</sup> and Chris Wilcox<sup>1,2</sup>

<sup>1</sup> CSIRO, Oceans and Atmosphere, Hobart, TAS, Australia, <sup>2</sup> Centre for Marine Socioecology, University of Tasmania, Hobart, TAS, Australia.

## OPEN ACCESS

### Edited by:

Samiya Ahmed Selim,  
Leibniz Centre for Tropical Marine  
Research (LG), Germany

### Reviewed by:

Ifesinachi Okafor-Yarwood,  
University of St Andrews,  
United Kingdom  
Athanasios Kampas,  
Agricultural University of  
Athens, Greece

### \*Correspondence:

Mary Mackay  
mary.mackay@csiro.au

### Specialty section:

This article was submitted to  
Ocean Solutions,  
a section of the journal  
Frontiers in Marine Science

**Received:** 30 July 2020

**Accepted:** 23 September 2020

**Published:** 12 October 2020

### Citation:

Mackay M, Hardesty BD and Wilcox C  
(2020) The Intersection Between Illegal  
Fishing, Crimes at Sea, and Social  
Well-Being. *Front. Mar. Sci.* 7:589000.  
doi: 10.3389/fmars.2020.589000

Illegal, unregulated, and unreported (IUU) fishing is a major contributor to global overfishing, threatening food security, maritime livelihoods, and fisheries sustainability. An emerging narrative in the literature posits that IUU fishing is associated with additional organized criminal activities, such as drug trafficking, human trafficking, slavery, and arms smuggling. We explored this narrative through a systematic literature review to identify the empirical evidence of the association between illegal fisheries activities and organized crimes. Here we show that there is minimal evidence of organized crimes being linked to IUU fishing. Due to the covert nature of both organized crime and IUU fishing, we supplemented the literature review with analysis of media reports on illegal fishing from 2015 to 2019. We reviewed more than 330 individual media reports from 21 countries. From this database, < 2% reported crimes associated with illegal fishing. The predominantly associated crime mentioned were violations of worker's rights, forced labor and/or modern slavery. We resolve the contradiction between the common narrative that fisheries and other crimes are linked by presenting three distinct business models for maritime criminal activities. These models explain why certain crimes such as forced labor are associated with illegal fishing, while other crimes such as trafficking or smuggling are less likely to be linked to fishing activities. By disentangling these crimes from one another we can better focus on solutions to reduce illegal behavior on the sea, protect those vulnerable to fisheries exploitation, and enhance livelihoods and social well-being.

**Keywords:** illegal fishing, organized crime, forced labor, fisheries crime, social well-being

## INTRODUCTION

Fisheries are one of the largest and oldest primary industries in the world, providing an estimated 59.6 million people with jobs globally (FAO, 2018). The increasing dependency on fisheries is evident from the increase in per capita fish consumption, from 9 kgs in the 1960s to 20.5 kg in 2018, fuelling an industry with a total export trade worth US\$164 billion in 2018 with exports of fish and fish products representing about 11% of the export value of agricultural products (FAO, 2020b). Fisheries contribute to the food security of millions of people and are the predominant protein sources in developing countries. While fisheries management can be successful (Hilborn et al., 2020), overfishing remains persistent, with 33% of stocks currently overfished and 40% fished to their maximum limit (FAO, 2018). The threatened economic and social stability of fisheries is

further weakened by the prevalence of illegal, unregulated, and unreported (IUU) fishing (formal definition see FAO, 2001, Articles 3.1–3.3). IUU fishing is a major contributor to global overfishing, threatening food security, maritime livelihoods, and fisheries sustainability (Pauly et al., 2002; Gallic and Cox, 2006; Sumaila et al., 2006). IUU fishing is widespread, comprising an estimated 20% of global fish catch (Agnew et al., 2009), with annual economic losses estimated between US\$26–\$50 billion (Sumaila et al., 2020).

IUU fishing can occur at all scales, in domestic and international waters, with catastrophic effects on fisheries and the marine environment. For example, The Southern Ocean was once a hotspot of IUU fishing activity, with a substantial illegal catch of Patagonia Toothfish reported from the mid 1990s until the late 2000s (Österblom et al., 2010). Toothfish stocks came close to commercial collapse, seabirds such as albatross were significantly threatened due to by-catch by illegal fishers, and licensed fishers lost hundreds of millions of dollars (CCAMLR, 2002; COLTO, 2003; Michael et al., 2017). A consolidated and collaborative effort, facilitated through a network of state actors, the fishing industry, and environmental non-governmental organizations reduced the prevalence of IUU fishing in the Southern Ocean (Österblom et al., 2014). Subsequently, the stock status of Patagonia Toothfish began to recover and is now deemed “sustainable” (Patterson, 2018).

The consequences of IUU fishing impact the economies of developing countries most. For example, Indonesia alone has lost an estimated US\$4 billion in revenue annually to IUU fishing (Palma et al., 2010). This has been linked to foreign-flagged vessels fishing within Indonesia’s exclusive economic zone (EEZ) (Sodik, 2009). China, South Korea and Taiwan are ranked as the top three flag states fishing in foreign EEZs (Cabral et al., 2018). The Indonesian government issued a moratorium on foreign-flagged vessels fishing within their EEZ in 2014, as it was thought to be a key driver of illegal fishing. By removing the fishing effort from foreign vessels the subsequent reduction in IUU fishing has the potential to generate a 14% increase in catch and a 12% increase in (legal) profit (Cabral et al., 2018).

Despite some progressive examples of aggressive governance and collaborative approaches, IUU fishing remains pervasive. There is an arms race of progress between combating IUU fishing and new and innovative ways to commit IUU fishing. Illegal transshipment is an example of the latter. Transshipment is the exchange of goods between alternative modes of transport and is not necessarily illegal. It does, however, open up issues around transparency of the supply chain and documentation of difficulties (Satria et al., 2018) facilitating IUU fishing. Technological advancements such as the use of radar and automatic identification systems (AIS) are helping to combat clandestine activities, which may be linked to IUU fishing (Ford et al., 2018).

Recognizing the consequences and prevalence of IUU fishing has led to increased research focus on the fishing industry, including the potential link between IUU fishing and organized crime, and the interplay between illegal fishing and other crimes. This was specifically mentioned by the UN General Assembly, where members noted a possible connection between IUU fishing and organized crime, and called for increased

knowledge and understanding of the potential issue (UNGA, 2009). Subsequently, The United Nations Office of Drugs and Crime (UNODC) commissioned a report focusing on transnational organized crime in the fishing industry (UNODC, 2011). The report was predominantly a review of literature, supplemented by expert consultation. The report presented several instances of workers’ rights violations, such as forced labor and inhumane treatment. The report also discussed the use of fishing vessels for smuggling migrants and trafficking of drugs, serving as venues for illegal activity, supply ships or as a cover for illicit behavior. Following this, empirical studies have documented crimes occurring within fisheries activities. For example, there has been a concentrated effort in researching the working conditions and treatment of fishers. These reports document 20+ h workdays, unsafe working conditions, physical abuse, or abandonment of fishers without pay (ITF, 2006; IOM, 2016; Yea, 2016). Predominantly, this research is found within the gray literature published by non-governmental organizations, as opposed to the primary literature.

Despite this recent progress in addressing IUU fishing and associated crimes, significant knowledge gaps remain. There is a paucity of empirical evidence on actual links between illegal fishing and organized crimes. However, a narrative is emerging that fisheries violations are linked to other crimes, including labor abuses, drug trafficking, and human trafficking (Liddick, 2014; Telesetsky, 2014). The narrative suggests that the involvement of organized crime is resulting in the mixing of these activities (Chapsos and Hamilton, 2019; Lindley et al., 2019). Here, we explore the veracity of these two claims. Specifically, we (1) used a literature analysis to examine the balance of direct vs. indirect evidence for links among IUU fishing and other crimes, (2) through this analysis, we evaluated the genesis of this narrative, and the level of primary data in the source literature, and (3) conducted a media analysis in a case study region to evaluate the coincidence of fisheries and other crimes from primary sources.

## METHODS

### Literature Review

The literature review method is based on that used by the Centre for Reviews and Dissemination (CRD, 2001), which employs systematic examination of research databases using keyword searches. We used SCOPUS and Web of Science databases. All document types were searched and the search was not limited by language or publication date. The search for keywords was limited to paper titles, abstracts, and paper keywords only. The keyword search terms used were: illegal AND fishing AND organi\* AND crime. Additional searches were conducted using “IUU” but these searches did not provide any additional results. Papers were included if they included both illegal fishing and organized crime. Information was extracted on location, details of associated crimes, and data types [primary data- where the information is collected by researchers first hand, or secondary data- where information is not directly collected but cited from secondary sources (Rabianski, 2003)]. We term the papers identified in the literature review the first generation papers i.e. *parent papers*.

For papers that used secondary data, key references were identified. The 10 most common key references across all parent papers and -as an additional step of verification- 15 randomly selected key references across all parent papers made up the second generation literature review (“*children papers*”). The data type (primary or secondary) was also noted for these papers. The search was conducted on 19th September 2019.

## Media Review

News articles were collected through ProQuest news portfolio which has access to current and cataloged news from over 3,000 of the world’s news sources (ProQuest, 2019). The ProQuest search included searching across 45 databases. The source types included newspapers, reports and government and official publications, as well as “Other Sources.” Document type “Theses” was excluded. Google Alerts was also set up for News articles. For both, “illegal fish\*” was used as search terms. Data collated by Liberty Asia, a non-profit organization working on labor abuses in South East Asia among other locations, was shared with the authors to supplement and cross-reference the articles found. Only articles that were within the Asia-Pacific Fishery Commission (APFIC) region were included.

The Asia-Pacific region was selected as a case study because the region is the world’s largest producer of fish and aquaculture (50 and 89%, respectively) (FAO, 2020a). Fisheries sectors within this region are important contributors to the social and economic security as 85% of people employed in fisheries and aquaculture worldwide are located within Asia (FAO, 2020a). This results in a higher number of people who are vulnerable to loss of livelihood through the collapse of stocks or rampant IUU fishing. The APFIC is also considered to be a hotspot for trafficking of persons and contraband within the fishing industry, and therefore potentially vulnerable to such crimes. The adaptive capacity to changes are generally low within this region and predicted to be more vulnerable and less resilience to changes in markets and reduced access to services (Allison et al., 2009; Blasiak et al., 2017; Cinner et al., 2018). The APFIC region spans the Indian to the Pacific Ocean and includes Australia, Bangladesh, Cambodia, China, France, India, Indonesia, Japan, Malaysia, Myanmar, Nepal, New Zealand, Pakistan, Philippines, Republic of Korea, Sri Lanka, Timor-Leste, Thailand, United Kingdom, United States of America, and Vietnam.

The final dataset comprised of media articles published between 01 January 2015 and 15 August 2019, inclusive. Articles were translated into English if published in another language. For each article, we extracted information about the location of the incident, reporting entity, and additional crime(s) mentioned.

## RESULTS

### Direct vs. Indirect Evidence of Associated Crimes

The systematic review of literature produced 24 first generation papers (hereafter called “*parent papers*”). Of these, 12 were discarded as they either did not refer to both illegal fishing and organized crime or were duplicates. Of these 12 remaining studies, three focussed on Indonesia and one on Thailand, one

was in Cameroon and one in South Africa, three focussed on multiple locations or global context, one was geographically unreferenced, one focused on Australia, and one on the Southern Ocean (Table 1).

The types of crimes mentioned in addition to IUU fishing included forced labor and human rights violations, which were mentioned in nine of the 12 papers (75%; papers 1–9). Drug smuggling was referred to in five papers (42%; papers 3, 5, 9, 10, 11), all based on secondary sources. Fisheries violations, including illegal exploitation or smuggling of high value species and endangered marine mammals, were mentioned in five papers (42%; papers 1, 2, 3, 10, 11).

Three of the papers included primary data (papers 1, 2, 6), however, for one of those papers the primary data collected was on the availability of liability insurance (paper 6). For this paper, there was no primary or secondary data to support the claim that IUU fishing is related to human rights violations and organized crime. Therefore, only two (17%; papers 1 and 2) included primary data collected on illegal fishing and associated crimes.

The majority of the papers ( $n = 7$ ; 59% of papers) were published in the last 2 years, while the oldest papers were published in 2011 (Table 1).

### Genesis of Narrative

For papers that used secondary data, key references were identified (the 10 most common key references and 15 randomly selected key references from *parent papers*), hereafter called “*children papers*.”

The types of additional crimes within these publications consisted of mostly forced labor or human rights violations (mentioned in 17 of the papers or 68% of the total), followed by drug trafficking which was mentioned in four or 16% of the papers. Smuggling which was mentioned in three (12% of papers) (list of *children papers* provided in supplementary materials).

Of these 25 papers, six included primary data (24%) with the majority of citations from gray literature ( $n = 5$ , 20%). Only one paper included primary data from the peer reviewed literature. Of the remaining papers, five (20%) were peer reviewed and based on secondary data. The majority of papers cited by the parent papers were based on secondary data and information gleaned from gray literature consisting of reports from NGOs and media reports (Figure 1). When findings are not based on primary data collected, they should ideally be backed up by empirical research as opposed to secondary data. The most cited paper was the report written by the UNODC, which is based on secondary data and was not peer reviewed.

### Case Study Review of Media Content

A total of 330 independent events were collected from thousands of news articles scanned. From these 330 events, only six events included incidents of additional crimes (Table 2).

Half of these reports mentioned labor abuses such as modern slavery or human trafficking, while documentation offenses were mentioned in two stories and drug smuggling was mentioned in two stories. The number of stories that included any additional crime accounted for just under 2% of the total reports on IUU fishing.

**TABLE 1** | Summary of first generation literature review (parent papers).

Author Year	Journal	Data Type	Methodology	Geography	Additional crimes mentioned
1 Beseng (2019)	Marine Policy	Primary Secondary	Direct observations, informal group discussions, and semi-structured interviews ( $n = 28$ ) Published articles, government reports, speeches, and Navy Facebook.	Cameroon	Corruption (i.e., bribery and extortion), document and identity fraud, illegal exploitation of fish and endangered marine mammals, illegal recruitment, and abuse of workers' rights, smuggling of contraband goods, and illegal migration.
2 Chapsos and Hamilton (2019)	Trends in Organized Crime	Primary	Surveys ( $n = 285$ ) Interviews ( $n = 1,342$ )	Indonesia	Recruitment patterns and target groups; document forgery; forced labor and abuse; and fisheries violations.
3 Lindley et al. (2019)	Australian Journal of International Affairs	Secondary	Literature review	Australia	Drug, human, weapon, and other contraband trafficking and smuggling; irregular maritime arrivals; and maritime piracy.
4 Moreto et al. (2019)	Deviant Behavior	Secondary	Content analysis of reports	Thailand and UK	Labor trafficking.
5 Yuliantiningsih et al. (2018b)	E3S Web of Conferences	Secondary	Literature review	Indonesia	Human trafficking, smuggling, drugs trading, corruption, and piracy.
6 Soyer et al. (2018)	Transnational Environmental Law	Primary NONE	On the availability of liability insurance On relatedness to organized crime	N/A	IUU linked to human rights violations and organized crime.
7 Yuliantiningsih et al. (2018a)	Journal of East Asia and International Law	Secondary	Literature review	Indonesia	Human rights violations, child labor, human trafficking.
8 Ewell et al. (2017)	Marine Policy	Secondary	Review of regional fisheries management organization policies	Multiple	Linking transshipment at sea to facilitating human trafficking, forced labor, and human rights abuses.
9 Telesetsky (2014)	Ecology Law Quarterly	Secondary	Literature Review	Multiple	Human and drug trafficking. Posits that IUU fishing should be considered a transnational organized crime.
10 Liddick (2014)	Trends in Organized Crime	Secondary	Literature Review	Multiple	Organized criminal groups engage in IUU fishing, illegal harvesting and smuggling of high value marine products, money laundering, drug, and human trafficking and racketeering.
11 Raemaekers et al. (2011)	Ocean and Coastal Management	Secondary	Literature Review	South Africa	Trading illegal abalone for drugs.
12 Österblom et al. (2011)	Trends in Ecology and Evolution	Secondary	Literature Review/Commentary	Southern Ocean	Illegal fishing as an organized criminal activity.

Included are a number of each paper, author, year, journal, data type (primary/secondary), the method employed, geographic location of the study if reported, and list of additional crimes included in the publication.

## DISCUSSION

There is an emerging narrative suggesting that there are links between organized crime and illegal fishing, despite a dearth of evidence. This narrative suggests that the crimes are associated; for example, that fishers who are involved in illegal fishing will also be involved in smuggling drugs and a range of other crimes via organized criminal networks. We found little evidence to suggest this is true when examining both primary and gray literature (e.g., published reports). Analysis of recent media from South East Asia found that < 2% of stories on illegal fishing mentioned any additional crimes. Here, we discuss these results

in further detail, specifically using the findings to offer distinct business models that operate within the world's oceans to offer clarity on maritime criminal activities.

While there are many illegal activities taking place on the ocean, there are distinctions and differences between them. These activities can be conceptualized through their underlying business models. We propose there are three basic business models operating: harvesting, moving cargo, and provision of a venue (Table 3). The three models are distinct based on key components of a business model. There are some consistencies, notably that they are all based on a physical asset. Perhaps this is why these different business models are sometimes



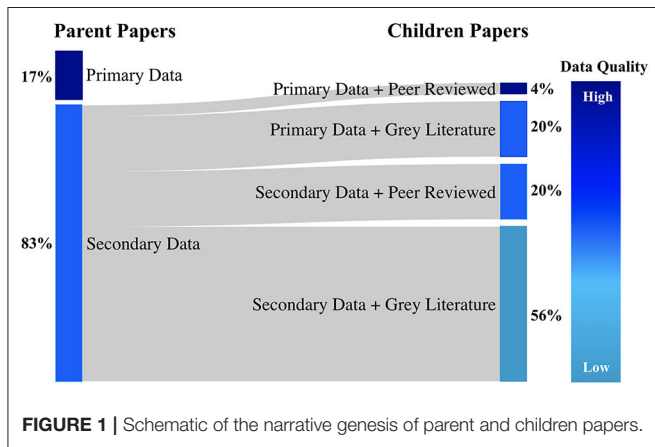
incorrectly conflated. However, they differ in key activities and value proposition. We suggest that integrated criminal activities where multiple business models are operating simultaneously are uncommon.

In our data analysis, harvesting, and cargo endeavors are more often associated such as trafficking drugs via a fishing vessel, compared with venue based crimes. This may be because harvesting and cargo associated activities are more likely to be based on movements between ports, whereas venue based crimes could be stationed offshore. Most likely, cargo based crimes are mimicking harvesting based activities, such as fishing, and therefore are more likely and incorrectly combined as one activity.

There is a logical differentiation between business models from the perspective of the criminal organization. For instance, for a business moving illegal drugs between countries the key value proposition is the movement of the material in a clandestine manner over a short period. The time the cargo spends in transit is an opportunity cost, as the sunk assets of

production cannot be recovered until the onward sale occurs. In contrast, illegal harvesting is constrained by the rate of discovery and harvest of the species of interest. For instance, vessels harvesting giant clams must find appropriate habitat, deploy divers, and then recover the clams. In this case, the transit out and back from the fishing grounds is purely a cost, while the operation on the fishing ground is likely less costly in fuel, but generates increasing revenue per time. Given this, vessels using a harvesting model should be expected to maximize their returns by staying at sea as long as possible –constrained by the volume of catch the vessel can hold, and its fuel and food supplies. Thus, the harvesting and cargo business models are in some sense fundamentally at odds in terms of their likely operating model. As such, one might expect vessels engaged in one business, such as harvesting, to occasionally move cargo as a minor activity in the context of their harvesting business, but it is unlikely that vessels would simultaneously engage in a mixed model.




There was a lack of evidence for certain crimes, such as drug and weapon smuggling being related to IUU fishing. The predominant crimes identified both in the literature and media data were forced labor and workers’ rights violations. Extensive over-fishing and declines in fish stocks have been linked to driving increases in human slavery and forced labor activities (Brashares et al., 2014). Decker Sparks and Hasche (2019) highlighted how geographic, regulatory, and cultural contexts create a supply of vulnerable peoples who can be exploited, while the current fisheries context provides the demand in the cycle. Specifically, as stocks decrease and catch per unit effort decreases, effort must increase to maintain catches resulting in smaller profit margins. Subsequently, the demand for cheap labor increases and the chance of labor exploitation increases as does the susceptibility of fishers to engage in illicit activity (Okafor-Yarwood, 2020). In geographical contexts where there are high volumes of displaced peoples, undocumented workers, migrants, or geographic isolation, exploitative practices are more likely (International Labour Office (ILO), 2005; Robertson, 2011;



**TABLE 2 |** Media cases with additional crimes reported, based on 330 independent events, 2015–2019 inclusive.

Additional crime	Type of Vessel	Location	Reporting entity	Year	Headline (Hyperlink)
Modern slavery/Human trafficking	Refrigerated cargo ship	Indonesia	Business Mirror	2015	Indonesia court upholds seizure of fishing vessel
Drug smuggling	Fishing vessel	Indonesia	Straits Times	2018	1 ton of crystal meth seized from boat off Batam
Fake documentation	Fishing vessels	Thailand	Phuket News	2016	Navy seizes suspected IUU fishing boats in Phuket
Modern slavery/Human trafficking	Fishing vessel	Thailand	Phuket News	2018	Phuket whale shark fishing boats probed for human trafficking
Labor abuses/Lack of correct documentation	Fishing vessel	Indonesia	Manila Times	2015	43 pinoy fishermen repatriated from Indonesia
Kidnapping/drug smuggling	Various vessels (non-specific)	Malaysia	Targeted News Service/Interpol	2016	INTERPOL Alerts Issued for Kidnapped Sailors Following Maritime Security Operation

**TABLE 3** | Key components of different marine business models.

			
Component	Harvest	Cargo	Venue
Key activities	Producing a product-e.g., seafood	Providing a service e.g., moving cargo	Providing an asset e.g., offering venue with less exposure
Product/Value proposition	Reducing costs e.g., illegal fishing, harvesting endangered species	Covert transport e.g., Drugs, arms, people smuggling by boat, or vessel	Privacy e.g., Drug production, gambling, prostitution on a boat, or vessel
Target Customer	Mass Market—those who want to purchase seafood/marine species	Multi-sided—supply and demand segments	Niche Market—those in need of discretion
Key Resources	Physical assets—vessels to harvest	Physical assets—vessels to move cargo	Physical assets—vessels as venues
Cost Structure	Cost-driven—minimizing costs	Variable costs—costs that vary proportionally with the volume of goods, discretion required, urgency	Variable costs—costs that vary proportionally with the volume of goods and services
Revenue Models	Asset sale—ownership of physical product e.g., seafood	Usage fee—offering a particular service e.g., moving cargo	Leasing/Renting -temporary exclusive access to particular asset e.g., venue on a vessel
Key Partnerships	Buyer-supplier relationships to assure reliable supplies	Joint ventures to develop new businesses	Joint ventures to develop new businesses

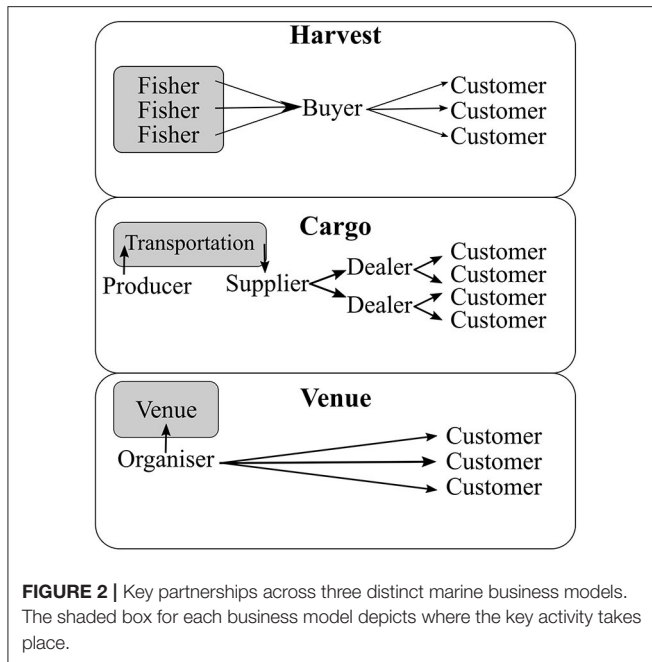
Crane, 2013). More so, if the regulatory context is one which has government complicity, political instability, high levels of corruption, limited regulations, regulatory failures, poor fisheries management, a lack of effective regulatory infrastructure, and much less enforcement (Crane, 2013; Pomeroy et al., 2016). Finally, cultural contexts can also exacerbate the vulnerability of certain groups, for example, if there are deep-rooted social inequalities (Crane, 2013; Decker Sparks and Hasche, 2019). These drivers reduce alternative choices for groups of people, leaving them extremely vulnerable in a context with little agency. There is a clear relationship between the fishing industry, and hence IUU fishing, and forced labor, human rights violations and examples of modern slavery. For example, the empirical data collected from the International Organization for Migration reported more than 1,200 trafficked fishers in 2015 in Indonesia alone (IOM, 2016). Worryingly, within Lake Volta's fishing industry 56% of workers ( $n = 444$ ) are child workers who have been trafficked into forced labor (Adeyemi et al., 2015).

When it comes to the relationship between the fishing industry and cargo based illegal activities such as smuggling, the connection is less clear. Trends in drug, human, arms, and wildlife trafficking vary. Arms trade is unclear due to difficulties in differentiating between legal and illegal sales, drug trafficking is thought to be stabilizing, while human and wildlife trafficking are on the rise (Jacobson and Daurora, 2014). The use of boats for these activities has been documented (Sorensen, 1990; Kassar and Dourgnon, 2014; Atkinson et al., 2017), as illicit cargo vessels can often avoid detection or inspection at sea. In port, they can be

disguised as fishing vessels. Organized criminal groups have even gone to the extent of purchasing fish processing factories and registering as a fishing company as a cover for drug trafficking (Aning, 2007). Within the UNODC report, it is explicit that fishing vessels are used for smuggling activities but “it seems clear that, as in the case of migrant smuggling, fishers are not generally perceived to be part of the organized criminal activity” (93: 2011). There are examples, especially within drug smuggling reports, that fishers are “hired” on an *ad hoc* basis for navigation and maritime skills or lookouts, but as a separate endeavor, as opposed to in addition to fishing activities (Liss, 2014).

The use of vessels as venues for illegal activities was not evident within the media or literature we reviewed. The link between IUU fishing and illicit venues is not commonly discussed, however, there have been reports of illicit venues on vessels. “Women on Waves” is a Dutch non-profit group which offers reproductive information, workshops, and abortions offshore of countries with anti-abortion laws (Gomperts, 2002; Aljazeera, 2017). Boats have also hosted drug production laboratories (Boffey, 2019). There are examples of vessels being used as casino cruises for illegal gambling (Kra, 2004; Lo, 2015). Just as trafficking occurs on boats, so too do venue based criminal activities occur on vessels, yet the link between venue-based illicit activities and fishing is not made. However, the distinction between harvesting and venue business models are clear.

Where we see an association between crimes is within the harvesting business model, most notably linked with forced labor or human trafficking. This is likely due to the revenue



models within each business model. The harvesting business model is a price taker compared to the cargo and venue business models which are price setters. As a price taker, the harvesting model is based on accepting the prevailing market prices and is more closely linked to the customer (Figure 2). This results in a less stable market. Perhaps this explains the increase in associated crimes, as the crimes are attempts to maximize profit via reducing costs by forcing inhuman working hours or lack of pay. Price setters, for example, drug smuggling, may scale prices not only by quantity but also in risk, as cargo that carries a more severe punishment will come with a larger price (i.e., heroin vs. marijuana). For venue based activities, the cost will scale with infrastructure provisioning. This is inherently a more stable market and is further removed from customer interaction (Figure 2).

## CONCLUSION

The consequences and severity of illegal fishing, associated fisheries crimes, and organized crime that occurs on the sea are severe (Tickler et al., 2018; Moreto et al., 2019; Teh et al., 2019). While we present the argument that marine business models are discrete, there are numerous examples of leaders and experts conflating these issues (Witbooi et al., 2020). The intention of doing so may be to raise concern and attention to improve the well-being and safety of fishers however it may have the opposite effect. For example, the Indonesian minister of marine affairs and fisheries has stated “illegal fishing is often a vehicle for other crimes, such as people smuggling, drugs smuggling and slavery” (IOM, 2016: 1). Conflating these issues and including slavery or forced labor in the same context as drugs trafficking runs the risk of criminalizing victims of modern slavery or forced labor. For

example, recent literature has argued that fisheries are heavily linked to drug trafficking (Belhabib et al., 2020), whereas the link seems to be based on the use of fishing vessels as disguises as opposed to boats and crews that are actively fishing. The difference may seem subtle but we argue that links between organized crime and illegal fishing should be made with caution to protect those at risk.

This paper aimed to explore the empirical and secondary data surrounding a narrative linking illegal fishing and organized crime. While extensive media data was collected within South East Asia—which accounts for 68% of the world’s fishing fleet (FAO, 2020b)—there is potential regional bias within this data. Other regions such as West Africa and Latin America may have yielded different proportions of associated crimes and is worth exploring but was beyond the scope of this study. Additionally, within the literature review, additional papers may have emerged using different search terms such as “fisheries crime.” Finally, the clandestine nature of illegal activity creates uncertainty surrounding any conclusions as illicit relationships are more often anecdotally shared rather than empirically (Telesetsky, 2014). None-the-less our research is contributing to a significant knowledge gap and evolving the conversation to help identify where more resources can be allocated to improve fisheries operations globally.

While we suggest that there are links between IUU fishing and human rights abuses but less with IUU fishing organized crimes we stress that addressing all human and environmental violations are important. Protecting the people who work within marine industries and ensuring the sustainability of the global marine estate is complex and challenging. As difficult as enforcement is on land, it is exponentially more challenging to identify, enforce and prosecute illegal activities on the high seas. The trafficking of illegal substances, illicit arms trade and the vulnerability of exploited people, not to mention global food security, are transboundary issues of global concern. We present three distinct business models that operate within the world’s oceans to offer clarity on maritime criminal activities. This distinction explains why certain crimes such as forced labor are associated with illegal fishing, while other crimes such as trafficking or smuggling are less likely. By disentangling these crimes, we can better focus on solutions to reduce illegal behavior on the sea and protect those vulnerable to fisheries exploitation, to enhance livelihoods, social well-being and the sustainability of global fisheries.

## DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary materials, further inquiries can be directed to the corresponding author/s.

## AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

## ACKNOWLEDGMENTS

We would like to thank Liberty Asia for their contribution to the media database. We also thank Vanessa Mann and Toni Cannard for their data management and logistical assistance in

collating the media data. We gratefully thank the two anonymous reviewers for their valuable comments and suggestions. We would also like to thank Chris Cvitanovic, Thomas Botterill-James, Kathryn Willis, Lorraine Kelly, and Rachel Kelly for their constructive editorial input and advice.

## REFERENCES

- Adeyemi, A., Agbeko, H., Christy, K., and Langford, P. (2015). *Child Trafficking into Forced Labor on Lake Volta, Ghana*. International Justice Mission. 11–93. Available online at: <https://www.ijm.org/documents/studies/ijm-ghana-report.pdf>
- Agnew, D. J., Pearce, J., Pramod, G., Peatman, T., Watson, R., Beddington, J. R., et al. (2009). Estimating the worldwide extent of illegal fishing. *PLoS ONE* 4:e4570. doi: 10.1371/journal.pone.0004570
- Aljazeera (2017). *Dutch "abortion boat" arrives off the coast of Mexico*. *Mex. News, All Jazeera*. Available online at: <https://www.aljazeera.com/news/2017/04/dutch-abortion-boat-arrives-coast-mexico-170422042001781.html> (accessed February 13, 2020).
- Allison, E. H., Perry, A. L., Badjeck, M. C., Neil Adger, W., Brown, K., Conway, D., et al. (2009). Vulnerability of national economies to the impacts of climate change on fisheries. *Fish Fish.* 10, 173–196. doi: 10.1111/j.1467-2979.2008.00310.x
- Aning, K. (2007). Are there emerging West African criminal networks? the case of Ghana. *Glob. Crime* 8, 193–212. doi: 10.1080/17440570701507729
- Atkinson, M. P., Kress, M., and Szechtmann, R. (2017). Maritime transportation of illegal drugs from South America. *Int. J. Drug Policy* 39, 43–51. doi: 10.1016/j.drugpo.2016.07.010
- Belhabib, D., Le Billon, P., and Wrathall, D. J. (2020). Narco-fish: global fisheries and drug trafficking. *Fish Fish.* 21, 992–1007. doi: 10.1111/faf.12483
- Beseng, M. (2019). Cameroon's choppy waters: the anatomy of fisheries crime in the maritime fisheries sector. *Mar. Policy* 108, 1–10. doi: 10.1016/j.marpol.2019.103669
- Blasiak, R., Spijkers, J., Tokunaga, K., Pittman, J., Yagi, N., and Österblom, H. (2017). Climate change and marine fisheries: least developed countries top global index of vulnerability. *PLoS ONE* 12:e0179632. doi: 10.1371/journal.pone.0179632
- Boffey, D. (2019). *Booby Trap Scuppers Police Raid on Dutch Floating Crystal Meth Lab*. *Guard*. Available online at: <https://www.theguardian.com/world/2019/may/13/netherlands-police-raid-cargo-ship-crystal-meth-lab-moerdijk> (accessed February 13, 2020).
- Brashares, J. S., Abrahams, B., Fiorella, K. J., Golden, C. D., Hojnowski, C. E., Marsh, R. A., et al. (2014). Wildlife decline and social conflict. *Science* 345, 376–378. doi: 10.1126/science.1256734
- Cabral, R. B., Mayorga, J., Clemence, M., Lynham, J., Koeshendrajana, S., Muawanah, U., et al. (2018). Rapid and lasting gains from solving illegal fishing. *Nat. Ecol. Evol.* 2, 650–658. doi: 10.1038/s41559-018-0499-1
- CCAMLR (2002). *Report of the Twenty-First Meeting of the Commission*. Hobart. Available online at: [www.ccamlr.org](http://www.ccamlr.org) (accessed January 29, 2020).
- Chapsos, I., and Hamilton, S. (2019). Illegal fishing and fisheries crime as a transnational organized crime in Indonesia. *Trends Organ. Crime* 22, 255–273. doi: 10.1007/s12117-018-9329-8
- Cinner, J. E., Adger, W. N., Allison, E. H., Barnes, M. L., Brown, K., Cohen, P. J., et al. (2018). Building adaptive capacity to climate change in tropical coastal communities. *Nat. Clim. Chang.* 8, 117–123. doi: 10.1038/s41558-017-0065-x
- COLTO (2003). *Toothfish Piracy Drama in Southern Ocean*. Available online at: <https://www.scoop.co.nz/stories/WO0306/S00378/toothfish-piracy-drama-in-southern-ocean.htm> (accessed January 29, 2020).
- Crane, A. (2013). Modern slavery as a management practice: exploring the conditions and capabilities for human exploitation. *Acad. Manag. Rev.* 38, 49–69. doi: 10.5465/amr.2011.0145
- CRD (2001). *Undertaking Systematic Reviews of Research on Effectiveness*. *CRD's Guidance for Carrying Out or Commissioning Reviews*. (York: University of York).
- Decker Sparks, J. L., and Hasche, L. K. (2019). Complex linkages between forced labor slavery and environmental decline in marine fisheries. *J. Hum. Rights* 18, 230–245. doi: 10.1080/14754835.2019.1602824
- Ewell, C., Cullis-Suzuki, S., Ediger, M., Hocevar, J., Miller, D., and Jacquet, J. (2017). Potential ecological and social benefits of a moratorium on transshipment on the high seas. *Mar. Policy* 81, 293–300. doi: 10.1016/j.marpol.2017.04.004
- FAO (2001). *International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing*. (Rome: Informa UK Limited).
- FAO (2018). *The State of World Fisheries And Aquaculture 2018- Meeting the Sustainable Development Goals*. (Rome: FAO). Available online at: [www.fao.org/publications](http://www.fao.org/publications) (accessed January 22, 2020).
- FAO (2020a). *Asia-Pacific Fishery Commission (APFIC)*. Rome. Available online at: <http://www.fao.org/asiapacific/apfic/en/> (accessed March 25, 2020).
- FAO (2020b). *The State of World Fisheries and Aquaculture 2020*. (Rome: FAO).
- Ford, J. H., Peel, D., Kroodsma, D., Hardesty, B. D., Rosebrock, U., and Wilcox, C. (2018). Detecting suspicious activities at sea based on anomalies in automatic identification systems transmissions. *PLoS ONE* 13:e0201640. doi: 10.1371/journal.pone.0201640
- Gallic, B. L., and Cox, A. (2006). An economic analysis of illegal, unreported and unregulated (IUU) fishing: key drivers and possible solutions. *Mar. Policy* 30, 689–695. doi: 10.1016/j.marpol.2005.09.008
- Gomperts, R. (2002). Women on waves: where next for the abortion boat? *Reprod. Health Matters* 10, 180–183. doi: 10.1016/S0968-8080(02)00004-6
- Hilborn, R., Amoroso, R. O., Anderson, C. M., Baum, J. K., Branch, T. A., Costello, C., et al. (2020). Effective fisheries management instrumental in improving fish stock status. *Proc. Natl. Acad. Sci. U.S.A.* 117, 2218–2224. doi: 10.1073/pnas.1909726116
- International Labour Office (ILO) (2005). *A Global Alliance Against Forced Labour*. (Geneva: ILO).
- IOM (2016). *Report on Human Trafficking, Forced Labour and Fisheries Crime in the Indonesian Fishing Industry*. Jakarta, Indonesia. Available online at: <https://www.iom.int/sites/default/files/country/docs/indonesia/Human-Trafficking-Forced-Labour-and-Fisheries-Crime-in-the-Indonesian-Fishing-Industry-IOM.pdf>
- ITF (2006). *Out of Sight, Out of Mind- Seafarers, Fishers and Human Rights*, International Transport Workers' Federation.
- Jacobson, M. R., and Daurora, M. (2014). Significant trends in illicit trafficking: a macro view of the problem and potential means to address it. *Atl. Futur.* 8, 1–15. Available online at: [http://www.atlanticfuture.eu/files/326-ATLANTIC%20FUTURE\\_08\\_Transnational%20threats.pdf](http://www.atlanticfuture.eu/files/326-ATLANTIC%20FUTURE_08_Transnational%20threats.pdf)
- Kassar, H., and Dourgnon, P. (2014). The big crossing: Illegal boat migrants in the Mediterranean. *Eur. J. Public Health* 24, 11–15. doi: 10.1093/eurpub/cku099
- Kra, B. (2004). *Police Confiscate Five Casino Boats Off Eilat Shore, Arrest 19 linked to Gambling*. *Haaretz - Isr. News*. Available online at: <https://www.haaretz.com/1.4830732> (accessed February 13, 2020).
- Liddick, D. (2014). The dimensions of a transnational crime problem: the case of iuu fishing. *Trends Organ. Crime* 17, 290–312. doi: 10.1007/s12117-014-9228-6
- Lindley, J., Percy, S., and Techera, E. (2019). Illegal fishing and Australian security. *Aust. J. Int. Aff.* 73, 82–99. doi: 10.1080/10357718.2018.1548561
- Liss, C. (2014). *Assessing Contemporary Maritime Piracy in Southeast Asia: Trends, Hotspots and Responses*. Frankfurt: Peace Research Institute Frankfurt. Available online at: [www.priif.org](http://www.priif.org) (accessed September 10, 2020).
- Lo, S. S. H. (2015). *The Politics of Controlling Organized Crime in Greater China*. (London; New York, NY: Routledge).
- Michael, P., Thomson, R., Barbraud, C., Delord, K., De Grissac, S., Hobday, A., et al. (2017). Illegal fishing bycatch overshadows climate as a driver of albatross population decline. *Mar. Ecol. Prog. Ser.* 579, 185–199. doi: 10.3354/meps12248
- Moreto, W. D., Charlton, R. W., DeWitt, S. E., and Burton, C. M. (2019). The convergence of CAPTURED fish and people: examining the symbiotic nature of



- labor trafficking and illegal, unreported and unregulated fishing. *Deviant Behav.* 41, 733–749. doi: 10.1080/01639625.2019.1594587
- Okafor-Yarwood, I. (2020). The cyclical nature of maritime security threats: illegal, unreported, and unregulated fishing as a threat to Human and National security in the Gulf of Guinea. *African Secur.* 13, 116–146. doi: 10.1080/19392206.2020.1724432
- Österblom, H., Bodin, Ö., Sumaila, U. R., and Press, A. J. (2014). Reducing illegal fishing in the southern ocean: a global effort. *Solutions* 5, 72–79. Available online at: <https://www.thesolutionsjournal.com/article/reducing-illegal-fishing-in-the-southern-ocean-a-global-effort/>
- Österblom, H., Constable, A., and Fukumi, S. (2011). Illegal fishing and the organized crime analogy. *Trends Ecol. Evol.* 26, 261–262. doi: 10.1016/j.tree.2011.03.017
- Österblom, H., Sumaila, U. R., Bodin, Ö., Sundberg, J. H., and Press, A. J. (2010). Adapting to regional enforcement: fishing down the governance index. *PLoS ONE* 5:e12832. doi: 10.1371/journal.pone.0012832
- Palma, M., Tsamenyi, M., and Edeson, W. (2010). *Promoting Sustainable Fisheries: The International Legal and Policy Framework to Combat Illegal, Unreported and Unregulated Fishing*. Available online at: <https://books.google.com/books?hl=en&lr=&id=ZTN8Fivl-AAC&oi=fnd&pg=PR3&ots=b71tLAHFJ4&sig=S5EZHAq1YutLzO4CpiB-BpOqH8I> (accessed January 22, 2020).
- Patterson, H. (2018). *Status Of Australian Fish Stocks Report:Patagonian Toothfish 2018*. Available online at: <https://www.fish.gov.au/report/247-Patagonian-Toothfish-2018> (accessed March 11, 2020).
- Pauly, D., Christensen, V., Guénette, S., Pitcher, T. J., Sumaila, U. R., Walters, C. J., et al. (2002). Towards sustainability in world fisheries. *Nature* 418, 689–695. doi: 10.1038/nature01017
- Pomeroy, R., Parks, J., Mrakovcich, K. L., and LaMonica, C. (2016). Drivers and impacts of fisheries scarcity, competition, and conflict on maritime security. *Mar. Policy* 67, 94–104. doi: 10.1016/j.marpol.2016.01.005
- ProQuest (2019). *Proquest. News Newspapers*. Available online at: <https://www.proquest.com/libraries/academic/news-newspapers/>
- Rabianski, J. S. (2003). Primary and secondary data: concepts, concerns, errors, and issues. *Appraisal J.* 71, 43–55.
- Raemaekers, S., Hauck, M., Bürgener, M., Mackenzie, A., Maharaj, G., Plagányi, É. E., et al. (2011). Review of the causes of the rise of the illegal South African abalone fishery and consequent closure of the rights-based fishery. *Ocean Coast. Manag.* 54, 433–445. doi: 10.1016/j.ocecoaman.2011.02.001
- Robertson, P. (2011). *Trafficking of Fishermen in Thailand*. Bangkok. Available online at: <https://publications.iom.int/books/trafficking-fishermen-thailand> (accessed February 13, 2020).
- Satria, F., Sadiyah, L., Widodo, A. A., Wilcox, C., Ford, J. H., and Hardesty, B. D. (2018). Characterizing transshipment at-sea activities by longline and purse seine fisheries in response to recent policy changes in Indonesia. *Mar. Policy* 95, 8–13. doi: 10.1016/j.marpol.2018.06.010
- Sodik, D. M. (2009). IUU fishing and Indonesia's legal framework for vessel registration and fishing vessel licensing. *Ocean Dev. Int. Law* 40, 249–267. doi: 10.1080/00908320903076797
- Sorensen, C. E. (1990). Drug trafficking on the high seas: a move toward Universal Jurisdiction under International Law. *Emory Int. Law Rev.* 4, 207–230.
- Soyer, B., Leloudas, G., and Miller, D. (2018). Tackling IUU fishing: developing a holistic legal response. *Transnatl. Environ. Law* 7, 139–163. doi: 10.1017/S2047102517000267
- Sumaila, U. R., Alder, J., and Keith, H. (2006). Global scope and economics of illegal fishing. *Mar. Policy* 30, 696–703. doi: 10.1016/j.marpol.2005.11.001
- Sumaila, U. R., Zeller, D., Hood, L., Palomares, M. L. D., Li, Y., and Pauly, D. (2020). Illicit trade in marine fish catch and its effects on ecosystems and people worldwide. *Sci. Adv.* 6:eaz3801. doi: 10.1126/sciadv.aaz3801
- Teh, L. C. L., Caddell, R., Allison, E. H., Finkbeiner, E. M., Kittinger, J. N., Nakamura, K., et al. (2019). The role of human rights in implementing socially responsible seafood. *PLoS ONE* 14:e0210241. doi: 10.1371/journal.pone.0210241
- Telesetsky, A. (2014). Laundering fish in the global undercurrents: illegal, unreported, and unregulated fishing and transnational organized crime. *Ecol. Law Q.* 41, 939–997. doi: 10.15779/Z38656G
- Tickler, D., Meeuwig, J. J., Bryant, K., David, F., Forrest, J. A. H. H., Gordon, E., et al. (2018). Modern slavery and the race to fish. *Nat. Commun.* 9:4643. doi: 10.1038/s41467-018-07118-9
- UNGA (2009). *Resolution Adopted by the General Assembly on 5 December 2008 A/RES/63/112 - E - A/RES/63/112*. Available online at: <https://undocs.org/A/RES/63/112> (accessed January 22, 2020).
- UNODC (2011). *Transnational Organized Crime in the Fishing Industry. United Nations Off. Drugs Crime, 140*. Available online at: [http://www.unodc.org/documents/human-trafficking/Issue\\_Paper\\_-\\_TOC\\_in\\_the\\_Fishing\\_Industry.pdf](http://www.unodc.org/documents/human-trafficking/Issue_Paper_-_TOC_in_the_Fishing_Industry.pdf)
- Witbooi, E., Ali, K.-D., Santosa, M. A., Hurley, G., Husein, Y., Maharaj, S., et al. (2020). *Organised Crime in the Fisheries Sector. The High Level Panel on a Sustainable Ocean Economy*. Washington, DC: World Resourced Institute. Available online at: <https://oceanpanel.org/blue-papers/organised-crime-associat-> (accessed September 11, 2020).
- Yea, S. (2016). *Diluted Justice : Protection and Redress for Trafficked Fishermen in Asia*, Transient Workers Count Too.
- Yuliantiningsih, A., Suherman, A. M., and Latifah, E. (2018a). From illegal, unreported and unregulated fishing to transnational organised crime in fishery from an Indonesian perspective. *J. East Asia Int. Law* 11, 335–358. doi: 10.14330/jeast.2018.11.2.04
- Yuliantiningsih, A., Suherman, A. M., and Latifah, E. (2018b). Law and justice for the oceans: Study on illegal, unreported and unregulated fishing and related crimes. *E3S Web Conf.* 47:06006. doi: 10.1051/e3sconf/20184706006

**Conflict of Interest:** The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Copyright © 2020 Mackay, Hardesty and Wilcox. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.