Commissioned by

HIGH LEVEL PANEL *for*
A SUSTAINABLE
OCEAN ECONOMY

BLUE PAPER

Illegal, Unreported and Unregulated Fishing and Associated Drivers

LEAD AUTHORS

Sjarief Widjaja, Tony Long and Hassan Wirajuda

CONTRIBUTORS:

Hennie Van As, Per Erik Bergh, Annie Brett, Duncan Copeland, Miriam Fernandez, Ahmad Gusman, Stephanie Juwana, Toni Ruchimat, Steve Trent and Chris Wilcox

oceanpanel.org

About the High Level Panel for a Sustainable Ocean Economy

The High Level Panel for a Sustainable Ocean Economy (Ocean Panel) is a unique initiative by 14 world leaders who are building momentum for a sustainable ocean economy in which effective protection, sustainable production and equitable prosperity go hand in hand. By enhancing humanity's relationship with the ocean, bridging ocean health and wealth, working with diverse stakeholders and harnessing the latest knowledge, the Ocean Panel aims to facilitate a better, more resilient future for people and the planet.

Established in September 2018, the Ocean Panel has been working with government, business, financial institutions, the science community and civil society to catalyse and scale bold, pragmatic solutions across policy, governance, technology and finance to ultimately develop an action agenda for transitioning to a sustainable ocean economy. Co-chaired by Norway and Palau, the Ocean Panel is the only ocean policy body made up of serving world leaders with the authority needed to trigger, amplify and accelerate action worldwide for ocean priorities. The Ocean Panel comprises members from Australia, Canada, Chile, Fiji, Ghana, Indonesia, Jamaica, Japan, Kenya, Mexico, Namibia, Norway, Palau and Portugal and is supported by the UN Secretary-General's Special Envoy for the Ocean.

The Ocean Panel's approach is both ambitious and practical. Collaborative partnerships are essential to converting knowledge into action. To develop a common understanding of what a sustainable ocean economy looks like, the Ocean Panel gathers input from a wide array of stakeholders, including an Expert Group and an Advisory Network. The Secretariat, based at World Resources Institute, assists with analytical work, communications and stakeholder engagement.

In the spirit of achieving the UN Sustainable Development Goals (SDGs), providing value to the UN Decade of Ocean Science for Sustainable Development and meeting the objectives of the Paris Agreement, the Ocean Panel commissioned a comprehensive assessment of ocean science and knowledge that has significant policy relevance. This includes a series of 16 Blue Papers and various Special Reports that offer a synthesis of knowledge, new thinking and perspectives, and opportunities for action. This body of work is informing a new ocean narrative in the forthcoming Towards a Sustainable Ocean Economy report. Together, this research and new narrative serve as inputs to the Ocean Panel's deliberations for its forthcoming action agenda.

Ultimately, these papers are an independent input to the Ocean Panel process and do not necessarily represent the thinking of the Ocean Panel, Sherpas or Secretariat.

Suggested Citation: S. Widjaja, T. Long, H. Wirajuda, et al. 2020. *Illegal, Unreported and Unregulated Fishing and Associated Drivers.* Washington, DC: World Resources Institute. Available online at www.oceanpanel.org/iuu-fishing-and-associated-drivers.

Table of Contents

Foreword

The High Level Panel for a Sustainable Ocean Economy (Ocean Panel) commissioned us, the co-chairs of the Ocean Panel Expert Group, to produce a series of Blue Papers to explore pressing challenges at the nexus of the ocean and the economy to ultimately inform a new ocean report and the Ocean Panel's action agenda. The Ocean Panel identified 16 specific topics for which it sought a synthesis of knowledge and opportunities for action. In response, we convened 16 teams of global experts—over 200 authors from nearly 50 countries—who reviewed and analysed the latest knowledge. They then provided new thinking and perspectives on how technology, policy, governance and finance can be applied to catalyse a more sustainable and prosperous relationship with the ocean. In short, these Special Reports and Blue Papers provide the information needed to transition to a sustainable ocean economy.

The Expert Group, a global group of over 70 experts, is tasked with helping to ensure the high quality and intellectual integrity of the Ocean Panel's work. All Blue Papers are subject to a rigorous and independent peer-review process. The arguments, findings and opportunities for action represent the views of the authors. The launches of these papers, which are taking place between November 2019 and October 2020, create opportunities for exchange and dialogue between political leaders, policymakers, the financial community, business leaders, the scientific community and civil society.

This Blue Paper, which examines illegal, unreported and unregulated (IUU) fishing and the drivers associated with it, comes at an extremely relevant time. IUU fishing is already undermining the sustainability of the ocean, and recognition of the significant risks it poses for future fisheries productivity and the attainment of a sustainable ocean economy is growing, along with our understanding of the cascading social and environmental consequences that go beyond fisheries to impact food, nutritional and maritime security. The paper details tangible actions that must be taken to end this threat. Many of these are recognisable from previous high-level papers and reports dating to 2001, indicative that the global response has been extremely slow. However, the paper also makes clear that there are decisive opportunities for transformational action, enabled by new technology, knowledge and partnerships that can turn the tide. We know what needs to be done, and leaders must take the opportunity to act. With only one year left to fulfil the target set by UN Sustainable Development Goal 14.4—to end IUU fishing and overfishing by 2020—we are delighted to be able to contribute to this debate through this paper.

As co-chairs of the Expert Group, we are excited to share this paper and wish to warmly thank the authors, the reviewers and the Secretariat for supporting this research. We are also grateful for the vision of the Ocean Panel members in commissioning this important body of work. We hope they and other parties act on the opportunities identified in this paper.

Hon. Jane Lubchenco, Ph.D.
Oregon State University

Professor Peter Haugan, Ph.D.
Institute of Marine Research, Norway

Hon. Mari Elka Pangestu, Ph.D.
University of Indonesia

Highlights

- By agreeing to Sustainable Development Goal (SDG) 14.4 to end illegal, unreported and unregulated (IUU) fishing and overfishing by 2020, countries have acknowledged the importance of combatting IUU fishing. However, they will fall well short of this goal without an immediate, forceful and unified effort.
- Ocean food production is threated by overfishing and habitat destruction often caused by IUU fishing and exacerbated by climate change, which in turn leaves coastal communities more vulnerable to the impacts of this loss.
- Continued IUU fishing will deplete fish stocks and destroy habitats, decrease the value of many fisheries, threaten species extinction, disrupt marine food webs, increase food security risks and disrupt coastal communities' social cohesion. Many of these effects are already being felt.
- The worst examples of IUU fishing are often connected to transnational crimes, including human rights abuses, bonded labour, tax evasion, piracy, and drug, arms and human trafficking. Fraudulent papers, hidden ownership and a lack of transparency facilitate extraction of fish in a way that is difficult to track.
- The global fishing fleet is two to three times larger than needed to catch the amount of fish that the ocean can sustainably support. Technological improvements in fish detection and fishing gear have made each vessel more efficient, allowing it to further deplete resources.
- Fish harvested legally and sustainably can be properly managed to provide animal protein for generations to come. Improved management and ending IUU fishing are imperative to achieving this.
- The three main drivers of IUU fishing are **economic incentives** that make IUU fishing a low-risk, high-profit activity; **weak governance** that fails to enact or live up to fisheries management regulations; and **barriers to enforcement** of fishing regulations caused by lack of political will, lack of enforcement capacity, and sometimes corruption.
- The illegal fishery is highly profitable because it is not effectively regulated. Economic incentives can be changed if countries and the fishing industry insist on transparent tracking of vessels and of their catches throughout the value chain to document legality. This type of documentation is now possible with new technology. Governments must follow through with tough responses to violations.
- Weak governance at the national, regional and international level creates a regulatory patchwork that has allowed IUU fishing to flourish. Ocean governance mechanisms can be strengthened by addressing the non-uniformity of regional fishery management organisation regulations and improving coordination and data transparency between these organisations, flag states, regional bodies, scientific establishments and coastal and market states.
- Barriers to enforcement must be removed by building the capacity of developing coastal states to enforce regulations at ports and on the water, including adopting new tracking technologies.
- This paper offers a checklist of actions that could be taken by various stakeholders to regulate IUU fishing and could be submitted in support of the SDG 14.4 in 2020.
- The most urgent action opportunities are:
    - **Adopt global transparency in fisheries.** Technological advances in tracking methods—both for tracking fishing vessel movements and for tracking a fish catch through the value chain—offer new hope for fisheries management. This, applied to existing regulations and combined with better public understanding of which vessels are authorised to transship or fish and where, will drive better compliance.
    - **Enact tighter controls at ports.** All port states should ratify and implement the Food and Agriculture Organization of the United Nations' (FAO) Port State Measures Agreement (FAO 2009) to stop IUU-caught fish entering the market. The agreement requires parties to place tighter controls on foreign-flagged vessels seeking to use their ports to detect and prevent the trade of IUU products.
    - **Enhance collaboration.** Because IUU fishing does not honour political boundaries, regional collaboration among nations is essential. Collaboration between government departments and governments, and also among businesses and financial institutions, scientific establishments and the civil sector, will generate new solutions, maximise impact and lower costs.

Introduction

Overview

Illegal, unreported and unregulated (IUU) fishing accounts for 20 percent of the world catch and up to 50 percent in some areas. This industry often uses bonded labour, destructive fishing practices and deceptive practices to reap profits at the expense of local fisheries, coastal states and the marine environment. Although international resolutions and reports have been issued for decades, countries have failed to enact and enforce regulations to stop these practices due to a lack of political will, resources and capacity.

At the beginning of a new decade, with deadlines approaching for the Sustainable Development Goals, nations have a major opportunity to form the partnerships and enforcement mechanisms to stop illegal, unreported and unregulated fishing practices.

Advancing, and more affordable, technologies also present new opportunities to implement and enforce new and old agreements and regulations. These technologies can track not only the location and documentation of fishing vessels but also the progress of a particular fish catch through the value chain to ensure legality.

By exploring the underlying drivers of IUU fishing—economic incentives, weak governance, and poor enforcement—we propose effective actions that can be taken in the current international framework to address the issue. The best use of appropriate technologies, combined with good policy and international cooperation, partnerships and collaboration can be cost-effective and scaled globally to transform fisheries. Fish harvested legally and sustainably can provide animal protein for generations to come.

UN Sustainable Development Goal 14.4 commits countries, by 2020, to effectively regulate fishing; end overfishing, IUU fishing, and destructive fishing practices; and implement science-based management plans to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics. The world is clearly not yet on track to achieve those goals.

In this paper, we outline the state of knowledge and trends in IUU fishing, ways in which it contributes to overfishing, how it exacerbates the impacts of climate change, and specific aspects of how it operates in coastal areas, on the high seas and in areas beyond national jurisdiction. Successful country strategies are highlighted, that, if more widely adopted, will help transition the IUU fishing fleet to one of compliance.

As one of a series of Blue Papers prepared as an input to the High Level Panel for a Sustainable Ocean Economy, this paper provides scientific and policy background as well as opportunities for action to reinvigorate international cooperation and efforts to effectively regulate IUU fishing.

Context

The promotion, regulation and monitoring of responsible fishing practices, through robust fisheries management and governance frameworks, are essential for the sustainability of fisheries resources in both coastal areas and high seas. The principles of responsible fisheries management have been prescribed in a number of international ocean and fisheries instruments. However, states do not always satisfactorily fulfil their duties in line with such instruments and IUU fishing often occurs, undermining national, regional and global efforts to manage fisheries sustainably. It is not enough for states to detect IUU fishing; they must strengthen fisheries laws and regulations and be able to take effective action against perpetrators to deter non-compliance. (FAO 2018)

Illegal, unreported and unregulated (IUU) fishing threatens the sustainability of global fisheries in national coastal waters and on the high seas (SEAFDEC 2015). Developing countries are most at risk from illegal fishing, with estimated actual catches in West Africa, for example, being 40 percent higher than reported catches.

IUU fishing is widespread (Sumaila et al. 2006), and such levels of exploitation severely hamper the sustainable management of marine ecosystems (Agnew et al. 2009). This exploitation causes enormous economic losses to coastal developing countries, disrupts social and environmental situations in coastal communities, enables crimes and human rights abuses, and even threatens military conflict over scarce resources. It also exacerbates the effects of climate change on ocean resources.

Economic Losses to States and Communities

One in every five wild-caught fish is likely to be illegal or unreported (Agnew et al. 2009); thus, the economic value of these fish never reaches the communities that are the rightful beneficiaries.

Annual global losses due to this illegal activity are valued at US$10 billion to $23.5 billion, representing 11–26 million tonnes of fish (Agnew et al. 2009). The volume of illegal trade in Pacific Ocean marine resources is 4–7 million tonnes per year, costing Pacific nations $4.3 billion to $8.3 billion per year in loss of gross revenues. The losses substantially increase when impacts across the fish value chain are considered (Konar et al. 2019). Another recent study reveals that IUU fishing in one Pacific Islands region represents $616 million annually, with 276,000–338,000 tonnes of Pacific tuna illegally caught each year (MRAG Asia Pacific 2016).

Social and Environmental Costs

Although monetary values often take the headlines, illegal fishing has significant social and environmental costs, such as the loss in value of fisheries from depleted stocks, the threat of species extinction, the impact on marine food webs, increased food security risks and potential disruption to coastal communities' social cohesion (Tinch et al. 2008; Sumaila 2018). Moreover, destruction of habitats and overfishing of mature adult fish compromise the health of the ecosystem and therefore the opportunity for fisheries and other uses in the future.

Crime and Human Rights Abuses

The worst examples of IUU fishing are often connected to transnational crime, including human rights abuses, tax evasion, piracy and drugs, arms, and human trafficking (Sumaila and Bawumia 2014; Telesetsky 2014). Much of today's IUU fishing activity takes place on an organised, systematic scale across multiple jurisdictions (Haenlein 2017). These crimes are net losses to a country's economy and will result in lost economic, environmental and social opportunities, both short term and long term, and may diminish food security (FAO 2002; Sumaila 2018).

Possibility of Military Conflicts

The military departments of many nations study the environment and resources as an aspect of national security. The UK Ministry of Defence's 2018 *Global Strategic Trends* makes clear that habitat destruction and overexploitation will lead to loss of biodiversity and the need to secure diminishing resources may lead to conflict (DCDC 2018). Long-term strategies to ensure continued production and resource abundance are key for national and regional security.

Worsening the Effects of Climate Change

Climate change is significantly changing ocean ecology in ways that will affect fisheries, including reducing fisheries catches, especially in the tropics. Unsustainable fishing practices worsen the effects of these negative changes; therefore, sustainable and adaptive fishing management practices should be employed to help mitigate them.

The International Situation

The need to combat IUU fishing is increasingly enshrined in high-level institutions. See Appendix A for current institutions and agreements. Recent international actions are outlined below.

- A 2018 UN resolution on sustainable fisheries refers to the need to address IUU fishing and the importance of policies available to combat it.

- The 2015 UN Sustainable Development Goals (SDGs) include SDG 14.4[1] on overfishing. This SDG is unlikely to be implemented by the 2020 deadline.
- The Convention on Biological Diversity, having fallen short on previous commitments, has set clear targets for 2020 on sustainable harvests for many of its goals, and the threat from IUU fishing and overfishing is made clear.
- Declarations on combatting IUU fishing were issued at the G7 (Charlevoix Blueprint 2018) and the G20 (Osaka Leaders' Declaration 2019).
- In 2019, Asia-Pacific Economic Cooperation officials and ministers officially endorsed a roadmap to combat IUU fishing.
- The 2019 UN Framework Convention on Climate Change Conference of Parties, referred to as the Blue COP to underline the emphasis on ocean conservation, sought to offer leadership and financial resources to gather momentum and address ocean issues.
- An ongoing UN intergovernmental conference is considering a new legally binding instrument under the UN Convention on the Law of the Sea (UNCLOS) that could result in robust protection for marine biological diversity in areas beyond national jurisdiction.
- In December 2017, the UN General Assembly proclaimed 5 June—the date the Port State Measures Agreement (PSMA) came into force—as the international day for the fight against IUU fishing—a significant milestone that raised the importance of the issue to global awareness.

Significant Reports on IUU Fishing

IUU fishing is recognised as a serious problem that must be addressed through national action and cooperation. Two significant reports have recommended reform: the High Seas Task Force's (2006) Closing the Net and the Global Ocean Commission's (2014) From Decline to Recovery: A Rescue Package for the Global Ocean.

This paper aligns with these reports and with key voluntary guidance such as the Food and Agriculture Organization of the United Nations' (FAO) 2001 International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (IPOA-IUU), which highlighted the need for countries to share information and implement its recommendations either through their fisheries management agencies, regional organisations or the FAO. It also recommended encouraging full participation of stakeholders—including industry, fishing communities and non-governmental organisations (NGOs)—in combatting IUU fishing.

Need for National Good Governance

Because of the complexity and the scale of IUU fishing, a comprehensive global system of enforcement and compliance is needed to tackle this issue. Although many efforts to stem IUU fishing are international, national governments must initiate much of the action, including regulating their own coastal fisheries, enacting regulations at ports of entry, ratifying international agreements, and employing new tracking and transparency technologies.

Three Drivers of IUU Fishing

Despite many official statements and reports, and some traction, the problem remains a huge threat to future fisheries, food and social security and healthy ocean ecosystems. This paper assesses the nature of the problem and suggests approaches needed to tackle it.

We assess three major drivers of IUU fishing and offer some actions that would be decisive if adopted by the majority of stakeholders. The three main drivers are the large economic incentives for illegal fishing, weak governance at all levels that creates an easily evadable regulatory patchwork, and barriers to enforcement, mainly the lack of surveillance, monitoring and consistent prosecution of illegal activities.

1. *SDG 14.4: By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics.*

- **Economic incentives** drive IUU fishing and other illicit activities such as bonded labour. IUU fishing is a low-risk, high-gain activity. Market and government mechanisms that promote traceability and transparency throughout the supply chain can help shift these incentives.
- **Weak governance** at the national, regional and international levels creates a regulatory patchwork that has allowed IUU fishing to flourish. Coordinated ratification and implementation of strong international fisheries governance regimes, such as the FAO's PSMA, can begin to fill these gaps.
- **Barriers to enforcement** stemming from a lack of resources and the logistical difficulties of effective monitoring, control and surveillance (MCS) over vast areas of the ocean undermine attempts to stop IUU fishing. Emerging low-cost, yet powerful technologies for surveillance and catch documentation coupled with regional partnerships offer new opportunities to overcome these barriers. Decisive penalties for violators of fishing regulations must follow.

This paper summarises detailed opportunities for action to combat each driver. Chapter 7 describes some immediate opportunities for action. Appendix A summarises existing fisheries agreements and bodies, and Appendix B offers a list of specific actions for various stakeholders as possible voluntary actions to submit under SDG 14.4.

1. The Need to Combat IUU Fishing

Global fishing is important for food security. This chapter discusses the importance of the global fishery for food security, the scale of the IUU problem and how the illegal fishery operates. See Box 1 for the official definition of IUU fishing.

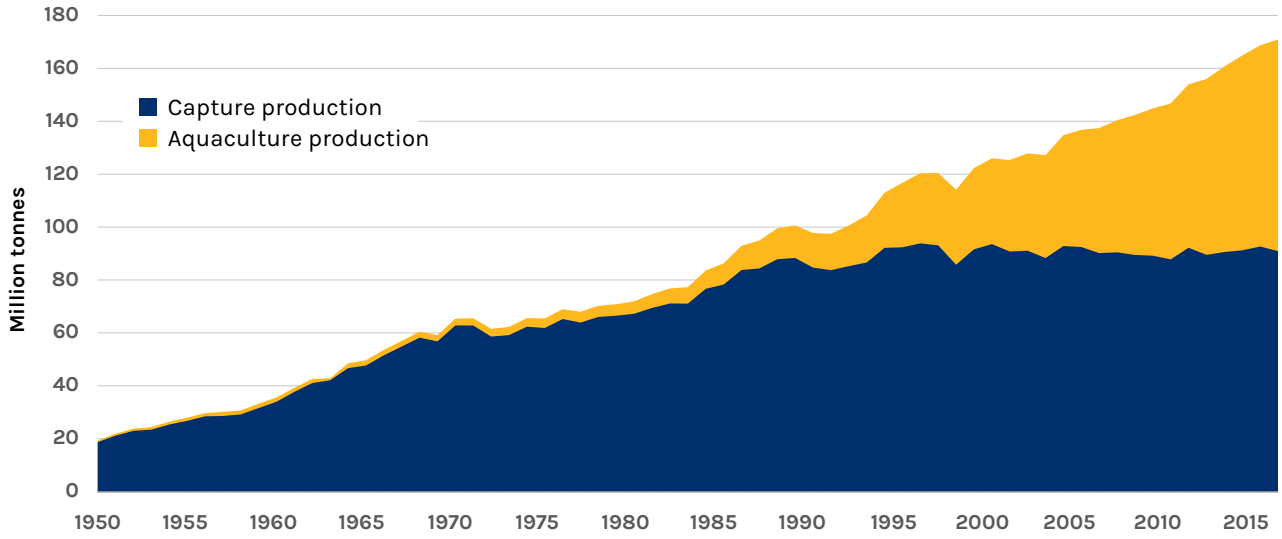
1.1 Trends in the Global Fish Catch and Its Importance to Global Food Security

Reported global fish catch plateaued in the late 1980s and has declined slightly. Adding an estimate for illegal and unreported catches significantly boosts the catch estimate but indicates that the global fishery may be in decline. Aquaculture is expanding but it relies heavily on capture fisheries for feed. Meanwhile fish consumption is rising at a rate faster than population growth. Fish is an excellent source of nutrition, and preferable to many other protein sources for climate change mitigation.

Estimated global fish catch

The FAO reported in its 2018 *State of World Fisheries and Aquaculture* report that global fish[2] production peaked in 2016 at 171 million tonnes (with aquaculture representing 53 percent of this amount), which was valued at $362 billion (FAO 2018). Wild-caught fisheries increased steadily since 1950 but broadly plateaued in the late 1980s (Figure 1). Since 1974, the percentage of underfished stocks has continued to reduce, and today only 7 percent of the world's fisheries are underfished while 33 percent are overfished.

Figure 1. World Capture Fisheries and Aquaculture Production, 1950–2016



Note: Excludes aquatic mammals, crocodiles, alligators and caimans, seaweeds and other aquatic plants.

Source: FAO 2018.

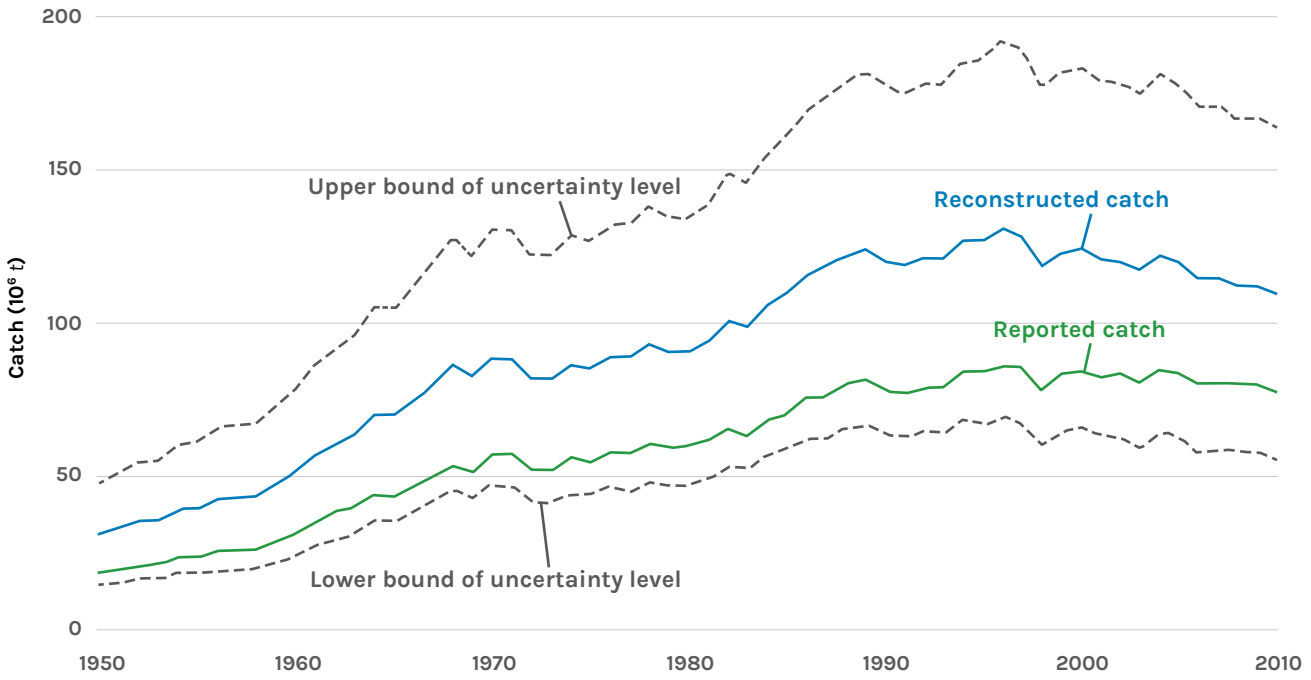
2. *The term* fish *in reference to the FAO's State of World Fisheries and Aquaculture indicates fish, crustaceans, molluscs and other aquatic animals but excludes aquatic mammals, crocodiles, caimans, seaweeds and other aquatic plants. Global fish production peaked in 2016 at about 171 million tonnes, with aquaculture representing 47 percent of the total and 53 percent, if non-food uses (including reduction to fishmeal and fish oil) are excluded.*

To add estimated illegal catches to the FAO reported data, Pauly and Zeller (2016) reconstructed unreported fish catches from 1950 to 2010. Their results showed not only the enormity of the illegal catch but the possibility that due to sustained overfishing and under-reporting of catches, global marine fisheries catches are declining much more than FAO data indicates (Figure 2). This decline in reconstructed catches reflects declines in industrial catches and to a smaller extent a decline in discarded catches, despite the expansion of industrial fishing from industrialised countries to the waters of developing countries. The differing trajectories suggest a need for improved monitoring of all fisheries, including often-neglected small-scale fisheries, and illegal and other problematic fisheries, as well as of the discarded bycatch.

Aquaculture depends on capture fisheries

With capture fishery production relatively static or declining since the 1980s, aquaculture has continued impressive growth to supply fish for human consumption. Yet this sector remains heavily dependent on wild-caught fish as feed and therefore remains inextricably linked to the issues of IUU fishing and threats to the ocean ecosystem through heavy extraction of 'trash fish'; fish too young or too small for human consumption. An estimated 63 percent of all wild-caught forage fish are used for fish meal and account for upwards of 1 trillion fish taken from the ocean annually, valued at $17 billion (Pikitch et al. 2012). Significant expansion of fed mariculture systems, seen as necessary

Figure 2. Trajectories of Reported and Reconstructed Marine Fisheries Catches, 1950–2010



Source: Pauly and Zeller 2016.

to producing more food, is predicated on major innovations in feed to make production less dependent on capture fisheries. Until that innovation is achieved, management of capture fishery resources will be critical to ensuring environmental and economic sustainability as well as food security (Costello et al. 2019).

Fish consumption expands beyond population growth

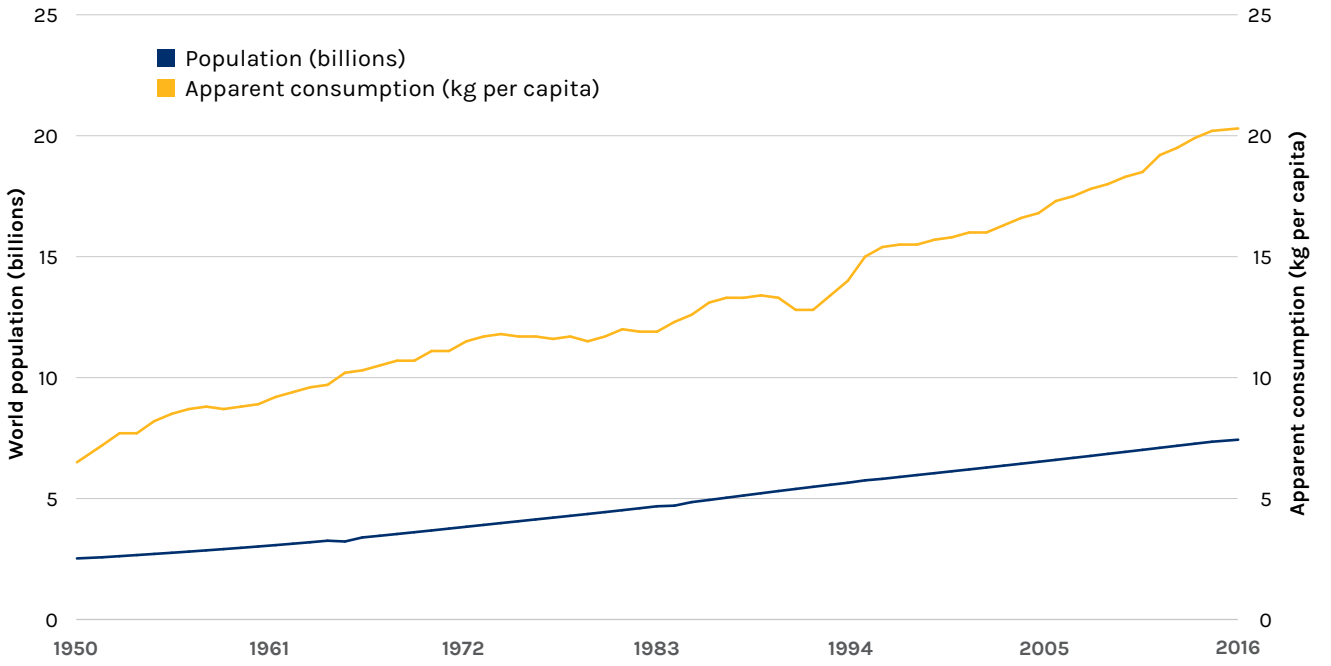
Fish consumption is increasing at 3.2 percent annually, outpacing the global population growth of 1.6 percent (Figure 3). Urbanisation is leading to increased fish consumption (Béné 2015), especially in the emerging Asian economies. Asia's share of world fish consumption increased from 67 percent in 2008 to 70 percent in 2013 (FAO 2017). Many Southeast Asian markets, including Indonesia and the Philippines, prefer fish to other types of animal protein. Total global consumption of seafood is projected to increase by 20 percent (30 million tonnes) by 2030, with most of the increased demand coming from developing nations in Latin America, Africa, Oceania and Asia (FAO 2018).

Fish provide almost 20 percent of the average per capita intake of animal protein globally. The percentage is higher in some areas, such as in Bangladesh, Cambodia, the Gambia, Ghana, Indonesia, Sierra Leone, Sri Lanka and some small island developing states, where over 50 percent of people's animal protein intake can come from fish (Figure 4).

The Importance of Seafood for Nutrition and Food Security

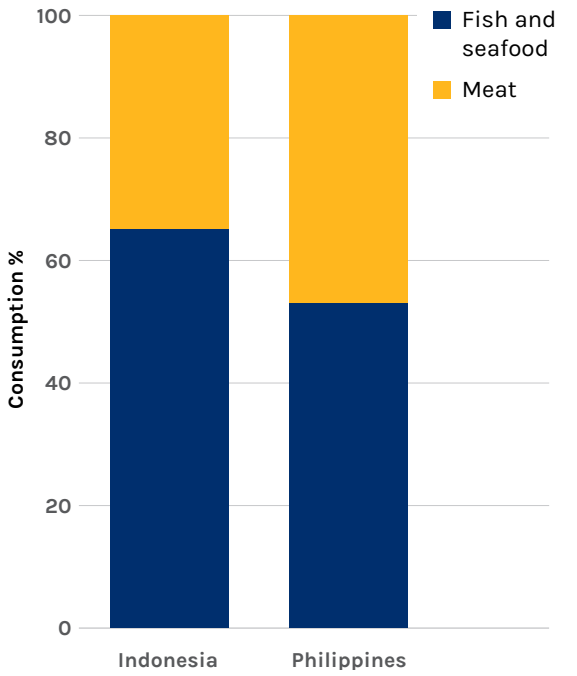
Food from the sea is uniquely poised to contribute to food security because fish is a highly efficient form of protein—150 grams of fish provide 50-60 percent of an adult's daily protein requirement (FAO 2018). Fish is also a unique source of essential nutrients, including omega-3 fatty acids, iodine, vitamin D, and calcium. Fish consumption by expectant mothers aids their children's neurodevelopment and these proteins and nutrients remain particularly crucial in the first two years of a child's life (FAO 2018).

Figure 3. Increase in World Population and Apparent Consumption of Fish, 1950–2016



Source: FAO 2018.

Figure 4. Comparisons of Meat and Seafood Per Capita Consumption in Indonesia and the Philippines, 2014



Source: Friend 2015.

Shifting diets towards fish consumption could also help mitigate climate change because ocean-based proteins are substantially less carbon intensive than land-based proteins (especially beef and lamb). It is estimated that shifting diets to ocean-based proteins can result in mitigation potential of 0.24–0.84 gigatonnes of carbon dioxide equivalent (GTCO2e) per year in 2030 (Hoegh-Guldberg 2019).

IUU fishing impacts fisheries management because it skews scientific data, making assessments of fish stocks unreliable and therefore risking the collapse of the populations of overfished species. Fish harvested legally and sustainably can be properly managed to provide animal protein for generations to come. With judicious conservation and improved management, capture fisheries could produce as much as 20 percent more catch than today and up to 40 percent more than projected future catch under current fishing pressures (Costello et al. 2019).

1.2 The Scale of IUU Fishing

IUU fishing, as the name implies, is fishing that is illegal, unreported and/or unregulated (Box 1). Estimating the scale of IUU fishing is challenging. The most recent global estimate suggests that the global illegal and unreported annual catch is between 11 million and 26 million tonnes of fish, with a value of $10 billion to $23 billion. IUU fishing accounts for up to 20 percent of the world's catch and as much as 50 percent in some fisheries. This often-quoted report is based on data from 2005 and focuses on industrial-scale fisheries (Agnew et al. 2009).

A more recent regional study of the western and central Pacific Ocean found lower estimates of IUU fishing volume and value: the value was estimated at $707 million to $1.56 billion (MRAG Asia Pacific 2016). Whereas Agnew et al. (2009) made regional and global estimates across a suite of species (e.g., demersal fish, shrimp), which included parts of Indonesia and the Philippines (across FAO Area 71), MRAG Asia Pacific (2016) focused on tuna and included Indonesia and the Philippines; thus, direct comparisons should be made with caution.

The FAO is considering developing a new report on the state of IUU fishing. The first step was to review studies estimating IUU fishing and methods they used (Macfadyen et al. 2016). The decision to go ahead with a new report was pending as of late 2019.

Box 1. Definition of Illegal, Unreported and Unregulated Fishing

The IPOA-IUU provides the following definition of IUU fishing.

Activities are classified as **illegal** fishing if they are:

> conducted by national or foreign vessels in waters under the jurisdiction of a State, without the permission of that State, or in contravention of its laws and regulations;
>
> conducted by vessels flying the flag of States that are parties to a relevant regional fisheries management organization but operate in contravention of the conservation and management measures adopted by that organization and by which the States are bound, or relevant provisions of the applicable international law; or
>
> in violation of national laws or international obligations, including those undertaken by cooperating States to a relevant regional fisheries management organization.

Unreported fishing refers to activities which:

> have not been reported, or have been misreported, to the relevant national authority, in contravention of national laws and regulations; or
>
> are undertaken in the area of competence of a relevant regional fisheries management organization which have not been reported or have been misreported, in contravention of the reporting procedures of that organization.

Finally, a catch is considered **unregulated** if fishing is conducted:

> in the area of application of a relevant regional fisheries management organization that is conducted by vessels without nationality, or by those flying the flag of a State not party to that organization, or by a fishing entity, in a manner that is not consistent with or contravenes the conservation and management measures of that organization; or
>
> in areas or for fish stocks in relation to which there are no applicable conservation or management measures and where such fishing activities are conducted in a manner inconsistent with State responsibilities for the conservation of living marine resources under international law. (FAO 2001)

1.3 The Modus Operandi of IUU Fishing

The perpetrators of IUU fishing tend to follow particular methods to achieve their goals. Identifying these practices and patterns can help monitoring authorities or law enforcement officers detect IUU fishing or other crimes. These include moving the catch from one vessel to another at sea (transshipment), using flags of convenience or non-compliance, using ports of convenience which offer little inspection, deactivating vessel monitoring or automatic identification and tracking systems, using a complex network of ownership, carrying fraudulent ship's documents and maintaining poor conditions for the ship's crew. IUU fisheries operate mainly offshore but have also infiltrated small artisanal fisheries.

Transshipment: Moving the catch from vessel to vessel

Transshipment—moving the fish catch from one vessel to another, at sea or in port—is a common practice in the global fishing industry. At sea, transshipment facilitates the efficient delivery of fish to ports while allowing fishing vessels to continue to fish without having to put in to a port.

However, poorly governed transshipment has significant costs. The benefit of transshipment is generally with the industry in terms of improved profits, while the costs are felt most by the legal fishers and the society that owns the resource. Think of a transshipment vessel as a floating port. The fish transferred to this vessel do not always land at the adjacent coastal states port; indeed, the catch is often taken far away, and the economic benefits are not fully felt at the point of catch. In the western and central Pacific Ocean alone, a recent study

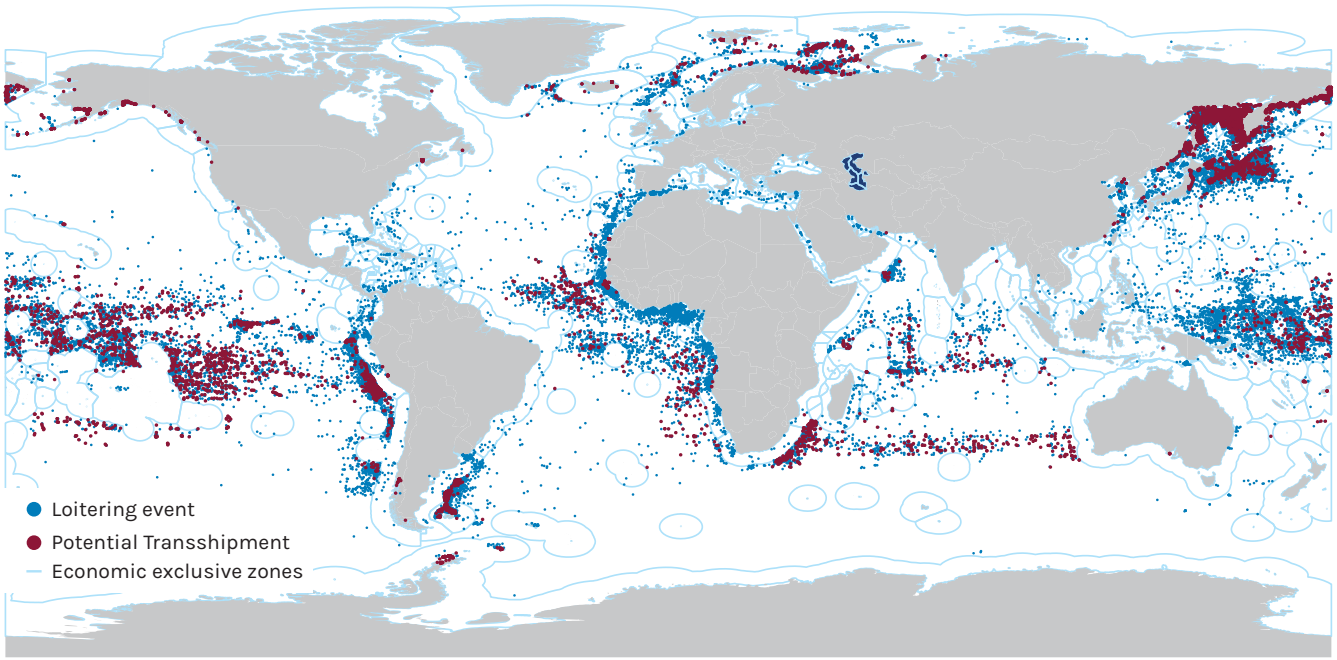
estimated that more than $142 million worth of tuna and tuna-like products are lost in illegal transshipments each year (MRAG Asia Pacific 2016).

Transshipment is pervasive in high seas fisheries. Both refrigerated cargo vessels and larger fishing vessels transfer fresh catch from thousands of fishing vessels and take it to the first point of landing for onshore processing. Although transshipment touches a wide range of seafood products, tuna makes up a particularly large portion of it, in part because this highly prized fish can be frozen and brought from distant waters and still command high values at the market. Although moving catch from vessel to vessel may seem harmless, a lack of effective monitoring allows bad actors to obscure or manipulate data on their fishing practices, the species or amounts caught and the catch locations, thus badly distorting supply chains and efforts to make them more transparent.

Transshipment allows fishing vessels to remain at sea longer, which means more continuous fishing effort and, ultimately, additional overfishing of vulnerable fish stocks, especially tuna. While at sea, fish are kept in holds for longer periods, leading to co-mingling of IUU and non-IUU caught fish prior to landing and further muddying the traceability of supply chains.

Global Fishing Watch used five years (January 2012 to December 2017) of Automatic Identification System data to produce a report which showed that 694 vessels were capable of transshipping fish at sea. It produced a map showing 46,570 instances in which these transshipment-capable vessels were going slow enough long enough to make a transshipment and 10,233 instances in which a fishing vessel was in the proximity of a transshipment vessel long enough to engage in transshipments. Figure 5 shows a global map of possible ship contacts for transshipment.

Figure 5. Loitering Events and Potential Transshipment at Sea, January 2012 to December 2017



Source: Global Fishing Watch 2017.

Using flags of convenience and flags of non-compliance

Flags of convenience. Under international law, the country whose flag a vessel flies is responsible for regulating and controlling the vessel's activities. Flags of convenience (FOCs) refer to the registration of a vessel to a flag state with no genuine link to the vessel's owners or operators. This offers competitive advantages to vessel owners, including limited regulatory oversight, ease of registration, reduced taxation, and ability to obscure beneficial ownership. Generally, an FOC country has an open registry, making a business from granting its flags to vessels (including fishing vessels) that are owned by nationals from other states.

FOCs are one of the simplest and most common ways in which unscrupulous fishing operations can circumvent management and conservation measures and avoid penalties for illegal fishing. Fishing vessels can use FOCs to re-flag and change ship names rapidly to confuse management and surveillance authorities, a practice known as flag hopping (EJF 2009). Extensive labour abuses and lack of safety protocols are well documented on FOC vessels (International Transport Worker Federation 2020). The use of FOCs has existed for decades, and the majority of today's merchant marine fleet is flagged to FOC countries (International Chamber of Shipping 2015).

In international waters, measures to regulate fishing apply only to countries that are members of regional fisheries management organisations (RFMOs), but if a vessel re-flags to a state that is not a party to these agreements, it can fish with total disregard for agreed management measures. A 2009 report by the Environmental Justice Foundation shows that RFMO blacklists are dominated by vessels with FOCs or flags unknown (EJF 2009). In recent years, many FOC countries have become members of RFMOs and do abide by the regulations.

Just because a vessel has an FOC does not mean it is fishing illegally, but the proven culpability of many FOC vessels in illegal fishing cases presents a compelling argument for an end to their use by fishing vessels. States that offer FOCs are listed by the International Chamber of Shipping, but many of these flags are not used significantly by fishing vessels. The International Transport Workers' Federation maintains a list focused on labour conditions.

Flags of non-compliance. Many flag states without open registries have poor reputations for combatting illegal fishing and associated crimes. These countries often offer 'flags of non-compliance,' which means they grant authorisation to a vessel to fly its flag as well as authorisation to fish, but they lack the resources or the intent to monitor and control these vessels.

The obligations of flag states have been tested. The International Tribunal for the Law of the Sea issued an advisory opinion (April 2015) on Case 21 posed by the West African Sub-Regional Fisheries Commission (SRFC), which stated that a flag state remains obligated for the conduct of a vessel, even when it is in a third country's exclusive economic zone (EEZ), because a flag state 'is under the "due diligence obligation" to take all necessary measures to ensure compliance and to prevent IUU fishing by fishing vessels flying its flag' and that 'the SRFC member states may hold liable the Flag State' (Owen 2016).

Similarly, the International Court of Justice was involved in fisheries cases (1974 and 1998) and remains a jurisdiction to be considered in pursuing IUU fishing violations.

Using ports of convenience

In an attempt to avoid adequate inspections, companies engaging in IUU fishing send their vessels to ports with poor or no inspection controls. Ports of convenience are ports where catches can be landed with minimum inspection due to a lack of capacity, poor recording systems for catch landings, or corruption among inspectors. These ports of convenience allow the illegal fishing industry to gain access to the marketplace and to ensure logistical support for their vessels.

Some ports of convenience are also free trade ports (or free economic zones). These zones have favourable customs regulations and little or no controls for landings or transshipment. Illegally caught fish can easily enter the market and be shipped onwards undetected by the flag state or even the port state. The increasing transport

of fish by refrigerated container is a growing challenge because these containers often transit through different areas of a port (or separate ports) and are frequently under the jurisdiction of government agencies other than those responsible for fisheries.

Deactivating vessel identification and monitoring systems

Monitoring is always challenging work in fisheries. The main tools used for monitoring fishing vessel activities are the Vessel Monitoring System (VMS) and the Automatic Identification System (AIS). Yet, IUU fishing vessels often deactivate or manipulate these systems to hide their identity and location.

Many authorities use VMS to combat IUU fishing and manage their fisheries. However, not all countries operate a VMS system, and those that do often do not operate the same system or have information-sharing agreements; thus, information transfer is hampered, does not happen or is costly. Additionally, some flag states fail to uphold their responsibilities to monitor their fleet (see earlier discussion of FOCs). That being said, a properly used VMS system can be very effective.

AIS is a tracking system for ships, designed for collision avoidance. It allows vessels to be 'seen' by each other regardless of their size or the weather conditions. AIS was originally a coastal ground station system limited to coastal zones or between ships at sea, but since the satellite transmission of AIS data became possible, the resulting global coverage made it quickly useful for understanding vessel behaviour with applications beyond collision avoidance.

The AIS data set, however, has limitations. There is no global mandate for fishing vessels to use AIS, although several states, including the European Union, do mandate its use. Vessels that use AIS can turn off or tamper with it. Some fishers turn off their AIS to hide their fishing locations from competitors or because of security or piracy risks in the area. Others turn off their AIS because they are engaging in IUU fishing and wish to hide their activities. Some vessels may simply have malfunctioning AIS devices. The FAO recently published a *Global Atlas of AIS Fishing* which provides further insight in the value of AIS in monitoring fishing activity (Taconet et al. 2019).

Ships operated and financed by a complex network of ownership

Investigating and prosecuting illegal fisheries cases throughout the value chain is a complex and resource-intensive process (Box 2). Because fisheries operations occur in a number of jurisdictions, investigators need close cooperation and information sharing among countries, agencies and relevant international institutions. Unfortunately, most illegal fishing cases at the national level focus on prosecuting only the vessel and its crew for the alleged violation. There is often little effort to identify illegal activities that may have taken place by the same vessel in other jurisdictions or to prosecute the networks, and ultimately the owners, behind these IUU operations. The use of shell companies and joint-venture agreements to 'own' and operate fishing vessels makes it even more complex to identify and target the individuals benefitting from the illegal activities.

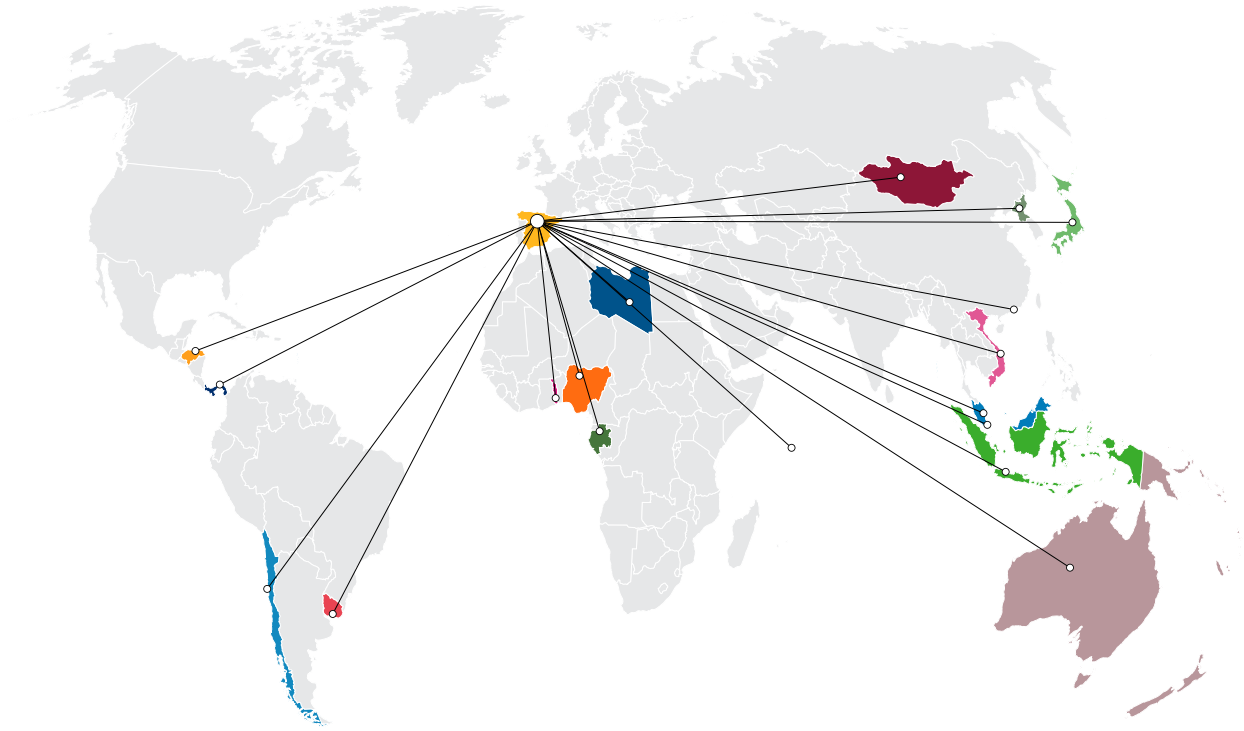
A shell company holds funds and manages financial transactions for another company. Although shell companies are legal in many countries, their use can benefit those involved in illegal fishing, both in terms of avoiding taxes and hiding true ownership of fishing operations.

A joint venture agreement is an arrangement in which two entities develop a new entity for their mutual benefit. Joint ventures are used widely, and often perfectly legally, in fisheries around the world. In countries where access to fisheries resources is prioritised for nationals, joint ventures allow foreign players to access the fishery. While many joint-venture agreements are legal, these types of agreements can be exploited to perpetuate illegal fishing. Local partners, who in theory are majority shareholders, can in fact have little say in or control of the fishing operation, and it is frequently unclear how profits are shared. Joint ventures are also linked to corruption to protect vessels and their owners from prosecution and fines.

Box 2. The Complex Case of the Fishing Vessel *F/V Viking*

An example of a complex ownership network is found in the operation of the *F/V Viking*. This vessel changed its name 12 times and used 10 different flags. The identity of the owner was well hidden. Interpol and the governments of Indonesia, Norway, Spain and South Africa worked together to uncover the beneficial owners and bring an end to their operation. The *F/V Viking* was caught and sunk in Indonesia in 2016. While the *F/V Viking* was operating, its catches were exported to Hong Kong, Malaysia, Vietnam and Taiwan through an investment company in South Africa. The *F/V Viking* was owned by Spanish and Panamanian companies and operated by an agent in Seychelles and Southeast Asia, which domiciled in several countries. The *F/V Viking* was also operated from Singapore for crewing, logistics and financing (Figure B2.1).

Figure B2.1. Travels of the *F/V Viking*



Honduras	Flag 8	**Nigeria**	1 company listed as owner	**Vietnam**	1 company as buyer
Panama	1 company listed as owner of *Viking*	**Libya**	Flag 10	**Hong Kong**	1 company listed as owner
Chile	Captain's nationality	**Seychelles**	1 company listed as owner	**Mongolia**	Flag 7 & 9
Uruguay	Flag 3	**Australia**	Agent operator's nationality	**North Korea**	Flag 5
Togo	Flag 2 & 6	**Indonesia**	Manning agency	**Japan**	Flag 1
Equatorial Guinea	Flag 4	**Singapore**	Operational site of the agent and where they were arrested		

Source: Task Force 115 2018.

Use of fraudulent documents and vessel identification

Documents carried on a fishing vessel should provide information about the vessel's identity, registration, physical characteristics, authorised fishing activities and authorised locations, and whether it has been certified as compliant with required safety regulations. However, documents can be altered, replicated or obtained by illegal means, so it is essential that vessel documents are systematically verified as part of the fisheries MCS process.

False documents are used to hide illegal activities or to avoid obligations and costs. False vessel registration certificates, fishing licenses or catch certificates are key elements in many cases of illegal fishing; illegal operators either alter existing documents or create forged documents. There are several reasons an illegal fishing operator may use false documents, including for the following purposes:

- **Concealing the true identity of a vessel.** For example, to cover up a history of illegal activity or unpaid fees, a vessel owner may falsify the vessel's identity when seeking port access, registration or licensing by using false documents.
- **Avoiding complying with safety regulations.** For example, false certificates may be used to conceal that a vessel has not passed safety inspections or that safety equipment may be out of date or not suitable for the vessel size or type.
- **Avoiding or underpaying fees.** For example, the cost of vessel registration, licensing, port access and other services is often linked to vessel capacity or size, with vessels in a larger tonnage or length category paying more.
- **Gaining illegal access to resources or services.** For example, inshore fisheries waters may be reserved for smaller vessels, or authorisation to transship may be granted only to vessels of a certain type or carrying a certain fishing license.
- **Gaining additional benefits.** For example a vessel registered with one flag state with genuine documents could remain registered with a second flag state to secure access to benefits available from each flag state, such as access to subsidies under one flag and fisheries access under the other.

False documents can take a number of forms: they can be obtained by deception and/or by corruption; they can be used incorrectly, such as for the wrong vessel; original documents can be doctored; and false documents can replicate authentic ones.

Verification of documents relating to fishing vessels is therefore a key component of fisheries MCS. Documents should be checked and verified when a fishing vessel is inspected during at-sea or port inspections, and when a fishing vessel operator provides documents to an authority; for example, when applying for a fishing license. Flag, coastal, port and market states are all vulnerable to false documents, and all have a responsibility to have robust document verification capacity and routines in place. This should include through visual analysis, cross-referencing of information, and verification by issuing authorities.

Vessel identity fraud is used to hide fishing and operational history and activity; reduce costs; misinform and confuse licensing, flagging and inspection authorities; cover up a history of IUU fishing; and evade sanctions when caught violating regulations or breaking laws. Three main forms of vessel identify fraud are common:

- A vessel may use the genuine identity of another vessel, which results in two or more vessels using the same identity simultaneously—cases have been detected involving up to five vessels using one identity.
- A single vessel may use more than one identity, appearing under different names, flags and so on in different jurisdictions and records.
- A vessel may use a new identity that has not been registered with any national authority.

An individual vessel may be involved in more than one of these forms of identity fraud at any one time. Identity fraud can enable a vessel to operate illegally under the cover of a legal and authorised vessel's identity—for example, a vessel operator might purchase one legal fishing license which is used by the vessel named on the license as well as by several other vessels that assume its identity.

Vessel identity fraud can also involve changes to the physical vessel appearance. Inspectors should look for signs that a vessel's name, call sign and other identifiers have recently been repainted or altered. It is also important to check that any historic name or other identifiers visible under paint on the hull match the name history of the current vessel identity—this can be done through verification with the flag state and using sources such as RFMO authorised vessel lists. The systematic collection and comparative analysis of vessel photographs is also important to detect vessel identity fraud.

Poor working conditions and safety standards

Sub-standard working conditions and poor safety standards are a hallmark of vessels engaged in IUU fishing. Operators who under-report catch or fish illegally are less likely to provide their crews with adequate labour conditions, training or safety equipment and more likely to fish in hazardous weather. To minimise up-front costs, their vessels might have inadequate equipment or inappropriate modifications and might operate for extended periods without undergoing inspections or safety certifications. International investigations have shown that some migrant workers seeking employment overseas have been tricked with false promises of jobs on land and end up toiling in abhorrent working conditions on board unsafe fishing vessels roaming the high seas (Pew Charitable Trusts 2018).

To ensure the safety of crews on board fishing vessels and improve working conditions, governments can implement the International Labour Organization (ILO) Work in Fishing Convention (C188) and accede to the Cape Town Agreement (CTA). Enforcing labour standards will impact on the profit margins of IUU fishers and drive better behaviour.

The CTA is not yet in force but will set minimum requirements on the design, construction, equipment and inspection of fishing vessels 24 meters or longer that operate on the high seas. Its entry into force would empower port states to carry out safety inspections that could be aligned with fisheries and labour agencies to ensure transparency of fishing and crew activities.

1.4 IUU Fishing Invades Small-Scale and Artisanal Fisheries

IUU fishing also has significant impacts in small-scale and artisanal fisheries. The challenges faced by these fisheries are different from those of industrial and high seas fisheries. In the first place, most small-scale fisheries are open access in nature, and entry into the fishery remains unrestricted in many fisheries throughout the world. Fishing restrictions, however, have been implemented in a substantial number of artisanal fisheries, recognising that nowadays these fisheries are capable of generating significant economic exchanges and exert substantial fishing effort.

IUU fishing practices in small-scale fisheries are common and diverse, including the use of dynamite and other explosives and poisons to kill fish; the use of fine mesh fishing nets and other destructive gears, methods and techniques; the use of traps and weirs; the destruction of mangroves and coral reefs; and the catch of juvenile and immature fish and invertebrates, among others.

One clear indication of the lack of regulations or enforcement is growing evidence that worldwide, small unassessed stocks are in substantially worse condition than large assessed stocks. Local decline of small-scale stocks has been related to IUU fishing practices. Recent studies in West Africa showed a tenfold increase in fishing effort in the past 50 years, correlated with a one-third decline in the catch per unit of effort (Belhabib et al. 2017).

In high-value species targeted by artisanal fisheries, such as abalone, lobster, swim bladder and bêche-de-mer, the illegal catch may be higher than the legal catch, and this has been identified as the main cause of fisheries collapse (Hilborn et al. 2005).

Box 3. Regulations Fail to Stop Illegal Fishing for High-Value Chilean Loco

Artisanal fisheries are socially and economically important in Chile, engaging nearly 90,000 fishers. The existence of two management strategies regulating the exploitation of most benthic resources for the past 15 years allows comparisons of fishing mortality under co-management in the novel territorial use rights for fisheries (TURF) system and under traditional top-down management (e.g., bans, minimum legal size) in open access areas (OAAs). Enforcement is more efficient in TURFs than in OAAs since the fishers themselves have a vested interest in protecting their TURF. Access to fishing grounds and enforcement level seem to be critical factors determining the abundance of exploited resources.

Comparative studies conducted in two management areas of central Chile showed that densities of all benthic resources and coastal fishes were higher in TURFs than in nearby OAAs. The densities of locos (Concholepas concholepas), the most valuable resource, are also significantly higher in co-managed TURFs and Marine Protected Areas than in OAAs, despite loco exploitation being completely banned in OAAs since 1993. This pattern of abundance suggests that illegal fishing of locos seems to occur in OAAs and offers a platform to analyse the extent of illegal fishing in traditional, open access management regimes. To date, illegal fishing of locos has been reported inside TURFs, and it seems to be relevant. Illegal fishing in OAAs may have tremendous impacts on the abundances of locos and other resources, especially considering the large fraction of the coast under an open access regime observing poor enforcement. This is of global interest since the problems are common in artisanal fisheries worldwide (data-poor fisheries, illegal fishing, poor enforcement), highlighting, with precautions, the value of TURFs for management and conservation in such scenarios.

Source: Andreu-Cazenave et al. 2017.

Unreported fish catches are substantial. The consequences are large, considering that artisanal fisheries account for 30 percent of the world catch and employ 90 percent of all fishers. Indeed, the recent *Hidden Harvest Report* (Fluet-Chouinard et al. 2018) suggests it is more like 50 percent of world catch. Moreover, 90 percent of the landings from artisanal fisheries are currently directed to human consumption, in contrast with 50 percent of the landings of industrial fisheries.

Artisanal fisheries are an important source of employment and income in the developing world, yet most strategies to overcome the IUU catches concentrate on large stocks and larger ships. While this focus will have a positive impact where large and small vessels are targeting the same stock, there is a need to more closely monitor small-scale fleets and improve small-scale fishing behaviour. The cost of technology needed to track smaller vessels currently inhibits widespread use, but costs will drop, and consequently, the number of small vessels being tracked will increase. There is increasing evidence, thanks to the growing number of fisheries projects focused on artisanal fisheries, that smaller-scale fishers want to be tracked to speed up their access to ports and to protect them from unscrupulous larger vessels.

IUU fishing causes a significant threat to global fisheries and to the health of the ocean. It damages legitimate fishing activity and associated livelihoods. Illegal gear impacts biodiversity and abundance, which in turn impacts food and economic security. Plus, unreported IUU fishing skews the scientific data, making sustainable fisheries management difficult to implement.

2. The Impacts of IUU Fishing

2.1 Impacts on Biodiversity

Fishing has had by far the greatest impact on loss of biodiversity in the ocean (IPBES 2019). IUU fishing, which undermines fisheries management and conservation measures, obscures accurate assessment of fish stocks and fishing pressure, which allows stocks to be fished beyond sustainable limits to the risk of collapse.

Before 2015, limited monitoring and control and poor enforcement, exacerbated by open access regimes and subsidies, made Indonesian waters a haven for IUU fishing. The Arafura Sea, one of Indonesia's most productive areas since the 1970s, became a hot spot for illegal shrimp trawling by domestic and foreign fleets. From reporting, it became evident that the populations of shrimps, hair tails, snappers and groupers in the Arafura Sea were steadily declining, as well as the average size of the catches. Similar problems were being seen in the South China Sea and Java Sea.

In central Chile, coastal artisanal fisheries have experienced the illegal and unreported removal of highly valued gastropod (Box 3) and a carnivorous fish, which produces a cascading effect on trophic interactions driving a deterioration of natural habitats (kelp forest), affecting species richness and generating unpredictable consequences on the sustainability of several benthic fisheries (Andreu-Cazenave et al. 2017).

A significant court decision further illustrates the damage that can be done to coastal fisheries. From 1987 to 2001, Arnold Bengis, Jeffrey Noll and David Bengis engaged in an elaborate scheme to illegally harvest large quantities of rock lobsters off the south and west coasts of South Africa for export to the United States in violation of both South African and U.S. law. Their actions led to the collapse of the rock lobster fishery, and a New York court ordered a restitution award for what it would cost South Africa to restore the fishery to the level it would have been had the defendants not engaged in overharvesting—almost $30 million (United States v. Bengis 2013).

Impacts on non-target species have been significant. For instance, catch of albatross by IUU toothfish fisheries in Antarctic waters under the Convention on the Conservation of Antarctic Marine Living Resources has been estimated to be one of the primary drivers of decline in some albatross populations (Michael et al. 2017). Some trawling and dredging gear disturbs or destroys seafloor habitat. For example, Clark et al. (2019) found that benthic communities associated with biogenic habitats formed by deep-sea corals and sponges on seamounts are among the most susceptible to fishing impacts because their resilience is apparently very low. The researchers found little recovery 15 years after trawling. Recovery times of benthic communities on seamounts may be on the order of decades—making restoration unachievable in the short term, as well as prohibitively expensive in the deep sea.

The growing literature on the extent of bottom trawling, together with a greater recognition of the potential severity of human impacts in the deep sea and the long recovery periods from such impacts, support the contention that spatial management is likely to be the most effective strategy to conserve benthic communities of seamount ecosystems (Clark et al. 2019).

2.2 Social and Economic Impacts

IUU fishing has economic impacts for fishers and consumers. In the short term, these impacts may be positive because any fish catch brings returns to fishers and cheaper fish to consumers. However, in the medium and long terms, the impacts become negative since

a reduction in fish stocks leads to increased fishing costs, higher prices to consumers and economic losses to the tourism sector (Tinch et al. 2008; Zimmerhackel et al. 2018).

Indirect impacts continue across the value chain, which rarely ends when the catch is landed (except for subsistence fisheries where the catch is directly consumed). Instead, value is created each time the fish changes hands; for example, it is sold to markets and resold to consumers or to an intermediary who purchases large quantities for processing and resale to a retail outlet (Dyck and Sumaila 2010). Therefore, a reduction in catch results in a potential loss of added value across the fish value chain in the legitimate formal sector as well as a loss in household income to fisheries workers. For example, illicit trade in the marine resources of West Africa, including illegal fishing practices, is estimated to cost the region nearly $1.95 billion in lost economic impact across the fish value chain and $593 million per year in lost household income (Sumaila 2018). Another study estimated the economic and household income impact losses to be up to $21.1 billion and $5.4 billion respectively per year for the Pacific Ocean (Konar et al. 2019). The same study estimated the loss in tax revenues at $200 million to $1.6 billion per year, which means this money is not available for public spending on, for example, infrastructure, education or health care (Konar et al. 2019).

Value is created each time the fish changes hands; for example, it is sold to markets and resold to consumers or to an intermediary who purchases large quantities for processing and resale to a retail outlet.

Decreased fish stocks due to overfishing may lead to social impacts, loss of cohesion and migration away from the coast towards urban areas, ultimately even stretching to conflict over resources (DCDC 2018). More likely is local disorder among fishers as a consequence of a decrease in household income due to reduced catch opportunities and reduced employment. For example, in Sierra Leone, skirmishes between artisanal and larger IUU fishing vessels is common in the inshore area, where trawlers often fish to within 100 meters of the shoreline, placing them in direct competition with smaller vessels. Gear conflicts also occur, and there is often damage the artisanal fisher's nets or boats (Drammeh 2000). Another study using data from the Arafura Sea in Indonesia demonstrated that IUU fishing is one of the main drivers of gear conflict and gear loss (Richardson et al. 2018). For another example, see Box 4.

IUU fishing has created a culture of non-compliance because it takes advantage of corrupt administrations and exploits weak management regimes, especially those of developing countries that lack the capacity for effective MCS. IUU fishing can take fish from the waters of bona fide fishers, which can lead to the collapse of local fisheries, with small-scale fisheries in developing countries particularly vulnerable. Legal fishers and aquaculture producers, who are forced to compete with the unfair practices of IUU operators, face loss of market share and trade distortions due to the different cost structures of legal and illegal operators (Tinch et al. 2008). Products derived from IUU fishing can find their way into overseas trade markets, thus throttling local food supply (FAO 2018).

Fisheries-related crimes are closely linked with IUU fishing operations. These include forged fishing licenses, tax evasion, money laundering and inappropriate working conditions. More serious crimes, such as drug trafficking, human trafficking, arms trafficking and piracy, are also linked to IUU fishing (Interpol Fisheries Crime Working Group Prospectus 2018). For more information, see the forthcoming Blue Paper 'Organised Crimes in Fisheries'.

2.3 Climate Change and Fisheries Management

Climate change is significantly changing ocean ecology in many ways that will affect fisheries, including reducing the fisheries catches, especially in the tropics. Unsustainable fishing practices worsen the effects of these negative changes; therefore, sustainable and adaptive fishing management practices should be employed to help mitigate them.

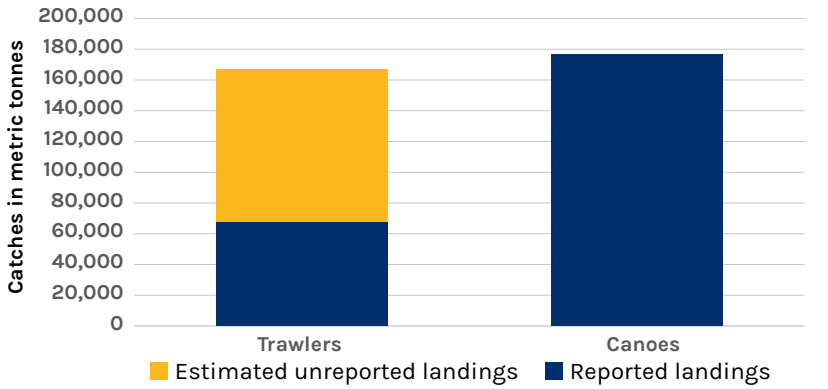
Box 4. IUU Fishers Impinge on Artisanal Fishery in Ghana

Saiko is the local name for illegal fish transshipments in Ghana, where industrial trawlers transfer frozen fish to specially adapted canoes out at sea. It used to be a practice whereby canoes would buy the unwanted bycatch of industrial vessels. However, the practice has developed into a lucrative industry in its own right, for which industrial fishers actively fish. Today, industrial trawlers target not only the demersal (bottom-dwelling) species for which they are licensed but also the same species as the artisanal fishing community, including the severely depleted small pelagics such as sardinella and mackerel. These catches, which often contain juvenile fish, are landed by the saiko canoes for onward sale to local markets. This has severe implications for Ghana's artisanal fishing sector, which is critical to food security and provides significantly more jobs than the saiko industry. Saiko is prohibited under Ghana's fisheries laws, attracting a fine of $100,000 to $2 million. The minimum fine increases to $1 million when catches involve juvenile fish or the use of prohibited fishing gear. Although saiko activities are widespread, there is a very low risk of arrest and sanction. Cases are generally settled through opaque out-of-court settlement processes, and there are no known examples of the minimum fines in the legislation being paid. In addition, most of the industrial vessels engaged in saiko are linked to foreign beneficial owners, which also contravenes Ghanaian law.

From March to September 2018, after a two-month closed season for industrial trawlers, the government of Ghana intensified enforcement action against saiko, resulting in at least one high-profile arrest. This action led to a notable decline in saiko activities at the major saiko landing site of Elmina in Ghana's Central Region. During this period, trawlers were required to land their bycatch at either the Sekondi or Tema port: this 'official' bycatch was packed in cardboard and labelled with information on the trawler company that caught the fish, for onward transport to local markets. This allowed government fisheries inspectors to monitor this catch and to check that it did not contain juveniles.

Some confusion now exists on the legality of saiko, and since 2018, landings have re-commenced at Elmina, with up to 15 saiko canoes landing fish each day. The 2010 Fisheries Regulations specifically prohibits the transshipment of fish at sea from Ghanaian industrial vessels to canoes. A recent legal opinion found that since the entry into force of the 2010 Fisheries Regulations, only those forms of transshipment that are not expressly prohibited under the regulations may be considered legal if supervised by an authorised officer. Since saiko is prohibited in the regulations, the legal opinion concluded it cannot be authorised.a

Figure B4.1. Impacts of Saiko Fishing



Source: EJF and Hen Mpoano 2019.

A recent Intergovernmental Panel on Climate Change (IPCC) special report, Ocean and Cryosphere in a Changing Climate (IPPC 2019), predicted that changes in global temperatures will impact the footprint of fisheries, consequently changing the behaviour of fishers, the incidence of IUU fishing and the connected ocean economy. The report offered likely changes with low, medium or high confidence at various emissions scenarios. It predicted (with medium confidence) a decrease in the global biomass of marine animal communities, their production, and fisheries catch potential, and a shift

in species composition over the 21st century from the surface to the deep seafloor under all emission scenarios. The rate and magnitude of decline are projected to be highest in the tropics (high confidence), whereas impacts would be diverse in polar regions (medium confidence). Projected impacts increase in high-emission scenarios. The report states that ocean warming has contributed to an overall decrease in maximum catch potential (medium confidence), compounding the impacts of overfishing for some fish stocks (high confidence; IPCC 2019). As fish stocks decline, fisher competition will likely increase, probably resulting in more IUU fishing (FAO 2018).

As the ocean has warmed, marine fish and invertebrates have shifted to track their preferred temperatures (Perry et al. 2005; Dulvy et al. 2008; Poloczanska et al. 2013; Pinsky et al. 2013). In general, this has resulted in shifts of fish populations poleward and into deeper waters. At a mean rate of 72 kilometres per decade, marine species have been moving an order of magnitude faster than terrestrial species (Poloczanska et al. 2013). This redistribution of marine resources in effect redistributes wealth among coastal states, since some will lose their fisheries while others will gain. New fishing opportunities will emerge, while some established fisheries will be reduced (Bell et al., 2011; Fenichel et al. 2016). Areas under fisheries management could be destabilised, and some fish stocks could shift into unregulated fishing areas (Cheung 2016). This type of change often triggers conflict over access to resources (DCDC 2018).

The IPCC report underlined risks of severe impacts on biodiversity, which are projected to be higher for elevated temperatures under high-emissions scenarios. Projected changes include losses of species habitat and diversity and degradation of ecosystem functions. The capacity of organisms and ecosystems to adapt is higher at lower-emissions scenarios (high confidence). For sensitive ecosystems such as sea grass meadows and kelp forests, high risks are projected if global warming exceeds 2°C above pre-industrial temperature, combined with other climate-related hazards (high confidence). Warm water corals are at high risk already and are projected to transition to very high risk even if global warming is limited to 1.5°C (very high confidence).

Reducing the pressure of IUU fishing could lessen ocean degradation. Although nations must take rapid ambitious action to curb climate change, they must also fast-track adaptive fisheries management, along with new agreements that take a system-wide approach to marine resources management and ensure that benefits are shared fairly. Such a response would not only improve resilience and future-proof these vital industries but could also improve profits in some regions (Gaines et al. 2019).

The actions of fishers, management institutions and markets all influence the benefits derived from fisheries (Costello et al. 2016) and could mitigate many of the negative impacts of climate change (Gaines et al. 2018). Gaines et al. (2018) document the benefits of implementing climate-adaptive fisheries management reforms that address both changes in species distribution and productivity caused by climate change (Free et al. 2019). Incentivising cooperation to establish data sharing and collaborative management will require overcoming prevailing management mentalities that one party 'wins' while the other 'loses' when stocks shift across boundaries (Gaines et al. 2019).

This is a point to keep in mind as the UN Intergovernmental Conference negotiates a new legally binding instrument under the UNCLOS that, if successful, will result in robust protection for marine biological diversity in areas beyond national jurisdiction. While negotiating countries have agreed that the new instrument should avoid undermining existing bodies, they remain divided over whether the instrument should address fisheries management directly. Clearly, they should address the impacts of fisheries on biodiversity and are in a position to reduce gaps in governance and change the mentality of 'win-lose'.

Economic incentives are the first of the three drivers of illegal fishing described in Chapter 1. Economics directly drives IUU fishing activities (Sumaila et al. 2006). Increasingly thin margins in legal fishing operations and high potential revenues from IUU fishing are strong motivators for illegal activity (Becker 1968; Gallic and Cox 2006). However, voluntary market instruments supported by governments and new technological capability can begin to reshape these incentives. See also Appendix B for action suggestions.

3. Reframing the Economic Incentives for IUU fishing

3.1 Understanding Economic Incentives for IUU Fishing

In the most straightforward economic terms, IUU fishing is a high-reward, low-risk activity. There are too many highly lucrative opportunities where fishers' expected benefits from breaching regulations—large catches with low operating costs—outweigh the downside, in particular the risk of being detected and suffering any punishment.

Too much fishing capacity

The global fishing fleet has increased, and fish stocks are facing record levels of overexploitation (Watson et al. 2013). The result is a global fishing fleet that is two to three times larger than needed to catch the amount of fish that the ocean can sustainably support (Joseph et al. 2010). At the same time, technological improvements in fish detection and fishing gear have made vessels more efficient, allowing them to further deplete resources (Knauss 2005). Access to deep-sea fisheries resources requires technology only available to industrialised countries with the capacity to build or acquire the large vessels. Developing countries, which are unable to partake in this industry and often have little capacity for enforcement, often see vessels from industrial countries fishing off their own coasts, which has been described predatory behaviour (Hornidge and Hadjimichael 2019).

In 2002, the FAO estimated that $3 million in revenue was gained from 1,335 fishing vessels flying FOCs from 21 countries. This value was considered an underestimate because it did not include money gained from franchise/royalty fees or tonnage taxes.

Fishing farther away or differently is not always an alternative for small-scale artisanal fishers, who continue fishing the same overfished stocks, in many cases violating management regulations (e.g., spatial or reproductive bans, minimum legal size).

Without large government subsidies, as much as 54 percent of the present high-seas fishing grounds would be unprofitable at current fishing rates (Sala et al. 2018). Worldwide, governments spend about $35 billion annually—about 20 percent of the total value of all marine fish caught at sea and brought to port—to support the fishing sector (Martini 2019; Sumaila et al. 2016). Unfortunately, many of these subsidies are harmful and drive unsustainable practices. For example, the largest reported subsidy is for fuel, and this subsidy is the one most directly linked to overfishing.

Government subsidies and other fishing incentives pad the thin margins in many fisheries. The patterns of fishing profitability vary widely among countries, types of fishing and distance to port. Deep-sea bottom trawling often produces net economic benefits only thanks to subsidies, and much fishing by the world's largest fishing fleets would largely be unprofitable without subsidies and low labour costs (often associated with IUU fishing operations). These results support recent calls for subsidy and fisheries management reforms on the high seas. As of 2019, no real progress to eliminate capacity-enhancing subsidies had been made (Sumaila 2019).

3.2 Changing Economic Incentives

If IUU fishing is a low-risk high-gain activity, the response must be to increase the risk of detection and reduce the gain. Regional entities with strategic roles in the seafood market can use market tools to eliminate IUU fishing products entering the region. Governments can build on these tools with sanctions and strict standards for the industry.

Transparent supply chains

Voluntary efforts in the seafood industry can achieve clearer supply chains by encouraging transparency and more due diligence in the buying chain. Several organisations—including Sustainable Fisheries Partnership, International Seafood Sustainability Foundation, Seafood Business for Ocean Stewardship, and the Marine Stewardship Council—are examples of such initiatives. These traceability efforts can provide assurance to consumers of the provenance of seafood while creating pressure for other market actors to adopt full supply chain transparency. Financing institutions such as banks and insurance companies can create additional pressure by requiring traceability and transparency as conditions of contracts. There are downsides; for example, they can act as trade barriers to developing countries where the fisheries sector is still evolving and the pricetag and complexity of certification is a significant barrier.

Smart new tracking technologies

New technologies are making full supply chain traceability more technically and economically viable. For instance, the recent development of blockchain technology promises to allow for full traceability of fish products from their origin to their ultimate fate. Blockchain is an incorruptible, distributed digital ledger of transactions, which allows users to effectively and transparently measure, record and transact value. A 'transaction' can involve contracts, records, currency or almost any other information of value. Through a series of cryptographically secure algorithms, multiple blockchain nodes validate the transaction in a process known as consensus protocol. That transaction is combined in a block of data, which forms a chain of records maintained simultaneously across thousands of distributed nodes, hence forming a 'blockchain' that is permanent and unalterable. In effect, blockchain enables a single source of truth for chain of custody of any commodity along entire supply chains, from producer to consumer. Because of blockchain's immutable and verifiable nature, it offers greater levels of transparency and trust in supply chain transactions. It is a powerful lever to impose on market forces.

Consequences for bad behaviour

Governments can support industry action through regulation. For example, the European Union adopted an IUU fishing regulation to limit access of IUU fish to the market. Under this regulation, non-EU countries identified as having inadequate prevention mechanisms for illegal fishing may be issued a formal warning (known as a 'yellow card') to improve the situation within one year. If they fail to do so, they face having their fish banned from the EU market (known as a 'red card'), among other measures. The mechanism is seen as a success. As an example, South Korea and the Philippines received yellow cards, and both countries responded by diverting resources to deal with the problem. The cards were lifted following good responses from both countries. South Korea now has sufficient means to proactively prevent, deter and eliminate IUU fishing by closing loopholes in its systems. The Philippines has strengthened its commitment to fighting IUU fishing at the international level by ratifying the UN Fish Stocks Agreement (UNFSA) and initiating procedures to ratify the PSMA (EJF et al. 2015). Another example of an effort to control IUU fishing is given in Box 5.

Box 5. Increasing the Risk to IUU Fisheries

There is increasing interest in how private companies can reduce IUU fishing by increasing the risk to IUU fishers and their beneficial owners. At the first Ocean Risk Summit, held in Bermuda in 2018, leaders from across the political, economic, environmental and risk sectors identified potential exposures to ocean risk and prepared to generate new and dynamic solutions. As a result, the Ocean Risk and Resilience Action Alliance (ORRAA) was launched. This progressive concept brings together organisations from the public and private sectors and civil society focused on developing risk management strategies to deal with climate change and threats to communities which could include IUU fishing, the presence of bonded labour or other illicit activities. The Canadian government, AXA XL, Willis Towers Watson, the Nature Conservancy and Ocean Unite led the conception and development of ORRAA. Additional partners include the Inter-American Development Bank, Bank of America, KfW, the United Nations Development Programme and Rare. The Stockholm Resilience Center at Stockholm University will be a key scientific and knowledge partner. Companies like Planet Tracker are also driving change by engaging financial markets for sustainable practices across several commodities, including fish.

Corruption can undermine the process

Corruption undermines good governance in fisheries. Vulnerabilities to corruption occur throughout the whole value chain, from rich countries' negotiations of access to territorial waters, to malpractices in fisheries management at the local level. Processors and distributors, and of course fishers themselves, can engage in corrupt practices (Sumaila et al. 2017).

4. Overcoming Weak Governance

4.1 Governance Gaps

IUU fishing is propelled by governance gaps internationally, regionally and domestically. These gaps are exploited by the IUU fishers and create obstacles to enforcement by authorities and fisheries managers. Weak governance is the second of the three drivers of IUU fishing. See also Appendix B for action suggestions.

Governance problems persist

The High Seas Task Force's (2006) *Closing the Net Report* found that, despite the appearance of a strong legal framework based on the UNCLOS, there were serious concerns about whether the UNCLOS can deliver an effective management regime and flag states can fulfil their responsibilities. An analysis of the discussions for the report indicated broad agreement on the following main governance-related problems:

- Failure of some states to participate in existing multilateral instruments as a critical constraint to effective implementation and enforcement.
- Inadequate implementation of existing instruments at the regional level, including lack of effective institutional arrangements, conservation and management measures that do not meet the standards set by the existing legal framework, and lack of coordination between regional bodies and inadequate harmonisation of measures.
- Inadequate flag state control over fishing vessels.
- Geographical and structural gaps in the system of high seas governance.
- Subsidies and other perverse signals that displace rather than eliminate unsustainable fishing.

Contributions to this Blue Paper indicate that little has changed in the 13 years since the High Seas Task Force report, but many of the tools predicted to be available are now mature and ready to be applied. The 2014 Global Ocean Commission report also named poor governance as a driver of decline in the ocean, stating, 'The existing high seas governance framework is weak, fragmented and poorly implemented. Different bodies regulate different industries and sectors, and in many cases, modern principles of ecosystem-based management, precaution…have yet to be brought to bear' (Global Ocean Commission 2014, 18).

Regional fisheries management organisations and high-seas governance

The UNCLOS governs fishing in areas beyond national jurisdictions. Many of the world's most valuable fisheries, including tuna, are in international waters. However, human activities such as maritime transportation, marine pollution and fishing have caused serious depletion in high seas fish stocks (Freestone 2010). The UNCLOS, under Article 116, expresses a state's 'right to fish' the high seas, but this freedom is subject to the condition that marine living resources be used sustainably and with the rights and duties of coastal states in terms of straddling stocks.

The 1995 UNFSA[3] complements and strengthens the UNCLOS by requiring fisheries management to be based on precautionary and ecosystem approaches. It also enhances monitoring, control and enforcement (and even extends to boarding of non-compliant vessels) both by flag states and through international cooperation. Regional action, particularly through RFMOs, is necessary to implement the agreement effectively.

3. *Officially, the United Nations Agreement for the Implementation of the Provisions of UNCLOS relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks.*

However, there are regulatory gaps in the management regime created by RFMOs (Rayfuse and Warner 2008). In the case of high seas fishing, which is managed primarily by RFMOs, severe challenges result from a lack of cooperation between states; conflicting interests in resource use and conservation; fragmented responsibilities; lack of political will; lack of enforcement; and perverse economic incentives for 'free riders' to cheat the system (Global Ocean Commission 2014).

RFMOs are principally membership organisations. While under the UNCLOS all states have the general obligation to cooperate with each other in the conservation and management of living resources of the high seas, and parties to the UNFSA can only fish on the high seas if they apply the conservation and management measures set by the RFMO competent over that area or species, there are loopholes in the regional fisheries management scheme. RFMOs cannot exert control over non-member state fleets, and their members have limited capacity to apply some sanctions—for example, trade restrictions and import bans on certain types of fish products—to uncooperative non-member countries. Because RFMOs do not have uniform provisions across convention areas, this creates a patchwork of governance (Table 1).

RFMOs vary on their policies on how to set catch limits, monitor catches and impose penalties. The non-uniformity of RFMO policies makes some areas more vulnerable to IUU fishing. The five tuna RFMOs worked to remedy this patchwork by coordinating through the Kobe Process named after its launch in Kobe, Japan, in January 2007. The Kobe Process seeks to improve coordination across the whole range of RFMO policy, including scientific research, market issues, monitoring and surveillance, the impact of bycatches, and support for developing countries. One of the main concerns of the Kobe meeting and subsequent action plan was to secure support for developing nations to implement the recommended management measures, particularly those intended to prevent IUU fishing. However, only tuna RFMOs are involved.

NGO advocacy and UN General Assembly Resolutions 59/25 (2004) and 61/105 (2006) show a positive response to unregulated deepwater bottom fishing. Three new RFMOs—South Indian Ocean Fisheries Agreement, South Pacific Regional Fisheries Management Organisation and North Pacific Fisheries Commission—have formed to manage deep-sea bottom fisheries on the high seas. However, the deepwater bottom fisheries—particularly bottom trawl fisheries in all three Pacific and Indian Ocean RFMOs, and to a lesser extent in portions of the Atlantic—are not yet managed consistently with actions called for by the UN General Assembly. These actions are based on key conservation provisions of the UNFSA as well as the FAO Code of Conduct for Responsible Fisheries. Therefore, these fisheries could fit the definition of IUU fisheries, even though technically they are regulated (Gianni et al. 2016).

Further, RFMOs are not equipped with their own MCS systems. To track movements at sea, states use monitoring systems such as VMS, but only authorised people, typically the government officials in relevant flag or coastal states, can access this information. Most RFMOs require the use of VMS by large vessels authorised to fish within their convention areas. However, the member flag states are the ones with the authority, jurisdiction, and enforcement responsibility for mandating installation and operation of VMS and enforcing reporting obligations. Some RFMOs have initiated policies to allow direct transmission of VMS data to the RFMOs' secretariats. The effectiveness depends on the member states, and RFMOs have not yet established consequences for failure to comply. Some have considered or are considering the use of AIS as a more cost-effective means of tracking.

The performance of RFMOs has been under scrutiny for some time. The High Seas Task Force (2006) and the Global Ocean Commission (2014) have raised concerns with their effectiveness, and NGOs continue to press for better performance in the annual commission meetings.

Lack of universal mechanism to assess state compliance

Although some NGOs have produced reports to assess states' performance in combatting IUU fishing, there are insufficient tools and mechanisms to assess and evaluate states' adoption and implementation of the most important international instruments relating to IUU fishing. Therefore, states with poor performance do not have sufficient information on what areas need improvement and do not receive enough pressure to make improvements.

Table 1. Comparisons of Several Provisions among Tuna RFMOs

	INTERNATIONAL COMMISSION FOR THE CONSERVATION OF ATLANTIC TUNAS (ICCAT)	INTER-AMERICAN TROPICAL TUNA COMMISSION (IATTC)	INDIAN OCEAN TUNA COMMISSION (IOTC)	WESTERN AND CENTRAL PACIFIC FISHERIES COMMISSION (WCPFC)	COMMISSION FOR THE CONSERVATION OF SOUTHERN BLUEFIN TUNA (CCSBT)
Requirement of International Maritime Organization (IMO) number	For vessels 20 m and greater	For vessels greater than 12 m	For vessels greater than 24 m	For vessels greater than 12 m	For vessels 100 gross tonnage and greater
100% observer coverage	For vessels 20 m and greater during specific times or closures, as well as for bluefin fishery	For large-scale purse seine vessels		For large-scale purse seine vessels	
Resolution on Labour Standards for Crew on Fishing Vessels				*Resolution on Labour Standards for Crew on Fishing Vessels* (Resolution 2018-01). Non-binding.	
Cross-listing of IUU fishing vessels list	Allows cross-listing with other RFMOs		Allows cross-listing with other RFMOs		Allows cross-listing with other RFMOs
Prohibition of drift nets	Drift nets prohibited for fisheries of large pelagic in Mediterranean		Large-scale drift nets prohibited	Large-scale drift nets prohibited	
Allowing at-sea transshipment	Allowed for large-scale pelagic longline vessels, defined as those greater than 24 m length overall Purse seine vessels (with some exceptions) prohibited from transshiping at sea and must transship in port	Allowed for large-scale tuna fishing vessels Purse seine vessels (with some exceptions) prohibited from transshiping at sea and must transship in port	Allowed for large-scale tuna fishing vessels Purse seine vessels (with some exceptions) prohibited from transshiping at sea and must transship in port	Not allowed for other than purse seine vessels except in cases where the CCM has identified and reported vessels as being impractical not to transship at sea Allowed for purse seine vessels 600 metric tonnes or less from Papua New Guinea and Philippines, New Zealand, domestic purse seine vessels, and for other vessels where Conservation and Management Measures has determined that it is impracticable to prohibit at-sea transshipment	Allowed for tuna longline fishing vessel with freezing capacity of storing 500 kg of southern bluefin tuna at –30°C or below

Source: Drawn from Commission Webpages 2020.

The FAO's IPOA-IUU is by far the most relevant international guidance, providing a set of measures that states should adopt to combat IUU fishing. Many countries have developed their own national plans of action (NPOAs) to reflect this guidance in their national context. However, the FAO does not assess the content or implementation of these national plans. Moreover, now close to 20 years old, the IPOA may benefit from a revision to reflect the latest developments in technological tools and transparency measures, as well as the inclusion of measures to support adoption and implementation of NPOAs. If the FAO could benchmark states against the measures detailed in the IPOA-IUU, states with poor performance would get a clearer understanding of areas needing improvement. In addition, the FAO, ILO and IMO can do more to help states ratify and implement the important suite of international treaties relevant to the fight against IUU fishing: the FAO'S Port State Measures Agreement, ILO Work in Fishing Convention and IMO Cape Town Agreement.

Gap between fisheries management and preventing human rights abuses

The causal relationship of human rights abuses within IUU fishing has been described above. However, there is a gap between international organisations that manage fisheries and those that work to prevent human rights abuses. For example, currently only one tuna RFMO, the WCPFC, has a resolution addressing workers' human rights protection. However, there are opportunities within the existing international legal framework—for example, the ILO C188 and the CTA on fishing vessel safety—to protect fishers from human trafficking and forced labours.

The financial drivers behind illegal fishing can lead to poor safety and labour conditions for vessel crews. When stocks are overfished, fishers' catches and income are further reduced. The CTA sets minimum safety standards and allows flag, coastal and port states to inspect commercial fishing vessels. It is therefore a powerful tool that states can use to ensure that fishers are safe, conditions are decent and fishing operations are legal. But as long as enough countries do not ratify the agreements, they remain weak. It should be noted that at the meeting of the IMO in Torremolinos, Spain, in 2019, 48 countries committed to ratify the CTA by 2022. The WCPFC's recent Resolution on Labour Standards for Crew on Fishing Vessels (Resolution 2018-01) is groundbreaking yet falls short of providing adequate protections due to its status as a non-binding resolution with no non-compliance penalties.

The issue could be more adequately handled through licensing provisions specific to crew welfare agreed on in 2019 and due to be imposed at a sub-regional level by the Pacific Islands Forum Fisheries Agency (FFA) in 2020.

4.2 Solutions to Weak Governance

Strong, uniform governance is needed at the national, regional and global levels to combat IUU. Several international agreements provide a path forward towards consistent and effective fisheries management. States can adopt and implement these agreements to reduce IUU fishing. The IPOA-IUU provides clear and comprehensive guidance.

Adopt the Port State Measures Agreement

Since international efforts to combat IUU fishing cannot depend solely on the regime of flag state responsibility, more opportunities could be given to authorities of port and coastal states to address all impacts of IUU fishing. Illegal fishing operations cannot operate without a market for their catch. Fishing vessels (or supporting vessels such as reefers) must at some point visit a port to land fish, refuel, re-supply and take on crew, and vessels involved in illegal fishing operations are no exception. State regulation of access to port facilities is therefore a highly effective way of controlling illegal fishing.

The FAO adopted a key instrument targeting IUU fishing—the PSMA—at its 36th session on 22 November 2009. This agreement in principle strengthens the comprehensive and integrated approach to combatting IUU fishing, since it supports previously adopted instruments in the FAO framework, such as better performance by flag states, MCS, market access and trade measures. Generally, the PSMA authorises port states to apply it to vessels not entitled to fly a state's flag that are seeking entry to its ports or are in one of its ports. In particular, the agreement encourages each party to integrate its port state measures with the broader system of port state controls and measures in accordance with the IPOA-IUU at the national level.

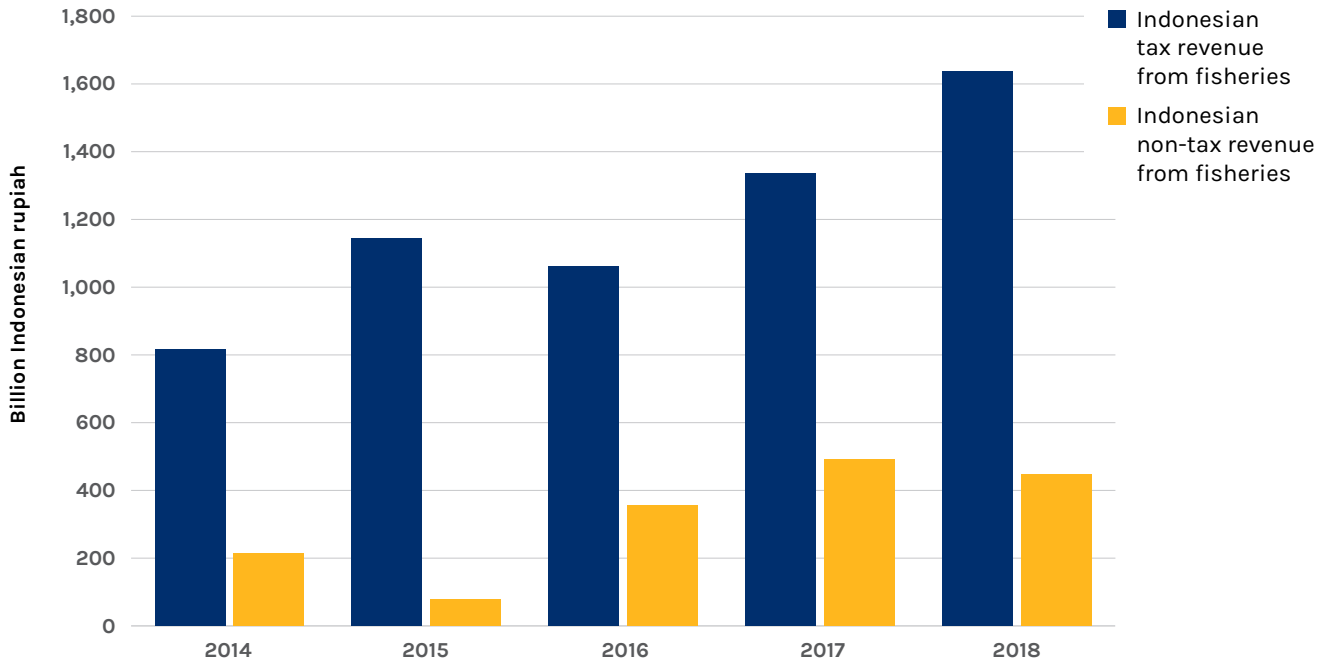
The PSMA aims to prevent IUU catches from being landed and entering international markets. Since vessels must come to port prior to their fish entering the market, port state measures are potentially the most effective means to combat IUU fishing. The agreement sets a global standard of port inspection, improves information exchange and puts developing states in a better place to combat IUU fishing with the funding mechanisms provided by the agreement. Importantly, the PSMA is applicable to any vessel supporting IUU fishing, so it can be used to address fuelling/bunkering vessels or the carrier vessels that bring the fish to port. There is a further advantage; ports with low inspection resources can simply deny a vessel port entry under the PSMA. The more ports that implement the PSMA, the more effective it becomes.

Close the FOC registry to fishing vessels

FOC states are those that register foreign-owned fishing vessels with minimum requirements and assessments. Closing such registries to the registration of fishing and fisheries-support vessels is an important and low-cost measure to combat IUU fishing. The FOC registries often have little connection to national fisheries ministries and are likely to represent a small source of income that is outweighed by the reputational damage done to the countries associated with IUU fishing; for example, the risk that legitimate national operators lose the right to export seafood to important markets such as the European Union.

Although they appear to incur short-term loss, transitioning policies and efforts to combat IUU fishing efforts are economically beneficial in the long run. After imposing a closed registry policy in 2015, Indonesia has gained tax and non-tax revenue from the fisheries sector (California Environmental Associates 2018). Once the foreign-owned vessels, which all had committed various fisheries violations, were eliminated from the Indonesian registry and waters, they were replaced by new vessels owned by Indonesian industry. Since 2015, government agencies have been equipped with more advanced monitoring tools and supported by better fisheries governance, resulting in increasing tax and non-tax revenue from fisheries (Figure 6).

Figure 6. Indonesian Revenue from Fisheries



Source: Ministry of Marine Affairs and Fisheries of the Republic of Indonesia 2019.

Create strong deterrents

Deterrence is a key element in the battle to combat IUU fishing. Deterrence can be achieved via strong port controls, at-sea patrols, heavy fines or sanctions and other measures.

Port controls. In terms of port controls, this paper emphasises the importance of the PSMA and encourages more states to ratify and implement this agreement. Because IUU fishing is a complex activity, those working to deter or eliminate it need a selection of mechanisms to make sure IUU fishers cannot slip though.

Sanctions. It is often said that sanctions for IUU fishing are not sufficient to hurt the fisher and are seen as a cost of doing business. The IPOA-IUU calls on states to ensure that sanctions are heavy for IUU fishing offenders. Realising the immense loss caused by IUU fishing, countries are executing stronger penalties. In May 2019, Thailand's criminal court handed out a fine of over $16 million to six defendants in the prosecution of the overseas fishing vessel *Chotchainavee 35* (Undercurrent News 2019). In 2018, the owner of the pirate fishing vessel F/V Thunder was fined $10.1 million in a civil case brought by the Spanish government (Holland 2018). In another example, Indonesia has elected to sink offending vessels as an optimum penalty to create a strong deterrent. Minister of Maritime Affairs and Fisheries Susi Pudjiastuti reported in her farewell speech in October 2019 that 556 vessels engaged in IUU fishing had been sunk during her tenure. This policy has resulted in a reduction of at least 25 percent in fishing effort within the Indonesian EEZ, based on VMS data together with AIS and night light satellite imaging data (Cabral et al. 2018).

IUU vessel lists published individually by each RFMO and as a combined historical list by Trygg Mat Tracking act as a deterrent to a degree, but there is now a movement to see all fines and sanctions be published and transparent. This would show who is being fined or sanctioned and for what, and also which states and organisations are taking seriously the need to act against IUU fishers (EJF 2018).

Transparency. A vessel whose behaviour is public is likely to become compliant. Again, several NGOs have promoted 10 principles of transparency. These measures are in line with reports from organisations such the High Seas Task Force (2006), the Global Ocean Commission (2014), the Royal United Services Institute (Haenlein 2017) and the Organisation for Economic Co-operation and Development (Hutnikzac and Delpeuch 2018). Countries are also steadily embracing transparency, with notable action by Chile, Panama, Peru and Indonesia in sharing VMS vessel tracking data and the European Union, Taiwan, Thailand and Mozambique in publishing authorised vessel lists.

At-sea patrols. Patrols will always be necessary but are a relatively high-cost option.

Multilateral agreements. Where possible, resource sharing and multilateral agreements should ensure that at-sea assets can be effectively tasked and made as cost-effective as possible. Agreements such as the Niue Treaty Subsidiary Agreement (NTSA) should be replicated. The NTSA is an agreement in which FFA members agree on monitoring, control and surveillance of fishing—including provisions on exchange of fisheries data and information, as well as procedures for cooperation in monitoring, prosecuting and penalising operators of IUU fishing vessels.

Improve transboundary case handling

Enhanced cooperation on investigation and prosecution processes can be achieved through the framework of temporary multilateral investigative support teams, mutual legal assistance between states and an established international team such as the Global Fisheries Enforcement Team supported by Interpol. Even in the absence of a mutual legal assistance framework, states across regions have come to work together in handling transboundary cases.

Box 6. Case Study: *HUA LI 8*—Transboundary Cooperation to Catch an Illegal Fishing Vessel

A success story in tracking and capturing an IUU vessel is the case of the vessel HUA LI 8. The vessel was detected fishing illegally within Argentina's 200-nautical-mile EEZ. Two ships and a helicopter from the Argentine naval command confronted the vessel, which proceeded to take evasive action. Ignoring several requests to stop broadcast in Spanish and English on applicable international VHF channels, as well as visual and audio signals (on Maritime Mobile Service VHF Channel 16) and warning shots, the boat endangered its crew, Argentinian authorities and other ships in the vicinity by continuing to sail. The pursuit was subsequently called off, and visual contact was lost after the boat's entry into Uruguayan waters.

Given the obstructive way in which the vessel evaded security forces, Argentina requested the assistance of Interpol through the Environmental Crime Programme's Project Scale in alerting other member countries to the illegal fishing activities of HUA LI 8 through issuance of a Purple Notice (an international communication mechanism alerting authorities to the modus operandi in IUU fishing), as well as engagement with other countries to track the vessel as it travelled across the Atlantic and Indian Oceans. On 21 April 2016, the Indonesian navy (Lantamal 1 Naval Base at Belawan, North Sumatera) detected the HUA LI 8 in waters near Aceh, Indonesia, and successfully boarded and began its inspection of the vessel.

Source: Interpol 2016

Enhance transparency in fisheries

Global transparency in the fishing industry is a solution to governance issues that has relatively low cost and is a manageable action. The Environmental Justice Foundation publication *Out of the Shadows* contains 10 principles for global transparency in the fishing industry that all countries could adopt:

- Give all vessels a unique number.
- Make vessel tracking data public.
- Publish lists of fishing licences and authorisations.
- Publish punishments handed out for fisheries crimes.
- Ban transferring fish between boats at sea—unless pre-authorised and carefully monitored.
- Set up a digital database of vessel information.
- Stop the use of FOCs for fishing vessels.
- Publish details of the true owners of each vessel—who takes home the profit?
- Punish anyone involved in IUU fishing.
- Adopt international measures that set clear standards for fishing vessels and the trade in fisheries products. (EJF 2018)

Transparency is highlighted by the Fisheries Transparency Initiative (FiTI), a unique effort that complements and supports other national, regional and global efforts to achieve responsible fisheries governance. The purpose of the FiTI is to increase transparency and participation in fisheries governance for the benefit of a more sustainable management of marine fisheries. The FiTI is not owned or operated by one organisation, nor does it represent the work of a single interest group. Instead, the diversity of stakeholders is a central feature of how the FiTI works, for national implementations as well as international governance.

The FiTI is a global initiative, and its implementation is country centred. The intention to join the FiTI and the initiation of the official process must come from a country's government. It is a voluntary initiative with mandatory requirements, built on a multi-stakeholder governance structure, ensuring that stakeholders from government, companies and civil society are equally represented. The FiTI embraces the following principles:

- Public registry of national fisheries laws, regulations and official policy documents
- Summary of laws and decrees on fisheries tenure arrangements

- Publication of all foreign fishing access agreements
- Publication of existing national reports on the state of fish stocks
- Public online registry of authorised large-scale vessels, as well as information on their payments and recorded catches
- Information on the small-scale sector, including the numbers of fishers, their catches and financial transfers to the state
- Information on the post-harvest sector and fish trade
- Information on law enforcement efforts, including a description of efforts to ensure compliance by fishers and a record of offences in the sector
- Information on labour standards in the fisheries sector
- Information on government transfers and fisheries subsidies
- Information on official development assistance regarding public sector projects related to fisheries and marine conservation
- Information on the country's status regarding beneficial ownership transparency

5. Ensuring Effective Enforcement

Even strict regulations are not always implemented or enforced. Lack of enforcement is the third of the three drivers of IUU. This section identifies barriers to enforcement and makes suggestions on how to improve enforcement. See also Appendix B for action suggestions.

5.1 Barriers to Enforcement

Lack of political will, coupled with the logistical difficulties in monitoring and reaching vast areas of the ocean, often results in weak enforcement. In some instances, the penalties imposed by courts of law have been described as a 'slap on the wrist' or 'part of the costs of doing business'. The penalties imposed by courts should reflect the importance with which marine living resources are viewed. The public and potential transgressors should be made aware of instances in which severe penalties are imposed. The judiciary should therefore be sensitised in this regard. National bodies, such as organisations representing prosecutors and/or judges, should disseminate information among their members in attempts to encourage uniformity at an appropriate scale.

These barriers to effective enforcement allow IUU fishers to exploit weaknesses in the system to fish undetected. New technological capabilities, alongside tighter port controls and clearer understanding of vessel activity and authorisations, show new possibilities for how these can be overcome.

These actions often fall to governments, but industry and the private sector can play a vital role in driving their supply chains towards better-governed and more diligent fisheries, vessels and ports. Action by the private sector could help port states focus on better enforcement against illegal and unreported fishing activities. Some enforcement is hampered by the unwillingness of states to enforce the law against their own fishing fleets. Some states do not have adequate facilities to conduct MCS.

Monitoring is also a responsibility of flag states. As stipulated in the UNCLOS, flag states' responsibility includes ensuring the level of compliance of their fleets operating inside and outside of their waters. But some resource-challenged states find this difficult, while others have other priorities. A forthcoming global review by Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO) of the scientific literature on the causes of fisheries depletion is expected to document that the lack of MCS is the most common driver of fisheries depletions. This lack is cited as one of the key drivers in 90 out of 164 studies. Given the tight link between fisheries depletion and illegal fishing, the resulting weak control of fisheries operations further exacerbates depletion as a driver for both domestic and foreign illegal fishing.

In reality, no mechanism obligates all states to share monitoring data publicly. One initiative has been created—Global Fishing Watch—but it remains voluntary, so its effectiveness depends on states' awareness and willingness to cooperate. States currently use different types of fisheries monitoring platforms that do not integrate data routinely, which leads to inefficiencies in fisheries monitoring systems globally. Systems like OceanMind and Skylight are designed to improve the sharing of non-public data and drive direct enforcement action. Beyond fisheries, there is a trend to create fusion centres, designed to bring monitoring of different maritime issues, including fishing, together in one centre. This is a positive concept. Such systems are a positive step forward in the fusion of military and civilian data.

The enforcement of RFMOs' respective instruments is still frequently hampered by the willingness of their member states to enforce the regulations against their own vessels and the activities of non-parties. Principally, enforcement is undertaken by flag states, as laid down in Article 92(1) of the UNCLOS. However, Article 21 of the UNFSA includes provisions allowing various types

of enforcement by states other than flag states on the high seas, although this exception can only be invoked under certain conditions. First, it only applies in high seas areas that fall within the geographical competence of RFMOs. Second, only members of these RFMOs are allowed to take enforcement measures, and only for the purpose of ensuring compliance with conservation and management measures of these RFMOs. Third, only fishing vessels flying the flag of a state party to the UNFSA can be subjected to these enforcement measures, whether or not that state is also a member of these RFMOs. Fourth, the procedures for high seas enforcement as set out in paragraphs 4 to 18 of Article 21 and Article 22 of the agreement shall be applicable if RFMOs do not establish their own procedures (Molenaar 2011).

Looking at those strict conditions that invoke this exception, it is argued that it hardly affects the flag state primacy. Once an infringement is detected, the flag state should be notified to pursue enforcement process. Therefore, the effectiveness of enforcement remains subjected to flag state willingness and capacity, unless RFMOs have their own procedures. Conversely, viable penalties for flag states are not in place in case of non-compliance.

5.2 Improving Enforcement

Improving enforcement will require capacity building and support for port states and coastal states, regional and global information sharing, and heightened monitoring of fishing fleets, transshipment incidents and catch data.

Build capacity and support

In some areas, illegal fishing perpetrators are largely unpunished or poorly punished for many reasons. Among others are poor awareness among law enforcement officers, difficulties in communication between related agencies and inadequate capability to conduct a thorough investigation. Effective law enforcement requires law enforcement officers and other role players in the criminal justice system to have adequate skills to handle the complexities of IUU fishing operations, which are often associated with other crimes.

A joint capacity-building program accommodates sharing of ideas and experiences besides capacity-building trainings.

FishFORCE Academy, a platform for training officials who are involved in the fight against fisheries crime, has been established at the Nelson Mandela University. The project will aim to establish fisheries crime law enforcement as a new and emerging fisheries compliance model and will endeavour to achieve knowledge and intelligence-led investigations and increase successful prosecutions of criminals engaged in fisheries crime. While building capacity, the project will also enable fisheries law enforcement officers to obtain formal qualifications in their chosen field of expertise. These qualifications will include higher certificates, diplomas and a post-graduate diploma, which will also provide access to further academic qualifications.

Similarly, the Australian government recently ran a capacity-building program implemented by the CSIRO, Australia's national science institution, to build capacity among fisheries monitoring and surveillance officers across the Southeast Asian region. The two-phase program included country visits to understand capacity and needs for fisheries MCS analysis and to identify key emerging enforcement issues, followed by a customised training course targeting MCS analysts. The training course included three fisheries staff members from each of the 12 regional countries. The weeklong training course included instruction and tools for identifying abnormal patterns in monitoring and surveillance data; analysing spatial and temporal data such as VMS, landings and observer records; and developing risk assessment models and prioritising inspections and other MCS activities.

In recent years, NGOs are increasingly involved in enforcement, through provision of capacity such as vessels, technology or training, and work closely with coastal states in global geographies such as Italy, Gabon, Ghana, Namibia, Benin and Cape Verde to help combat IUU fishing.

Establish regional information-sharing and cooperation mechanisms

The experiences of the FISH-i Africa and Fisheries Committee for the West Central Gulf of Guinea West Africa Task Forces, as well as the FFA's Niue Treaty Subsidiary Agreement and associated Niue Treaty Information System, have demonstrated the value of groups of countries establishing mechanisms and communication platforms for the increased sharing of fisheries intelligence, cooperation of MCS operations and cases, and coordination and harmonisation of fisheries management and regulations. This approach has clearly demonstrated that regional cooperation and information sharing, coupled with dedicated analysis and technical expertise, can exclude high-risk vessels and operations from a region, prevent IUU catch from entering ports and getting to market, and significantly hinder the ability for illegal operators to operate and make a profit. The basic structures of successful cooperation are in line with and benefit from increased availability and, where possible, transparency of information—including sharing of information on licensed vessels, port inspections and vessel movements—and cooperation on investigations. If this can be achieved, the results have proved to be significant, with a range of illegalities quickly uncovered and acted on, including arrests, settlements, payments of fines, exposing and shutting down fraudulent licenses and other documents, and an increase in license revenue.

Box 7. Case Study: *Silver Sea 2*—Transshipment and Human Trafficking

The fishing vessel Silver Sea 2 was seized by the Indonesian navy in August 2015 amid a crackdown on illegal fishing and after an Associated Press investigation showed its links to human trafficking in the fishing industry. When identified by the SkyTruth analysts through AIS and Digital Globe satellite images, the Silver Sea 2 was in Papua New Guinea waters, receiving illegal Indonesian catch from two fishing trawlers via transshipment. It was captured by an Indonesian navy vessel off the island of Sumatra after returning to Indonesian waters. The Thai captain was detained, and a probe was launched into suspected human trafficking, transporting illegal fish and off-loading the catch at sea. The Associated Press investigation resulted in the freeing of more than 2,000 men from Myanmar, Cambodia, Thailand and Laos, more than a dozen arrests, the changing of U.S. legislation, and lawsuits.

Source: McDowell et al. 2015.

Monitor transshipments

The monitoring and control of transshipment poses a significant problem because so much of the activity takes place out of sight and reach of authorities. This is especially true for at-sea transshipment, which occurs far from land. Even in port, proper oversight often cannot be guaranteed because of limited inspection capacity or insufficient port state processes, protocols or procedures. Collectively, these practices contribute to IUU fishing. To make matters worse, the lack of transparency regarding the monitoring and control over transshipment fosters conditions conducive to other criminal activities, such as trafficking in weapons, drugs and people, and contributes to concerns about labour conditions on board vessels that are at sea for extended periods (Box 7).

Emerging transparency tools, like Global Fishing Watch, or more proprietary systems, like OceanMind and Skylight, that fit the more traditional enforcement-focused models, provide new capabilities to identify and monitor these transshipment activities. The private sector is key here, since it brings into the commercial space new capabilities that can then be used to monitor effectively. A good example of this is HawkEye 360, which has used military technology to develop a commercial system that can detect radio and radar emissions from vessels. This could be very useful for detecting vessels attempting to avoid transmitting on their AIS or VMS.

Flag, coastal and landing states can also play a major role in this area. For instance, Thailand now equips all of its fish carrier vessels with electronic monitoring, including on-demand real-time video cameras. This allows fisheries officials in the national monitoring centre to oversee vessel operations, including location, use of onboard machinery, access to refrigerated storage, and other activities in real time. If suspicious activity is detected, the staff can bring the onboard video cameras online via satellite connection, allowing them to see any suspicious activity, including transshipment.

Surveillance technologies for monitoring non-compliant vessels combined with onboard monitoring of carrier vessels has the potential to remove transshipment completely as a source of IUU fishing risk.

Improve monitoring of the fishing fleet

Leading experts are calling for a conscious reframing of the perception of what is possible in terms of monitoring the fishing fleet and support vessels and for people to act now and at scale. Seeing transparency and compliance as a vital tool in the good stewardship of our global ocean is part of that reframing—to fight illegal fishing, to protect fish stocks and livelihoods and to increase the safety and well-being of fishers. If countries publicly share their fishing vessel monitoring data, then a more complete and connected picture of global fishing activity can be created. Law-abiding fishers are tracked easily and openly, demonstrating their compliance. Rogue operators stand out due to their patchy track record or suspicious behaviour. Compliant fishers can be rewarded through faster, more efficient port entry and landings. Unauthorised vessels and those that have a history of non-compliance can be prioritised for inspection or even denied port entry. By embracing transparency, nations have a more cost-effective way of monitoring vessels that puts the burden on fishers to demonstrate compliance rather than on the country to prove illegality. Transparency can incentivise, recognise and reward honest fishers, while exposing, penalising and ultimately putting out of business those who act outside the law.

The simplest way to combat the absence of tracking data is to make it a condition of landing fish. If a vessel cannot explain or display its track history since its last landing, then it should not be able to land its catch. At the very least, it should be subject to robust inspection and verification.

6. Three High-Level Decisive Opportunities for Action

Three specific opportunities for action provide a robust yet achievable response to the global threat of IUU fishing and help ensure ocean health, biodiversity and a sustainable ocean economy in the future. These actions are clear and tangible routes to implementing global policy or supporting existing vital policies. They are directly associated with solving the key drivers of IUU fishing identified in this paper—economic incentives, weak governance, and poor enforcement—and they can be sustained and are not dependent on consensus in the face of a belligerent state or actor. They can be addressed by flag, port, coastal and market states. Business, industry, private sector organisations, scientists and civil society can also contribute through advocacy, leadership and firm actions of their own. These three actions are

- adopt global transparency in fisheries,
- ratify and implement the FAO's PSMA, and
- enhance regional cooperation.

6.1 Adopt Global Transparency in Fisheries

The first opportunity for action is to adopt global transparency in fisheries. There are several elements to this shift in narrative away from an enforcement-focused system to one that rewards compliance and good behaviour. In promoting transparency, the international community will be addressing all three drivers of IUU fishing. Transparency makes it far more difficult to bring IUU fish to port by shifting economic incentives. Vessels with missing information can be treated as suspicious and prioritised for inspection or action. Transparency is an effective way to support key policies such as the PSMA. It makes monitoring and inspections easier to prioritise and more cost-effective. It addresses weak governance and barriers to enforcement by improving information and data sharing. It shifts the burden to the fisher to prove compliance, rather than the state to prove malpractice. Actions in this category can be achieved quickly and will have a positive impact on the fight to end IUU fishing and will not disadvantage the more resource-challenged countries. Significant commitment could be demonstrated before the end of 2020 in support of SDG 14.4:

- Flag or coastal states could make unedited VMS data, or other proprietary tracking systems, public or mandate AIS for fishing vessels. Industry and other private sector organisations should seek this action as a part of their conditions of contract or in doing business.
- Coastal states could publish up-to-date lists of all fishing licenses, authorisations and vessel registries, transshipment authorisations and refrigerated vessels registries. Private sector organisations should seek these documents as a part of their conditions of contract or in doing business.
- Port, flag or coastal states could mandate IMO numbers for all eligible vessels and implement a national Unique Vessel Identifier (UVI) scheme for non-eligible vessels, maintaining a vessel registry and providing all information to the FAO Global Record of Fishing Vessels. Industry and private sector organisations should seek this action as a part of their conditions of contract or in doing business.
- Business, industry and finance institutions are encouraged to make fisheries transparency and traceability conditions of their contracts.
- All sectors should make sure of the accuracy of ownership information to avoid the use of shell companies.

More progressive actions would include the following efforts:

- Publish information on beneficial ownership in all public lists and require companies to provide information on true beneficial ownership when applying for a fishing license, fishing authorisation or registration to their flag.
- Mandate and implement the near-term adoption of cost-effective digital tools that safeguard in a digital form key information on vessel registration, licenses, unloading records, catch location and information and crew documentation that should be designed in such a way as to support a rapid move towards a universal, interoperable digital catch certification scheme.
- Improve transshipment activities information through mandatory and public pre-authorisation and robust and verifiable electronic monitoring scheme by the end of 2020 in support of SDG 14.4.
- All states should publish information on arrests and sanctions imposed on individuals and companies for IUU fishing activities, human trafficking and other related crimes to an accessible international platform.

6.2 Ratify and Implement the FAO's Port State Measures Agreement

The second opportunity for action is the ratification and proper implementation of the FAO's PSMA by all port states. Again, it addresses all three drivers of IUU fishing. Fully implemented, it represents a cost-effective method of stopping IUU-caught fish from entering the market. The PSMA is the first binding international agreement that deals specifically with IUU fishing by requiring parties to place tighter controls on foreign-flagged vessels seeking to use their ports, with a view to detect and prevent the trade of IUU products. States implementing the PSMA can refuse entry to ports or access to port services to vessels known to have engaged in IUU fishing, allow vessels entry into port for inspection for vessels suspected of having engaged in IUU fishing, and encourage information-sharing mechanisms with other relevant states and organisations to facilitate cooperation in enforcement actions. The PSMA changes behaviour and stops the formation of ports of convenience that undermine good governance. The CTA and the ILO C188 are complementary regulations and can be considered during ports inspections under the PSMA. Industry and the private sector should seek this action as a part of their conditions of contract or in doing business.

6.3 Enhance Regional Cooperation

The third opportunity for action is to enhance regional cooperation. To make marked progress in addressing the drivers of IUU fishing activities, we need a more 'joined-up' approach among governments, civil society, science, industry and the private sector for a system that is coherent and consistent in its actions to combat IUU fishing. Actions under this banner would include the following efforts:

- An international forum or other mechanism should address the non-uniformity of RFMO regulations.
- Coordination and data transparency must be improved among RFMOs, flag states, regional mechanisms and the coastal and market states. Coastal states should communicate information on IUU fishing–related infringements to neighbouring coastal states. Port states should provide information to flag states on transshipments, landings and denials of use of port involving vessels flying their flag, as well as the result of inspections. Flag states should cooperate with the RFMO or nation state to investigate and take action in cases of presumed IUU fishing by their vessels.
- All RFMOs should adopt strong policies on monitoring and enforcement and also create sanctions for flag states not performing enforcement measures.
- In terms of institutional arrangement, an authorised international body should oversee the performance of each RFMO, identify the gaps where fisheries management is non-existent and push forward marine protected areas in the high seas.
- Digital schemes for documenting catch data should be implemented in order to promote global exchange of information. All states should mandate and implement the near-term adoption of cost-effective digital tools that safeguard in a digital form key

information on vessel registration, licenses, unloading records, catch location and information and crew documentation. These digital systems must be secure and have built-in procedures to prevent the unauthorised deletion or overwriting of data.

- Regional information-sharing and coordination bodies, such as Regional Plans of Action to address IUU fishing, should be developed. The Regional Plan of Action in the Southeast Asian region is a key forum for countries in the region to discuss IUU fishing–related issues and coordinate actions.

These actions are tangible and transformational if achieved. It should be noted that as well as addressing the three drivers of IUU fishing, they can be pressed home by industry, the private sector and civil society, as well as by governments.

Appendix A outlines existing fisheries agreements and organisations, and Appendix B summarises the voluntary actions that can be taken by various stakeholders to meet the goals of SDG 14.4.

Appendix A: Instruments and Tools to Combat IUU Fishing

A.1 Binding International Instruments on IUU Fishing

Legally binding instruments are available to states, which accommodate state measures and set standards on combatting IUU fishing within their jurisdictions, such as the UN Convention on the Law of the Sea, the Port State Measures Agreement, the UN Fish Stocks Agreement and the Food and Agriculture Organization of the United Nations (FAO) Compliance Agreement. Several instruments related to IUU fishing operations address other issues such as safety of life at sea and human rights abuses of fisheries workers; namely, the International Labour Organization (ILO) Work in Fishing Convention and the Cape Town Agreement. These instruments do not prevent illegal fishing in artisanal fisheries, which rely on local, usually informal, markets.

- **UN Convention on the Law of the Sea (UNCLOS).** The UNCLOS is a landmark instrument sometimes described as a 'constitution for the ocean'. It provides the international legal basis for the protection and use of living and non-living resources of the world's ocean. However, the UNCLOS did not devote much attention to high seas fishing (FAO 2000). The UNCLOS includes the following key features concerning IUU fishing:
  - All states enjoy the traditional freedoms of navigation, over-flight, scientific research and fishing on the high seas; they are obliged to adopt, or cooperate with other states in adopting, measures to manage and conserve living resources.
  - Every state shall effectively exercise its jurisdiction and control in administrative, technical and social matters over ships flying its flag.
  - Disputes can be submitted to the International Tribunal for the Law of the Sea established under the UNCLOS, to the International Court of Justice, or to arbitration.
- **Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (Compliance Agreement).** In 1993, the FAO Conference adopted the Compliance Agreement. The principal aim of this agreement is to enhance the role of flag states and to strengthen their control over their vessels in ensuring compliance with relevant international instruments.

  The FAO Compliance Agreement in principle applies to all fishing vessels that are used or intended for fishing on the high seas. It acknowledges the issue regarding the failure of flag states to fulfil their responsibilities in ensuring the compliance of vessels entitled to fly their flag with international conservation and management measures for living marine resources. Therefore, it heavily focuses on measures to be taken by flag states to address such a failure. The FAO Compliance Agreement also underscores the importance of international cooperation, particularly cooperation with developing countries and cooperation as an effort to encourage non-state parties to adopt laws and regulations consistent with the provisions of the agreement.

  Despite the importance of this instrument, some observers have indicated that most states often involved with IUU fishing and the practice of flags of convenience (FOCs) are not willing to ratify the FAO Compliance Agreement (Tanaka 2012). As of July

2018, the agreement only had 42 parties.

- **UN Fish Stocks Agreement (UNFSA).** The 1995 UNFSA further elaborates possible mechanisms for international cooperation, as stipulated in the UNCLOS, concerning the conservation and management of straddling and highly migratory fish stocks, especially through the establishment of sub-regional and regional fisheries management organisations (RFMOs) and arrangements. These organisations and arrangements need to address the following essential matters:
  - Stocks to which conservation and management measures apply
  - Area of application
  - Relationship between the work of the new organisation or arrangement and the role, objectives and operations of any relevant existing organisations or arrangements
  - Mechanisms by which the organisation or arrangement will obtain scientific advice and review on the status of the stocks

A.2 Non-binding International Instruments on IUU Fishing

Non-binding instruments provide voluntary guidelines for states to follow.

- **FAO Code of Conduct for Responsible Fisheries (CCRF).** The FAO has also initiated the CCRF, which was adopted in Resolution 4/95 by the FAO Conference on 31 October 1995. This voluntary, non-binding instrument aims to set 'international standards of behavior' for responsible practices with regard to the conservation, management and development of marine living resources. Although the CCRF does not create legally binding obligations, it may be given or have already been given binding effect as a result of the implementation of relevant rules of international law by state parties, such as the UNCLOS and the UNFSA. In addition, despite the fact that it is a voluntary instrument, the CCRF has been regarded as an influential instrument in guiding national governments in developing their fisheries sector policies (Allison 2001).
- **International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (IPOA-IUU).** The IPOA-IUU underscores the importance of a comprehensive and integrated approach in combatting IUU fishing. In this regard, this instrument encourages states to adopt measures necessary to address the failure of flag states in fulfilling their responsibilities, including port state measures, coastal state measures, and market-related measures. As with the CCRF, commitments under the IPOA-IUU are built on relevant international legal instruments, particularly the UNCLOS, the UNFSA, and the Compliance Agreement. Such commitments are also supported through the adoption of a plan of action at the national level (National Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing, or NPOA-IUU) as well as the regional level (Regional Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing, or RPOA-IUU).
- **Voluntary Guidelines for Flag State Performance and Voluntary Guidelines for Catch Documentation Schemes.** The FAO has also adopted Voluntary Guidelines for Flag State Performance and Voluntary Guidelines for Catch Documentation Schemes. These non-binding instruments complement international efforts taken under the aegis of the FAO in combatting IUU fishing. It could therefore be concluded that the FAO has attempted to galvanise all key and crucial factors in combatting IUU fishing. These include the adoption of multiple state jurisdictions (flag state, coastal state and port state) in enforcing laws and measures against IUU fishing, as well as the acknowledgement of the role of non-state entities in addressing all impacts of IUU fishing.

A.3 Data Sharing and Data-Enabled Technology to Detect and Combat IUU Fishing

Date-sharing organisations

- **Regional Plans of Action (RPOAs) to address IUU fishing.** Upon request and reports, the RPOA Secretariat may circulate the information through the RPOA website and/or official letter, as well as requesting RPOA-relevant participating countries to deny the vessel port entry or access to port facilities.

Programs and activities are held, such as workshops and trainings, and information is exchanged on IUU fishing vessel lists and capacity-building programs on port state measures. While the RPOA is a voluntary instrument, it provides a framework for countries to take individual or collective action to enhance conservation and sustainable use of fisheries resources and combat IUU fishing in the region. These measures involve a range of coastal, flag and port state requirements which in most cases require political will, significant resources and time to address fully (APEC 2008).

- **Interpol's Project Scale.** Interpol's Global Fisheries Enforcement initiative, launched in 2013 under the name Project Scale, supports enforcement agencies in the organisation's 192 member countries in identifying, deterring and disrupting transnational fisheries crime. As a part of this initiative, several Purple Notices have been requested by member countries and issued by Interpol for fishing vessels. The Purple Notice is used to seek information on modus operandi, objects, devices and concealment methods used by criminals and have led to the apprehension of several notorious vessels that conducted IUU fishing.
- **West Africa Task Force.** The Fisheries Committee for the West Central Gulf of Guinea (FCWC) West Africa Task Force (WATF) was formally established in 2015 by the six member states of the FCWC—Benin, Côte d'Ivoire, Ghana, Liberia, Nigeria and Togo. Facilitated by the FCWC Secretariat and supported by a technical team which includes Trygg Mat Tracking (TMT) and Stop Illegal Fishing, the WATF was initially supported by a Norwegian Agency for Development Cooperation–funded project entitled Fisheries Intelligence and Monitoring, Control and Surveillance Support in West Africa, and based on the regional cooperation model pioneered by the FISH-i Africa Task Force in the Western Indian Ocean.

  The WATF's core objectives are to improve cooperation, coordination and communication among member states, and to operationalise important fisheries monitoring, control and surveillance (MCS) enforcement commitments of the FCWC, including the 2014 Convention on the Pooling and Sharing of Information and Data on Fisheries in the Zone of the FCWC and the recently updated FCWC RPOA on IUU fishing.
- **FISH-i Africa.** FISH-i Africa was formed in 2012 as a regional task force of coastal states which share a common problem with IUU fishing and hoped to find a common solution by working together. FISH-i is a partnership between the eight East African coastal countries of Comoros, Kenya, Madagascar, Mauritius, Mozambique, Seychelles, Somalia and the United Republic of Tanzania, supported by a technical team of experts. This alliance is showing that regional cooperation and information sharing, coupled with dedicated analysis and technical expertise, can stop illegal catch from getting to market and prevent illegal operators from pursuing their lucrative business unhindered. Task force members share information on licensed vessels, port inspections and vessel movements and cooperate on investigations—and the results have been significant, with a range of illegalities quickly uncovered and acted on. Results have included arrests, settlements, payments of fines, a fraudulent licensing operation being closed and an increase in license revenue.

Data-enabled technology and tools

- **Fisheries Analytical Capacity Tool (FACT).** The use of FOCs, opaque company structures, limited public data on many important global fishing fleets and associated companies, and compliance history presents a significant challenge to the global community's ability to tackle illegal fishing operators effectively. TMT has developed FACT, a fisheries intelligence management and analytical system built with the express purpose of capturing and analysing the identities, characteristics and operations of the global industrial fishing fleet and the companies that operate it. FACT supports 'deep' analysis by providing information on vessel movements, identity, authorisations, operators, ownership and operational structures and whether vessels and companies are involved in violations of fisheries law or broader crimes.

  FACT directly populates the Combined IUU Vessel List website (www.iuu-vessels.org), TMT's public service website that provides the best available, up-to-date

information on all vessels that appear on the lists of IUU fishing vessels published by RFMOs. Unlike the IUU lists published on RFMO websites, which may update vessel details only annually, the Combined IUU Fishing Vessel List is kept up-to-date through FACT's processes with the best available information regarding changes to vessel identity, flag state, ownership and location. The aim of the site is to improve the effectiveness of the original IUU lists as a tool to combat illegal fishing and broader fisheries crime.

- **International Monitoring, Control and Surveillance (MCS) Network.** The International MCS Network aims to improve the efficiency and effectiveness of fisheries-related MCS activities through enhanced cooperation, coordination, information collection and exchange among national organisations and institutions responsible for fisheries-related MCS.
- **Information Fusion Centre (IFC) Singapore.** The IFC aims to provide actionable information to cue responses by regional and international navies, coast guards and other maritime agencies to deal with the full range of maritime security threats and incidents. This includes piracy, sea robbery, maritime terrorism, contraband smuggling, illegal fishing and irregular human migration.
- **Public sector data, technology and capacity-development providers.** Australia's national research institution, the Commonwealth Scientific and Industrial Research Organisation (CSIRO), runs a program which develops open source analytical tools for the Automatic Identification System (AIS), the Vessel Monitoring System (VMS), satellite radar and other data sources. These analytical tools are supported by the development of new low-cost surveillance technologies, such as hydrophones to record underwater sound from vessels. The CSIRO embeds these technologies in a capacity-building framework, working with fisheries agencies in the Southeast Asian, Pacific, European, and North and South American regions. The CSIRO makes all of its products available free of charge.
- **Not-for-profit technology platforms.** Global Fishing Watch is leading the way in implementing technology and computational power to analyse a massive amount of data on ocean activity under a not-for-profit banner. Yet other non-profits, such Conservational International, the Nature Conservancy and WWF are working to provide a wide variety of data sources, including satellite observations, vessel tracking data, electronic monitoring, vessel identity databases, fishing license information, and detailed fisheries rules and regulations, accessing both public and proprietary data sources. Data sources are added continually as new technologies become available. Machine learning techniques and big data analytics applied to these data sets can immediately identify non-compliance with global fishing regulations and generate real-time marine intelligence for immediate investigation of illegal activity.
- **Global Fishing Watch.** Global Fishing Watch has focused on transparency and has revolutionised fisheries monitoring by bringing this data into one platform, publicly available and free of charge, to provide the first global view of industrial fishing (monitoring 70,000 vessels). The result has been a global push for transparency in fisheries that includes initiatives by top fishing nations such as Peru, Panama and Indonesia to share their VMS data and has led to Chile, Costa Rica and Namibia publicly committing to share vessel tracking data. Researchers increasingly use data and analysis tools on this free access platform.
- **OceanMind.** Ocean Mind's mission is to advance ocean sustainability through providing actionable intelligence on fishing activities to maritime authorities, government agencies, ocean conservationists and seafood buyers. OceanMind tends to work on proprietary data and works closely with a country's MCS staff. The best example of this is the productive relationship between OceanMind, the Seafood Task Force and the Thai government in the successful response to an EU yellow carding.
- **Vulcan's Skylight.** Skylight operates on a vision which is similar to that of OceanMind but under a for-profit model. Skylight provides maritime intelligence software and service solutions for identifying suspicious vessel behaviors and "dark vessel" activity and delivers this through an online alerting platform and watch floor service.

A.4 Institutions, Organisations and Tribunals Governing the World's Fisheries

- **Food and Agriculture Organization of the United Nations (FAO).** The FAO was established in 1945 as a specialised agency under the United Nations that leads international efforts to defeat hunger and to achieve food security. In this context, fisheries have been long regarded as a vital sector in achieving the mission of the FAO. A subsidiary body known as the Committee on Fisheries (COFI) was established in 1965 to serve as the global intergovernmental forum tasked with examining major international fisheries and aquaculture problems and issues. COFI has two main functions: to review FAO programs in fisheries and aquaculture and their implementation and to conduct periodic general reviews of international fisheries and aquaculture problems and recommend possible solutions. The FAO has adopted several binding legal instruments and voluntary guidelines addressing IUU fishing. In 1993, the FAO Conference adopted the Compliance Agreement. The FAO has also initiated the Code of Conduct for Responsible Fisheries (CCRF), which was adopted in Resolution 4/95 by the FAO Conference on 31 October 1995. On 2 March 2001, it adopted the International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (IPOA-IUU). The FAO also adopted the Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (Port State Measures Agreement) at its 36th session on 22 November 2009. In addition to these instruments, the FAO has adopted Voluntary Guidelines for Flag State Performance and Voluntary Guidelines for Catch Documentation Schemes.
- **Regional fisheries management organisations.** Regional measures in the conservation and management of fish resources through RFMOs may have been regarded as the most reasonable approach in dealing with issues arising from the use of transboundary marine living resources. These organisations reflect the essential duty of states under international law to cooperate in ensuring the conservation and sustainable use of transboundary resources or resources beyond areas of national jurisdiction. Nevertheless, unresolved issues have become obstacles for states in effectively implementing the commitments made through their RFMOs. These issues arise from the activities of non-participating states, since according to international law, treaties are only binding on their parties and do not create rights or obligations to third parties without their consent. Thus, vessels registered under the flag of states that are not parties to a particular RFMO are not obliged to comply with the rules that have been agreed by the state parties of the RFMO. Such states are known as 'free riders', and they might undermine conservation and management measures and any incentive for member state nationals to comply.

Some scholars have proposed a new approach to resolve the problem of free riders by recognising that each element of IUU fishing needs to be tackled individually and that there is a need to examine the situation of non-RFMO members in a more detailed manner (Serdy 2017). Currently, there are 18 Regional Fishery Bodies in the world:

- International Commission for the Conservation of Atlantic Tunas (ICCAT)
- Indian Ocean Tuna Commission (IOTC)
- Western and Central Pacific Fisheries Commission (WCPFC)
- Inter-American Tropical Tuna Commission (IATTC)
- Agreement on the International Dolphin Conservation Program (AIDCP; sister organisation to IATTC)

- Commission for the Conservation of Southern Bluefin Tuna (CCSBT)
- North-East Atlantic Fisheries Commission (NEAFC)
- Northwest Atlantic Fisheries Organization (NAFO)
- North Atlantic Salmon Conservation Organization (NASCO)
- South East Atlantic Fisheries Organisation (SEAFO)
- South Indian Ocean Fisheries Agreement (SIOFA)
- South Pacific Regional Fisheries Management Organisation (SPRFMO)
- Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR)
- General Fisheries Commission for the Mediterranean (GFCM)
- Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea (CCBSP)
- Western Central Atlantic Fishery Commission (WECAFC)
- Fisheries Committee for the Eastern Central Atlantic (CECAF)

- **International Tribunal for the Law of the Sea (ITLOS).** As of May 2019, 27 cases had been brought before ITLOS, including cases related to the question of prompt release of vessels, the use of marine living resources, the protection and preservation of the marine environment, and maritime boundary delimitation. Of these cases, the judgments of ITLOS with regard to prompt release of vessels are perhaps mostly relevant to fisheries issues. These include, for instance, the *Camouco* case *(Panama v. France*), the *Volga* case (*Russian Federation v. Australia*) (ITLOS. 1999a), and the *Tomimaru* case (*Japan v. Russian Federation*). Although these cases did not directly touch on the issue of IUU fishing, the judgments of ITLOS provided useful guidance with regard to administrative procedures and law enforcement undertaken by coastal states as parts of combatting IUU fishing. In addition, the judgment of ITLOS on the *M/V Saiga* (No. 2) case (*Saint Vincent and the Grenadines v. Guinea*) (ITLOS. 1999b) presented the response of ITLOS on the application of a 'genuine link' between the vessel and the flag state as stipulated under the UNCLOS, and its relation to the implementation of the UNFSA and the FAO Compliance Agreement. In this case, Guinea argued that there was no genuine link between the Saiga and Saint Vincent and the Grenadines as the flag state. Therefore, Guinea contended that it was not obliged to recognise the claims of Saint Vincent and the Grenadines in relation to the ship.

Appendix B: Voluntary Actions for Ocean Fishery Stakeholders under SDG 14.4

IUU fishing is a global problem that threatens food security, livelihoods and ecosystem health. Effectively combatting IUU fishing begins by recognising its major drivers: economic incentives for illegal behaviour; weak governance regimes at the national, regional and international level; and barriers to effective enforcement.

As this paper makes clear, many actions are available to address each problem area. Readers are encouraged to consider the potential of the full range of actions—local, national, regional or international—to have an impact on IUU fishing. Collaboration maximises effects and rationalises costs. Collaboration must be considered across government, businesses and private sectors; the civil sector; and science establishments.

Sustainable Development Goal (SDG) 14 is to conserve and sustainably use the ocean, seas and marine resources for sustainable development. Subgoal 14.4 states: By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics.

Obviously, this subgoal will not be met, but we encourage new voluntary action commitments by the end of 2020.

We offer the following actions for consideration that can be taken by any stakeholder, including countries; regional associations; industry, labour, or financial organisations; or non-governmental organisations.

B.1 Strengthen Existing Ocean Governance Mechanisms

- The non-uniformity of regional fisheries management organisation (RFMO) regulations should be addressed through an international forum/mechanism. The UN General Assembly may be the most efficient. The Kobe Process is a foundation for any call to action; however, this should involve all of the world's RFMOs, not just the tuna RFMO.
- Coordination and data transparency among RFMOs, flag states, regional mechanisms and the coastal and market states should be improved.
- All RFMOs should adopt strong transboundary policies on monitoring and enforcement, including on the high seas.
- Sanctions should be created for flag states which are not performing enforcement measures.
- A mechanism or authorised international body should be considered to oversee the performance of each RFMO.
    - The gaps and inconsistencies in fisheries management should be identified.
    - Transshipment practices should be properly regulated.
- Specific efforts should be focused on the management of small-scale and artisanal fisheries.
- The significant gaps in high seas governance should be addressed.
- The Food and Agriculture Organization of the United Nations (FAO) and RFMOs should ban unsustainable fishing gears and practices.

B.2 Flag State Actions and Responsibilities

- Flag states should exert adequate control over the vessel registry, including ensuring that the management of the registry is within the flag state (and not held by an external private company). Flag states must demonstrate and maintain a genuine link between the vessel and the flag state. Open registries should be closed to fishing vessels.
- The significant gaps in high seas governance should be addressed.
- All states registering a fishing vessel should require companies to provide information on the vessel's true beneficial owner and apply sanctions if it is found that the information provided is false.
- In addition to the beneficial owner, the vessel registry should include details of vessel characteristics and history, including prior flag and name changes; information on the operator; and information on markings and Unique Vessel Identifiers (UVIs), in line with international standards.
- A list of fishing license holders should be made publicly available (for example, online) and regularly updated. It should contain the same information as in the vessel registry, as well as details of any quota or other limits allocated to vessels (if applicable), period of license, gears and target species and areas where the vessels are authorised to fish.
- Eligible vessels should be required to apply for and install an International Maritime Organization (IMO) number as a condition of registration.
- Any vessel that is in non-compliance should be 'blacklisted' from the registry.
- Catch certificates should be digitally validated. Flag states should implement controls and verification/data cross-checks for the reliable certification of catches for export to countries that require the validation of a catch certificate. This should be done through (non-exhaustive list) checks of logbook data and landing/transshipment declaration, verification of fishing location using Vessel Monitoring System (VMS) positions, inspections at sea and in port, and presence of observers on board.
- Due diligence should be shown for new license holders. All states granting fishing authorisations to vessels should maintain a register of license holders that is up-to-date and in line with the vessel registry. States should verify the infraction history of vessels and vessel owners when a license is requested.

B.3 Coastal State Actions and Responsibilities

- Effective monitoring, control and surveillance (MCS) measures should be adopted to ensure compliance with Conservation and Management Measures (CMMs).
- VMS should be required on board all industrial fishing vessels (with regular reporting), and a fisheries monitoring centre for monitoring VMS data should be established. VMS should be made public, or Automatic Identification System (AIS) should be mandated for public tracking.
- Vessel captains should be required to maintain a logbook (and consider mandating e-logbooks), and vessels should be required to report fisheries-related data, including catches and fishing effort. In case of non-compliance, states should take prompt action with respect to the identified infringements and apply deterrent sanctions in a consistent and transparent manner.
- Transshipments at sea should be banned unless they are pre-authorised and are subject to robust and verifiable electronic monitoring and/or are covered by a human observer scheme appropriate to the fishery.
- Labour regulations should be sufficient to facilitate the identification and investigation of forced labor, labor abuse and human trafficking cases detected on board fishing vessels. Regulations should also be sufficient to allow for the lawful prosecution and penalisation of perpetrators of these crimes. The Cape Town Agreement (CTA) and International Labour Organization (ILO) Work in Fishing Convention (C188) should be ratified and adopted.
- Appropriate port-side and at-sea inspection regimes should be initiated to facilitate the identification and investigation of labour abuses. These should involve a trained labour inspector who can detect the common indicators of forced labor and human

trafficking. These indicators should follow the 11 ILO indicators of forced labor and/or the ILO indicators for human trafficking. These inspections should follow a precautionary and victim-centred approach to labor investigations, ensuring that fisher workers' safety, security and privacy are always a top priority. Wherever applicable, trained and qualified translators should be included to facilitate communications with foreign workers.

- Specific efforts should be focused on the management of small-scale and artisanal fisheries.

B.4 Port State Actions and Responsibilities

- The Port State Measures Agreement (PSMA), a key tool in the fight against IUU fishing that directly supports SDG 14.4, should be ratified. While it can take more than a year to adjust legislation to permit the ratification of the PSMA, states should make clear commitments to do so without delay. Implementation of any ratified states must be a priority for those states.
  - The PSMA should be implemented.
- To ensure the safety of crews on board fishing vessels and improve working conditions, the ILO C188 should be implemented and countries should accede to the CTA.
  - The Cape Town Agreement and ILO C188 are complementary regulations and can be considered during port inspections under the PSMA.

B.5 Market State Actions and Opportunities

- Regulations similar to the European Union's IUU fishing Regulation should be adopted.
- The PSMA should be implemented.
- Transparency measures should be implemented.
- Incentives (e.g., waive import tariff) should be given to countries with good performance in combatting IUU fishing.
- The significant gaps in high seas governance should be addressed and a commitment made to doing so where the timescale is more than two years.

B.6 Legal Frameworks for Actions

- Strong legal frameworks are needed for improved MCS, enforcement and sanctions.
- Market, flag, port and coastal states should ensure that they ratify, accept or accede to, as appropriate, relevant legal instruments (Appendix A), including the following key instruments:
  - UN Convention on the Law of the Sea (UNCLOS)
  - UN Fish Stocks Agreement (UNFSA)
  - Port State Measures Agreement (PSMA)
  - FAO Compliance Agreement
- National legislation should be adopted/updated to ensure that the legal framework is consistent with these requirements, as well as CMM measures established by the RFMO of which the country is a member.
- Legal frameworks should establish a clear, comprehensive and transparent system of proportionate and deterrent sanctions for IUU fishing offences, including for nationals supporting or engaging in IUU fishing.
- There should be a legal basis for all MCS and enforcement measures that may include issuing licenses to vessels, requiring vessels to carry and operate VMS or AIS, conducting inspections of vessels, investigating infringements, refusing access of IUU vessels to port, and regulating beneficial ownership.
- States should publish or provide information on their legislation and actions in combatting IUU fishing to an authorised international body, such as the FAO.

B.7 Adopt Global Transparency Rules and Technology

- All state registries should be made available to the FAO Global Record of Fishing Vessels.
- Unedited VMS, or other proprietary tracking system, data should be made public with regular transmission intervals sufficient to ensure vessels can be permanently tracked, or AIS should be required for fishing vessels.

- Up-to-date lists should be published of all fishing licenses, authorisations and vessel registries, transshipment authorisations and refrigerated vessels registries.
- IMO numbers (free to obtain) should be mandated for all eligible vessels, and a national UVI scheme should be implemented for non-eligible vessels, maintaining a vessel registry and providing all information to the FAO Global Record of Fishing Vessels (which ultimately includes all eligible vessels over 12 meters in length overall).
- States should be encouraged to publish information, on an accessible international platform, on arrests and sanctions imposed on individuals and companies for IUU fishing activities, human trafficking and other related crimes.
- Transshipment activities information should be improved through mandatory and public pre-authorisation and robust and verifiable electronic monitoring schemes.
- There should be mandatory near-term adoption of cost-effective digital tools, such as blockchain, that safeguard in a digital form key information on vessel registration, licenses, unloading records, catch location and information and crew documentation; these should be designed in such a way as to support a rapid move towards a universal, interoperable digital catch certification scheme.
- Information on beneficial ownership should be published, and companies should be required to provide information on true beneficial ownership when applying for a fishing license, fishing authorisation or registration to their flag.

B.8 Enhance International Cooperation

- All countries should cooperate to prevent, deter and eliminate IUU fishing at the bilateral and sub-regional levels. Where mechanisms exist, they must be prioritised within government agendas.
    - States should develop and implement a national plan of action on IUU fishing in line with the recommendations of the International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing. Such cooperation should include the following measures:
    - Coastal states should communicate information on IUU fishing-related infringements to neighbouring coastal states.
    - Port states should provide information to flag states on transshipments, landings and denials of use of port involving vessels flying their flag, and the result of inspections.
    - Flag states should cooperate with investigations and act in cases of presumed IUU fishing by their vessels.
    - All states should build capacity to support analysis, implementation and application of policy and technology.

B.9 Domestic Fisheries Actions by Coastal States

- There should be well-established and adequately resourced domestic fisheries management arrangements, supported by sound and properly enforced legislation.
- Clear and transparent CMMs should be established in national legal frameworks, based on the best available scientific advice and consistent with obligations under UNCLOS, UNFSA and RFMO rules.
- A national fisheries management plan should be developed and implemented, and total allowable catch based on the best available scientific evidence should be determined.
- Vessels operating in the exclusive economic zone (EEZ) should be required to hold a license, and there should be a balance between the number of licenses granted/size of fishing activity in the EEZ and the status of stocks. This should be based on scientific and precautionary stock assessments in accordance with maximum sustainable yield and total allowable catch.
- A record of vessels licensed to fish in the EEZ should be established, made publicly available (online) and kept up-to-date. The record should contain vessel details (name, tonnage, flag, registration number); vessel and/or gear type and target species; details

of any quota allocated (if applicable); and details of the vessel's legal owner and operator, including beneficial owner, period of the license, license fee and crew manifest.

- IMO numbers should be required for foreign-flagged eligible fishing vessels as a condition of their license to operate.

B.10 Digital Documentation for All States

- All states should implement digital schemes for documenting catch data to promote global exchange of information, vessel registration and licenses, unloading records, catch location and information and crew documentation.
    - These digital systems must be secure and have built-in procedures to prevent the unauthorised deletion or overwriting of data.

B.11 Actions for Business, Industry, Financial Institutions, Scientists and Civil Society

- Enhanced action by private sector organisations can create strong pressure on fisheries businesses to maintain a high level of compliance.
- Financial institutions (e.g., banks and insurance companies) are encouraged to make fisheries transparency and traceability conditions of contracts.
- Buyers and lenders should establish the accuracy of ownership information to avoid the use of shell companies.
- Private sector organisations should not deal with flag states that fall short of their duties under the UNCLOS.
- The use of PSMA-ratified ports should be made a condition of contract or insurance.
- Assurance should be provided to consumers on the traceability and quality of the fish products (e.g., provide such information on the packaging).
- Zero-waste products should be promoted by creating other products from waste.
- Appropriate machineries and methods for a cost-effective production should be used.
- Science has a crucial role in policymaking. Scientists are expected to provide the following information to create better fisheries governance:
    - The best assessment of fish stocks globally
    - Change of fish behavior/migration pattern caused by climate change
    - Advancing technology of sustainable fishing gears

Civil society can bring communities together for collective action

- Civil society can promote awareness on fisheries sustainability to educate consumers to choose fish products with guaranteed traceability.
- Civil society can advocate for artisanal fisheries to be aware of fisheries sustainability.

References

Agnew, D.J., J. Pearce, G. Pramod, T. Peatman, R. Watson, J.R. Beddington, and T.J. Pitcher. 2009. "Estimating the Worldwide Extent of Illegal Fishing." *PLoS ONE* 4 (2): e4570.

Allison, E.H. 2001. "Big Laws, Small Catches: Global Ocean Governance and the Fisheries Crisis." *Journal of International Development* 13: 933–43.

Andreu-Cazenave, M., M.D. Subida, and M. Fernandez. 2017. "Exploitation Rates of Two Benthic Resources across Management Regimes in Central Chile: Evidence of Illegal Fishing in Artisanal Fisheries Operating in Open Access Areas." *PLoS ONE* 12 (6): e0180012.

APEC (Asia-Pacific Economic Cooperation). 2008. *Assessment of Impacts of Illegal, Unreported and Unregulated (IUU) Fishing in the Asia-Pacific*. Singapore: APEC.

Becker, G.S. 1968. "Crime and Punishment: An Economic Approach." *Journal of Political Economy* 76 (2): 169–212.

Belhabib, D., K. Greer, and D. Pauly. 2017. "Trends in Industrial and Artisanal Catch per Effort in West African Fisheries." *Conservation Letters* 0 (0): 1–10.

Bell, J.D., J.E. Johnson, A.S. Ganachaud, P.C. Gehrke, A.J. Hobday, O. Hoegh-Guldberg, R. Le Borgne, et al. 2011. *Vulnerability of Tropical Pacific Fisheries and Aquaculture to Climate Change*. Noumea, New Caledonia: Secretariat of the Pacific Community.

Béné, C. 2015. "Feeding 9 Billion by 2050—Putting Fish Back on the Menu." *Food Security* 7 (2): 261–74.

Cabral, R.B., J. Mayorga, M. Clemence, J. Lynham, S. Koeshendrajana, U. Muawanah, D. Nugroho, et al. 2018. "Rapid and Lasting Gains from Solving Illegal Fishing." *Nature Ecology & Evolution* 2 (4): 650–58.

California Environmental Associates. 2018. *Trends in Marine Resources and Fisheries Management in Indonesia*. San Francisco: California Environmental Associates.

CCSBT (Convention for the Conservation of Southern Bluefin Tuna). 1993. *Convention for the Conservation of Southern Bluefin Tuna*. Canberra: CCSBT.

Cheung, W. 2016. "Climate Change Effects on Illegal, Unreported and Unregulated Fishing." Nippon Foundation, February 22. https://nereusprogram.org/works/climate-change-effects-on-illegal-unreported-and-unregulated-fishing.

Clark, M.R., D.A. Bowden, A.A. Rowden, and R. Stewart. 2019. "Little Evidence of Benthic Community Resilience to Bottom Trawling on Seamounts after 15 Years." *Frontiers in Marine Science* 6: 63. doi:10.3389/fmars.2019.00063. https://www.frontiersin.org/articles/10.3389/fmars.2019.00063/full#B10.

Costello, C., L. Cao, and S. Gelcich. 2019. *The Future of Food from the Sea*. Washington, DC: World Resources Institute. http://www.oceanpanel.org/future-food-sea.

DCDC (Development, Concepts and Doctrine Centre). 2018. *Global Strategic Trends*. London: Ministry of Defence.

Drammeh, O.K.L. 2000. *Illegal, Unreported and Unregulated Fishing in Small Scale Marine and Inland Capture Fisheries*. Sydney: Government of Australia and FAO.

Dulvy, N.K., S.I. Rogers, S. Jennings, V. Stelzenmüller, S.R. Dye, and H.R. Skjoldal. 2008. "Climate Change and Deepening of the North Sea Fish Assemblage: A Biotic Indicator of Warming Seas." *Journal of Applied Ecology,* 1029–39. https://doi.org/10.1111/j.1365-2664.2008.01488.x@10.1111/(ISSN)1365-2664.CLIMATE_JPE.

Dyck, A.J., and U.R. Sumaila. 2010. "Economic Impact of Ocean Fish Populations in the Global Fishery." *Journal of Bioeconomics* 12: 227–43.

EJF (Environmental Justice Foundation). 2009. *Lowering the Flag—Ending the Use of Flags of Convenience by Pirate Fishing Vessels*. London: EJF.

EJF. 2018. *Out of the Shadows: Improving Transparency in Global Fisheries to Stop Illegal, Unreported and Unregulated Fishing*. London: EJF. https://ejfoundation.org/resources/downloads/Transparency-report-final.pdf.

EJF and Hen Mpoano. 2019. *Stolen at Sea: How Illegal "Saiko" Fishing Is Fuelling the Collapse of Ghana's Fisheries*. London: EJF.

EJF, Oceana, Pew Charitable Trusts, and WWF. 2015. "EU Regulation to Combat Illegal Fishing Third Country Carding Process: Success for South Korea and the Philippines." Case Study 2. http://www.iuuwatch.eu/wp-content/uploads/2015/06/Case-Study2.FINAL_.EN_.pdf.

FAO (Food and Agriculture Organization of the United Nations). 2000. *Expert Consultation on Illegal, Unreported and Unregulated Fishing*. Sydney: FAO.

FAO. 2001. *The International Plan of Action to Prevent and Deter Illegal, Unreported and Unregulated Fishing*. Rome: FAO.

FAO. 2002. *Implementation of the IPOA-IUU.* Rome: FAO.

FAO. 2009. *Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing*. Rome: FAO.

FAO. 2017. *Short-Term Projection of Global Fish Demand and Supply Gaps*. Rome: FAO..

FAO. 2018. *The State of World Fisheries and Aquaculture 2018—Meeting the Sustainable Development Goals*. Rome: FAO.

Fenichel, E.P., S.A. Levin, B. McCay, K. St. Martin, J.K. Abbott, and M.L. Pinsky. 2016. "Wealth Reallocation and Sustainability under Climate Change." *Nature Climate Change* 6 (3): 237–44.

Fluet-Chouinard, E., S. Funge-Smith, and P.B. McIntyre. 2018. "Global Hidden Harvest of Freshwater Fish Revealed by Household Surveys." *Proceedings of the National Academy of Sciences* 115 (29): 7623–28. doi:10.1073/pnas.1721097115.

Free, C.M., T. Mangin, J. García Molinos, E. Ojea, C. Costello, and S.D. Gaines. 2019. "Realistic Fisheries Management Reforms Could Mitigate the Impacts of Climate Change in Most Countries." BioRxiv. https://doi.org/10.1101/804831.

Freestone, D. 2010. "Problems of High Seas Governance." In *The World Ocean in Globalisation: Challenges and Responses*, edited by Davor Vidas and Peter Johan Schei, 99–130. Leiden: Brill and Martinus Nijhoff.

Friend, E. 2015. "Meat Consumption Trends in Asia Pacific, and What They Mean for Foodservice Strategy" (blog) August 25. https://blog.euromonitor.com/meat-consumption-trends-in-asia-pacific-and-what-they-mean-for-foodservice-strategy.

Gaines, S., R. Cabral, C. Free, and Y. Golbuu. 2019. *The Expected Impacts of Climate Change on the Ocean Economy*. Washington, DC: World Resources Institute. http://www.oceanpanel.org/expected-impacts-climate-change-ocean-economy.

Gaines, S.D., C. Costello, B. Owashi, T. Mangin, J. Bone, J. García Molinos, M. Burden, et al. 2018. "Improved Fisheries Management Could Offset Many Negative Effects of Climate Change." *Science Advances* 4 (8): eaao1378. https://doi.org/10.1126/sciadv.aao1378.

Gallic, B., and A. Cox. 2006. "An Economic Analysis of Illegal, Unreported and Unregulated (IUU) Fishing: Key Drivers and Possible Solutions." *Marine Policy* 30: 689–95.

Gianni, M., S.D. Fuller, D.E.J. Currie, K. Schleit, L. Goldsworthy, B. Pike, B. Weeber, S. Owen, and A. Friedman. 2016. *How Much Longer Will It Take? A Ten-Year Review of the Implementation of United Nations General Assembly Resolutions 61/105, 64/72 and 66/68 on the Management of Bottom Fisheries in Areas beyond National Jurisdiction*. Amsterdam: Deep Sea Conservation Coalition.

Global Fishing Watch. 2017. "First Global View of Transshipment at Sea." https://globalfishingwatch.org/transshipment-success/report-first-global-view-transshipment-sea.

Global Ocean Commission. 2014. *From Decline to Recovery: A Rescue Package for the Global Ocean*. Oxford: Global Ocean Commission.

Haenlein, C. 2017. "Below the Surface: How Illegal, Unreported and Unregulated Fishing Threatens Our Security." RUSI Occasional Paper, July. https://rusi.org/sites/default/files/201707_rusi_below_the_surface_haenlein.pdf.

High Seas Task Force. 2006. *Closing the Net: Stopping Illegal Fishing on the High Seas*. Bellegarde, France: Governments of Australia, Canada, Chile, Namibia, New Zealand, and the United Kingdom, WWF, IUCN, and the Earth Institute at Columbia University.

Hilborn, R., J.M. (Lobo) Orensanz, and A.M. Parma. 2005. "Institutions, Incentives and the Future of Fisheries." *Philosophical Transactions of the Royal Society B: Biological Sciences* 360 (1453): 47–57.

Hoegh-Guldberg, O. 2019. *The Ocean as a Solution to Climate Change: Five Opportunities for Action*. Washington, DC: World Resources Institute.

Holland, J. 2018. "Spanish Tycoon Hit with USD 10 Million Fine for Illegal Fishing." Seafood Source, April 24. https://www.seafoodsource.com/news/environment-sustainability/spanish-tycoon-hit-with-usd-10-million-fine-for-illegal-fishing.

Hornidge, A.K., and M. Hadjimichael. 2019. "Ocean Governance. Pasts, Presents, Futures." https://www.oceangov.eu/wp-content/uploads/2019/06/OceanGov_edVol_CfP.pdf.

Hutnikzac, B., and C. Delpeuch. 2018. *Combatting Illegal, Unreported and Unregulated Fishing: Where Countries Stand and Where Efforts Should Concentrate in the Future*. Paris: OECD.

International Chamber of Shipping. 2015. "Shipping Industry Flag State Performance Table." https://www.ics-shipping.org/free-resources/flag-state-performance-table.

International Transport Worker Federation. 2020. "Flags of Convenience." https://www.itfglobal.org/en/sector/seafarers/flags-of-convenience.

Interpol. 2016. *Project Scale*. Lyon, France: Interpol. https://www.interpol.int/content/download/5116/file/Project%20Scale%20brochure.pdf.

IPBES (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services). 2019. *Summary for Policymakers of the Global Assessment Report on Biodiversity and Ecosystem Service of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. Bonn: IPBES Secretariat.

IPCC (Intergovernmental Panel on Climate Change). 2019. "Summary for Policymakers." In *IPCC Special Report on the Ocean and Cryosphere in a Changing Climate* (forthcoming).

ITLOS (International Tribunal for the Law of the Sea). 1999a. *M/V "Saiga" (No. 2) (Saint Vincent and the Grenadines v. Guinea), Judgment*. Hamburg: ITLOS.

ITLOS. 1999b. *Southern Bluefin Tuna (New Zealand v. Japan; Australia v. Japan), Provisional Measures.* Hamburg: ITLOS.

Joseph, J., D. Squires, W. Bayliff, and T. Groves. 2010. "Addressing the Problem of Excess Fishing Capacity in Tuna Fisheries." In *Conservation and Management of Transnational Tuna Fisheries*, edited by Robin Allen, James Joseph, and Dale Squires, 11–38. Ames, IA: Blackwell.

Knauss, J.M. 2005. "The Growth of British Fisheries during the Industrial Revolution." *Ocean Development and International Law* 36 (1): 1–11.

Konar, M., E. Grey, L. Thuringer, and U.R. Sumaila. 2019. "The Scale of Illicit Trade in Pacific Ocean Marine Resources." Working Paper. Washington, DC: World Resources Institute.

Macfadyen, G., B. Caillart, and D. Agnew. 2016. *Review of Studies Estimating Levels of IUU Fishing and the Methodologies Utilized*. Portmore, UK: Poseidon Aquatic Resources Management.

Martini, R. 2019. "Many Government Subsidies Lead to Overfishing. Here's a Solution." OECD, February 28. https://www.oecd.org/agriculture/government-subsidies-overfishing.

McDowell, R., M. Mendoza, and M. Mason. 2015. “AP Tracks Slave Boats to Papua New Guinea.” AP, July 27. https://www.ap.org/explore/seafood-from-slaves/ap-tracks-slave-boats-to-papua-new-guinea.html.

Michael, P.E., R. Thomson, C. Barbraud, K. Delord, S. de Grissac, A.J. Hobday, P.G. Strutton, et al. 2017. “Illegal Fishing Bycatch Overshadows Climate as a Driver of Albatross Population Decline.” *Marine Ecology Progress Series* 579: 185–99.

Ministry of Marine Affairs and Fisheries of the Republic of Indonesia. 2019. “KKP 4-Year Program Performance Achievement.” https://kkp.go.id/infografis-detail/2633-pencapaian-kinerja-program-4-tahun-kkp.

Molenaar, E.J. 2011. “Non-participation in the Fish Stocks Agreement: Status and Reasons.” *International Journal of Marine and Coastal Law* 26: 195–234.

MRAG Asia Pacific. 2016. *Towards the Quantification of Illegal, Unreported and Unregulated (IUU) Fishing in the Pacific Islands Region*. Queensland: MRAG Asia Pacific. https://www.ffa.int/files/FFA%20Quantifying%20IUU%20Report%20-%20Final.pdf.

Owen, D. 2016. “Introductory Briefing on the Due Diligence Obligation of Flags States Regarding Their Fishing Vessels, the Liability for Breach of This Obligation and the Possibilities for Litigation.” World Wildlife Fund. https://www.chathamhouse.org/sites/default/files/Daniel%20Owen.pdf.

Pauly, D., and D. Zeller. 2016. “Catch Reconstructions Reveal That Global Marine Fisheries Catches Are Higher than Reported and Declining.” *Nature Communications* 7 (1): 10244.

Perry, A.L., P.J. Low, J.R. Ellis, and J.D. Reynolds. 2005. “Climate Change and Distribution Shifts in Marine Fishes.” *Science* 308 (5730): 1912–15. https://doi.org/10.1126/science.1111322.

Pew Charitable Trusts. 2018. “The Cape Town Agreement Explained: How One International Treaty Could Combat Illegal Fishing and Save Lives.” https://www.pewtrusts.org/-/media/assets/2019/09/ctaexplained_brief.pdf.

Pikitch, E., P.D. Boersma, D.O. Conover, P. Cury, Timothy E. Essington, S.S. Heppell, E.D. Houde et al. 2012. “Little Fish, Big Impact: Managing a Crucial Link in Ocean Food Webs.” Washington, DC: Lenfest Ocean Program.

Pinsky, M.L., B. Worm, M.J. Fogarty, J.L. Sarmiento, and S.A. Levin. 2013. “Marine Taxa Track Local Climate Velocities.” *Science* 341 (6151): 1239–42. https://doi.org/10.1126/science.1239352.

Poloczanska, E.S., C.J. Brown, W.J. Sydeman, W. Kiessling, D.S. Schoeman, P.J. Moore, K. Brander, et al. 2013. “Global Imprint of Climate Change on Marine Life.” *Nature Climate Change* 3 (10): 919–25. https://doi.org/10.1038/nclimate1958.

Rayfuse, R., and R. Warner. 2008. “Securing a Sustainable Future for the Oceans Beyond National Jurisdiction: The Legal Basis for an Integrated Cross-Sectoral Regime for High Seas Governance for the 21st Century.” *International Journal of Marine and Coastal Law* 23 (3): 399–421.

Richardson, K., R. Gunn, C. Wilcox, and B.D. Hardesty. 2018. “Understanding Causes of Gear Loss Provides a Sound Basis for Fisheries Management.” *Marine Policy* 96: 278–84.

Sala, E., J. Mayorga, C. Costello, D. Kroodsma, M.L.D. Palomares, D. Pauly, U.R. Sumaila, and D. Zeller. 2018. “The Economics of Fishing the High Seas.” *Science Advances* 4 (6): eaat2504.

SEAFDEC (Southeast Asian Fisheries Development Center). 2015. *Asian Guidelines for Preventing the Entry of Fish and Fishery Products from IUU Fishing Activities into the Supply Chain*. Myanmar: SEAFDEC.

Serdy, A. 2017. “Pacta Tertiis and Regional Fisheries Management Mechanisms: The IUU Fishing Concept as an Illegitimate Short-Cut to a Legitimate Goal.” *Ocean Development and International Law* 48: 345–64.

Sumaila, U.R. 2018. “Illicit Trade in the Marine Resources of West Africa.” *Ghanaian Journal of Economics* 6 (1): 108–16.

Sumaila, U.R. 2019. “Updated Estimates and Analysis of Global Fisheries Subsidies.” *Marine Policy* 109: 1–11.

Sumaila, U.R., J. Alder, and H. Keith. 2006. “Global Scope and Economics of Illegal Fishing.” *Marine Policy* 30 (6): 696–703.

Sumaila, U.R., and M. Bawumia. 2014. “Fisheries, Ecosystem Justice and Piracy: A Case Study of Somalia.” *Fisheries Research* 157: 154–63.

Sumaila, U.R., J. Jacquet, and A. Witter. 2017. “When Bad Gets Worse: Corruption and Fisheries.” In *Corruption, Natural Resources and Development*, edited by A. Williams and P. Le Billon 93–105. Cheltenham, UK: Edward Elgar.

Sumaila, U.R., V. Lam, F. Le Manach, W. Swartz, and D. Pauly. 2016. “Global Fisheries Subsidies: An Updated Estimate.” *Marine Policy* 69: 189–93.

Taconet, M., D. Kroodsma, and J.A. Fernandes. 2019. *Global Atlas of AIS-Based Fishing Activity: Challenges and Opportunities*. http://www.fao.org/documents/card/en/c/ca7012en.

Tanaka, Y. 2012. *International Law of the Sea*. Cambridge: Cambridge University Press.

Task Force 115. 2018. “Ending Fisheries Crime in Indonesia.” *FishFORCE Newsletter* 003/2018.

Telesetsky, A. 2014. “Laundering Fish in the Global Undercurrents: Illegal, Unreported and Unregulated Fishing and Transnational Organized Crime.” *Ecology Law Quarterly* 41 (4): 939–97.

Tinch, R., I. Dickie, and B. Lanz. 2008. *Costs of Illegal, Unreported and Unregulated (IUU) Fishing in EU Fisheries*. London: Economics for the Environment Consultancy. .

Undercurrent News. 2019. “Thai Court Hands Out Fines of over $16m to IUU Operation,” May 17. https://www.undercurrentnews.com/2019/05/17/thai-court-hands-out-fines-of-over-16m-to-iuu-operation.

United States v. Bengis, S1 03 Crim. 0308 (LAK), at *2 (S.D.N.Y. Jun. 14, 2013).

Watson, R.A., W.W.L. Cheung, J.A. Anticamara, R.U. Sumaila, and D. Pauly. 2013. “Global Marine Yield Halved as Fishing Intensity Redoubles.” *Fish and Fisheries* 14: 493–503.

Zimmerhackel, J.S., A.A. Rogers, M.G. Meekan, K. Ali, D. Pannell, and M.E. Kragt. 2018. “How Shark Conservation in the Maldives Affects Demand for Dive Tourism.” *Tourism Management* 69: 263–71.

Acknowledgements

The paper's technical reviewers, Alf Hakon Hoel, Adriana Fabra, Paulus Kaigne, Jim Leape and Juan Mayorga, as well as its arbiter, Nicola Frost, all provided helpful technical comments on this Blue Paper.

The authors also thank the World Resources Institute for providing support as the Ocean Panel Secretariat.

While our colleagues were very generous with their time and input, this report reflects the views of the authors alone.

The authors thank LSF Editorial for copyediting and Jen Lockard for design.

About the Authors

Co-authors

Sjarief Widjaja is a Professor of Production Management and Shipping Operations and is the Director General of Agency for Marine and Fisheries Research and Human Resources, Ministry of Marine Affairs and Fisheries (Indonesia).

Tony Long is the CEO of Global Fishing Watch (USA) and retired Royal Navy officer (UK).

Hassan Wirajuda is a scholar of International Ocean Law and Policy, a former Minister for Foreign Affairs (Indonesia), and a co-founder of the Indonesia Ocean Justice Initiative.

Contributing Authors

Hennie Van As is a Professor of Public Law and a Director at the Nelson Mandela Metropolitan University, Port Elizabeth (South Africa).

Per Erik Bergh is CEO of Nordenfjeldske Development Services (NFDS), Managing Director of NFDS Africa.

Annie Brett is an André Hoffman Fellow at Stanford Center for Ocean Solutions and a Fellow at the World Economic Forum Center for the 4th Industrial Revolution (USA).

Duncan Copeland is the Executive Director of Trygg Mat Tracking (TMT) (Norway).

Miriam Fernandez is a Senior Research Fellow at the Knowledge Media Institute (KMi), Open University, and a member of KMi's Social Data Science Group.

Achmad Gusman is the Vice Dean and an assistant professor at the Law Faculty, Universitas Padjadjaran (Indonesia).

Stephanie Juwana is a founder of the Indonesia Ocean Justice Initiative and former legal counsel at the Special Task Force to Combat IUU fishing (SATGAS 115)

Toni Ruchimat is a lecturer at Jakarta University of Fisheries and former Director of Fisheries Research Center, Ministry of Marine Affairs and Fisheries (Indonesia).

Steve Trent is co-founder and Director of Environmental Justice Foundation (UK).

Chris Wilcox is a research scientist with Commonwealth Scientific and Industrial Research Organisation (CSIRO) (Australia).

.

HIGH LEVEL PANEL *for*
A SUSTAINABLE OCEAN ECONOMY

10 G Street NE
Suite 800
Washington, DC 20002, USA
+1 (202) 729-7600

oceanpanel.org