Part IV:
The illicit in natural resource supply chains

Undercurrents: illegal fishing and European Union markets

Ina Tessnow-von Wysocki, Dyhia Belhabib and Philippe Le Billon

Introduction

Fish is currently the most widely traded food commodity on the planet. With a global capture fisheries production of 96.4 million tons in 2018, it is a crucial industry for exporters and a source of protein for importers (FAO 2020). The massive scale of this trade hides a deep crisis within capture marine fisheries which is notably characterised by illegal fishing practices undermining the sustainability of overexploited fish stocks and involves fraudulent and abusive practices ranging from tax evasion to slavery. There is a dire need to stop the flow of illegal, unreported and unregulated (IUU) wild-seafood products (fish and other marine life forms) within international markets. Despite numerous efforts to counter such activities, so far, limited progress has been made at the *global* level. Here, we look at the case of illegally caught fish reaching European markets, with a focus on fish originating from Ghana in West Africa.

Illegal fishing refers to fishing activities that violate existing laws, such as fishing in foreign waters without permission and activities that do not abide by regulations of the Regional Fisheries Management Organisations (RFMOs) that the state under which the vessel operates has to follow, or by other international or national legislation. Illegal fishing is often linked to other forms of 'fish crimes' (crimes related to the fishing sector, including labour abuses, document fraud, smuggling and money laundering, see Belhabib, Le Billon and Wrathall 2020; Belhabib and Le Billon 2020; INTERPOL 2020), though we caution against framing all illegal fishing activities as organised crime (Satizábal et al. 2021).

International strategies to reduce illegal fishing have been delayed so far for two main reasons. First, existing global and regional measures lack implementation and currently do not include comprehensive regulations to fight IUU fishing as a global problem, namely to disincentivise these activities, ensure transparency along the supply chain, detect violations and prosecute perpetuators, particularly beneficial vessel owners (i.e. the individuals who benefit from the ownership though the corporations may be under another name). A lack of international consensus, for example with-

in the Food and Agriculture Organization (FAO) and the World Trade Organization (WTO), has so far had a negative impact on the emergence of global regulations, such as the obligation to provide detailed information on the origin of fish or a broad ban on fishing subsidies (Pramod and Pitcher 2019; Sumaila et al. 2021). Second, illegal fishing and its impacts on depleted stocks are in part the result of subsidies that increase fleet capacity (Arthur et al. 2019). Estimates of global fisheries subsidies identify China, the European Union (EU), the United States (US), South Korea and Japan as the largest subsidy providers (Sumaila et al. 2019). Despite Sustainable Development Goal (SDG) target 14.6 and the initial timeline of 2020 for WTO negotiations to end fisheries subsidies, progress was delayed (Koop and Aldred 2020) and an agreement only adopted recently (June 2022). Five countries account for about 90 % of the global Distant Water Fishing (DWF) effort, including China (38 %; note that its DWF fleet could be much larger than previously estimated, see Guttierez et al. 2020), Taiwan (21 %), Japan (10 %), South Korea (10 %) and Spain (10 %) (Yozell and Shaver 2019).

European markets play a major role in this international trade: while the DWF fleet from the EU is comparatively small, the EU's consumption market for *potentially* illegally caught fish is among the largest in the world (EUMOFA 2020). In 2008, the European Council passed a regulation to prevent, deter and eliminate IUU fishing (European Council 2008).[1] One pillar of the EU regulation introduced a 'carding system' to prevent illegally caught fish from entering EU markets and to incentivise exporting countries to improve their management of fisheries and ensure that their exports are legal. Countries exporting to the EU can be warned ('yellow card') to rapidly address identified shortcomings and be banned ('red card') if they fail to address them. At the time of writing, nine countries (Cameroon, Ecuador, Ghana, Liberia, Panama, Sierra Leone, St Kitts and Nevis, Trinidad and Tobago, Vietnam) have been yellow-carded and three

1 Council Regulation (EC) No 1005/2008 of 29 September 2008 establishing a Community system to prevent, deter and eliminate illegal, unreported and unregulated fishing (IUU Regulation) in conjunction with Commission Regulation (EC) No 1010/2009 of 22 October 2009 laying down detailed rules for the implementation of Council Regulation (EC) No 1005/2008 https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex%3A32008R1005. This regulation, which entered into force on 1 January 2010, resembles other market-access based initiatives, such as the European Union's Forest Law Enforcement, Governance and Trade Action Plan (see Maryudi and Meyers 2018) or the Kimberley Process Certification Scheme for diamonds (Le Billon 2008). For US regulations, including the Seafood Import Monitoring Program (SIMP), see He (2018) and Fang and Asche (2021).

(Cambodia, Comoros, St Vincent and the Grenadines) red-carded. While this carding system can be regarded as a best-practice example in countering IUU fishing, it still has some shortcomings, including interests to avoid the yellow- or red-carding of countries with which the EU maintains broader trade relations, such as China (Okafor-Yarwood and Belhabib 2020), and differences in the thoroughness of inspections of catch landings and imports in the ports of different EU members, with some fishers landing illegal catches in selected EU countries rather than others in order to reduce the risk of penalties (Mundy 2018). Illegally caught fish entering EU markets remains a complex challenge that requires further regulations and cooperation on regional and international levels.

Following this introduction, the first section provides a brief overview of the global extent of IUU fishing and resulting environmental, social and economic impacts, the second examines the modi operandi of how illegal fish enters EU markets, focusing on the example of Ghana, the third describes existing efforts to curb these activities and current shortcomings, and the fourth discusses possible solutions to counter IUU fishing, followed by the conclusion.

1. The global problem of illegal fishing

Illegal fishing is a global problem prevalent in various geographical areas, including coastal waters and the high seas, and affects numerous target species (Liddick 2014; Sumaila, Alder and Keith 2006; Battista et al. 2018; Österblom and Bodin 2012). It is accompanied by fishing activities that lack reliable reporting or that are not regulated under existing law. In order to prevent impacts from illegal, unreported and unregulated (IUU) fishing, this complex problem has to be tackled with a holistic approach.

1.1 Defining IUU

Coined in the late 1990s, the term IUU covers three categories of fishing activities, as defined below according to the FAO (2001):

> **Illegal fishing**, i.e. fishing conducted a) 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; b) by vessels flying the flag of states that are parties to a relevant Regional Fisheries Management Organisation (RFMO) but operate in contraven-

tion of the conservation and management measures adopted by that organisation and by which the states are bound, or relevant provisions of the applicable international law; or c) in violation of national laws or international obligations, including those undertaken by cooperating states to a relevant RFMO.

Unreported fishing concerns fishing activities that a) have not been reported or have been misreported to the relevant national authority, in contravention of national laws and regulations; or b) are undertaken in the area of competence of a relevant RFMO and have not been reported or have been misreported, in contravention of the reporting procedures of that organisation.

Unregulated fishing refers to fishing a) in the area of application of a relevant RFMO that is conducted by vessels without nationality, or by those flying the flag of a state not party to that organisation, or by a fishing entity, in a manner that is not consistent with or contravenes the conservation and management measures of that organisation; or b) 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.

This chapter focuses on *illegal* fishing, though it also covers some other governance issues such as misreporting and unregulated practices. We stress that more thorough reporting and sound regulations beyond the EU are needed to address IUU fishing as a global problem. Some activities not (yet) considered illegal, such as the instrumental use of flags and ports of convenience, transshipment and '*post-fishing*', require greater regulatory attention, as discussed in Section 4.

1.2 Impacts of IUU fishing

IUU fishing has significant adverse effects on the marine environment and coastal communities. It is also often linked to crimes affecting national and regional security. This section discusses the various environmental, social and economic harms of IUU fishing (Liddick 2014).

Environmental harms include impacts on marine ecosystems (Metuzals et al. 2010; Liddick 2014; Petrossian 2015) through the destruction of marine habitats (Petrossian and Pezzella 2018) and the overexploitation

and depletion of fish stocks beyond legal limits (Liddick 2014; Flothmann et al. 2010; Petrossian 2015). In addition, the use of destructive fishing methods, including blast bombing and cyanide fishing, and of prohibited gear further contributes to the problem of bycatch (the unintended capture of non-target species). For example, illegal longline fishing results in the annual loss of an estimated 100,000 albatross (Petrossian 2015) and contributes to dramatic losses of sharks (Pacoureau et al. 2021). Illegal fishing can negatively affect fish populations and the ecosystems supporting them, including through ignoring and undermining national and regional fisheries management and conservation measures (Flothmann et al. 2010).

IUU fishing also contributes to a number of social impacts, affecting millions of people who depend on fisheries for survival (Petrossian 2015; Petrossian and Pezzella 2018). Such activities also threaten regional and national stability, as they are often linked to major human rights violations and to organised crime (Soyer, Leloudas and Miller 2018). The social harms of illegal fishing are far-reaching, as it impacts society at present and in the future. IUU fishing exacerbates poverty, as it takes away catch opportunities from the most vulnerable, and often reduces food security and livelihood options of coastal populations (Liddick 2014; Petrossian and Pezzella 2018; Soyer, Leloudas and Miller 2018). This, in turn, can undermine the buffering effects of small-scale fishing crucial to the resilience of small-scale fishing-dependent coastal communities and countries, especially when these are affected by natural disasters or armed conflicts (Belhabib et al. 2018). In addition, illegal fishing often creates situations in which people are forced to take extreme measures, such as working on board vessels that are prone to human rights violations (Soyer, Leloudas and Miller 2018). Illegal fishing is often self-perpetuating: by reducing catch opportunities in vulnerable poverty-prone regions, it creates the need to seek alternative forms of livelihood such as illegal fishing (e.g. fishing using illegal gear or fishing in marine protected areas), illicit drug trade (Belhabib et al. 2020) or armed robbery and piracy – activities that are often linked to poverty and environmental crimes such as marine pollution (Okafor-Yarwood 2020).

Economic losses due to IUU fishing are significant. Estimates of illegal and unreported catch range from 11 to 16 million tons with a value of US$10–23.5 billion yearly (Agnew et al. 2009), accounting for at least 15 % of the total world catch (Liddick 2014). The cost to developing countries amounts to US$2–15 billion in economic losses annually (Liddick 2014). In the short run, illegal fishing takes away fish that can secure high prices on markets (e.g. tuna or sword fish) and hence economic prospects for coastal states. In the long run, illegal fishing threatens the commercial via-

bility of targeted fish species by jeopardising conservation efforts and can undermine the sustainability of fish populations more generally, including through bycatch and damage to marine ecosystems (Metuzals et al. 2010). At the community level, illegal fishing takes away fishing opportunities, reducing income and resulting in increased poverty and reduced economic resilience and employment prospects (Belhabib, Sumaila and Pauly 2015).

1.3 Drivers of illegal fishing

Deterrence models argue that an individual commits a crime if the expected benefits from doing so exceed the benefits from engaging in legal activity (Sumaila, Alder and Keith 2006). Sumaila, Alder and Keith (2006) assume the following direct drivers and motivators for illegal fishing: (1) benefits that can be realised by engaging in the illegal activity; (2) the probability that the illegal activity is detected, depending on the level of enforcement and existing regulations; (3) the penalty the fisher faces if caught; (4) the cost to the fisher of engaging in avoidance activities; (5) the fisher's moral and social standing in society and how it is likely to be affected if the fisher engages in illegal fishing.

Beyond the concept of "opportunity makes the thief" quoted by Felson and Clarke (1998) and revisited by Sumaila, Alder and Keith (2006), the driver of *necessity* to engage in illegal activities (rather than greed) is often associated with a low threshold for resilience to crises and poverty and has not been sufficiently studied. In this case, the cost of being caught matters less than the cost of not engaging in such illicit activity, which – especially in the case of poor individual fishers – is associated with survival as opposed to profit (Belhabib, Le Billon and Bennett 2022). The fight against IUU fishing needs to take this into account if it is not to harm vulnerable small-scale fishing households and communities. Anti-IUU efforts can hurt small-scale fishers, notably when these efforts disregard the "diversity, legitimacy and sustainability of small-scale fisheries practices and their governing systems", unfairly burden small-scale fishers, favour large-scale fishers able to meet anti-IUU and certification requirements and result in violent crackdowns against small-scale fishing (Song et al. 2020: 831). It is thus crucial to differentiate between small-scale fishers, who are often themselves the "victims", when they engage in illegal activities due to poverty, and people benefiting from industrial-scale IUU fishing activities.

To date, IUU fishing has been a lucrative, low-risk and high-reward activity. IUU fishing is "positively related to the number of commercially sig-

nificant species found within [a country's] territorial waters and its proximity to known ports of convenience" (Petrossian 2015). Such ports of convenience are strategically chosen by the actors undertaking the illicit activity, as regulations and standards of port inspections are lower there (Petrossian, Marteache and Viollaz 2015). IUU activities tend to occur in circumstances of low monitoring, control and surveillance (MCS) capacity, particularly in highly corrupt states (Petrossian 2015) and on the high seas – that is, beyond the limits of coastal states' Exclusive Economic Zones (EEZs), areas which are 200 nautical miles away from shore and for which the UN Convention on the Law of the Sea (UNCLOS) requires "measures for the conservation of the living resources of the high seas" (UNCLOS 1982: Part VII. Section 2. Art. 116–120), rather than national regulations (Österblom et al. 2016). A combination of economic incentives, a fragmented international governance framework and a lack of enforcement capacity results in the persistence of the problem (Widjaja et al. 2019). While low-income countries are particularly vulnerable to IUU fishing, due to limited monitoring and enforcement capacity (Agnew et al. 2009; Battista et al. 2018), the markets reached by illegally caught seafood are much more widespread, including in jurisdictions with elaborate regulations and ethical consumer concerns, including the European Union.

2. IUU fishing and European Union markets

The European Union is the largest fish importing market, before the US and Japan (EUMOFA 2021: 62). The EU's fish demand mainly relies on imports, particularly for the top five species consumed in the EU: tuna, salmon, cod, Alaska pollock and shrimps (EUMOFA 2021: 31). Table 1 gives an overview of seafood imports into the EU market (to which are added 17,000 tonnes of mostly salmonids from aquaculture), countries of origin and their associated IUU Fishing Index and port risk (i.e. risk of illegally caught fish entering ports), as well as the cards issued to them under the EU carding system.

Table 1: Import of seafood products into EU markets and associated IUU fishing risks and responses

Country of origin	**Percentage of imports (in value) (2020)**	**IUU Fishing Index (2021)**	**Port risk (2020)**	**Countries listed under the EU carding system (2012–2021)**
Norway	26.0 %	2.10	2.43	-
Faroes	UK 7.0 %	n.a. (UK 2.17)	n.a. (UK 2.65)	-
China	6.0 %	3.86	3.08	-
Ecuador	5.0 %	2.38	2.66	Yellow (since October 2019)
Morocco	5.0 %	2.28	2.45	-
Iceland	4.0 %	1.95	2.08	-
Greenland	3.0 %	n.a. (Denmark: 1.72)	n.a.	-
Vietnam	3.0 %	2.33	2.92	Yellow (since October 2017)
United States	3.0 %	2.51	2.26	-
India	3.0 %	2.36	2.57	-
Other 141 non-EU countries	35 %	n.a.	n.a.	n.a.

Sources: Percentage of imports: European Commission 2021; IUU Fishing Index: GI-TOC 2021[2]; port risk: Pew 2020: 10; carding: European Commission 2021[3], Mundy 2018.

2 IUU Fishing Index uses 40 indicators to assess the vulnerability to, prevalence of, and response to IUU fishing from 1–5.

3 Continuously updated list of pre-identified, revoked, identified, listed and de-listed third countries.

Given its nature and the broad scope of its definition, there is no precise and robust estimate of illegal catch. In 2007, EU market imports of illegal fishery products were estimated at 500,000 tons, amounting to about US$1.3 billion (Mundy 2018).[4] Illegally caught fish entering the EU are often high-value species. While it is difficult to trace value chains, certain trends after the yellow-carding of some countries illustrate trade anomalies in species such as tuna, swordfish and sharks and in surimi preparations, which have – despite new carding regulations – found ways into the EU, e.g. through the Netherlands from Ghana and Thailand and through France from Belize, the Philippines and Sri Lanka (Mundy 2018). The industrial sector is often the main sector involved in fish exports (apart from limited artisanal sea cucumber and shark fin fisheries, whose main market is not the EU).

2.1 Modus operandi of illegal fishing: major flows and actors

Illegal fishing activities are manifold and include fishing in prohibited areas (e.g. marine protected areas, zones reserved for artisanal fishers), fishing in contravention of the licence issued (e.g. species, above quota, out of season) and the use of prohibited gear (e.g. drifting nets) and illegal fishing techniques.

There are two main ways through which illegally caught seafood products reach EU markets.

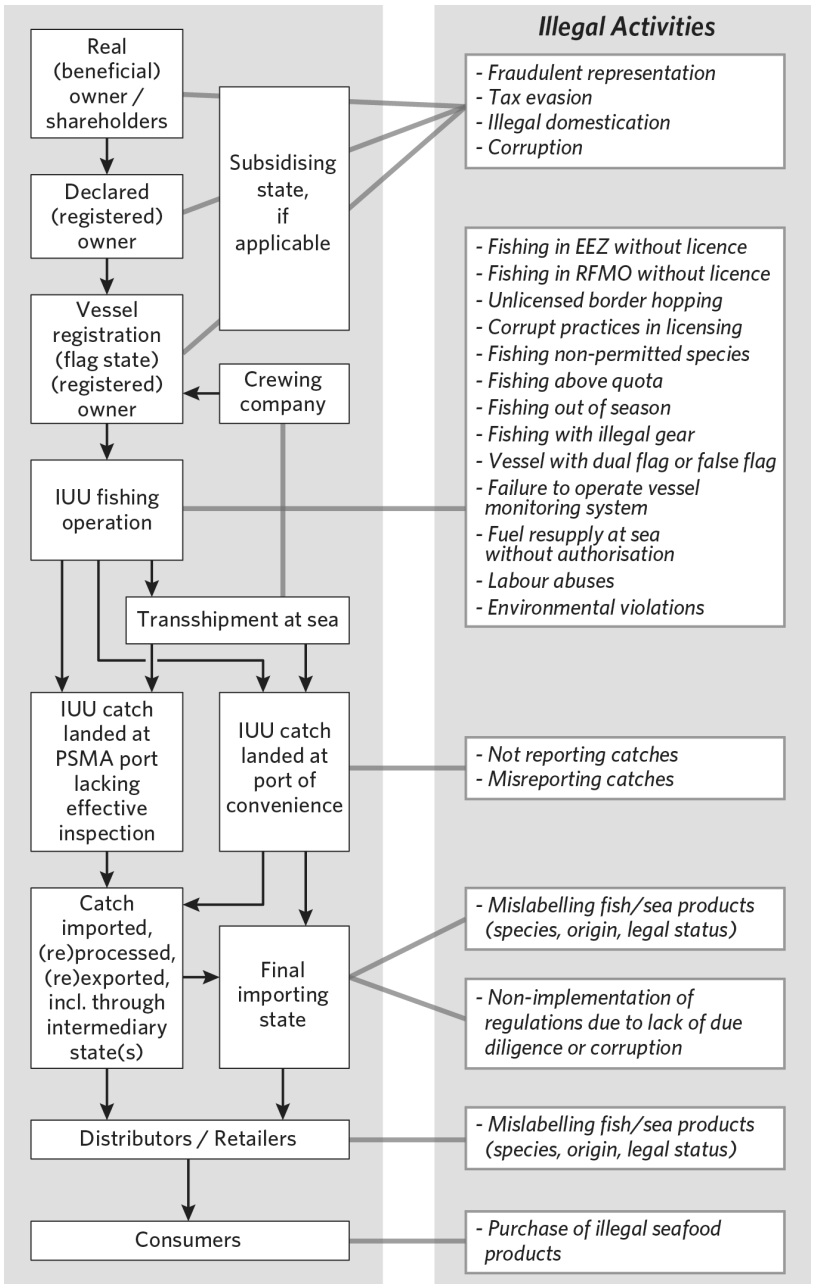
> Illegal fishing by EU fleets: several countries within the EU have large fishing fleets, many of whose vessels operate under fishing access agreements, with an unknown number of them operating illegally. Despite operating under a legitimate fishing access agreement with a coastal state, vessels can infringe upon domestic regulations (by incursions into prohibited zones) (Belhabib et al. 2020) or upon EU regulations (e.g. Italian vessels shark finning off Sierra Leone where shark finning is not illegal, CFFA 2020). These vessels' products may not be seized by the coastal state and may be transshipped (i.e. transferred to another ship – generally a 'reefer' (refrigerated cargo ship) – at sea rather than at a port, thus increasing the risk of fraud), then traded within the EU market using EU ports. If the vessel is not caught, it is unlikely that the product is banned from EU markets.

4 Amounts were converted from euros to US dollars for the sake of comparison within the article (1 US dollar equals 0.83 euros).

Third-party vessels, sea food companies and trading entities, including individual exporters/importers: this is exemplified by cases where illegally caught seafood products from non-EU countries enter EU markets under international trade deals or through intermediaries, including organised-crime networks specialising in bringing illegally caught fish into EU markets and laundering financial gains.

To undertake illegal fishing activity, perpetrators are following a pattern of activities (modus operandi) (INTERPOL 2014) which are currently low-risk and high-gain (Long et al. 2020). Figure 1 shows the different pathways by which illegal fishing takes place and how the catch enters EU markets. Prior to fishing activity, companies need to register their vessels under the flag of a state (flag state) under which activities will be conducted and obtain fishing licences for the intended activity. In this step, abuses of vessel registries and licences serve as a pathway into IUU fishing. This includes not registering at all, registering several vessels under the same identity (sister ships) and using flags of convenience (FOCs) to take advantage of weak or non-existent regulations in certain flag states, leading to misrepresentation (e.g. false vessel identity), tax evasion and illegal domestication (i.e. re-registration of a foreign vessel as a domestic coastal state one), fuelled by corruption. FOCs are one of the many diversion strategies used by fishing vessels and illegally operating seafood companies to escape detection. The use of dual or false flags is a strategy to change some aspects of a vessel's identity, while registration in tax havens and the multiplication of subsidiaries and branches remain two of the best options to reduce illegal fishing sanctions through the domestic re-registration of a vessel (which results in a lower sanction based on laws directed towards domestic vessels, compared to foreign ones) or to avoid any sanctioning at all if the flag state has lax regulations.

Figure 1



A second significant modus operandi of illegal fishing is transshipment. Transshipment is the practice of transferring catches, supplies, crews, fuel from one vessel to another (Miller et al. 2018). It poses an extreme challenge to transparency when reliable observers are lacking and allows fishing vessels to stay out at sea for extended periods of time – up to several years – without ever visiting a port. Transshipment can serve to trade fish in defiance of regulations (e.g. getting fish from unlicensed artisanal fishers, unloading fish outside authorised ports or in the absence of observers). In this way, illegal catch is mixed with legal catch at sea, which makes it practically impossible to reliably document origin and methods of catch and to detect illegal activity during port inspection. However, transshipment goes beyond masking illegal catch and has been strongly linked to other fisheries crimes, such as human rights and labour abuses in various forms, as has been extensively documented in relation to human trafficking and forced labour within the fishing industry in parts of Southeast Asia and within some Distant Water Fishing fleets (Belhabib and Le Billon 2022; Vandergeest and Marschke 2021). A model developed by Global Fishing Watch has identified transshipments as mostly occurring with tuna longliners, with transshipments also co-occurring with human rights and labour abuses (McDonald et al. 2021). Transshipment for illegal activities is undertaken in port, near coastal harbours and on the high seas, where oversight of activities is currently not manageable. It can include transshipping to motherships or reefers, as well as transshipping from industrial vessels to artisanal vessels and vice versa.

Often, ports of convenience, where regulations for port inspections are low or completely lacking, are used by perpetrators to land their catch. States that are parties to the Port State Measures Agreement (PSMA) – which requires parties to put in place and implement port inspections on landed fish catch – sometimes lack capacity to enact regulations (Vince et al. 2021). This provides an opportunity to reprocess or re-export IUU catch to change seafood origin or to mislabel seafood products (size, volume, species) for the purpose of evading regulations or taxes.

Common modi operandi to avoid MCS include interfering with electronic monitoring systems and intentionally obscuring vessel markings and identity (INTERPOL 2014).

The previous pathways all require willing vessel operators to catch the fish illegally, unwilling or incapable state(s) to monitor, supervise and control activities, a willing port to receive the catch, and willing or uninformed buyers to take and further distribute the products on the market. Another willing actor is the subsidising state whose subsidies enable illegal fishing.

2.2 Illegally caught fish making its way into EU markets: the case of Ghana

Ghana has been associated with heavy fishing within prohibited zones in its waters by (domesticated) Chinese vessels and with illegal catch imports into EU markets (Belhabib, Sumaila and Le Billon 2019). Ghana is generally recognised as one of the most stable and best governed countries in West Africa but suffers from several of the problems affecting African fisheries (see Belhabib, Sumaila and Le Billon 2019). With about 539 km of coastline on the Gulf of Guinea and an EEZ of 225,000 km², Ghana controls major fishing grounds since it ratified UNCLOS in 1983. As a member of the International Commission for the Conservation of Atlantic Tunas (ICCAT), Ghana also has a voice and role in regional tuna stock management. Its waters are mostly patrolled by Ghana's navy, whose two primary missions are oil infrastructure protection and counter-narcotics. All fishing operations fall under the mandate of the Monitoring, Control, and Surveillance Division (MCSD) of the Fisheries Commission, which enforces fisheries regulations and manages satellite-gathered data on (foreign) fishing vessels (MFAD 2020). About 85 % in value of Ghana's fisheries exports are going to EU markets (EJF 2020). Mostly consisting of processed and unprocessed tuna products valued at about US$176 million, exports to the EU also include about US$15 million in cephalopods (squid, cuttlefish and octopus). More sea products from Ghana could also be transiting via China before ending up in EU markets (EJF 2020).

In 2021, Ghana had an IUU Fishing Index of 1.95 and a port risk of 2.35, compared to the worldwide medians of 2.25 and 2.36, respectively. Based on 2017 data, Pramod (2018) identified major weaknesses in the area of aerial patrols and onboard fisheries observers. This report also noted that Ghana has a poor inspection and sanctioning record despite the rampant use of illegal gear, particularly by Chinese-owned (Ghanaian-flagged) vessels. In addition, Belhabib et al. (2020) identified Ghana as a hotspot for fishing within prohibited zones.

Ghana received a yellow card in 2013, which was lifted in 2015 and recently reintroduced in June 2021. The European Commission's rationale for carding Ghana in 2013 included: Ghana's trawlers not yet having been fitted with vessel monitoring systems (VMS); ICCAT notifications of illegal transshipments between vessels flagged to Ghana; IUU fishing vessels being (re)registered in Ghana; Ghanaian-flagged vessels operating in neighbouring waters without fishing authorisations; and laundering of IUU-caught fish through Ghanaian (processing) companies (European Commission 2013). Even though the vessels are flagged to Ghana, most of

the beneficial ownership is Chinese (EJF 2020). The opaque transactions behind this domestication seek to circumvent regulations against foreign involvement in the trawl sector, challenging efforts to determine who ultimately benefits from illegal fishing activities. Investigations by the Environmental Justice Foundation have found that trawlers with IUU fishing records "are linked to the same beneficial owners as tuna vessels authorised to export seafood to the EU" (EJF 2020: 5).

Industrial trawlers contribute to illegal fishing in four main ways (EJF 2020). First, by catching a species that they are legally authorised to fish (e.g. squid) but not to export to the EU market, which is instead exported to China before being re-exported (legally) as Chinese catch to the EU market. Second, by catching a species that they are not legally authorised to fish (e.g. sardinella, a key species for local food security), which is then illegally transshipped onto local Ghanaian canoes (artisanal fishing boats that are legally authorised to catch these species) to be brought to the Ghanaian market and then exported to the EU market. Third, trawlers illegally operating in prohibited areas, often reserved to the artisanal fleet. Ghanaian fishing by trawlers within prohibited areas constitutes 40 % of all fishing within prohibited areas of Africa (Belhabib, Sumaila and Le Billon 2019). Fourth, transshipping fish illegally to smaller boats for a fee. The smaller boats operating as "saiko" (i.e. laundering low-value fish illegally caught by industrial vessels through canoe operators) then land the fish in local ports and outcompete the genuine artisanal fishing sector by selling it as legal catch on local markets. In these cases, Chinese industrial trawlers fraudulently domesticated in Ghana use the Chinese and Ghanaian markets to traffic IUU fish into EU markets. Furthermore, imports of potential IUU-caught fish into EU markets seem to be selectively channelled according to the level of port inspections within the different EU jurisdictions. Out of 4,349 non-EU vessels that landed in EU ports in 2016 and 2017, EU member states inspected only 635 (European Commission 2020). An extensive study by a number of NGOs, including the Environmental Justice Foundation, Oceana, The Pew Charitable Trusts and WWF, found that within the context of the yellow-carding of Ghana in 2013, while indeed some species imports into EU markets – which are still allowed under a yellow card, as opposed to a red one – did decline, other fish imports into EU markets *shifted* from Spain and Germany to Italy and the Netherlands (Mundy 2018). In 2021, Ghana received a yellow card again, due to identified shortcomings including illegal transshipments at sea of large quantities of undersized juvenile pelagic fish between industrial trawl vessels and canoes in Ghanaian waters, deficiencies in the monitoring, control and surveillance of the fleet and a legal framework that is not aligned with the relevant in-

ternational obligations Ghana had signed up to (EC 2021b). The EJF links illegal fishing activities in Ghanaian waters to human rights abuses (Alberts 2021). It is expected that Ghana ensures effective monitoring and control of fishing activities, the implementation of its enforcement and sanctioning system and sound fisheries management; otherwise it would be regarded as a "non-cooperating country" and be issued a red card, followed by sanctions such as a ban of fishery exports from Ghana to the EU market (EC 2021b).

3. Efforts to curb illegal fishing and their shortcomings

Efforts to reduce illegal fishing need to take place across many jurisdictions along the fishing supply chains to be globally effective (FAO 2001), including ensuring regional and international cooperation, the integration of various actors and holistic application of existing frameworks (Lindley and Techera 2017).

Fishing area jurisdiction: Within territorial waters and EEZs, coastal states have fishing area jurisdiction. Governance of the remaining parts of the world's ocean – comprising 64 % of the surface and nearly 95 % of its volume – is *beyond* the jurisdiction of any individual state and regulated under intergovernmental organisations. Within their mandates, RFMOs have fishing area jurisdiction in ABNJ, which, however, do not comprehensively cover all areas and species. Vulnerability to illegal fishing depends on the capacity and political will of the responsible state or RFMO to monitor, supervise and control the waters under its jurisdiction and the fleets operating therein and to enforce compliance;

Fishing fleet jurisdiction: On the high seas, flag states have exclusive jurisdiction over vessels; fishing activity is therefore subject to the flag state's treaty obligations (Ferrell 2005). The registration of fishing vessels is overseen by the flag state. Based on a vessel's history and intended fishing activity, certain flags of convenience and flag hopping practices are likely to be used to facilitate illegal activities. Authorisation for the vessel is given by the flag state – at this stage, conditions for adequate identification of the vessel, reliable reporting of catch and authorisation for transshipment, if applicable, are overseen. Moreover, the flag state has the responsibility to hold a record of its fishing fleet and report its catch.

Fish imports jurisdiction: The port state sets regulations and standards for port inspection. The port state's engagement in countering landing and port operations by vessels involved in IUU practices determines the port state's openness to illegal and poorly traceable fishing products and to serving vessels with known infractions. The PSMA intends to counter this risk factor, but efficient monitoring requires resources, which are often lacking despite a state's engagement within the framework of the PSMA. The port state is responsible for certification schemes and the transparency and documentation of catch imports.

Several efforts have been made to curb illegal fishing since IUU fishing emerged on national and international agendas in the mid-1990s (see Christensen 2016).

The European Union has been active in addressing the problem through a regulation to prevent, deter and eliminate IUU fishing, which includes three strategies: First, a catch certification scheme seeks to ensure that only marine fisheries products validated as legal by the competent flag state or exporting state can be imported into or exported from the EU. This, however, may be challenged by a lack of transparency from the flag states, as vessels can launder illegal catches through legitimate ports. Second, the European Commission instituted a carding system that incentivises exporting countries to reduce illegal fishing under their flag in order to maintain their access to the EU market and has led to improvements of measures in exporting countries (Sumaila 2019). This carding process includes issuing warnings to and eventually blacklisting states that do not take action against IUU activity. The regulation includes measures for blocking access to EU markets at EU ports for blacklisted vessels identified as involved in IUU fishing, or for vessels registered under countries that have a poor reputation for cooperating with international efforts to prevent, deter and eliminate IUU fishing (Soyer, Leloudas and Miller 2018). An EU list of IUU vessels is issued regularly, based on IUU vessels identified by RFMOs.[5] Since the introduction of the system, three formerly red-carded countries were removed from the list, and 13 countries had their yellow card removed. Third, substantial penalties for EU operators undertaking illegal fishing, proportional to the economic value of their catch, have deprived them of any – or at least some – of their profit (Petrossian and Pezzella 2018).

5 We note that while the EU uses RFMO lists, China has an additional independent blacklist for its own fleet, which often results in stricter measures against vessels and companies by the Chinese government (Shen and Huang 2021).

Despite the significance of these measures in improving seafood sourcing for EU members and fishing practices in exporting countries (Leroy, Galletti and Chaboud 2016; Wongrak et al. 2021), some IUU-caught fish is still being imported into the EU, in part due to shortcomings in the regulation and its implementation. For example, Okafor-Yarwood and Belhabib (2020) have shown that the EU failed to red-card countries with which it has major trade exchanges. In addition, diversion strategies still exist, notably relabelling the origin of fish caught in red-carded countries, relocating companies from the countries carded and transshipping fish on the high seas. Some recent examples show the inability of the EU to sanction its own DWF fleet when it operates illegally, as seen with an Italian vessel shark finning off Sierra Leone which went unpunished (CFFA 2020). Some exporters have learnt how to navigate the differing capacities and diligence among EU members (Mundy 2018). After the carding system was implemented, some exporters of suspected IUU-caught fish made use of differing port inspection standards within the EU (Mundy 2018). In terms of impacts on fishers and the countries where the fishing is taking place, Beyens, Failler and Asiedu (2018) observed "growing difficulty of institutions in adapting to more and more stringent EU regulations and developing new sets of domestic rules and […] lack of collaboration between key institutions, which does not allow the setting up of efficient food safety systems". This may have negative impacts on developing countries and small-scale fishers in particular.

On the international level, various additional frameworks exist to counter illegal fishing. The United Nations Fish Stocks Agreement (UNFSA) adopted in 1995 is an implementation agreement of UNCLOS regarding the conservation and sustainable use of fisheries (Metuzals et al. 2010; Rosello 2017). RFMOs are responsible for the management of fisheries within their respective geographical mandates. One measure adopted by RFMOs allows the blacklisting of vessels that have been engaging in some forms of illegal fishing (Metuzals et al. 2010). However, the resulting aggregated list contains less than 300 vessels combined and does not paint an accurate picture of the other thousands of vessels that engage in similar illegal activities but have not been suggested for blacklisting (Belhabib and Le Billon 2018).

The FAO has adopted soft law, including the 1995 Code of Conduct for Responsible Fisheries and the 2001 International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing, which have significantly contributed to solutions (Agnew et al. 2009; Metuzals et al. 2010; Rosello 2017). The FAO's Committee on Fisheries (COFI) has adopted a range of Voluntary Guidelines, including for Flag

State Performance clarifying state obligations (Ventura 2015), and for Catch Documentation Schemes (Hosch 2020). The 2005 PSMA, as an international legally binding agreement to reduce incentives of IUU vessels to operate while blocking IUU fish from reaching national and international markets (European Commission 2020), has been joined by 68 states to date (the EU is also party to the agreement). It describes the steps that should be taken by responsible port states and relevant RFMOs to ensure compliance at ports (Petrossian and Pezzella 2018; Soyer, Leloudas and Miller 2018). Through this measure, port states can take action by inspecting and/or detaining visiting vessels, and the access of IUU catches to markets can be blocked (Soyer, Leloudas and Miller 2018). However, varying implementation capacities result in a small number of ratifications and a lack of effective enforcement, preventing international standards of port inspections.

The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) should also be mentioned (Metuzals et al. 2010), regarding its regulatory measures (including observation schemes), flag and port state measures (including documentation schemes and inspection standards) as well as various resolutions (Miller, Slicer and Sabourenkov 2010). Best-practice examples include CCAMLR's electronic documentation system, which resulted in more comprehensive and accurate catch reporting and real-time access to documents, enhancing enforcement and reducing misreporting, catch laundering and fraud; as well as public dissemination of CCAMLR's IUU Vessel Lists which, however, did not entirely eliminate the problem in the region (Miller, Slicer and Sabourenkov 2010).

Current MCS measures entail a number of activities, including: the tracking of vessel movements and monitoring of vessel activities based on their VMS and automatic identification systems (AIS); the deployment of surveillance assets such as vessels, planes and drones; as well as community co-surveillance operations (Soyer, Leloudas and Miller 2018). NGOs undertake data collection to reveal information to authorities and the public, assist with arrests and raise general awareness (Soyer, Leloudas and Miller 2018). This includes investigations into trade flows and ownership, the creation of spyglass.fish (which removes a layer of opacity from illegal fishing activities), the IUU Fishing Index (a joint project between a for-profit firm and a non-profit organisation to analyse states' vulnerability, exposure and responses to IUU fishing (Lycan & van Buskirk, 2021)) and policy advocacy at national, regional and international levels. We stress that the militarisation of surveillance of small-scale fisheries may result in the securitisation of the latter, to the benefit of an industrial sector that is much

more harmful when it engages in illegal fishing (Okafor-Yarwood 2019). Hence, addressing illegal fishing within the small-scale sector requires understanding the drivers of illegal fishing within this sector and addressing them accordingly. Lastly, efforts of the private sector can discourage illegal fishing through the use of traceability and labelling schemes (Soyer, Leloudas and Miller 2018). Overall, measures have been taken on fishing area, fleet and port jurisdiction, but stronger regulations and oversight are necessary to close governance gaps to prevent, deter and eliminate IUU fishing as a global problem.

4. The way forward: possible solutions to reduce harm from IUU fishing

Despite the above-mentioned efforts to curb IUU fishing, the solution remains a global challenge. This section lays out how shortcomings of existing efforts can be bridged and environmental, social and economic harms from IUU fishing be reduced along the supply chain (see also Introduction in this volume).

4.1 Address flags of convenience and tax havens

Strategies to eliminate IUU fishing often focus explicitly on prosecuting the vessel and crew members that were actively involved in the activity but fail to address the problem at its source by identifying the networks and prosecuting the beneficial owners that stand behind the operations (Widjaja et al. 2019). Increased transparency in vessel registries and closure of flag of convenience (FOC) registries are needed to prevent IUU fishing. Holding flag of convenience states accountable and requiring full disclosure of a company's corporate network of fishing vessels will play a major role in reducing some of the IUU practices enabled by FOC-based evasion strategies.

Apart from identifying and sanctioning FOC IUU vessel owners, blacklisting and financial methods (Ferrell 2005), more recent suggestions include encouraging a) countries with open registries to close them to fishing vessels; b) coastal states and RFMOs to ban the use of FOCs by all fishing vessels authorised to fish within their fishing area jurisdictions; c) flag states, coastal states and RFMOs to make access agreements and lists of authorised vessels public; d) all countries to publicly register their entire fishing fleet (including foreign-flagged vessels owned by their nationals);

and e) all countries to adopt legislation similar to the EU legislation to prevent their nationals from engaging in, supporting or benefiting from the activities of identified IUU vessels (Petrossian et al. 2020).

4.2 Curtail economic gains from illegal fishing

Illegal fishing is currently still a low-risk and high-reward activity. Future efforts to curb illegal fishing therefore need to curtail economic gains from illegal activities and reward compliance with existing regulations.

Subsidised industrial fleets put local fleets at a disadvantage and contribute to illegal fishing (Arthur et al. 2019). Ending such subsidies has been encouraged by a number of NGOs, as well as formally proposed by the COFI members (FAO 2021). The WTO agreement reached in 2022 is a step towards ending such subsidies, provided that comprehensive implementation and continued dialogue on pending issues follow (Fitt 2022). Restrictions of access to insurance for those involved in IUU fishing could also increase the financial risks of IUU practices (Miller et al. 2016). Studies of how availability of liability insurance contributes to the problem of IUU fishing reveal that vessels suspected of involvement in illegal fishing have no serious difficulty in obtaining liability insurance, which facilitates illegal fishing. Companies can be financially disincentivised through trade sanctions, e.g. through the EU carding system (Rosello 2017). As discussed in this chapter, stricter sanctions by the EU (Okafor-Yarwood and Belhabib 2020) and additional sanctions by other main seafood markets, such as Japan and the US, (Sumaila 2019) would more comprehensively address global IUU fishing. Certification schemes encourage seafood companies to integrate greater transparency into the supply chain and point customers to the legal fish on the market. However, the practice of mislabelling seafood challenges this measure when MCS and enforcement measures are lacking (Helyar et al. 2014). Another way to stop illegal fishing of attractive species would be to further safeguard such species through additional trade bans and limitations (Petrossian 2015), e.g. under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Moreover, making non-compliance with existing fishing regulations public can damage an industry's image and could encourage further transparency in the supply chain on the part of the seafood producers.

4.3 Increase monitoring, control and surveillance by linking available data

Especially on the high seas, illicit activities often remain "unseen". MCS is a real challenge, particularly for low-income countries and in areas beyond national jurisdiction, as it is expensive and requires high technological standards. AIS data linked to the vessel's GPS can identify individual fishing vessels (IMO number, maritime mobile security information number, vessel name, call sign) and trace position, speed and course in real-time (Dunn et al. 2018) from the port of departure until the final destination. Through the real-time location of fishing vessels and their speed, fishing activity can be suspected and even predicted (Crespo et al. 2018), and thus conservation and sustainable use measures can be improved. For this to happen, however, a comprehensive coverage of the global fishing activity needs to be available.

Turning off AIS may imply suspicious activity but is not proof of an offence in contexts where AIS is not mandatory for fishing vessels. Currently, only vessels with gross tonnage over 300 have to carry AIS for safety purposes (IMO 2015), which translates to only 14 % of all vessels registered in the Consolidated List of Authorized Vessels for tuna, and in many cases individual country regulations are weaker or entirely lacking (Dunn et al. 2018).

Comprehensive coverage of activities at sea can be ensured through 1) mandatory use of AIS at all times; 2) registration of IMO numbers and 3) effective enforcement of regulations (Dunn et al. 2018). Sierra Leone, for instance, has made AIS mandatory on all industrial fishing vessels licensed to fish in the country's waters, and Russia sanctions its DWF vessels if they shut down the AIS.

The combination of AIS technology, data obtained using VMS and cameras on board the vessels is valuable to ensure traceability throughout the supply chain. Satellite technology can identify further crimes at sea, such as forced labour (McDonald et al. 2021). Having open access to and sharing information with authorities of flag and port states across jurisdictions and combining different data sources is crucial for comprehensive data analysis. Law enforcement on the high seas is challenged by the reliance on flag state responsibility, as well as governance gaps in areas beyond national jurisdiction and many states' lack of capacity for MCS activities (Cremers, Wright and Rochette 2020a). In this regard, the ongoing negotiations for a legally binding agreement on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction offer an opportunity to strengthen MCS obligations on the high seas (Tessnow-von Wysocki and Vadrot 2020).

4.4 Enhance international cooperation and capacity building

The importance of regional and international cooperation to address the global problem of IUU fishing is undisputed. The EU is seen as a pioneer in adopting IUU regulations that combine transparent reporting (catch documentation scheme) and concrete sanctions (blacklisting of vessels). However, measures against (and sanctions for) serious infringements differ among member states, with rules being differently interpreted and enforced (European Commission 2020). A unified implementation of the IUU regulations needs to be found in order to tackle the problem holistically. Cooperation among different authorities within one country is as important as regional and international cooperation, as well as the integration of different stakeholders, including RFMOs, NGOs, the fisheries sector and authorities from the flag and port states along the supply chain. Best-practice examples include FISH-i Africa[6], Project Eyes on the Seas[7] and Global Fishing Watch[8] (Cremers, Wright and Rochette 2020b). Moreover, access to technologies, tools and training to collect, access and analyse data needs to be guaranteed for states that do not have these capacities to effectively engage in MCS and enforcement.

4.5 Eliminate transshipment, particularly on the high seas

While transshipment reduces logistical costs, it also challenges transparency in the supply chain, which is necessary to trace the fishing methods used and the origin of catch and to determine whether the fish was caught legally. A recent FAO report shows evidence that transshipment can be linked to severe crimes at sea and concludes that the "lack of sufficient ca-

6 FISH-i Africa is a partnership of eight East African countries – Comoros, Kenya, Madagascar, Mauritius, Mozambique, Seychelles, Somalia and Tanzania – that brings together national enforcement authorities, regional organisations and international technical and legal experts to combat large-scale illegal fishing in the Western Indian Ocean through information-sharing and regional cooperation. See https://fish-i-network.org/.

7 Project Eyes on the Seas is a partnership between The Pew Charitable Trusts and the UK Government's Satellite Applications Catapult to help governments detect suspicious fishing activity using AIS and VMS data, satellite imagery, vessel information databases and computer algorithms.

8 Global Fishing Watch is an independent NGO founded by Oceana, Google and SkyTruth that makes data on global commercial fishing activity more publicly available.

pacity in competent authorities makes it impossible to deter and prevent these activities systematically" (Quelch et al. 2020: 115). The South East Atlantic Fisheries Organisation (SEAFO) has prohibited all transshipment at sea by members operating within the convention area (Ewell et al. 2017), but transshipment regulations vary significantly among flag states and RFMOs (Miller et al. 2018). With regard to transshipment notifications and authorisations of RFMO secretariats, only 62.5 % of them reported having a requirement for the RFMO to be informed by the flag state contracting parties prior to/at the point of authorisation for at-sea transshipments, and 12.5 % reported having a mechanism to review and approve transshipment authorisations by flag states (Quelch et al. 2020). Scholars have suggested a moratorium on transshipment on the high seas to address both IUU fishing and human rights abuses (Ewell et al. 2017). Until transparent prior notification of intended transshipments and tonnages and MCS strategies are sufficiently developed to oversee transshipment operations, such activities need to be declared illegal to prevent greater harm.

The FAO has recognised the need for national and international guidelines for effective regulation, monitoring and control of transshipment (FAO 2020). Recently, COFI members were urged to develop global transshipment guidelines (Carreon 2021) to define transshipment, containerisation and landing; introduce transshipment authorisation requirements; require the submission by fishing vessels of standardised transshipment declarations to all relevant authorities; monitor measures; and standardise open-access information-sharing procedures among flag, coastal and port states and RFMO secretariats, which would mark a "major step towards establishing transparent transshipment processes that support a sustainable and verifiable seafood supply chain" (Borg Costanzi and Wozniak 2021).

4.6 Address ports of convenience through the PSMA

At sea, MCS is dangerous, costly and in most cases impossible to undertake. Having effective measures in place when the vessels get into port is therefore unavoidable. The Port State Measures Agreement has been an important milestone in this regard. However, all port states must ratify and implement the PSMA to ensure that IUU fishing perpetrators are not making use of ports of convenience (Widjaja et al. 2019). To date, many countries that are party to the PSMA do not have the capacity to implement it. Capacity translates into the ability to have qualified inspectors at ports at all times during vessel landings. Inspectors should be trained to inspect catches and detect multiple offences. Hence, international efforts should

focus on capacity building in these countries, in terms of either personnel or resources directly allocated to these countries (without intermediaries).

4.7 Digitalise records of fish imports

Effective documentation of the catch is crucial for transparency. Catch documentation schemes (CDS) can address and eliminate several types of illegal fishing, including fishing without licence and (in combination with VMS) non-compliance with days-at-sea regulations as well as spatial and temporal fishing closures, among others (Hosch 2020). Existing examples of CDS include three multilateral schemes and one unilateral scheme, the latter being that of the EU, which covers all marine wild-caught fish traded by non-EU countries into the EU market. The FAO Voluntary Guidelines for CDS indicate a preference for electronic catch documentation (FAO 2017). While all schemes initially started as paper-based schemes, two have by now switched to electronic CDS, namely CCAMLR and ICCAT. The European Commission has suggested a switch to an electronic system (CATCH), which would facilitate information sharing between member states and increase efficiency of IUU controls and now awaits adoption and implementation. The adoption of the Fisheries Control System (European Parliament 2021) enables greater transparency through the introduction of on-board cameras and by tracing the origin of fishery and aquaculture products throughout the entire food chain. It is, however, equally important to ensure accurate reporting of the catch, as the increased margin of error in the reports could leave up to 40 % of seafood caught by the EU fleet unreported (EU Fisheries Control Coalition 2021).

4.8 Extend the concept of IUU to 'post-fishing' harm to marine life

So-called 'ghost fishing gear' is wreaking havoc on marine life long after fishing operations have ended. Every year, about 640,000 tonnes of 'ghost gear' are added to the ocean, adding not only to plastic pollution but also to deadly drifting nets, lines and hooks (Greenpeace 2019). This abandoned, lost or otherwise discarded fishing gear (ALDFG) should be seen as a form of IUU fishing since – intentionally or not – it kills fish in illegal ways. Research has pointed to this problem and suggested ways forward (Richardson, Hardesty and Wilcox 2019; Tessnow-von Wysocki and Le Billon 2019), and several initiatives seek to reduce and recover ALDFG,

such as the Global Ghost Gear Initiative (an alliance of NGOs, private sector, fishing industry, academia and governments) and the FAO Voluntary Guidelines on the Marking of Fishing Gear (FAO 2019). Among the most promising initiatives is the reporting of fishing gear before and after fishing operations, so that vessels suspected of having generated ALDFG can be properly tracked and sanctioned, including through listing on the EU's IUU vessels lists in case of repeated ALDFG reports and suspicion of negligent practices. ALDFG recovery could also benefit from economic incentives, replacing cost-cutting with revenue generation incentives (e.g. Sea Shepherd's (2019) programme for the recovery of totoaba gillnets in vaquita habitats).

4.9 Going beyond IUU to look into fairness of fishing licence contracts

'Legally', fish may be caught under contracts that are unfair to coastal states and local fishing communities. There is a need for greater transparency and benchmarking in the contracts between foreign (or domesticated) fishing fleets and host authorities (Belhabib and Le Billon forthcoming). These contracts also need to consider impacts on local populations in terms of both food security and domestic fishing-related livelihoods. Ensuring such 'fair' fisheries is not only the next step after ensuring 'legal' ones, but one that needs to happen in parallel to prevent negative impacts on local fishing. Supply chain policies and instruments involving formalisation and legalisation can have counterproductive effects, such as increased inequalities among resource users (Le Billon and Spiegel 2021). Parallel efforts at a *global* level therefore need to be made in order to ensure a level playing field among DWFs from different countries. Disclosure of licensing contracts and regional transparency standards are required. Existing initiatives such as the Fisheries Transparency Initiative or the Extractive Industries Transparency Initiative could – despite their limitations – serve as a starting point (Rustad, Le Billon and Lujala 2017).

5. Conclusion

Illegal fishing is a severe environmental crime with adverse impacts on the environment on the one hand, but also with negative consequences for small-scale fishers, coastal populations and entire economies of low-income countries. Often linked to drug and human trafficking, as well as

slavery, IUU fishing constitutes a complex challenge with a variety of actors involved within a global supply chain. In light of the overexploitation and depletion of fish stocks, it is a significant threat to the marine environment on which the natural system as well as current and future generations rely. In order to effectively curb IUU activities, solutions are required that go beyond the existing national, regional and international regulations, which were important steps in the fight to curb IUU fishing but have proven insufficient.

This chapter has introduced the global problem of IUU fishing with its significant impacts on different levels that go beyond economic losses and include severe environmental and social harms. It shows that while low-income countries in the Global South may be more prone to illegal and unreported fishing activities due to limited MCS measures, developed countries play an integral part in the supply chain by offering a consumer market. To prevent IUU fishing, several regulations have been put in place on national, regional and international levels. Ten years after the implementation of the EU's IUU fishing regulation, the Environmental Justice Foundation assessed the initiative as "a truly effective policy that has had a real, positive impact around the world, safeguarding marine ecosystems and the communities that rely on them" (Trent 2020). Many researchers point to the importance and challenges of spreading the adoption of this governance approach to other major fish markets across the world (Sumaila 2019; Fang and Asche 2021; Garcia, Barclay and Nicholls 2021; Rogers 2021). Yet, as this chapter suggests, there is still room for improvement. The supply chain of IUU fish is complex and requires extensive consideration of local, national and transnational dimensions, from the legality of the fishing activity, the implications of the implementation of anti-IUU reforms on small-scale fishers and the licence and operations of the fishing vessels to processes of transshipment, re-exportation and verification at landing ports and within European markets.

As a next step, the EU is encouraged to more strongly counter IUU activities, including with regard to unified implementation of IUU regulations among EU member states, its own fishing fleet and main foreign trade partners. Our case study of Ghana suggests that many backdoors to EU seafood markets exist, such as the illegal domestication of third-country vessels. This implies that the problem of IUU fishing cannot be solved regionally but requires a global approach. The identification of the different steps and actors within the supply chain can help to identify the motivations and connections behind illicit activities in order to develop more effective measures to prevent IUU fishing on a global level. Finally, this chapter briefly presented some of the options to curb IUU fishing,

including i) addressing flags of convenience and tax havens; ii) curtailing economic gains; iii) increasing MCS; iv) enhancing international cooperation and capacity building; v) eliminating transshipment; vi) implementing the PSMA; vii) digitalising records of fish imports; and extending the concept of IUU fishing by viii) addressing 'post-fishing'; and ix) ensuring fairness of fishing licence contracts.

References

Agnew, David J./Pearce, John/Pramod, Ganapathiraju/Peatman, Tom/Watson, Reg/ Beddington, John R./Pitcher, Tony J. (2009): "Estimating the worldwide extent of illegal fishing". In: PLOS ONE, 4, 2, e4570.

Alberts, Elizabeth Claire (2021): "On board Ghana's trawlers, claims of human rights abuses and illegal fishing". At: https://news.mongabay.com/2021/08/on-board-ghanas-trawlers-claims-of-human-rights-abuses-and-illegal-fishing/ (accessed 16 May 2022).

Arthur, Robert/Heyworth, Stephanie/Pearce, John/Sharkey, William (2019): "The cost of harmful fishing subsidies". At: https://pubs.iied.org/16654iied (accessed 13 May 2022).

Battista, Willow/Romero-Canvas, Rainer/Smith, Sarah Lindley/Fraire, Jose/Effron, Micah/Larson-Konar, Dylan/Fujita, Rod (2018): "Behavior change interventions to reduce illegal fishing". In: Frontiers in Marine Science, 5.

Belhabib, Dyhia/Cheung, William W. L./Kroodsma, David/Lam, Vicky W.Y./Underwood, Philip J./Virdin, John (2020): "Catching industrial fishing incursions into inshore waters of Africa from space". In: Fish and Fisheries, 21, 2, pp. 379–92.

Belhabib, Dyhia/Dridi, Raouf/Padilla, Allan/Ang, Melanie/Le Billon, Philippe (2018): "Impacts of anthropogenic and natural 'extreme events' on global fisheries". In: Fish and Fisheries, 19, 6, pp. 1092–1109.

Belhabib, Dyhia/Le Billon, Philippe (2018): "Tax havens are the tip of the iceberg". In: Nature Ecology & Evolution, 2, 1679.

Belhabib, Dyhia/Le Billon, Philippe (2020): "Editorial: Illegal fishing as a trans-national crime". In: Frontiers in Marine Science, 7.

Belhabib, Dyhia/Le Billon, Philippe (2022): "Fish crimes in the global oceans". In: Science Advances, 8, 12, eabj1927.

Belhabib, Dyhia/Le Billon, Philippe (forthcoming): "Adjacency and vessels domestication as enablers of fish crimes". In: Frontiers in Marine Science.

Belhabib, Dyhia/Le Billon, Philippe/Bennett, Nathan (2022): "Ocean sustainability for all requires deeper behavioural research". In: Nature Human Behaviour, 6, pp. 6–8.

Belhabib, Dyhia/Le Billon, Philippe/Wrathall, David J. (2020): "Narco-Fish: Global fisheries and drug trafficking". In: Fish and Fisheries, 21, 5, pp. 992–1007.

Belhabib, Dyhia/Sumaila, U. Rashid/Le Billon, Philippe (2019): "The fisheries of Africa. Exploitation, policy, and maritime security trends". In: Marine Policy, 101, pp. 80–92.

Belhabib, Dyhia/ Sumaila, U. Rashid/Pauly, Daniel (2015): "Feeding the poor. Contribution of West African fisheries to employment and food security". In: Ocean & Coastal Management, 111, pp. 72–81.

Beyens, Yolaine/Failler, Pierre/Asiedu, Berchie (2018): "Institutional challenges and constraints for Ghana in exporting fishery products to the European Union". In: Food Reviews International, 34, pp. 265–89.

Borg Costanzi, Dawn/Wozniak, Esther (2021): "International guidelines would helps illegal activity tied to at-sea transfer of fish". At: https://www.pewtrusts.org/en/research-and-analysis/articles/2021/01/22/international-guidelines-would-help-stem-illegal-activity-tied-to-at-sea-transfer-of-fish (accessed 13 May 2022).

Carreon, Bernadette (2021): "FAO Committee on Fisheries members urged to adopt global transshipment guidelines by 2022". At: https://www.seafoodsource.com/news/environment-sustainability/fao-committee-on-fisheries-members-urged-to-adopt-global-transshipment-guidelines-by-2022 (accessed 13 May 2022).

CFFA, Coalition for Fair Fisheries Agreements (2020): "CSOs complaint about Italian vessels illegal activities in Sierra Leone. The European Commission is dragging its feet". At: https://www.cffacape.org/news-blog/csos-complaint-about-italian-vessels-activities-in-sierra-leone-the-european-commission-is-dragging-its-feet (accessed 13 May 2022).

Christensen, Joseph (2016): "Illegal, unreported and unregulated fishing in historical perspective". In: Poulsen, Bo/Schwerdtner Máñez, Kathleen (eds.): Perspectives on Oceans Past. A handbook on marine environmental history. Dordrecht: Springer, pp. 133–153.

Cremers, Klaudija/Wright, Glen/Rochette, Julien (2020a): "Strengthening monitoring, Control and surveillance in Areas Beyond National Jurisdiction". At: https://www.prog-ocean.org/wp-content/uploads/2020/01/Cremers-Wright-and-Rochette-2019.-Strengthening-Monitoring-Control-and-Surveillance-in-Areas-Beyond-National-Jurisdiction-1.pdf (accessed 13 May 2022).

Cremers, Klaudija/Wright, Glen/Rochette, Julien (2020b): "Strengthening monitoring, control and surveillance of human activities in marine areas beyond national jurisdiction: Challenges and opportunities for an international legally binding instrument". In: Marine Policy, 122, 103976.

Crespo, Guillermo Ortuño/Dunn, Daniel C./Reygondeau, Gabriel/Boerder, Kristina/Worm, Boris/Cheung, William/Tittensor, Derek P./Halpin, Patrick N. (2018): "The environmental niche of the global high seas pelagic longline fleet". In: Science Advances, 4, 8, eaat3681.

Dunn, Daniel C./Jablonicky, Caroline/Crespo, Guillermo O./McCauley, Douglas J./Kroodsma, David A./Boerder, Kristina/Gjerde, Kristina M./Halpin, Patrick N. (2018): "Empowering high seas governance with satellite vessel tracking data". In: Fish and Fisheries, 19, 4, pp. 729–739.

EC, European Commission (2013): "Commission Decision of 26 November 2013 on notifying the third countries that the Commission considers as possible of being identified as non-cooperating third countries pursuant to Council Regulation (EC) No 1005/2008 establishing a Community system to prevent, deter and eliminate illegal, unreported and unregulated fishing (2013/C 346/03)". In: Official Journal of the European Union, pp. C 346/26–C 346/49.

EC, European Commission (2020): "Report from the Commission to the European Parliament and the Council on the application of Council Regulation (EC) No 1005/2008 establishing a community system to prevent, deter and eliminate illegal, unreported and unregulated (IUU) fishing (the IUU Regulation)". At: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0772 (accessed 13 May 2022).

EC, European Commission (2021a): "Illegal fishing". At: https://ec.europa.eu/oceans-and-fisheries/fisheries/rules/illegal-fishing_en (accessed 31 May 2022).

EC, European Commission (2021b): "Fighting against illegal, unreported and unregulated fishing. Commission notifies the Republic of Ghana with a yellow card". At: https://ec.europa.eu/commission/presscorner/detail/en/ip_21_2745 (accessed 13 May 2022).

European Council (2008): "Council Regulation (EC) No 1005/2008 of 29 September 2008 establishing a Community system to prevent, deter and eliminate illegal, unreported and unregulated fishing". At: https://eur-lex.europa.eu/eli/reg/2008/1005/oj (accessed 13 May 2022).

EJF, European Justice Foundation (2020): "Europe – A market for illegal seafood from West Africa. The case of Ghana's industrial trawl sector". At: https://ejfoundation.org/reports/europe-a-market-for-illegal-seafood-from-west-africa-the-case-of-ghanas-industrial-trawl-sector (accessed 13 May 2022).

EU Fisheries Control Coalition (2021): "Two steps forward, one giant step back. European Parliament votes for modern and transparent fisheries, but opens grave loophole". At: http://www.transparentfisheries.org/2021/03/11/two-steps-forward-one-giant-step-back-european-parliament-votes-for-modern-and-transparent-fisheries-but-opens-grave-loophole/ (accessed 13 May 2022).

European Parliament (2021): "Fishing rules: Compulsory CCTV for certain vessels to counter infractions". At: https://www.europarl.europa.eu/news/en/press-room/20210304IPR99227/fishing-rules-compulsory-cctv-for-certain-vessels-to-counter-infractions (accessed 13 May 2022).

EUMOFA, European Market Observatory for Fisheries and Aquaculture Products (2020): "The EU Fish Market. 2020 Edition". At: https://www.eumofa.eu/documents/20178/415635/EN_The+EU+fish+market_2020.pdf/fe6285bb-5446-ac1a-e213-6fd6f64d0d85?t=1604671147068 (accessed 13 May 2022).

EUMOFA, European Market Observatory for Fisheries and Aquaculture Products (2021): "The EU Fish Market. 2021 Edition". At: https://www.eumofa.eu/documents/20178/477018/EN_The+EU+fish+market_2021.pdf/27a6d912-a758-6065-c973-c1146ac93d30?t=1636964632989 (accessed 16 May 2022).

Ewell, Christopher/Cullis-Suzuki, Sarika/Ediger, Mikaela/Hocevar, John/Miller, Dana/Jacquet, Jennifer (2017): "Potential ecological and social benefits of a moratorium on transshipment on the high seas". In: Marine Policy, 81, pp. 293–300.

Fang, Yingkai/Asche, Frank (2021): "Can U.S. import regulations reduce IUU fishing and improve production practices in aquaculture?". In: Ecological Economics, 187, 107084.

FAO, Food and Agriculture Organization of the United Nations (2001): "International Plan of Action to prevent, deter and eliminate illegal, unreported and unregulated fishing". At: http://www.fao.org/fishery/ipoa-iuu/en (accessed 06 October 2021).

FAO, Food and Agriculture Organization of the United Nations (2017): "Voluntary Guidelines for Catch Documentation Schemes". At: http://www.fao.org/iuu-fishing/resources/detail/en/c/1132200/ (accessed 16 May 2022).

FAO, Food and Agriculture Organization of the United Nations (2019): "Voluntary Guidelines on the Marking of Fishing Gear. Directives volontaires sur le marquage des engins de pêche. Directrices voluntarias sobre el marcado de las artes de pesca". At: http://www.fao.org/documents/card/en/c/CA3546T/ (accessed 16 May 2022).

FAO, Food and Agriculture Organization of the United Nations (2020): "The State of World Fisheries and Aquaculture 2020. Sustainability in action". At: http://www.fao.org/publications/sofia/2020/en/ (accessed 16 May 2022).

FAO, Food and Agriculture Organization of the United Nations (2021): "2021 COFI Declaration For Sustainable Fisheries and Aquaculture, Thirty-fourth Session, 1–5 February". At: http://www.fao.org/3/ne472en/ne472en.pdf (accessed 16 May 2022).

Hosch, Gilles (2020): "Catch documentation schemes". In: FAO, Food and Agriculture Organization of the United Nations/Hosch, Gilles: Catch Documentation Schemes for Deep-sea Fisheries in the ABNJ, pp. 17–43.

Felson, Marcus/Clarke, Ronald V. (1998): Opportunity makes the thief. Practical theory for crime prevention. London: Home Office Research, Development and Statistics Directorate.

Ferrell, Jessica K. (2005): "Controlling flags of convenience. One measure to stop overfishing of collapsing fish stocks". In: Environmental Law, 35, 2, pp. 323–390.

Fitt, Elizabeth (2022): "WTO finally nets deal curbing fisheries subsidies, but tables key bits for later". At: https://news.mongabay.com/2022/06/wto-finally-nets-deal-curbing-fisheries-subsidies-but-tables-key-bits-for-later/ (accessed 22 August 2022).

Flothmann, Stefan/Von Kistowski, Kristín/Dolan, Emily/Lee, Elsa/Meere, Frank/Album, Gunnar (2010): "Closing loopholes. Getting illegal fishing under control". In: Science, 328, 5983, pp. 1235–1236.

Garcia, Sonia Garcia/Barclay, Kate/Nicholls, Rob (2021): "Can anti-illegal, unreported, and unregulated (IUU) fishing trade measures spread internationally? Case study of Australia". In: Ocean & Coastal Management, 202, 105494.

GI-TOC, Global Initiative Against Transnational Organized Crime (2021): "IUU Fishing Index". At: https://iuufishingindex.net/ (accessed 31 May 2022).

Greenpeace (2019): "Ghost gear. The abandoned fishing nets haunting our oceans". At: https://www.greenpeace.org/aotearoa/publication/ghost-gear-the-abandoned-fishing-nets-haunting-our-oceans/ (accessed 16 May 2022).

Gutierrez, Miren/Daniels, Alfonso/Jobbins, Guy/Guttierez Almazor, Guillermo/Montenegro, Cesar (2020): "China's distantwater fishing fleet -Scale, impact and governance". At: https://cdn.odi.org/media/documents/chinesedistantwaterfishing_web.pdf (accessed 16 May 2022).

He, Juan (2018): "From country-of-origin labelling (COOL) to seafood import monitoring program (SIMP). How far can seafood traceability rules go?". In: Marine Policy, *96*, pp. 163–174.

Helyar, Sarah J./Lloyd, Hywel Ap D./De Bruyn, Mark/Leake, Jonathan/Bennett, Niall/Carvalho, Gary R. (2014): "Fish product mislabelling. Failings of traceability in the production chain and implications for illegal, unreported and unregulated (IUU) fishing". In: PLOS ONE, *9*, 6, pp. e98691.

IMO, International Maritime Organization (2015): "Resolution A.1106(29) Adopted on 2 December 2015 (Agenda item 10) Revised Guidelines for the Onboard Operational Use of Shipborne Automatic Identification Systems (AIS)". At: https://wwwcdn.imo.org/localresources/en/OurWork/Safety/Documents/AIS/Resolution%20A.1106(29).pdf (accessed 16 May 2022).

INTERPOL (2014): "Study on fisheries crime in the West African coastal region." In: INTERPOL Environmental Security Sub-Directorate (ENS).

INTERPOL (2020): "Fighting illegal, unreported and unregulated fishing". At: https://www.interpol.int/News-and-Events/News/2020/Fighting-illegal-unreported-and-unregulated-fishing (accessed 16 May 2022).

Koop, Fermin/Aldred, Jessica (2020): "WTO fails to meet fishing subsidies deadline". At: https://chinadialogueocean.net/15886-wto-fails-to-meet-fishing-subsidies-deadline/ (accessed 16 May 2022).

Le Billon, Philippe (2008): "Diamond wars? Conflict diamonds and geographies of resource wars". In: Annals of the Association of American Geographers, *98*, 2, pp. 345–372.

Le Billon, Philippe/Spiegel, Samuel (2021): "Cleaning mineral supply chains? Political economies of exploitation and hidden costs of technical fixes." In: Review of International Political Economy.

Leroy, Antonia/Galletti, Florence/Chaboud, Christian (2016): "The EU restrictive trade measures against IUU fishing". In: Marine Policy, *64*, pp. 82–90.

Liddick, Don (2014): "The dimensions of a transnational crime problem: the case of iuu fishing". In: Trends in Organized Crime, *17*, pp. 290–312.

Lindley, Jade/Techera, Erika J. (2017): "Overcoming complexity in illegal, unregulated and unreported fishing to achieve effective regulatory pluralism". In: Marine Policy, *81*, pp. 71–79.

Long, Tony/Widjaja, Sjarief/Wirajuda, Hassan/Juwana, Stephanie (2020): "Approaches to combatting illegal, unreported and unregulated fishing". In: Nature Food, 1, pp. 389–91.

Lycan, Tyler/Van Buskirk, Lexie 2021: "What we know about maritime environmental crime". At: http://www.safeseas.net/wp-content/uploads/2021/09/What_We_Know_About_Maritime_Environmental_Crime.pdf (accessed 16 May 2022).

Maryudi, Ahmad/Myers, Rodd (2018): "Renting legality. How FLEGT is reinforcing power relations in Indonesian furniture production networks". In: Geoforum, 97, pp. 46–53.

McDonald, Gavin G./Costello, Christopher/Bone, Jennifer/Cabral, Reniel B./Farabee, Valerie/Hochberg, Timothy/Kroodsma, David/Mangin, Tracey/Meng, Kyle C./Zahn, Oliver (2021): "Satellites can reveal global extent of forced labor in the world's fishing fleet". In: Proceedings of the National Academy of Sciences, 118. 3, e2016238117.

Metuzals, Kaija/Baird, Rachel/Pitcher, Tony/Sumaila, Rashid/Ganapathiraju, Pramŏd (2010): "One fish, two fish, IUU and no fish. Unreported fishing worldwide". In: Grafton, R. Quentin/Hilbron, Ray/Squires, Dale/Tait, Maree/Williams, Mery (eds.): Handbook of marine fisheries conservation and management. Oxford: Oxford University Press, pp. 165–181.

MFAD, Ministry of Fisheries and Aquaculture Development, Republic of Ghana (2020): "Monitoring, Control, and Surveillance Division". At: https://www.mofad.gov.gh/agencies/fisheries-commission/divisions-of-fisheries-commission/monitoring-control-and-surveillance-division/ (accessed 06 October 2021).

Miller, Dana D./Sumaila, U. Rashid/Copeland, Duncan/Zeller, Dirk/Soyer, Baris et al. (2016): "Cutting a lifeline to maritime crime. Marine insurance and IUU fishing". In: Frontiers in Ecology and the Environment, 14, 7, pp. 357–362.

Miller, Denzil G. M./Slicer, Natasha/Sabourenkov, Eugene N. (2010): "IUU fishing in Antarctic waters. CCAMLR actions and regulations." In: Vidas, Davor (ed.): Law, technology, and science for oceans in globalisation". Leiden: Brill Nijhoff, pp. 175–196.

Miller, Nathan A./Roan, Aaron/Hochberg, Timothy/Amos, John/Kroodsma, David A. (2018): "Identifying global patterns of transshipment behavior". In: Frontiers in Marine Science, 5.

Mundy, Victoria (2018): "The impact of the EU IUU Regulation on seafood trade flows. Identification of intra-EU shifts in import trends related to the catch certification scheme and third country carding process". At: http://www.iuuwatch.eu/wp-content/uploads/2018/02/TDA_report_IUUwatch_HQ.pdf (accessed 16 May 2022).

OECD, Organisation for Economic Co-operation and Development (2020): "Fighting illegal, unreported and unregulated fishing". In: OECD Review of Fisheries 2020. Paris: OECD iLibrary.

Okafor-Yarwood, Ifesinachi (2019): "Survival of the richest! Towards an understanding of the impacts of the securitisation of small-scale fisheries in West Africa". Edinburgh: European Conference on African Studies. At: https://nomadit.co.uk/conference/ecas2019/paper/48744 (accessed 16 May 2022).

Okafor-Yarwood, Ifesinachi (2020): "The cyclical nature of maritime security threats. Illegal, unreported, and unregulated fishing as a threat to human and national security in the Gulf of Guinea". In: African Security, 13, 2, pp. 116–46.

Okafor-Yarwood, Ifesinachi/Belhabib, Dyhia (2020): "The duplicity of the European Union Common Fisheries Policy in third countries. Evidence from the Gulf of Guinea". In: Ocean & Coastal Management, 184, 104953.

Österblom, Henrik/Bodin, Örjan (2012): "Global cooperation among diverse organizations to reduce illegal fishing in the Southern Ocean". In: Conservation Biology, 26, 4, pp. 638–648.

Österblom, Henrik/Bodin, Örjan/Press, Anthony J./Sumaila, U. Rashid (2016): "The high seas and IUU fishing". In: Smith, Hance D./Suárez de Vivero, Juan Luis/Agardy, Tundi S.: Routledge Handbook of Ocean Resources and Management. Abingdon, Oxon, UK: Routledge, pp. 232–240.

Pacoureau, Nathan/Rigby, Cassandra L./Kyne, Peter M./Sherley, Richard B./Winker, Henning et al. (2021): "Half a century of global decline in oceanic sharks and rays". In: Nature, 589, pp. 567–571.

Petrossian, Gohar A. (2015): "Preventing illegal, unreported and unregulated (IUU) fishing. A situational approach". In: Biological Conservation, 189, pp. 39–48.

Petrossian, Gohar A./Marteache, Nerea/Viollaz, Julie (2015): "Where do 'undocumented' fish land? An empirical assessment of port characteristics for IUU fishing". In: European Journal on Criminal Policy and Research, 21, 3, pp. 337–351.

Petrossian, Gohar A./Pezzella, Frank S. (2018): "IUU fishing and seafood fraud. Using crime script analysis to inform intervention". In: Annals of the American Academy of Political and Social Science, 679, 1, pp. 121–139.

Petrossian, Gohar A./Sosnowski, Monique/Miller, Dana/Rouzbahani, Diba (2020): "Flags for sale. An empirical assessment of flag of convenience desirability to foreign vessels". In: Marine Policy, 116, 103937.

PEW, The Pew Charitable Trusts (2020): "Port Risk: risk of illegally-caught fish passing through port". At: https://www.pewtrusts.org/en/research-and-analysis/data-visualizations/2020/port-activity-study-reveals-potential-for-illegal-fish-to-enter-markets (accessed 16 May 2022).

Pramod, Ganapathiraju (2018): "Ghana country report". In: IUU Risk Intelligence: Policing the open seas, global assessment of fisheries monitoring control and surveillance in 84 countries. Canada.

Pramod, Ganapathiraju/Pitcher, Tony J. (2019): "In defence of seafood import analysis. Credulity bamboozled by supply chain laundering". In: Marine Policy, 108, 103651.

Quelch, Glenn D./Von Kistowski, Kristin/Young, Mark/Carrara, Giuliano/Rey Aneiros, Adelaida et al. (2020): "Transshipment: a closer look. An in-depth study in support of the development of international guidelines". In: Moistero Cabanelas, Alicia (ed.): FAO Fisheries and Aquaculture Technical Papers, Series No. 661. Rome: Food and Agricultural Organization.

Richardson, Kelsey/Hardesty, Britta Denise/Wilcox, Chris (2019): "Estimates of fishing gear loss rates at a global scale. A literature review and meta-analysis". In: Fish and Fisheries, 20, 6, pp. 1218–1231.

Rogers, Kimberly (2021): Examining the impact of the European Union's carding scheme to combat Illegal, Unreported, and Unregulated fishing on the Republic of Panama's seafood trade. San Diego: Center for Marine Biodiversity and Conservation, UC San Diego.

Rosello, Mercedes (2017): "Cooperation and unregulated fishing. Interactions between customary international law, and the European Union IUU fishing regulation". In: Marine Policy, 84, pp. 306–312.

Rustad, Siri Aas/Le Billon, Philippe/Lujala, Päivi (2017): "Has the Extractive Industries Transparency Initiative been a success? Identifying and evaluating EITI goals". In: Resources Policy, 51, pp. 151–162.

Satizábal, Paula/Le Billon, Philippe/Belhabib, Dyhia/Saavedra-Díaz, Lina M./Figueroa, Isabela/Noriega, Gina/Bennett, Nathan J. (2021): "Ethical considerations for research on small-scale fisheries and blue crimes". In: Fish and Fisheries, 22, 6, pp. 1160–1166.

Sea Shepherd (2019): "Sea shepherd removes over 1000 pieces of illegal fishing gear from vaquita habitat". At: https://seashepherd.org/news/sea-shepherd-removes-over-1000-pieces-of-illegal-fishing-gear-from-vaquita-habitat/ (accessed 16 May 2022).

Shen, Huihui/Huang, Shuolin (2021): "China's policies and practice on combatting IUU in distant water fisheries". In: Aquaculture and Fisheries, 6, 1, pp. 27–34.

Song, Andrew M./Scholtens, Joeri/Barclay, Kate/Bush, Simon R./Fabinyi, Michael/Adhuri, Dedi A./Haughton, Milton (2020): "Collateral damage? Small-scale fisheries in the global fight against IUU fishing". In: Fish and Fisheries, 21, 4, pp. 831–843.

Soyer, Barış/Leloudas, George/Miller, Dana (2018): "Tackling IUU fishing. Developing a holistic legal response". In: Transnational Environmental Law, 7, 1, pp. 139–163.

Sumaila, Ussif Rashid/Alder, Jacqueline/Keith, Heather (2006): "Global scope and economics of illegal fishing". In: Marine Policy, 30, 6, pp. 696–703.

Sumaila, Ussif Rashid (2019): "A carding system as an approach to increasing the economic risk of engaging in IUU fishing?". In: Frontiers in Marine Science, 6.

Sumaila, Ussif Rashid/Ebrahim, Naazia/Schuhbauer, Anna/Skerritt, Daniel/Li, Yang et al. (2019): "Updated estimates and analysis of global fisheries subsidies". In: Marine Policy, 109, 103695.

Sumaila, Ussif Rashid/Skerritt, Daniel/Schubauer, Anna/Villasante, Sebastian/Cisneros-Montemayor, Andres M. et al. (2021): "The World Trade Organization must prohibit harmful fisheries subsidies". In: Science, 374, 6567, p. 544.

Tessnow-von Wysocki, Ina/Le Billon, Philippe (2019): "Plastics at sea. Treaty design for a global solution to marine plastic pollution". In: Environmental Science & Policy, 100, pp. 94–104.

Tessnow-von Wysocki, Ina/Vadrot, Alice B. M. (2020): "The voice of science on marine biodiversity negotiations. A systematic literature review". In: Frontiers in Marine Science, 7.

Trent, Steve (2020): "A decade of the EU's regulation on illegal fishing. Real-world progress". At: https://ejfoundation.org/news-media/a-decade-of-the-eus-regulation-on-illegal-fishing-real-world-progress (accessed 16 May 2022).

UNCLOS (1982): United Nations Convention on the Law of the Sea.

Vandergeest, Peter/Marschke, Melissa (2021): "Beyond slavery scandals. Explaining working conditions among fish workers in Taiwan and Thailand". In: Marine Policy, 132, 104685.

Ventura, Victor Alencar Mayer Feitosa (2015): "Tackling illegal, unregulated and unreported fishing. The ITLOS Advisory Opinion on Flag-state Responsibility for IUU fishing and the principle of due diligence". In: Revista de Direito Internacional, 12, 1, pp. 51–66.

Vince, Joanna/Hardesty, Britta Denise/Wilcox, Chris (2021): "Progress and challenges in eliminating illegal fishing". Fish and Fisheries, 22, 3, pp. 518–531.

Widjaja, Sjarief/Long, Tony/Wirajuda, Hassan/Van As, Hennie/Bergh, Per Eik et al. (2019): "Illegal, unreported and unregulated fishing and associated drivers". At: https://www.oceanpanel.org/blue-papers/illegal-unreported-and-unregulated-fishing-and-associated-drivers (accessed 16 May 2022).

Wongrak, Garnchanok/Hur, Nancy/Pyo, Insoo/Kim, Jungsuk (2021): "The Impact of the EU IUU regulation on the sustainability of the Thai fishing industry". In: Sustainability, 13, 12, 6814.

Yozell, Sally/Shaver, Amanda (2019): "Shining a light. The need for transparency across distant water fishing". At: https://www.stimson.org/2019/shining-light-need-transparency-across-distant-water-fishing/ (accessed 16 May 2022).