

STUDY

Requested by the PECH Committee

Role and impact of China on world fisheries and aquaculture



Fisheries



This report should be cited as:

Pauly, D., M. Ansell, E. Chu, W. Emam, N. Franceschelli, C. Jiang, K. Krueger, M.L.D. Palomares, V.A. Parducho, N. Peacock, M. Sanz and S. Tong. 2022. Research for PECH Committee – Role and Impact of China on World Fisheries and Aquaculture. European Parliament, Policy Department for Structural and Cohesion Policies, Brussels, 153 p.

RESEARCH FOR PECH COMMITTEE

Role and impact of China on world fisheries and aquaculture

This study reviews China's mariculture and marine fisheries with emphasis on the operations of its Distant Water Fleets (DWF). China's DWF are analysed with some emphasis on the subsidies they receive from their government, their Illegal, Unreported and Unregulated catches and practices, the challenges they represent to international agreements, and to competing fleets from the EU, particularly in six focal countries, i.e., Mauritania, Senegal, Madagascar, Mauritius, Ecuador and the Solomon Islands. Finally, the trade of Chinese fishery and mariculture products is reviewed with some emphasis on the import of fish feed by China, which may increasingly impact some food-deficient countries.

This document was requested by the European Parliament's Committee on Fisheries.

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LINGUISTIC VERSIONS

Original: EN

ABOUT THE PUBLISHER

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Manuscript completed in December 2022

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[http://www.europarl.europa.eu/thinktank/en/document.html?reference=IPOL_STU\(2022\)733101](http://www.europarl.europa.eu/thinktank/en/document.html?reference=IPOL_STU(2022)733101)

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Ansell, M., Chu, E., Emam, W., Franceschelli N., Jiang, C., Krueger, K., Palomares, M.L., Parducho, V.A., Pauly, D., Peacock, N., Sanz, M., Tong S. 2022, Research for PECH Committee – Role and impact of China on world fisheries and aquaculture, European Parliament, Policy Department for Structural and Cohesion Policies, Brussels

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Pauly, D. *et al.* (2022)

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LIST OF ABBREVIATIONS

AIS	Automatic identification system
BPI	Blue Ports Initiative
BRI	Belt and Road Initiative
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
CFP	Common Fisheries Policy
COFI	Committee on Fisheries
DWF	Distant Water Fleets
EC	European Commission
ECA	European Court of Auditors
EEZ	Exclusive Economic Zone
EMOD-PACE	European Marine Observation and Data Network Partnership for China and Europe
EMODnet	European Marine Observation and Data Network
EU	European Union
EUR	Euros
FAO	Food and Agriculture Organization of the UN
GDP	Gross Domestic Product
GFW	Global Fishing Watch
IATTC	Inter-American Tropical Tuna Commission
ICCAT	International Commission for the Conservation of Atlantic Tunas
IFFO	Fishmeal & Fish Oil Organisation (now The Marine Ingredients Organisation)
IMO	International Maritime Organization
IOTC	Indian Ocean Tuna Commission
ITC	International Trade Centre (of the WTO)

IUU	Illegal, unreported and unregulated
MSC	Monitoring, control and surveillance
MoU	Memorandum of Understanding
MPAs	Marine Protected Areas
mt	Million tonnes
NMDIS	National Marine Data and Information Service of China
NPFC	The North Pacific Fisheries Commission
OACPS	Organisation of African, Caribbean and Pacific States
Pa	Per annum
PECH	European Parliament's Committee on Fisheries
PSMA	Port State Measures Agreement
RFB	Regional Fisheries Body
RFMO	Regional Fisheries Management Organizations
SPRFMO	South Pacific Regional Fisheries Management Organization
USD	United States dollar
VMS	Vessel monitoring system
WCPFC	Western and Central Pacific Fisheries Commission
WFE	Whole Fish Equivalent or live fish weight
Wt	Weight
WTO	World Trade Organisation

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EXECUTIVE SUMMARY

Overview of the Chinese fishing fleet, aquaculture, and trade

There is a large discrepancy and uncertainty in the number of vessels of the Chinese distant water fleets (DWFs). The low estimate of 'visible' vessels is around 900; a higher estimate assumes that about 2000 'invisible' vessels must be added. However, the discrepancy may be that the larger number includes vessels operating in waters close to China, e.g., in Korea. Although the overwhelming majority of mariculture production along China's coastlines consists of bivalves such as clams, mussels and oysters, which require no feed, the smaller tonnage of marine fish that are farmed, i.e., about 2 mt per year, generate a demand for feeds which has made China the world's major importer of fishmeal. This is becoming a problem in some West African countries, e.g., in Senegal, where the small fish that were consumed by people are now diverted to fishmeal factories and exported to China. The overall situation of the Chinese fish and seafood sector is, from an international trade perspective, one of transition. This transition is from a leading processor of fish raw material for re-export as primary products (fillet) increasingly towards one of sourcing aquatic products – many of them prime items and some processed – for domestic consumption. The other key trend is the steady replacement of primary by secondary processed products in the Chinese export offer.

Fishing access agreements

For the EU, the fleets deployed by Chinese companies, and their impact both on the fisheries resources in the Exclusive Economic Zones (EEZ) of various countries and on the positions of the governments of these countries, obviously represent serious competition and a challenge. It is difficult to suggest a stance for the EU fleets fishing in the EEZ of various countries of the Global South other than strict adherence to the letter and spirit of the fishing agreements and local legislation regulating their operations. To the extent that Chinese or other distant water fleets do not adhere to such regulations, this good-faith behaviour should lead, in the countries where, e.g., EU and Chinese fleet compete, to the EU gaining respect and, eventually, more advantageous terms.

Fisheries subsidies

Chinese fleets operating in Mauritania and Senegal received high levels of subsidies from the Chinese government, while those operating in Madagascar, Mauritius, Ecuador and the Solomon Islands seem to have little 'visible' information on subsidies. This suggests that transparency is an issue not only regarding the deployment of fleets and their catches, but also regarding subsidies.

Illegal, unreported and unregulated (IUU) fishing practices

The large number of vessels of the Chinese distant water fleets, and the various techniques that enable these vessels to 'go dark', increase the chances of IUU infractions. This happens in spite of the attempt by most of the focus countries studied here to mitigate such infractions by adhering to international initiatives. However, the continuous lack of necessary data in reporting such infractions hinders international mitigation initiatives.

EU-China cooperation and agreements

In part due to agreements such as the Blue Partnership for the Oceans, cooperation and dialogue between the EU and China at the bilateral level has significantly increased in recent years. However, obstacles to cooperation include conflicting geopolitical agendas and the potentially compromised role of the central institutions of the EU in light of individual agreements between China and some EU Member States. At the regional and global levels, Chinese-EU cooperation is encouraged through their participation in Regional Fisheries Management Organisations (RFMOs) and mutual promotion of

ocean governance through recent agreements such as the Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean (CAOFA) and the WTO Agreement on Fisheries Subsidies.

Consequences for the EU

One of the most important environmental consequences of the Chinese fishing fleet on the EU's distant-water fishing activities is the depletion of fisheries stocks, which is associated with environmental degradation and results in reduced resource availability for all actors involved. Furthermore, illegal fishing undermines any form of good governance that the EU might hope to see introduced. The main consequence of illegal fishing is the direct competition with legal fishing at all scales and along the entire supply chain, which represents a form of unfair competition for the EU and other relevant stakeholders. In terms of consequences for the fishing fleet for the EU, the study highlights the impact on local communities in host countries; the reduced access to resources; the unfair competition and the reduced availability of exported products. In addition, some of the consequences for the aquaculture sector are the impact on the fishmeal, on the EU caviar sector and on the Norwegian and Scottish salmon sectors.

Recommendations

Finally, the study suggests a series of recommendations focusing on how to best protect the EU against unfair global competition practices:

1. To develop an appropriate strategy to respond to China's increasing domination of global fishmeal supplies, and to secure EU access to this important resource.
2. With a view to the future, to encourage EU seafood firms to seek primary processing partners outside China, e.g., focusing upon partners in other developing countries with capable but more cost-effective workforces (e.g., Vietnam, Cambodia, South Asia as well as Latin American or African alternatives).
3. To protect EU access to fishing opportunities, considering China's expanding impact on access to fish stocks of interest to the EU, e.g., tuna, particularly in the Pacific and within the EEZ of Islands in the Western Pacific.
4. To encourage the Member States to refrain from negotiating individual agreements and to instead focus on cooperation with the EU's central institutions.
5. To call for more transparency and reliable information on fishing activity and fisheries agreements of Chinese DWF at bilateral and global level.
6. To support and provide funding of civil society organisations investigating and reporting the activities of actors who prefer to operate in the dark.
7. To ensure an adequate implementation of the existing EU legislation (e.g., IUU Regulation, Due Diligence Directive). Amongst other benefits, this will contribute to implementing an adequate traceability system; to ensuring responsible fishing practices, to improving the safety at sea and labour conditions on fishing vessels, and to enhancing accurate reporting of catch.
8. To ensure a rule-based global system that considers the divergent interests of all parties is in place to regulate international ocean affairs and economic activities, including fisheries.
9. To ensure an effective implementation of international agreements on safety at sea of fishing vessels (Cape Town Agreement - IMO) and labour conditions on fishing vessels (ILO C188); and the negotiation of the agreement on Biodiversity Beyond National Jurisdiction would also

enhance a fair competition between China and the EU and contribute to the protection of the Ocean.

10. To strengthen the monitoring, control and surveillance units of the Department of Fisheries (or equivalent agencies) of the countries with which the EU has signed fisheries agreements, and thus to strengthen their capacity to enforce fisheries control.
11. In interactions with Chinese negotiators, to point out that China's central government has proclaimed an 'Ecological Century' and insists on international cooperation leading to mutual benefits. This proclamation excludes the predatory practices that lead to unfair competition. Fisheries agreements and contracts should not lead to increased exploitation of fully or overexploited stock. The EU, through the appropriate agency, should fund EU and/or other scientific groups capable of assessing the state of targeted stocks of countries in the Global South to determine the level of exploitation.
12. The above point would also support the dialogue with China about the overfishing problem in the South China Sea; and about the need to reduce the Chinese subsidies for the distant water fleets that lead to unfair competition.

INTRODUCTION

This study is intended to provide the European Parliament (PECH Committee) with useful information about the role and impact of China on world fisheries and aquaculture.

It covers geopolitically "mainland China" as the territory governed by the People's Republic of China (PRC) excluding dependent territories of the PRC and other territories within Greater China, as they are considered separate entities in terms of fisheries.

Namely, the study addresses the following points:

- Provide an overview of the Chinese fishing fleet/catches, aquaculture sector, and import and export of fisheries and aquaculture products.
- A description of the practices of granting fishing licences to Chinese vessels (6 country case studies were developed: Eastern Atlantic: Mauritania and Senegal; Western Indian Ocean: Madagascar and Mauritius; Western Pacific: Solomon Islands; Eastern Pacific: Ecuador).
- A description of China's subsidies for its fishing sector.
- A description of illegal, unreported and unregulated (IUU) fishing practices (focus on China's distant fleet).
- A description of the EU-China cooperation in fisheries at three levels (bilateral, regional, and global).
- An overview of China's international agreements.
- Analysis of the environmental, socio-economic and geopolitical consequences of the Chinese fishing fleet and the Chinese aquaculture sector for the EU.
- Analysis of how best to protect the EU fisheries and aquaculture sector against unfair global competition practices regarding both sustainable fishing opportunities and sustainable aquaculture.
- Provision of recommendations for EU policy makers (and mainly for Members of the European Parliament).

The study was mainly developed on the basis of desk research and stakeholder consultations:

- Desk Research: a thorough review of all available information regarding China's fisheries (e.g. key published documents/reports, Government data, industry information, etc.), aimed to develop a better understanding of the six thematic areas (catches, fleet, imports, exports, fishing activities outside Chinese waters and IUU), and to identify gaps and/or issues. A description of the approach / the sources used for data collection is presented in Annex 1. The complete list of references is also provided at the end of the study.
- Stakeholder consultations: in October 2022 the contractor consulted relevant stakeholders, including the EC, fisheries industry, NGOs, and other stakeholders. The list of stakeholders consulted is included in Annex 2.

1. OVERVIEW OF THE CHINESE FISHING FLEET, AQUACULTURE AND TRADE

This section presents an overview of the Chinese fishing fleet and its catches (section 1.1.), aquaculture sector (section 1.2.), and import and export of fisheries and aquaculture products (FAPs) (section 1.3.).

1.1. Chinese distant-water fishing fleet

This sub-section presents various aspects of the marine fisheries of the People’s Republic of China

KEY FINDINGS

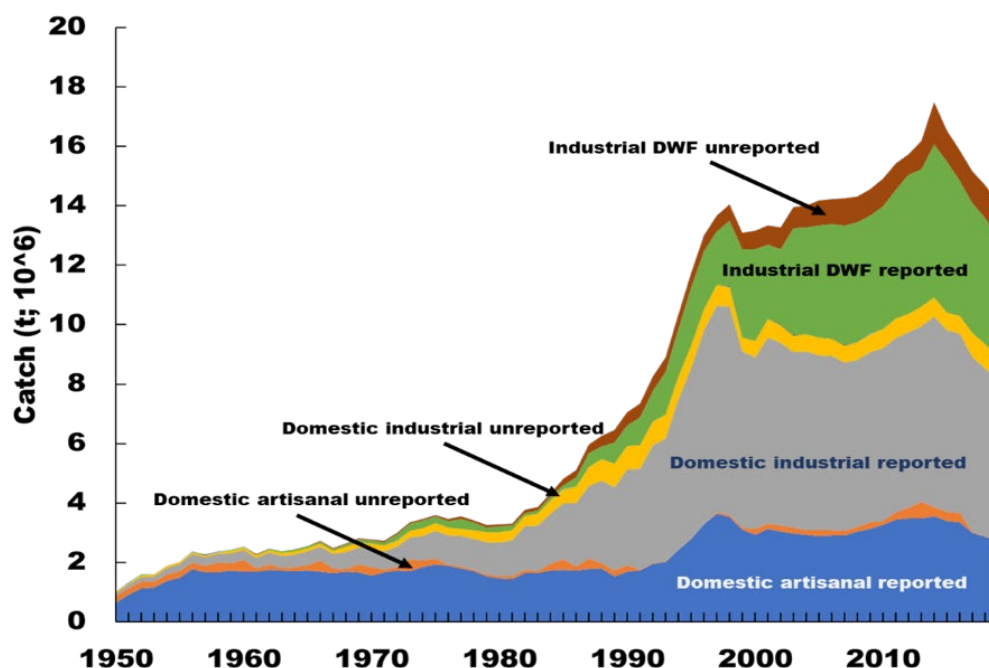
- The total marine catches of Mainland China currently amount to 14-16 million tonnes (mt), of which 3-4 mt originate from distant-water fishing, notably from the waters off West Africa and Western South America.
- China is the top fishing country in the high seas since 2014, and is one of five countries driving high seas fisheries and transshipment of large tuna and sharks, and more recently, of the squid fisheries.
- Distant Water Fleets (DWFs) of Mainland China (operated from 2018-2020) operate in hot spots around the focus areas chosen for this study, i.e., off of Ecuador, off the west of Africa (Mauritania and Senegal), off the east coast of Madagascar, around Mauritius and around the east and southern coasts of the Solomon Islands.
- Hot spots of transshipment activities confirm that these are usually taking place in the high seas and usually with reefers that fly third-country flags, i.e., dominated by Panama, known mostly for hiding beneficial ownerships.
- There is a large discrepancy and uncertainty in the number of vessels of the Chinese distant water fleets (DWFs). The low estimate of ‘visible’ vessels is around 900; a higher estimate assumes that about 2000 ‘invisible’ vessels must be added. However, the discrepancy may be that the larger number includes vessels operating in waters close to China, e.g., in Korea.

(‘Mainland’ China). The total marine catches of Mainland China by sector are presented for the period 1950 to 2019.

Distant water fleets take, on average, between 30-35% of the total catch of China during the period 2000-2019 (see Figure 1 below; see also Oceana 2021¹).

¹ Oceana (2021) China’s Global Fishing Footprint. Oceana.
https://usa.oceana.org/wp-content/uploads/sites/4/Oceana_ChinaFishing_FactSheet_PRINT.pdf.

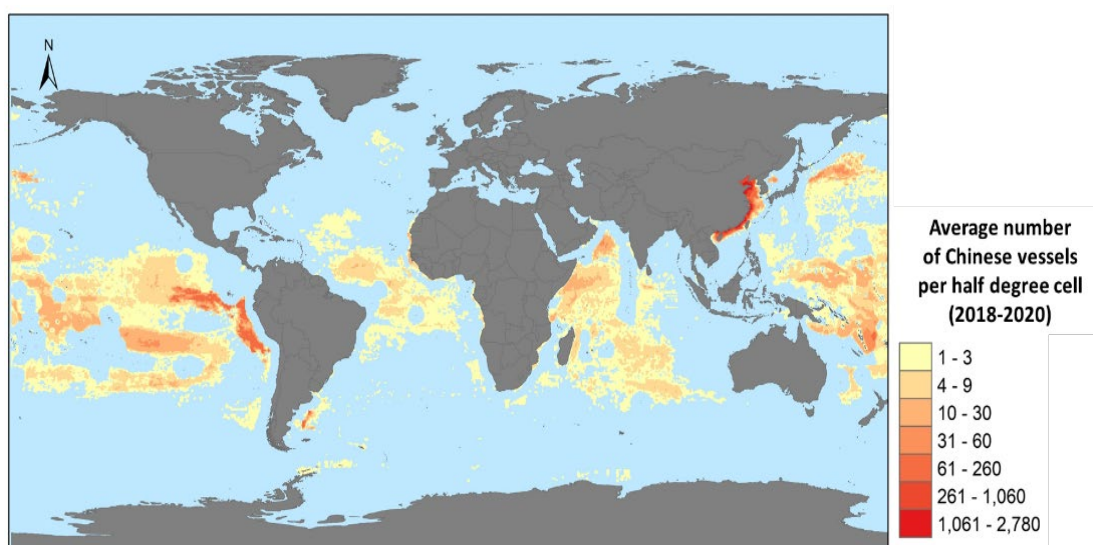
Figure 1: Marine fisheries catch by Mainland Chinese domestic and distant water fleets



Source: Based on data reported by Mainland China to the FAO, with adjustments for IUU catches from Pauly *et al.* (2014), Pauly and Le Manach (2015) and Tsui *et al.* (2020)

Figure 2 presents the heat map of Mainland Chinese-flagged vessels obtained from the GFW dataset for 2018-2021 (see Kroodsmma *et al.* 2018). Note that this dataset does not include information on beneficial ownership.

Figure 2: Average number of Mainland Chinese-flagged vessels per half degree cells operating in the world’s oceans in 2018-2020



Source: GFW database (2022 version)

Figure 2 shows the extent of the reach of the Chinese DWF fleets, whose vessels are now showing up in the North Atlantic (from which they were absent in 2000-2011; Pauly *et al.* 2014) and in Antarctica,

along the EEZs of many countries, as well as in large numbers off the Peruvian and Ecuadorian coasts. The high concentrations (in red) of Chinese DWF are consistent with squid jiggers off the north-western coast of South America (off Peru and Ecuador; see Yue *et al.* 2014, Brush and Dury-Agri 2022, MOA 2019-2020, and the recent comprehensive *New York Times* article by Myers *et al.* 2022). Note also the concentration of Chinese DWF off the coast of West Africa, which might be reflective of the activity of fleets targeting small pelagic fish, as mentioned in Greenpeace Africa (2017)² and in Yozell and Shaver (2019).

In 1991, four trawlers from the Shanghai Fisheries Group Co. targeting cephalopods marked the beginning of China's involvement in Mauritanian waters (see Chen *et al.* 2017). Between 2007-2010, the distant water vessel "XinYu No.1" operated for 200-250 days per year and had an annual catch of small pelagics of 12,000-19,000 t, for which Zhang *et al.* (2011) give the following catch composition: 37% sardine (*Sardina pilchardus*), 26% horse mackerel (*Trachurus spp.*), 16% sardinellas, (*Sardinella spp.*), 10% Japanese mackerel (*Scomber japonicus*) and 1% largehead haitail (*Trichiurus lepturus*), the last a much-prized fish in China. The Chinese DWF operations started to target small pelagics in Mauritanian waters in 2006 with large scale trawlers, which counted 10 trawlers in 2011 (Zhang *et al.* 2011). By 2015, this grew to 50 trawlers from the Shanghai Fisheries Group Co. and the China National Fisheries Corp. targeting cephalopods in Mauritania (Chen *et al.* 2017). In 2019-2020, the catch of Mauritanian flagged vessels (which included vessels participating in the 25-year licence agreement signed by the government of Mauritania with the Hong Dong Fishing Company) was made up of 56% pelagic species and 23% cephalopods (see Groupe Multipartite National (GMN) FiTI de la Mauritanie 2022).

During the peak of Chinese-flagged DWF operations (2012), around 10 large mid-water trawlers targeting pelagic species operated in the area between Senegal and Morocco; this has since decreased due to high production costs, and a subsequent change from pelagic to bottom trawls (see Zhou *et al.* 2021).

Greenpeace (2017) also mentions the following details:

- While the small-scale pirogue fishery of Mauritania, which has been steadily increasing in recent years, was previously oriented towards the exploitation of octopus, the inshore fishery uses small (Mauritanians and Senegalese) vessels targeting octopus, and small purse seiners of various origins, e.g., flying the flags of Morocco, Turkey, and China, mainly targeting coastal small pelagic species. In recent years, catches of artisanal and coastal fisheries have increased significantly. Much of this new trend is due to increased fishing focus on small pelagic fishes, i.e., sardinella (*Sardinella spp.*) and bonga shad (*Ethmalosa fimbriata*) due to the expansion of the fish meal industry. Sardinella and bongo shad are shared stocks (Samb and Pauly 2000; Palomares *et al.* 2020) which have been overexploited for several years;
- In Guinea Bissau, industrial fishing is wholly carried out by foreign flagged vessels. In March 2017, about 177 fishing vessels (including 17 support vessels) operated in waters under Guinea-Bissau jurisdiction (official list of the Ministry of Fisheries). These are from China, France, Spain, Comoros, Panama, Senegal, Portugal, Greece, South Korea, Guinea Conakry, Curaçao, Cabo Verde, Guatemala, and Belize (i.e., a mixture of 'real' flags and flags of convenience; Miller and Sumaila 2014), and mainly exploit demersal species. A relatively small part of this industrial fleet, mainly European, targets tuna. There were six pelagic trawlers, including four flagged to Comoros, one from China and one from Guinea;

² Greenpeace Africa (2017) The Cost of Ocean Destruction - Report from Greenpeace Ship Tour of West African Fisheries 2017. Greenpeace Africa. 52p

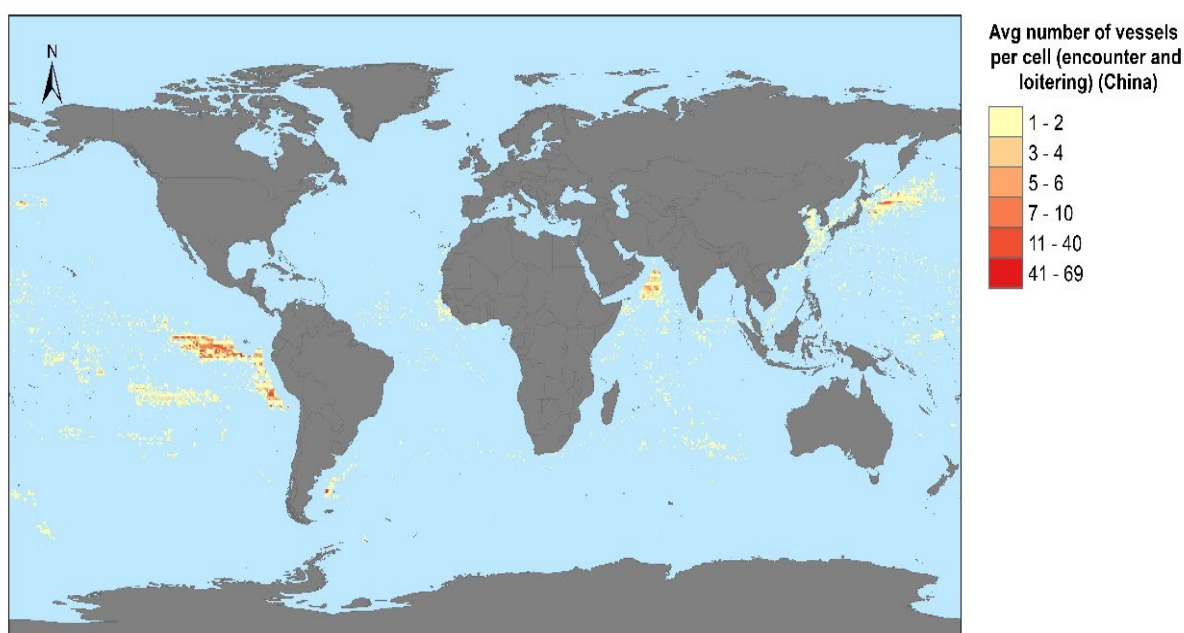
- In Guinea, industrial fishing involves pelagic, cephalopod, shrimp and demersal fishing. This sector targets high quality species, e.g., croakers (*Pseudotolithus* spp.) threadfins (*Polydactylus* spp.), white grunt, sea bream, red carp, red mullet, flounder, grouper, etc.), mainly for export purposes. In 2017, some 70 licensed industrial vessels operated in waters under Guinean jurisdiction. Almost 56% (39 vessels) of this industrial fleet consist of bottom trawlers, with a strong presence of Chinese ships (35 vessels);
- In Sierra Leone, about 143 industrial vessels were operating in Sierra Leone waters in January 2017. This includes vessels from, China (which account for 50% of the vessels), Spain, France, Belize, Curaçao, Panama, Guatemala, Cabo Verde, Senegal, Guinea, Ivory Coast, Italy, South Korea, St Kitts and Nevis and Comoros (again, a mixture of 'real' flags and flags of convenience). This industrial fleet is largely dominated by bottom trawlers (about 40% of the total) fishing for species such as demersal fish, shrimp and cephalopods. The other parts of this industrial fleet are tuna vessels and mid-water trawlers fishing for small pelagic species.

China was the top fishing country in the high seas, targeting squid, tuna, and mackerel species in 2014 (Yue *et al.* 2016), and this has continued to the present (Myers *et al.* 2022). Shi *et al.* (2014) suggested that over 40 Chinese-owned vessels were operating in the NW Pacific targeting Pacific saury (*Cololabis saira*). Recently, the Chinese Ministry of Agriculture and Rural Affairs approved the operation of 69 lift nets targeting mackerel to operate in the high sea areas of the NW Pacific (MOA 2020). Also, the ZheJiang Ocean Family Co. Ltd, which operates 4 tuna purse seine vessels targeting skipjack and yellowfin tuna operating in Papua New Guinea, Micronesia, Kiribati and Nauru waters, has deployed 14 longliners targeting big-eye tuna, yellowfin tuna, and swordfish in the Pacific, Indian, and Atlantic Oceans (see ZheJiang Ocean Family Co. Ltd 2022a, 2022b).

Miller *et al.* (2018) identified 694 cargo vessels from AIS data (2012-2017) from Kroodsma *et al.* (2018) that were capable of transshipments. They also report that only 45% of these vessels have flags corresponding to their beneficial ownership and that 47% of their activities occurred in the high seas. Russia and US-flagged fishing vessels mostly transhipped with Russia- and USA-flagged reefers inside their EEZs. China, Taiwan, South Korea and Japan-flagged fishing vessels mostly had encounters with variously-flagged reefers in the high seas, i.e., most likely flags of convenience (these encounters were dominated by Panama, Liberia, and Vanuatu-flagged reefers).

In the interest of showing these transshipment activities on a map, specifically for China, a dataset based on the method and assumptions of Miller *et al.* (2018) was extracted from the GFW database (see Kroodsma *et al.* 2018) for 2018-2020. Our results confirm those of Miller *et al.* (2018) and are presented in Figure 3 and Figure 5.

Figure 3: Average number of Mainland Chinese-flagged vessels per half degree cells operating in the world's oceans that are suspected of being involved in transshipments in 2018-2020



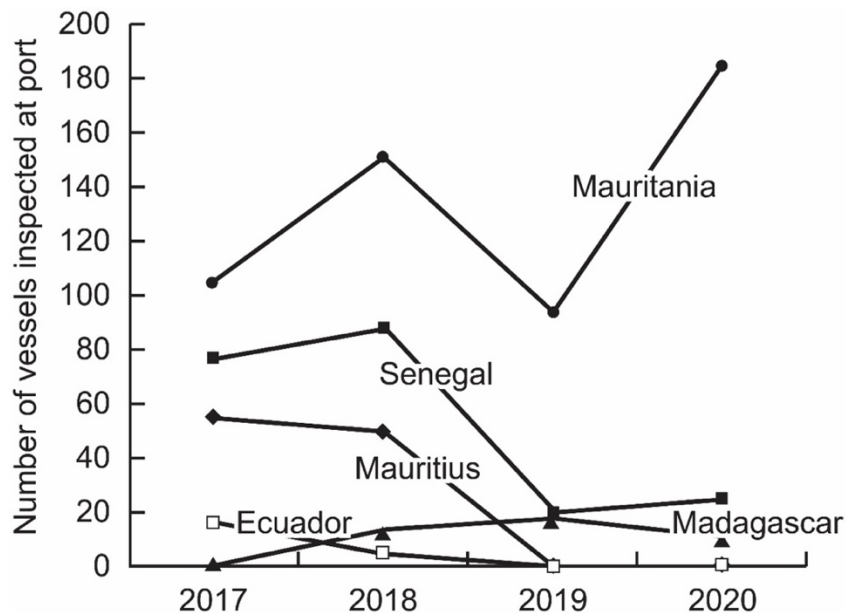
Source: GFW database (version 2022)

Figure 3 suggests that the average number of Mainland Chinese-flagged vessels that were involved in transshipment is highest in the high seas of FAO Statistical Area 61 (Pacific, Northwest), 87 (Pacific, Southeast), and 51 (Indian Ocean, Western), with a small concentration in Area 41 (Atlantic Southwest). The Pacific Ocean transshipment activities might be associated with squid jiggers (also with longliners and purse seiners; see Boerder *et al.* 2018), while the Indian Ocean activities might be associated with pelagic fisheries (e.g., sharks and tunas, see White *et al.* 2019). The transshipment off the coast of Patagonia is most likely associated with tuna, squid and groundfish targeted by the trawl, squid jigger and longline fisheries (Broeder *et al.* 2018). Note that China is one of the five entities that drive high seas fisheries and transshipment, notably of large tuna and sharks, responsible for 14.4% of these activities (see White *et al.* 2019). The other four entities are Mexico (30.4%), Taiwan (22.7%), Japan (13.3%) and the USA (13.3%).

Figure 4 shows the number of Mainland Chinese-flagged vessels operating in the waters of our focus countries (except the Solomon Islands) reported to be inspected at port by the Ministry of Agriculture and Rural Affairs of the People's Republic of China (see MOA 2017-2020).³

³ Note that no data is available for the Solomon Islands

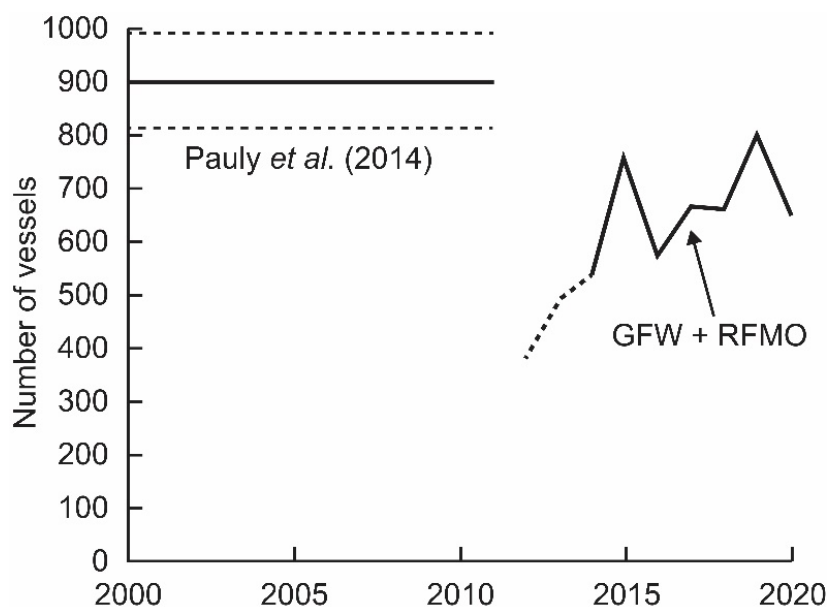
Figure 4: Number of Mainland Chinese-flagged vessels operating in the focus study areas



Source: MOA 2017-2020

Figure 5 presents the number of vessels obtained from the GFW and the RFMO databases for the period 2012 to 2020. It should be noted that these numbers are lower than given in Blomeyer *et al.* (2012) and Pauly *et al.* (2014), which is likely due to the GFW database being incomplete, particularly in 2012 and immediately thereafter. Overall, given that the GFW data are known to be incomplete, and that the data for 2000-2011 were associated with a wide confidence interval, Figure 5 should be interpreted as suggesting that there were no large changes in the size of Chinese DWF from 2000 to the present.

Figure 5: Estimated number of Mainland Chinese-flagged fishing vessels operating in the world's oceans



Source: GFW and the RFMO databases for the period 2012 to 2020

Five of the six focus countries (except the Solomon Islands) are signatories of the Port State Measures Agreement (PSMA; FAO 2016⁴). The Port State Measures Support Programme (FAO 2022) that helps countries to build the capacity to comply with the PSMA lists five projects involving the six focus countries. These projects provide a total of \$14.6 million USD (see Annex 3) to help build capacity in these countries. Four of these projects are current and are expected to boost awareness and advocacy about IUU fishing and improve mitigation of dark fleets (Cutlip 2016; Fujita *et al.* 2018; Valentine 2021).

Although Chinese-flagged vessels seem to be responsible for a large number of dark fleets (see Valentine 2021), European fleets are also going dark, as reported in Godfrey (2021), Heubl (2021), and Anon (2022a).

Note however, that the switching off of AIS data cannot be fully assumed to directly account for going dark. Issues with internet stability and other technological difficulties might also cause AIS switch off, as discussed in Fujita *et al.* (2018), Ferra *et al.* (2020), Brousseau (2021), Emmens *et al.* (2021), Arsenaut and Le Billon (2022). Thus, databases like the GFW whose data are being used for analyses like those done in this study would need to assure users that such issues have been addressed in the datasets that they provide to the wider public.

As to the number of Chinese vessels operating in regions outside of China: 689 data points (rows) were reported for 2001-2022. Slightly over half of these data points (380) were of Chinese DWF observed in 65 EEZs for 2010-2022, with a maximum number of Chinese DWF operations observed in 2013 in North Korea (604 vessels; see MOA, 2013), in 2018-2020 in Argentina (433 vessels; see Valentine, 2021), in Peru in 2018 (377 vessels; see MOA, 2018) and in Ecuador in 2020 (342 vessels; see Ford, 2020). About 41% of these observations covers the Pacific Ocean, 34% the Atlantic Ocean and 22% the Indian Ocean.

The Ministry of Agriculture and Rural Affairs of China noted 2,460 distant water fleet vessels in 2015 (Yue *et al.*, 2016) with 569 squid jiggers (CNFC, 2015). By the end of 2019, 178 pelagic fishery enterprises in China operated 2,701 pelagic distant water fleets taking an annual catch of 2.2 mt (MOA, 2021).

The maximum number of Chinese vessels observed in the Atlantic and Pacific Oceans ranges from 600 to 610 (see Watkins *et al.*, 2016; WCPFC, 2022), and the maximum observed in the Indian Ocean is 488 (see CNFC, 2015).

Gutierrez *et al.* (2020) estimated a very high number (16,966) of Chinese vessels operating in all oceans for 2017-2018, with 94.5% flying the Chinese flag and 5.5% flagged to a third country with possible beneficial ownership by Chinese operators. This very high figure likely includes vessels from China's domestic fleet and is thus ignored here.

The maximum recorded number of vessels for Mauritania is 169 (Chen, 2017; Chen, 2019; number of observations gathered (n) is 58), 112 for Senegal (Li, 2018; n=14), 132 for Madagascar (Carver, 2021; n=27), Mauritius 6 (55; MOA, 2017), 65 for Solomon Islands (Honiwala, 2011; n=9), and 342 for Ecuador (Ford, 2020; n=15). These numbers are higher than those recorded in Pauly *et al.* (2014) for these countries, but this does not allow inferences for the Chinese DWF as a whole (see also Figure 5).

Note however, that there are sources, notably Yozell and Shaver (2019) stating that only one third of the Chinese DWF is "visible," which seems to be confirmed by Yue *et al.* (2016) and MOA (2021), i.e., 1000 vessels out of 3000. This would correspond approximately to the numbers in Watkins *et al.* (2016), WCPFC (2022) and CNFC (2015), i.e., about 1,100 vessels (see also Figure 4).

⁴ FAO (2016) Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing. Food and Agriculture Organization of the United Nations, Rome. Accessed on October 3 2022 from <https://www.fao.org/3/i5469t/i5469T.pdf>.

One possible explanation for the discrepancy between the estimate of about 1000 for the number of vessels in China DWF (see Figure 5) and the high estimate of Yozell and Shaver (2019), which assumes that over two-thirds of China's DWF makes itself invisible to the GWF, is that Yozell and Shaver (2019) counted Chinese vessels operating (from bases in China) in southern Japan and around the Korean Peninsula, which are not usually counted as part of the Chinese DWF (see Figure 5), and whose number was estimated as 2532 (95% confidence interval: 2094 – 2744; Pauly et al 2014). Clearly, there is a large amount of uncertainty there.

Irrespective of the absolute number of Chinese DWF vessels, GFW data can be used to determine hot spots of Chinese vessel concentration to confirm the validity of the choices of the focus countries for this study. For example, the hot spot off Peru and Ecuador in Figure 2 confirms the locally high number of vessels cited in Ford (2020).

1.2. Chinese marine aquaculture sector

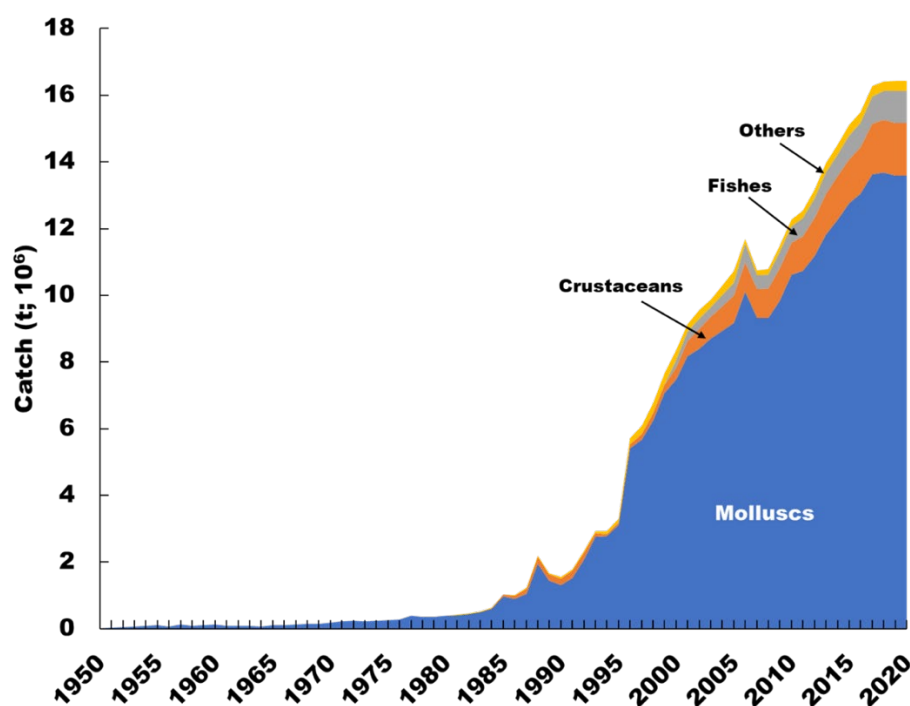
KEY FINDINGS

- China's mariculture industry reached 16 million tonnes (mt) in 2020, of which 14 mt are of bivalves, i.e., oysters (4.6 mt), clam (4.0), scallop (1.8), mussels (0.85), razor clams (0.79), cockle (0.36), with fish, crustaceans and other molluscs (snails, abalones, etc.) making up the rest.
- Overall, the industry generates about 52 billion Euros per year. However, various forms of pollution, which also affect exports, are a major problem.
- Fish and crustacean farming generate a huge demand for fishmeal, which has turned China into the largest fishmeal importer in the world, and may also impact the staple fish consumption of some of the food-insecure countries from which the fishmeal is imported.
- This is becoming a problem in some West African countries, e.g., in Senegal, where the small fish that were consumed by people are now diverted to fishmeal factories and exported to China.

This sub-section briefly reviews the major aspects of China's mariculture industry (excluding seaweed), starting with Figure 6 showing the trends of production by major commodity groups (molluscs, overwhelmingly bivalves), crustaceans, fish and other groups, and in Figure 7 by province from 1950 to 2020.

From 1950 to 2019, mariculture in China developed exponentially, with a slow start from the 1950s to the 1970s, and a rapid, near linear increase to about 16 million tonnes per year thereafter (Figure 6).

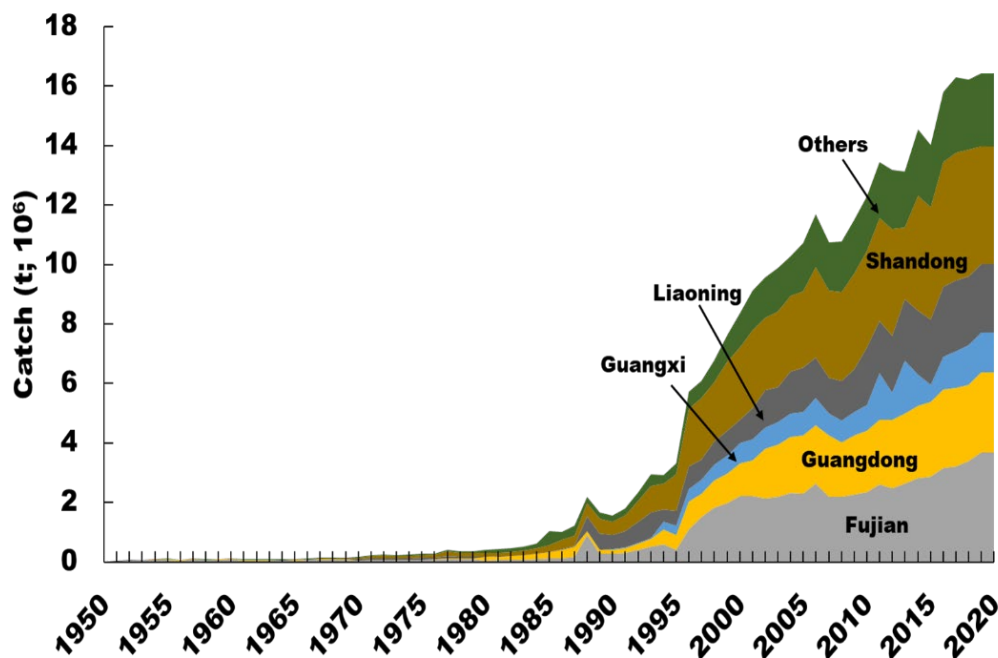
From 2016 to 2020, the annual production increase was about 10% and the strongest increases were for bivalves (14 mt/year, representing almost all of the molluscs in Figure 6), crustaceans, and fish.

Figure 6: Mariculture production (excluding algae) by major groups farmed in China

Source: own elaboration

The major bivalve species farmed in Chinese mariculture are, according to Mao *et al.* (2019), mainly oysters (4.6 mt), clams (4.0), scallops (1.8), mussels (0.85), razor clams (0.79), cockles (0.36), with other molluscs (snails, abalones, etc.) making up the rest. The major species are the oysters *Crassostrea gigas*, *C. rivularis*, *C. plicatula*, *C. angulata* and *Ostrea denselamellosa*, the Manila clam (*Ruditapes philippinarum*), and the mussels *Mytilus galloprovincialis*, *M. coruscus* and *Perna viridis* (Mao *et al.* 2019). Razor clams include *Sinonovacula constricta*, *Solen grandis*, *S. strictus* and *Cultellus attenuatus*. Of these, *S. constricta* is the most important; its main production areas are in Zhejiang, Fujian, Jiangsu and Shandong. The clams are *Meretrix lusoria*, *M. lyrata*, *M. chinensis*, *M. veneriformis*, *Paphia undulata*, *Cyclina sinensis* and *Coelomactra antiquata*, while the blood clams include *Scapharca broughtonii* and *Tegillarca granosa*. (Yang, 2021).

Figure 7 shows China's mariculture production by province. As can be seen, for 2011 to 2019 there was an increase of 58% in Zhejiang, 41% in Fujian and Hainan, 38% in Hebei and Liaoning (33%) which dominate the production of the whole country. However, production declined in 3 provinces, i.e., Shanghai (-97%), Tianjin (-67%) and Guangxi (-15%), for causes that could not be elucidated.

Figure 7: Mariculture production (excluding algae) by Chinese Province

Source: own elaboration

One-sixth of the world's population rely on seafood as the main source of animal protein. With the increase in population and the improvement of living standards, the demand for aquatic products will continue to increase. In China, the improvement of living standards is the main driver for the increased demand for seafood, and thus the emphasis on the culture of seafood (Chen *et al.*, 2012).

From 1959 to 1976, the production of mariculture increased steadily, driven by improvements in mariculture technology. From 1978 to 1992, the surface of coastal areas devoted to mariculture increased rapidly. However, serious environmental problems increased as well, as did the frequency of diseases. In spite of these issues, from 1992 to the early 2000s, the areas devoted to mariculture continued to increase, as did its production, outpacing mariculture increases in other parts of the world. The breeding technology of algae, shellfish, shrimp, and fish is now basically mature, and scientific research focuses on the breeding of new species, disease control and integrated mariculture, which has a lower ecological footprint (Chen *et al.*, 2012). In the 21st century, the aquaculture of highly valuable species such as sea cucumbers and abalones has increased, and intensive aquaculture methods such as deep-water cages and factory farming have been developed (Li, 2007).

With the continuous development of China's mariculture industry, the number of countries to which China exports mariculture products increased from 112 in 2002 to 170 in 2010. However, Japan, the United States, the European Union and South Korea are still the most important export markets for China (Chen *et al.*, 2012). The Economic Cooperation Framework Agreement signed between Mainland China and Taiwan in 2010 increases the trade of seafood between the two. Also, exports to countries in Central and South America, Africa and Oceania increased. All these developments created favourable conditions for the further development of China's mariculture.

According to the "China Fishery Statistical Yearbook for 2020", the output value of China's marine aquaculture in 2019 was 358 billion Yuan (about 52 billion Euros), and the ratio of the output value of

aquaculture products to fisheries products was 79.5: 20.5. The aquaculture output and value of aquaculture have been increasing year on year, largely meeting the demand for seafood products (Zhu, 2021).

However, the rapid development of Chinese mariculture has caused environmental problems such as pollution and low efficiency. For example, the coastal waters, especially the intensive aquaculture waters, are seriously polluted, and the frequency of fish and other diseases, red tides and, *Enteromorpha prolifera* outbreaks keeps increasing (Li 2007). Moreover, due to the high protein content of the feeds given to carnivorous fish and invertebrates, pollution from nitrogen, phosphorus, organic matter and suspended solids is increasing (Yang *et al.*, 2020), especially from non-eaten feeds and faeces, which increase pathogenic bacteria and viruses in coastal seawater (Song *et al.*, 2019; (Yang *et al.*, 2020).

The use of pelleted feeds in China is still low, i.e., about one third of all feeds is comprised of pellets. Also, the feed conversion of most aquaculture species is still in the range of 2.1-4.0 (Mai *et al.*, 2001), far higher than in western countries. As a result, currently four to five million tonnes of forage fish are used as feed annually, much of it stemming from the Chinese domestic trawl fishery (Cao *et al.* 2015). Here, mariculture, rather than reducing fishing pressure on coastal ecosystems, actually increases it, including in other countries (e.g., Senegal), which now export fish feed to China that is derived from sardinella and other local staple fish (Hicks *et al.* 2019; Pauly 2019). Indeed, China has now become the largest fishmeal importer in the world ((Anon 2022b). This points to the need for better technologies and policies (Lei, 2010; Cao *et al.* 2015), involving, among other things a better utilisation of fish processing waste, and the use of plant-based feedstuff. Fortunately, feeds are not required in bivalve culture, which contributes the bulk of Chinese mariculture production.

In order to address these and related issues, the Chinese government issued in 2019 "Several Opinions on Accelerating the Promotion of the Green Development of the Aquaculture Industry," which is the first document of its kind approved by the State Council. This puts forward specific requirements for the Chinese aquaculture industry to reduce its environmental footprint. Also, in 2021, the State Council issued the "Guiding Opinions on Accelerating the Establishment and Improvement of a Green, Low-Carbon and Circular Development Economic System", which again emphasised the need to reduce the ecosystem impacts of agriculture and aquaculture.

Liu *et al.* (2022) warned that chronic impacts on coastal ecosystems would lead to tides, the emergence of diseases, and even a serious threat to future of mariculture.

Moreover, one of the problems that the aquaculture sector faces is the use of drug to avoid diseases. Ning *et al.* (2007) reported that in December 2002, due to excessive drug residues and microbial counts in poultry meat and frozen shrimp exported from China, the European Commission adopted a decision⁵ impacting the import of animal-derived products from China for human consumption or as animal feed (Anon. 2002), causing a loss to China's aquaculture industry of more than 600 million US dollars. This question is further developed in section 6.1.2.

⁵ European Commission (2002). Commission Decision 2002/994/EC of 20 December 2002 concerning certain protective measures with regard to the products of animal origin imported from China. Available at <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32002D0994&from=EN>

1.3. Chinese import and export of fisheries and aquaculture products (FAPs)

KEY FINDINGS

- Chinese seafood trade is going through a period of significant change.
- China's role as a primary seafood processor (filleting) to the world is changing in favour of secondary value-added processing.
- Rising Chinese wealth is unsurprisingly leading to increased imports of expensive prime seafood (fresh salmon, fillet products, shellfish) for domestic consumption.
- However, there is one thing that has not changed. This is China's dominance of the trade in fishmeal. In 2012 China was importing 30% of the traded total, and provisional data for 2021 suggests this is now approaching 50%. When China's domestic production is included, China appears to be consuming 60% of global fishmeal production.

Specific findings regarding China's fish & seafood trade:

- Growing imports of prime whole fresh fish (Atlantic salmon).
- Reducing imports of raw whole frozen fish (northern gadoid white fish).
- Increasing imports of prime shellfish (shrimp, squid).
- Reducing exports of primary fish fillet products (whitefish & Pacific salmon).
- Offset by largely matching increased exports of secondary value-added fish & shellfish.
- But non-food import of fishmeal is the most important import from a resource impact viewpoint, by a large measure.
- Threats to the accuracy of trade data, as demonstrated by China's seafood imports.

This sub-section focuses on the Chinese import and export of fisheries and aquaculture products including data on trade balance, fishmeal, on the geographic dimension and the key species and species groups involved. Moreover, this section includes recommendations specifically related to the case studies; offers an overview of the main environmental, geographical and socioeconomic consequences of the fisheries fleet and aquaculture sector for the EU; and it finally provides some conclusions and recommendations.

The approach adopted to elaborate this sub-section has been one of travelling from the general to the particular, i.e., looking at the big picture to identify relevant topics then moving on to assess these in greater detail. This means that the research has been structured as follows:

- **Overview** – analysis of China's fisheries imports, exports and trade balance by major product category – e.g., fresh fish, frozen fish, fillets, crustacea etc, 2012 to 2021.
- **Geographic:** China's seafood trade by **major origin** (imports) and **destination** (exports) 2012 to 2021.

- **Resource related:** Trade by key **species or species groups** – to tease out the significant species that have a high profile in the Chinese seafood trade and thus are likely to reflect the stocks subject to significant impact from Chinese activities.

These three analytical stages provide the basis for subsequent specific, detailed and relevant analysis expressed through brief case studies, based upon:

- Relevance to the six case study third countries.
- Prospects for providing insights regarding implications for the EU, especially the protection of EU interests.
- Significant wider global environmental, socio-economic and geopolitical implications.

The data used in this analysis is mostly that provided by the World Trade Organisation (WTO) through its International Trade Centre (ITC) TradeMap website and the FAO through its FishStat database. Much of the quantitative data is converted into live weight or whole fish equivalent (WFE) which both refer to the original weight of the whole aquatic animal when caught alive (see Appendix 2 for detail of conversion factors used), as opposed to product weight, so like can be compared with like.

1.3.1. Overview of the Chinese seafood trade patterns

From a trade perspective it is clear that China's role in the global fish and seafood sector is changing. Over the past decade volumes have increased steadily by 3% pa (and faster at 5% pa in live weight or WFE terms). Imports reached over 4.4 million tonnes (product weight) in 2019 but have dropped back subsequently, no doubt with the pandemic a major factor (the clampdown on eating out, probably exacerbated by rumours that Covid could be imported in frozen seafood). The "headline" characteristics of the trade – which is of course huge, along with most aspects of the Chinese economy - can be summarised as:

- China's **imports** of fish and seafood have risen to over 4 million tonnes within the past 10 years but may have been tailing off latterly, if provisional data is to be believed. In the perhaps more meaningful whole fish terms (WFE) Chinese seafood imports have settled down at 5.5-6 million tonnes, and are valued at \$13-14bn annually.
- Expressed as product weight, **exports** were lower (3.7-4.2 million tonnes), but much exceed imports when converted to WFE values (7.5 to 8.5 million tonnes) worth around \$20bn annually. The much higher WFE value reflects the high degree of processing.

However, although scale clearly dominates any perception of the Chinese seafood economy, it is the ways in which it is changing that are currently more interesting. Taking imports and then exports in turn, this section starts by assessing the key indicators of this change.

1.3.2. China's Seafood Imports

It is in the makeup of the trade that the change is most apparent. Chinese imports are dominated by whole frozen fish and have been so for the past decade (and previously) – accounting for 65% of the total. Together with shellfish, whole frozen fish accounts for a very dominant 90% of imports, and taken together these categories have consistently been the major contributors to seafood imports.

However, frozen fish imports have actually been falling, with a rapid reduction after 2019 highlighting the change. Covid and associated continued lockdowns in China might explain the steep reduction in 2020-21, but analysis of the percentage of whole fish compared with China's total fish import shows clearly that the decline began much earlier - in 2017 - and suggests this is a key underlying trend.

At the same time, imports of shellfish have been growing very rapidly (14%pa) and some minor seafood categories have been growing even faster – most notably fillet products. What appears to be happening is a consistent underlying trend towards increasing higher value imports that are offsetting a decline in arrivals of lower cost frozen raw material.

1.3.3. China's Seafood Exports

Chinese seafood exports always exhibited a very different profile to that of imports. Whilst this is not surprising, it is instructive. Some whole frozen fish is exported but it is fillets that dominate (especially when their importance is highlighted through conversion to WFE values). Added to this are sizeable quantities of secondarily processed (value-added) seafood (fish and shellfish). Taken together these four categories accounted for close to 80% of all seafood exports, with molluscs (mostly squid) the only other significant category.

In terms of quantity, Chinese seafood exports have been effectively static over the past decade at 3.6 million tonnes, but did rise during the middle of the decade, peaking at 4.2 million tonnes in 2017. However, when translated into WFE, the figures are much higher (at 7.8 and almost 9 million tonnes respectively) – as would be expected given that processing leads to the discarding of as much as two thirds of the fish concerned. Seen this way, China is a net exporter of seafood, ostensibly demonstrating a substantial contribution from domestic capture and culture.

The overall rise and demise pattern applies similarly to most categories of seafood exports. The outlier is highly processed (value-added) seafood which has shown continuous rapid growth (6% pa), especially for fish *per se*, as opposed to shellfish. The overall outcome has then been a reduction of most of the primarily processed products exported, following a peak in 2017-18, largely offset by a rapid rise in their secondarily processed (value-added) alternatives. China's seafood processing sector has apparently been "upping its game".

1.3.4. Trade balance

What explains this import/export pattern is China's well-established role in the global seafood sector as a specialist processor rather than a primary producer. Whole frozen fish are imported and processed fish – usually fillet – is exported, sometimes back to the original country of origin of the raw fish. It is, though, with this basic processing that the change mentioned above has become evident over the past 3-4 years. In short, China is processing less fish for export, but adding more value to what it does process, indicated by a move away from fillet and towards value-added products.

In addition, something else is also happening. This is to do with unit price (e.g., expressed as € or \$US/kg), or more specifically, average unit border prices. Chinese exports have seen little change in prices (except in 2021, which may be erroneous as it is provisional). In contrast, import prices have been rising steadily and it appears that China is trading up when importing. The combined impact of higher unit values and the increase in shellfish imports – which are invariably highly priced items - appears to be the cause. Taking imports and exports together, the way the net trade position has evolved over the past decade is instructive:

- Whilst declining in relative terms as an import, net trade in whole frozen fish has remained largely steady until just recently.
- Shellfish trade has switched from net deficit to net surplus – i.e., more shellfish is being consumed in China. For crustacea, which is dominated by shrimp, the transition occurred between 2014 and 2015 – a period when commentators on the shrimp farming industry had suggested that

China was indeed moving from being a net exporter to net consumer of shrimp. The same has recently happened to molluscs (dominated by squid).

- Perhaps the most striking aspect to emerge is the clarity regarding the trend in net exports moving away from primary processed fillet towards secondary value-added products.

1.3.5. Fishmeal

One key element of the Chinese fish and seafood trade balance is missing from the preceding analysis. This is fishmeal – a nonhuman food item that can be overlooked. This would be a mistake, as fishmeal probably represents the area where China has the largest impact upon global aquatic bio-resources through trade. What tends to disguise the importance of fishmeal is the apparently relatively modest quantity in product weight terms (at least in comparison with China’s total aquatic product trade – at just 1.3 million tonnes p.a. of fishmeal on average over the past decade). But when the volume of fish consumed in the production of fishmeal is considered, the impact is very significant. It takes 4.4 kg of whole fish to produce one kg of fishmeal, so when viewed in WFE terms, fishmeal constituted a majority import category at 8 million live weight tonnes in 2021 (this means that, when converted back to live weight, 8 million tonnes of whole fresh fish were processed to produce the 1.82 million tonnes of fishmeal that China imported in 2021). China’s exports are, on the other hand, minimal, at 2,000 tonnes or less pa, i.e. less than 0.2% of imports, so this is in effect an inwards-only trade - and a very large one.

The implications of this are certainly significant. If the data is correct, China is not just the dominant player in the global fishmeal trade (now accounting for 50% of the global import) but due to its domestic fishmeal production, possibly responsible for over 60% of all global consumption. China’s massive terrestrial farming industry (pork and chicken) no doubt accounts for much of this, but a huge aquaculture industry is also a key factor driving China’s clear dominance of the supply of this important global protein feedstock.

1.3.6. Key overview findings

Clearly fishmeal is a major part of the story and needs to be included in the analysis. At the same time, the general significance of whole fish equivalent (WFE) is clear, and so restating import data in WFE terms is instructive. Doing so makes the degree to which fishmeal has dominated China’s 2012-21 aquatic product imports clear – whilst it contributed 29% to imports over the decade in product weight terms, when converted to WFE the contribution was 59%, whilst the contribution by whole frozen fish dropped from 46% (product weight) to 23% WFE.

When looked at in this way, fishmeal clearly has resource implications that exceed those of the conventional seafood imports (although the latter is substantially more important economically, of course). So, although China is a net exporter of seafood, it is no such thing for aquatic resources overall when fishmeal is included. Indeed, there is now an annual WFE Chinese quantitative trade deficit of 1-2 million tonnes overall.

Taken together, these findings point to China having retained its role as “seafood processor to the world”, but one that is increasingly switching from filleting to more sophisticated value-adding. This is overlain by a move upmarket as the country has increased its imports of high-end shellfish. The latter trade is apparently aimed at domestic consumption, presumably funded by China’s increasing wealth. Specifically, key observable trends are:

Imports. The majority of Chinese fish and shellfish imports are raw or semi-processed materials, with four product categories accounting for the great majority (over 90%) of the total – these being

- Whole frozen fish: 65% (average 2012-21, product weight)

- Molluscs (mostly squid): 13%
- Crustacea (mostly shrimp): 12%
- Fish fillet: 4%

Some other products are exhibiting very rapid import growth (e.g., fresh fish, cured fish and “others” – including jellyfish and echinoderms) but from such tiny bases that current quantities are relatively minimal (though given the vast scale of the China economy, hardly insignificant). But most important of all is the very high level of fishmeal imports

Exports are more diverse from a product viewpoint - with 6 significant categories (i.e. contributing more than 2% to quantities) but with the top four contributing over 80% of the total. The key categories over the past decade, in order of importance (when ranked in WFE terms), are:

- Fish fillet: 23% (average 2012-21, product wt)
- Secondarily processed (value-added) fish*: 19%
- Frozen whole fish: 25%
- Secondarily processed (value-added) shellfish: 10%
- Molluscs: 14%
- Crustacea&cured: 7%

* was top of the list by 2020.

1.3.7. The Geographic Dimension

China sources seafood globally and exports very widely – for example the key raw material, whole frozen fish, arrived from 97 countries whilst key exports (fillets) were dispatched to 140 countries over the past decade. However, a far narrower range of partners accounted for the great majority of the trade, especially where imports are concerned.

Chinese imports by origin

Sourcing patterns are instructive - the origin of the fish can be telling, regarding the species involved. This section assesses the principal providers to China, concentrating on the four categories that account for the great majority of the imports. – these being whole frozen fish, fish fillet, crustacea (especially shrimp) and molluscs (especially squid), all assessed in product weight terms here.

The dominance of the leading suppliers is evident, as is the degree to which these leaders tended to increase that dominance over the decade (whole frozen fish being the only exception to this). Other trends noted regarding sourcing are as follows:

- In general, the top three sources provide more than 50% of the total supply within each category – confirming that sourcing tends to rely upon a narrow supply base.
- This is certainly the case for frozen whole fish raw material – where 60-70% arrives from the top three suppliers: Russia, USA and Norway, although latterly there has been some broadening of the supply base, so reducing Russian and US dominance.
- Primary processed fish imports (fillet) have grown rapidly whilst being very narrowly sourced – now with 82% sourced from a single supplier, Vietnam. This reinforces Vietnam’s emerging role as a key fish “contract” processor, able to challenge China on the basis of cost effectiveness. Although the

great bulk of Vietnam's fillet exports are pangasius, rising Vietnamese exports of cold-water fish (gadoids and salmon) confirms Vietnam's progress in this direction.

- For prime shellfish (essentially shrimp & squid), sourcing is more diverse but has latterly narrowed down to a more limited range of key suppliers, especially for shrimp, where Ecuador dominates. China's transition from net exporter to net importer of shrimp may partially account for this (perhaps favouring bulk low-cost suppliers as this becomes more of a commodity market).
- Molluscs are more widely sourced, with Japan, Indonesia and Peru – the top current suppliers – each contributing less than 17%.

Chinese exports by destination

For Chinese seafood exports, the market leaders again take substantial market share, but this concentration is much less marked, and these exports reach a very wide range of markets. In this case five key categories have emerged as significant: whole frozen fish, frozen fish fillet, crustacea (e.g. shrimp, crabs, lobster), molluscs (squid, scallops and clams) and value-added fish (e.g. canned pelagics - large & small). Again, product weights are the basis for comparisons here.

Again, the Chinese trade pattern for key products is informative, with that for exports characterised as follows:

- As Chinese exports are far less concentrated upon a few countries than its sourcing, the top three tend to account for a much lower proportion of this more widely dispersed trade – mostly less than 50% for each export product category.
- Primarily processed fish mostly goes to western markets, with the EU still a major destination (with the EU taking 31% of the total over the past decade, rising to over 35% recently, with Germany the largest importer).
- Secondary processed (value-added) fish is more widely exported, destinations including many emerging markets as well as western markets (and with the EU, in this case, only accounting for 4% of the total for this category).
- Shellfish exports mostly go to wealthier Asian and western markets. However, the EU as a destination for Chinese crustacea is diminishing by 8% pa, having dropped to around 5% of the total. In contrast, for Chinese molluscs, EU demand has been rising by 2% pa, and now accounts for 11% of the total Chinese mollusc export.

1.3.8. The key species and species groups involved

For the purposes of this study, it is the species and species groups involved rather than the products that are of key interest. Understanding this is central to identifying the impact that China's fish trade is likely to be having upon wild stocks. It also provides pointers regarding the likelihood that EU interests might be affected, as well as helping to interpret the involvement of the six case study third countries.

Chinese imports by species group

Trade data provides species and species group data, and whilst this is not necessarily consistent and is subject to misclassification, it is probably the best data available. The following analysis focuses upon the more important species where they are identified (much of the trade is undifferentiated species-wise). All quantities have been assessed in WFE terms to highlight the impact upon the respective resource. The range of species assessed was limited to the most important items, but still collectively represented 72% of the total import. The detail is provided in the attached Annex 4, and 19

species/species groups that were both differentiated and represented the key contributors to China's seafood imports were identified. Taken in turn, key aspects noted for these were:

- **Salmon imports:** Atlantic salmon imports now dominate whole fresh fish imports, accounting for nearly 70% of the category. Fresh salmon must be air-flown, because fresh fish (unlike frozen) cannot be sent by land or sea from producer countries (mostly Norway in this case) to China as it is too perishable and the journey time is overly long. It is thus expensive (\$11/kg), and so its use as raw material for exported products is unlikely, and the high-end domestic market is the likely end use. Pacific salmon is also imported in quantity but in this case, it is a whole frozen product at \$3/kg, making reprocessing a practical option.
- **Whole frozen whitefish imports:** Alaskan pollock continues to dominate the category in spite of the decline in its import (-6%pa), and together with cod-like fish and flatfish still constitutes 44% of the category's import. Arriving at \$1.1-\$1.3/kg, this is clearly a commodity product, priced for reprocessing.
- **Pangasius fillet imports:** China's fillet imports are dominated by a single product from a single source – farmed pangasius catfish from Vietnam, which now accounts for 64% of the category after very rapid growth. A landed price of \$2/kg for a fillet product explains its rise in popularity.
- **Crustacea – shrimp imports:** China's crustacean imports have been rising across the species range, but it is shrimp where the growth has been exceptional. China's pivot from net exporter to net importer must have played a part here, and it has been Ecuador that has been a major beneficiary (61% of the total). Much of the warm water shrimp imported could then only be farmed *Penaeus vannamei*, especially as the other major supplier, India, also now farms *P vannamei*. The other clearly differentiated type of shrimp imported is cold water shrimp, which mostly comes from Canada, but some is supplied by the EU – from Greenland and Denmark in particular. This is almost all imported in frozen form (at an average price of \$US5/kg) which would make it potentially economic to reprocess for export - or it could supply domestic demand.
- **Molluscs – squid & scallop imports:** Squid has been a major Chinese import and has continued growing at 6% pa over the past decade. The more surprising trade has been in scallops, growing at 25% pa to reach 670,000 tonnes, although this is perhaps overstated as it is assessed as shell-on (WFE) for a product believed to be mainly traded as detached meats. Both species can provide potential markets for the EU in China, but this is a market where Spain is the only EU member to have made much of an impression recently (and that at only a modest 6-7,000 tonnes pa).
- **Other product imports:** Jellyfish is the only other product category to make a significant contribution, but as with scallops the WFE estimate probably exaggerates the product – mostly believed to be traded in dried form. Even so, the 44,000 tonnes imported latterly represents the result of 27% pa growth, so is not inconsequential.

Chinese exports by species group

As with imports, Chinese exports are analysed in terms of their species composition, and as before the quantities shown are all whole fish equivalent (WFE), and the range covered is limited to the most important items, but still collectively represented almost 70% of the total export.

- **Whitefish fillet exports:** Fillet exports have declined as already noted, but still remain sizable. Alaska pollock fillet exports averaged 0.72 million tonnes (WFE) set against imports of raw whole pollock of 0.67 million tonnes – values close enough to confirm that reprocessing for export is

China's main use of this pollock*. This is a product category that has particular relevance for the EU, which received 220,000 tonnes in 2021 (for Germany especially), although the quantity has been declining slowly.

- **Pacific salmon fillet exports:** the comparison made for Alaskan pollock applies similarly to Pacific salmon. An import of 160,000 tonnes (WFE) of whole salmon can be linked to a fillet export of 170,000 tonnes (WFE)* signalling another reprocessing trade.
- **Tilapia exports:** China is the world's largest farmer of tilapia, with an industry closely tied to exports. These exports mostly go to the USA (fillets) and Africa (fish too small to fillet so exported whole), all frozen. This trade seems to have declined rapidly, especially since 2018, with the overall disruption to US/China trade likely to have been a determining factor.
- **Value added fish exports:** EU imports of these secondary processed products increased (in direct contrast to the declining trend for primary fillet products) rising from 17,000 tonnes in 2012 to 40,000 tonnes in 2021, showing growth of 10% pa, ahead of global growth of these Chinese exports of 9% pa. However, they still remain small in relation to primary processed fillet imports to the EU.
- **Tuna value-added exports:** China now exports 260,000 tonnes pa (WFE) of presumably mostly canned tuna, up from around 100,000 tonnes in 2012. If this does signal China's intention to expand in the canned fish sector it will have implications for island states – especially case study countries such as the Solomon Islands, Mauritius and Madagascar, as well as Senegal and Ecuador. All are current or former players in the canned tuna industry, as well, of course, as the EU tuna industry.
- **Shellfish exports.** Chinese shellfish exports essentially reflect imports, with shrimp, squid and scallops prominent but with the addition of clams – with the latter two categories' contributions probably inflated by conversion to WFE. Shrimp has shown the greatest change, as raw shrimp exports declined by 7% pa whilst value added exports were steadier – suggesting that domestic consumption was rising whilst secondary processing for export continued to increase.

* In the consultant's experience, these discrepancies between the Chinese imported quantity and the reciprocal export of between 4% and 6% are not unusual for trade data and within the norm for errors, rather than signalling unexplained quantities (e.g., undeclared landings).

1.3.9. Case studies

In response to the issues raised by the preceding analysis, a number of brief case studies were assessed, especially wherever there was evident relevance for countries such as Mauritania, Senegal, Madagascar, Mauritius, Solomon Islands and Ecuador, EU interests or a wider impact upon the marine ecosystem and environment. These studies, which are set out in Annex 4, explored these aspects and form the basis for assessing the implications that Chinese trade in seafood (and aquatic bio-resources) has for the EU member states and the six case study third countries

- **Case study 1: Fishmeal – China's largest trade-related impact on global aquatic bio-resources.** China's massive impact upon the global supply of fishmeal has already been described, and so this case study looks into this in more detail.

Relevance: Such is China's domination of this trade that its impact is global, affecting all countries with livestock industries, in that a key feed ingredient is likely to get more expensive and perhaps less available. More specifically, two case study countries that are suppliers to China are directly affected – Ecuador, as a long-term supplier to China, and Mauritania (where a recently concluded EU fisheries agreement adds immediate relevance).

- **Case study 2: Prime Whitefish fillet exports:** China has traditionally played a leading role in the fish “re-processing” industry – where raw material (whole frozen fish) is imported, primarily processed as fillet and then exported, with the EU as a major recipient.

Relevance: The importance to the EU appears to be in decline, and the EU can probably expect reducing scope for “contract processing” of prime cold water fish by China, with alternatives where labour costs are lower possibly required. Germany, where Alaskan pollock is popular, is the Member State most likely to be impacted.

- **Case study 3: Value-added tuna exports:** Trade data suggests that China is developing its tuna industry, with expansion in the sourcing of raw material (through capture and trade) and processing.

Relevance: If China succeeds in becoming a leader in the tuna sector it will have a potential impact upon (i) the EU tuna fleet’s access to tuna in some states EEZ, particularly in the West Pacific (e.g., Solomon Islands) and (ii) countries involved in tuna processing (past and present) which include all but one of the case study countries. Furthermore (iii) it may have implications for the EU tuna canning sector (mostly Spanish now) which has already faced high levels of overseas competition and will not welcome further such competition.

- **Case study 4 - Ecuador, Vietnam & China - warm water shrimp (*Penaeus vannamei*).** A curious triangular relationship arose in 2016 which involved Ecuadorian shrimp, exported to Vietnam, that is believed to have eventually arrived in China. The event was telling regarding the integrity of global seafood trade data. As the detailed case study below shows, this shrimp has apparently “disappeared”, as it was not re-exported or consumed in Vietnam, where there is an oversupply of shrimp.

Relevance: This affects Ecuador as it has become closely tied to the Chinese market, whilst for EU consumers there is the potential eventual narrowing of warm water shrimp sourcing options as Ecuador becomes increasingly China-orientated. The distortion of trade reporting that this issue has highlighted, is seen as discouraging.

- **Case study 5 Salmon, Pacific and Atlantic.** Salmon exemplifies some of the key themes evident in Chinese seafood trade involving both China’s move towards higher value imports and role as a bulk fish processor – of fresh Atlantic salmon and frozen whole Pacific salmon.

Relevant implications: This trade would affect EU member states rather than third countries, and the potential impact could be mixed and probably minor, involving competition for raw salmon and availability of processed salmon.

- **Case study 6: Shellfish.** China is increasingly becoming an importer of prime shellfish, unsurprising in view of the longstanding popularity of seafood, rising national wealth and the predilection for extravagant entertaining.

Relevance: Cold water shrimp offers the EU export opportunities in China whilst China’s increasing demand for high value shellfish generally increases competition for supplies of products popular in the EU, and could raise prices.

2. PRACTICES OF GRANTING FISHING LICENCES

KEY FINDINGS

- Distant water fleets operating in the study areas usually gain legal access in these countries' EEZs through joint ventures, bilateral agreements, private agreements and licensing.
- Details of these agreements or licensing often lack transparency as they are seen as commercially sensitive.
- The Sustainable Fisheries Partnership Agreements (SFPA) between the EU and various maritime countries are more transparent.
- In the six focus countries, currently only Mauritania, Mauritius, and Senegal have active SFPAs with the EU, Madagascar and the Solomon Islands have dormant SFPAs (there is no Implementing Protocol and therefore EU vessels are not allowed to fish), and Ecuador has no SFPA.
- In the past decade, China has been actively expanding the countries involved in its Belt and Road Initiative (BRI).
- All focus countries but Mauritius have joined the initiative, and the fisheries sector has been an important component of China's involvement with these countries.
- However, concrete details on these agreements are not publicly available.
- Many of China's distant water fishing companies also engage in joint ventures or private agreements in foreign countries. This makes it hard to trace who the actual beneficial ownership is and adds another layer of opaqueness on the operation of China's distant water fleet.

This section includes a description of practices, including transparency issues, of granting fishing licences to Chinese vessels in Senegal (section 2.1), Madagascar (section 2.2), Ecuador (section 2.3), Solomon Islands (section 2.4), Mauritius (section 2.5), and Mauritania (section 2.6). These agreements are contrasted to what is known about the agreements offered by China as part of its BRI, the 'Fisheries Transparency Initiative' (FiTI) launched by some countries in 2015, and other initiatives.

The distant water fleets usually gain legal access to the fisheries resources in other countries' Exclusive Economic Zones (EEZ) through joint ventures, bilateral agreements, private agreements and licensing. In exchange for access to the country's waters, the foreign party will often contribute financially and/or make investments in infrastructure or training programmes for the local fisheries industry. However, the details of these agreements or licensing often lack transparency as they are seen as commercially sensitive. Furthermore, payments can be presented as aid or development projects for the host country. Of the six focus countries we looked at, all received aid and funding for their fisheries sector through engaging in fisheries-related agreements with other countries. However, whether or not these joint projects could actually be part of a fisheries access agreement is not known, since details of fisheries access agreements are opaque.

The Sustainable Fisheries Partnership Agreements (SFPA) between the EU and various maritime countries are more transparent. There are currently 13 active SFPAs, and the majority of them concern tuna or tuna and hake (*Merluccius* spp.); only four SFPA are mixed species agreements. In the six focus

countries, currently only Mauritania, Mauritius, and Senegal have active SFPAs with the EU. In these agreements, the EU gives financial and technical support to partner countries in exchange for access to the fisheries resources in their Exclusive Economic Zones (EEZs).

While an SFPA is actively in place, vessels from the EU are not allowed to engage in private agreements with the partner country, but are allowed to form joint ventures under specific conditions. However, aside from reports about the Spanish association Cluster de Empresas Pesqueras en Países Terceros (Vigo Empresa 2005),⁶ which includes 220 joint venture companies, and another group, Asociación de Empresas Comunitarias en Sociedades Mixtas de Pesca (ACEMIX), including 53 joint venture companies from Spain (Cooperativa de Armadores de Pesca del Puerto de Vigo 2022)⁷, there is little information on joint ventures from other EU members.

In order to address transparency issues in the fisheries sector around the world, a few countries have initiated a 'Fisheries Transparency Initiative' (FiTI) in 2015 (<https://www.fiti.global/>). Countries that decide to engage in FiTI are subject to an annual assessment of the transparency in their fisheries sector and given recommendations on how to increase credibility in their information in the future. However, up till now, only Mauritania and Seychelles are candidate countries that have been given annual assessments with full length reports submitted.

Ecuador, Madagascar, and Senegal have only publicly announced that they are committed to implementing the FiTI, without officially applying to become a candidate country yet. Mauritius and the Solomon Islands have not made any engagement with the initiative yet. However, stakeholders in Mauritius have been working with the FiTI to increase awareness on the importance of transparency. The FiTI also initiated a transparency assessment on information on Mauritius's publicly available websites (Fisheries Transparency Initiative 2022a). As a result, out of six focus countries, Mauritania provides the most information on fishing access agreements and licensing practices available to the public.

The government of Mauritius, Mauritania, and the Solomon Islands have been publishing the number of licences they issued to different foreign countries every year (with and without bilateral agreements). The Mauritanian and Mauritius governments also publish the amount of revenue generated from fishing licences.

In the past decade, China has been actively expanding the countries involved in its BRI. Out of the six focus countries, all but Mauritius have joined the initiative, and the fisheries sector has been an important component of China's involvement with these countries. However, concrete details on these agreements are not publicly available. Moreover, even when the countries have bilateral agreements in place, many of China's distant water fishing companies also engage in joint ventures or private agreements in foreign countries. This makes it hard to trace who the actual beneficial ownership is and adds another layer of opaqueness on the operation of China's distant water fleet.

2.1. Senegal

In Senegal, bilateral agreements, private agreements, joint ventures, and licensing are ways foreign vessels can gain access to Senegal waters (FAO 2022a, MPEM 2022). According to Niass and Seck (2011), there are records of joint ventures from Spain, Italy, Greece and China with Senegalese companies in 2010. However, other than the SFPA with the European Commission, the details of all the other

⁶ Vigo Empresa 2005 El Cluster de Empresas Pesqueras en Países Terceros se pone en marcha. [Accessed Oct 5, 2022] <https://www.vigoempresa.com/el-cluster-de-empresas-pesqueras-en-paises-terceros-se-pone-en-marcha/>

⁷ <http://www.arvi.org/acemix/>

agreements and licences granted are not publicly available, or hard to access. This lack of transparency, coupled with corruption and illegal practices, is undermining the fisheries sector of Senegal (Vidal 2012a). In particular, governmental actions lack credibility and licences that were previously granted to foreign vessels have been revoked before, due to disapproval of local fishermen groups or non-governmental groups (Vidal 2012b; Gorez 2015; Pêche & Développement 2020; Nwoye 2020).

For example, in 2020, there were documents detailing Senegal issuing 54 fishing licences to vessels from different companies that were mostly joint ventures with Chinese investments (APRAPAM 2020). However, not only are the details on how much the companies pay for licensing these vessels largely unknown, but some of the companies only have a share capital of 100,000 CFA francs (about \$150 USD), i.e., a symbolic sum investment amount. The approval of these fishing licences caused a lot of backlash from the local community, as those vessels also had IUU fishing incidents. This resulted in the Ministry publicly rejecting these licences (AFP 2020, Philippe 2020). However, it was later found that some of the vessels involved were secretly given licences (Nwoye 2022).

Outside of the joint ventures mentioned above, Senegal also became part of China's BRI in 2018 (Bai 2018). According to Chinese state media, 112 vessels from China's distant water fleet were registered in Senegal in that year (Li 2018). In the past decade, there are also different reports on Chinese distant water fleet companies sending vessels headed for Senegal for fishing opportunities with valid fishing licences (Intellivoire 2020; CNFC 2015; EJF 2022; MOA 2019, 2020a-d). However, details of how and what type of agreements these vessels were involved in were not disclosed.

2.2. Mauritania

Since joining FiTI, Mauritania has produced two reports with details on the fishing agreements it has with foreign fleets in 2018-2020 (see their website at <http://www.fiti-mauritanie.mr/>). Mauritania has an abundance of fisheries resources along its coast. However, Mauritania historically does not have a close relationship to the sea, and this had the effect that, although fisheries are now a major component of the country's economy, the bulk of Mauritania's income from the fisheries sector is derived from the selling of fishing licences to foreign countries, and not from fisheries products (FAO 2022b).

Foreign fishing vessels can obtain fishing licences under Mauritania's 'national scheme' or 'foreign scheme'. Under the foreign scheme, the bilateral and private agreements Mauritania has with the European Commission and with Japan and Russia provide licences to around 28% of the large-scale fishing vessels in the country's waters. The remaining 72% of vessels are under the national scheme, which includes national vessels, but also vessels from the Chinese-based FuZhou HongDong and Poly HongDong company, and chartered Turkish and Senegalese vessels (Fisheries Transparency Initiative 2021, 2022b).

Since the first bilateral agreement for Chinese vessels to fish in Mauritanian waters in 1991, the Chinese distant water fleet has been a major player in Mauritania's fisheries sector. In 2012, Mauritania was one of the many African countries that signed the "China-Africa Fishery Union". Under the union, the Chinese party provided loans to joint ventures for fishing vessel and the African party provided fishing licences (Chinafrica 2012). The loans for the vessels were then repaid in instalments by the joint venture company (Chinafrica 2012).

The relations between the two countries were deepened in 2018, when the Chinese government signed an agreement with Mauritania to supply a loan for the construction of a fishing port in the capital (Embassy of the People's Republic of China in the Islamic republic of Mauritania 2018). This was also the year that Mauritania became part of China's BRI (Sacks 2021). In 2020, China also provided

Mauritania with a low-interest loan of \$87 million USD for the construction of a new fishing harbour north of the capital, Nouakchott, that is capable of offloading 400,000 t of fish per year (NBSCXH 2020).

As made public by the disclosed agreement from FiTI, the agreement between FuZhou HongDong and the Mauritanian government signed in 2010 is a 50-year agreement. The agreement allows vessels from the company to catch over 100,000 t of fish per year in Mauritanian waters. Up till 2017, the company invested over \$200M USD in total in the agreement, constructing ports, fishing vessels, and processing plants in the country, creating over 1500 employment opportunities (Foodex 2019). By 2020, the company had a fishery base that spanned over 90 thousand square feet and 169 fishing vessels given fishing licences from the Mauritanian government, producing over \$70M USD per year in fishery products, making it the largest fisheries company in the country (NBSCXH 2020).

Similar to FuZhou HongDong, another Chinese company, Poly-HonDong Pelagic Fishery also has a 25-year agreement with the Mauritanian government that was signed in 2010 (FiTI Mauritania 2022, Le Ministère des Pêches et de L'Economie Maritime de La Republique Islamique de Mauritanie 2016). Through the agreement, the company was spared from all import customs and exempt from paying taxes on profits for the first 5 years (Prieur 2011). Furthermore, Poly HonDong was allowed to deploy 100 vessels in Mauritanian waters, with 80 vessels being owned and operated by the Chinese operators and 20 vessels being built for, and to be operated by, Mauritanian fishers.

However, within the agreement there was also a clause stating that if the Mauritanian fishers were not able to utilise the 20 vessels, the quota and operation of those vessels would be transferred to the Chinese vessels. As the local interest in the fisheries sector is low in Mauritania, this effectively means that Chinese companies have access to 100 vessels instead of the original 80 vessels. In return, the company invested \$100M USD in 2010 to construct ports, fishing vessels, and processing plants in Nouakchott, creating 2000 employment opportunities (Embassy of the People's Republic of China in the Islamic republic of Mauritania 2010). Starting in 2016, another subsidiary of the same company group, Poly Technologies Inc, began the construction of the multi-functional port of N'Diogo that was estimated to cost \$325M USD (NBSCXH 2020, Mulyungi 2021). It is the largest project China has in Mauritania, and upon completion the port serves as a commercial quay, fishing port, naval base, and ship yard. (NBSCXH 2020). This heavy involvement of China in Mauritania fisheries operations is not unique to China. The EU co-financed 20% of the construction and equipment of the fishing port of Nouadhibou through sectoral support funds (Defaux 2019). Germany, Japan, African Development Bank, and the World Bank has also provided financial aid for the construction or expansion of fishing ports (see Table 4).

2.3. Mauritius

In the past decade, Mauritius has had bilateral agreements with Seychelles, the Federation of Japan Tuna Fisheries Co-operative Associations (FJTFC), and the European Commission. Outside of these agreements, vessels from Taiwan, China, Korea, Malaysia and Oman purchase their fishing licences directly from the licensing division of the Fisheries Division of Mauritius (Ministry of Agro-Industry and Fisheries 2012, 2013; Ministry of Ocean Economy, Marine Resource, Fisheries and Shipping 2018, 2019; Ministry of Blue Economy, Marine Resource, Fisheries and Shipping 2020). Overall, the majority of foreign licences are issued to European vessels (Ministry of Agro-Industry and Fisheries 2013). The revenue generated from fishing licence sales averages \$1.5 million USD per year, making it around 70% of the total income of the Ministry. (Ministry of Ocean Economy, Marine Resource, Fisheries and Shipping 2017, 2018, 2019, 2020).

China currently does not have any bilateral access agreements with Mauritius. Instead, Chinese vessels purchase their fishing licences directly from the licensing division of Mauritius. Prior to 2012, the

Mauritius government published detailed breakdowns on how many fishing licences were issued to each foreign country without an annual fishing agreement. From those reports we can see that, on average, 70% of the foreign fishing licences that Mauritius issues for foreign vessels without fisheries agreements is actually to Taiwan-owned vessels from 2003–2011. In contrast, only 2-3 vessels owned by the People’s Republic of China obtained annual fishing licences from Mauritius (Ministry of Agro-Industry and Fisheries 2004, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013). Although it is not clear how that licence number has changed since 2012, in 2019 a free trade agreement was signed between Mauritius and China to deepen the relations between their countries (Mauritius Chamber of Commerce and Industry 2019). Within the agreement, enhancing cooperation in the fisheries sector between the two countries was one of the areas of focus. The agreement mentions that the cooperation was to be done not only through trade and investments in the ocean economy, but also through capacity building for fisheries and aquaculture development, fish stock assessment, fisheries management, and policy planning. While the agreement does not outline what specific actions will be taken, the areas of focus overlap a lot with the other fisheries-related agreements that Mauritius has with New Zealand, Australia, and the EU (See Annex 3).

2.4. Madagascar

In Madagascar, joint ventures and bilateral agreements, other than the SFPAs with the European Commission, are also not published and lack transparency. There is a local industry group, Groupement des Aquaculteurs et Pêcheurs de Crevettes à Madagascar (GAPCM), that is made up of multiple joint venture fisheries companies backed by majority French investors. The industry group also has involvements from the Malagasy government, European Union, and the French Ministry of Foreign Affairs. These companies hold the majority of inshore fishing permits from the Malagasy government and include the largest shrimp company in Madagascar (GAPCM 2022a, 2022b; Carver 2018a). However, the details on the agreements between the companies and the government is not publicly available.

In 2017, Madagascar joined China’s BRI and the two parties agreed to strengthen the fisheries industry relations between their countries (SSAP 2017). Chinese distant water vessels involvement in Madagascar waters happens through joint ventures (Gorez 2020, Carver 2021). For example, one of the companies in the GAPCM group, SOMPECHE, is partly owned by the state-owned Chinese distant water fisheries company, CNFC Overseas Fisheries. CNFC purchased 77% of the company in 2009 to gain the right to fish in the country (CNFC Overseas Fisheries 2014, Carver 2021). Most often, the details on what each of those agreements entails are not known to the public. However, even when they are public, it is apparent that their terms are not always in the best interest of the local fisheries sector – this despite the overall support China gives to the host country.

For example, the agreement the government of Madagascar granted to the joint venture company Côte d’Or only requires the company to pay a nominal annual fee. In return, the company gets access to fish resources that normally generate high fees through multi-species licences, causing the Madagascar government to lose out on significant revenue that it would have otherwise gained (Gorez 2020).

In 2018, the Malagasy president also signed a fishing access agreement with a Chinese distant water company to allow 330 vessels to fish in Madagascar over the course of ten years, in exchange for 2.7 billion USD (Carver 2018b). However, there were a lot of protests from local fishers and NGOs when the agreement was announced. The Madagascar president who signed the agreement finished his term of presidency two days after signing the agreement; there are no signs that this agreement have been fulfilled after it was signed (Gorez 2020).

On 28 October 2022, the EU and Madagascar agreed on the text of a new [sustainable fisheries partnership agreement](#) (SFPA), together with its implementing protocol, restoring their partnership interrupted in 2018.

2.5. Solomon Islands

The Solomon Islands have joined seven other Pacific Island countries in signing “The Parties to the Nauru Agreement”. Under this agreement, the eight countries have adopted the “Vessel Day Scheme” (VDS),⁸ which controls the number of fishing days fishing vessels can purchase from each of the eight countries per year (PNA 2022). In 2017, the Solomon Islands gained around USD 23.6 million from access fees (MFMR 2017). As of 2021, multiple entities, including Japan, South Korea, the Philippines, Taiwan, Vanuatu, Fiji, Kiribati and China, planned and/or signed agreements with the Solomon Islands (e.g., multilateral, bilateral, sub-pooling, FSMA, and the Tokelau arrangement) (WCPFC 2022).

Although the last active SFPA between the European Union and the Solomon Islands ended in 2015, the EU has been indirectly involved in the Solomon Islands’ fisheries through the joint venture of Soltai Fishing and Processing Ltd. since 2010. Tri Marine, a fishing company controlled by two Italian nationals gained majority share and control over Soltai (Hamilton *et al.* 2011).

Between the Solomon Islands and China, in 2019, the Chinese government announced that the Solomon Islands joined the BRI and the 21st Century Maritime Silk Road, and both countries agreed to strengthen cooperation in the fisheries sector (International investment and trading network 2019). However, details on how the two countries will cooperate under those two initiatives is unknown. In 2022, a maritime cooperation agreement draft between China and the Solomon Islands was leaked to the media (Packham 2022). According to the agreement, China committed to constructing a deep-sea fishing base and a “blue economy cooperation base”, as well as the construction of fishing vessels and vessel repairs facilities in the Solomon Islands. Although the draft of the agreement was not yet signed, the implications of the terms of the agreement raised concerns from the U.S. and Australia, as they are the current security services providers for the country, and there is growing suspicion about whether the infrastructure China committed to can be used for military use (Kapetas 2022).

2.6. Ecuador

In Ecuador, there are records of joint ventures between Chinese corporations with Ecuadorian companies since 2003 (Xue 2006). Normally, information on registered fishing vessels, companies, and fisheries personnel are published on the website of the Ecuadorian Government. However, which of these vessels or companies are actually in joint ventures with foreign companies is not known. In a recent joint venture between China Ocean Group and MERCOSUR, it was reported that the two companies were committed to the development of fisheries-related infrastructure and training programmes in Manta, off Ecuador, in exchange for China having 100 distant water vessels operate in Ecuadorian and Colombian waters (OFweek 2020). In a similar way, countries like Spain have also signed agreements with Ecuador to provide training and assistance to the Ecuador fishing sector in order to strengthen Ecuadorian fisheries products in the international market (El Universo 2017) as over 60% of the country’s tuna exports go to the EU market (Feijóo 2021). However, whether these agreements are also tied to fishing access agreements is not known, as the EU currently does not have any SFPAs with Ecuador in place, and there are also no private agreements that are publicly known.

⁸ <https://www.pnatuna.com/content/pna-vessel-day-scheme>

In the past five years, China has surpassed the EU in becoming the major export destination for Ecuadorian fisheries products (Bello 2021). Not only has Ecuador joined China's BRI, but in the beginning of 2022, the government of China and Ecuador released a joint statement to commit to deepening the partnership between the two countries in trade and economics (XinHua News Agency 2022). Both parties agreed on deepening their partnership in the fishing industry by increasing communication in the area to promote proper fisheries management practices. However, concrete details on how those terms are to be realized in actuality are not available.

3. CHINA'S SUBSIDIES FOR ITS FISHING SECTOR

KEY FINDINGS

- China provides \$2.4 billion annually to its distant water fleets operating in the Exclusive Economic Zones of other countries, and \$68 million to its distant water fleets operating in the high seas.
- Harmful subsidies provided by China to its DWFs are concentrated on those operating along the coast of African countries (22 EEZs; amounting to an annual average income of \$240 million US).
- China also provided beneficial subsidies worth \$604 million in 2019 (or 15% of the total).
- Chinese government subsidies decreased by about 26% from 2014 to 2019, or an annual decline of 5.2%.
- The subsidy database did not have data for four of the six focus countries, suggesting that either the subsidies database is incomplete, and/or that these countries provide negligible subsidies to their fisheries.
- Results suggest that transparency is an issue not only regarding the deployment of fleets and their catches, but also regarding subsidies.

This section includes a description of China's subsidies for its fishing sector (see also discussion in section 7.3).

The fisheries subsidies database of Sumaila *et al.* (2019b) contains information on harmful subsidies provided by the Chinese Government for its domestic and distant water fleets (DWF) operating in the Exclusive Economic Zones (EEZ) of 39 countries, and those operating in the high seas, for the period 2014-2019. Note that Pauly *et al.* (2014) reported that Chinese vessels operated in the EEZ of over 90 countries for the period 2000-2011. Thus, the database of Sumaila *et al.* (2019b) contains subsidies information for nearly half of the countries where Chinese vessels previously operated, or still do.

Three types of subsidies can be differentiated: 1) **beneficial** subsidies, such as the cost of ensuring safety at sea or managing fisheries; 2) **harmful** subsidies, which increase fishing capacity by reducing the cost of fishing operations, e.g., by providing cheaper fuel or tax-free import of spare parts, or reducing interest of bank loans for purchasing new vessels; and 3) ambiguous subsidies, whose impact on fishing capacity cannot be easily assessed prior to them being provided, e.g., vessel buy-backs, which can provide the funds for the down payment on new vessels or for fishers' retirement.

This dataset suggests that harmful subsidies provided by China to its DWFs (see Figure 8) are concentrated on the Chinese fleets operating along the coast of African countries (22 EEZs; amounting to an annual average income of \$240 million US). These data also suggest that the largest harmful subsidies (amounting to \$1.8 billion US) provided by China to its DWFs are those that operate in six EEZs in Asia and Oceania. For instance, China has special agreements for exploiting shared stocks with North and South Korea and Japan (Pauly *et al.* 2014). Also, Chinese DWFs operating in the EEZ of four European countries (including Russia) are provided a total of \$367 million US, while those operating in the seven EEZs in the Americas (in the USA and six South America countries, including Peru which

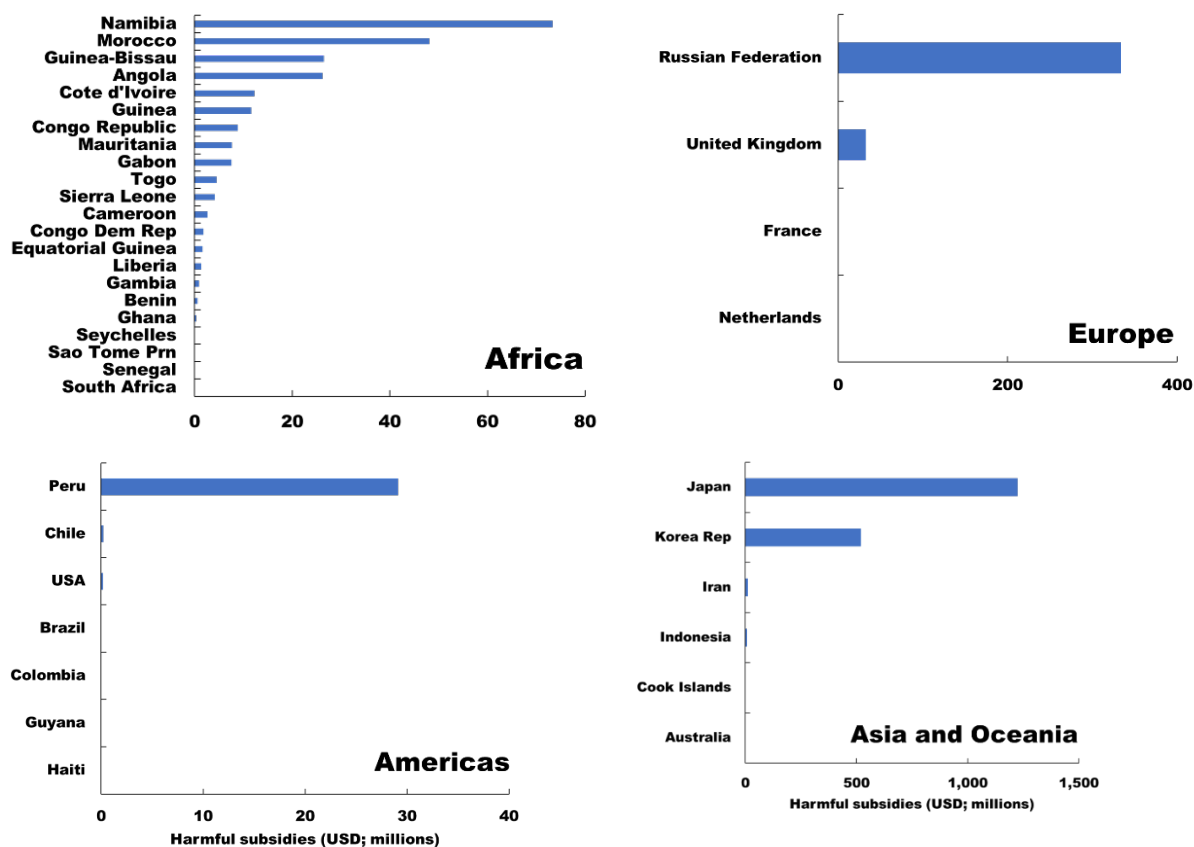
receives the highest subsidies in the region) received the equivalent of \$29.5 million US of harmful subsidies from the Chinese Government.

Altogether, China provides its fleets a total of \$5.9 billion US, with \$3.4 billion (58% of the total) provided to fleets fishing within its own EEZ, \$2.4 billion (41%) to distant water fleets operating in the EEZ of other countries and \$68 million (1%) to distant water fleets operating in the high seas. OCEANA (2021) reports that China also provided beneficial subsidies worth \$604 million in 2019 (or 15% of the total) and suggests a decline in Chinese government subsidies by about 26% from 2014 to 2019, or an annual decline of 5.2%.

Chinese DWFs operating in Africa received 4% of the total subsidies from their government, with the highest subsidies to DWFs operating in Namibia, Morocco, Guinea-Bissau, Angola, Côte d’Ivoire, and Guinea. Of the four focus countries in Africa, only two have data of Chinese DWFs operating in their EEZs in the subsidies database of Sumaila *et al.* (2019b). Chinese DWFs operating in Mauritania received \$7.6 million US and those operating in Senegal received only about \$3,000 US.

Given that the subsidy database did not have data for four of the six focus countries, this suggests that either the subsidies database is incomplete, and/or that these countries provide negligible subsidies to their fisheries. Also, and perhaps more importantly, the results suggest that transparency is an issue, not only regarding the deployment of fleets and their catches, but also regarding subsidies. The figure below, demonstrating harmful subsidies by continent and country obtained from Sumaila *et al.* (2019b), suggests that China provides large harmful subsidies to its fleets in Africa, the Russian Federation, Peru, Japan, and South Korea.

Figure 8: Harmful subsidies to the Chinese DWF by continent and country obtained



Source: Sumaila *et al.* (2019b).

4. IUU FISHING PRACTICES

KEY FINDINGS

- The unreported industrial catch of Chinese distant water fleets (DWF) subject to illicit trade is, on the average, 65% of the unreported DWF catch and 17% of the total DWF catch (1980-2019).
- The rate of increase in illicit trade volumes grew from about 9000 t·year⁻¹ in the 1980s to 15,568 t·year⁻¹ in the 2010s, or an average of about 18,000 t·year⁻¹ from 1980 to 2019.
- Greatest number of incidents were reported in Ecuador (35%), the Philippines (25%) and Mauritania (13%). Infractions reported in Senegal, Madagascar, Mauritius, and the Solomon Islands represent only about 2% of the incidents reported.
- Almost half (46%) of the incidents were committed by Chinese squid jiggers, 38% by longliners, 15% by purse seiners and the rest by trawlers.
- The switching off of AIS can be assumed to directly account for “going dark”. Lack of data on position of vessels are due to vessels ‘going dark’.
- Transshipment at sea from ‘catcher vessels’ to much bigger cargo vessels (‘reefers’) can hide the illegal origin of catches. Chinese DWFs mostly had encounters with variously-flagged reefers mostly in the high seas, i.e., most likely flags of convenience, with encounters dominated by Panama-, Liberia-, and Vanuatu-flagged reefers.
- Available databases suffer from opaqueness, i.e., unknown vessel names, origin or ownership. The implications of this opaqueness result in loss of income, notably in poor countries, e.g., \$1.3 billion US is lost with 37% of the catch due to IUU fishing in West Africa.

This section describes IUU fishing practices (see also section 6.1.1 for a discussion of IUU fishing). The widespread term ‘IUU’ stands for ‘Illegal, Unreported and Unregulated’ fisheries catches and, by extension, to the fishing operations which generated these catches. Here, we argue that IUU catches can be broadly approximated by ‘illicit’ catches, linked to money, goods or value gained from illegal and generally unethical activity. Examples for various international fishing fleets are provided, with some emphasis on Chinese fishing operations.

Sumaila *et al.* (2020) report that the unreported industrial catch of Chinese distant water fleets (see Figure 1 for the catch data, and Annex 1 for the method) that may be subject to illicit trade is, on the average, 65% of the unreported DWF catch and 17% of the total DWF catch (1980-2019). The rate of increase in illicit trade volumes grew from about 9000 t·year⁻¹ in the 1980s to 15,568 t·year⁻¹ in the 2010s, or an average of about 18,000 t·year⁻¹ from 1980 to 2019.

According to a recent Special Report of the European Court of Auditors (ECA, 2022), the extent of illegal, unreported and unregulated fishing was estimated at 10 to 26 million tonnes worldwide in the early 2000s, i.e., 11 to 19% of reported catches, worth USD 10 to USD 23 billion (Agnew *et al.* 2009).⁹ It is worth mentioning that the same report considers: ‘that the control systems in place to combat illegal

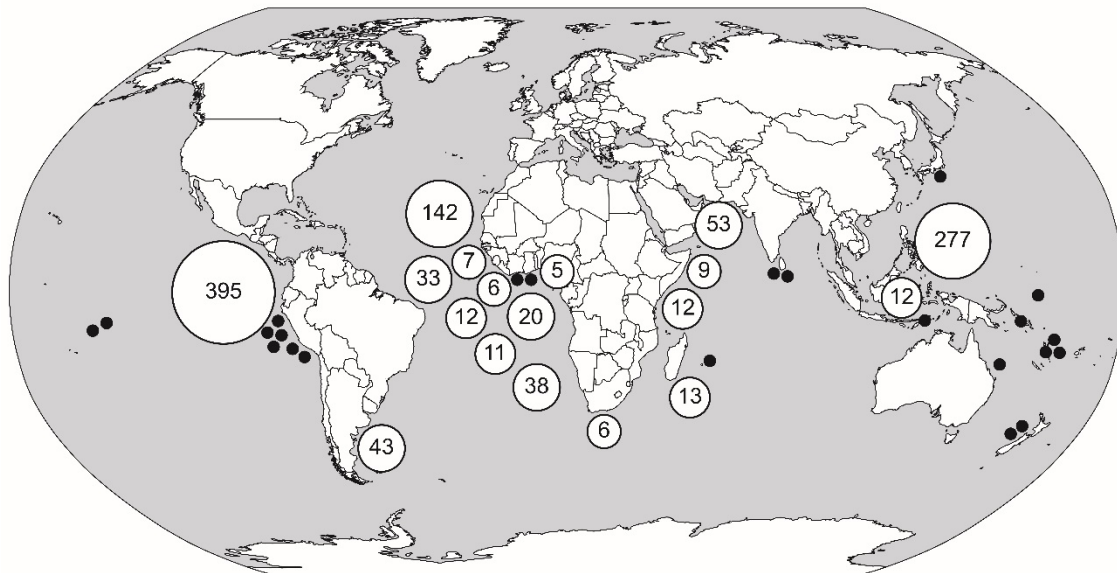
⁹ European Court of Auditors, 2022. Special Report 20/2022 : EU action to combat illegal fishing, p. 9 and 4. Available at https://www.eca.europa.eu/Lists/ECADocuments/SR22_20/SR_Illegal_fishing_EN.pdf

fishing are partially effective; although they mitigate the risk, their effectiveness is reduced by the uneven application of checks and sanctions by Member States’.

Data gathered from 35 published sources (incidents committed by over 1100 vessels; see Figure 9 below), which suggest that illegal activities, often by industrial Chinese vessels (purse seiners, long-liners, trawlers and squid jiggers), can be categorised into the following types of incident (ordered from the most to the least records of incidents): infraction into an EEZ without licence or agreement, shark finning, harvest of protected species (e.g., seahorses), illegal transshipment, switching off of tracking systems, underreporting of vessel’s gross tonnage, labour abuse and slavery, use of fishing vessel to cover up for smuggling of regulated non-marine resources. EJF (2022) notes that the Chinese DWF’s main infractions are mostly (42% of 554 incidents) fishing without a licence/authorisation, followed by the use of illegal gear (11.5%) and catching of protected species (10.3%). The data we gathered here emulate EJF (2022)’s findings.

Figure 9 suggests that over 61% of these infractions by Chinese DWFs were observed or reported in the Pacific Ocean, with 26% reported in the Atlantic Ocean and over 8% in the Indian Ocean. The greatest numbers of incidents were reported in Ecuador (35%), followed by the Philippines (25%) and Mauritania (13%). Infractions reported in Senegal, Madagascar, Mauritius, and the Solomon Islands represent only about 2% of the incidents reported. Illegal fishing incidents might be more visible in Ecuador because of the issues with the Galapagos Islands large EEZ, and its supposed marine protected zones (see Arsenault and Le Billion 2022). Note that taken together, infractions in northwest Africa (from Mauritania to Nigeria) make up over 16%. The impact of illegal fishing is a big concern in this region because the local small pelagic fisheries (e.g., sardinella) market chain provides income to women fishmongers and the distribution of fish protein to inland communities (ADF, 2021; see also EJF, 2018). Thus, any disturbance to this *status quo* would be highly visible. The low number of incidents reported in the Indian Ocean, notably in the region around Madagascar and Mauritius, is doubtful. However, note that China signed a ‘secret’ 10-year right to fish in Madagascar in 2010 (see Mallory, 2013; White *et al.* 2022), which might have decreased the monitoring for IUU infractions by Chinese vessels; however, it would have been subject to scrutiny once it was revealed.

Figure 9 below presents distribution of vessels committing illegal, unreported and unregulated fishing activities, obtained from 50 references containing data on 1116 incidents worldwide. Note the prevalence of incidents in the high seas off Ecuador (Pacific Southeast) representing over 35% of all incidents. Other hotspots include the eastern seaboard of the Philippines (25%) and northwest Africa (13%).

Figure 9: Distribution of vessels committing IUU fishing activities

Source: own elaboration

This dataset also suggested that of the 135 incidents where the gear type was identified, almost half (46%) of the incidents were committed by Chinese squid jiggers, 38% by longliners, 15% by purse seiners and the rest by trawlers. Note that EJV (2022)¹⁰ explained that trawlers are the most common type of gears allowed in EEZ-specific offshore fishing projects, which might explain the small number of trawlers being reported committing IUU infractions. However, the recent development of the Chinese squid jigger fleet resulted in an increase in approved offshore fishery projects (see EJV 2022), that most likely also opened up the possibility of IUU infractions and thus the large portion of squid jiggers reported as IUU incidents.

The switching off of AIS data can be assumed to directly account for “going dark”. However, internet stability and other technological difficulties might also cause AIS switch off as discussed in Fujita *et al.* (2018), Ferra *et al.* (2020), Brousseau (2021), Emmens *et al.* (2021), Arsenault and Le Billon (2022). Thus, databases like the GFW, whose data are being used for analyses like those done in this study, would need to assure users that such issues have been addressed in the datasets that they provide to the wider public.

Transshipment at sea from ‘catcher vessels’ to much bigger cargo vessels (‘reefers’) can hide the illegal origin of catches. Miller *et al.* (2018) identified 694 reefers from AIS data (2012-2017) from Kroodsma *et al.* (2018) that were capable of transshipment activities. They report that 45% of these vessels are operated by their beneficial owners and that 47% of the activities occurred in the high seas. Russia- and USA-flagged fishing vessels mostly transhipped with Russia- and USA-flagged reefers inside their EEZs. On the other hand, China-, Taiwan-, South Korea- and Japan-flagged fishing vessels mostly had encounters with variously-flagged reefers mostly in the high seas, i.e., most likely flags of convenience, with encounters dominated by Panama-, Liberia-, and Vanuatu-flagged reefers.

Note that five of the six focus countries of this study (the Solomon Islands being the exception) are signatories of the Port State Measures Agreement (PSMA; FAO 2016). The PSMA is the “first binding

¹⁰ <https://eifoundation.org/resources/downloads/The-Ever-Widening-Net-2022-final.pdf>

international agreement that specifically targets illegal, unreported and unregulated (IUU) fishing."¹¹ The minimum set of standard measures meant to be applied when vessels enter a country's port or when a vessel is at port were drawn up in 2005 and approved during the 36th session of the FAO Conference of the Parties held on November 22 2009. The FAO then developed the Port State Measures Support Programme¹², designed to help countries to build the capacity to comply with the PSMA. Annex 3 lists five projects in which five focus countries studied here are involved. These projects provide a total of \$14.6 million USD (Annex 3) to help build capacity in these countries. Four of these projects are current and are expected to boost awareness and advocacy about IUU fishing and improve mitigation of dark fleets (Cutlip 2016; Fujita et al. 2018; Valentine 2021). It is thus important to continue monitoring IUU incidents being committed (and repeatedly committed) within the EEZs of these countries.

Although Chinese-flagged vessels seem to be responsible for a large number of dark fleets (see Valentine 2021), European fleets are also going dark, as reported in Godfrey (2021), Heubl (2021), and Anon (2022a).

FAO's Global Record of Fishing Vessels, Refrigerated Transport Vessels and Supply Vessels¹³ provides a list of vessels committing IUU-related activities reported by 12 regional fisheries bodies (RFB; see Annex 5). This list contains 516 sightings of 204 vessels from 2003-2022 with 27% of sightings from ICCAT, 19% from the CCAMLR RFB, 15% from IOTC, 14% from GFCM, the rest from six other RFBs. Missing information on vessel flag and ownership were obtained from FleetMon¹⁴ for sightings that only had IMO data or vessel name. Only the records with matching IMO number and vessel name or records with a single vessel name match were integrated into the analysis. Most of these sightings (276) did not record flag information and only 114 of these recorded IMO data. More than half (279) of these did not record ownership information; only 61 of these recorded IMO data. Only nine of the 204 vessels are recorded to fly the Chinese flag, and none of these have IMO nor ownership information. Of those 204 vessels, 48 are assumed to be of the Chinese flag, but only three of these have IMO data and 34 have no ownership data. Those with ownership data (13 vessels) suggest nine owners, one of which, the Belfast Global SA, is registered in Panama, i.e., the top reefer flag operating in the high seas (see Miller et al. 2018).

Note that although China participates in eight RFMOs (as opposed to the EU's participation in 18; see Gutierrez *et al.* 2020), the prevalence of IUU fishing by Chinese-flagged and owned vessels remains in the dark. As the FAO's disclaimer notes, the data from these RFMO websites is provided by the FAO on an 'as is' basis, and is full of inconsistencies. The lack of flag, ownership and IMO information prevents proper use of this dataset. For this dataset to be of value, more research on the vessel names will need to be done, but that is a daunting and tedious task that might need more resources, other than access to the Internet. Such datasets suggest the difficulty in unmasking IUU incidents, and the absence of flags and ownership data show the opaqueness of such lists and implies that a large percentage of IUU incidents may still go unrecorded. The implications of this opaqueness result in loss of income, notably in poor countries, e.g., \$1.3 billion US is lost with 37% of the catch due to IUU fishing in West Africa (Global Initiative Against Transnational Organized Crime 2015).

¹¹ <https://www.fao.org/port-state-measures/background/en/>

¹² <https://www.fao.org/port-state-measures/capacity-development/overview/en/>

¹³ <https://www.fao.org/global-record/information-system/rfb-iuu-vessels-lists/en/>

¹⁴ <https://www.fleetmon.com/>

5. EU-CHINA COOPERATION

KEY FINDINGS

- EU-China cooperation at bilateral level has advanced considerably in the past few years, partly due to the establishment and the political visibility of the Blue Partnership for the Oceans.
- The Blue Partnership for the Oceans has opened the path for cooperation and dialogue, and encourages the EU and China to cooperate on the Regional Fisheries Management Organisations (RFMOs) to promote better governance.
- The conflicting geopolitical agenda on the overfishing problem of South China Sea and the blocking of additional Maritime Protected Areas (MPAs) is slowing the effective progress of the cooperation between the EU and China.
- Individual agreements between China and some EU Member States might jeopardise the role of the EU's central institutions in the cooperation with China.
- Chinese activities in the Arctic are another important component in global ocean governance, and both the EU and China were signatories of the Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean (CAOFA).
- At the global level, significant progress in ocean sustainability cooperation was demonstrated with the June 2022 WTO Agreement on Fisheries Subsidies.

This section was prepared based on desk research. The section presents an overview of the EU-China cooperation in fisheries at bilateral level, more specifically of the Blue Partnership for the Oceans; the cooperation at regional level, through the Regional Fisheries Management Organisations (RFMOs); and at global level, via the cooperation with the Food and Agriculture Organisation of the UN (FAO).

5.1. Bilateral Level

On the occasion of the 20th EU-China Summit celebrated in Beijing on 16 July 2018, the EU signed a unique **partnership agreement with China (named the 'Blue Partnership for the Oceans: Towards Better Ocean Governance')**. It was the first cooperation partnership of its kind between both sides. In the partnership, the two sides commit to protecting the marine environment and to coordinating actions and policies to achieve the protection of the oceans. In the declaration on the establishment of the Blue Partnership for the Oceans,¹⁵ the EU and China acknowledge their important role on the promotion of sustainable development and global ocean governance; and their cooperation on ocean affairs through several instruments such as the High-Level Dialogue on Law of the Sea and Polar Affairs, the High Level Dialogue on Fisheries, and the meetings of the EU-China Working Group on IUU fishing.¹⁶

¹⁵ European Commission (2018) Declaration on the establishment of a Blue Partnership for the Oceans: towards better ocean governance, sustainable fisheries and a thriving maritime economy between the European Union and the People's Republic of China, 13 July 2018. Available at <https://data.consilium.europa.eu/doc/document/ST-10947-2018-INIT/en/pdf>

¹⁶ Meetings held in 2016 and 2017.

Both sides 'agreed on a Blue Partnership for the Oceans as a means to improve cooperation aiming at **better ocean governance, sustainable fisheries, and a thriving maritime economy between the EU and China**. Both sides also reaffirmed their commitment to **fight against illegal, unreported and unregulated (IUU) fishing**, and their shared interest in **dialogue** on matters related to the **Law of the Sea and polar affairs**'.¹⁷

The idea of the Blue Partnership originated from the Blue Growth agenda published by the European Commission in 2012.¹⁸ Given the considerable increase of technological resources developed in recent years to work offshore in ever-deeper waters; the awareness of the limitation of the marine resources; and the need to improve the energy efficiency of ships to reduce greenhouse gas emissions, the EU considered that there was an opportunity for blue growth, by controlling the potential of European waters. Blue Growth is intrinsically related to the concept of 'blue economy', that should focus on 'improving human well-being and social equity, while significantly reducing environmental risks and ecological scarcities' (UNEP, 2013 cited at Pauly, 2018). This concept should be present in all economic activities related to the oceans, coastal and marine resources (Ebarvia, 2016 as cited in Raftopoulos and Nissen, 2021) such that the blue economy should be sustainable and more locally-based (Pauly, 2018).

Besides, growth in the blue economy 'can contribute to EU's international competitiveness, resource efficiency, job creation and new sources of growth whilst **safeguarding biodiversity and protecting the marine environment, this preserving the services that healthy and resilient marine and coastal ecosystems provide**' (European Commission, 2012).

The following table summarises the main objectives and areas of cooperation and arrangements between the EU and China.

¹⁷ Joint Statement of the 20th EU-China Summit, signed by Li Keqiang, Donald Tusk and Jean-Claude Juncker (para. 33). Available at <https://www.consilium.europa.eu/media/36165/final-eu-cn-joint-statement-consolidated-text-with-climate-change-clean-energy-annex.pdf>

¹⁸ European Commission (2012). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Blue Growth opportunities for marine and maritime sustainable growth. Available at <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2012:0494:FIN:EN:PDF>

Table 1: EU-China cooperation at bilateral level

	Date	Goals/Objectives	Areas of cooperation	Arrangements
EU-China Blue Partnership for the Oceans	16.07.2018	<ul style="list-style-type: none"> Enhanced cooperation Maintain, strengthen, create ocean governance mechanism and structures to promote clean oceans and sustainable investing climate Enhance technical cooperation (exchange of information and views on policy, initiatives) Increase coherence and efficiency, quality, and impact of activities Promote the circular economy within the blue economy (via clean technologies and best practices) 	<ul style="list-style-type: none"> Ocean governance: conservation and sustainable use of marine biodiversity in the high seas, conservation of marine living resources in Antarctica Blue economy Fisheries issues: fisheries governance and the prevention of IUU fishing Cross-cutting tools to promote the partnership Marine pollution (including marine plastic litter and microplastics) Mitigation of and adaptation to climate change impacts on the oceans (including the Arctic Ocean) Efforts for increasing ocean literacy, observation, and open science and data 	<ul style="list-style-type: none"> Focal points (ensure coordination and involvement) High Level Dialogues (coordinating mechanism) Partnership Forum (held on occasion of High-Level Dialogues and assemble representatives from both Sides) Possibility of ad-hoc working groups Consulting/Informing on areas of mutual interest Communication measures on Partnership visibility, objectives, and principles Underline commitment to the Paris Agreement goals and progressing work in the International Maritime Organization (IMO) towards implementation of the IMO strategy for reduction of greenhouse gases (GHGs) from ships
First Blue Partnership Forum for the Oceans	05.09.2019	<ul style="list-style-type: none"> Improve international ocean governance Implement Ocean Partnership established in 2018 Achieve 2030 Agenda for Sustainable Development 	<ul style="list-style-type: none"> Blue Economy Finance Initiative and Principles Reinforce implementation of existing legal framework (ratification of the Port State Measures Agreement), enhancing RFMO performance, strengthening fight against IUU fishing and strengthening fisheries data transparency Planning of marine protected areas and advancement of global maritime spatial planning; EU proposal to create two marine protected areas in the Southern Ocean¹⁹ 	

¹⁹ https://oceans-and-fisheries.ec.europa.eu/news/eu-and-china-join-forces-improve-international-ocean-governance-2019-09-10_en

To promote the EU's environmental agenda and goals, particularly those aligned with marine conservation and sustainable use and the strengthening of global partnerships, the **16 Blue Partnership Principles** were established to align with the "blue" outcomes of joint marine conservation, scientific marine development, enhanced marine wellbeing, blue prosperity, and the construction of a world-wide "blue homeland" ("16 Principles for Blue Partnership")²⁰. The titles, measures, and objectives of the Blue Partnership Principles are presented in Annex 6.

Since signing the partnership agreement, both the **Chinese and the EU administrations have developed joint actions for implementing the Blue Partnership for the Oceans.**

Prominent actions on behalf of the EU and China include the initiation of two collaborative projects with the goal of developing a closer relationship regarding marine data. Both projects were launched in February 2020 with scheduled duration periods of 30 months.

The first project, European Marine Observation and Data Network (EMODnet) Partnership for China and Europe (**EMOD-PACE**)²¹ is funded under the EU Partnership Instrument ('Strengthening international ocean data through the EU's ocean diplomacy with China')²². The goal of the project through, among other initiatives, the fostering of a close working relationship between the National Marine Data and Information Service of China (NMDIS) and the European Marine Observation Data Network (EMODnet), is to increase knowledge of the oceans and provide high quality marine data and data products globally in contribution to overarching marine environmental protection and sustainability objectives.

The second collaborative project, China-EU Marine Data Network Partnership (**CEMDnet**)²³ was also developed with the expectation of positive contributions to the China-EU Blue Partnership for the Oceans. As a response to the EU-initiated EMOD-PACE project, the NMDIS initiated their own partnership to encourage marine data interoperability by connecting the EMODnet and NMDIS data-sharing platforms.

Furthermore, in January 2021, the EMODnet and the NMDIS signed a **Memorandum of Understanding (MoU) agreement**²⁴ to continue the enhancement of EU-China cooperation on marine data and knowledge-sharing. The agreement outlined cooperation in the areas of specific types of data, knowledge and best practice exchanges, and common work plan development and implementation targeting issues such as ocean reanalysis, seabed habitat mapping, ecological vulnerability and coastal zone adaptation.

Moreover, China has also continued making efforts on the line established at the Blue Partnership for the Ocean by signing **bilateral Blue Partnership agreements with several countries**, including the Seychelles and Mozambique, **and EU Member States**, such as Portugal.²⁵ China considers Portugal as a key stakeholder due to the role of Portugal in connecting maritime and road corridors, and has strongly invested in land and maritime infrastructures. However, as mentioned in the EP Study on the Role of China in World Fisheries (EP, 2012), the negotiation and content of some agreements seems not to be totally transparent (e.g., it is very difficult to find copies of the above-mentioned bilateral agreements). Besides, the signature of bilateral agreements with individual Member States, such as Portugal, might jeopardise

²⁰ 16 Principles for Blue Partnership, available at <http://www.cfocean.org.cn/data/upload/ueditor/20220707/62c69bcdaa519.pdf>

²¹ <https://emodnet.ec.europa.eu/en/emod-pace/about>

²² EuropeAid/139904/DH/SER/CN

²³ <http://www.cmoc-china.cn/pages/detail.html>

²⁴ <https://emodnet.ec.europa.eu/en/eu-china-partnership-sets-pace-international-marine-data-sharing>

²⁵ As cited on World Economic Forum, WeForum website, <https://www.weforum.org/friends-of-ocean-action/sustainable-blue-partnership-cooperation-network>

the role of the EU central institutions in the negotiations with China (Di Donato, 2020, as cited in Raftopoulos and Nissen, 2021).

Furthermore, despite the cooperation of both actors in the environmental questions, some **geopolitical conflicts** have also arisen, such as the overfishing problem in the South China Sea and the Chinese blockage to creating additional Marine Protected Areas (MPAs) in the Southern Ocean (Raftopoulos and Nissen, 2021)²⁶.

It is also important to consider the perspectives of China and the EU towards the Blue Economy itself. While the European Commission outlines the Blue Economy as “all industries and sectors related to oceans, seas and coasts” with a heavy emphasis on environmental sustainability,²⁷ China’s perception can be viewed as somewhat differing to that of the EU because of the strong role of the Chinese state in guiding its economic policy. In an analysis of recent Chinese state discourse, scholars highlighted the link in China of the Blue Economy concept to that of “a state-centric vision of modernisation”²⁸. The idea of economic nationalism (in which national power is tied to economic power) is considered to be encompassed within the Chinese Blue Economy goals since the discourse surrounding the Blue Economy is indicative of the ambitions of the Chinese state. In a 2019 policy brief by Premier Li Keqiang, Chinese state perspective of the Blue Economy was conveyed through the description of China’s desire to “vigorously develop the blue economy, protect the ocean environment, and construct a maritime power” (Li, 2019). In this statement, the concept of national maritime power is presented alongside the Blue Economy and ocean environmental protection goals. Concerns for the EU interests in this differing conception include the potential subordination of environmental sustainability initiatives, as well as challenges in prioritising damage incurred by industrial fishing and the marginalisation of weaker stakeholders due to the fact that “with the interweaving of ecological sustainability and economic growth, the [Chinese] economy still takes priority and is always entwined with the vision of a strong state and party” (Fabinyi et al, 2021).²⁹

5.2. Regional Level

At **regional level and global level**, the Blue Partnership for the Oceans also encourages both the EU and China to cooperate in global and international fora. Hence, the Declaration of Establishment of the Partnership includes amongst the areas of cooperation for the EU and China to dialogue and cooperate in the areas of ocean governance, blue economy, fisheries and cross-cutting tools to promote partnership. More precisely, the Declaration states that the EU and China should focus on the ‘coordination and cooperation in Regional Fisheries Management Organisations (RFMOs) to which both sides are Parties to promote better governance, science, compliance and science-based fisheries management’ and on **‘promoting the initiatives of the FAO and of relevant RFMOs aiming at fighting IUU fishing activities and exchanging information relating to fishing vessels suspected** of such activities and conducting necessary follow-up cooperation (...)’ (European Commission, 2019 p.5).

²⁶ Raftopoulos and Nissen, 2021. EU and China’s strategic partnership on the Blue Economy. Routledge.

²⁷ https://ec.europa.eu/commission/presscorner/detail/en/ip_21_2341

²⁸ Fabinyi et al., 2021, China’s Blue Economy: a State Project of Modernisation <https://journals.sagepub.com/doi/10.1177/1070496521995872>

²⁹ <https://journals.sagepub.com/doi/10.1177/1070496521995872>

The following table presents the RFMOs in which both the EU and China are members and summarises the main objectives and areas of cooperation.

Table 2: RMFOs in which both China and the EU are members (based upon the EC's Regional fisheries management organisations)

	Year	Members	Objectives	Areas of cooperation
International Commission for the Conservation of Atlantic Tunas (ICCAT)	1966	51 states + EU; Albania, Algeria, Angola, Barbados, Belize, Brazil, Canada, Cape Verde, China, Côte d'Ivoire, Croatia, Egypt, Equatorial Guinea, El Salvador, EU, France (St. Pierre & Miquelon), Gabon, Gambia, Ghana, Guatemala, Guinea, Guinea Bissau, Grenada, Honduras, Iceland, Japan, South Korea, Liberia, Libya, Mauritania, Mexico, Morocco, Namibia, Nicaragua, Nigeria, Norway, Panama, Philippines, Russia, Senegal, Sierra Leone, South Africa, St. Tome and Principe, St. Vincent and the Grenadines, Syria, Trinidad and Tobago, Tunisia, Turkey, UK, USA, Uruguay, Vanuatu and Venezuela	<ul style="list-style-type: none"> Cooperate in maintaining the populations of tuna and tuna-like fishes found in the Atlantic Ocean at levels which permit the maximum sustainable catch for food and other purposes 	<ul style="list-style-type: none"> Co-operation with the FAO of the UN and other Specialised Agencies Cooperation with other international fisheries commissions and scientific organizations Cooperation with appropriate international organisations and any Government member of the UN
Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR)	1982	25 states + EU: Argentina, Australia, Belgium, Brazil, Chile, China, EU, France, Germany, India, Italy, Japan, Republic of Korea, Namibia, Netherlands, New Zealand, Norway, Poland, Russian Federation, South Africa, Spain, Sweden, Ukraine, UK, USA, Uruguay	<ul style="list-style-type: none"> Combat illegal, unreported, and unregulated (IUU) fishing Establish Marine Protected Areas (MPAs) in the Southern Ocean Reduce seabird mortality Establishment/conduct of the CCAMLR Ecosystem Monitoring Program (CEMP) Management of Vulnerable Marine Ecosystems (VMEs) 	<ul style="list-style-type: none"> Co-operative work with intergovernmental and non-governmental organisations (such as the Scientific Committee on Antarctic Research, the Scientific Committee on Oceanic Research, and the International Whaling Commission) Co-operation with the Antarctic Treaty Consultative Parties Co-operation with the FAO of the UN and other Specialised Agencies
South Pacific Regional Fisheries Management Organisation (SPRFMO)	2009	15 states + EU: Australia, Chile, China, Cook Islands, Cuba, Ecuador, EU, Denmark, Republic of Korea, New Zealand, Panama, Peru, Russian Federation, Chinese Taipei, US, Vanuatu	<ul style="list-style-type: none"> Conservation and management of living resources in the high seas areas of the South Pacific 	<ul style="list-style-type: none"> Cooperation with inter-governmental organisations and NGOs (participation in SPRFMO Commission meetings, observer status granted to 17 NGOs) Adoption of new or revision of existing SPRFMO Conservation Management Measures (CMMs) that form regulatory framework for the SPRFMO fisheries; currently 23 CMMs in place (concerning issues such as technical measures, data collection requirements and

				reporting, monitoring, control and surveillance, and enforcement)
Inter-American Tropical Tuna Commission (IATTC)	1949 (initial Convention replaced by the Antigua Convention entered into force in 2010)	19 states + EU: Belize, Canada, China, Colombia, Costa Rica, Ecuador, El Salvador, EU, France, Guatemala, Japan, Kiribati, Korea, Mexico, Nicaragua, Panama, Peru, USA, Vanuatu, Venezuela	<ul style="list-style-type: none"> • Ensure the long-term conservation and sustainable use of the fish stocks of tuna and tuna-like species, associated species and their ecosystems throughout the Eastern Pacific Ocean (from Canada to Chile). 	<ul style="list-style-type: none"> • Co-operation with subregional, regional, and global fishery organisations and arrangements. • Co-operation with the WCPFC in overlapping areas. • Establishment of Non-Party Cooperating members in 2003 (Bolivia, Chile, Honduras, Indonesia, Liberia). • Direct co-operation for the States or through an international organisation. • Co-operation with Non-Members of the IATTC in meetings of the Commission as Observers.
Southern Indian Ocean Fisheries Agreement (SIOFA)	2012	9 states + EU: Australia, China, the Cook Islands, EU, France, Japan, Republic of Korea, Mauritius, the Seychelles, Thailand	<ul style="list-style-type: none"> • Long-term conservation and sustainable use of the fishery resources in the Southern Indian Ocean • Promotion of sustainable fishery development • Account for the needs of developing States (particularly the least developed and small-island developing States) among the Contracting Parties 	<ul style="list-style-type: none"> • Establishment of a Scientific Committee that serves as an advisory body to meetings, promotes cooperation in scientific research regarding fishery resources and impact on the marine environment and produces data and recommendation • Management work (such as through CMMs, Interim Bottom Fishing Measures, submission by Contracting Parties of a Bottom Fishing Impact Assessment for individual bottom fishing activities, management of demersal stocks) • Monitoring, control, and surveillance (register of ports, records of authorised vessels, high seas boarding and inspections procedures) • Compliance Monitoring Scheme adopted in 2018 to produce yearly assessment of compliance level in regard to SIOFA obligations
Indian Ocean Tuna Commission (IOTC)	1996	33 states + EU: Australia, Bangladesh, Belize, China, Comoros, Eritrea, EU, France, Guinea, India, Indonesia, Iran, Japan, Kenya, Korea, Madagascar, Malaysia, Maldives, Mauritius, Mozambique, Oman, Pakistan, Philippines, Seychelles, Sierra Leone, Somalia, South Africa, Sri Lanka, Sudan, Tanzania, Thailand, UK, Yemen	<ul style="list-style-type: none"> • Ensure conservation and optimum utilisation of stocks (as covered by the organisation's establishing Agreement) • Foster the sustainable development of fisheries 	<ul style="list-style-type: none"> • Review of the conditions and trends of the stocks • Gathering, analysing, and disseminating scientific information • Encourage, recommend, and coordinate research and development activities in respect of the stocks and fisheries covered by the IOTC • Adopt CMMs to ensure conservation of the stocks • Review social and economic aspects on the fisheries based on the stocks

				<ul style="list-style-type: none"> • Commission subsidiary bodies of Scientific, Compliance, Administration, and Finances Committees
Western & Central Pacific Fisheries Commission (WCPFC)	2004	25 states + EU: Australia, China, Canada, Cook Islands, EU, Federated States of Micronesia, Fiji, France, Indonesia, Japan, Kiribati, Republic of Korea, Republic of Marshall Islands, Nauru, New Zealand, Niue, Palau, Papua New Guinea, Philippines, Samoa, Solomon Islands, Chinese Taipei, Tonga, Tuvalu, USA, Vanuatu	<ul style="list-style-type: none"> • Address management problems in high seas fisheries (unregulated fishing, over-capitalisation, excessive fleet capacity, vessel re-flagging to escape controls, insufficiently selective gear, unreliable databases, insufficient multilateral cooperation) • Recognise special requirements of developing States • Cooperation with other RFMOs 	<ul style="list-style-type: none"> • Follow-up with guidelines of the Convention for the Conservation and Management of High Migratory Fish Stocks in the Western and Central Pacific Ocean (WCPF convention)
The North Pacific Fisheries Commission (NPFC)	2015	9 states + EU: Canada, China, EU, Japan, Republic of Korea, Russian Federation, Chinese Taipei, USA, and Vanuatu	<ul style="list-style-type: none"> • "Ensure the long-term conservation and sustainable use of the fisheries resources in the Convention Area while protecting the marine ecosystems of the North Pacific Ocean in which these resources occur"³⁰ 	<ul style="list-style-type: none"> • Uphold the Convention on the Conservation and Management of the High Seas Fisheries Resources in the North-Pacific Ocean • Fisheries for Bottom and Pelagic fish stocks

³⁰ https://www.npfc.int/about_npfc

Furthermore, another significant geographic region of ocean governance cooperation is the Arctic. Both the EU and China were among the signatories of the October 2018 Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean (CAOFA).³¹ The signatories are referred to as the “Arctic 5+5” as they include the five Arctic Ocean coastal states (Canada, Denmark, Norway, Russia, and the United States) as well as the group of China, the EU, Iceland, Japan, and South Korea. China was the last among the group to approve the CAOFA, with the Chinese government only approving the agreement nearly three years later in May 2021. The agreement focuses on the prevention of unregulated fishing in the high seas portion of the central Arctic Ocean (CAO). While it has been praised as “a milestone for the protection of Arctic environment under international law”, China’s geopolitical concerns, particularly tensions with the United States regarding Arctic policy, were factors in the delay of the agreement’s approval.³²

In further context to China’s presence among Agreement signatories, it is essential to highlight the increased Chinese presence and demonstrated interest in the Arctic region in recent years. China has worked to construct a “robust Arctic identity” despite its geographical distance from the region, and this identity has been used to justify its engagement in Arctic governance and diplomacy (Lanteigne, 2020).³³ In its January 2018 Arctic strategy, China positioned itself as a ‘near-Arctic’ state and even laid out a ‘Polar Silk Road’ economic strategy in a clear indication of its goals to access Arctic resources and shipping routes (Lino, 2020).³⁴ In consequence for EU Arctic policy, China has exploited differing attitudes among the EU Member States towards its Arctic ambitions. While Central and Eastern European countries are characterised as more open to Chinese economic investments, Member States such as Denmark have expressed concerns about China’s Polar Silk Road initiative and worked with the US to prevent Chinese purchase of an abandoned former naval base in Greenland (Lino, 2020).

5.3. Global Level

At **global level**, as already mentioned the Blue Partnership for the Oceans also promotes the FAO initiatives to fight IUU fishing activities, and the coordination and cooperation in global fora, such as the FAO.

Within the FAO, China cooperates with the FAO since resuming its status as a member nation in 1973, while the EU has served as an FAO member (as a regional economic integration organisation) and cooperation partner since 1991.³⁵ The FAO’s fisheries and aquaculture division is organised beneath the principal authority of the Committee on Fisheries (COFI), which holds biennial sessions and contains the subsidiary bodies of the Sub-Committee on Aquaculture and the Sub-Committee on Fish Trade. Both China and the EU are among the COFI’s 126 members.³⁶

Moreover, “Blue Growth” – which has since been reformulated as ‘Blue Transformation’³⁷ – is cited as one of the COFI’s central themes and cooperation in recent years has taken place beneath initiative such the Blue Ports initiative (BPI) that was developed to enable more positive city-port relations focusing on ‘better

³¹ EU (2018). Agreement to prevent unregulated high seas fisheries in the Central Arctic Ocean. Available at [https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:22019A0315\(01\)&qid=1665143737592&from=EN](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:22019A0315(01)&qid=1665143737592&from=EN)

³² <https://thediplomat.com/2021/06/china-and-the-agreement-to-prevent-unregulated-high-seas-fisheries-in-the-central-arctic-ocean/>

³³ Lanteigne, Marc (2020). Identity and Relationship-Building in China’s Arctic Diplomacy. The Arctic Institute. Available at: <https://www.thearcticinstitute.org/identity-relationship-building-china-arctic-diplomacy/>

³⁴ Lino, Marisa. (2020). Understanding China’s Arctic activities. IISS. Available at: <https://www.iiss.org/blogs/analysis/2020/02/china-arctic>

³⁵ <https://www.fao.org/legal-services/membership-of-fao/en/>

³⁶ <https://www.fao.org/unfao/qovbodies/qsbhome/committee-fi/en/>

³⁷ As noted in the 2022-2030 Blue Transformation Roadmap: https://knowledge4policy.ec.europa.eu/publication/blue-transformation-roadmap-p-2022%E2%80%932030-vision-fao%E2%80%99s-work-aquatic-food-systems_en

production, better nutrition, better environment, and better life' (FAO, 2022).³⁸ The EU and China demonstrated involvement within these initiatives, with the first FAO Blue Ports workshop organised by the Port of Vigo, Spain in June 2019. The workshop included two members of the work team from China and two from the European Union, including one member from the European Commission.³⁹

Finally, another significant development at the global level of cooperation between the EU and China regarding ocean governance was the adoption of the Agreement on Fisheries Subsidies by the World Trade Organization on 17 June 2022. By prohibiting harmful fishery subsidies, the Agreement is an important achievement in combating the depletion of fishery stocks around the world. The Agreement also marks the "first Sustainable Development Goal (SDG) target to be fully met, [and] the first SDG target met through a multilateral agreement."⁴⁰ Although the Agreement has been adopted, it is still necessary for two-thirds of the WTO members to deposit their instruments of acceptance in order for implementation to be set in motion.⁴¹

³⁸ FAO (2022) The Blue Ports as a Tool to Strengthen Blue Transformation in Coastal Areas. COFI Meeting 7-9 June 2022. Available at <https://www.fao.org/3/cb9060en/cb9060en.pdf>

³⁹ 2019 Blue Fishing Ports Workshop agenda available at <http://estaticos.ipmedios.com/media/5/3/381a6042f70af2fa604ec0af02710801-original.pdf>

⁴⁰ https://www.wto.org/english/tratop_e/rulesneg_e/fish_e/fish_e.htm

⁴¹ https://www.wto.org/english/news_e/news22_e/fish_29sep22_e.htm

Table 3: EU-China cooperation with the Food and Agriculture Organization of the UN (FAO)

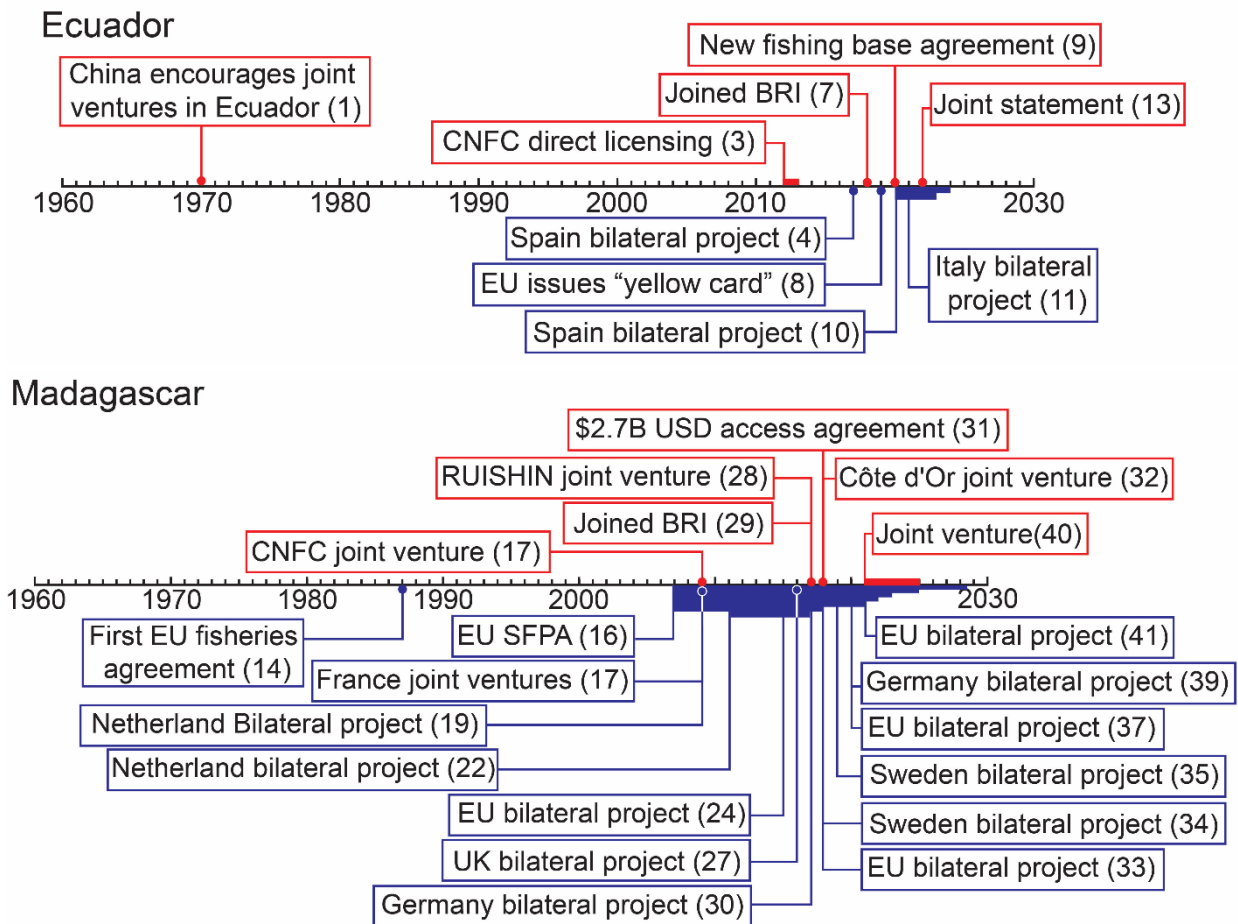
Mentions of specific EU-China cooperation	Aquaculture and Fisheries
<p>FAO in China lists the Delegation of the EU to China as one of their international cooperation partners</p>	<ul style="list-style-type: none"> • Committee on Fisheries (COFI) with Sub-Committee on Aquaculture and Sub-Committee on Fish Trade; COFI holds biennial sessions • Examine major international fisheries and aquaculture problems • Issue periodic recommendations to governments, regional fishery bodies, NGOs, fish workers, FAO and international community • Supplement work of other organisations working in the field of fisheries and aquaculture • Sub-Committee on Aquaculture provides forum for consultation and discussion on aquaculture and holds advisory role to the COFI on technical and policy matters • Key areas of work of the FAO Fisheries and Aquaculture Division include capture fisheries, management and conservation, fisheries policies, utilisation, trade, market, knowledge/information, and information networks • Several international plans of action and programmes in different target work areas

5.4. China’s fisheries-related agreements and projects

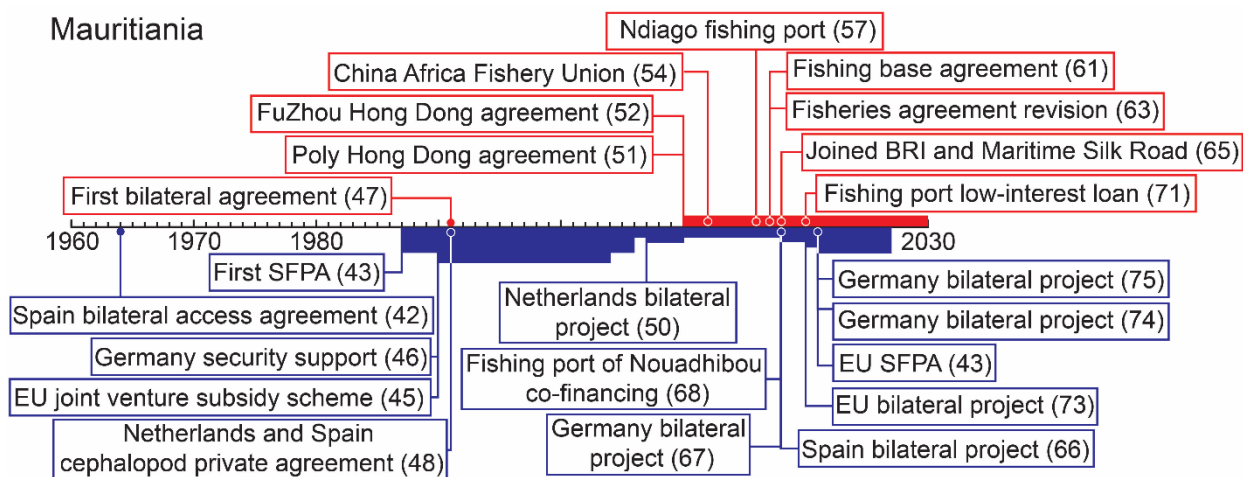
The number of agreements has increased over the last 20 years, with EU dominance evident in Mauritania, Senegal, Madagascar and Mauritius. This demonstrates the EU’s historic interest in the fisheries of these countries. On the other hand, China’s dominance in Ecuador and the Solomon Islands might be reflective of its increased interest in squid fisheries. A list of fisheries-related agreements signed between the six countries of focus and other countries, including the EU and China, is presented in Annex 7.

Figure 10 presents a schematic representation of the agreements made by Chinese companies including those operated by the Chinese government (red) and the EU (blue) with the six focus countries over time. Note the larger number of agreements notably in the last 20 years, and the EU’s dominance in Mauritania, Senegal, Madagascar and Mauritius, which demonstrates the EU’s historic interest in the fisheries of these countries. Note China’s dominance in Ecuador and the Solomon Islands, which might be reflective of its increased interest in squid fisheries. The figures in brackets represent the item number from Table 21 in Annex 7.

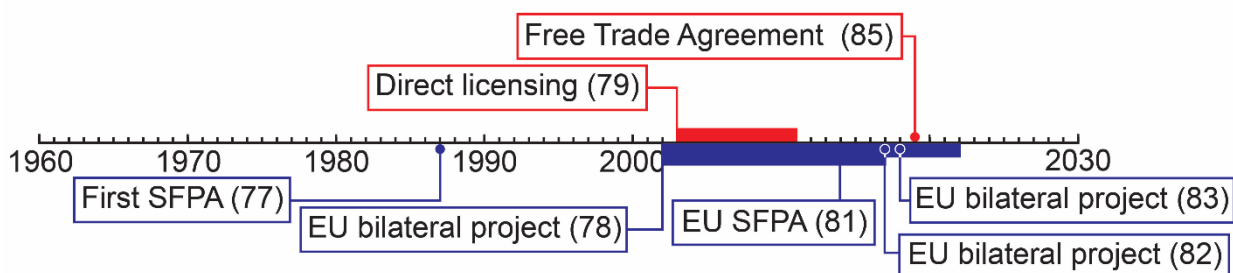
Figure 10: Representation of the agreements made by Chinese companies



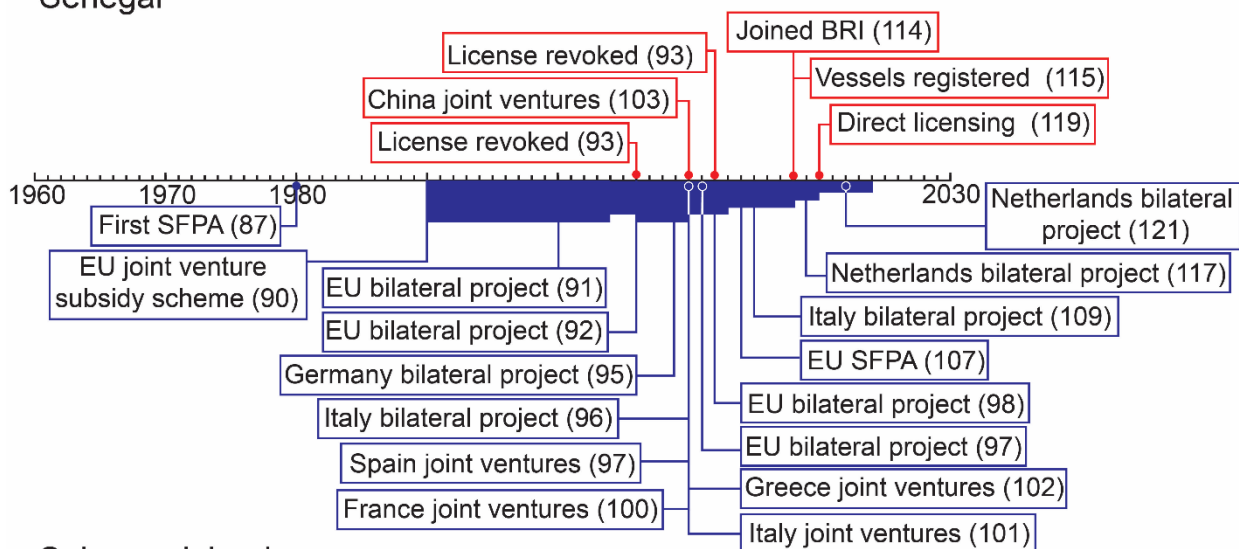
Mauritania



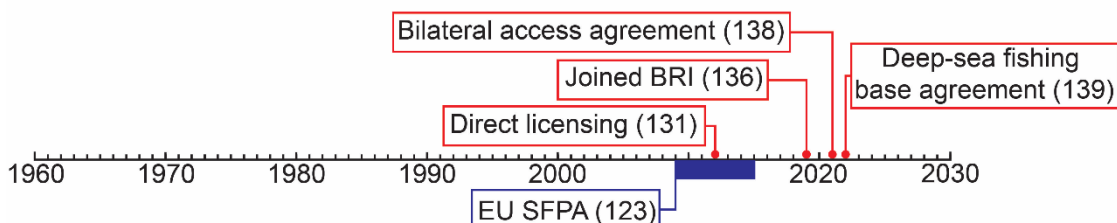
Mauritius



Senegal



Solomon Islands



Source: own elaboration

6. CONSEQUENCES OF THE CHINESE FISHING FLEET AND AQUACULTURE FOR THE EU

KEY FINDINGS

- Chinese subsidies for their distant water fleet lead to unfair competition.
- Overfishing results in environmental degradation and reduced resource availability, as well as socio-economic implications for local communities.
- The risk of overfishing is exacerbated by the lack of reliable data and transparency around the number of fish landed.
- Health concerns and food security issues over the aquaculture products may affect the supply of Chinese products to the EU. However, this might also increase opportunities for domestic aquaculture production.
- The Chinese increasing demand for high quality seafood reduces the sources of supply of the traditionally importing nations. However, it also increases the export opportunities of some products.
- The EU aquaculture sector, largely depending on fishmeal, has been impacted by the extremely high cost of fish feed.

This section presents an overview of the main impact of China's fishing fleet and aquaculture sector for the EU. The section is organised in three sub-sections presenting the identified environmental (sub-section 7.1), socioeconomic (7.2) and geopolitical consequences (7.3).

Assessing the environmental, socioeconomic and geopolitical consequences of China's distant water fleet is a complex exercise made harder by the lack of transparency. However, what is certain is that China's distant water fishing fleet is the world's largest and operates globally (Environmental Justice Foundation, 2022). As one of the stakeholders involved in the preparation of this study (the Environmental Justice Foundation - EJF) pointed out, the role and impact of China really is quite widespread; EJF described China's fishing activities as "in a whole different league" to the EU and other fishing nations in terms of scale (>4500 Chinese vessels versus >250 EU vessels)⁴².

It is worth keeping in mind that — as has already been discussed throughout previous sections of this study, and in detail under the section on trade (1.3) — one of the largest impacts of the Chinese seafood sector on global fisheries resources in general is the huge demand for fishmeal in their aquaculture and even agriculture sectors. It is worth recalling, for example, that China imports 60% of its fishmeal from pelagic fisheries in South America. This has knock-on effects on a whole array of factors relevant to the discussion in this section.

There are also general themes that run throughout this section, such as the unfair competitive advantage and the lack of transparency and data reliability. This is further exacerbated by the extent of Chinese subsidies for their distant water fleet. Therefore, it is important to keep in mind for this section,

⁴² Coalition for Fair Fisheries Arrangements. Fishing outside EU waters: <https://www.cffacape.org/long-distance-fleet#:~:text=The%20EU%20%E2%80%9CLong%2DDistance%20fleet,waters%2C%20but%20excluding%20the%20Mediterranean.>

that the consequences of China's activities are cumulative and add up to create an overall system that fosters and encourages so-called bad practices (e.g., no enforcement of monitoring or control, a lack of transparency, promoting harmful fisheries subsidies, etc.).

6.1. Environmental consequences

This sub-section presents an overview of the main consequences for the fishing fleet (7.1.1), e.g., the depletion of fisheries resources and environmental degradation; consequences of the IUU; and for the aquaculture (7.1.2), e.g., food security concerns.

6.1.1. Fishing fleet

Depletion of fisheries resources and environmental degradation

One of the main environmental consequences of the Chinese fishing fleet on the EU's distant water fishing activities is undoubtedly the depletion of fisheries stocks which is associated with environmental degradation and results in reduced resource availability for all actors involved. As Mallory (2013) points out, "fisheries governance experts argue that fisheries access agreements on the whole have led to unsustainable use of fisheries resources and have negatively impacted the socioeconomic development of host countries". In Africa, fishing by distant water fleets has led to a depletion of fisheries resources through overfishing, catch misreporting and transshipment at sea, fishing in illegal areas and the use of inappropriate methods or gear (Mallory, 2013). One of the stakeholders consulted during the preparation of this study (EJF) described the declines in fisheries productivity in some areas where Chinese fishing fleets have been involved as "catastrophic". Perhaps the best case of overfishing and resource mismanagement is the stocks of *Sardinella* in Mauritania where the EU currently has an SFPA in place.

Bonfil *et al.* (1998) reported a reduction in the overall sustainability of small pelagic fish stocks in Namibia of around 20% as a result of distant water fleets fishing in this country. This would obviously apply to both the EU and the Chinese fishing fleets; however, the activities of the EU fishing fleet are arguably more transparent. The same phenomenon was found to apply to small pelagic fisheries in Mauritania, Senegal, Ecuador and Iceland (Bonfil *et al.*, 1998). Similarly, the European Fish Processors Association – European Federation of National Organisations of Importers and Exporters of Fish (AIPCE-CEP), consulted during the preparation of this study, expressed concern about Chinese longline vessels in the Atlantic and Pacific tuna fisheries tipping fishing effort over sustainable levels. This same sentiment was echoed in the findings by the Joint Scientific Committees in their reports on the SFPAs with Mauritania and Senegal. These reports express concern over the state of exploitation of small pelagic and demersal stocks. However, it is important to distinguish tuna stocks - which form the majority of what is targeted by the EU SFPAs - from other targeted fish stocks since they tend to be better managed through the various tuna commissions.

The risk of overfishing is exacerbated by the lack of reliable data and transparency around the numbers of fish landed (as alluded to in previous sections of this study). Furthermore, the key fish resources prone to or subject to overfishing are generally ones that do not receive much coverage or scientific monitoring by the authorities in question. Poor management is exacerbated in the case of countries with underdeveloped infrastructure where the national governments themselves struggle to manage the coastal environment without the involvement of local communities (see case study on Madagascar under Section 1.1).

Moreover, one of the interviewees consulted during the preparation of this study (EJF) described the downward pressure ("a race to the bottom") exerted by the decline in fisheries resource resulting in

increased pressure on fishing vessel skippers to meet their quotas, which may be correlated with a violation of human rights abuses and other illegal practices.

It is also worth mentioning the role that such ecosystem degradation caused by destructive fishing practices plays in the fight against climate change. Benthic habitats are known to be important carbon sinks and bottom trawling can cause significant disruption to these habitats. Furthermore, China's actions in areas such as the South China Sea pose an obstacle to the EU's stated aim to protect marine biodiversity. For example, interventions to halt the establishment of marine protected areas under the guise of protecting the country's fishing rights (Raftopoulos & Nissen, 2021).

Illegal, Unregulated and Unreported (IUU) fishing

Above all else, illegal fishing undermines any form of good governance that the EU might hope to see introduced. A report released by the Environmental Justice Foundation in the beginning of 2022 on illegal fishing in China's fishing fleet highlights that illegal practices such as fishing without a permit, the use of prohibited gear, fishing for protected species, shark finning and not reporting catch, are 'not negligible' (EJF, 2022). This study also reported a 'high frequency' of human rights abuses. The report concludes that the Chinese government is failing to effectively regulate or control its distant water fleet. However, as will be discussed in Section 8, there are actions that the EU can take to encourage China down a more constructive path. In fact, there is evidence of this already, such as in the case of illegal fishing and the overexploitation of fish stocks in South China Sea where the EU has restricted access to its market to products emanating from illegal fishing activities (Grare, 2021).

The first victims of illegal fishing are the coastal communities that depend on these marine resources for their livelihoods and for food security. For the purposes of this section of the study, the main consequence of illegal fishing is the direct competition with legal fishing at all scales and along the entire supply chain. This represents a form of unfair competition for the EU and other relevant stakeholders. As mentioned in various sections of this study, the theme of unfair competition and lack of a level playing field is recurrent. The report by the EJF (2022) outlines several instances of Chinese industrial-scale fishing operations destroying the fishing gear of local and artisanal fishers. In addition, they document numerous examples of Chinese vessels operating in areas reserved for local small-scale fisheries. The consequence of this for the EU, as we will see in the subsequent sections, is that the host countries equate Chinese actions with EU ones and attribute a negative reputation despite the EU's efforts at holding their fleets to a high standard. However, a positive consequence of the aforementioned illegal fishing practices could be that the host country increases observation, monitoring, registration and quality control.

6.1.2. Aquaculture

As mentioned earlier in the study, China's marine aquaculture sector has witnessed rapid growth that has come with sizeable ecological costs likely to limit the sector's future growth (Cao, 2016). There are already numerous reports of organic and chemical pollution around China's coast leading to large-scale hypoxia events that have changed the composition of the region's fish fauna (Kang *et al.*, 2021). Liu *et al.*, (2022) warn that such pollution is likely to lead to tides of harmful algal blooms which, in turn, could lead to disease outbreaks and mass mortalities for aquaculture producers, thereby threatening China's aquaculture sector.

Although one might think that the EU may benefit from a decline in China's global dominance of the aquaculture sector, which would then create a more level playing field. However, it is important to remember that: (1) China is not only the largest aquaculture producer in the world, but the second and third largest (Indonesia and Vietnam) generate only 25 % and 12 % of China's output. Thus, a reduction

of the growth of Chinese aquaculture is unlikely to create a level playing field for the E.U, whose member countries collectively generate an aquaculture production equivalent to 2 % of China's. Also, as alluded to in Section 5 of this study, the EU imports around 70% of its fishery products, of which a substantial component is sourced from China. Thus, a decline of Chinese aquaculture production, by affecting China's exports, would be likely to result in a net loss to the EU.

As the global aquaculture sector continues to grow rapidly, one of the major issues faced by Chinese aquaculture, as with most aquaculture producing nations, is the increase in the incidence of disease. The typical response to this problem is the use, and sometimes overuse, of antibiotics which has led to a serious health problem in the form of drug residues in aquatic products. This, in turn, has made it difficult for China to export their farmed aquatic products. For example, in 2001, the German Consumer Protection Centre issued an alert to ban the import of prawns containing excessive chloramphenicol, which were primarily produced in China and India. A year later, the European Commission adopted a decision limiting imports of Chinese animal-derived products destined for human consumption or animal feed, due to excessive drug residues and microbial counts.⁴³ This policy, which was applied to frozen shrimp, resulted in a loss of 600 million USD to the Chinese shrimp farming sector.

Despite this ban being lifted in 2004, the EU maintains strict restrictions on drug residues in various aquatic products (Ning *et al.*, 2007). Regardless, the occurrence of health concerns in Chinese-produced aquaculture continues to crop up (Chen *et al.*, 2017; 2022; Yang *et al.*, 2019). Although this has negative consequences to the EU in terms of supply disruption (keeping in mind that the EU is a net importer of aquatic foods), it is also possible that the EU benefits from such a situation through increased opportunities for domestic aquaculture production.

The aforementioned issue of diverting potential food fish for humans into animal feed also represents a form of inefficiency in terms of protein use. This is a global problem affecting food security not only in the EU but around the world.

6.2. Socio-economic consequences

This sub-section presents an overview of the main consequences for the fishing fleet (7.2.1), e.g., the impact on local communities in host countries; the reduced access to resources; the unfair competition and the reduced availability of exported products. Moreover, this sub-section shows some of the consequences for the aquaculture sector (7.2.2), e.g., the impact on the fishmeal, on the EU caviar sector and on the Norwegian and Scottish salmon sectors.

6.2.1. Fishing fleet

Impacts on local fisheries in host countries

As highlighted in the report by Bonfil *et al.* (1998), the activities of distant water fleets such as the Chinese (and EU) one can reduce the potential earnings of local fisheries by up to 50%. Although this is not a direct impact on EU fishing activities *per se*, there are obvious knock-on implications since one of the key aims of the EU SFPAs with the third countries is to improve socioeconomic conditions on the ground.

Loss of access to resources

⁴³ European Commission (2002). Commission Decision 2002/994/EC of 20 December 2002 concerning certain protective measures with regard to the products of animal origin imported from China. Available at <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32002D0994&from=EN>

One of the main socioeconomic consequences of the activities of the Chinese fishing fleet on the EU fishing fleet is denial of access to key resources in countries where both entities have fishing rights. To set the scene, firstly, China's demand for fishery products continues to grow, both in terms of fish for human consumption and fish to be used for fishmeal (60% of global consumption). The inherent consequence of this relentless demand is the reduced availability of a fishery resource to other interested parties such as the EU. The competition for fishing grounds between the EU and China has undoubtedly increased over the past two decades (Grare, 2021). Belhabib *et al.*, (2015) note that the volume of EU catches has declined in recent years whilst Chinese catches continue to increase. To put the significance of this fact in context, it is important to keep in mind that 25% of EU fish are caught in West Africa.

As outlined in Section 2 of this study, foreign distant water fleets typically gain access to fisheries resources in other countries' EEZs in exchange for that country contributing financially or investing in infrastructure/training for the local fisheries sector. However, and in contrast to the EU fishing agreements which are publicly available, since these agreements (with the exception of EU SFPAs, which are publicly available) are seen as commercially sensitive, the details are not shared. Moreover, information on the licences granted is not available and, in some countries, corruption and illegal practices are alleged. This has led - for example in the case of Senegal, with which the EU has a fishing agreement - the government of the host country in question to unilaterally suspend licences issued to foreign vessels (including EU vessels). This effectively represents a denial of access to resources. Local artisanal fishers and non-governmental organisations that oppose EU SFPAs typically group the fishing fleets of other countries such as China with those of the EU and perhaps unfairly campaign against these. This is a direct consequence of multiple countries fishing in the same area (Mallory, 2013). There are also anecdotal reports of some distant water fishing nations using the 'excuse' of resource conservation in order to enhance their own competitiveness in fishing areas by excluding new countries (Mallory, 2013).

This aforementioned lack of transparency and the apparent willingness by the host country governments to maintain such unequal relationships has resulted in a difficult environment for EU fisheries negotiators. However, as Mallory (2013) points out, China risks losing permission from host countries if it does not abide by their laws and does not adopt a cooperative attitude on protecting fisheries resources. This could be advantageous to the EU fishing fleet in terms of increased fishing opportunities. As mentioned in previous sections, if the EU is perceived as a partner that operates in a more beneficial way to the host countries, the EU fleet could eventually gain the upper hand.

Unfair competition and lack of level playing field

As referred to in section 3, Chinese subsidies to their fishing fleet are likely greater than EU subsidies or other nations' fisheries subsidies. This contributes to the scenario of the unlevel playing field which already exists between the EU and the Chinese fishing fleets. Interviewed stakeholders from the European Association of Fish Processors and Traders (EFFAT) expressed concerns about the lack of transparency around 'unknown subsidies' to all phases of fishing (i.e., including shipbuilding). They also mentioned the potential of human rights violation on board fishing fleets either directly or indirectly associated with China.

As pointed out by Les Pêcheurs de Bretagne at the EU's Market Advisory Council (MAC) working group meeting in May 2022, there is a risk to European catch marketing where the same product is also marketed by China. Les Pêcheurs de Bretagne provide the example of cephalopod fisheries, where there is a lack of scientific advice on total catch allowances. In such an instance, the EU's marketed catch needs to meet high social and environmental standards and as a result might receive a lower scoring under the sustainability criteria of the marketing standards framework than the Chinese production.

He urges the MAC to push for inclusion of social and economic criteria under the marketing standards framework.

Availability of exported products

Whitefish

As discussed in section 1.3, another key implication of China's fishing activities is related to the primary processing of fish fillets. China has been traditionally the key producer and exporter of fish raw material in the form of primary products. However, it has now expanded into secondary processing of a number of key species that are consumed in high numbers by the EU, namely whitefish species such as Alaskan pollock. As such, the EU is currently receiving lower quantities of reprocessed fish through Chinese exports, and this has effects on EU Member States such as Germany that consume considerable volumes of these whitefish.

Competition for the highest quality seafood

Section 1.3 outlines the impact of China's demand for seafood on EU consumers and their improved ability-to-pay which constitutes direct competition with the EU seafood market. This is possibly best exemplified in the case of Ecuadorian shrimp, for which China is the preferred destination given the recent rapprochement of the two countries. This leaves key EU importing nations such as Spain, France and Italy with reduced sources of supply. However, the EU also benefits from the Chinese demand through key exports such as Danish cold-water shrimp and brown crab from northern Europe.

Bilateral economic relationships with individual Member States

It is important to remember that China and the EU are major trading partners in fisheries and aquaculture products (EJF, 2022). However, the European Commission itself is not involved in exports to China, each individual EU Member State maintains its own individual bilateral agreements. As such, this situation allows China to apply rules to one EU Member State and not another and accept products (including fishery and aquaculture-derived) from one Member State but not another. Discussions at the EU Market Advisory Council working group meeting in May 2022 suggested that the nature of these individual bilateral relations creates fertile grounds for state-specific political agendas to be enacted. For example, if China is not happy with a given action that Ireland has taken within another sphere, it can retaliate by imposing stricter import restrictions on products from that country or not accepting imports from that country at all.

There is also the issue of differing standards for health certification, for example, the testing of cadmium levels in the white and brown meat of crab. As a result, there is a risk that consignments will be returned if they fail the tests due to the testing methodology implemented by the Chinese authorities. Representatives consulted from the Irish Killybegs fishermen's organisation expressed concerns over the Chinese authorities inconsistently applying their policy of issuing health certificates to Irish-produced live brown crab one year and not the next. The organisation described these as "divide and conquer" strategies, which are on the grounds of excessive levels of metals such as cadmium. However, in reality, this is likely to be a form of political gamesmanship.

It is perhaps worthwhile to consider the potential challenge that bilateral cooperation between individual EU Member States and China poses to the successful negotiation of the EU's interests as a united block. As mentioned in Section 5, the case of Portugal's increasingly close ties with China is notable in this regard, with China making substantial investments in Portuguese ports (Raftopoulos & Nissen, 2021). Furthermore, the consequences of China's actions affect some EU member states more than others. For example, French interests are particularly threatened by Chinese fishing practices in

the Pacific and Indian Oceans such as in French Polynesia, where Chinese vessels have been accused of illegal operations (Grare, 2021).

6.2.2. Aquaculture

Fishmeal

One of the key consequences of China's aforementioned huge demand for fishmeal (60% of global consumption), is that key feed ingredients are likely to become scarcer and therefore much less affordable. As described in detail in Section 1.3, although China is a net exporter of seafood in whole fish terms, once fishmeal is factored in, China becomes a net importer of 'aquatic bioresources' with an annual trade deficit of 1.2 million tonnes overall. This demand is mostly fulfilled through fishing activities by the Chinese fishing fleet or foreign fleets that export to China. Therefore, EU aquaculture sectors largely dependent on fishmeal, such as seabass and seabream farms in the Mediterranean, will be adversely affected through higher costs and reduced profitability.

This is particularly pertinent given that the almost prohibitively high cost of feed is frequently cited as a major obstacle to continued growth of the sector (Naylor *et al.*, 2021). The high cost of fish feed will also affect other neighbouring countries exporting farmed fish to the EU such as the Scottish and Norwegian salmon sectors, resulting in higher product costs for EU consumers. However, such an issue also affects countries outside the EU and also hurts other large aquaculture-producing countries. As such, it is possible that the EU aquaculture sector actually benefits at the expense of external markets struggling (i.e., EU consumers prioritising domestically produced farmed aquatic foods).

As has been mentioned previously, many of the third countries with which the EU has SFPAs are food-insecure and as such, should not be encouraged to export their small pelagic fish (*e.g.*, *Sardinella spp.*) which can provide an important source of animal protein and micronutrients for the poorest members of their society. This is particularly problematic when such fish are used to make fishmeal for Chinese aquaculture. The consequences of this for the EU is that, by fishing in these same countries, their fleet is inadvertently contributing to a local scenario of food insecurity.

The EU caviar production sector

In the last 15 years, the steep growth in Chinese farmed sturgeon has led to the availability of much lower-priced caviar, thereby undercutting the global caviar production market — including the EU — by up to 10 times. To put this in context, Chinese caviar currently sells for around 140 euros per kg whereas the lowest that EU caviar-producing countries — namely Italy, France, Poland, Germany, Bulgaria and Belgium — are able to supply their caviar is around 400 euros per kg, almost three times more expensive than that produced by China (EUMOFA, 2018). Furthermore, the quality of Chinese-produced caviar is on a par with that cultivated by European producers, meaning it is hard for the EU to compete on the basis of quality alone. As consumers are unable to discern the difference in quality, the EU hospitality, restaurant and catering sectors are increasingly opting for cheaper caviar and the EU is now a net importer of caviar (EUMOFA, 2018).

The reason that this constitutes a form of unfair competition is that, even though there is high demand (and a preference) within China for foreign products, including EU-produced caviar, the government has put in place protectionist policies making it hard to import caviar from countries such as Italy and France. As the Federation of Aquaculture Producers consulted during the preparation of this study suggested, one way to level the playing field is to impose a stricter labelling and traceability scheme for all fishery and aquaculture products including caviar, so that consumers are able to discern exactly where their caviar is coming from. A similar phenomenon was pointed out by the French Comité

National de la Conchyliculture (CNC), regarding molluscs, whereby China restricts EU imports and as such tips trade flows in its favour.

The Norwegian and Scottish salmon sectors

As with the case of Ecuadorian shrimp, China's increasing demand for Atlantic salmon from Norway and Scotland could have ramifications on the quantities available to the EU, thereby limiting sourcing options and potentially increasing the cost. However, this could also provide impetus to fledgling EU salmon-producing countries such as Denmark and Sweden, although current projections of growth in Chinese demand suggests that this will still only represent a small fraction of Norwegian or Scottish output.

6.3. Geopolitical consequences

Although the EU and China consider themselves as "strategic partners" in pursuit of cooperation on environmental and particularly maritime environmental issues, their interests in leading global environmental governance are also closely tied to their desire to develop their maritime economies and geopolitical agendas. Moreover, China continues to be an economic competitor and a "systemic rival" for the EU. While concrete bilateral actions remain limited, the two actors have developed a dialogue-centred partnership regarding ocean governance, as evidenced by their Blue Partnership agreement to advance the development of a Blue Economy. In line with this partnership, 'the EU expects China to engage more actively in the areas of sustainable fisheries and marine resources including by supporting the establishment of additional marine protected areas in the Southern Ocean and delivering concrete results in the fight against illegal, unreported and unregulated fishing'.⁴⁴ However, China's actions regarding overfishing (particularly in the South China Sea) and marine conservation outline potential geopolitical consequences for the EU fishing fleet and aquaculture.

China's fishing fleet has also been characterised as "an unofficial militia" and "the third arm of its navy" as it has engaged in alleged fishing activities in disputed territory (Grare, 2021). This hostile characterisation of Chinese fishing activities was echoed in a 2017 US report from the Pentagon that declared that China is "building a state-owned fishing fleet for its maritime militia force in the South China Sea".⁴⁵

Researchers have noted that the balance of power within the EU-China relationship has tipped towards China's favour (Raftopoulos & Nissen, 2021). This is particularly evident in the case of climate and ocean governance, which have increased in stature for both parties due to the size of their coastline and the maritime sector's increasingly important contribution to their economies (Raftopoulos & Nissen, 2021).

6.3.1. EU access to fishing opportunities

As China increases its global reach, the fishing opportunities left for other nations are reduced. This is perhaps best exemplified by the case of China's tuna canning sector which is explored in detail in Section 1.3. Given China's apparent shortage of raw tuna for processing, an increased demand for existing tuna stocks has been noted which translates into direct competition with EU tuna-fishing

⁴⁴ European Union (2022a) EU-China relations (p.2). Available at https://www.eeas.europa.eu/sites/default/files/documents/EU-China_Factsheet_01Apr2022.pdf

⁴⁵ https://dod.defense.gov/Portals/1/Documents/pubs/2017_China_Military_Power_Report.PDF

nations such as the Spanish and French fleets. This is most poignant in the Western Pacific where the Chinese fishing fleet also fishes for tuna.

As highlighted in Section 1.1 on case study countries, as a result of China's financial contributions towards fisheries development in Senegal in 2005, the country came to play a key role in the economic and social decisions taken by the Senegalese government. The consequences of this for the EU could include limiting their access to fishing opportunities and negating some of the core activities programmed within the SFPAs between the two parties, such as promoting Senegalese on-land processing and improved fisheries management, etc. (Oceanic Development, 2005).

6.3.2. Reliability and integrity of data held by intergovernmental institutions

China has been frequently accused of inaccurately reporting its catch, production and trade statistics to key institutions such as the United Nations Food and Agriculture Organization and the World Trade Organization. This makes it harder for these bodies to issue accurate recommendations related to stock management, trade or taxation. Given the numerous examples outlined in the earlier sections of this report of false flag flying by Chinese vessels and secrecy surrounding agreements between China and countries in which it is fishing, it becomes very difficult for the EU fishing fleet to meet its obligations for due diligence and capacity building under its SFPAs.

6.3.3. Switching of allegiances by territories in question

It is interesting to note that due to the increased Chinese influence in the Solomon Islands, this country has now switched its political alignment from Taiwan to Mainland China. A similar phenomenon could occur in other coastal countries with large tuna stocks or that have/have had a tuna canning industry, and with which China has strong connections, e.g., Mauritius, Madagascar, Senegal and Ecuador. This phenomenon is exacerbated by joint partnerships between Chinese companies and other companies in the countries in question, such as the case of Ecuador as we have seen in Section 1.1.

7. PROTECTION FOR THE EU FISHERIES AND AQUACULTURE SECTOR AGAINST UNFAIR GLOBAL COMPETITION PRACTICES

KEY FINDINGS

- The EU's best protection practices should be transparency and adherence to the letter and spirit of the fishing agreements it has with third countries and upholding local regulations relating to their operations. Ensuring adequate enforcement of the existing EU legislation and of international agreements on safety at sea and labour conditions on fishing vessels is also recommended.
- A rule-based global system that considers the divergent interests of all parties needs to be in place to regulate international affairs and economic activities, including fisheries.
- Strengthening the statistical units of the Department of Fisheries (or equivalent agencies) of the countries with which fisheries agreements are concluded might contribute to mitigating the current absence of reliable and detailed fisheries statistics.
- It is important that food-insecure countries are not encouraged to export the small fish that represent one of the only sources of animal protein and micronutrients available to the poorest members of their populations to make feeds for aquaculture in China or elsewhere.
- Another recommendation, in interactions with Chinese negotiators, or with their allies in various countries, is to point out that China's central government has proclaimed an 'Ecological Century' and insists on international cooperation leading to mutual benefit. It is recommended to take this into account in interactions with Chinese negotiators.

This section suggests a series of recommendations focusing on how to best protect the EU against unfair global competition practices, such as the effective implementation of a rule-based global system (8.1); ensuring a level playing field (8.2); the removal of subsidies (8.3); the promotion of transparency (8.4); improved methods of data reporting (8.5); the use of electronic monitoring, control and surveillance (8.6) and of catch certification schemes (8.7).

This section also explores how to best protect the EU market supply (8.8); and finally, it briefly suggests some recommendations on the bilateral cooperation with China (8.9).

General remarks

In general, the best protection practice should be adherence to the letter and spirit of the fishing agreements it has with third countries and upholding local regulations relating to their operations. This will allow the EU to gain respect by host countries through good-faith behaviour *vis-à-vis* the bad actions of Chinese or other distant water fleets. This, in turn, could lead to more advantageous terms for the EU. The AIPCE-CEP have described the year-on-year decline in EU distant water fleet quotas (and consequential reduction in presence of the physical fleet) as a "loss of EU influence" in global fisheries management fora, which in turn emboldens other actors such as China to play a larger role in decision-making processes.

One of the interviewees consulted during this study (EJF), who is very experienced with the process of negotiations with Chinese senior government officials, commented that the Chinese government is well aware of the issues outlined in this study and could well take necessary actions to address them if they so wished. The EJF suggested that, in fact, the Chinese 5-year fisheries plans imply an almost deliberate policy to expand the distant water fishing fleet whilst preserving the resources within their own waters.

7.1. Effective implementation of a rule-based global system

Reflecting on the material presented above on China's role in distant water fisheries leads us to realise that it be explained, at least to a large extent, by China's history.

In the 15th Century, during the Ming Dynasty, China possessed a vast fleet of ocean-going vessels which it used to document its cultural and technical superiority over countries of the Indo-Pacific region, and which reached all the way to East Africa (Levathes. 1994).

However, under the Qing Dynasty, China failed to modernise and ended up, from the mid-19th century on, weak and unable to prevent western powers, from sacking Beijing and taking control of part of their territory, then invading China's coastal areas and much of her interior.

Moreover, even after 1949, when the People's Republic of China was founded, several disastrous policies of the ruling Communist Party set back the rebuilding of China's economy and, thus, its international influence. It was only in the 1980s that China could begin to assert herself in the global arena. Notably – and this is relevant to our topic here – 1985 was when the first Chinese distant water fleets started to operate from a base in Hainan, in the Southwest of China (Pang and Pauly 2001).

This background information on China's history is mentioned here because many actors may have difficulty accepting that China claims an important international role since the late 20th and early 21st centuries. This is, however, a fact that is a feature of the world in which we now live, and not an aberration that will somehow go away.

Fortunately, in the 21st century, most of the competition between cultures and countries' economies is limited through the legal and trade rules by the United Nations and the World Trade Organization (WTO), and not shaped by brute force, notwithstanding current armed conflicts such as those in south-eastern Europe or the Horn of Africa.

This means that a rule-based global system that considers the divergent interests of all parties needs to be in place to regulate international affairs and economic activities, including fisheries.

Already, the world has developed a powerful tool – the United Nations Convention on the Law of the Sea or UNCLOS – which contains international fisheries in the form of the 200-mile Exclusive Economic Zones (EEZ) that maritime countries can exploit for fishing or other resources as they see fit (Relano *et al.* 2021) or, for a fee, let other countries exploit (Belhabib *et al.* 2015).

UNCLOS works very well for strong countries such as the USA (which has not ratified it), whose Coast Guard can prevent incursions onto large parts of her EEZ designated as Marine Protected Areas (Relano *et al.* 2021). It does not work well for managing the fisheries of European countries, which often have EEZs smaller than the distribution range of exploited fish populations. UNCLOS also does not work well for low-income countries of the Global South, whose governments have no tax base to speak of, thus forcing them to provide foreign access to their natural resources, e.g., the fisheries resources in their EEZ.

UNCLOS is also disrespected in the South China Sea; there, China is challenging the fact that each maritime country, i.e., the Philippines, Malaysia, Indonesia and Vietnam, should have an EEZ extending

200 miles from their coast. This challenge is in contravention to the letter and the spirit of UNCLOS, as is the fact that China has turned several small atolls and reefs into 'islands' which, it claims, justify the extensions of its EEZ to the so-called '9-dash line.'⁴⁶ The 9-dash line has no basis in international law, and it overlaps with the legitimate EEZs claimed by China's neighbours.

The International Court in the Hague has condemned this 'sea-grabbing', to no avail. China's determination to stick to an extreme position in this regard suggests that this is an issue of national security, and not one of access to fisheries resources. However, in other parts of the world, the Chinese government insists that it plays by the rules, even if Chinese companies do not.

One good example is the massive fishery for squid (mainly for the Humboldt squid, *Dosidicus gigas*; see Arkhipkin et al. 2022) around the Galapagos Islands (a province of Ecuador). A massive Chinese fleet of squid jiggers operates about 20 miles away from the border of the Galapagos EEZ, i.e., in the high sea, thus 'respecting' the rules of UNCLOS (Relano et al 2021).

The irony is that while Ecuadorian politicians criticise this Chinese fishery, Ecuadorian vessels exploit the same squid stock inside the Galapagos EEZ, and that neither China nor Ecuador have assessed the squid population in the Central East Atlantic. It should also be mentioned here that squid populations appear to be increasing worldwide (Hunsicker et al. 2010; Doubleday et al. 2016), especially in the Eastern Central Pacific, not least because of the Ecuadorian fisheries for tuna and especially sharks (Anon. 2020), which prey on squid. Note also sharks are fished both for their fins (exported to China) and for their meat (exported to Peru and, increasingly, to Brazil).

This type of conflict, with China fishing in the high seas but adjacent to an EEZ, are likely to increase as the Chinese DWFs cease to consist – as they did earlier – simply of their coastal fleet operating off the coast of other countries (Pang and Pauly 2001).

One way to overcome conflicts of this sort in the long-term might be to make the high seas a huge fishing-free zone (White and Costello 2014; Sumaila et al. 2015). Turning the high seas, which make up 2/3 of the world's oceans, into an immense Marine Protected Area would not reduce global fisheries catches because the overwhelming majority of fish caught in the high sea are 'highly migratory,' dashing in and out of the EEZ of maritime countries. Indeed, closing the high seas to fishing, which would be easy to monitor via satellites, would improve international equity, as it would allow two dozen countries to share in the catch that is presently near-monopolized by a handful of countries with huge DWFs (Sumaila et al. 2015).

Obviously, turning the high seas into a no-fishing zone may seem unrealistic. However, it is worth highlighting that in the 1960s, when Ecuador and Chile declared '*patriotic sea*', reaching up to 400 miles into the ocean from their coasts, this was immediately condemned by the major distant water fishing nations of the time, notably, Japan and the ex-Soviet Union. Yet, only two decades later, the UNCLOS was ratified by a majority of the world's maritime countries, which allowed every maritime country to claim EEZs of up to 200 miles from their coastlines. Thus, what may appear unrealistic now, might become widely accepted within a few years.

Another reason why closing the high seas to fishing might be an idea whose time has come is that the fishery sector, like all economic sectors, might soon have to reduce its greenhouse gas emissions. These

⁴⁶ The 9-dash line, defining the approximate boundaries of a huge part of the South China Sea (SCS) that China claims control of, was first published by officials of the Republic of China (ROC) in 1947 (as an '11-dash line'). It was subsequently adopted by the People's Republic of China (PRC), and extended to the east of Taiwan. The 9-dash line, includes large chunks of the Exclusive Economic Zones claimed by neighbouring countries (e.g., Malaysia, Philippines, Vietnam) and high seas area, both of which in contravention of the United Nations Law of the Sea Convention (https://en.wikipedia.org/wiki/Nine-dash_line).

emissions are considerable (Greer et al. 2019a, 2019b) and largely unnecessary because overfishing has globally reduced fish populations. The catch per tonne of CO₂ emission of fishing vessels would be higher if international fleet capacity were reduced, which would also financially benefit the fleet operators and eliminate a justification for providing subsidies to fishing fleets. Indeed, limiting the subsidies the fisheries sectors that European, Chinese and other fleets will have to be implemented even if the recently concluded subsidies negotiations at the World Trade Organization (WTO) have again failed to establish rules for reducing subsidies.⁴⁷ In this context, the EU might at some point take up the issue of banning fisheries on the high seas as part of humanity's fight against global warming. It would reduce maritime criminality, ensure more equity in access to migratory fish stocks, and help combat warming. Most probably, China would not agree at first, but it might be convinced to join an international treaty extending the United Nations Convention on the Law of the Sea.⁴⁸

Moreover, the effective implementation of international agreements on safety at sea of fishing vessels (Cape Town Agreement - IMO) and labour conditions on fishing vessels (ILO C188) would also enhance a fair competition between China and the EU.

Furthermore, the EU is committed to protecting the Ocean through another tool: the negotiations on a Treaty of the High Seas ('the implementing agreement on Biodiversity Beyond National Jurisdiction' – BBNJ). The BBNJ is an international legally-binding instrument under the UNCLOS on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction. The EU 'urges States to reach agreements and conclude the treaty in 2022'. Moreover, in the negotiations of the treaty the EU considers the MPAs as one of the key tools to ensure an effective and fair BBNJ. As stated by the Heads of State and Government and the EU, the EU believes that it is necessary to 'enable the Conference of the Parties of the future treaty to effectively act and decide transparently on the establishment and management of area-based management tools and marine protected areas with effective management plans in order to conserve and sustainably use areas requiring protection in areas beyond national jurisdiction'.⁴⁹

Regarding more specifically the fisheries of tuna, it is also important to note that China is part of four tuna RFMOs⁵⁰ and is obliged to follow the rules in this context. According to a recent ISSF report⁵¹ (ISSF, 2022) the tuna fisheries are mostly exploited sustainably as '86% of global tuna catch comes from stocks at healthy levels, and 9% require stronger management'.⁵²

7.2. Level playing field

One of the recurrent themes throughout this report is the level playing field between EU and non-EU fishery and aquaculture producers. This is a topic that is frequently discussed at meetings of the various

⁴⁷ The WTO agreement to disallow subsidies when overfishing occurs cannot be adequate, given that countries can claim the stocks they exploit are not overfished, or by performing fake assessments claiming the same

⁴⁸ Progress of this sort was recently demonstrated by China's acquiescence to establish the first high sea no-take Marine Protected Area in the Ross Sea, in Antarctica

⁴⁹ A High Ambition Coalition on Biodiversity beyond National Jurisdiction. Protecting the Ocean: Time for Action, p. 2. Available at https://oceans-and-fisheries.ec.europa.eu/ocean/international-ocean-governance/protecting-ocean-time-action_en

⁵⁰ IATTC: Inter-American Tropical Tuna Commission; ICCAT: International Commission for the Conservation of Atlantic Tunas; IOTC: Indian Ocean Tuna Commission; WCPFC: Western and Central Pacific Fisheries Commission.

⁵¹ ISSF. 2022. Status of the World Fisheries for Tuna: July 2022. Available at <https://www.iss-foundation.org/research-advocacy-recommendations/our-scientific-program/scientific-reports/download-info/issf-2022-13-status-of-the-world-fisheries-for-tuna-july-2022/>

⁵² ISSM, press release (27 July 2022) <https://www.iss-foundation.org/blog/2022/07/27/issf-report-86-of-global-tuna-catch-comes-from-stocks-at-healthy-levels-9-require-stronger-management/>

EU advisory councils (e.g., the Aquaculture Advisory Council [AAC], the Market Advisory Council [MAC] and the Long Distance Fisheries Advisory Council [LDAC]). As noted by members of the MAC at a working group meeting earlier in 2022, one way of creating a level playing field between domestic and imported products is by ensuring that all imported products are fully traceable. The theme of an unfair competitive advantage was emphasised by interviewees from Oceana who described how hard it is for EU consumers to know where their aquatic food products are coming from, even if they wanted to avoid illegally or 'dubiously' caught fish. They pointed out that the issue cannot be solved through a single EU Regulation and as such, the overall system suffers.

Given that EU aquaculture products are subjected to higher environmental and health standards than Chinese products, the EU can insist on a stricter level of sanitary control, and on the general sustainability of the mariculture operation that produced seafood. The EU must uphold minimum requirements such as decent working conditions, decent wage and no physical abuse.

7.3. Removal of subsidies

The fact that Chinese fleets operating in Mauritania and Senegal were found to have received high levels of subsidies from the Chinese government whilst those operating in Madagascar, Mauritius, Ecuador and the Solomon Islands seemed to have little 'visible' information on subsidies suggests that transparency is an issue, not only regarding the deployment of fleets and their catches, but also regarding subsidies. Although it is encouraging to note that China was not the main obstacle to global efforts in 2022 by the World Trade Organization (WTO) to reduce harmful fisheries subsidies, Chinese subsidies to its fishing fleets still represent more than half of the world's subsidies (Villasante *et al.*, 2022). Furthermore, China has taken steps to curb dependence on subsidies, which is promising. However, the EU should push for continuing negotiations on overfishing and overcapacity of the recently concluded WTO subsidies agreement given that, in its present form, the agreement will do little to reduce the subsidisation of distant water fishing fleets.

Indeed, limiting the subsidies of the fisheries sectors of EU, Chinese and other fleets will have to be implemented even if the recently concluded subsidies negotiations at the World Trade Organization have again failed to establish rules for reducing subsidies. (The WTO agreement to disallow subsidies when overfishing occurs cannot be adequate, given that countries can claim the stocks they exploit are not overfished, or by performing fake assessments claiming the same).

7.4. Promoting increased transparency

In general, the EU should increase engagement with China and push for the application of equivalent standards of sustainability and transparency. The EU should also push its fleet and the fleets of all other distant water fishing nations to be more transparent and accurate in their reporting, i.e., 'sunlight is the best disinfectant'. This can be achieved in several ways, for example, by strengthening existing data reporting systems, mandating the use of catch certification systems or by installing electronic monitoring systems, all of which are outlined below. The EJF (2022) urge the EU to push for effective implementation of the transparency agreements by partner countries and to tackle the factors that enable illegal fishing practices such as corruption. The AIPCE-CEP recommends that agreements with third countries to obtain fish licences should be transparent, as this can help the EU exert pressure on bad actors where appropriate. As underlined by Oceana, interviewed during the preparation of this study, transparency alone is not enough. The key point of transparency is that it **leads to accountability**.

In October 2022, Oceana has released a report⁵³ about EU nationals fishing in third countries using fishing vessels with non-EU country flags. By its very nature, this form of fishing, although legal, leads to misreported catches, i.e., one component of IUU fishing, and the EU has not even begun to get a handle on this issue. For example, such individuals are not subject to any sanctions by the EU. Their main concern is that this goes against the EU's zero-tolerance policy on IUU fishing and is a clear infringement of EU law. To stop this inaction, they recommend making information on the beneficial ownership by EU nationals of non-EU vessels publicly available. Such increased transparency would "allow fisheries managers and enforcement officials to determine who is legally accountable for – and profiting from – illegal activities".

7.5. Data reporting

This report has made a clear case, amongst other recommendations, for strengthening the statistical units of the fisheries ministries (or equivalent authority) in the host countries with which fisheries agreements are concluded. This can be achieved either by capacity building or by out-posting personnel in the relevant locations. The rational basis of most of the fisheries agreements involving China (and often other entities) cannot be reliably assessed, given the absence of reliable and detailed fisheries statistics, which should also include estimates of catches that were made (legally or illegally) but not reported. Interviewed stakeholders from the AIPCE-CEP questioned whether the EU has reliable information on the size of the Chinese fleet, in particular the longline fleet, and whether EU inspectors are able to directly verify reported information. Interviewees representing EFFAT described how official Chinese statistics over-report the domestic catch and significantly under-report the catch by the distant water fleet, thereby "allowing local officials to claim they have met politically-determined domestic production targets while hiding the excessive catch by the distant water fleet that regularly exceeds fishing quotas".

The large number of vessels of the Chinese distant water fleets and the various techniques that enable these vessels to 'go dark' increases the chances of IUU infractions. This happens in spite of the attempt by most of the focus countries studied here to mitigate such infractions by adhering to international initiatives. However, the continuous lack of necessary data in reporting such infractions hinders international mitigation initiatives, and this is why greater efforts in data reporting must be made.

Support for international monitoring and recording systems and institutions is important. Accuracy and timeliness are critical if these systems are to both retain the wider community's confidence and to provide the basis for well-informed decisions concerning resource and economic management. This is of course a far wider issue than the seafood trade, but the imperative to understand a given segment of trade, if there is to be wise policy making, reinforces the broader need to ensure that these systems are respected. The example relating to several US\$ billions worth of shrimp that is described above suggests that this is something of a concern.

7.6. Electronic monitoring, control and surveillance (MCS)

Interviewed representatives of the AIPCE-CEP expressed 'deep concern' regarding the general lack of transparency in the monitoring and control of Chinese fishing activity and the seafood industry. To this end, they recommend vessel monitoring system (VMS) in operation 24 hours, all year round. They also questioned whether existing Chinese monitoring centres had ever been inspected. Further recommendations include the reinforcement of RFMO mandatory decisions over the oceans with

⁵³ Oceana (2022), Report on 'Problematic EU ownership of fishing vessels in countries that fail to tackle illegal fishing'. Available at <https://europe.oceana.org/reports/problematic-eu-ownership-of-fishing-vessels-in-countries-that-fail-to-tackle-illegal-fishing/>

active EU involvement, upholding the FAO's *Port State Measures Agreement* and not shying away from giving China a 'red card' through IUU card system. Interviewees from Oceana have also asked that VMS is compulsory for the Chinese fleet, just as is for the EU fleet. Besides, some stakeholders consulted (EJF) cast doubt on the relevance of any privacy issues surrounding the use of VMS/MCS that have been raised by MEPs in previous parliamentary discussions.

7.7. Catch certification schemes

A number of stakeholders that were interviewed in the preparation of this report mentioned the importance of having accurate and well-functioning catch certification schemes. Representatives from EFFAT mentioned for example the presence of 517 Chinese fishing vessels in Ghana, meaning that some of the 'Ghanaian' fish entering the EU market is in fact coming from the Chinese fleet. ClientEarth were particularly vocal about the importance of catch certificates and in their 2019 report,⁵⁴ they recommend subjecting all imports to Member States to standardised control systems as a way to combat IUU fishing, and to make use of a catch certification scheme such as the database and application developed by the EU ('CATCH').⁵⁵ They mentioned the impetus Council Regulation (EC) No. 1005/2008 (the IUU Regulation) has given in that regard. This regulation sets out clear pathways to tackle the entry of products from IUU fishing into the EU, but its success is contingent on the strict and consistent application of the IUU Regulation and in particular, *vis-à-vis* import controls. Interviewees from Oceana also expressed concerns at how easy it is to falsify catch certificates currently and urged the introduction of a more robust tamper-proof system. However, ClientEarth (2019), in line with the ECA (2022) report,⁵⁶ warn that the divergence in the application of import control measures between Member States risks products of illegal fishing being diverted to countries with less stringent measures. Their report recommends that national authorities carry out the following:

- a. Increase the number of random sample checks on fishery products;
- b. Inspect all catch certificates on third-country fishery products entering the EU;
- c. Make progress on implementing the IUU Regulation in order to set an example of good practice for other Member States;
- d. Increase resources to effectively control imports of fishery products; and
- e. Coordinate their import control activities between the relevant public bodies so that measures are implemented efficiently and effectively.

7.8. Protecting EU market supply

7.8.1. The fishmeal sector

China's domination of the global fishmeal supply could potentially signify a systemic risk to users in the EU i.e. livestock and fish farmers and their support industries. It seems that this will merit some strategic thinking by the EU alongside other Western countries, and the need to develop an appropriate strategy

⁵⁴ ClientEarth. 2019. Intra-EU trade in fishery products bound for Spain: Possible traffic control measures for illegal fishery products. www.clientearth.org/media/haunz1rz/intra-eu-trade-in-fishery-products-bound-for-spain-possible-traffic-control-measures-for-illegal-fishery-products-ce-en.pdf

⁵⁵ ClientEarth. 2021. Digitising the control of fishery product imports. A panorama of the systems in place and ways forward. <https://www.clientearth.org/media/umnbgq5s/eu-catch-system-report-clientearth-2021-it.pdf>

⁵⁶ European Court of Auditors, 2022. Special Report 20/2022: EU action to combat illegal fishing, p. 9 and 4. Available at https://www.eca.europa.eu/Lists/ECADocuments/SR22_20/SR_Illegal_fishing_EN.pdf

to secure EU/Western access to this important resource. To this should be added concern about the management of the small pelagic and trash fish resources used to produce fishmeal. The ethical, socio-economic and pragmatic justification for the diversion of these resources to livestock feed ingredients as opposed to human food is an additional concern.

7.8.2. The secondary seafood processing sector

As with the fishmeal sector, the impact of China's domination of the consumption and production of seafood needs to be mitigated. As discussed in Sections 1.3 and 7, this is particularly important for the secondary processing of seafood. A number of EU-based seafood producers have relied upon China for the supply of primary processed aquatic food products (i.e., fish fillets), which often have an EU provenance to begin with (e.g., raw whole fish). Subsequent value-adding tends to occur within the EU, after the labour-intensive stages of the value chain had been migrated out to low-cost processors in China. As mentioned previously, China appears to be moving away from this activity and as such, EU-based operators within the seafood sector may have to consider seeking alternative processing partners over the coming years. This may mean focusing upon partners in other developing countries with capable but more cost-effective work forces, such as Vietnam, Cambodia, South Asia as well as Latin American or African alternatives.

7.9. Bilateral cooperation with China

7.9.1. Diplomatic talks

As outlined in Section 5, EU-China cooperation has advanced considerably in recent years through important initiatives such as the Blue Partnership for the Oceans signed in 2018. This has opened the path for cooperation and dialogue which would underline the potential of this avenue. Interviewee Steven Trent commented that from his experience in China, there was a lack of understanding of how the Chinese government hierarchy worked. For discussions with China to have a chance of success, they need to be aimed at a very high level (i.e., at the presidential level). He reiterated the importance of cooperation; that the approach has to be one of encouragement as opposed to 'bullying'. Interviewed representatives of EFFAT reminded the EU that China also relies on the EU to feed its large population and that despite being powerful in many ways, China is also quite vulnerable to food security issues; therefore, the EU should "not be afraid" to pressure China into compliance with relevant global environmental and labour regulations.

When interacting with Chinese negotiators or their allies, remind them of the 'Ecological Century' proclaimed by China's central government. This proclamation underlines the concept of cooperation led by mutual benefit. Therefore, this should preclude predatory practices that lead to unfair competition. In addition to increasing multilateral cooperation mechanisms, the EJM (2022) also urge the EU to bring in relevant trade-based measures.

Representatives of EFFAT recommended that the EU pushes the International Labour Organization to elaborate standards for good labour practices specific to the fishing sector. They also mentioned the importance of properly enforcing the Due Diligence Directive, for which traceability is essential. They warn, however, that the way China structures its fishing fleets means that it has 'ghost' fleets in various locations (primarily in Africa) making traceability difficult. EFFAT suggested that these Chinese practices are in fact built to hide responsibility and shield ownership, and that therefore, a number of the fishing practices currently employed by China are not compatible with the Due Diligence Directive.

Interviewees from Oceana were keen to remind the EU that the push for increased collaborative decision-making between the EU and China should also be participatory for all other stakeholders too.

7.9.2. Access to fishing opportunities

China seems likely to further expand its fishing activities in the Pacific, particularly within the EEZ of Small Islands States in the Western Pacific. This is a part of what appears to be a broadly more active stance that China is adopting in the region, one to which Western nations are currently having to develop responses. Access to fishing resources is perhaps a minor aspect of this major geopolitical realignment, but it is one where significant EU interests could be disadvantaged. This will add to the importance of establishing workable, mutually fair and economically beneficial arrangements that embody long term sustainability with countries in the region.

7.9.3. Trade sanctions / diplomatic measures / limiting market access

As mentioned in earlier sections of this report, one method of addressing the issue of illegally caught fish is by having fully traceable and certified fishery products. Fortunately, there are existing technologies that can help with this. ClientEarth has produced several reports on the effectiveness of catch certification schemes within the EU. One of these reports recommends that the various international bodies involved in the fight against IUU fishing “must coordinate their IUU fishing control activities with shared electronic databases, clear strategies and structured plans that result in the lowest possible level of IUU fishing practices at an international level”⁵⁷.

The EJF’s 2022 report recommends strengthening controls over imported products coming from the Chinese fleet to protect the domestic market from seafood produced through forced labour and other human rights abuses. When consulted during the preparation of this study, EJF suggested that the EU could limit China’s access to its markets while the EU market is still valuable to China. EJF emphasised the importance of fisheries being at the centre of the discussion around limiting general market access (i.e., not just limiting seafood market access).

7.10. Lead by example and call out bad practices

The EU should support ongoing efforts to investigate and publicly denounce the illegal practices by fishing vessels of any country, whether or not they have a fishing agreement with them. This will empower NGOs and lend them legitimacy, which in turn should benefit the EU fleets who are respecting norms.

Fisheries agreements and contracts should not lead to increased exploitation of fully or overexploited stock. The EU, through the appropriate agency, should fund EU and/or other scientific groups capable of assessing the exploited stocks of target countries in the Global South, such that the appropriateness of new exploitation schemes, by Chinese or other actors, can be objectively assessed.

With regards to aquaculture, it is important that food-insecure countries are not encouraged to export the small fish that represent one of the only sources of animal protein and micronutrients available to the poorest members of their citizens to make (or as) feeds for aquaculture in China or elsewhere.

With regards to mariculture product grown on feed extracted from animal-protein and micronutrient-deficient countries, it may be appropriate for the EU to fund a study that would derive an index that would express, for seafood on international markets, whether they were derived from seafood diverted from people in food-deficient countries.

⁵⁷ ClientEarth. 2019. The Spanish legal process for prosecuting illegal fishing: a story of success? <https://www.clientearth.org/media/cd0iqn3j/the-spanish-legal-process-for-prosecuting-illegal-fishing-a-story-of-success-ce-en.pdf>

8. CONCLUSIONS AND RECOMMENDATIONS

This last section summarises the conclusions of the study and suggests a list of recommendations focusing on how to best protect the EU against unfair global competition practices.⁵⁸

8.1. Conclusions

1. There is a large discrepancy and uncertainty regarding the number of vessels of the Chinese DWFs. The estimate ranges from around 900 'visible' vessels to about 3000 when including 'invisible' vessels, although many of these may be operating in waters close to China (e.g., Korea) and are not considered to be part of the DWF.
2. The overall marine catches of Mainland China currently amount to 14-16 million tonnes (mt), of which 3-4 mt originate from distant-water fishing, where a large proportion are taken in waters off West Africa and off Western South America (off Ecuador and Peru).
3. China is one of the five countries that drive high seas fisheries and transshipment, notably of large tuna and sharks. The study identified hotspots of transshipment activity in the high seas of FAO Statistical Area 61 (Pacific, Northwest), 87 (Pacific, Southeast), and 51 (Indian Ocean, Western), with a small concentration in Area 41 (Atlantic Southwest).
4. There are concerns that a large number of vessels of the Chinese distant water fleets 'go dark', using techniques such turning off their AIS, which increases the possibility of IUU infractions. This has led calls for widespread adoption of VMS – satellite-based system that are tamper-proof. Distant water fleets operating in the study areas usually gain legal access to the focus countries' EEZs by joint ventures, bilateral agreements, private agreements, and licensing. However, there is general lack of details and transparency on these agreements and licensing.
5. China provides 2.4 billion USD annually to its distant water fleets operating in the EEZs of third countries, and 68 million USD to its distant water fleets operating in the high seas. Most of the harmful subsidies provided by China go to the DWFs that operate across the coast of African countries.
6. Subsidy data was not available for four of the six focus countries which suggests data gaps and a lack of transparency, similar to the situation of limited information on deployment of fleets and their catches.
7. Considering the scale of Chinese subsidies in their distant water fleet, this leads to unfair competition in relation to EU fleets as well other fleets.
8. The risk of overfishing is exacerbated by the lack of reliable data and transparency on fishing activity as well as deficient monitoring systems in the main areas where Chinese DWF are active, including in the high seas. This has led to environmental degradation and reduced resource availability, as well as socio-economic implications for local communities in some areas.
9. China's mariculture industry reached 16 million tonnes (mt) in 2020, and it generates about 52 billion EUR per year, most of which stem from production of bivalves. The bivalve industry struggles as a result of various forms of pollution, which also affect exports.

⁵⁸ Some recommendations were already discussed in the previous sections

10. Fish and crustacean farming represent a small part of overall Chinese mariculture production, but generate a huge demand for fishmeal due to inefficiency (feed conversion is in the range of 2.1-4.0).
11. China is the largest fishmeal importer in the world, and this has increased from 30% in 2012 of the traded total to 50% in 2021 (provisional data). When China's domestic production is included, China appears to be consuming 60% of global fishmeal production.
12. China's massive terrestrial farming industry (pork and chicken) no doubt accounts for much of this demand for fishmeal, but a huge aquaculture industry is also a key factor driving China's clear dominance of the supply of this important global protein feedstock.
13. The EU aquaculture sector, largely dependent on fishmeal, has been impacted by the extremely high cost of fish feed.
14. From the perspective of international trade, the overall situation of the Chinese fish and seafood is one of transition (e.g., from a leading processor of fish raw material for re-export as primary products (fillet) increasingly towards one of sourcing aquatic products). Another relevant trend is the steady replacement of primary by secondary processed products in the Chinese export offer.
15. Rising Chinese wealth is leading to increased imports of expensive prime seafood for domestic consumption, increasing global competition for some products favoured by EU consumers.
16. Cooperation with China has considerably advanced in the recent past at bilateral and global level in the area of fisheries and ocean governance.
17. One of the main instruments of dialogue and cooperation between the EU and China at the bilateral level is the Blue Partnership for the Oceans. However, the fact that China is concluding individual agreements with some Member States might jeopardise the role of the central EU institutions in negotiations with China.
18. The conflicting geopolitical agenda on the overfishing problem of South China Sea and the blocking of additional Maritime Protected Areas (MPAs) is slowing the progress of effective cooperation between the EU and China.
19. At the global level, the recent signature in June 2022 of the WTO Agreement on Fisheries Subsidies was a milestone in ocean sustainability cooperation. Another significant milestone concerns the Arctic where both the EU and China were among the signatories of the October 2018 Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean (CAOFA).

8.2. Recommendations

1. To develop an appropriate strategy to respond to China's increasing domination of global fishmeal supplies, and to secure EU access to this important resource.
2. With a view to the future, to encourage EU seafood firms to seek primary processing partners outside China, e.g., focusing upon partners in other developing countries with capable but more cost-effective workforces (e.g., Vietnam, Cambodia, South Asia as well as Latin American or African alternatives).

3. To protect EU access to fishing opportunities, considering China's expanding impact on access to fish stocks of interest to the EU, e.g., tuna, particularly in the Pacific and within the EEZ of Islands in the Western Pacific.
4. To encourage the Member States to refrain from negotiating individual agreements and to instead focus on cooperation with the EU's central institutions.
5. To call for more transparency and reliable information on fishing activity and fisheries agreements of Chinese DWF at bilateral and global level.
6. To support and provide funding of civil society organisations investigating and reporting the activities of actors who prefer to operate in the dark.
7. To ensure an adequate implementation of the existing EU legislation (e.g., IUU Regulation, Due Diligence Directive). Amongst other benefits, this will contribute to implementing an adequate traceability system; to ensuring responsible fishing practices, to improving the safety at sea and labour conditions on fishing vessels, and to enhancing accurate reporting of catch.
8. To ensure a rule-based global system that considers the divergent interests of all parties is in place to regulate international ocean affairs and economic activities, including fisheries.
9. To ensure an effective implementation of international agreements on safety at sea of fishing vessels (Cape Town Agreement - IMO) and labour conditions on fishing vessels (ILO C188); and the negotiation of the agreement on Biodiversity Beyond National Jurisdiction would also enhance a fair competition between China and the EU and contribute to the protection of the Ocean.
10. To strengthen the monitoring, control and surveillance units of the Department of Fisheries (or equivalent agencies) of the countries with which the EU has signed fisheries agreements, and thus to strengthen their capacity to enforce fisheries control.
11. In interactions with Chinese negotiators, to point out that China's central government has proclaimed an 'Ecological Century' and insists on international cooperation leading to mutual benefits. This proclamation excludes the predatory practices that lead to unfair competition. Fisheries agreements and contracts should not lead to increased exploitation of fully or overexploited stock. The EU, through the appropriate agency, should fund EU and/or other scientific groups capable of assessing the state of targeted stocks of countries in the Global South to determine the level of exploitation.
12. The above point would also support the dialogue with China about the overfishing problem in the South China Sea; and about the need to reduce the Chinese subsidies for the distant water fleets that lead to unfair competition.

REFERENCES

- ADF. 2021. Hunger lies in the wake of China's enormous fishing fleet. ADF, January 2021, <https://adf-magazine.com/2021/01/hunger-lies-in-the-wake-of-chinas-enormous-fishing-fleet/>. Accessed on 12 August 2022.
- AECID. 2021. Support for artisanal fishermen and shellfish collectors in the Province of Esmeraldas. [In Spanish]. [Accessed Sept 29, 2022] https://www.aecid.es/EN/Paginas/Sala%20de%20Prensa/Noticias/2021/2021_07/20_ecuador.aspx
- AFP. 2020. Senegal rejects dozens of foreign trawler permits. [Accessed Sept 9, 2022] <https://www.barrons.com/news/senegal-rejects-dozens-of-foreign-trawler-permits-01591711506>
- Agnew DJ, Pearce J, Pramod G, Peatman T, Watson R, Beddington JR, Pitcher TJ. 2009. Estimating the worldwide extent of illegal fishing. *PLoS ONE* 4(2): e4570. <https://doi.org/10.1371/journal.pone.0004570>
- All-China Federation of Industry and Commerce. 2020. Mauritania: China Mauritania Marine Comprehensive Industrial Park [In Chinese]. [Accessed Sept 22, 2022] http://www.acfic.org.cn/zjg_327/nsjg/llb/llbgzhdzt/2019zhinan/2019zhinan_3/202008/t20200803_241913.html
- Anon. 2022. Spanish government sanctions two fishing vessels for turning off AIS. The Fishing Daily September 21 2022. Retrieved from <https://thefishingdaily.com/latest-news/spanish-government-sanctions-two-fishing-vessels-for-turning-off-ais/> on October 3 2022.
- Anon. 2022. Global Fish Meal Market (2022 to 2027) – china dominates the Fish Meal Landscape Among the Importing Countries- ResearchAndMarkets.com. Businesswire Feb 22 2022. <https://www.businesswire.com/news/home/20220218005362/en/Global-Fish-Meal-Market-2022-to-2027---China-Dominates-the-Fish-Meal-Landscape-Among-the-Importing-Countries---ResearchAndMarkets.com>.
- APRAPAM. 2020. List of License Applications in Senegal / Year 2020. [Accessed Sept 8, 2022] <https://aprapam.org/storage/articles/April2020/FFdAVBcYt5hmmuUUmDY5.pdf>
- Arsenault C and Le Billon P. 2022. To fight illegal fishing in the Galapagos, Ecuador turns to Canadian satellite and sensing technology. CBC News June 4 2022. [Accessed Oct 4, 2022] <https://www.cbc.ca/news/world/galapagos-illegal-fishing-satellite-technology-1.6469424>
- Bai, J. 2018. Xi Jing Ping meets with Senegal prime minister Sall. Xinhua News. [Accessed Sept 9, 2022] <https://www.yidaiyilu.gov.cn/xwzx/xgcdn/64682.htm>
- Belhabib, D., Sumaila, U. R., Lam, V. W. Y., Zeller, D., Le Billon, P., Abou Kane, E. and Pauly, D. 2015. Euros vs. Yuan: Comparing European and Chinese Fishing Access in West Africa. *PLoS ONE*, 10(3): e0118351.
- Bello, M. 2021. Ecuador on the Frontier of a Changing Ocean. The Wilson Center, Washington DC. 14 p.
- Bernadett, L. D. 2014. The Parties to the Nauru Agreement's Vessel Day Scheme: Accounting for the Rare Success of an International Agreement. *Chicago-Kent Journal of International and Comparative Law*, 14(2):103-122
- Blomeyer, R., Goulding, I., Pauly, D. Sanz, A. and Stobberup, K. 2012. The role of China in World Fisheries. European Parliament, Directorate General for Internal Policies. Policy Department B:

Structural and Cohesion Policies - Fisheries. Brussels, 97 p. http://www.europarl.europa.eu/meetdocs/2009_2014/documents/pech/dv/chi/china.pdf

- Boerder, K., Miller, N.A. and Worm, B. 2018. Global hot spots of transshipment of fish catch at sea. *Science Advances* 4: eaat7159.
- Bonfil, R., Munro, G., Sumaila, U.R., Valtysson, H., Wright, M., Pitcher, T., Priekshot, D., Haggan, N, and Pauly, D. 1998. *Impacts of distant water fleets: an ecological, economic and social assessment*. Fisheries Centre Research Reports 6(6). University of British Columbia, 111 p.
- Brousseau, M. 2021. A comprehensive analysis and novel methods for on purpose AIS switch off detection. Thesis, Master of Computer Science. Dalhousie University, Halifax, Nova Scotia. 61 p.
- Brush, A., Dury-Agri, J.R. 2022. Who Controls the Distant Water Squid Fishing Fleet? C4ADS, Washington, D.C. 24 p.
- Campbell, B. and Pauly, D. 2013. Mariculture: A global analysis of production trends since 1950. *Marine Policy*. 39: 94-100. doi 10.1016/j.marpol.2012.10.009.
- Campbell, B., Alder, J., Trujillo, P. and Pauly, D. 2016. A global analysis of mariculture production and its sustainability, 1950-2030, p. 137-151 In: D. Pauly and D. Zeller (eds.) *Global Atlas of Marine Fisheries: A critical appraisal of catches and ecosystem impacts*. Island Press, Washington D.C.
- Cao, H. Y. 2016. Research on the sustainable development of healthy aquaculture in seawater. *Agriculture and Technology*.
- Cao, L., Naylor, R., Henriksson, P., Leadbitter, D., Metian, M., Troell M. and Zhang, W. 2015. Global food supply. China's aquaculture and the world's wild fisheries. *Science* 347:133-135.
- Carver, E. 2021. China joins the foreign fleets quietly exploiting Madagascar's waters. Mongabay Series: Conservation in Madagascar. Retrieved from <https://news.mongabay.com/2021/08/china-joins-the-foreign-fleets-quietly-exploiting-madagascars-waters/>
- Carver, E. 2018. Madagascar's fishermen oppose opening fisheries to China. [In Chinese] [Accessed Sept 6, 2022] <https://asiatimes.com/2018/11/atc-fishermen-oppose-2-7-bn-deal-opening-madagascar-to-chinese-fishing/>
- Carver, E. 2018a. Top Madagascar shrimp co. moved millions among tax-haven shell companies. [Accessed Sept 7, 2022] <https://news.mongabay.com/2018/10/top-madagascar-shrimp-co-moved-millions-among-tax-haven-shell-companies/>
- Carver, E. 2018b. Madagascar's fishermen oppose opening fisheries to China. [In Chinese] [Accessed Sept 6, 2022] <https://asiatimes.com/2018/11/atc-fishermen-oppose-2-7-bn-deal-opening-madagascar-to-chinese-fishing/>
- Carver, E. 2021. Changes to Madagascar's trawling sector raise questions and hopes. [Accessed Sept 6, 2022] <https://news.mongabay.com/2021/12/changes-to-madagascars-trawling-sector-raise-questions-and-hopes/>
- CCFA and COAPA. 2015. Joint ventures in African fisheries: What challenges for sustainable development? [Accessed Oct 5, 2022] <https://static1.squarespace.com/static/5d402069d36563000151fa5b/t/5dad9c7951bf6e19d66b83fa/1571658881290/CCFA%2BCAOPA%2Bpaper%2Bon%2Binvestments.pdf>
- Chen, M.-L. 2017. Fishery provides new jobs, expansion in West Africa. China Daily. http://www.chinadaily.com.cn/world/2017brics/2017-09/02/content_31449401.htm.

- Chen, Y.-Q. 2019. Big catch on the coast of Mauritania. China Daily. http://www.chinadaily.com.cn/cndy/2019-04/28/content_37463351.htm
- Chen, C., Chen, X., Lei, L., Wang, J., Liu, D., Xu, L., and Huang, J. 2017. Study on fishing ground of bottom trawl based on the habitat suitability model in Mauritania. *Journal of Shanghai Ocean University*, 26(6): 939-945.
- Chen, C.Q., Zheng, L., Zhou, J.L. and Zhao, H., 2017. Persistence and risk of antibiotic residues and antibiotic resistance genes in major mariculture sites in Southeast China. *Science of the Total Environment*, 580: 1175-1184.
- Chen, Y. S., Fang, R, J. and Qiao, J. 2012. Research on the development of mariculture in China. *Agricultural Economic problems*. 33(06): 72-77+112. doi10.13246/j.cnki.iae.2012.06.014. [in Chinese].
- Chen, Y., Xie, H., Junaid, M., Xu, M., Zhu, Y., Tao, H., and Wong, M. 2022. Spatiotemporal distribution, source apportionment and risk assessment of typical hormones and phenolic endocrine disrupting chemicals in environmental and biological samples from the mariculture areas in the Pearl River Delta, China. *Science of the Total Environment* 807: 150752.
- Cherif, A. M. 2009. The Bilateral Agreements Between The European Union And Mauritania On Fisheries. *Studia Diplomatica*, 62(4):127-149. [Accessed Sept 23, 2022] <http://www.jstor.org/stable/44838617>
- Chinafrica. 2012. China-Africa Fishery Union formed in Beijing. [In Chinese] [Accessed Sept 1, 2022] http://www.chinafrica.cn/chinese/zqbd/txt/2012-12/12/content_506851.htm
- CNFC. 2015. China National Fisheries Corporation report of issuing of shares, purchasing of assets, and raising supporting funds and related transactions. CNFC. <http://static.cninfo.com.cn/finalpage/2015-03-05/1200669914.PDF>.
- CNFC Overseas Fisheries. 2014. Evaluation of shareholder's equity in regards to CNFC Overseas Fisheries' restructuring of Zhongyu Global Seafood Co. Ltd. [Accessed Aug 25, 2022] <http://static.cninfo.com.cn/finalpage/2015-03-05/1200669958.PDF>
- CNFC. 2015. China National Fisheries Corporation report of issuing of shares, purchasing of assets, and raising supporting funds and related transactions. [Accessed Aug 15, 2022] <http://static.cninfo.com.cn/finalpage/2015-03-05/1200669914.PDF>
- Collyns, D. 2020. It's terrifying. Can anyone stop China's vast armada of fishing boats? *The Guardian* August 25 2020. [Accessed Oct 9, 2022] <https://www.theguardian.com/environment/2020/aug/25/can-anyone-stop-china-vast-armada-of-fishing-boats-galapagos-ecuador>
- Cooperativa de Armadores de Pesca del Puerto de Vigo. 2022. Asociación de Empresas Comunitarias en Sociedades Mixtas de Pesca. [Accessed Oct 5, 2022] <http://www.arvi.org/acemix/>
- Council of the European Union. 1980. Council Regulation (EEC) No 2212/80 of 27 June 1980 on the conclusion of the Agreement between the Government of the Republic of Senegal and the European Economic Community on fishing off the coast of Senegal, of the Protocol, and of the exchanges of letters referring thereto. [Accessed Sept 23, 2022] <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31980R2212>
- Cutlip, K. 2016. Going dark: when vessels turn off AIS broadcasts. Data and Technology, Global Fishing Watch, July 30 2016. [Accessed Oct 4, 2022] <https://globalfishingwatch.org/data/going-dark-when-vessels-turn-off-ais-broadcasts/>

- Defaux, V. (ed). 2019. Évaluation rétrospective et prospective du Protocole à l'accord de partenariat dans le domaine de la pêche durable entre l'Union européenne et la République islamique de Mauritanie : rapport final 25 mars 2019. European Commission, Directorate-General for Maritime Affairs and Fisheries, Publications Office. <https://data.europa.eu/doi/10.2771/656537>
- Directorate-General for Maritime Affairs and Fisheries. 2021. EU and Mauritania announce the conclusion of negotiations for a new fisheries agreement. European Commission. [Accessed Sept 5, 2022] https://oceans-and-fisheries.ec.europa.eu/news/eu-and-mauritania-announce-conclusion-negotiations-new-fisheries-agreement-2021-07-29_en
- Doubleday, Z.A., Prowse, T.A., Arkhipkin, A., Pierce, G.J., Semmens, J., Steer, M., Leporati, S.C., Lourenço, S., Quetglas, A., Sauer, W. and Gillanders, B.M. 2016. Global proliferation of cephalopods. *Current Biology*, 26(10): R406-R407.
- d-portal. 2022a. Fisheries: Fishery Development Project. [Accessed Oct 7, 2022] http://www.d-portal.org/ctrack.html?country_code=EC§or_group=313#view=act&aid=XM-DAC-41108-1100000006
- d-portal. 2022aa. Küsten- und Meeresschutz II. [Accessed Sept 29, 2022] http://d-portal.org/ctrack.html?country_code=MG§or_group=313#view=act&aid=DE-1-201768837
- d-portal. 2022ab. Appui au Marché Plsicole dANAlamanga - phase 2 (AMPIANA2). [Accessed Oct 7, 2022] http://d-portal.org/ctrack.html?country_code=MG§or_group=313#view=act&aid=XI-IATI-EC_INTPA-2021%2F418-947
- d-portal. 2022ac. Mauritania- Artisanal Fisheries Development Project [Accessed Oct 6, 2022] http://www.d-portal.org/ctrack.html?country_code=MR§or_group=313#view=act&aid=46002-P-MR-AAF-001
- d-portal. 2022ad. Mauritania- Artisanal Fisheries Development Project (Phase II) [Accessed Oct 6, 2022] http://www.d-portal.org/ctrack.html?country_code=MR§or_group=313#view=act&aid=46002-P-MR-AAF-003
- d-portal. 2022ae. Mauritanie - Projet d'Appui au Secteur de la Pêche. [Accessed Oct 6, 2022] http://www.d-portal.org/ctrack.html?country_code=MR§or_group=313#view=act&aid=46002-P-MR-AAF-002
- d-portal. 2022af. DAM visserijproject fase 2. [Accessed Oct 6, 2022] http://www.d-portal.org/ctrack.html?country_code=MR§or_group=313#view=act&aid=NL-1-PPR-16522
- d-portal. 2022ag. Adaptation des politiques de pêche aux changements climatiques à l'aide des savoirs scientifiques et de connaissances endogènes (Afrique de l'Ouest). [Accessed Oct 6, 2022] http://www.d-portal.org/ctrack.html?country_code=MR§or_group=313#view=act&aid=XM-DAC-301-2-104682-001
- d-portal. 2022ah. The Project for the Expansion of Fishing Port in Nouadhibou. [Accessed Oct 4, 2022] http://www.d-portal.org/ctrack.html?country_code=MR§or_group=313#view=act&aid=XM-DAC-701-8-2013010620
- d-portal. 2022ai. TC aggregated activities. [Accessed Oct 6, 2022] http://www.d-portal.org/ctrack.html?country_code=MR§or_group=313#view=act&aid=XM-DAC-701-8-2013952990

- d-portal. 2022aj. TC aggregated activities. [Accessed Oct 6, 2022] http://www.d-portal.org/ctrack.html?country_code=MR§or_group=313#view=act&aid=XM-DAC-701-8-2013952997
- d-portal. 2022ak. TC aggregated activities. [Accessed Oct 6, 2022] http://www.d-portal.org/ctrack.html?country_code=MR§or_group=313#view=act&aid=XM-DAC-701-8-2013958491
- d-portal. 2022al. TC aggregated activities. [Accessed Oct 6, 2022] http://www.d-portal.org/ctrack.html?country_code=MR§or_group=313#view=act&aid=XM-DAC-701-8-2013961854
- d-portal. 2022am. TC aggregated activities. [Accessed Oct 6, 2022] http://www.d-portal.org/ctrack.html?country_code=MR§or_group=313#view=act&aid=XM-DAC-701-8-2013952989
- d-portal. 2022an. TC aggregated activities. [Accessed Oct 6, 2022] http://www.d-portal.org/ctrack.html?country_code=MR§or_group=313#view=act&aid=XM-DAC-701-8-2014958136
- d-portal. 2022ao. TC aggregated activities. [Accessed Oct 6, 2022] http://www.d-portal.org/ctrack.html?country_code=MR§or_group=313#view=act&aid=XM-DAC-701-8-2014953029
- d-portal. 2022ap. TC aggregated activities. [Accessed Oct 6, 2022] http://www.d-portal.org/ctrack.html?country_code=MR§or_group=313#view=act&aid=XM-DAC-701-8-2014953025
- d-portal. 2022aq. TC aggregated activities. [Accessed Oct 6, 2022] http://www.d-portal.org/ctrack.html?country_code=MR§or_group=313#view=act&aid=XM-DAC-701-8-2014953024
- d-portal. 2022ar. TC aggregated activities. [Accessed Oct 6, 2022] http://www.d-portal.org/ctrack.html?country_code=MR§or_group=313#view=act&aid=XM-DAC-701-8-2014953023
- d-portal. 2022as. TC aggregated activities. [Accessed Oct 6, 2022] http://www.d-portal.org/ctrack.html?country_code=MR§or_group=313#view=act&aid=XM-DAC-701-8-2014958251
- d-portal. 2022at. Appui à la formulation et la mise en oeuvre du plan de développement des pêches en Mauritanie. [Accessed Oct 7, 2022] http://www.d-portal.org/ctrack.html?country_code=MR§or_group=313#view=act&aid=XM-DAC-41301-653981
- d-portal. 2022au. Nouadhibou Eco-Seafood Cluster Project. [Accessed Oct 7, 2022] http://www.d-portal.org/ctrack.html?country_code=MR§or_group=313#view=act&aid=44000-P151058
- d-portal. 2022av. Éco-labélisation de la pêcherie de poulpe en Mauritanie. [Accessed Oct 7, 2022] http://www.d-portal.org/ctrack.html?country_code=MR§or_group=313#view=act&aid=XM-DAC-41301-645808
- d-portal. 2022aw. Mauritania 2018 Fondo Fiduciario Pesca Promoción y formación 1ª Fase. [Accessed Oct 7, 2022] http://www.d-portal.org/ctrack.html?country_code=MR§or_group=313#view=act&aid=XM-DAC-50-21-Z03-18-01-14100

- d-portal. 2022ax. Mauritania 2020 Fondo Fiduciarios pesca artesanal-sensibilización ambiental en Nuadibú. [Accessed Oct 7, 2022] http://www.d-portal.org/ctrack.html?country_code=MR§or_group=313#view=act&aid=XM-DAC-50-21-Z03-20-01-18900
- d-portal. 2022ay. Modernisation du port des pêches artisanales à Nouadhibou. [Accessed Oct 7, 2022] http://www.d-portal.org/ctrack.html?country_code=MR§or_group=313#view=act&aid=DE-1-201669001
- d-portal. 2022az. Project for the construction of the Inspection and Analysis Laboratories of the ONISPA in Nouadhibou. [Accessed Oct 7, 2022] http://www.d-portal.org/ctrack.html?country_code=MR§or_group=313#view=act&aid=XM-DAC-701-2-2019010613
- d-portal. 2022b. Project for the rehabilitation of fisheries facilities for fisheries development. [Accessed Sept 29, 2022] http://d-portal.org/ctrack.html?country_code=EC§or_group=313#view=act&aid=XM-DAC-701-8-2012110021
- d-portal. 2022ba. TCPF: Etude approfondie_ pêche continentale mauritanienne et formulation d'1 progr.Dév.Pisciculture-PConti. [Accessed Oct 7, 2022] http://www.d-portal.org/ctrack.html?country_code=MR§or_group=313#view=act&aid=XM-DAC-41301-641042
- d-portal. 2022bb. Appui aux petits producteurs et transformateurs des produits de la pêche face aux effets du Covid-19 et la mise en place des infrastructures nécessaires pour le développement de la pêche continentale et la pisciculture. [Accessed Oct 7, 2022] http://www.d-portal.org/ctrack.html?country_code=MR§or_group=313#view=act&aid=XM-DAC-41301-660542
- d-portal. 2022bc. Projet d'appui à la consolidation des acquis de la contribution effective de la société civile à la bonne gouvernance et au développement de la pêche artisanale en Mauritanie. [Accessed Oct 7, 2022] http://www.d-portal.org/ctrack.html?country_code=MR§or_group=313#view=act&aid=XI-HATI-EC_INTPA-2020%2F415-044
- d-portal. 2022bd. Artisanal fishing and fish processing and distribution port Tanit. [Accessed Oct 7, 2022] http://www.d-portal.org/ctrack.html?country_code=MR§or_group=313#view=act&aid=XM-DAC-5-7-6617551
- d-portal. 2022be. Programm nachhaltige Bewirtschaftung der Ressource Fisch. [Accessed Oct 7, 2022] http://www.d-portal.org/ctrack.html?country_code=MR§or_group=313#view=act&aid=DE-1-201667278
- d-portal. 2022bf. Strengthening fishery products health conditions in ACP/OCT countries. [Accessed Oct 7, 2022] http://www.d-portal.org/savi/?aid=XI-HATI-EC_INTPA-2001/15709/0
- d-portal. 2022bg. Marine and Fisheries Management. [Accessed Oct 6, 2022] http://www.d-portal.org/ctrack.html?country_code=MU§or_group=313#view=act&aid=AU-5-O13637-MU
- d-portal. 2022bh. Contribution of Sustainable Fisheries to the Blue Economy of the Eastern Africa, Southern Africa and the Indian Ocean (EA-SA-IO) region. [Accessed Oct 7, 2022] http://www.d-portal.org/savi/?aid=XI-HATI-EC_INTPA-2018/39977/0
- d-portal. 2022bi. New Zealand fisheries experts to Mauritius (A12987). [Accessed Oct 6, 2022] http://www.d-portal.org/ctrack.html?country_code=MU§or_group=313#view=act&aid=NZ-1-ACT-0100207

- d-portal. 2022bj. Support to the development of a policy and strategic plan for the fisheries sector in Mauritius. [Accessed Oct 7, 2022] http://www.d-portal.org/ctrack.html?country_code=MU§or_group=313#view=act&aid=XM-DAC-41301-695262
- d-portal. 2022bk. DEV. PECHE ARTISA. / PETITE COTE. [Accessed Oct 4, 2022] http://www.d-portal.org/ctrack.html?country_code=SN§or_group=313#view=act&aid=46002-P-SN-AAF-002
- d-portal. 2022bl. ETUDE D'1 STRATEGIE POUR RELANCE PECHE I.[Accessed Oct 4, 2022] http://www.d-portal.org/ctrack.html?country_code=SN§or_group=313#view=act&aid=46002-P-SN-AAF-001
- d-portal. 2022bm. APPUI A LA PECHE ARTISANALE. [Accessed Oct 6, 2022] http://www.d-portal.org/ctrack.html?country_code=SN§or_group=313#view=act&aid=XI-IATI-EC INTPA-1999%2F14667%2F0
- d-portal. 2022bn. AU DELA DE L'ENTREPRISE DE SURVIE: APPUI AUX FEMMES ENTREPRENEUSES DE LA VILLE DE ZIGUINCHOR, SENEGAL. [Accessed Oct 6, 2022] http://www.d-portal.org/ctrack.html?country_code=SN§or_group=313#view=act&aid=XI-IATI-EC INTPA-2005%2F094-614
- d-portal. 2022bo. Adapting Fishing Policy to Climate Change with the Aid of Scientific and Endogenous Knowledge (West Africa). [Accessed Oct 6, 2022] http://www.d-portal.org/ctrack.html?country_code=SN§or_group=313#view=act&aid=XM-DAC-301-2-104682-001
- d-portal. 2022bp. Setting an Example for Marine protected Area Effectiveness in the West African Marine Ecoregion. [Accessed Oct 4, 2022] http://www.d-portal.org/ctrack.html?country_code=SN§or_group=313#view=act&aid=DE-1-200907022-0
- d-portal. 2022bq. DONNE, PESCA E DIRITTI IN SENEGAL: RAFFORZAMENTO ECONOMICO E ORGANIZZATIVO DELLE UNIONI LOCALI DELLA FENAGIE PECHE. [Accessed Oct 6, 2022] http://www.d-portal.org/ctrack.html?country_code=SN§or_group=313#view=act&aid=XM-DAC-6-4-009443-02-2
- d-portal. 2022br. Mission de formulation d'un projet sur la pche au Sénégal et mesures d'accompagnement. [Accessed Oct 6, 2022] http://www.d-portal.org/ctrack.html?country_code=SN§or_group=313#view=act&aid=XI-IATI-EC INTPA-2010%2F248-687
- d-portal. 2022bs. Aménagement Durable des Pcheries du Sénégal (ADuPeS). [Accessed Oct 6, 2022] http://www.d-portal.org/ctrack.html?country_code=SN§or_group=313#view=act&aid=XI-IATI-EC INTPA-2011%2F22566%2F0
- d-portal. 2022bt. Women's Entrepreneurship and Adaptation. [Accessed Oct 4, 2022] http://www.d-portal.org/ctrack.html?country_code=SN§or_group=313#view=act&aid=CA-3-S065792001
- d-portal. 2022bu. TC AGGREGATED ACTIVITIES. [Accessed Sept 29, 2022] http://www.d-portal.org/ctrack.html?country_code=SN§or_group=313#view=act&aid=XM-DAC-701-8-2014953309
- d-portal. 2022bv. Direct Aid Program (DAP) 2014-15. [Accessed Oct 4, 2022] http://www.d-portal.org/ctrack.html?country_code=SN§or_group=313#view=act&aid=AU-5-INL471-SN

- d-portal. 2022bw. Projet de pisciculture du mulet. [Accessed Oct 6, 2022] http://www.d-portal.org/ctrack.html?country_code=SN§or_group=313#view=act&aid=XM-DAC-41301-636804
- d-portal. 2022bx. Sviluppo sostenibile e lavoro dignitoso nella filiera del settore peschiero a Ziguinchor. [Accessed Oct 6, 2022] http://www.d-portal.org/ctrack.html?country_code=SN§or_group=313#view=act&aid=XM-DAC-6-4-010335-01-0
- d-portal. 2022by. The Construction of Refrigerated Warehouse Project. [Accessed Oct 4, 2022] http://www.d-portal.org/ctrack.html?country_code=SN§or_group=313#view=act&aid=KR-GOV-021-17ED00023
- d-portal. 2022bz. The Supply of Refrigerated Trucks Project. [Accessed Oct 4, 2022] http://www.d-portal.org/ctrack.html?country_code=SN§or_group=313#view=act&aid=KR-GOV-021-17ED00022
- d-portal. 2022c. TC AGGREGATED ACTIVITIES. [Accessed Sept 29, 2022] http://d-portal.org/ctrack.html?country_code=EC§or_group=313#view=act&aid=XM-DAC-701-8-2014957926
- d-portal. 2022ca. Senegal Illegal, Unregulated and Unreported Fisheries Cooperation. [Accessed Oct 6, 2022] http://www.d-portal.org/ctrack.html?country_code=SN§or_group=313#view=act&aid=NZ-1-ACT-0A12457
- d-portal. 2022cb. The Project for the Improvement of Advanced Fish Landing Facilities for Adding Value to Fishery Products in the Department of Mbour. [Accessed Oct 6, 2022] http://www.d-portal.org/ctrack.html?country_code=SN§or_group=313#view=act&aid=XM-DAC-701-2-2018010618
- d-portal. 2022cc. Senegal Fish. [Accessed Oct 7, 2022] http://www.d-portal.org/ctrack.html?country_code=SN§or_group=313#view=act&aid=NL-KVK-27378529-CBISN2301
- d-portal. 2022cd. Feminine Governance et Innovation in Sénégal. [Accessed Oct 4, 2022] http://www.d-portal.org/ctrack.html?country_code=SN§or_group=313#view=act&aid=CA-3-P005811001
- d-portal. 2022ce. TCPF: Etude sur les mécanismes innovants et durables de financement des fonctions de gestion des pêches. [Accessed Oct 6, 2022] http://www.d-portal.org/ctrack.html?country_code=SN§or_group=313#view=act&aid=XM-DAC-41301-698622
- d-portal. 2022cf. Catfish fingerling production in Senegal. [Accessed Oct 6, 2022] http://www.d-portal.org/ctrack.html?country_code=SN§or_group=313#view=act&aid=NL-KVK-27378529-DHIF21H034
- d-portal. 2022cg. Improving resilience and adaptive capacity of fisheries-dependent communities in Solomon Islands. [Accessed Oct 5, 2022] http://www.d-portal.org/ctrack.html?country_code=SB§or_group=313#view=act&aid=AU-5-O13814-SB
- d-portal. 2022ch. Pacific Fisheries Program. [Accessed Oct 5, 2022] http://www.d-portal.org/ctrack.html?country_code=SB§or_group=313#view=act&aid=AU-5-INI079-SB

- d-portal. 2022ci. AusAID NGO Cooperation Program Development Plans. [Accessed Oct 5, 2022] http://www.d-portal.org/ctrack.html?country_code=SB§or_group=313#view=act&aid=AU-5-INI384-SB
- d-portal. 2022cj. ANCP Program Funding 2013-14 onwards. [Accessed Oct 7, 2022] http://www.d-portal.org/ctrack.html?country_code=SB§or_group=313#view=act&aid=AU-5-INL021-SB
- d-portal. 2022ck. ANCP 2017-18. [Accessed Oct 5, 2022] http://www.d-portal.org/ctrack.html?country_code=SB§or_group=313#view=act&aid=AU-5-INM256-SB
- d-portal. 2022cl. Direct Aid Program (DAP) 2016-17. [Accessed Oct 5, 2022] http://www.d-portal.org/ctrack.html?country_code=SB§or_group=313#view=act&aid=AU-5-INM061-SB
- d-portal. 2022cm. Forum Fisheries Agency Core Funding. [Accessed Oct 5, 2022] http://www.d-portal.org/ctrack.html?country_code=SB§or_group=313#view=act&aid=AU-5-INJ091-SB
- d-portal. 2022cn. Pacific Fisheries and Food Security - SPC. [Accessed Oct 5, 2022] http://www.d-portal.org/ctrack.html?country_code=SB§or_group=313#view=act&aid=AU-5-INJ589-SB
- d-portal. 2022co. Fisheries Development Assistance in the Pacific. [Accessed Oct 5, 2022] http://www.d-portal.org/ctrack.html?country_code=SB§or_group=313#view=act&aid=AU-5-INJ201-SB
- d-portal. 2022cp. Solomon Islands Fisheries Programme. [Accessed Oct 5, 2022] http://www.d-portal.org/ctrack.html?country_code=SB§or_group=313#view=act&aid=NZ-1-ACT-0A10381
- d-portal. 2022cq. Fisheries Grant Funding Arrangement. [Accessed Oct 5, 2022] http://www.d-portal.org/ctrack.html?country_code=SB§or_group=313#view=act&aid=NZ-1-ACT-0A10372
- d-portal. 2022cr. Solomon Islands Fisheries Development. [Accessed Oct 5, 2022] http://www.d-portal.org/ctrack.html?country_code=SB§or_group=313#view=act&aid=NZ-1-ACT-0A12090
- d-portal. 2022cs. Solomon Islands Fisheries New Phase 2020-2024. [Accessed Oct 6, 2022] http://www.d-portal.org/ctrack.html?country_code=SB§or_group=313#view=act&aid=NZ-1-ACT-0101058
- d-portal. 2022ct. Community-based Marine Resource Governance. [Accessed Oct 7, 2022] http://www.d-portal.org/ctrack.html?country_code=SB§or_group=313#view=act&aid=AU-5-O14516-SB
- d-portal. 2022cu. Fisheries Development Assistance for Pacific Islands Nations. [Accessed Oct 5, 2022] http://www.d-portal.org/ctrack.html?country_code=SB§or_group=313#view=act&aid=XM-DAC-701-8-2012110016
- d-portal. 2022cv. Dispatch of Technical Expert. [Accessed Oct 5, 2022] http://www.d-portal.org/ctrack.html?country_code=SB§or_group=313#view=act&aid=XM-DAC-701-8-2012110032
- d-portal. 2022cw. Government Partnerships for development. v2015.2. [Accessed Oct 5, 2022] http://www.d-portal.org/ctrack.html?country_code=SB§or_group=313#view=act&aid=AU-5-INK959-SB
- d-portal. 2022cx. Pacific Islands Regional Oceanscape Program - Solomon Islands. [Accessed Oct 8, 2022] http://www.d-portal.org/ctrack.html?country_code=SB§or_group=313#view=act&aid=44000-P151777

- d-portal. 2022cy. Solomon Islands - Bina Harbour and Cannery Project. [Accessed Oct 5, 2022] http://www.d-portal.org/ctrack.html?country_code=SB§or_group=313#view=act&aid=NZ-1-ACT-0101373
- d-portal. 2022cz. Bina Region Arrangements for Governance. [Accessed Oct 5, 2022] http://www.d-portal.org/ctrack.html?country_code=SB§or_group=313#view=act&aid=NZ-1-ACT-0102583
- d-portal. 2022d. Ecuador 2019 Pesca CISP. [Accessed Sept 29, 2022] http://d-portal.org/ctrack.html?country_code=EC§or_group=313#view=act&aid=XM-DAC-50-21-Z03-20-01-19300
- d-portal. 2022e. Innovation and sustainability strengthening the artisanal fishing sector at Manabi (I.Su.S.A.Fi.Se.M). [Accessed Sept 29, 2022] http://d-portal.org/ctrack.html?country_code=EC§or_group=313#view=act&aid=XM-DAC-6-4-012314-01-9
- d-portal. 2022f. Madagascar- Tuléar Fishing Communities Support Project (PACP). [Accessed Oct 4, 2022] http://www.d-portal.org/ctrack.html?country_code=MG§or_group=313#view=act&aid=46002-P-MG-AAF-001
- d-portal. 2022g. Private Sector Investment programme (PSI). [Accessed Oct 4, 2022] http://d-portal.org/ctrack.html?country_code=MG§or_group=313#view=act&aid=NL-KVK-27378529-23408
- d-portal. 2022h. Sea cucumber farming. [Accessed Oct 4, 2022] http://www.d-portal.org/ctrack.html?country_code=MG§or_group=313#view=act&aid=NL-KVK-27378529-PSI11MG01
- d-portal. 2022i. TC Aggregated Activities. [Accessed Oct 4, 2022] <http://www.d-portal.org/ctrack.html#view=act&aid=XM-DAC-701-8-2014952923>
- d-portal. 2022j. TC Aggregated Activities. [Accessed Oct 4, 2022] <http://www.d-portal.org/ctrack.html#view=act&aid=XM-DAC-701-8-2014950145>
- d-portal. 2022k. TC Aggregated Activities. [Accessed Oct 4, 2022] <http://www.d-portal.org/ctrack.html#view=act&aid=XM-DAC-701-8-2014952918>
- d-portal. 2022l. TC Aggregated Activities. [Accessed Oct 4, 2022] <http://www.d-portal.org/ctrack.html#view=act&aid=XM-DAC-701-8-2013952895>
- d-portal. 2022m. TC Aggregated Activities. [Accessed Oct 4, 2022] <http://www.d-portal.org/ctrack.html#view=act&aid=XM-DAC-701-8-2013952901>
- d-portal. 2022n. TC Aggregated Activities. [Accessed Oct 4, 2022] <http://www.d-portal.org/ctrack.html#view=act&aid=XM-DAC-701-8-2013950137>
- d-portal. 2022o. Mud crab aquaculture. [Accessed Oct 4, 2022] http://www.d-portal.org/ctrack.html?country_code=MG§or_group=313#view=act&aid=NL-KVK-27378529-PSI14MG04
- d-portal. 2022p. Innovation in the Blue Economy (Indian Ocean). [Accessed Oct 4, 2022] http://www.d-portal.org/ctrack.html?country_code=MG§or_group=313#view=act&aid=AU-5-INL801-MG
- d-portal. 2022q. Projet d'Appui aux Marchés Piscicoles en Analamanga (AMPIANA). [Accessed Oct 4, 2022] http://d-portal.org/ctrack.html?country_code=MG§or_group=313#view=act&aid=XI-IATI-EC_INTPA-2015%2F355-808

- d-portal. 2022r. MAG - Tilapia Aquaculture. [Accessed Sept 29, 2022] http://d-portal.org/ctrack.html?country_code=MG§or_group=313#view=act&aid=NO-BRC-971277882-QZA-15%2F0475-4
- d-portal. 2022s. MAG - Sea Cucumber. [Accessed Oct 7, 2022] http://d-portal.org/ctrack.html?country_code=MG§or_group=313#view=act&aid=NO-BRC-971277882-QZA-15%2F0475-3
- d-portal. 2022t. South Africa Safety Initiative for Small Vessels - Operational Take-Up (OASIS-TU) and Madagascar Safety Initiative for Small Vessels - Operational Take-Up (MSIS-TU). [Accessed Oct 4, 2022] http://www.d-portal.org/ctrack.html?country_code=MG§or_group=313#view=act&aid=GB-GOV-13-GCRF-UKSA_ZA_UKSA-037
- d-portal. 2022u. Conservation de la biodiversité marine et côtière. [Accessed Oct 4, 2022] http://d-portal.org/ctrack.html?country_code=MG§or_group=313#view=act&aid=DE-1-201669027
- d-portal. 2022v. Promotion des chaines de valeur adaptées au changement climatique. [Accessed Oct 4, 2022] http://d-portal.org/ctrack.html?country_code=MG§or_group=313#view=act&aid=XI-IATI-EC_INTPA-2018%2F398-749
- d-portal. 2022w. Leading the Change: Civil Society, Rights and Environment - Northern Mozambique Channel Channel initiative Thematic Hub. [Accessed Sept 29, 2022] http://d-portal.org/ctrack.html?country_code=MG§or_group=313#view=act&aid=SE-ON-802005-9823-MG-500403
- d-portal. 2022x. Havs- och vattenmyndigheten-HaV 2019-22. [Accessed Sept 29, 2022] http://d-portal.org/ctrack.html?country_code=MG§or_group=313#view=act&aid=SE-0-SE-6-6105014501-MDG-31310
- d-portal. 2022y. Sustainable Tilapia Value Chain Development" in Tamatave, Madagascar. [Accessed Oct 4, 2022] http://d-portal.org/ctrack.html?country_code=MG§or_group=313#view=act&aid=NO-BRC-971277882-QZA-19%2F0271-1
- d-portal. 2022z. Programme d'Appui au Financement de l'Agriculture et aux Filières Inclusives Autour d'Antananarivo Madagascar (AFAFI-Centre). [Accessed Oct 7, 2022] http://d-portal.org/ctrack.html?country_code=MG§or_group=313#view=act&aid=XI-IATI-EC_INTPA-2019%2F41602%2F0
- EJF. 2018. China's hidden fleet in West Africa: A spotlight on illegal practices within Ghana's industrial trawl sector. EJF, London, 31p.
- EJF. 2022. The ever-widening net: Mapping the scale, nature and corporate structures of illegal, unreported and unregulated fishing by the Chinese distant-water fleet. Environmental Justice Foundation, London, 55 p. [Accessed Oct 7, 2022] <https://ejfoundation.org/resources/downloads/China-Report-2022-final.pdf>
- EJF. 2022. THE EVERWIDENING NET: Mapping the scale, nature and corporate structures of illegal, unreported and unregulated fishing by the Chinese distant-water fleet. Environmental Justice Foundation: London, UK. [Accessed July 15 2022]. <https://ejfoundation.org/resources/downloads/The-Ever-Widening-Net-2022-final.pdf>

- El universo. 2017. Ecuador and Spain will strengthen cooperation in fisheries matters. [Accessed Sept 1, 2022] <https://www.eluniverso.com/noticias/2017/09/15/nota/6382900/ecuador-espana-estrecharan-cooperacion-materia-pesquera/>
- Embassy of the People’s Republic of China in the Islamic republic of Mauritania. 2010. Ambassador Zhang Xun and the Mauritania prime minister attends groundbreaking ceremony. [In Chinese] [Accessed Sept 1, 2022] <https://www.mfa.gov.cn/ce/cemr/chn/sbgx/t771491.htm>
- Embassy of the People’s Republic of China in the Islamic Republic of Mauritania. 2018. Ambassador Zhang Jian Guo and the Mauritania Minister of Economy and Finance signs an agreement on the framework for preferential loans. [In Chinese] [Accessed Sept 1, 2022] http://mr.china-embassy.gov.cn/sbgx/201803/t20180306_6089303.htm
- Embassy of the People’s Republic of China in the Islamic republic of Mauritania. 2018. Ambassador Zhang Jian Guo and the Mauritania Minister of Economy and Finance signs an agreement on the framework for preferential loans. [In Chinese] [Accessed Sept 1, 2022] http://mr.china-embassy.gov.cn/sbgx/201803/t20180306_6089303.htm
- Emmens, T., Amrit, C., Abdi, A., and Ghosh, M. 2021. The promises and perils of Automatic Identification System data. *Expert Systems with Applications* 178: 114975.
- European Commission. 2012. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Blue Growth opportunities for marine and maritime sustainable growth. Available at <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2012:0494:FIN:EN:PDF>
- European Commission. 2018. Declaration on the Establishment of a Blue Partnership for the Oceans. Available at <https://data.consilium.europa.eu/doc/document/ST-10947-2018-INIT/en/pdf>
- European Commission. 2022. Blue Transformation- Roadmap 2022-2030- A vision for FAO’s work on aquatic food systems. Available at https://knowledge4policy.ec.europa.eu/publication/blue-transformation-roadmap-2022%E2%80%932030-vision-fao%E2%80%99s-work-aquatic-food-systems_en
- European Commission. 2018. ANNEX 2 of the Commission Decision on the Annual Action Programme 2018 - part 2 in favour of Eastern and Southern Africa and the Indian Ocean to be financed from the 11th European Development Fund: Action Document for Contribution of Sustainable Fisheries to the Blue Economy of the Eastern Africa, Southern Africa and Indian Ocean region. [Accessed Oct 7, 2022] [https://ec.europa.eu/transparency/documents-register/detail?ref=C\(2018\)4132&lang=en](https://ec.europa.eu/transparency/documents-register/detail?ref=C(2018)4132&lang=en)
- European Commission. 2019. Commission notifies the Republic of Ecuador over the need to step up action to fight illegal fishing. [Accessed Aug 27, 2022] https://ec.europa.eu/commission/presscorner/detail/en/IP_19_6036
- European Commission. 2019. Protocol on the implantation of the Agreement on a Sustainable Fisheries Partnership between the European Union and the Republic of Senegal. Official Journal of the European Union, 299: 13-42. [https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:22019A1120\(02\)&from=EN](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:22019A1120(02)&from=EN)
- European Commission. 2019a. Commission notifies the Republic of Ecuador over the need to step up action to fight illegal fishing. [Accessed Aug 27, 2022] https://ec.europa.eu/commission/presscorner/detail/en/IP_19_6036

- European Commission. 2019b. Évaluation rétrospective et prospective du Protocole à l'accord de partenariat dans le domaine de la pêche durable entre l'Union européenne et la République islamique de Mauritanie. <https://op.europa.eu/en/publication-detail/-/publication/08e725d1-5a8f-11e9-9151-01aa75ed71a1>
- European Commission. 2019c. Protocol on the implantation of the Agreement on a Sustainable Fisheries Partnership between the European Union and the Republic of Senegal. Official Journal of the European Union, 299: 13-42. [https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:22019A1120\(02\)&from=EN](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:22019A1120(02)&from=EN)
- European Commission. 2022. Madagascar- Sustainable fisheries partnership agreements with Madagascar. [Accessed Aug 26, 2022] https://oceans-and-fisheries.ec.europa.eu/fisheries/international-agreements/sustainable-fisheries-partnership-agreements-sfpas/madagascar_en
- European Commission. 2022. Mauritania. Sustainable fisheries partnership with Mauritania. [Accessed Aug 29, 2022]. https://oceans-and-fisheries.ec.europa.eu/fisheries/international-agreements/sustainable-fisheries-partnership-agreements-sfpas/mauritania_en
- European Commission. 2022. Sustainable fisheries partnership agreement with Senegal. [Accessed Sept 2, 2022] https://oceans-and-fisheries.ec.europa.eu/fisheries/international-agreements/sustainable-fisheries-partnership-agreements-sfpas/senegal_en
- European Commission. 2022. Sustainable fisheries partnership with Mauritius. [Accessed Sept 6, 2022] https://oceans-and-fisheries.ec.europa.eu/fisheries/international-agreements/sustainable-fisheries-partnership-agreements-sfpas/mauritius_en
- European Commission. 2022a. Madagascar- Sustainable fisheries partnership agreements with Madagascar. [Accessed Aug 26, 2022] https://oceans-and-fisheries.ec.europa.eu/fisheries/international-agreements/sustainable-fisheries-partnership-agreements-sfpas/madagascar_en
- European Commission. 2022b. Mauritania. Sustainable fisheries partnership with Mauritania. [Accessed Aug 29, 2022]. https://oceans-and-fisheries.ec.europa.eu/fisheries/international-agreements/sustainable-fisheries-partnership-agreements-sfpas/mauritania_en
- European Commission. 2022c. Sustainable fisheries partnership with Mauritius. [Accessed Sept 6, 2022] https://oceans-and-fisheries.ec.europa.eu/fisheries/international-agreements/sustainable-fisheries-partnership-agreements-sfpas/mauritius_en
- European Commission. 2022d. Sustainable fisheries partnership agreement with Senegal. [Accessed Sept 2, 2022] https://oceans-and-fisheries.ec.europa.eu/fisheries/international-agreements/sustainable-fisheries-partnership-agreements-sfpas/senegal_en
- European Commission. 2022e. Sustainable fisheries partnership agreement with Solomon Islands. [Accessed Sept 2, 2022] https://oceans-and-fisheries.ec.europa.eu/fisheries/international-agreements/sustainable-fisheries-partnership-agreements-sfpas/solomon-islands_en
- European Commission. n.d. Annexe IV à l'Accord Instituant le Fonds Fiduciaire 'European Union Emergency Trust Fund for stability and addressing root causes of irregular migration and displaced persons in Africa', et ses règles internes (T05-EUTF-SAH-MR-04). [Accessed Oct 7, 2022] https://ec.europa.eu/trustfundforafrica/sites/default/files/t05-eutf-sah-mr-04_giz-oit_peche.pdf

- European Council (2018) Joint Statement of the 20th EU-China Summit, signed by Li Keqiang, Donald Tusk and Jean-Claude Juncker (para. 33). Available at <https://www.consilium.europa.eu/media/36165/final-eu-cn-joint-statement-consolidated-text-with-climate-change-clean-energy-annex.pdf>
- European Market Observatory for Fisheries and Aquaculture Products (EUMOFA). 2018. The caviar market. Production, trade and consumption in and outside the EU. Luxembourg: Publications Office of the European Union, November 2018.
- European Union, 2022. A High Ambition Coalition on Biodiversity beyond National Jurisdiction. Protecting the Ocean: Time for Action. Available at https://oceans-and-fisheries.ec.europa.eu/ocean/international-ocean-governance/protecting-ocean-time-action_en
- Fabinyi, M., Wu, A., Lau, S., Mallory, T., Barclay, K., Walsh, K., & Dressler, W. (2021). China's Blue Economy: A State Project of Modernisation. *The Journal of Environment & Development*, 30(2), 127–148. <https://doi.org/10.1177/1070496521995872>
- FAO (2016) Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing. Food and Agriculture Organization of the United Nations, Rome. Accessed on October 3 2022 from <https://www.fao.org/3/i5469t/i5469T.pdf>.
- FAO (2022). The Blue Ports as a Tool to Strengthen Blue Transformation in Coastal Areas. COFI Meeting 7-9 June 2022. Available at <https://www.fao.org/3/cb9060en/cb9060en.pdf>
- FAO (undated). Handbook of Fisheries Statistics (Coordinating Working Party on Fishery Statistics (CWP)) [Accessed July, 2022] <https://www.fao.org/cwp-on-fishery-statistics/handbook/en/>
- FAO 2022. Fishery and Aquaculture Country Profiles. Solomon Islands. Country Profile Fact Sheets. Fisheries and Aquaculture Division, Rome. [Accessed Sept 6, 2022] <https://www.fao.org/fishery/en/facp/slb?lang=en>
- FAO FishStatJ database [Accessed July, 2022] <https://www.fao.org/fishery/en/statistics/software/fishstaj>
- FAO. 1989. Yield and nutritional value of the commercially more important fish species Torrey Research Station.
- FAO. 2022. Fishery and Aquaculture Country Profiles. Mauritania. Country Profile Fact Sheets. Fisheries and Aquaculture Division. Rome. [Accessed August 29, 2022]. <https://www.fao.org/fishery/en/facp/mrt?lang=en>
- FAO. 2022a. Fishery and Aquaculture Country Profiles. Sénégal. Country Profile Fact Sheets. Fisheries and Aquaculture Division, Rome. [Accessed Sept 6, 2022] <https://www.fao.org/fishery/en/facp/sen?lang=fr>
- FAO. 2022b. Fishery and Aquaculture Country Profiles. Mauritania. Country Profile Fact Sheets. Fisheries and Aquaculture Division. Rome. [Accessed August 29, 2022]. <https://www.fao.org/fishery/en/facp/mrt?lang=en>
- Feijóo, M. 2021. Ecuador tuna sector focused on getting EU yellow card lifted. [Accessed Sept 1, 2022]. <https://www.undercurrentnews.com/2021/09/13/vigo-tuna-conference-dg-mare-plans-policy-reform-for-level-playing-field/#19982>

- Ferra C, Tasseti AN, Armelloni EN, Galdelli A, Scarcella G, Fabi G (2020) Using AIS to attempt a quantitative evaluation of unobserved trawling activity in the Mediterranean Sea. *Frontiers in Marine Science* 7:580612. <https://doi.org/10.3389/fmars.2020.580612>
- Fisheries Transparency Initiative. 2021. Premier rapport de la Mauritanie à l'Initiative pour la Transparence des Pêches (FiTI) Année: 2018. [Accessed August 30, 2022] https://www.peches.gov.mr/IMG/pdf/gmn_vfrapport_fiti_mauritanie_2018_20210518.pdf
- Fisheries Transparency Initiative. 2022. Ecuador. [Accessed Aug 30, 2022] <https://www.fiti.global/ecuador>
- Fisheries Transparency Initiative. 2022. FiTI participates in workshop with senior officials of Senegal's Ministry of Fisheries and Maritime Economy. [Accessed Sept 7, 2022] <https://www.fiti.global/fiti-participates-in-workshop-with-senegal-s-ministry-of-fisheries-and-maritime-economy>
- Fisheries Transparency Initiative. 2022a. Ecuador. [Accessed Aug 30, 2022] <https://www.fiti.global/ecuador>
- Fisheries Transparency Initiative. 2022a. Mauritania. [Accessed August 30, 2022] <https://www.fiti.global/mauritania>
- Fisheries Transparency Initiative. 2022a. TAKING STOCK FiTI initiates online transparency assessment of fisheries management information for Mauritius. Fisheries Transparency Initiative. [Accessed Sept 8, 2022] <https://www.fiti.global/taking-stock-online-transparency-assessment-for-mauritius>
- Fisheries Transparency Initiative. 2022b. Madagascar. [Accessed Aug 30, 2022] <https://www.fiti.global/madagascar>
- Fisheries Transparency Initiative. 2022b. Rapport de la Mauritanie à l'Initiative pour la Transparence des Pêches (FiTI) Années: 2019 et 2020. [Accessed August 30, 2022] https://www.peches.gov.mr/IMG/pdf/gmn- deuxieme-rapport-fiti-mauritanie-2019_2020_vf_20220322.pdf
- Fisheries Transparency Initiative. 2022b. Rapport de la Mauritanie à l'Initiative pour la Transparence des Pêches (FiTI) Années: 2019 et 2020. [Accessed August 30, 2022] https://www.peches.gov.mr/IMG/pdf/gmn- deuxieme-rapport-fiti-mauritanie-2019_2020_vf_20220322.pdf
- Fisheries Transparency Initiative. 2022c. Mauritania. [Accessed Aug 30, 2022] <https://www.fiti.global/mauritania>
- Fisheries Transparency Initiative. 2022d. Senegal. [Accessed August 30, 2022] <https://www.fiti.global/senegal>
- FiTI Mauritania. 2022. Normes FiTI/Exigences 2018. [In French] [Accessed Sept 7, 2022] <http://www.fiti-mauritanie.mr/2018-2/>
- Foodex. 2019. Fu Zhou Hong Dong Fisheries Co. Ltd. [In Chinese] [Accessed Sept 1, 2022] <https://www.foodex360.com/news/show-23329.html>
- Ford, A. 2020. Illegal Chinese fishing in the Galapagos: a threat to the biodiversity of the Latin American Pacific. *OpenDemocracy, DEMOCRACIAABIERTA: INVESTIGATION*. Retrieved from

<https://www.opendemocracy.net/en/democraciaabierta/pesca-ilegal-china-galapagos-biodiversidad-pac%C3%ADfico-latinoamericano-en/>

- Fujita, R., Cusack, C., Karasik, R., Takade-Heumacher, H., and Baker, C. 2018. Technologies for Improving Fisheries Monitoring. Environmental Defense Fund, San Francisco. 71 pages.
- GAPCM. 2022a. La Peche. [Accessed Sept 7, 2022] <https://www.gapcm.org/peche/>
- GAPCM. 2022b. Les Pêcheries De Nossi-Be (PNB). [Accessed Sept 7, 2022] <https://www.gapcm.org/pecheries-nossi-be/>
- Gauriat, V. 2022. "Nothing, there's nothing": Senegal's plummeting fish stocks drive migrant surge to Europe. EuroNews. [Accessed Sept 12, 2022] <https://www.euronews.com/2022/02/11/nothing-there-s-nothing-senegal-s-plummeting-fish-stocks-drive-migrant-surge-to-europe>
- Global Agenda Councils. 2012. Illicit trade: Innovative technological solutions to enhance supply chain integrity and transparency. Annual Report of the Global Agenda Councils 2011-2012. <https://reports.weforum.org/global-agenda-council-2012/#view/global-agenda-council-2012/councils/illicit-trade/>
- Global Initiative Against Transnational Organized Crime. 2015. Illicit migration to Europe. Consequences of illegal fishing and overfishing in West Africa. [Accessed Oct 7, 2022] <https://globalinitiative.net/analysis/illicit-migration-to-europe-consequences-of-illegal-fishing-and-overfishing-in-west-africa/>
- Godfrey M (2021) IUU vessel-tracker shows possible widespread abuse of AIS switch-off capability. SeafoodSource. [Accessed Oct 3, 2022] <https://www.seafoodsource.com/news/environment-sustainability/iuu-vessel-tracker-shows-possible-widespread-abuse-of-ais-switch-off-capability>
- Gorez, B. 2015 Russian Roulette. Samudra Report No. 70. International Collective in Support of Fishworkers. <https://www.icsf.net/samudra/russian-roulette/>
- Gorez, B. 2020 Small scale fisheries at risk: Madagascar signs destructive fishing agreements with Chinese investors. CFFA. [Accessed Sept 6, 2022] <https://www.cffacape.org/publications-blog/small-scale-fisheries-at-risk-madagascar-signs-destructive-fishing-agreements-with-chinese-investors>
- Grare, F. 2021. Fish and Ships: Chinese Fishing and Europe's Indo-Pacific Strategy. *European Council on Foreign Relations. Policy Brief. August.*
- Greer, K., D. Zeller, J. Woroniak, A. Coulter, M. Winchester, M.L.D. Palomares and D. Pauly. 2019b. Reply to Ziegler *et al.* "Adding perspectives to: Global trends in carbon dioxide (CO₂) emissions from fuel combustion in marine fisheries from 1950-2016" and addressing concerns of using fishing effort to predict carbon dioxide emissions. *Marine Policy* 107: 103491.
- Greer, K., D. Zeller, J. Woroniak, A. Coulter, M. Winchester, M.L.D Palomares and D. Pauly. 2019a. Global trends in carbon dioxide (CO₂) emissions from fuel combustion in marine fisheries from 1950-2016. *Marine Policy* 107: 103382.
- Greenpeace Africa. 2017. The Cost of Ocean Destruction- Report from Greenpeace Ship Tour of West African Fisheries 2017. Greenpeace Africa. 52p.
- Groupe Multipartite National (GMN) FiTI de la Mauritanie. 2022. Rapport de la Mauritanie à l'Initiative pour la Transparence des Pêches (FiTI) Années: 2019 et 2020. Fisheries Transparency Initiative. 71 p.

- Gutiérrez M, Daniels A, Jobbins G, Almazor GG, Montenegro C (2020) China's distant-water fishing fleet: scale, impact and governance. Overseas Development Institute: London, UK. Accessed [Accessed July 30, 2022]. Retrieved from https://cdn.odi.org/media/documents/chinesedistantwaterfishing_web.pdf
- Hamilton, A., A. Lewis, M.A. McCoy, E. Havice, L. Campling. 2011. Market and Industry Dynamics in the Global Tuna Supply Chain. Pacific Islands Forum Fisheries Agency (FFA), Solomon Islands. 395 p. <https://www.ffa.int/node/567>
- Heubl, B. 2021. How Europe's dark fishing fleets threaten West Africa. The Institute of Engineering and Technology. [Accessed Oct 3, 2022] <https://eandt.theiet.org/content/articles/2021/03/europe-s-dark-fishing-fleets-in-west-africa-s-waters/>
- Hicks, C.C., Cohen, P.J., Graham, N.A., Nash, K.L., Allison, E.H., D'Lima, C., Mills, D.J., Roscher, M., Thilsted, S.H., Thorne-Lyman, A.L. and MacNeil, M.A., 2019. Harnessing global fisheries to tackle micronutrient deficiencies. *Nature*, 574(7776), pp.95-98.
- Honiwala, E. 2011. Annual report to the Western and Central Fisheries Commission Part 1: Information on fisheries, research and statistics 2010 Solomon Islands. WCPFC <https://www.spc.int/DigitalLibrary/Doc/FAME/Meetings/WCPFC/SC7/AR-CCM-21.html>.
- Hunsicker, M.E., Essington, T.E., Watson, R. and Sumaila, U.R. 2010. The contribution of cephalopods to global marine fisheries: can we have our squid and eat them too? *Fish and fisheries*, 11(4): 421-438.
- Information Office, Ministry of Agriculture, PRC. 2017. 2017 China-Mauritania Fishery Joint Committee Meeting Held in Beijing [In Chinese]. Ministry of Agriculture, PRC. [Accessed Sept 22, 2022] http://www.moa.gov.cn/xw/gjil/201711/t20171101_5857101.htm
- Intellivoire. 2020. 6 nouveaux navires chinois à destination du Sénégal et de la Guinée-Bissau pour du thon et des crevettes. [Accessed Sept 12, 2022] <https://intellivoire.net/6-nouveaux-navires-chinois-a-destination-du-senegal-et-de-la-guinee-bissau-pour-du-thon-et-des-crevettes/>
- International Investment and Trading Network. 2019. China and Solomon Islands sign memorandum on Belt and Road Initiative [In Chinese]. [Accessed Sept 12, 2022] <http://china-ofdi.org/newsDetail/9/6539>
- ITC TradeMap database [Accessed July, 2022] www.trademap.org
- Kang, D., Bakun, A., Lin, L., Pauly, D. 2021 The increase of a hypoxia-tolerant fish, the Bombay duck (*Harpadon nehereus*) as a result of ocean deoxygenation off southwestern China. *Environmental Biology of Fishes*. doi: 10.1007/s10641-021-01130-7.
- Kapetas, A. 2022. China's Maritime Deal with Solomon Islands Hints at Dual-use Facilities. Real Clear Defense. [Accessed Oct 8, 2022] https://www.realcleardefense.com/articles/2022/05/19/chinas_maritime_deal_with_solomon_islands_hints_at_dual-use_facilities_833099.html
- Kroodsmas, D.A., Mayorga, J., Hochberg, T., Miller, N.A., Boerder, K., Ferretti, F., Wilson, A., Bergman, B., White, T.D., Block, B.A., Woods, P., Sullivan, B., Costello, C., and Worm, B. 2018. Tracking the global footprint of fisheries. *Science* 359, 904–908. doi: 10.1126/science.aao5646
- Lanteigne, M. 2020. Identity and Relationship-Building in China's Arctic Diplomacy. The Arctic Institute. Available at <https://www.thearcticinstitute.org/identity-relationship-building-china-arctic-diplomacy/>

- Le Ministère des Pêches et de L'Economie Maritime de la République Islamique de Mauritanie. 2016. Protocole d'Accord d'Investissement Conclu entre le Ministère des Pêches et de l'Economie Maritime de la République Islamique De Mauritanie et Fuzhou Hongdong Pelagic Fishery Co. Ltd. [Accessed Sept 1, 2022] <http://www.fiti-mauritanie.mr/wp-content/uploads/2020/12/PROTOCOLE-D-ACCOD-FUZHOU-HONDONG.pdf>
- Lei, J. L. 2010. Strategic thinking on the structure of mariculture industry in China. *China Fisheries Science*. 17(3): 600-609. [in Chinese].
- Li, D. H. 2007. Research on the development of mariculture in China from the perspective of economics. *Ocean University of China*. 200p. [in Chinese].
- Li, L. 2018. Say goodbye to the days with no restrictions, China will not be barbarians in distant water fisheries. Ta Kung Pao. [Accessed Aug 17, 2022] <http://news.takungpao.com/world/exclusive/2018-05/3568443.html>
- Li, L. 2018. Say goodbye to the days with no restrictions, China will not be barbarians in distant water fisheries. Ta Kung Pao. [Accessed Aug 17, 2022] <http://news.takungpao.com/world/exclusive/2018-05/3568443.html>
- Lino, M. 2020. Understanding China's Arctic activities. IISS. Available at <https://www.iiss.org/blogs/analysis/2020/02/china-arctic>
- Liu, N. 2021. China and the Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean. *The Diplomat*. Available at <https://thediplomat.com/2021/06/china-and-the-agreement-to-prevent-unregulated-high-seas-fisheries-in-the-central-arctic-ocean/>
- Liu, Q., Xu, G. J., Yang, S. H., Li, H. F., Xiao, J. N. and Zheng, L. N. 2022. Solutions and suggestions for the treatment of mariculture tail water pollution. *Environmental Ecology*. 4(08): 76-79. [in Chinese].
- Loaiza, Y. 2022. Ecuador commits to giving public access to information on its fisheries. *Mongabay*. [Accessed Aug 30, 2022] <https://es.mongabay.com/2022/03/ecuador-se-compromete-a-dar-acceso-publico-a-informacion-sobre-pesquerias/>
- Ma, Chuang. 2017. China and Madagascar signed the "Memorandum of Understanding between the Government of the People's Republic of China and the Government of the Republic of Madagascar on Jointly Promoting the Construction of the Silk Road Economic Belt and the 21st Century Maritime Silk Road" [In Chinese]. *China National Radio*. [Accessed Sept 7, 2022] <https://www.ydylcn.com/zx/zdfzcc/340310.shtml>
- Mai, K. S. and Zhao, X. G. 2001. Research on Aquatic Animal Nutrition and the Developing Strategy of Fishery Feed in China. *Journal of Zhejiang Ocean University: Natural Science Edition*. 20(B09): 1-5. [in Chinese].
- Mallory, T.G. 2013. China's distant water fishing industry: evolving policies and implications. *Marine Policy*, 38, 99-108. doi.org/10.1016/j.marpol.2012.05.024.
- Mao, Y., Lin, F., Fang, J., Fang, J., Li, J. and Du, M. 2019. Bivalve production in China, p. 51-72 In: A.C. Smaal, J.G. Ferreira, J. Grant., J.K. Petersen and Ø, Strand (eds) *Goods and Services of Marine Bivalves* Springer, Cham.
- Mauritius Chamber of Commerce and Industry. 2019. Free trade agreement between the government of the Republic of Mauritius and the government of the People's Republic of China. [Accessed Sept 7, 2022] <https://www.mcci.org/media/278863/doc-1-mauritius-china-fta-text.pdf>

- Mauritius Chamber of Commerce and Industry. 2019. Free trade agreement between the government of the Republic of Mauritius and the government of the People's Republic of China. [Accessed Sept 7, 2022] <https://www.mcci.org/media/278863/doc-1-mauritius-china-fta-text.pdf>
- MFMR. 2015. Fisheries Management Act 2015 (No.2 of 2015). Ministry of Fisheries and Marine Resources. [Accessed Sept 12, 2022] <https://www.fisheries.gov.sb/mfmr-docs/fisheries-management-act-2015.pdf>
- MFMR. 2017. 2017 Annual Report. Ministry of Fisheries and Marine Resources. [Accessed Sept 12, 2022] <https://www.fisheries.gov.sb/images/annual-reports/1.%20Annual%20Report%202017%20Final.pdf>
- Miller, N., Roan, A., Hochberg, T., Amos, J., and Kroodsma, D.A. 2018. Identifying global patterns of transshipment behaviour. *Frontiers in Marine Science* 5:240. doi: 10.3389/fmars.2018.00240.
- Miller, D.D. and Sumaila, U.R. 2014. Flag use behavior and IUU activity within the international fishing fleet: Refining definitions and identifying areas of concern. *Marine Policy*, 44: 204-211.
- Minister des peche et de L'Economie Maritime. 2016. Accord Sur Les Activites de Peches Dans les Eaux Sous Juridiction Mauritanienes Entre Le Ministere des Peches et De L'Economie Maritime De La Republique Islamique De Mauritanie et L'Associatioin Japonaise De Cooperatives De Peche Au Thon (Japan Tuna Fisheries Cooperative Association). [Accessed Sept 7, 2022] <http://www.fiti-mauritanie.mr/wp-content/uploads/2020/12/ACCORD-JAPAN-TUNA-FISHERIES-COOP.pdf>
- Ministerio de produccion, comercio exterior, inversiones y pesca. 2022. Registro Nacional De Embarcaciones. [Accessed Sept 2, 2022] <https://srp.produccion.gob.ec/registro-nacional-de-embarcaciones/>
- Ministry of Agro-Industry and Fisheries. 2004. Fisheries Division Annual Report 2003. <https://blueeconomy.govmu.org/Documents/7annualreport2003.pdf>
- Ministry of Agro-Industry and Fisheries. 2006. Fisheries Division Annual Report 2004. https://blueeconomy.govmu.org/Documents/6annualreport_2004.pdf
- Ministry of Agro-Industry and Fisheries. 2006. Fisheries Division Annual Report 2004. https://blueeconomy.govmu.org/Documents/6annualreport_2004.pdf
- Ministry of Agro-Industry and Fisheries. 2007. Fisheries Division Annual Report 2005. <https://blueeconomy.govmu.org/Documents/5annrep2005.pdf>
- Ministry of Agro-Industry and Fisheries. 2007. Fisheries Division Annual Report 2005. <https://blueeconomy.govmu.org/Documents/5annrep2005.pdf>
- Ministry of Agro-Industry and Fisheries. 2007. Fisheries Division Annual Report 2005. <https://blueeconomy.govmu.org/Documents/5annrep2005.pdf>
- Ministry of Agro-Industry and Fisheries. 2008. Fisheries Division Annual Report 2006. <https://blueeconomy.govmu.org/Documents/8-fmanagementa.pdf>
- Ministry of Agro-Industry and Fisheries. 2009. Fisheries Division Annual Report 2007. https://blueeconomy.govmu.org/Documents/1-FISHERIES_2007_ANNUAL_REPORT.pdf
- Ministry of Agro-Industry and Fisheries. 2010. Fisheries Division Annual Report 2008. <https://blueeconomy.govmu.org/Documents/2-chap1to9.pdf>

- Ministry of Agro-Industry and Fisheries. 2010. Fisheries Division Annual Report 2008. <https://blueeconomy.govmu.org/Documents/2-chap1to9.pdf>
- Ministry of Agro-Industry and Fisheries. 2011. Fisheries Division Annual Report 2009. <https://blueeconomy.govmu.org/Documents/2-chap1to10.pdf>
- Ministry of Agro-Industry and Fisheries. 2012. Fisheries Division Annual Report 2010. <https://blueeconomy.govmu.org/Documents/4report%202010.pdf>
- Ministry of Agro-Industry and Fisheries. 2013. Fisheries Division Annual Report 2011. https://blueeconomy.govmu.org/Documents/3fisheries_Annual%20report%202011.pdf
- Ministry of Blue Economy, Marine Resource, Fisheries and Shipping. 2020. Annual Report of Performance Fiscal Year 2019/20. https://blueeconomy.govmu.org/Documents/Annual%20Report%2019_20%20Final%20311221.pdf
- Ministry of Blue Economy, Marine Resource, Fisheries and Shipping. 2021. Annual Report of Performance Fiscal Year 2020/21. <https://blueeconomy.govmu.org/Documents/Publications/Annual%20Report%202020-2021.pdf>
- Ministry of Blue Economy, Marine Resource, Fisheries and Shipping. 2020. Annual Report of Performance Fiscal Year 2019/20. https://blueeconomy.govmu.org/Documents/Annual%20Report%2019_20%20Final%20311221.pdf
- Ministry of Blue Economy, Marine Resources, Fisheries and Shipping. 2022. Fisheries Planning and Licensing Division. [Accessed Sept 7, 2022] [https://blueeconomy.govmu.org/Pages/Departments/Albion%20Fisheries%20Research%20Centre%20\(AFRC\)/Fisheries%20Planning%20and%20Licensing%20Division/Fisheries-Planning-and-Licensing-Division.aspx](https://blueeconomy.govmu.org/Pages/Departments/Albion%20Fisheries%20Research%20Centre%20(AFRC)/Fisheries%20Planning%20and%20Licensing%20Division/Fisheries-Planning-and-Licensing-Division.aspx)
- Ministry of Commerce, PRC. Agreement on Fisheries between the Government of the People's Republic of China and the Government of the Islamic Republic of Mauritania. [Access Sept 22, 2022] <http://policy.mofcom.gov.cn/pact/pactContent.shtml?id=47>
- Ministry of Ocean Economy, Marine Resource, Fisheries and Shipping. 2017. Annual Report of Performance Fiscal Year 2016/17. <https://blueeconomy.govmu.org/Pages/Publication/Annual%20Report%20on%20Performance%2016-17%20-%20Min%20of%20Ocean%20Economy.pdf>
- Ministry of Ocean Economy, Marine Resource, Fisheries and Shipping. 2018. Annual Report of Performance Fiscal Year 2017/18. <https://blueeconomy.govmu.org/Documents/Annual%20Report%20on%20Performance%2007-09-2020.pdf?csf=1&e=5KD5Ze>
- Ministry of Ocean Economy, Marine Resource, Fisheries and Shipping. 2019. Annual Report of Performance Fiscal Year 2018/19. https://blueeconomy.govmu.org/Documents/Annual%20Report%2019_20%20Final%20311221.pdf
- Ministry of Ocean Economy, Marine Resource, Fisheries and Shipping. 2017. Annual Report of Performance Fiscal Year 2016/17. <https://blueeconomy.govmu.org/Pages/Publication/Annual%20Report%20on%20Performance%2016-17%20-%20Min%20of%20Ocean%20Economy.pdf>
- Ministry of Ocean Economy, Marine Resource, Fisheries and Shipping. 2018. Annual Report of Performance Fiscal Year 2017/18. <https://blueeconomy.govmu.org/Documents/Annual%20Report%20on%20Performance%2007-09-2020.pdf?csf=1&e=5KD5Ze>

- Ministry of Ocean Economy, Marine Resource, Fisheries and Shipping. 2019. Annual Report of Performance Fiscal Year 2018/19. https://blueconomy.govmu.org/Documents/Annual%20Report%2019_20%20Final%20311221.pdf
- MOA. 2013. Notice for joint venture fisheries in waters east of North Korea in 2013. Ministry of Agriculture and Rural Affairs of the People's Republic of China.
- MOA. 2015. Notice for joint venture fisheries in waters east of North Korea in 2015. Ministry of Agriculture and Rural Affairs of the People's Republic of China.
- MOA. 2017. 2017 China-Mauritania joint fishery committee meeting held at Beijing. Ministry of Agriculture and Rural Affairs of the People's Republic of China.
- MOA. 2017. China, Sierra Leone sign MOU on fisheries cooperation. Ministry of Agriculture and Rural Affairs of the People's Republic of China. Retrieved from http://english.moa.gov.cn/roll/201711/t20171102_298972.html
- MOA. 2017. The Ministry of Agriculture's 2017 workplan for overseas inspection of distant water fleet and assessment of distant water fleet crew. Ministry of Agriculture and Rural Affairs of the People's Republic of China. http://www.moa.gov.cn/gk/tzgg_1/tfw/201701/t20170117_5440615.htm.
- MOA. 2018. The Ministry of Agriculture's 2018 workplan for overseas inspection of distant water fleet and assessment of distant water fleet crew. Ministry of Agriculture and Rural Affairs of the People's Republic of China.
- MOA. 2019. Notice for the 4th batch of confirmed distant water fishery projects in 2019. Ministry of Agriculture and Rural Affairs of the People's Republic of China.
- MOA. 2019. Notice for the 5th batch of confirmed distant water fishery projects in 2019. Ministry of Agriculture and Rural Affairs of the People's Republic of China. [Accessed July 15 2022]. http://www.moa.gov.cn/nybgb/2019/201908/202001/t20200109_6334599.htm
- MOA. 2019. Notice for the 7th batch of confirmed distant water fishery projects in 2019. Ministry of Agriculture and Rural Affairs of the People's Republic of China.
- MOA. 2019. Notice for the 8th batch of confirmed distant water fishery projects in 2019. Ministry of Agriculture and Rural Affairs of the People's Republic of China.
- MOA. 2020a. Notice for the 1st batch of confirmed distant water fishery projects in 2019. Ministry of Agriculture and Rural Affairs of the People's Republic of China. [Accessed July 15 2022]. http://www.moa.gov.cn/nybgb/2020/202003/202004/t20200423_6342188.htm
- MOA. 2020b. Notice for the 3rd batch of confirmed distant water fishery projects in 2019. Ministry of Agriculture and Rural Affairs of the People's Republic of China. [Accessed July 15 2022]. http://www.moa.gov.cn/nybgb/2020/202006/202007/t20200708_6348293.htm
- MOA. 2020. Notice for the 4th batch of confirmed distant water fishery projects in 2019. Ministry of Agriculture and Rural Affairs of the People's Republic of China.
- MOA. 2020. Notice for the 5th batch of confirmed distant water fishery projects in 2019. Ministry of Agriculture and Rural Affairs of the People's Republic of China.
- MOA. 2020c. Notice for the 6th batch of confirmed distant water fishery projects in 2019. Ministry of Agriculture and Rural Affairs of the People's Republic of China. [Accessed July 15 2022]. http://www.moa.gov.cn/nybgb/2020/202008/202010/t20201020_6354677.htm

- MOA. 2020d. Notice for the 7th batch of confirmed distant water fishery projects in 2019. Ministry of Agriculture and Rural Affairs of the People's Republic of China. [Accessed July 15 2022]. http://www.moa.gov.cn/nybgb/2020/202010/202012/t20201201_6357365.htm
- MOA. 2020. Notice for the 8th batch of confirmed distant water fishery projects in 2019. Ministry of Agriculture and Rural Affairs of the People's Republic of China.
- MPEM. 2022. Fishing License. Ministere Des Peches et de L'Economie Marimte. [Accessed Sept 6, 2022] <https://mpem.gouv.sn/services/extra-activities/>
- Mulyungi, P. 2021. Construction of the port of N'Diago in Mauritania nears completions. Construction review Online. [Accessed Sept 7, 2022] <https://constructionreviewonline.com/news/construction-of-the-port-of-ndiago-in-mauritania-nears-completion/>
- Myers, S.L, A. Chang, D. Watkins and C. Fu. 2022. China, With Its Seas Depleted, Casts Nets Off Other's Coasts. The New York Times, Saturday, October 1, 2022, p. A1 and A12-13.
- Naylor, R.L., Kishore, A., Sumaila, U.R., Issifu, I., Hunter, B.P., Belton, B., Bush, S.R., Cao, L., Gelcich, S., Gephart, J.A., Golden, C.D., Jonell, M., Koehn, J.Z., Little, D.C., Thilsted, S.H., Tigchelaar, M., and Crona, B. 2021. Blue food demand across geographic and temporal scales. *Nature Communications*, 12: 5413.
- NBSCXH. 2020. China loans Mauritania \$87m for port construction. [In Chinese] [Accessed Sept 1, 2022] <http://www.nbscxh.com/index.php?m=content&c=index&a=show&catid=30&id=8752>
- Niass, M. L. & Seck, M. 2011. L'accaparement des ressources marines ouest africaines: Sociétés mixtes de façade et licences de complaisance Expériences du Sénégal et de la Mauritanie. Eglises Evangéliques en Allemagne pour le Développement (EED), Germany. <http://hdl.handle.net/1834/4574>
- Ning, X. R., Liu, C. G., Hao, J. and Le, F. F. 2007. Sustainable development of mariculture resources and environment. *Oceanographic Research*. (03):75-83. [in Chinese].
- Nwoye, C. I. 2022. Chinese trawlers with an illegal fishing record have been licensed by Senegal. Quartz Africa. [Accessed Sept 9, 2022] <https://qz.com/africa/1915624/senegal-okays-chinese-boats-with-illegal-fishing-record-greenpeace/>
- Oceana. 2021. China's Global Fishing Footprint Oceana. https://usa.oceana.org/wp-content/uploads/sites/4/Oceana_ChinaFishing_FactSheet_PRINT.pdf.
- Oceanic Development, Poseidon Aquatic Resource Management Ltd and MegaPesca Lda. 2005. [Ex ante evaluation for Senegal], Oceanic Development, Poseidon Aquatic Resource Management Ltd and MegaPesca Lda. 178 p.
- OFweek. 2020. China Ocean Group and MERCOSUR plan to develop distant water fishery base. [Accessed Sept 6, 2022] <https://www.ofweek.com/smartocean/2020-12/ART-190525-8460-30473787.html>
- Oirere, S. 2022. CEPESCA accuses Senegal of denying fishing permits to EU fleet. SeafoodSource. [Accessed Sept 8, 2022] <https://www.seafoodsource.com/news/supply-trade/spain-accuses-senegal-of-denying-eu-fleet-fishing-permits>

- Okafor-Yarwood, I. 2022 African countries must protect their fish stocks from the European Union – here’s how. *The Conversation*. [Accessed Sept 12, 2022] <https://theconversation.com/african-countries-must-protect-their-fish-stocks-from-the-european-union-heres-how-177095>
- Packham, B. 2022 China fishing deal reels in Solomon Islands. *The Australian*, Australia. [Accessed Sept 12, 2022] <https://www.theaustralian.com.au/nation/china-fishing-deal-reels-in-solomon-islands/news-story/24d084cb20a0f42de04d2443cf47f684>
- Palomares, M.L.D., M. Khalfallah, J. Woroniak and D. Pauly. 2020. Assessment of 14 species of small pelagic fish caught along the coast of Northwest African countries. p. 77-108 In: M.L.D. Palomares, M. Khalfallah, J. Woroniak and D. Pauly D (eds.). *Assessments of marine fisheries resources in West Africa with emphasis on small pelagics*, Fisheries Centre Research Report 28(4).
- Pang, L. and D. Pauly. 2001. Part 1 - Chinese marine capture fisheries from 1950 to the late 1990s: the hopes, the plans and the data. p. 1-27. In: R. Watson, L. Pang and D. Pauly (eds.) *The marine fisheries of China: development and reported catches*. Fisheries Centre Research Report 9(2).
- Pauly, D. 2018. A vision for marine fisheries in a global blue economy. *Marine Policy*, Volume 87, 371-374. <https://doi.org/10.1016/j.marpol.2017.11.010>
- Pauly, D. 2019. Micronutrient richness of global catches. *Nature* <https://doi.org/10.1038/d41586-019-02810-2>; <https://rdcu.be/bSRf8>.
- Pauly, D. and F. Le Manach. 2015. Tentative adjustments of China's marine fisheries catches (1950-2010). Fisheries Centre Working Paper #2015- 28, Fisheries Centre, University of British Columbia, Vancouver. 16 p.
- Pauly, D., Belhabib, D., Blomeyer, R., Cheung, W.W.L., Cisneros-Montemayor, A., Copeland, D., Harper, S., Lam, V.W.Y., Mai, Y., Le Manach, F., Österblom, H., Mok, K.M., van der Meer, L., Sanz, A., Shon, S., Sumaila, U.R., Swartz, W., Watson, R., Zhai, Y. and Zeller, D. 2014. China’s distant- water fisheries in the 21st century. *Fish and Fisheries* 15(3): 474-488.
- Peche & Developpement. 2020. Communiqué des professionnels de la pêche artisanale en réaction à la venue de bateaux de pêche chinois au Sénégal. [Accessed Sept 12, 2022] <https://peche-dev.org/spip.php?article296>
- Philippe, J. 2020. Senegal: The Ministry of Fisheries will not grant licenses to the 54 vessels of Chinese and Turkish origin. CAPECFFA. [Accessed Sept 9, 2020] <https://www.capecffa.org/blog-actualites/sngal-le-ministre-de-la-pche-noctroiera-pas-de-licences-aux-54-navires-dorigine-chinoise-et-turque>
- Philippe, J. 2020a. EU-Senegal Fisheries Agreement: asking “the right questions”. CAPECFFA. [Accessed Sept 12, 2022] <https://www.cffacape.org/news-blog/eu-senegal-fisheries-agreement-asking-the-right-questions>
- Philippe, J. 2020b. Senegal: The Ministry of Fisheries will not grant licenses to the 54 vessels of Chinese and Turkish origin. CAPECFFA. [Accessed Sept 9, 2020] <https://www.capecffa.org/blog-actualites/sngal-le-ministre-de-la-pche-noctroiera-pas-de-licences-aux-54-navires-dorigine-chinoise-et-turque>
- Philippe, J. 2022. EU-Mauritania SFPAs: The request of the Mauritanian artisanal fisheries and civil society. Coalition for fair fisheries arrangements. [Accessed Sept 2, 2022] <https://www.cffacape.org/publications-blog/eu-mauritania-sfpa-the-requests-of-the-mauritanian-artisanal-fisheries-and-civil-society>

- PNA. 2022. PNA vessel day scheme. The Parties to the Nauru Agreement. [Accessed Sept 6, 2022] <https://www.pnatuna.com/content/pna-vessel-day-scheme>
- Prieur, L. 2011. Mauritanian opposition seethes at China fish deal. Reuters. [Accessed Sept 2, 2022] <https://www.reuters.com/article/ozabs-mauritania-china-fish-20110608-idAFJOE7570JS20110608>
- Raftopoulos and Nissen, 2021. EU and China's strategic partnership on the Blue Economy. Routledge
- Relano, V., M.L. D. Palomares and D. Pauly. 2021. Comparing the performance of four very large marine protected areas with different levels of protection. *Sustainability* 13, 9572, doi.org/10.3390/su13179572
- Sacks, D. 2022. Countries in China's Belt and Road Initiative: Who's In and Who's Out. [Accessed Sept 1, 2022] <https://www.cfr.org/blog/countries-chinas-belt-and-road-initiative-whos-and-whos-out>
- Samb, B. and D. Pauly. 2000. On 'variability' as a sampling artefact: the case of Sardinella in North-western Africa. *Fish and Fisheries* 1: 206-210. doi 10.1046/j.1467-2979.2000.00016.x.
- Shanghai Fisheries Group Co Ltd. 2012. Information for the 1st fundraising of short-term bond in 2012. Shanghai Fisheries Group Co. Ltd. http://pg.jrj.com.cn/acc/CN_DISC/BOND_NT/2012/08/15/ls0000000000005t6ch.pdf
- Sheng, H., Huang, S. 2021. China's policies and practice on combatting IUU in distant water fisheries. *Aquaculture and Fisheries*, 6(1), 27-34. doi.org/10.1016/j.aaf.2020.03.002.
- Song, H. Q., Gu, C. C. and Zhang, Y. L. 2019. Tail water treatment methods for aquaculture systems. *Anhui Agricultural Science Bulletin*. 25(22):85-87. doi10.16377/j.cnki.issn1007-7731.2019.22.032. [in Chinese].
- SSAP. 2017. China and Madagascar signs the "Memorandum of understanding between the government of the People's Republic of China and the government of the Republic of Madagascar on jointly promoting the construction of the silk road economic belt and the 21st century maritime silk road". [In Chinese] [Accessed Sept 2, 2022] <https://www.ydylcn.com/zx/zdfzcc/340310.shtml>
- SSAP. 2022. China and Madagascar signs the "Memorandum of understanding between the government of the People's Republic of China and the government of the Republic of Madagascar on jointly promoting the construction of the silk road economic belt and the 21st century maritime silk road". [In Chinese] [Accessed Sept 2, 2022] <https://www.ydylcn.com/zx/zdfzcc/340310.shtml>
- Sumaila, U.R., Ebrahim, N., Schuhbauer, A., Skerritt, D., Li, Y., Kim, H.S., Mallory, T.G., Lam, V.W.L., and Pauly, D. 2019b. Updated estimates and analysis of global fisheries subsidies. *Marine Policy*, 109, 103695. doi.org/10.1016/j.marpol.2019.103695.
- Sumaila, U.R., Skerritt, D., Schuhbauer, A., Ebrahim, N., Li, Y., Kim, H.S., Mallory, T.G., Lam, V.W.L., and Pauly, D. 2019a. A global dataset on subsidies to the fisheries sector. *Data Brief* 27, 104706. doi: 10.1016/j.dib.2019.104706.
- Sumaila, U.R., Zeller, D., Hood, L., Palomares, M.L.D., Li, T., and Pauly, D. 2020. Illicit trade in marine fish catch and its effects on ecosystems and people worldwide. *Science Advances*, 6(9), DOI: 10.1126/sciadv.aaz3801.
- The Fishing Daily. 2022. Fisheries MEPs call on Senegal to unlock fishing partnership with the EU. [Accessed Sept 8, 2022] <https://thefishingdaily.com/latest-news/fisheries-meps-call-on-senegal-to-unlock-fishing-partnership-with-the-eu/>

- The Parties to the Nauru Agreement. 2022. PNA vessel day scheme. [Accessed Sept 6, 2022] <https://www.pnatuna.com/content/pna-vessel-day-scheme>
- Tickler, D., Bryant, K., David, F., Forrest, J.A.H., Gordon, E., Meeuwig, J., Oh, B., Pauly, D., Sumaila, U.R., and Zeller, D. 2018. Modern slavery and the race to fish. *Nature Communications*, 9(1):4643; doi 10.1038/s41467-018-07118-9.
- Tsui, G., Derrick, B., de Leon, S., Parducho, V., Popov, S., Noël, S.-L., Relano, V., and Ik Zhang, C. 2020. Countries of the northwest Pacific: Updating catch reconstructions to 2018, p. 102-121. In: B. Derrick, M. Khalfallah, V. Relano, D. Zeller and D. Pauly (eds). Updating to 2018 the 1950-2010 Marine Catch Reconstructions of the Sea Around Us. Part II: The Americas and Asia-Pacific. Fisheries Centre Research Report 28(6).
- UndercurrentNews. 2020. China provides \$87 million loan for Mauritania to build large fishing port in Mauritania [In Chinese] (L. Hu, Trans.). [Accessed Sept 22, 2022] <http://www.nbscxh.com/index.php?m=content&c=index&a=show&catid=30&id=8752>
- Urbina, I., 2019. The outlaw ocean: crime and survival in the last untamed frontier. Random House.
- Valentine, M. 2021. Now You See Me, Now You Don't: Vanishing Vessels Along Argentina's Waters. OCEANA. Accessed [27 July 2022]. Retrieved from <https://doi.org/10.5281/zenodo.4118526>.
- Vidal, J. 2012. Senegal revokes licenses of foreign fishing trawlers. The Guardian. [Accessed Sept 12, 2022] <https://www.theguardian.com/environment/2012/may/04/senegal-revokes-licences-foreign-fishing-vessels>
- Vidal, J. 2012a Senegal's fishing community will act on foreign fleets if government doesn't. The Guardian. [Accessed Sept 12, 2022] <https://www.theguardian.com/global-development/2012/apr/02/senegal-fishing-community-act-foreign-fleets>
- Vidal, J. 2012b Senegal revokes licenses of foreign fishing trawlers. The Guardian. [Accessed Sept 12, 2022] <https://www.theguardian.com/environment/2012/may/04/senegal-revokes-licences-foreign-fishing-vessels>
- Vigo Empresa 2005 El Cluster de Empresas Pesqueras en Países Terceros se pone en marcha. [Accessed Oct 5, 2022] <https://www.vigoempresa.com/el-cluster-de-empresas-pesqueras-en-paises-terceros-se-pone-en-marcha/>
- Watkins, K., Gutierrez, M. and Matheson, I. 2016. Western Africa's missing fish: the impacts of illegal, unreported and unregulated fishing and under-reporting catches by foreign fleets. ODI. Retrieved from <https://odi.org/en/publications/western-africas-missing-fish-the-impacts-of-illegal-unreported-and-unregulated-fishing-and-under-reporting-catches-by-foreign-fleets/>
- Watson, R. and Pauly, D. 2001. Systematic distortions in world fisheries catch trends. *Nature* 414: 534-536. doi 10.1038/35107050.
- WCPFC. 2022. Vessels in the RFV by vessel type. WCPFC. <https://www.wcpfc.int/vessels/charts/types>.
- WCPFC. 2022. Annual report to the commission. Part I: Information on Fisheries, Research, and Statistics. WCPFC-SC18-AR/CCM-22. Western and Central Pacific Fisheries Commission. <https://meetings.wcpfc.int/node/15337>

- Western And Central Pacific Fisheries Commission. 2022. Annual report to the commission. Part I: Information on Fisheries, Research, and Statistics. WCPFC-SC18-AR/CCM-22. Western and Central Pacific Fisheries Commission. <https://meetings.wcpfc.int/node/15337>
- White, C. and Costello, C. 2014. Close the high seas to fishing? *PLoS biology*, 12(3), p.e1001826.
- White, E.R., Baker-Médard, M., Vakhitova, V., Farquhar, S., and Ramaharitra, T.T. 2022. Distant water industrial fishing in developing countries: a case study of Madagascar. *Ocean and Coastal Management*, 216, 105925. doi.org/10.1016/j.ocecoaman.2021.105925.
- World Trade Organization. 2022. Agreement on Fisheries Subsidies. Available at https://www.wto.org/english/tratop_e/rulesneg_e/fish_e/fish_e.htm
- World Trade Organization. 2022. Put landmark Fisheries Subsidies Agreement into motion, governments urged at Public Forum. Available at https://www.wto.org/english/news_e/news22_e/fish_29sep22_e.htm
- XinHua News Agency. 2022. Joint Statement of the People’s Republic of China and the Republic of Ecuador in Deepening China-Ecuador Partnership. [Accessed Sept 6, 2022] http://www.gov.cn/xinwen/2022-02/05/content_5672141.htm
- Xue, G. 2006. China’s distant water fisheries and its response to flag state responsibilities. *Marine policy*, 30:651-658.
- Yang, M. J., Wu, D., Wang, W. and Min, W. W. 2020. Research progress in aquaculture tail water treatment. *Agricultural extension service*. 37(09):114-116. [in Chinese].
- Yang, X., Wang, L., Zhang, A., Liu, X., Bidegain, G., Zong, H., Guan, C., Song, M., Qu, L., Huang, W. and Yuan, X., 2019. Levels, sources and potential risks of polychlorinated biphenyls and organochlorine pesticides in sediments of Qingduizi Bay, China: does developing mariculture matter? *Frontiers in Marine Science*, 6, p. 602
- Yang, Y. H. 2021. New opportunity for the development of the beach shellfish industry. *Aquaculture*. (10): 73-76.
- Yozell, S., and Shaver, A. 2019. Shining a Light: The Need for Transparency across Distant Water Fishing. The Stimson Center, Washington D.C. 52 p.
- Yue, D., Wang, L., Huang, H., Zheng, H., Feng, C., and Xiong, M. 2016. Research on Countermeasures for Deep-sea Fishery Development in China. *Journal of Agricultural Science and technology* 18(2): 156-164. <https://www.cnki.net/kcms/doi/10.13304/j.nykjdb.2015.524.html>.
- Yue, D., Wang, L., Zheng, H., Tang, F., and Zhang, H. 2014. The Status and Technological Expectations of Distant Water Squid Jigging Fisheries in China. *Resource Science*, 36(8): 1686-1694.
- Zhang, S. 2022. Development of mariculture from 2016 to 2020. *Hebei Fisheries*. (04): 34-37. [in Chinese].
- Zhang, Y., et al. (2011) Current Status and Development Prospects of Small Pelagic Fish Resources Off Sea Area of Mauritania. *Modern Fisheries Information*, 26(6): 13-16.
- ZheJiang Ocean Family Co. Ltd. 2022. Tuna long line fleet. <http://www.zheyu.cn/fleet01.asp?id=1>
- ZheJiang Ocean Family Co. Ltd. 2022. Tuna purse seine fleet. <http://www.zheyu.cn/fleet01.asp?id=2>

- Zhou, A., Zhang, X., Feng, C., and Yu, Y. 2021. Optimization and experiment of the mid-water trawl for ocean medium single trawlers. *Transactions of the Chinese Society of Agricultural Engineering*, 37(23): 28-34.
- Zhu, Z. H. 2021. Efficiency analysis of mariculture in China. *Anhui Agricultural Sciences*, 49(24): 213-216. [in Chinese].

ANNEX 1 – DESCRIPTION OF SOURCES USED FOR DATA COLLECTION

The main sources used to prepare section 1.1 of the overview were:

- Sea Around Us catch data for Mainland China as a ‘fishing entity’ (see www.searoundus.org) were used to provide an overview of the domestic and distant-water catches by Chinese fishing fleets. Domestic marine catches, based on FAO and other sources are provided for 1950 to 2019, and maps are provided of where the Mainland Chinese Distant-Water Fleets (DWFs) operated in 2018-2020. They did not consider, except in a few cases, the beneficial ownerships of the fleet, which are generally hidden through a number of shell companies registered in tax heavens. A similar situation applies to legal and illegal transshipments, although, in this case, it was possible to provide maps showing where most transshipments involving Mainland Chinese vessels are presented.
- Global Fishing Watch (GFW) and Regional Fisheries Management Organization (RFMO) datasets:
 - i. Chinese-flagged vessels recorded in the GFW dataset (version 2022) for the period 2018-2020 were extracted as a CSV file. This period was chosen because it is likely less impacted by the lower GFW coverage of earlier years, i.e., there were less observations in 2012 and AIS data improved from 2013 onwards. Also, only vessels with haul hours >100 hours were used in the mapping process. The assumption here is that haul hours <100 hours might not be representative of fishing behaviour. Filtering for >100 hours seems to reduce data with fishing hours information by only 0.1-1.0%, and thus will not have a large impact on the data spread. Note, however, that vessels actually fishing but reporting <100 haul hours have been excluded from the analyses. The CSV files were then converted into shapefiles using the Sea Around Us base map of 150,000 half degree cells to create the heat maps of the annual average number of vessels per half degree cell;
 - ii. RFMO-licensed Chinese vessels for the period 2012-2022 were extracted from the websites of the Inter-American Tropical Tuna Commission (IATTC), International Commission for the Conservation of Atlantic Tunas (ICCAT), Indian Ocean Tuna Commission (IOTC), South Pacific Regional Fisheries Management Organization (SPRFMO), and Western and Central Pacific Fisheries Commission (WCPFC). RFMO-listed vessels that are in the GFW dataset for the same years were kept in the GFW database. These were subtracted from the vessel number per year estimations in the RFMO dataset. This combined list of the number of fishing vessel IDs (MMSIs) by year was then graphed together with the number Chinese (DWF) vessels estimated earlier for a report to the European Parliament, covering the Chinese DWF in the period from 2000 to 2011 (Blomeyer *et al.* 2012) and subsequently published in the primary literature (Pauly *et al.* 2014).
 - iii. Supplementary data on number of Chinese vessels operating in a specific region in a specific year were assembled from primary and grey literature (including Chinese, French and Spanish language documents). Such data were obtained from descriptions of Chinese-flagged vessels or vessels likely to be owned by Chinese enterprises, but using flags of convenience (Miller and Sumaila 2014) when operating within the 200-mile Exclusive Economic Zones (EEZs) of our 6 focal countries in 3 oceans (Eastern Atlantic: Mauritania and Senegal; Western Indian Ocean: Mauritius and Madagascar; Western Pacific: Solomon Islands; and Eastern Pacific: Ecuador). The required data were assembled for the years 2011-2021 and data from Pauly *et al.* (2014) were

added to extend the time series to the earlier periods covered in the earlier studies of Blomeyer *et al.* (2012) and Pauly *et al.* (2014).

Two sources of data were used to characterize the mariculture of China by province and for the entire country: (1) the annual production statistics for mariculture from 1950 to 2010 were downloaded from the website of the Sea Around Us, i.e., <https://www.seaaroundus.org/> (Campbell *et al.* 2013, 2016) and, (2) for 2011 to 2019, official Chinese production data by provinces, and data from various publications (Liu *et al.* 2022; Zhang 2022; Zhu 2021).

Contrary to the catch statistics of the Chinese marine fisheries, which suffered from major deficiencies (Watson and Pauly 2001), and which have persisted (Tsui *et al.* 2020), China's mariculture statistics appear to reflect the realities on the ground (Campbell *et al.* 2013, 2016). Thus, the only modifications of official data that were performed were interpolation for years with 'zeroes' that were representing missing data. In such cases, gaps were linearly interpolated to avoid distorting otherwise obvious trends.

The production data assembled here focus on commercial groups including molluscs (mainly bivalves), fish, crustaceans and other invertebrates, which in this instance refer to the output of farming activities for human consumption. Algae are not included, mainly because they are not widely produced or consumed in other countries, although they are now, in China, the most abundant mariculture product.

Regarding section 1.3. on import and export of fisheries and aquaculture products, the approach adopted has been one of travelling from the general to the particular, i.e. looking at the big picture to identify relevant topics then moving on to assess these in greater detail. This means that the research has been structured as follows:

- Overview – analysis of China's fisheries imports, exports and trade balance by major product category – e.g. fresh fish, frozen fish, fillets, crustacea etc, 2012 to 2021
- Geographic: China's seafood trade by major origin (imports) and destination (exports) 2012 to 2012
- Resource related: Trade by key species or species groups – to tease out the significant species that have a high profile in Chinese seafood trade and thus are likely to reflect the stocks subject to significant impact from Chinese activities.

These three analytical stages provide the basis for subsequent specific, detailed and relevant analysis expressed through brief case studies, based upon:

- Relevance to the 6 case study third countries
- Prospects for providing insights regarding implications for the EU, especially the protection of EU interests
- Significant wider global environmental, socio-economical and geopolitical implications

The data used in this analysis is mostly that provided by the World Trade Organisation (WTO) through its International Trade Centre (ITC) TradeMap website and the FAO through its FishStat database.

Section 2 was prepared on the basis of a desk review of published reports, news articles, press releases, and peer-reviewed journals of English and Chinese language from news sources, non-governmental organizations, and government websites were searched for in search engines of Chinese journals, university library, Google Scholar, and Google. Keywords that were used, but not limited to, are "Fisheries Access Agreement", "Sustainable Fisheries Partnership Agreement", "Fishing right", "Joint ventures", "Fisheries permit", "Distant water fleet", "Foreign fisheries", "Fisheries transparency", "捕鱼

协定”, “捕鱼权”, “中非合作”, “一带一路”, “渔业投资”, “21世纪海上丝绸之路建设”, and “远洋渔业”. Websites of different government ministerial branches of the six focus countries, China, and the European Commission were also surveyed for information related to access agreements or practices in licensing to foreign vessels.

Data on the subsidies that China provides to its fisheries fleets were obtained from the database described in Sumaila *et al.* (2019b), which was based on Sumaila *et al.* (2019a), and estimated subsidies converted to ‘real’ 2018 US dollar values using 2017 exchange rates and average annual Consumer Price Indices. This database is used by the Geneva-based World Trade Organization (WTO) as key element of its between-countries negotiations on global fisheries subsidies; the subsidy estimates this database contains have so far not been challenged by the delegates of any country.

This database differentiates between subsidies classified as ‘beneficial’ (e.g., ensuring safety at sea, conduction scientific research devoted to assessing the status of exploited stocks), ‘harmful’ subsidies (i.e., subsidies that enhance fishing capacity, e.g., tax-free fuel, or cheap loans for ship-building) and ‘ambiguous’ subsidies (whose impact on fishing intensity is context-dependant).

The data used in the section on the IUU were gathered according to the methodology described in Specific Objective 1.1. In addition, Sea Around Us reconstructed catch data was used to estimate the scope of the likely ‘illicit’ trade from unreported catches using the method described in Sumaila *et al.* (2020). Illicit trade is defined as trade that “involves money, goods or value gained from illegal and generally unethical activity. It encompasses a wide variety of illegal trading activities, including human trafficking, environmental crime, illegal trade in natural resources, various types of intellectual property infringements, trade in certain substances that cause health or safety risks, smuggling of excisable goods and trade in illegal drugs, as well as a variety of illicit financial flows” (Annual Report of the Global Agenda Councils 2011-2012, 2012).

Sumaila *et al.* (2020) argues that unreported catches can thus be used to provide an estimate that can be related to illegal and unregulated catches. Note also that not all unreported catches are illegal, i.e., small-scale artisanal, subsistence and recreational catches are often not recorded and thus not reported. Thus, it is safe to assume that only a part of unreported catches would go into the illicit trade stream. Sumaila *et al.* (2014) assumes that only industrial (50-80%) and artisanal (30-50%, or more conservatively 10-30%) fisheries catches are subject to illicit trade. Furthermore, they also assume that neither subsistence nor recreational fisheries catches are subject to illicit trade.

Known limitations of the China (mainland) catch data, and their reconstructions (see, e.g., Pauly and Le Manach 2015; Tsui *et al.* 2020) prevent us from estimating the catch that maybe subject to illicit trade in the artisanal and industrial sectors in China’s own waters. However, distant-water fleets belong to the industrial sector by definition. Thus, based on Sumaila *et al.* (2020), we provide here an estimate of potential illicit trade based on unreported catches estimated by the Sea Around Us to be taken by the Chinese distant-water fleets since its entry into the industry in the 1980s (see also Shen and Huang, 2021). This initial estimation is supplemented with data obtained from primary and grey literature.

ANNEX 2 – LIST OF STAKEHOLDERS CONSULTED

- AAC – Aquaculture Advisory Council, 6 October 2022
- AIPECEE - EU Fish Processors and Traders Association, 7 October 2022
- ClientEarth, 10 October 2022
- EJF – Environmental Justice Foundation, 6 October 2022
- European Federation of Food, Agriculture and Tourism Trade Unions (EFFAT), 10 October 2022
- Europêche, 17 October 2022
- FEAP - Federation of European Aquaculture Producers, 11 October 2022
- KFO – Killybegs Fishermen’s Organisation Ltd., 6 October 2022
- LDAC – Long Distant Fleet Regional Advisory Council, General Secretary, 14 October 2022
- Oceana, 10 and 13 October 2022
- Spanish Association of Wholesalers, Importers, Manufacturers and Exporters of fish products and Aquaculture (Conxemar), 19 October 2022
- Unit A4, Fisheries control policy, Directorate A Policy Development and Coordination, Directorate General Maritime Affairs and Fisheries, European Commission, 3 October 2022
- Visvederatie, 10 October 2022
- World Wildlife Fund - International WWF Centre for Marine Conservation, China Office, 14 October 2012
- World Wildlife Fund - International WWF Centre for Marine Conservation, 17 October 2012

ANNEX 3 - PSMA SUPPORT PROGRAMMES APPROVED FOR THE SIX FOCUS COUNTRIES

The following table presents a list of projects where the recipient and beneficiary of programme aid include the six focus countries in this study. Data obtained from the Agreement on Port State Measures (PSMA) support programme information portal⁵⁹ i.e., projects designed to build capacity to combat and mitigate illegal, unreported and unregulated fisheries.

⁵⁹ Global Records Information System: <https://www.fao.org/global-record/information-system/en/>, and the Global Capacity Development Portal: <https://www.fao.org/iuu-fishing/capacity-development/en/>.

Table 4: List of projects

Code	Approval Date	Start Date	End Date	Funds (\$US)	Recipients	Beneficiaries
GCP/INT/313/SWE	31/05/2018	03/06/2018	30/12/2022	5 800 600	Cambodia Equatorial Guinea Mauritania Mozambique Panama Papua New Guinea Saint Lucia Saint Vincent and the Grenadines Solomon Islands Sri Lanka Sudan Vanuatu Viet Nam	Panama Saint Vincent and the Grenadines Sri Lanka Equatorial Guinea Papua New Guinea Mozambique Saint Lucia Solomon Islands Cambodia Viet Nam Mauritania Vanuatu Sudan
GCP/GLO/1047/GER	16/12/2021	31/12/2021	30/12/2026	4 587 156	Gambia Kenya Madagascar Senegal	Kenya Madagascar Gambia Senegal
GCP/INT/307/NOR	10/12/2017	31/12/2017	30/12/2022	2 370 194	Ghana Indonesia Madagascar Namibia Papua New Guinea Sri Lanka	Namibia Madagascar Sri Lanka Ghana Papua New Guinea Indonesia
Pew-FFAGapAnalysis	12/06/2016	12/06/2016	18/04/2017	85 000	Cook Islands Fiji Kiribati Marshall Islands Micronesia (Federated States of) Nauru Niue Palau Samoa Solomon Islands Tonga Tuvalu Vanuatu	Samoa Nauru Tonga Fiji Micronesia (Federated States of) Niue Palau Kiribati Solomon Islands Tuvalu Cook Islands Marshall Islands Vanuatu
GCP/INT/321/EC	11/03/2018	12/03/2018	11/12/2021	1 803 617	Costa Rica Ecuador Peru	Peru Costa Rica Ecuador

ANNEX 4 - ADDITIONAL DATA RELATED TO IMPORT AND EXPORT OF FISHERIES AND AQUACULTURE PRODUCTS (FAPS)

Introduction

The data used in this analysis is mostly that provided by the World Trade Organisation (WTO) through its International Trade Centre (ITC) TradeMap website and the FAO through its FishStat database. Trade data is available for the 12 year review period (2012-2021), but that for 2021 is provisional and subject to possible future change. Much of this data is disaggregated to provide specific detail, but also unfortunately a lot of the data is aggregated in various “other” categories and thus relatively uninformative. Accordingly use is made of data where possible but in some cases the picture will inevitably be only partial. The analysis should then be viewed accordingly, and is anyway largely dependent upon the governments involved. Indeed, the risks of misstatement are made apparent in one of the detailed analyses undertaken.

The trade data generally shows quantities in terms of product weight, but for the purpose of this review, one of the more important indicators is the quantity of raw fish used in making these products. This can then be related to the output from respective capture or culture that provided the raw material, and thus provides an indication of the quantity of the resource involved. The convention is to convert traded products to whole/live fish weight so that a common quantity can be used throughout – this being “live weight” or whole fish equivalent (WFE). This is used throughout much of this trade section. Appendix 2 provides the conversion factors used, some qualifying notes and details of the sources for those conversion factors. The tables and graphs presented below show whether the data is shown in product weight or whole fish equivalent (WFE) terms

The approach taken in this analysis is move from the general to the particular – so initially the trade as a whole is assessed, and from this the key relevant aspects are identified for more detailed analysis. This subsequently covers origins of imports and destinations of Chinese exports as well as the species or species groups involved.

Overview

From a trade perspective it is clear that China’s role in the global fish and seafood sector is changing. Over the past decade volumes have increased steadily by 3% pa (and faster at 5% pa in WFE terms). As the table below shows, imports reached over 4.4 million tonnes (product weight) in 2019 but have dropped back subsequently, no doubt with the pandemic a major factor (the clamp down on eating out, probably exacerbated by rumours that Covid-19 could be imported in frozen seafood). The “headline” characteristics of the trade – which is of course huge along with most aspects of the Chinese economy - can be summarised as:

- China imports of fish and seafood have risen to over 4 million tonnes within the past 10 years, but may have been tailing off latterly if provisional data is to be believed. In the perhaps more meaningful whole fish terms (WFE), Chinese imports have settled down at 5.5-6 million tonnes, and are valued at \$13-14bn annually.
- Expressed as product weight, exports were lower (3.7-4.2 million tonnes), but much exceed imports when converted to WFE values (7.6 to 8.9 million tonnes) worth around \$20bn annually.

However, although scale clearly dominates any perception of Chinese seafood economy, it is the ways in which it is changing that are currently more interesting. Taking imports and then exports in turn, this section starts by assessing the key indicators of this change.

2.1 China's Seafood Imports

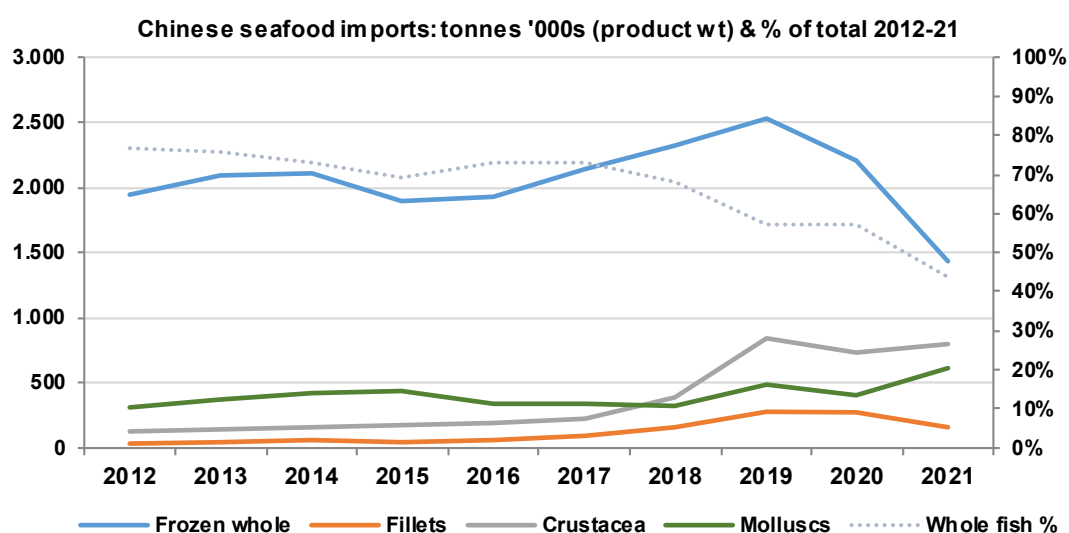
It is in the makeup of the trade that the change is most apparent. Chinese imports are dominated by whole frozen fish and have been for the past decade (and previously) – accounting for 65% of the total. Together with shellfish, frozen fish accounts for a very dominant 90% of imports and taken together these categories have consistently been the major contributors to seafood imports.

Table 5: Chinese imports of fish & seafood from 2012-2021 by main category, product weight

Units tonnes '000s	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Makeup
Live fish	11	16	15	13	14	16	22	26	16	25	1%
Fresh fish	22	21	39	57	49	55	90	105	65	78	2%
Frozen fish	1,951	2,090	2,101	1,889	1,935	2,143	2,313	2,529	2,203	1,433	65%
Fillets	34	48	54	51	61	88	156	278	276	167	4%
Cured dried fish	4	4	3	3	6	22	24	47	69	43	1%
Crustacea	128	144	153	175	195	223	381	842	739	794	12%
Molluscs	312	368	414	432	335	333	326	494	401	613	13%
Other	7	4	3	4	5	7	16	43	29	51	1%
Value-added fish	6	11	13	14	16	19	24	30	35	26	1%
Value- added shellfish	69	62	79	87	31	38	39	43	27	48	2%
Total	2,543	2,768	2,874	2,724	2,647	2,944	3,391	4,437	3,861	3,277	100%
WFE*	3,581	3,966	4,200	4,083	3,797	4,235	4,915	6,868	6,064	5,577	
Value \$billion	\$5.7	\$6.2	\$6.8	\$6.6	\$7.1	\$8.3	\$11.9	\$15.8	\$12.7	\$13.7	

Source: ITC TradeMap *WFE whole fish equivalent or live weight

But frozen fish imports have actually been falling as the graph below makes clear. The rapid reduction after 2019 highlights the change. Covid-19 and associated continued lockdowns in China might explain the steep reduction in 2021-21, but the curve showing the whole fish % of China's total fish trade shows clearly that the decline began much earlier - in 2017 - and suggests this is a key underlying event. At the same time, imports of shellfish have been growing very rapidly (14%pa) and some minor seafood categories have been growing even faster – most notably fillet products. What appears to be happening is a consistent underlying trend towards increasing higher value imports that are offsetting a decline in arrivals of frozen raw material.

Figure 11: Chinese seafood imports


Source: ITC TradeMap

China's Seafood Exports

Chinese seafood exports always exhibited a very different profile to that of imports. Whilst this is not surprising, it is instructive. Some whole frozen fish is exported but it is fillets that dominate (especially when their importance is highlighted through conversion to WFE values). Added to this are sizable quantities of secondarily processed (value-added) seafood (fish and shellfish). Taken together these four categories accounted for close to 80% of all seafood exports, with molluscs (squid mostly) the only other significant category.

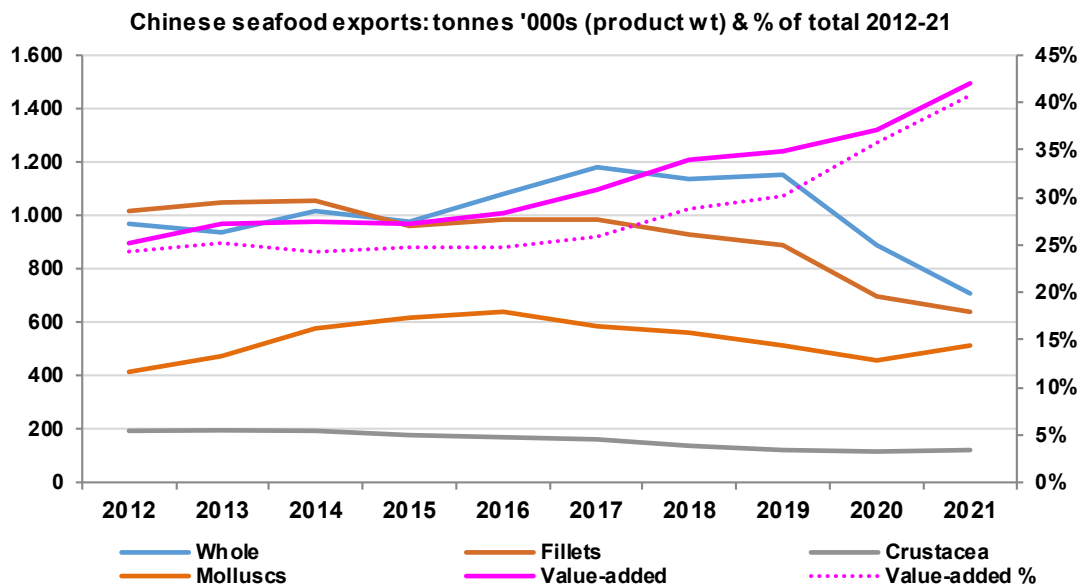
Table 6: Chinese exports of fish & seafood from 2012-2021 by main category, product weight

Units tonnes '000s	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Makeup
Live fish	80	90	91	94	89	82	89	93	98	99	2%
Fresh fish	35	38	28	28	28	20	21	25	33	36	1%
Frozen fish	966	935	1,018	977	1,078	1,181	1,135	1,152	891	708	25%
Fillets	1,014	1,048	1,055	962	984	983	930	892	696	639	23%
Cured dried fish	78	81	77	75	79	95	98	84	64	55	2%
Crustacea	189	195	194	177	171	161	140	117	116	120	4%
Molluscs	414	470	573	616	639	586	557	510	454	510	14%
Other	11	13	12	10	9	9	9	8	6	6	0%
Value-added fish	504	568	612	644	662	703	794	869	977	1,058	19%
Value-added shellfish	392	400	366	324	348	392	416	375	341	437	10%
Total	3,685	3,839	4,026	3,907	4,086	4,211	4,189	4,125	3,676	3,667	100%
WFE	7,847	8,261	8,674	8,426	8,754	8,906	8,829	8,581	7,619	7,745	
Value \$billion	\$18.1	\$19.4	\$20.9	\$19.6	\$20.0	\$20.4	\$21.5	\$19.9	\$18.3	\$21.1	

Source: ITC TradeMap *WFE whole fish equivalent or live weight

In terms of quantity, Chinese seafood exports have been static over the past decade at 3.6 million tonnes, but did rise during the middle of the decade, peaking at 4.2 million tonnes in 2017. However when translated into WFE, the figures are much higher (at 7.8 and almost 9 million tonnes respectively) – as would be expected given that processing leads to the discarding of as much as two thirds of the fish concerned. Seen this way, China is a net exporter of seafood, ostensibly demonstrating a substantial contribution to exports from domestic production (by capture and culture).

Figure 12: Chinese seafood exports: tonnes '000s & % of total 2012-2021



Source: ITC TradeMap

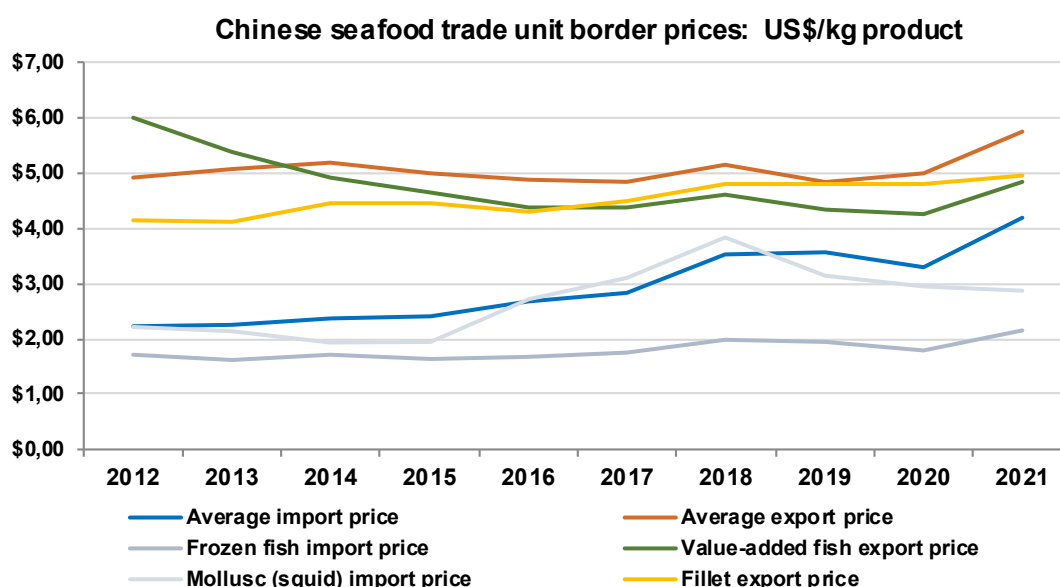
The overall rise and demise pattern apply similarly to most categories of exports. The outlier is highly processed (value-added) seafood which has shown continuous rapid growth (6% pa), especially for fish per se, as opposed to shellfish. The overall outcome has then been a reduction of most of the primarily processed products exported, following a peak in 2017-18, largely offset by a rapid rise in their secondarily processed (value-added) alternatives. China's seafood processing sector has apparently been upping its game.

Trade balance

What explains this import/export pattern is China's well established role in the global seafood sector as a specialist processor rather than a primary producer. Whole frozen fish are imported and processed fish – usually fillet – is exported, sometimes back to the original country of origin of the raw fish. It is within this basic processing segment that the change mentioned above has become evident over the past 3-4 years. In short China is processing less fish for export, but adding more value to what it does process and export, indicated by a move away from fillet and towards value-added products.

But something else is also happening. The graph below, which shows average unit border prices, demonstrates that exports have seen little change in prices (except in 2021 which may be erroneous as the data is provisional). In contrast, import prices have been rising steadily and it appears that China is trading up when importing. The combined impact of higher unit values and the increase in shellfish imports – which are invariably high ticket items - appears to be the cause.

Figure 13: Chinese seafood trade unit border prices

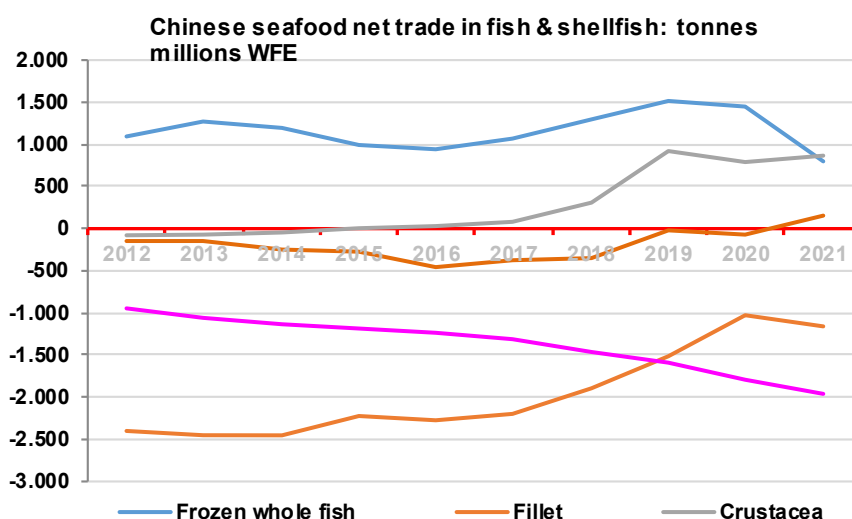


Source: ITC TradeMap

The final graph in this series, shown below, looks at the net trade position. The lines above the horizontal axis (which is in the middle of the graph) represent net imports, those below this axis, being the net exports. The way these have evolved over the past decade is instructive:

- Whilst declining in relative terms as an import, net trade in whole frozen fish has remained largely steady until just recently
- And shellfish trade has switched from net Chinese deficit to net surplus –i.e. more shellfish is being consumed in China. For crustacea, which is dominated by shrimp, the transition occurred between 2014 and 2015 – a period when commentators on the shrimp farming industry had suggested that China was indeed moving from being a net exporter to net consumer of shrimp. The same has recently happened to molluscs (dominated by squid).
- But perhaps the most striking aspect to emerge from the graph is the clarity regarding the trend in net exports moving away from primary processed fillet towards secondary value-added products.

Figure 14: Chinese seafood net trade in fish & shellfish



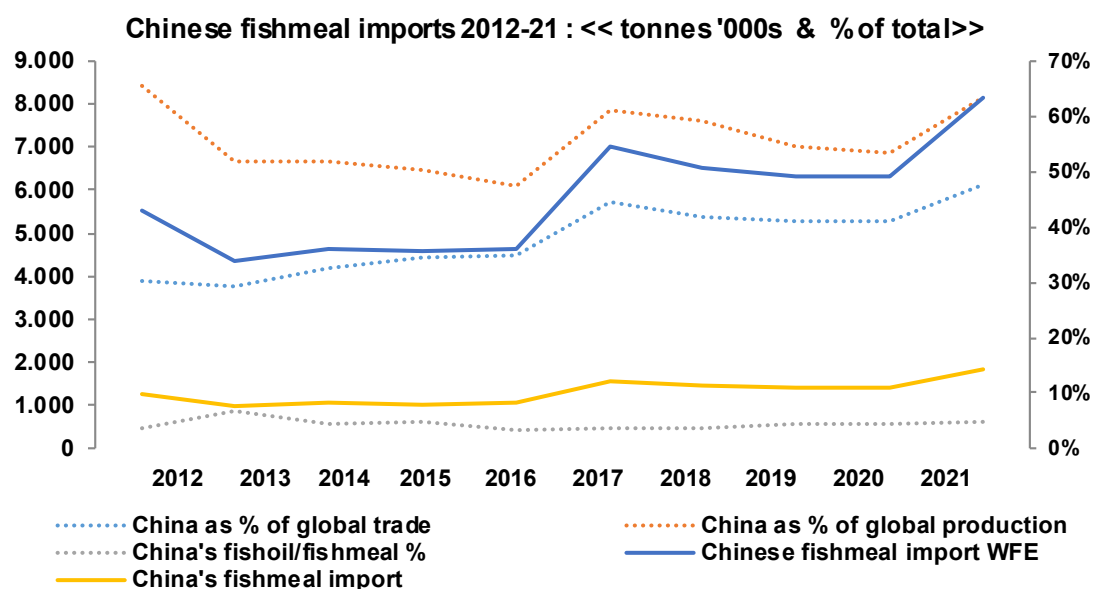
Source: ITC TradeMap

Fishmeal

One key element of the Chinese fish and seafood trade balance is missing from the preceding analysis. This is fishmeal – a non-human food item that can be overlooked. This would be a mistake as fishmeal probably represents the area where China has the largest impact upon global aquatic bio-resources through trade. China imports fishmeal – the product of rendering cheap small fish into a dry protein-rich powder as an important ingredient of fish and animal feeds - in large quantities (as well as also producing fishmeal domestically itself, also in quantity). What tends to disguise the importance of fishmeal is the apparently relatively modest quantity in product weight terms (at least in comparison with China’s total aquatic product trade –fishmeal imports were just 1.3 million tonnes p.a. vs 3.6 million tonnes p.a. of food fish over the past decade).

But when the volume of fish consumed in fishmeal’s production is considered, the impact is very much more significant. It takes 4.4 kg of whole fish to produce one kg of fishmeal, so when viewed in WFE terms, fishmeal now constitutes a majority import category at 8 million live weight tonnes - as the graph below demonstrates. China’s fishmeal exports are on the other hand minimal at 2,000tonnes pa or less, i.e., below 0.2% of imports, so this is in effect an inwards-only trade - and a very large one.

Figure 15: Chinese fishmeal imports 2012-21: tonnes '000s &% of total



Sources: ITC TradeMap and FAO FishStatJ Fish Commodities database

The implications of this are certainly significant. If the data is correct, China is not just the dominant player in the global fishmeal trade (now accounting for 50% of the global import) but when its domestic fishmeal production is included, China’s total consumption possibly equates to over 60% of all global fishmeal production. China’s massive terrestrial farming industry (pork and chicken) no doubt accounts for much of this, but a huge aquaculture industry is also a key factor driving China’s clear dominance in use of this important global protein feedstock.

The graph above shows the quantity of low value or trash fish implied in China’s consumption of fishmeal. It also notes China’s consumption of fish oil, showing this to be around 5% of fishmeal imports. For reasons discussed below, this indicates that fish meal (as opposed to fish oil) is the key determinant of China’s impact upon the global “trash” fish resource.

Overview conclusions

Clearly fishmeal is a major part of the story and needs to be included in the analysis. At the same time, the general significance of whole fish equivalent (WFE) is clear and so restating import data in WFE terms is instructive. The table and figure below do this, clearly demonstrating the degree to which fishmeal has dominated China's 2012-21 aquatic product imports, when converted to WFE.

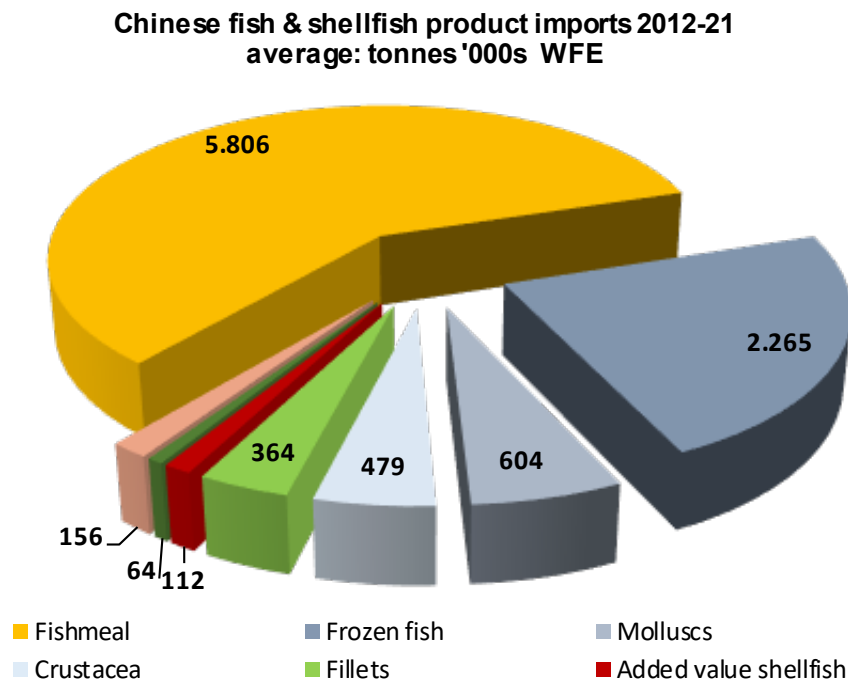
Table 7: Average Chinese fish and fish product imports 2012-21 product & WFE weights

Category	Product weight		Category	Live weight		Change
Tonnes '000s	2012-21		Tonnes '000s	2012-21		2012-21
Fishmeal	1,308	29%	Fishmeal	5,806	59%	4%
Frozen fish	2,059	46%	Frozen fish	2,265	23%	-3%
Molluscs	403	9%	Molluscs	604	6%	8%
Crustacea	377	8%	Crustacea	479	5%	23%
Fillets	121	3%	Fillets	364	4%	19%
Value-added shellfish	52	1%	Value-added shellfish	112	1%	-4%
Fresh fish	58	1%	Fresh fish	64	1%	1%
Other	76	2%	Other	156	2%	24%
	4,454	100%		9,850	100%	5%

Source: ITC TradeMap, FAO Handbook of Fisheries Statistics & Torrey study

When looked at this way, fishmeal clearly has resource implications that exceed those of the conventional seafood imports (although the latter is substantially more important economically of course). The diagram below makes the point with visual clarity.

So, although China is a net exporter of seafood, it is no such thing for aquatic resources overall when fishmeal is included. Indeed, there is now an annual WFE Chinese quantitative trade deficit of 1-2 million tonnes overall.

Figure 16: Chinese fish & shellfish product imports 2012-21

Taken together, these findings point to China having retained its role as “seafood processor to the world” but one that is increasingly switching from filleting to more sophisticated value-adding. This is overlain by a move upmarket as the country has increased its imports of high-end shellfish. The latter trade is apparently aimed at domestic consumption, presumably funded by China’s increasing wealth. Specifically, key observable trends are:

Imports The majority of Chinese fish and shellfish imports are raw or semi-processed materials with four product categories accounting for the great majority (90%) of the total – these being

- Whole frozen fish
- Molluscs (mostly squid)
- Crustacea (mostly shrimp) and
- Fish fillet.

Some other products are exhibiting very rapid import growth (e.g. fresh fish, cured fish and “others” – including jellyfish and echinoderms) but from such tiny base volumes that current quantities are relatively minimal (though given the vast scale of the China economy – hardly insignificant). But most important of all is the very high level of fishmeal imports

Exports are more diverse from a product viewpoint - with 6 significant categories (i.e. contributing more than 2% to quantities) but with the top four contributing over 80% of the total. The key categories over the past decade, in order of importance, are:

- Fish fillet
- Secondarily processed (value-added) fish (was top of the list by 2020)
- Frozen whole fish

- Molluscs
- Secondarily processed (value-added) shellfish
- Crustacea

The Geographic Dimension

China sources seafood globally and exports it very widely – for example the key raw material, whole frozen fish arrived from 97 countries whilst key exports (fillets) were dispatched to 140 countries over the past decade. However, a far narrower range of partners accounted for the great majority of the trade, especially where imports are concerned. This section starts by assessing imports, concentrating on the top three origins for each key product category. In most cases, these three origins collectively accounted for more than half of the trade last year.

Imports by origin

Sourcing patterns are instructive - the origin of the fish can be telling regarding the species involved. The principal providers to China are set out in the table below for the major imported product categories. Four such categories account for the great majority of the imports and so analysis is restricted to these where the top three contributors are listed in each case alongside the quantities they supply. These are shown in tonnes '000s (product weight, not WFE) alongside their market share. The table also covers the full 10-year review period, showing the position at the 2012 start and for the most recent data point in 2021.

Table 8: Chinese fish & seafood imports by origin in tonnes '000s & % composition

Units: tonnes '000s product wt	2012		2021		Units: tonnes '000s	2012		2021	
Frozen whole fish (product wt)					Fish fillet (product wt)				
<i>Origin (exporter)</i>	2012		2021		<i>Origin (exporter)</i>	2012		2021	
Russia	897	46%	519	36%	Viet Nam	16	46%	136	82%
USA	342	18%	160	11%	USA	7	21%	9	5%
Norway	153	8%	139	10%	Russia	2	4%	6	4%
Others*	558	29%	615	43%	Others*	10	29%	15	9%
Crustacea (eg shrimp, crabs, lobster)					Molluscs (eg squid, bivalves)				
<i>Origin (exporter)</i>	2012		2021		<i>Origin (exporter)</i>	2012		2021	
Ecuador	6	5%	379	48%	Japan	23	7%	97	16%
India	5	4%	122	15%	Indonesia	17	5%	94	15%
Canada	35	28%	51	6%	Peru	24	8%	83	14%
Others*	81	64%	242	30%	Others*	248	79%	339	55%

Source: ITC TradeMap * the import from all other suppliers

The dominance of the leading suppliers is evident, as is the degree to which these leaders have tended to increase that dominance over the decade (whole frozen fish being the only exception to this). Other trends noted regarding sourcing are as follows:

- In general, the top three sources provide more than 50% of the total supply within each category – confirming that sourcing tends to rely upon a narrow supply base

- This is certainly the case for frozen raw material – where 60-70% arrives from the top three: Russia, USA and Norway, although latterly there has been some broadening of the supply base, so reducing Russian and US dominance
- Primary processed fish imports (fillet) have grown rapidly whilst being very narrowly sourced - now with 82% sourced from a single supplier – Vietnam. This reinforces Vietnam’s emerging role as a key fish “contract” processor, able to challenge China on the basis of cost effectiveness. Although the great bulk of Vietnam’s fillet exports are pangasius, rising exports of cold-water fish (gadoids and salmon) confirms Vietnam’s progress in this direction
- For prime shellfish (essentially shrimp& squid), sourcing is more diverse but has latterly narrowed down to a more limited range of key suppliers, especially for shrimp. China’s transition from net exporter to net importer of shrimp may partially account for this (perhaps favouring bulk low cost suppliers as this becomes more of a commodity market)

Chinese exports by destination

The same exercise, structured in a similar manner has been applied to China’s seafood export trade (and again is based upon product weight). Again the market leaders take substantial market share, but for exports this concentration is much less marked and Chinese exports reach a wide range of markets.

Table 9: Chinese fish & seafood exports by destination in tonnes ‘000s & % distribution

Units: tonnes ‘000s	2012		2021		Product wt	2012		2021	
Whole frozen fish product wt					Frozen fish fillet product wt				
<i>Destination (importer)</i>	2012		2021		<i>Destination</i>	2012		2021	
S Korea	145	15%	116	16%	Japan	164	16%	123	19%
Philippines	117	12%	79	11%	USA	273	27%	108	17%
Thailand	92	9%	72	10%	Germany	132	13%	101	16%
Others*	613	63%	440	62%	Others*	444	44%	306	48%
Crustacea (egshrimp, crabs, lobster)					Molluscs (egsquid, bivalves)				
<i>Destination (importer)</i>	2012		2021		<i>Destination</i>	2012		2021	
S Korea	37	20%	35	29%	S Korea	127	31%	104	20%
Japan	36	19%	29	25%	Japan	81	20%	80	16%
Spain	16	9%	13	11%	Philippines	4	1%	52	10%
Others*	100	53%	42	35%	Others*	201	49%	275	54%
Value-added fish (egcanned pelagics)									
<i>Destination (importer)</i>	2012		2021						
USA	89	18%	180	17%					
Japan	131	26%	147	14%					
Mexico	14	3%	123	12%					
Others*	270	54%	608	57%					

Source: ITC TradeMap* the import from all other suppliers

Again the Chinese trade pattern for key products is informative, with that for exports characterised as follows:

- As Chinese exports are far less concentrated upon a few countries than its sourcing, the top three recipients tend to account for a much lower proportion of this more widely dispersed trade – mostly less than 50%
- Primarily processed fish mostly goes to western markets with the EU still a major destination (with the EU taking 31% of the total over the past decade, rising to over 35% recently, with Germany the largest importer)
- But secondary processed (value-added) fish is more widely exported, destinations including many emerging markets as well as western markets (and with the EU, in contrast, only accounting for 4% of the total for this category).
- Shellfish exports mostly go to wealthier Asian and western markets. However, the EU as a destination for Chinese crustacea is diminishing by 8% pa having dropped to around 5% of the total. In contrast for Chinese molluscs, EU demand has been rising by 2%pa and now accounts for 11% of the total Chinese mollusc export.

The key species and species groups involved

For the purposes of this study it is the species and species groups involved rather than the product categories that are of key interest. Understanding this is central to identifying the impact that China’s fish trade is likely to be having upon wild stocks. It also provides pointers regarding the likelihood that EU interests might be affected, as well as helping to interpret the involvement of the 6 target third countries.

Chinese imports

Trade data provides species and species group data, and whilst this is not necessarily consistent and is subject to misclassification, it is probably the best data available. The following tables list the more important species where they are identified (much of the trade is undifferentiated species-wise). All quantities have been converted to WFE to highlight the impact upon the respective resource (conversion factors are shown in Appendix 2 below) The range shown is limited to the most important items, but still collectively represents 72% of the total import

Table 10: Chinese seafood imports by species or species groups– main species/products WFE*

Tonnes '000s	Whole equivalent fish	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Fresh fish	Atlantic salmon	22.1	17.7	32.0	44.5	36.1	41.6	71.3	81.7	44.7	58.6
Frozen fish	Alaskan pollock	713.1	728.8	672.6	687.9	687.3	731.2	626.0	754.5	667.9	420.6
	Cod like fish	169.7	197.9	219.2	197.2	220.6	228.1	209.0	191.8	169.1	158.1
	Flatfish	90.1	167.7	171.4	140.9	148.7	160.6	172.8	163.3	178.1	120.1
	Mackerel	76.5	79.1	123.8	106.5	96.1	136.0	124.9	130.2	99.9	81.3
	Pacific salmon	118.5	203.9	163.2	150.3	175.6	169.5	242.9	170.1	78.3	91.6

Fillets	Catfish pangasius	10.1	20.5	21.4	36.0	67.5	105.3	256.5	549.8	551.0	280.8
Cured fish	No leading species identified										
Crustacea	Shrimp	41.7	41.4	56.0	83.6	87.1	90.2	258.3	843.6	705.7	787.0
	Coldwater shrimp	21.5	38.3	33.7	36.4	37.5	46.8	52.5	55.4	61.9	42.6
	Crabs	60.9	57.3	55.6	52.2	63.7	74.1	80.8	72.9	66.7	84.8
	Lobster	16.3	21.4	27.4	28.6	34.8	43.3	65.5	72.4	76.4	67.7
Molluscs	Squid & cuttlefish	409.0	442.7	481.0	415.7	202.7	389.9	302.8	532.4	429.5	672.3
	Scallops	92.5	161.3	198.6	379.4	308.5	237.8	471.3	458.8	397.2	673.0
	Octopus	6.6	11.0	2.7	2.6	3.7	7.6	13.7	26.6	18.8	15.1
Other	Jellyfish	25.4	12.1	9.0	10.8	8.7	16.8	45.0	154.0	106.7	219.8
	Sea cucumbers	4.1	3.4	2.4	3.6	4.5	7.1	16.8	29.7	18.5	16.0
Value-added	Tuna	3.0	6.4	5.1	5.1	4.7	5.3	5.4	5.9	7.0	5.6
Fish	Sardines	0.6	0.6	0.5	0.4	0.4	0.3	0.3	0.3	1.8	0.3
Value-added	Squid & cuttlefish	96.0	85.1	110.1	68.0	10.5	35.3	36.6	42.9	26.6	49.6
shellfish	Shrimp	1.0	1.0	0.8	1.6	2.7	3.3	6.1	6.4	5.8	6.0

Source: ITC TradeMap, FAO Handbook of Fisheries Statistics & Torrey study. * fishmeal imports are discussed in detail below

The table identifies the 19 species/species groups that represent the key contributors to China's seafood imports (where these have been differentiated). Taken in turn, these are:

- **Salmon imports:** Atlantic salmon imports now dominate whole fresh fish imports, accounting for nearly 70% of the category. These must be air-flown (because fresh fish (unlike frozen) cannot be sent by land or sea from producer countries (Norway mostly) to China as they are too perishable and the journey time is overly long. They are thus expensive (\$11/kg), and so their use as raw material for exported products is unlikely, and the high-end domestic market is the likely end use. Pacific salmon is also imported in quantity but in this case it is a whole frozen product at \$3/kg making reprocessing a practical option.
- **Whole frozen whitefish imports:** Alaskan Pollock continues to dominate the category despite of the decline in its import (by -6%pa), and together with cod like fish and flatfish still constitutes 44% of the category's import. Arriving at \$1.1-\$1.3/kg, this is clearly a commodity product, priced for reprocessing.
- **Pangasius fillet imports:** China's fillet imports are dominated by a single product from a single source – farmed pangasius catfish from Vietnam which now accounts for 64% of the category after very rapid growth. A landed price of \$2/kg for a fillet product helps to explain its rise in popularity.
- **Crustacea– shrimp imports:** China's crustacean imports have been rising across the species range, but it is shrimp where the growth has been exceptional. China's pivot from net exporter to net importer must have played a part here and it has been Ecuador that has been a major beneficiary (61% of the total). Much of the warm water shrimp imported could then only be farmed *Penaeus*

vannamei, especially as the other major supplier, India, also now farms *P vannamei*. The other clearly differentiated type of shrimp imported is cold water shrimp which mostly comes from Canada, but some is supplied by the EU – from Greenland and Denmark in particular. This is almost all imported in frozen form (at an average price of \$US5/kg) which would make it potentially economic for reprocessing or it could supply domestic demand.

- **Molluscs – squid & scallop imports:** Squid has been a major Chinese import and has continued growing at 6% pa over the past decade. The more surprising trade has been that in scallops growing at 25% pa to reach 670,000 tonnes although this is perhaps overstated as it is assessed as shell-on (WFE) for a product believed to be mainly traded as detached meats. Both species present potential market opportunity for the EU, but this is a market where Spain is the only EU member to have made much of an impression recently (and that at only a modest 6-7,000 tonnes pa).
- **Other product imports:** Jellyfish is the only other product category to make a significant contribution, but as with scallops the WFE estimate probably exaggerates the product – mostly believed to be traded as in dried form. Even so the 44,000 tonnes imported latterly represents the result of 27%pa growth, so is not inconsequential.

Chinese exports

As with imports, Chinese exports are analysed in terms of their species composition in the table below. As before the quantities shown are all whole fish equivalent (WFE), and the range shown is limited to the most important items, but still collectively represents almost 70% of the total export

Table 11: Chinese exports by species or species groups – main species/products WFE

Tonnes '000s	Whole fish equivalent	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Live fish	Carp, eels, other	87.8	375.1	320.7	287.8	278.1	264.1	264.3	292.0	210.7	192.1
Frozen fish	Mackerel	196.6	168.4	177.7	182.8	288.7	354.1	316.7	313.7	179.3	173.6
	Anchovies&sardines	132.1	123.6	106.8	73.4	67.2	86.3	113.6	211.6	175.1	153.7
	Tilapia	122.3	148.2	153.0	145.9	146.1	143.9	148.7	120.2	101.3	86.7
	YF tuna	10.4	12.4	25.0	29.0	30.6	33.3	16.7	24.2	38.8	25.3
Fillets	Alaska Pollock	897.5	948.0	810.6	727.3	702.8	667.4	668.1	737.9	532.6	485.6
	Cod	310.6	370.2	433.6	397.1	412.6	415.6	379.4	381.4	313.6	296.1
	Other northern whitefish	402.7	396.0	421.7	400.8	409.2	428.6	439.3	414.1	373.3	330.5
	Tilapia	493.2	500.1	468.5	421.4	402.6	375.7	310.0	211.9	80.0	71.7
	Pacific salmon	147.6	161.1	205.5	158.1	176.0	187.4	178.2	170.1	171.6	119.3
Cured fish											
Crustacea	Shrimp	185.3	187.1	180.4	151.9	156.2	140.7	115.0	85.8	95.6	99.8

	Coldwater shrimp	7.4	4.9	4.3	4.0	3.7	4.6	4.6	4.1	3.5	3.8
	Crabs	34.7	40.7	45.5	50.5	42.6	41.9	42.0	43.1	35.3	36.5
	Lobster	1.2	1.1	1.0	1.1	0.6	0.5	0.4	0.4	0.3	0.3
Molluscs	Squid & cuttlefish	325.7	406.0	484.5	536.6	536.7	586.3	584.8	525.6	460.2	531.1
	Scallops	142.5	160.8	198.6	185.3	194.9	156.9	159.5	147.9	126.8	194.4
	Octopus	71.5	72.8	85.0	75.1	70.1	58.2	47.3	36.2	39.7	43.1
	Clams	443.4	426.8	465.0	469.2	438.3	473.5	415.5	419.7	372.2	350.2
Other seafoods											
Value-added fish	Tuna	108.0	139.0	160.5	158.2	169.3	173.1	201.0	234.5	258.9	257.1
	Mackerel	106.5	108.1	115.8	141.3	127.5	141.1	128.5	159.8	220.6	186.9
	Sardines	34.5	44.7	43.7	38.6	53.8	63.2	52.2	77.6	142.3	157.6
Value-added Shellfish	Squid & cuttlefish	127.9	146.0	131.7	124.5	122.9	144.8	171.3	177.5	184.2	259.8
	Shrimp	337.0	329.6	243.4	191.3	220.1	278.8	340.0	262.2	226.1	273.5
	Clams	186.5	202.8	203.1	208.8	231.5	262.1	265.0	261.1	211.4	282.6
	Octopus	21.9	22.6	28.5	27.3	28.9	30.1	30.9	27.9	23.3	27.6

Source: ITC TradeMap, FAO Handbook of Fisheries Statistics & Torrey study

- **Whitefish fillet exports:** Fillet exports have declined as already noted, but still remain sizable. Alaska pollock fillet exports averaged 0.72 million tonnes (WFE) set against imports of raw whole pollock of 0.67million tonnes– values close enough to confirm that reprocessing for export is China’s main use of pollock*. This is a product category that has particular relevance for the EU which received 220,000 tonnes in 2021, although the quantity has been declining slowly.
- **Pacific salmon fillet exports:** the comparison made for Alaskan pollock applies similarly to Pacific salmon. An import of 160,000 tonnes (WFE) of whole salmon can be linked to a fillet export of 170,000 tonnes (WFE) signalling another reprocessing trade.⁶⁰

Tilapia exports: China is the world largest farmer of tilapia, with an industry closely tied to exports. These exports mostly go to the USA (fillets) and Africa (fish too small to fillet so exported whole) all frozen. This trade seems to have declined rapidly, especially since 2018 with the overall disruption to US/China trade likely to have been a determining factor.

- **Value added fish exports:** EU imports of these secondary processed products increased (in direct contrast to the declining trend for primary fillet products) rising from 17,000 tonnes in 2012 to

⁶⁰ In the authors’ experience, these discrepancies between the Chinese imported quantity and the reciprocal export of between 4% and 6% are not unusual for trade data and within the norm for errors rather than signalling unexplained quantities (e.g. undeclared landings).

40,000 tonnes in 2021 (44,000 tonnes in 2020) showing growth of 10%pa. This is ahead of global growth of these Chinese exports of 9% pa. However, they still remain small in relation to primary processed fillet imports by the EU.

- **Tuna value-added exports:** China now exports 260,000 tonnes pa (WFE) of presumably mostly canned tuna, up from around 100,000 tonnes in 2012. If this does signal China's intention to expand in the canned fish sector it will have implications for island states – especially the case study countries such as the Solomon Islands, Mauritius and Madagascar as well as Senegal and Ecuador. All are current or former players in the canned tuna industry, as well of course is the EU tuna industry.
- **Shellfish exports.** Chinese shellfish exports essentially reflect imports, with shrimp, squid and scallops prominent but with the addition of clams – and with the latter two categories' contributions probably inflated by conversion to WFE. Shrimp has shown the most change as raw shrimp exports declined by 7%pa whilst value added exports were steadier – suggesting that domestic consumption was rising whilst secondary processing for export continued to expand.

Conclusions

The overall situation of the Chinese fish and seafood sector is, from an international trade perspective, one of transition. This transition is from a leading processor of fish raw material for re-export as primary products (fillet) increasingly towards one of sourcing aquatic products – many of them prime items and some processed – for domestic consumption. The other key trend is the steady replacement of primary by secondary processed products in the Chinese export offer as this sector appears to be becoming more sophisticated and value-adding. This is a process in motion rather than a completed pivot to domestic consumption, but the trends are clear:

- Growing imports of prime whole fresh fish (Atlantic salmon).
- Reducing imports of raw whole fish (northern gadoid white fish).
- Increased imports of prime shellfish (shrimp, squid).
- Reduced exports of primary fillet products.
- But increased exports of secondary value-added products.
- But massive non-food import of fishmeal is the most important factor from a resource impact viewpoint (for reasons given in the first case study below).

It was perhaps inevitable that rising national wealth (especially amongst China's fast expanding middle class – put by some as 0.6 billion) would prompt such a transition, and indeed the rise in demand is already evident. However, such is the scale of the Chinese economy that even though some segments of the trade may be diminishing, they are still likely to generate substantial impact globally. Investigating this as it relates to the case study countries, to the EU and to the world more widely, is the objective of the brief case studies that follow. These try to take a more nuanced approach, focusing upon the likely significant impacts.

The Case Studies

This section concerns the third and final analytical stage of this assessment of the trade-related implications of China's impact upon global seafood and aquatic bio-resources. The preceding sections

provide the basis for this specific, detailed and relevant analysis of a number of key topics, chosen on the basis of being:

- Relevant to the six case study third countries
- Having potential for providing insights regarding the two key TOR requirements (TORs #7 and #8) i.e. implications for the EU, and especially the protection of EU interests

Having significant wider global environmental, socio-economical and geopolitical implications

This has been resolved through proving a number of brief case studies which are set out below

Case study 1: Fishmeal – China’s largest trade-related impact on global aquatic bio-resources.

China’s massive impact upon the global supply of fishmeal has already been broadly described, and so this case study looks into this in more detail. The analysis starts with assessing which of the products of the rendering of fish (fishmeal or fish oil) is the key determinant of China’s impact.

A graph in the text above (Figure 16) shows the quantity of low value (or “trash”) fish implied in China’s consumption of fishmeal, setting the scene for the analysis that follows. The graph also notes China’s consumption of fish oil. This is relevant here because, when fish is rendered, the outcome is two products - fishmeal and fish oil (i.e. the protein & lipid fractions). Production of the latter is generally in the ratio of 20:100, oil to fishmeal. I.e., for each 100kg of fishmeal, 20kg of oil is produced. If the ratio of national imports shows oil to exceed 20% of meal then it is oil that determines how much raw fish can be related to that country’s import. If the converse is true, then it is fishmeal that is the key indicator.

In this case oil is only around 5% of meal imports and so it is fishmeal that is the key determinant of China’s impact upon the global “trash” fish resource – and so this is the commodity focused upon here. Chinese dominance of trade is evident in the table below – where China accounts for nearly 40% over the past decade (and nearly 50% by 2021). This is over six times larger than the next largest importer, Japan.

Table 12: Global trade in fishmeal & China’s sourcing pattern within the global market place (product wt)

Units tonnes '000s, product wt	2012-21 average		2012-21 average	
World total import	3,450	100%	China total import	1,308 100%
China	1,308	38%	Peru	677 52%
Japan	205	6%	Viet Nam	108 8%
Norway	186	5%	USA	98 7%
Taiwan	147	4%	Chile	87 7%
Viet Nam	128	4%	Russia	62 5%
Turkey	114	3%	Thailand	58 4%
Indonesia	91	3%	Mauritania	55 4%
United Kingdom	85	2%	Mexico	40 3%
Greece	79	2%	Ecuador	33 3%

Source: ITC TradeMap

China’s sourcing of fishmeal is similarly highly skewed, as the majority of Chinese fishmeal imports come from Peru (52% over the past decade, 56% in 2021) alongside Chile (7%) and study target country, Ecuador (3%). This means that when Chilean and Ecuadorian contributions are included, the total supply from the SE Pacific is 61-62% of the total Chinese import. The implication is that the bulk of this will be anchoveta (*Engraulisringens*), perhaps alongside some other small pelagics from Chile.

Looked at from the Andean countries perspective, this means that China accounts for the great majority of their fishmeal export. Indeed, if this data is accepted, it suggests that China could account for the great majority of consumption of one of the world’s most abundant fish resources – 78% over the past decade, rising to 90% latterly – and all through trade.

Table 13: China's demand for small pelagics based fishmeal. Units: tonnes '000s WFE

Units: tonnes'000s WFE	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Andean Region, WE Pacific (anchoveta, <i>Engraulis</i>)WFE										
Global anchoveta catch	4,693	5,674	3,140	4,310	3,192	3,923	7,045	4,249	4,954*	5,712*
China's anchoveta import†	3,792	2,742	2,785	2,785	2,397	4,503	3,996	3,797	3,495	5,077
Chinese % of the total	81%	48%	89%	65%	75%	115%	57%	89%	71%	89%
Mauritania (<i>Sardinella</i>) WFE										
Total fishmeal export	139	153	297	295	331	532	568	490	571	422
Export to China	0	0	0	0	31	195	224	292	375	337
Chinese % of the total	0%	0%	0%	0%	9%	37%	39%	60%	66%	80%

Source: ITC TradeMap * projections† implied import in WFE terms if all fishmeal is anchoveta-based

Mauritania presents a comparable case, but perhaps one more directly relevant for this study, Mauritania being a case study country. The resource in question is another small pelagic, *Sardinella spp* in this case. What makes this particularly relevant is the involvement of China in this relatively recent expansion of the Mauritanian fishmeal industry, importing 80% of Mauritania’s exports. Moreover, press reports suggest Chinese companies (Fujian Poly Hong Dong&Sunrise) are major investors in the plants, working with Turkish vessels in the fishery.

Relevant implications:

Such is China’s domination of this trade that its impact is global, affecting all countries with livestock industries (pork, chicken and especially, aquaculture) in that a key feed ingredient is likely to get more expensive and perhaps less available. This obviously includes the EU, and some peripheral European countries with large salmon farming industries that depend upon fishmeal in their feed.

More specifically case study countries that are suppliers to China are directly affected – Ecuador as a long term supplier to China (100-200,000 tonnes pa) and Mauritania (an increasingly important source for China, rising from 30,000 tonnes to 340,000 tonnes since 2016).What adds particular EU interest in the latter case, is the recently concluded fisheries agreement with Mauritania (www.europarl.europa.eu/news,8/6/22), which provides EU vessels with fishing opportunities in Mauritanian waters, including access to the *sardinella* stock. This stock has already been the subject of concerns about overfishing as well as its conversion to meal rather than human food, and the EU agreement specifically addresses these concerns.

Case study 2: Prime Whitefish fillet exports: China has traditionally played a leading role in the fish “re-processing” industry – where raw material (whole frozen fish) is imported, primarily processed as

fillet and then exported, indeed sometimes back to the country of origin of the raw material. Within the EU the primarily processed fillet was frequently further secondarily processed into retail products (fish fingers, breaded fillet, ready meal packs). This relationship appears to be changing, as already noted above.

Chinese prime whitefish fillet exports have declined generally (4% pa overall), but still remain sizable. The headline product is Alaskan pollock, arguably the world's most abundant cold water medium quality white fish (3.4 million tonnes pa). Alaska pollock fillet exports averaged 0.72 million tonnes (WFE) set against imports of whole pollock of 0.70 million tonnes. For instance, exports exceeded imports by 3% but that is well within the tolerances that can realistically be expected for trade data. It does though tie in with FAO data showing China is no longer landing Alaskan pollock and tends to confirm that China's pollock trade is primarily based upon import, processing and export. As a result, China's impact upon global Alaskan pollock landings through trade is considerable – accounting for 20-23% of the total.

For higher quality exports (cod, flatfish) the numbers do not tie up so neatly, with fillet exports exceeding raw imports by 50-80% when expressed in WFE terms. The possibility that some fillet exports are mislabelled as better quality products might be suspected, but that might be over-interpreting the data (i.e. crediting it with greater precision than is reasonable to expect)

Table 14: China's trade in whitefish: raw imports and processed exports (WFE)

Tonnes '000s WFE	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Change pa
Chinese whole frozen fish imports											
Alaskan pollock	746	762	703	719	718	764	654	789	698	440	-6%
Cod	177	207	229	206	231	238	219	201	177	165	-1%
Flatfish	94	175	179	147	155	168	181	171	186	126	3%
Haddock	58	48	49	39	57	56	55	48	53	55	0%
Total	1,075	1,192	1,160	1,112	1,161	1,227	1,109	1,208	1,115	786	-3%
Chinese frozen fish fillet exports											
Alaskan pollock fillets	897	948	811	727	703	667	668	738	533	486	-7%
Cod fillets	311	370	434	397	413	416	379	381	314	296	-1%
Flatfish fillets	200	215	243	236	217	207	208	188	164	146	-3%
Haddock fillets	96	86	71	58	79	85	80	74	70	71	-3%
Total	1,504	1,619	1,558	1,418	1,411	1,376	1,336	1,381	1,081	998	-4%
Tilapia fillets	493	500	469	421	403	376	310	212	80	72	-19%

Source: ITC TradeMap

There is another aspect that may have an indirect impact upon EU ACP partners. Another historically important whitefish export is tilapia. Unlike the other white fish in question, the raw material is produced in China – China is the global leader in tilapia farming (1.2 million tonnes of a global total of 4.5 million). Most is filleted and exported, with USA as the principal market. This trade has been in decline, with the 25% tariffs imposed by the USA (partially lifted in March 2020) no doubt part of the explanation. There was a side trade to this – fish too small to fillet were exported to developing countries – principally in Africa – at low prices. The latter trade has been declining, possibly in concert

with the US fillet trade decline (leading to an overall drop in production), reducing both the availability of material and the incentive to supply developing countries.

Relevant implications: This is a product category that has had particular relevance for the EU which received 297,000 tonnes of Chinese mostly whitefish fillet in 2012 (about 10% was Pacific salmon). This has subsequently declined by 3%pa to 220,000 tonnes by 2021, but China’s total global fillet export has declined faster - by 5%pa. The implication is that the EU can probably expect reducing scope for “contract processing” of prime cold-water prime fish by China, with alternatives (e.g., Vietnam, N Africa) taking on this labour-intensive role in the value chain. Germany, where Alaskan pollock is popular, is the Member State most likely to be impacted.

Case study 3: Value-added tuna exports: The coastal zone south of Shanghai has been adding tuna processing to its suite of aquatic food industries with cities of Ningbo and Zhoushan as key foci. China now exports 260,000 tonnes pa (WFE) of presumably mostly canned tuna, up from around 100,000 tonnes in 2012 (The relevant HS code is 160414, which signifies canned tuna but includes frozen cleaned fillets or “loins”). However, the raw material supply to generate this export poses some questions. This supply is partly provided through imports (whole frozen skipjack and yellowfin tuna), which averaged 73,000 tonnes but has dropped to 20-40,000 tonnes recently. This pattern was matched by landings of 60-80,000 tonnes that have declined to around 20,000 tonnes latterly as the table below demonstrates.

Table 15: China's supply and export of skipjack and yellowfin tuna, Units: Tonnes 000s WFE

Units tonnes '000s WFE	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Frozen whole tuna imports	51	72	76	72	68	52	95	79	36	18
Chinese tuna landings	57	88	70	53	27	29	20	20	21*	22*
Total raw tuna supply	108	161	145	124	95	81	116	100	57	41
Processed tuna exports	108	139	160	158	169	173	201	235	259	257
Apparent deficit	0	22	-15	-34	-75	-92	-85	-135	-202	-217

Source: ITC TradeMap, FAO FishStat * projections

This shows that there was a balance between imports and exports at the beginning of the decade, but this rapidly changed to a substantial deficit by 2021. In short, the raw material input was far too small to match the level of exports (let alone to supply any additional domestic demand). The implication is that China must now be importing at least some 200,000 tonnes of raw tuna more than that declared, or alternatively landing an equivalent amount from its fishery, again in addition to the level of catch reported by FAO.

Relevant implications. If this does herald China’s intention to continue its expansion within the canned tuna sector it will have implications for island states – especially case study countries such as the Solomon Islands, Mauritius and Madagascar as well as possibly Senegal and Ecuador (and other ACP states) –i.e. all current or former players in the canned tuna industry. It could also impact the EU Spanish and French tuna fleet who could meet increasing competition for access to EEZs – especially in the Western Pacific - that they formerly fished. The apparent Chinese deficit in the raw material supply is an obvious cause for concern. Moreover, the increasing Chinese influence in the Western Pacific adds to the concern. The much-reported pivot by the Solomon Islands through switching alignment from Taiwan to China, is clearly a case in point. China’s averred aim to increase participation in the Solomons’ tuna industry does perhaps signal a substantial change.

Case study 4 - Ecuador, Vietnam & China - warm water shrimp (*Penaeus vannamei*). A curious triangular relationship was noted by shrimp industry commentators in 2016. Ecuador had begun to export shrimp in quantity to Vietnam according to Ecuadorian export statistics. Vietnam did not acknowledge any such imports, and indeed as the table below shows has been consistently a major net exporter (exports exceeding imports by 4.5 times over the past decade). One possibility is that this was a re-processing trade where Ecuador was providing cost-effective value-adding to Ecuadorean raw material for re-export – but the trade data shows no concomitant surge in Vietnamese exports of secondarily processed shrimp.

The conclusion reached at the time was that this substantial quantity of shrimp (43% of Ecuadorian output and 4.4% of the 5 million tonnes of shrimp farmed globally at the time) was entering the grey market or informal trade into China, possibly for tax-related reasons. Subsequent data shows rapidly rising Ecuadorian/China trade in shrimp from 2018-19, an outcome consistent with the regularisation of what was suspected to have been a previously informal trade relationship.

This occurred at a significant point in time, because it followed a pivot in China's role in the global shrimp sector from net exporter to net importer. However more significantly, it demonstrates how - despite both recipient countries being members of the WTO (China since 2001, Vietnam since 2007) - large volumes of high value seafood trade can apparently escape formal documentation.

Table 16: Shrimp trade between Ecuador, Vietnam & China (product weight)

Units: Tonnes '000s product wt	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Ecuador production & export										
Total Ecuador production	281	304	340	403	422	460	560	680	685*	754*
Total Ecuador export	209	223	297	342	371	442	512	645	689	848
Ecuador exports to Vietnam	17	38	73	118	166	226	204	61	6	6
Ecuador exports to China	7	8	15	28	11	16	99	352	361	391
Chinese crustacean imports										
Total Chinese import	128	144	153	175	195	223	381	842	739	794
Chinese imports from Vietnam	2	2	2	1	3	3	13	39	44	27
Chinese imports from Ecuador	6	7	17	27	14	15	77	323	319	379
Vietnamese crustacean trade										
Imports		29	333	41	42	53	46	39	40	41*
Exports: 1y processed shrimp		141	291	40	234	281	208	249	258	265*
Exports: 2y processed shrimp		104	127	94	110	123	111	111	139	125
Ecuador EU trade										
Exports to Major EU markets	72	73	81	80	87	82	87	91	106	129

Source ITC TradeMap. * projections

Relevant implications: this is clearly highly important for Ecuador as it has become closely tied to the Chinese market. For the EU the challenge is more the potential eventual narrowing of warm water shrimp sourcing options as Ecuador becomes increasingly China orientated. Spain, France and Italy could be most impacted as they now collectively import more than 100,000 tonnes/year of frozen raw

shrimp from Ecuador, as the table shows. Furthermore, this event also has generic implications in the way it has undermined confidence in the accuracy of seafood trade data.

Case study 5 Salmon, Pacific and Atlantic. Salmon exemplifies some of the key themes that have emerged from this analysis – responding to both the move towards high value imports and China’s role as a bulk fish processor. Two categories of raw material are involved – fresh whole farmed Atlantic salmon and frozen whole Pacific salmon. The former is imported apparently mostly for high-end domestic consumption and the import has been growing rapidly (11%pa). Continued growth at this rate would suggest that consumption could rise to 170,000 tonnes pa. However, in the context of the current 2.6 million tonnes now farmed globally (including 1.4 million tonnes from Norway) this seems unlikely to disturb the EU market

Table 17: Chinese trade in Atlantic and pacific salmon. Units: Tonnes’000s WFE

Units: Tonnes’000s WFE	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Change
Chinese salmon imports											
Fresh whole Atlantic salmon	22	18	32	44	36	42	71	82	45	59	11%
Frozen whole Atlantic salmon	6	8	19	14	14	15	16	16	17	5	-1%
Frozen whole Pacific salmon	117	202	162	149	174	168	241	169	78	91	-3%
Chinese salmon imports											
Frozen fillets of Pacific salmon	148	161	206	158	176	187	178	170	172	119	-2%
Import/export balance, Pac. salmon	126%	80%	127%	106%	101%	112%	74%	101%	221%	131%	

Source: ITC TradeMap

In contrast the Pacific salmon trade reflects China’s role as a contract processor as this is, like prime commodity whitefish, clearly mostly imported for reprocessing and export. Imports that averaged 155,000 tonnes (WFE) over the decade can be linked to a fillet export equivalent to 167,000 tonnes (also WFE). There is then an 8% disparity between these figures, which is of course well within the tolerances that reflect the errors inherent in trade data.

Relevant implications: This trade would affect EU member states rather than third countries, and the potential impact could be mixed – (i) China could take larger quantities of Atlantic salmon from the EU’s major supplier, Norway, prompting price increases for a product that has become widely popular, especially in France, and is no longer produced in quantity in the EU since UK’s departure. (ii) Pacific salmon is exported as processed products to the EU who benefit from the reduced processing costs. In both cases, the impact is seen as likely to be limited for reasons noted already.

Case study 6: Shellfish. China is increasingly becoming an importer of prime shellfish, unsurprising in view of the long standing popularity of seafood, rising national wealth and the predilection for extravagant entertaining that aims to impress. The rising dominance of warm water shrimp, particularly from Ecuador has been noted already in a previous case study. But there are some other relevant aspects of the shellfish trade, discussed below:

Crustacea – cold water shrimp imports: alongside warm water shrimp, another clearly differentiated type of shrimp is imported by China - cold water shrimp which mostly comes from Canada, but is also supplied by the EU. This *Pandalus* shrimp differs from water shrimp (*penaeids*) in various ways – it is captured rather than cultured, is small in size and is sold whole or as peeled tails. Whilst it has been imports of the warm water segment that has grown so rapidly, cold water shrimp has more than maintained its position, growing at 6% pa since 2012 to rise from 22,000 to 43,000 tonnes pa. Its share

of the segment fell from 40% of the import to 5% but that has been due to the exceptional growth in warm water shrimp supplies to China.

Relevant implications: Canada is the leading supplier but the EU is a major contributor, with Greenland and Denmark the major players along with the Baltic countries. Although increasingly becoming a relatively niche component of the Chinese market, it has in fact grown and clearly retained its role as a valuable niche product.

Shellfish exports overall. In terms of quantity, Chinese shellfish imports essentially mean shrimp, squid and scallops with the latter's contribution inflated by WFE (i.e. being traded as shucked meats, but adjusted by adding back in the weight of the heavy shell). Crabs and lobster are significant high-value niche contributors. Exports ostensibly reflect this pattern, but not when looked at more closely. Squid exports mirrored imports and net trade would seem to have been minimal at the beginning and end of the decade but there has been (i) strong growth in value-adding at 8% pa and (ii) a surge in exports from 2016 to 2018. Scallop exports are large, but only two thirds of reciprocal imports overall, and have been falling rapidly (to 30%) pointing to growing domestic consumption – a pattern magnified within the trade in shrimp. Clams are new entrants to the export market, again with a possibly exaggerated showing when assessed in WFE terms (for reasons already described- due to the high shell weight).

Table 18: Export-to-import ratios (by quantity WFE) for key shellfish categories

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Squid export/import	90%	105%	104%	137%	309%	172%	223%	122%	141%	110%
Scallop export/import	154%	100%	100%	49%	63%	66%	34%	32%	32%	29%
Shrimp export/import	825%	646%	473%	285%	299%	302%	145%	39%	42%	45%

Source: ITC TradeMap

The underlying trend over the decade has been for the balance of exports to imports to increasingly swing towards imports. And wherever the number in the table drops below 100% it signals that imports exceed exports (with all values converted to WFE terms). All major shellfish categories reflect this trend, but it has been shrimp where change is clearest. In 2012, shrimp exports exceeded imports eight fold but by 2018 had dropped to a mere 40-45% of imports (i.e. imports were over twice as large as exports). China's underlying pivot from net exporter to net importer of shrimp no doubt is part of the explanation, but the rapidity of the change suggests that domestic demand was rising very quickly. Underlying this was a marked decline in raw shrimp exports (-7% pa) whilst value added exports have largely marked time.

Relevant implications. As already mentioned, the implications are mixed, with China's domestic demand for high-end shellfish likely to add increasing competition within the market – with benefits for producers (Ecuador, some EU countries for cold water shrimp) but possible price escalation for EU Mediterranean shrimp consumers.

Appendix 1: Chinese imports by main species groups, Units: tonnes '000s Product weight

Tonnes '000s	Imports	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Live fish	Other live fish	10.95	16.18	14.99	12.60	13.81	15.53	21.72	25.42	15.87	23.98
	Eels	0.09	0.21	0.26	0.33	0.19	0.16	0.23	0.42	0.22	0.39
	Ornamentals	0.05	0.07	0.12	0.14	0.21	0.24	0.27	0.20	0.21	0.22
Fresh fish	Salmon Atl	20.1	16.1	29.1	40.4	32.8	37.8	64.8	74.2	40.6	53.3
	Other *	1.5	4.5	9.4	15.7	15.4	15.3	22.2	26.9	21.5	21.5
	Mackerel	0.0	0.0	0.0	0.0	0.0	0.2	0.5	0.8	0.9	1.0
Frozen fish	Alaskan pollock	648.3	662.5	611.5	625.3	624.8	664.7	569.1	685.9	607.2	382.3
	Other*	285.6	303.4	310.7	274.9	284.5	216.5	317.6	480.1	468.5	371.1
	Cod	154.3	179.9	199.2	179.2	200.5	207.4	190.0	174.4	153.7	143.8
	Flatfish	81.9	152.4	155.9	128.1	135.2	146.0	157.1	148.5	161.9	109.2
	Mackerel	76.5	79.1	123.8	106.5	96.1	136.0	124.9	130.2	99.9	81.3
	Pacific salmon	104.9	180.4	144.4	133.0	155.4	150.0	215.0	150.5	69.3	81.1
Fillets	Catfish panga	3.8	7.8	8.1	13.7	25.7	40.0	97.5	209.1	209.5	106.8
	Other*	21.1	26.6	30.5	25.9	21.8	27.2	33.3	44.7	47.5	39.5
	Alaskan pollock	1.8	4.6	5.4	5.0	4.2	11.2	10.4	6.9	9.7	12.7
	Cod like fish	3.6	4.4	4.0	3.0	4.8	5.3	8.2	11.6	5.7	5.2
Cured fish	Dried/salted fish	0.6	0.5	0.8	0.9	3.1	16.9	15.4	24.1	42.7	27.7
	Dried clupeoids	0.0	0.0	0.0	0.0	0.0	0.0	2.6	10.5	12.1	6.7
	Fish offal	0.3	0.2	0.4	0.1	0.1	1.7	1.9	4.1	3.1	3.0
	Fish heads maws	0.2	0.1	0.1	0.1	0.0	0.1	0.4	1.0	2.1	2.4
Crustacea	Shrimp	32.8	32.6	44.1	65.8	68.6	71.0	203.4	664.2	555.7	619.7
	Coldwater shrimp	21.5	38.3	33.7	36.4	37.5	46.8	52.5	55.4	61.9	42.6
	Crabs	60.9	57.3	55.6	52.2	63.7	74.1	80.8	72.9	66.7	84.8
	Lobster	10.3	13.6	17.3	18.1	22.0	27.4	41.5	45.8	48.3	42.9
Molluscs	Squid & cuttles	272.7	295.1	320.6	277.1	135.1	259.9	201.9	354.9	286.3	448.2
	Scallops	13.6	23.7	29.2	55.8	45.4	35.0	69.3	67.5	58.4	99.0
	Octopus	5.1	8.4	2.1	2.0	2.9	5.9	10.5	20.5	14.4	11.7
	Mussels	1.3	1.5	2.6	2.7	3.5	4.9	6.3	4.8	7.6	7.1
Other	Jellyfish	5.1	2.4	1.8	2.2	1.7	3.4	9.0	30.8	21.3	44.0
	Sea cucumbers	1.7	1.4	1.0	1.5	1.8	2.9	6.9	12.1	7.5	6.5
	Sea Urchins	0.1	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.1
Added-value	Other*	4.1	7.3	9.7	11.0	13.0	15.5	20.3	26.3	29.9	22.0
Fish	Tuna	1.6	3.4	2.7	2.7	2.5	2.8	2.9	3.1	3.7	3.0
	Sardines	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.9	0.2

Added-value	Squid & cuttles	66.2	58.7	75.9	46.9	7.2	24.4	25.2	29.6	18.3	34.2
Shellfish	Shrimp	0.4	0.4	0.3	0.6	1.0	1.2	2.2	2.3	2.1	2.1
	Sea cucumbers	0.0	0.1	0.1	0.5	0.1	0.1	0.1	0.4	0.8	2.1
	Other*	1.1	1.2	1.6	36.8	17.9	7.5	2.2	4.3	1.9	6.9
	Total	1,914	2,185	2,247	2,178	2,043	2,275	2,588	3,605	3,158	2,950
	% of full total	75%	79%	78%	80%	77%	77%	76%	81%	82%	85%

Source: ITC Source ITC TradeMap - * "other" is undifferentiated products where species is undisclosed

Appendix 2: Conversion factors applied to fish products in this study to convert them from product weight to whole weight equivalents (WFE) or live weight

Category	Factor applied	Notes
Fresh fish		
Atlantic salmon	1.10	gutted
Frozen whole fish		
White fish inc Alaska Pollock	1.10	Gutted
Mackerel	1.00	frozen whole
Pacific salmon	1.13	gutted
Fillets		
Catfish pangasius	2.63	fillets, skin off
Alaskan Pollock	2.78	fillets, skin off
Other northern whitefish	2.74	average skin off
Tilapia	2.75	fillets, skin off
Cod	3.23	fillets, skin off
Haddock	2.86	fillets, skin off
Pacific salmon	2.00	fillets, skin off
Crustacea		
Shrimp	1.27	whole & tails mix
Coldwater shrimp	1.00	frozen whole
Crabs	1.00	whole
Lobster	1.58	whole & tails mix
Molluscs		
Squid & cuttlefish	1.50	
Scallops	6.80	assuming meat only
Octopus	1.30	
Other		
Jellyfish	5.00	assume all dried
Sea cucumbers	2.45	assume all dried
Value-added fish (Canned)		
Tuna	1.90	
Mackerel	1.95	
Sardines	2.00	
Processed shellfish		
Squid & cuttlefish	1.45	
Shrimp	2.80	
Octopus	1.30	
Crabs	4.50	
Clams	6.00	
Fishmeal	4.44	IFFO & FAO

Sources: FAO Handbook of Fisheries Statistics (Coordinating Working Party on Fishery Statistics (CWP)) and Yield and nutritional value of the commercially more important fish species Torrey Research Station, UK, ISBN 92-5-102870-2

ANNEX 5 - LIST OF REGIONAL FISHERIES BODIES AND THE LINK TO THEIR LISTS OF IUU REPORTED VESSELS

This table includes a list of Regional Fisheries Bodies and the link to their lists of IUU reported vessels hosted by the FAO's Global Record of Fishing Vessels, Refrigerated Transport Vessels and Supply Vessels (see <https://www.fao.org/global-record/information-system/rfb-iuu-vessels-lists/en/>).

Table 19: List of Regional Fisheries Bodies and the link to their lists of IUU reported vessels

RFBs	Abbreviation	Link to IUU Vessel List
Commission for the Conservation of Antarctic Marine Living Resources	CCAMLR	CCAMLR Non-contracting party IUU Vessel List CCAMLR Contracting party IUU Vessel List
General Fisheries Commission for the Mediterranean	GFCM	GFCM IUU Vessel List
Indian Ocean Tuna Commission	IOTC	IOTC IUU Vessel List
Inter-American Tropical Tuna Commission	IATTC	IATTC IUU Vessel List
International Commission for the Conservation of Atlantic Tunas	ICCAT	ICCAT IUU Vessel List
North East Atlantic Fisheries Commission	NEAFC	NEAFC IUU Vessel A List NEAFC IUU Vessel B List
North Pacific Fisheries Commission	NPFC	NPFC IUU Vessel List
Northwest Atlantic Fisheries Organisation	NAFO	NAFO IUU Vessel List
South East Atlantic Fisheries Organisation	SEAFO	SEAFO IUU Vessel List
Southern Indian Ocean Fisheries Agreement	SIOFA	SIOFA IUU Vessel List
South Pacific Regional Fisheries Management Organisation	SPRFMO	SPRFMO IUU Vessel List
Western and Central Pacific Fisheries Commission	WCPFC	WCPFC IUU Vessel List

Source :FAO

ANNEX 6 - BLUE PARTNERSHIP PRINCIPLES

The below table presents the titles, descriptions, and objectives of the 16 Blue Partnership Principles that were established to align with the “blue” outcomes of joint marine conservation, scientific marine development, enhanced marine wellbeing, blue prosperity, and the construction of a world-wide “blue homeland” (see section 5.1 on EU-China cooperation at bilateral level for further details).

Table 20: Blue Partnership principles

N.	Principle title	Description/Measures ⁶¹	Objective
1	Conserve the Marine Ecosystems	<ul style="list-style-type: none"> • Share objectives of marine ecosystem conservation • Prevention and reversal of ecosystem degradation • Joint marine ecosystems monitoring • Support of nature-based solutions • Conservation and restoration of marine ecosystems • Establish and manage marine protected areas • Restore and maintain health • Service functions and biodiversity value of marine ecosystems 	“To promote the health and resilience of the marine ecosystems” (p. 2)
2	Tackle Climate Change	<ul style="list-style-type: none"> • Promote cooperation on climate change actions in ocean field • Strengthen academic research cooperation on topics such as sea level change, deoxygenation, acidification, ocean warming and heatwaves, melting of polar ice and snow, and blue carbon sink • Promote marine climate adaptation and mitigation • Information technology cooperation, sharing on marine observation and monitoring, disaster prediction, prevention and mitigation • Provide jointly public service products • Achieve “Ocean Carbon Neutrality” 	“To enhance the capacity of our partners on coping with disasters and climate change in ocean field, and to safeguard the blue homeland of human beings.” (p. 3)
3	Reduce Marine pollution	<ul style="list-style-type: none"> • Minimize use of non-essential disposable plastic products • Enhance management of marine litter and microplastics • Control and decrease dumping • Reduce marine pollution caused by land activities and ships • Limit damage of underwater noise to marine life 	“To keep the ocean healthy and clean” (p. 3)
4	Sustainable Use of Marine Resources	<ul style="list-style-type: none"> • Support conservation and sustainable marine biological resources and their genetic resources • Function and value evaluations of marine ecosystem services • Promotion of the value realization of ecological products 	To promote the sustainable development and use of marine resources under the

⁶¹ Description literally extracted from the text of the ‘16 Principles for Blue Partnership’, available at <http://www.cfocean.org.cn/data/upload/ueditor/20220707/62c69bcdaa519.pdf>

		<ul style="list-style-type: none"> • Encourage development of green and sustainable marine aquaculture • Support the end of overfishing, illegal, unreported, and unregulated fishing and destructive fishing practices • Maintain the sustainable production and safety of the oceans • Incentivize development of clean renewable energy 	premise of giving priority to protection. (p. 4)
5	Thrive Blue Economy	<ul style="list-style-type: none"> • Promote marine industries in a “technologically innovative and environmentally friendly way” • Upgrade existing marine industries based on clean production, green technologies, circular economy, and best practices • Promote formation of new blue industries • Create new financial platforms, products, standards, and service systems under the framework of Green Financial System and “Sustainable Blue Economy Finance Principles” • Explore healthy coastal tourism community models • Create ocean friendly spaces • Realize coordinated sustainable development of both land and sea areas 	“To tap the future development potential of the blue economy and promote the high-quality sustainable development 5 of global blue economy” (p. 4-5)
6	Strengthen Guidance of Technological Innovation	<ul style="list-style-type: none"> • Support foundation research in ocean field • Take part in and contribute to the United Nations Decade of Ocean Science for Sustainable Development (2021-2030) • Enrich knowledge necessary for sustainable development • Strengthen the comprehensive cognition and understanding of ocean • Facilitate the transformation of marine scientific and technological achievements • Promote widespread use of marine knowledge 	“To enhance the cognition of ocean and strengthen the leading role of knowledge to sustainable development” (p. 5)
7	Implement Integrated Management	<ul style="list-style-type: none"> • Advocate the implementation of integrated ecosystem-based marine management through the following measures: • Supporting the implementation of the global maritime spatial planning project • Reducing and avoiding the adverse impacts of human activities on coastal zones and oceans • Encouraging the exchange of best practices and implementation and evaluation studies 	“To advance marine conservation and sustainable development through the implementation of ecosystem-based integrated marine management.” (p. 6)
8	Contribute Solutions	<ul style="list-style-type: none"> • Encourage actions to support sustainable ocean development through nature-based solutions • Make efforts to conduct the cooperation into solutions contributing to achieve the 2030 Agenda for Sustainable Development Goals (particularly SDG14 and SDG17) • Bring positive impact on the health of marine ecosystems and the promotion of blue growth 	“To increase the efficiency of maritime cooperation and the pertinence of solutions.” (p. 6)
9	Reinforce Capacity Building	<ul style="list-style-type: none"> • Support small island states, low-and middle-income countries and the least developed countries through human resources training, technical assistance, and formulation of marine development planning • Encourage the development of localized blue industries • Create employment opportunities • Increase incomes • Improve livelihoods • Enhance their abilities to produce benefits through sustainable use of marine resources 	“To enhance the capacity for sustainable development of small island states, low-and middle-income countries and the least developed countries.” (p. 7)
10	Adhere to Openness and Inclusiveness	<ul style="list-style-type: none"> • Promote the establishment of an open and inclusive global blue partnership • Adhere to the principle of seeking common ground while reserving differences 	“To promote the formation of a more open, inclusive and

		<ul style="list-style-type: none"> • Respect the existence of diversity among partners with different levels of development, different governance models, pluralistic interests, and different traditional characteristics • Caring for the conservation and sustainable use of the oceans • Promote the building of a Marine Community of Shared Future • Jointly advance the realization of the 2030 Agenda for Sustainable Development Goals 	flexible cooperative relationship in ocean field.” (p. 7)
11	Welcome Multi-party Participation	<ul style="list-style-type: none"> • Recognize the wide participation of multi-stakeholders is the key to advancing global maritime cooperation • Welcome governments, intergovernmental organizations, non-governmental organizations, local governments, research institutions, companies and other stakeholders to play an active part and provide support in the Global Blue Partnership 	“To promote broad, democratic and scientific solutions to problems in ocean field.” (p. 8)
12	Encourage Voluntary Commitments	<ul style="list-style-type: none"> • Encourage partners to make voluntary commitments for the Blue Partnership within their respective capabilities, based on their own circumstances • Contribute the realization of the 2030 Agenda for Sustainable Development Goals 	“To enhance the initiative and enthusiasm of blue partners to deliver on their commitments.” (p. 8)
13	Take Collective Actions	<ul style="list-style-type: none"> • Willingness to work together with all governments and stakeholders • Strengthen communication and coordination among partners • Promote common understanding • Raise social awareness of the oceans • Share marine knowledge, best practices, experience • Engage in cooperative actions in various forms • Welcome all parties to provide financial support and other resource contribute • Contribute relevant knowledge to policy making • Address problems in ocean field of common concern 	“To strengthen partner cooperative relations, and engage in collective actions in various forms.” (p. 9)
14	Promote Legislative Governance	<ul style="list-style-type: none"> • Advocate activities among partners in accordance with international, regional, national laws and other relevant institutional frameworks, centered on the United Nations Convention on the Law of the Sea • Follow the principles of achieving shared growth through discussion and collaboration • Make institutional arrangements and projects for the conservation and sustainable use of oceans and marine resources reflect the will and interests of most countries 	“To promote marine governance mechanism more legislative and equitable.” (p. 10)
15	Share Development Outcomes	<ul style="list-style-type: none"> • Commit to sharing the outcomes of blue development • Publish the information about our activities and its positive and negative social, environmental, and economic impacts • Release the progress of the implementation of the principles based on respecting the principle of confidentiality and intellectual property 	“To ensure the openness and transparency of the Blue Partnership, make the outcomes of blue development benefit more people around the world.” (p. 10)
16	Safeguard Intergenerational Equity	<ul style="list-style-type: none"> • Take full consideration to the rights and opportunities of future generations to use marine resources and enjoy marine space • “Preserve a healthy, clean and beautiful blue home for our future generations” 	“To promote the intergenerational equity in marine 11 sustainable development” (p. 10-11)

ANNEX 7 - LIST OF FISHERIES-RELATED AGREEMENTS SIGNED BETWEEN THE SIX COUNTRIES OF FOCUS AND OTHER COUNTRIES, INCLUDING THE EU AND CHINA

This annex presents the list of agreements discussed in [section 5.4](#).

Table 21: List of fisheries-related agreements signed between the six countries of focus and other countries, including the EU and China

Item #	Countries/Regions/Organizations involved	Year	Description of the fishing access-related agreement or practice	Type of Agreement	Overlapping interests	Sources
1	Ecuador - China	1970s-2000s	There have been records showing China encouraging joint ventures between Chinese fishing companies and Ecuador and also establishing cooperation with Ecuador and 37 other states.	Joint Venture		Xue (2006)
2	Ecuador - IFAD	1978 - 1983	A total of \$280,000 USD financial aid was provided by International Fund for Agricultural Development (IFAD) to Ecuador through IFAD's "Fisheries Development Project".	International Assistance		d-portal (2002a)
3	Ecuador - China	2012 - 2013	The Chinese National Fisheries Corporation (CNFC), a Chinese state-owned distant water fishing company, obtained fishing permits from the Ecuadorian government for their shrimp trawlers and tuna seines.	Direct licensing		CNFC (2015)
4	Ecuador - Spain	2017	Spain and Ecuador signed an agreement in which Spain agreed to provide training and assistance to Ecuador's fishing sector in order to strengthen Ecuadorian fisheries products in the international market.	Bilateral agreement		El universo (2017)
5	Ecuador - Japan	2012 - 2013	Through the "Project for the rehabilitation of fisheries facilities for fisheries development", the Japan International Cooperation Agency (JICA) so far invested nearly \$400,000 USD in the rehabilitation and maintenance of fisheries-related facilities and equipment that have been damaged by natural disaster or other causes in Ecuador.	Bilateral agreement		d-portal (2022b)
6	Ecuador - Japan	2014	Undescribed small financial aid was provided to Ecuador by Japan. A total of \$6,741 USD was offered in 2014.	International Assistance		d-portal (2022c)
7	Ecuador-China	2018	Ecuador join's China's Belt and Road Initiative	Bilateral agreement		Sacks (2022)
8	Ecuador - EU	2019	The EU issued a warning ("yellow card") to Ecuador due to the poor management of their IUU fishing problem. Ecuador is working towards getting the "yellow card" revoked through improving its fisheries practice.			European Commission (2019a), Feijóo (2021)
9	Ecuador - China	2020	MERCOSUR, which Ecuador is part of, signed an agreement with China Ocean Group, and both parties will collaborate on building a new distant fishing base in Ecuador.	Joint Venture		OFweek (2020)
10	Ecuador - Spain	2020 - 2023	Through the "Ecuador 2019 Pesca CISP" project, the Spanish Agency for International Development Cooperation (AECID) so far invested €475,000 in Ecuador, as a means of improving the artisan fisheries sector of the country and facilitating capacity-building among local fishers.	Bilateral agreement		d-portal (2022d), AECID (2021)
11	Ecuador - Italy	2021 - 2024	Through the "Innovation and sustainability strengthening the artisanal fishing sector at Manabi (I.Su.S.A.Fi.Se.M)" project, the Italian Agency for Cooperation and Development (AICS) so far invested around \$1.6 million USD in Ecuador, as a means of reducing the effects of climate change and promoting the employment of women and young people in the fishing sector in the Province of Manabi, Ecuador.	Bilateral agreement		d-portal (2022e)

12	Ecuador	2022	Ecuador joined the Fisheries Transparency Initiative, under which Ecuador will be committed to improving the transparency of their information about the fisheries sector. Ecuador's Ministry of Production, Foreign Trade, Investment, and Fishing has made available the details of registered fishing vessels, fishermen, companies, and regulations online. However, details on how many of these vessels or companies are under joint ventures with foreign companies and what the agreements are between the companies are still largely unknown to the public.	Transparency agreement		Fisheries Transparency Initiative (2022a)
13	Ecuador - China	2022	China and Ecuador released a joint statement, in which both countries are committed to deepening the partnership between the two countries in the fisheries sector.	Bilateral agreement		XinHua News Agency (2022)
14	Madagascar - EU	1986	First fisheries agreement with the EU	Bilateral agreement		European Commission (2022a)
15	Madagascar - ADF	2006 - 2014	The African Development Fund (ADF) supported the development of the Tuléar Fishing Communities Support Project (Projet d'Appui aux Communautés de pêcheurs (PACP) de Tuléar), which aimed to halt the current dwindling production in traditional fishing areas threatened by overfishing, consolidate fishermen's organisations and state services, and provide fishermen with credit. Moreover, the project would produce an additional annual yield of 800 tonnes of octopus and 3,000 tonnes of fish, help fishermen to procure new fishing means and gain access to credit while engaging in sustainable management of fishery resources.	International Assistance		d-portal (2022f)
16	Madagascar - EU	2007 - 2018	EU and Madagascar had a 6-year (2007-2012 and renewed in 2013-2018) tuna fishery agreement (an SFPA) which allowed vessels from Spain, Portugal, Italy, and France to fish in Malagasy waters.	Bilateral agreement		European Commission (2022a)
17	Madagascar - China; Madagascar - France	Starting from 2009	CNFC Overseas Fisheries gained majority control over Somapeche, a member of the Groupement des Aquaculteurs et Pêcheurs de Crevettes à Madagascar (GAPCM). The GAPCM is a local group of eight large fishing companies that possess substantial fishing access in Madagascar. Many other companies in the GAPCM are backed by French investors.	Joint Ventures		Carver (2021)
18	Madagascar - China	2009	CNFC Overseas Fisheries purchased 77% of a Malagasy fishing company as a means to gain the right to fish in Madagascar.	Joint Ventures		CNFC Overseas Fisheries (2014)
19	Madagascar - Netherlands	2009 - 2021	The Dutch government initiated the "Private Sector Investment Programme", which is available for Dutch and foreign companies entering into long-term cooperation with local fisheries partners in Madagascar. The programme would boost the investment in significantly innovative projects in the private sector in developing countries.	Joint Ventures		d-portal (2022g)
20	Madagascar - Netherlands	2011 - 2017	The Dutch government invested around \$980,000 USD in a bilateral project that aimed to establish the first community-based commercial sea cucumber cultivation and processing facility to produce 5 tonnes of organic trepang annually.	Bilateral agreement	25	d-portal (2022h)
21	Madagascar - Japan	2013 - 2014	The Japanese government invested a total amount of \$2.85 million USD in Madagascar's fishing sectors. Details of the investments are not provided online.	Bilateral agreement		d-portal (2022i-n)
22	Madagascar - Netherlands	2014 - 2021	The Dutch government committed nearly \$50,000 USD to a bilateral project that aimed to establish two farms at the coast and a transfer-site near the airport for live crab (annual production of about 180,000 live crabs from own farms and the community-based farms) and a farm with an annual production of 36,000 soft shell crab.	Bilateral agreement	23, 24, 40	d-portal (2022o)

23	Madagascar - Australia	2015 - 2018	The Australian government invested \$2.1 million USD in the bilateral project "Innovation in the Blue Economy (Indian Ocean)", which sought to reengineer aquaculture to improve economic productivity and environmental sustainability with a particular focus on developing countries in the Indian Ocean region, and funded a joint workshop with the Commonwealth Scientific and Industrial Research Organisation (CSIRO) to identify challenges and opportunities for economic growth and environmental sustainability in the Indian Ocean.	Bilateral agreement		d-portal (2022p)
24	Madagascar - EU	2015 - 2021	The EU committed around \$1.9 million USD to a bilateral project that focuses on supporting small-scale farms to master the conduct of profitable and sustainable fish farming within the framework of an organised sector.	Bilateral agreement	21, 24, 40	d-portal (2022q)
25	Madagascar - Norway	2016	The Norwegian government committed nearly \$1.4 million USD to a bilateral project that focuses on fish farming development and structuring of a producers' organisation for commercialisation of production for national markets.	Bilateral agreement	21, 23, 40	d-portal (2022r)
26	Madagascar - Norway	2016	The Norwegian government committed around \$740,000 USD to a bilateral project that focuses on strengthening sea cucumber production, commercialisation, and the development of a producers' organisation to promote producers' interests and development.	Bilateral agreement	19	d-portal (2022s)
27	Madagascar - UK	2016	The United Kingdom's government committed \$2.1 million USD to a bilateral project that focuses on equipping fishing boats with location trackers, which can also transmit SOS signal to authorities when fishers press the provided SOS buttons.	Bilateral agreement		d-portal (2022t)
28	Madagascar - China	2017	RUIHUN, a company with vessels registered in China, started fishing in Malagasy waters under a joint venture with the local company, Maprosud.	Joint Venture		Gorez (2020)
29	Madagascar - China	2017	Madagascar joined China's Belt and Road Initiative, and both countries agreed to strengthen fisheries cooperation between the two countries. The details of how both countries would cooperate were not disclosed.	Bilateral agreement		Ma (2017)
30	Madagascar - Germany	2017 - 2022	The German federal government initiated a coastal protection project in collaboration with the Malagasy government, in which Germany committed \$11,844,754 USD to the sustainable management of natural resources in the coastal areas of Madagascar. The project facilitates the development and implementation of resource management agreements such as the designation of protection zones and times, restrictions on fishing instruments, the promotion of alternative sources of income in the areas of aquaculture and agriculture and the afforestation of mangrove forests.	Bilateral agreement		d-portal (2022u)
31	Madagascar - China	2018	A fishing access agreement worth \$2.7 billion USD was signed between China and Madagascar, which would allow China to operate 330 vessels in the country. Nonetheless, there is no sign that the agreement was later fulfilled.	Bilateral agreement		Carver (2018), Gorez (2020)
32	Madagascar - China	2018	The Malagasy company with a majority of Chinese investors, Côte d'Or, signed 2 fishing access agreements with the Malagasy government to gain fishing access for 28 vessels for various fishing types.	Joint venture		Gorez (2020)
33	Madagascar - EU	2018 - 2022	The EU committed around \$6.8 million USD to the promotion of value chains adapted to climate change in Madagascar's fishing sector.	Bilateral agreement		d-portal (2022v)
34	Madagascar - Sweden	2018 - 2022	The Swedish International Development Cooperation Agency (Sida), under the Swedish government, committed nearly \$330,000 USD to strengthening and empowering civic society in Madagascar so that they can actively influence marine governance, law and policymaking, and reform processes across the Northern Mozambique Channel.	Bilateral agreement		d-portal (2022w)
35	Madagascar - Sweden	2019 - 2024	Sida initiated a project in Madagascar that aims to enhance the economic benefits of the country from the sustainable use of marine resources, including through the sustainable management of fisheries, aquaculture and tourism.	Bilateral agreement		d-portal (2022x)

36	Madagascar - Norway	2020	The Norwegian government committed around \$1.7 million USD to a bilateral project that focuses on improving food security in Tamatave and Antananarivo on Madagascar, which will be achieved by increased healthy fish proteins in the form of fresh tilapia on ice, sold by Tilapia de l'Est (TDE) and their contractors at market outlets and by resellers, wholesalers and others who will increase their income from tilapia sales due to increased production by TDE.	Bilateral agreement	36	d-portal (2022y)
37	Madagascar - EU	2020 - 2022	The EU committed nearly \$14 million USD to a bilateral project that focused on the sustainable development of rural household incomes and their food and nutritional security, in particular, that of women and children, and the preservation of the natural environment in the peri-urban area of Antananarivo, Madagascar. Fisheries development is one of the programme's targets.	Bilateral agreement	35	d-portal (2022z)
38	Madagascar - Germany	2020 - 2029	Germany committed around \$8.6 million USD to the "Protection and Sustainable Use of Natural Resources" (Schutz und nachhaltige Nutzung natürlicher Ressourcen) programme in Madagascar. It aims for the sustainable management of mangroves and other natural marine resources by local communities, thereby improving their socio-economic livelihoods.	Bilateral agreement	-	d-portal (2022aa)
39	Madagascar	2021	Publicly committed to implementing the Fisheries Transparency Initiative (FITI).	Transparency agreement	-	Fisheries Transparency Initiative (2022b)
40	Madagascar - China	2021	A local company with Chinese ties gained rights for eight fishing vessels to fish in Madagascar till 2025.	Joint Venture	-	Carver (2021)
41	Madagascar - EU	2021 - 2025	The EU committed \$300,000 USD to developing a network of family farms, integrating rice-fish farming agro-ecological practices into their operating system, and to promote sustainable development of the sector. This project is part of the programme described in item #34.	Bilateral agreement	21, 23, 24	d-portal (2022ab)
42	Mauritania - Spain	1964	An agreement signed between the two countries allowed Spanish fleets to fish in the 6 miles of Mauritania territorial waters, with financial compensation, supported by the owners of the boats, and a transfer of skills from the Spanish fishermen to local fishermen.	Bilateral agreement	-	Cherif (2009)
43	Mauritania - EU	1987 - 2027	The EU and Mauritania have a long partnership in the fisheries sector. The first fisheries agreement was signed in 1987 and was in place until 2006. It was then replaced by a Fisheries Partnership Agreement, and in 2021, it was replaced by the current SFPA. Under the current SFPA, EU fishing vessels can choose from 8 different categories of marine species for their applications for fishing access. The EU pays €57.5 million of access fees per year plus €16.5 million over the course of the agreement to support local fishing communities and improve fisheries governance.	Bilateral agreement	-	Directorate-General for Maritime Affairs and Fisheries (2021), European Commission (2022b)
44	Mauritania - ADF	1989 - 2009	Through the artisanal fisheries development project, the African Development Bank (ADF) has provided funding for the development of a training centre to train new artisanal fishermen and provided them with vessels and appropriate tools for fishing.	International assistance	65, 72, 73	d-portal (2022ac, ad)
45	Mauritania - EU	1990-2004	The EU had a subsidy scheme for European shipowners to permanently transfer the vessel and set up a joint venture with local operators in a third country. Through the programme, 8 joint ventures were set up and 9 vessels were transferred to Mauritania. The programme was abolished at the end of 2004 due to pressure from civil society.	Joint Venture	-	CCFA and COAPA (2015)
46	Mauritania - Germany	1990-2022	Germany has been supporting Mauritania's effort to monitor fishery activities in its waters and promote responsible management of important fisheries resources through funding and engaging in dialogues in fisheries policies. The funding has aided in the implementation of policies, acquisition and construction of surveillance vessels, introduction of satellite-based monitoring system, and continual support to the Mauritan coast guards in technical equipment and training.	Bilateral agreement	52, 55, 59	-
47	Mauritania - China	1991	The first bilateral agreement was signed between the two countries, allowing Chinese vessels to fish in Mauritania waters.	Bilateral agreement	-	Ministry of Commerce, PRC (1991)

48	Mauritania - Spain; Mauritania - the Netherlands	1991	A private agreement signed between the two countries allowed Spain to catch cephalopod again after Mauritania originally banned all foreign fleets from cephalopod fisheries in the 1980s. In the same period, 10 Dutch pelagic trawlers were given private fishing licences.	Private agreement	-	Cherif (2009)
49	Mauritania - ADF	1999 - 2000	The African Development bank provided funding for the construction of the Nouakchott fishing wharf to aid in the development of artisanal and semi-industrial fisheries.	International assistance	65, 72, 73	d-portal (2022ae)
50	Mauritania - Netherlands	2007-2010	The Netherlands supplied over €200,000 for the improvement of shrimp culture fisheries and research in Mauritania.	Bilateral agreement	-	d-portal (2022af)
51	Mauritania - China	2010	Poly Hong Dong Pelagic Fishery signed a 25-year agreement with the Mauritanian government, which allowed the company to be spared from all import customs, be exempt from paying taxes on profits for the first 5 years, and hire 30% of foreigners.	Private agreement	-	FiTI Mauritania (2022), Prieur (2011)
52	Mauritania - China	2010	The Mauritanian government signed a 50-year long-term fishing agreement with the Chinese distant water company FuZhou Hong Dong Fisheries Company. The agreement allows the Chinese company to fish in its waters and its annual fishing quota reaches 100,000 tonnes.	Private agreement	-	Foodex (2019)
53	Mauritania - Canada	2010-2012	Canada provided funding to 6 West African to improve their fishing practices and policies in the face of climate change. The project involved bringing together stakeholders for bi-annual meetings to explore possible scenarios and develop different adaptation strategies.	International assistance	45, 55, 59, 74	d-portal (2022ag)
54	Mauritania - China	2012	Mauritania, along with a number of other African countries, joined the China-Africa Fishery Union, one of China's international fisheries initiatives. The goal of this group is to promote the development of China's and Africa's fisheries resources, facilitate fish trading, and strengthen their cooperation in the fisheries industry. Under the union, China was to provide loans to joint ventures for fishing vessels and the African party were to contribute by providing fishing licences. The loans for the vessels were to be repaid in instalments by the joint venture company.	Bilateral agreement	-	Chinafrica (2012)
55	Mauritania - Japan	2012	Japan funded a project to expand the fishing port in Nouadhibou.	Bilateral agreement	-	d-portal (2022ah)
56	Mauritania - Japan	2013-2014	Japan has provided Official Development Assistance (ODA) funds to support Mauritania's fisheries development and fishing policy and administrative management. The assistance also included scholarships for training in Japan.	International assistance	45, 52, 59, 74	d-portal (2022ai-as)
57	Mauritania - China	2016	In 2016, the China Poly Group invested in the construction of a comprehensive fishing port in Ndiago, which consists of commercial quay, fishing port, naval base, and shipyard.	Investment	-	Undercurrent News (2020), Mulyungi (2021)
58	Mauritania - Japan	2016	Mauritania and Japan Tuna fisheries Cooperative association signed access agreement to allow Japanese long-line vessels access to Mauritania waters.	Bilateral agreement	-	Minister des peche et de L'Economie Maritime (2016)
59	Mauritania - FAO	2016-2017	To further the development of the economic, social, nutritional, and environmental benefits of the fisheries sector, the FAO provided close to \$200,000 USD to promote youth employment and food security in the sector through the Blue Growth Initiative.	International assistance	-	d-portal (2022t)
60	Mauritania - World Bank	2016-2021	In order to encourage the development of seafood clusters in Nouadhibou with sustainable management of fisheries and generate value for the community (EcoSeafood), the World Bank has provided €16.5 million over 5 years, which includes a loan of €10.5 million, under the West Africa Regional Fisheries Programme (WARFP). The fund is used in planning and implementation of fisheries policy, fisheries-related education and training, and fishing harbours, markets, and logistics.	International assistance	45, 52, 55, 74	European commission (2019b), d-portal (2022au)

61	Mauritania - China	2017	Mauritania reached a fisheries investment agreement with China Ocean Group and China Road and Bridge Corporation, in which the two companies will build a new fishing base in the country and the government of Mauritania will grant fishing access, provide tax concessions and subsidies, and help lay out infrastructures such as utilities.	Bilateral agreement	-	All-China Federation of Industry and Commerce (2020)
62	Mauritania	2017	Mauritania joined the Fisheries Transparency Initiative.	Transparency agreement	-	Fisheries Transparency Initiative (2022c)
63	Mauritania - China	2017	Mauritania and China revised the fisheries agreement signed in 1991 and signed the amendment of that. The details of the amendment were not disclosed.	Bilateral agreement	-	Information Office, Ministry of Agriculture, PRC (2017)
64	Mauritania - FAO	2017 - 2019	The FAO provided about \$200,000 USD in support of ecological labelling of octopus products through finalising and validating the octopus labelling system and develop an action plan for its implementation, also through improving knowledge of impacts of octopus fishing on its habitat and ecosystem.	International assistance	-	d-portal (2022av)
65	Mauritania - China	2018	Mauritania joined China's Belt and Road Initiative and Maritime Silk Road.	Bilateral agreement	-	Sacks (2022)
66	Mauritania - Spain	2018 - 2022	Spain funds and supports "Promotion of employment and improvement of the living conditions of artisanal fishermen, young people and women of the surroundings of the protected natural areas of northern Mauritania (Promoción del empleo y mejora de las condiciones de vida de los pescadores artesanales, jóvenes y mujeres de los alrededores de los espacios naturales protegidos del norte de Mauritania)" programme. The first phase focuses on supporting artisanal fishing and facilitates professional training of young people and fishermen, and the second phase focuses on raising the environmental awareness of artisanal fishing. Spain has committed a total of \$1.7 million USD to the two phases.	Bilateral agreement	43, 48, 72, 73	d-portal (2022aw, ax)
67	Mauritania - Germany	2018 - 2027	Germany committed \$11.3 million USD to modernising small-scale fishing ports in Nouadhibou. This involves constructing an auction hall, 680 storage sheds, a sewage system, 7-km long paved roads, and a perimeter wall for the fisheries port.	Bilateral agreement	-	d-portal (2022ay)
68	Mauritania - EU	2018	The EU co-financed 20% of the construction and equipment of the fishing port of Nouadhibou	Bilateral agreement	-	Defaux (2019)
69	Mauritania - Japan	2019	Japan invested \$13 million USD in building inspection and analysis laboratories for the National Office of Sanitary Inspection of Fishery and Aquaculture Products (ONISPA) in Nouadhibou, Mauritania.	Bilateral agreement	-	d-portal (2022az)
70	Mauritania - FAO	2019-2020	The FAO has provided over \$100,000 USD in funding for updating and developing inland fisheries and fish farming.	International assistance	-	d-portal (2022ba)
71	Mauritania - China	2020	China provided a \$87 million USD low-interest loan to Mauritania for building a fishing port 25 km north of the capital of Mauritania. It was expected that the port would process 400,000 tonnes of catch every year.	Bilateral agreement	-	Embassy of the People's Republic of China in the Islamic republic of Mauritania (2018), Undercurrent News (2020)
72	Mauritania - FAO	2020 - 2022	FAO committed \$356,000 USD to a project that will support small producers and processors of fishery products in the face of the COVID-19 pandemic and the establishment of the necessary infrastructure for the development of inland fishing and fish farming.	International assistance	-	d-portal (2022bb)
73	Mauritania - EU	2020 - 2023	The EU funded a project in Mauritania that aims to strengthen the role of civil society in the governance and the development of artisanal fishing in Mauritania.	Bilateral agreement	43, 48, 65, 73	d-portal (2022bc)
74	Mauritania - Germany	2022	Germany provided a small fund for supporting women in artisanal fishing and fish processing and distribution in Port Tanit.	Bilateral agreement	43, 48, 65, 72	d-portal (2022bd)

75	Mauritania - Germany	2022 - 2031	Germany funded the installation of two permanent fisheries management institutions, the Mauritanian Coast Guard (GCM) and the Mauritanian Institute for Oceanographic Research and Fisheries (IMROP), to facilitate research on fisheries stocks and development. GCM also serves to fight IUU in the country.	Bilateral agreement	52, 55, 59	d-portal (2022be)
76	Mauritania - Senegal	(Undated)	A fishing agreement with Senegal was signed, allowing a number of seiners targeting small pelagic fisheries to fish in Mauritanian waters.	Bilateral agreement	-	FAO (2022)
77	Mauritius - EU	1987	The first fisheries agreement was signed between the two countries.	Bilateral agreement	-	European Commission (2022c)
78	Mauritius - EU	2002 - 2017	Mauritius was one of the beneficiary countries of the EU's project "STRENGTHENING FISHERY PRODUCTS HEALTH CONDITIONS IN ACP/OCT COUNTRIES", which aimed to optimise use of targeted countries' fishery resources in order to gain improvements in the production and trading capacity, thus improving the access of fisheries products to the world market.	Bilateral agreement	-	d-portal (2022bf)
79	Mauritius - China	2003-2011	70% of the foreign fishing licences that Mauritius issues for foreign vessels without fisheries agreements is to Taiwan owned vessels, and only 2-3 vessels are owned by the People's Republic of China per year.	Direct licensing	-	Ministry of Agro-Industry and Fisheries (2004, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013)
80	Mauritius - Australia	2008 - 2013	Australia committed \$86 million USD to improving the sustainability of Mauritius fisheries through the provision of technical cooperation and capacity building in marine and fisheries management.	Bilateral agreement	80, 82, 83, 85	d-portal (2022bg)
81	Mauritius - EU	Starting from 2014	The European Commission currently has a sustainable fisheries partnership agreement in place with Mauritius that began in 2014 to last for 6 years with it being renewable for a period of 3 years. Under the agreement, the EU contributes €575,000 to Mauritius, with €220,000 aimed at the development of the fisheries sector and €135,000 aimed at the development of maritime policy and ocean economy. In exchange, licences for 40 tuna seiners and 45 surface longliners per year are provided to vessels from Spain, France, Italy, and Portugal.	Bilateral agreement	79, 83, 85	European Commission (2022c)
82	Mauritius - EU	2017	Through the EU Emergency Trust Fund for Africa, the EU committed €14 million to promoting job creation in the fisheries sector to increase the economic opportunities of young and potential migrants and stabilise the population at the local level in Mauritius.	International assistance	-	European Commission (n.d.)
83	Mauritius - EU	2018	The EU committed nearly €30 million to a sustainable fisheries project that aimed to support sustainable fisheries governance, management and development in Mauritius and nearby countries, addressing climate change resilience and enhancing marine biodiversity, and combating IUU in Eastern Africa, Southern Africa and Indian Ocean region.	Bilateral agreement	79, 83, 85	d-portal (2022bh), European Commission (2018)
84	Mauritius - New Zealand	2018 - 2019	New Zealand contributed \$65,793 USD to support a small team of consultants (two from New Zealand, one from the EU) seconded to Mauritius to assist with the management, implementation and delivery of its aquaculture and stock assessment management plan.	Bilateral agreement	79, 80, 82, 85	d-portal (2022bi)
85	Mauritius - China	2019	A free trade agreement was signed between Mauritius and China to strengthen their economic cooperation. Some of the focuses of the agreement include cooperation in the fisheries sector, capacity-building in fishing practices, and investment in fisheries infrastructures. Nonetheless, the agreement does not outline what specific actions will be taken.	Bilateral agreement	-	Mauritius Chamber of Commerce and Industry (2019)
86	Mauritius - FAO	2021 - 2023	FAO committed \$261,000 USD to supporting the government of Mauritius for implementing a participatory policy formulation process, accompanied by capacity building related to the policy.	International assistance	79, 80, 82, 83	d-portal (2022bj)

87	Senegal - EU	1980	The first bilateral fisheries agreement was signed between the EU and Senegal.	Bilateral agreement	-	Council of the European Union (1980)
88	Senegal - ADF	1986	Senegal benefited from a project that promoted the development of small-scale fishing on the small coast and aimed to supply the Senegalese internal market with sea fish accessible to all social strata of the population. The project was funded by ADF, which invested nearly \$10 million USD in the project.	International assistance	-	d-portal (2022bk)
89	Senegal - ADF	1989 - 1997	ADF invested \$690,000 USD in assessing the restructuring needs of the industrial fishing sector of Senegal, with the focus on the development of equipment for coastal and deep demersal fishing, the restructuring of the industrial processing sector, and the financing of the industrial fishing sector.	International assistance	-	d-portal (2022bl)
90	Senegal - EU	1990-2004	The EU had a subsidy scheme for European shipowners to permanently transfer the vessel and set up a joint venture with local operators in a third country. Through the programme, 27 joint ventures were set up and 41 vessels were transferred to Senegal. The programme was abolished at the end of 2004 due to pressure from civil society.	Joint Venture	-	CCFA and COAPA (2015)
91	Senegal - EU	2000 - 2012	Within the 13-year period, the EU committed a total of \$4.6 million USD to supporting artisanal fisheries in Senegal.	Bilateral agreement	-	d-portal (2022bm)
92	Senegal - EU	2006 - 2010	The EU committed around \$551,000 USD to a bilateral project that aimed to support women entrepreneurs in the city of Ziguinchor, Senegal and target Senegal's fishing sector.	Bilateral agreement	95	d-portal (2022bn)
93	Senegal	2006, 2012	The government of Senegal revoked a number of fishing licences of foreign fleets in both years, in face of public rage over the problem of overfishing caused by foreign fleets.	-	-	Vidal (2012)
94	Senegal - Canada and UK	2008 - 2012	Canada and the UK funded a project in Senegal that aimed to help the country better adapt its fishing practice and policies to climate change through scientific knowledge sharing at local, regional, and national level.	Bilateral agreement	97	d-portal (2022bo)
95	Senegal - Germany	2009 - 2013	Germany invested \$670,000 USD in a bilateral project "Setting an Example for Marine Protected Area Effectiveness in the West African Marine Ecoregion".	Bilateral agreement	-	d-portal (2022bp)
96	Senegal - Italy	2010 - 2018	Italy committed \$28,000 USD to a project in Senegal that aimed to empower women who work with fish products and push for more funding for fishing activities from the Senegalese government.	Bilateral agreement	101	d-portal (2022bq)
97	Senegal - EU	2011	The EU committed around \$115,000 USD to the formulation and the preparation of a fisheries project in Senegal. Details about that fisheries project were not provided by the EU.	Bilateral project	-	d-portal (2022bd)
98	Senegal - EU	2012 - 2020	The EU committed \$2.9 million USD to a project, Aménagement Durable des Pêcheries du Sénégal (ADuPeS), that aimed to support the sustainable development of fisheries in Senegal. The funding was used to set up a sustainable management system for certain fisheries (including octopus and deep-sea shrimp management plans) and a system of evaluation and scientific advice on all demersal fisheries in Senegal.	Bilateral agreement	93	d-portal (2022br)
99	Senegal - Spain	2010	Records show there were 11 joint ventures with Spain in 2010 with 29 vessels engaging in deep-sea trawling and demersal trawling.	Joint venture	98, 99, 100, 101, 102, 106, 118	Niass and Seck (2011)
100	Senegal - France	2010	Records show there were 3 joint venture companies with France in 2010 with 24 trawlers	Joint venture	98, 99, 101, 102, 106, 118	Niass and Seck (2011)
101	Senegal - Italy	2010	Records show there were 2 joint venture companies with Italy in 2010 with 7 trawlers	Joint venture	98, 100, 101, 102, 106, 118	Niass and Seck (2011)
102	Senegal - Greece	2010	Records show there was 1 joint venture company with Greece in 2010 with 2 trawlers	Joint venture	98, 99, 100, 102, 106, 118	Niass and Seck (2011)
103	Senegal - China	2010	Records show there was 1 joint venture company with China in 2010 with 26 trawlers	Joint venture	98, 99, 100, 101, 106, 118	Niass and Seck (2011)

104	Senegal - Canada	2013 - 2014	Canada committed \$2.8 million USD, under the Canada Fund for African Climate Resilience Call for Proposals, to a bilateral project that aimed to promote the sustainable use and marketing of shellfish and fish stocks in villages of Dionewar, Niodior, and Falia in Senegal. Under the project, local communities are given opportunity to improve their economy, ensure members have access to sufficient, safe, and nutritious food, and enhance the role and position of women in their local communities.	Bilateral agreement	-	d-portal (2022bt)
105	Senegal - Japan	2013 - 2014	A range of financial aid was provided to Senegal's fisheries sector by Japan. A total of \$2 million USD was offered in the two years. Details of the aid are not provided	Bilateral agreement	-	d-portal (2022bu)
106	Senegal - Australia	2014 - 2015	Australia provided a \$130,000 USD grant to Senegal as a form of local-level assistance, targeting Senegal's fishing sector.	Bilateral agreement	-	d-portal (2022bv)
107	Senegal - EU	2014 - 2024	The EU and Senegal signed a new SFPA that will last till 2024 and is renewable afterwards. Currently, 28 tuna seiners, 10 pole and liners, 5 longliners, and 2 trawlers from Spain and France are allowed to fish in Senegal waters under the SFPA. Under the SFPA, the EU will also pay Senegal €1.7 million per year, with €900,000 dedicated to supporting the implementation of Senegal's sectoral fisheries policy, and an estimated maximum of €1.3 million will be paid to Senegal by vessel owners for fishing licences.	Bilateral agreement	98, 99, 100, 101, 102, 118	European Commission (2019c)
108	Senegal - FAO	2015 - 2016	FAO provided funding of around \$10,000 USD for a mullet fish farming project.	International assistance	-	d-portal (2022bw)
109	Senegal - Italy	2015 - 2020	Italy committed around \$991,000 USD to a project in Ziguinchor, Senegal which aimed at improving the working conditions and the skills of the actors working in the fishing industry, and strengthening the capacity of fishers' groups, fish processors, small fishmongers and fresh fish wholesalers, through actions oriented to improve safety and first aid at sea, conservation, processing and marketing of fish products, and environmental sustainability of fishing activities.	Bilateral agreement	-	d-portal (2022bx)
110	Senegal	2016	Publicly committed to implementing the Fisheries Transparency Initiative	Transparency agreement	-	Fisheries Transparency Initiative (2022d)
111	Senegal - South Korea	2017	South Korea invested nearly \$1.8 million USD in the construction of one refrigerated warehouse, training (operation and maintenance) by dispatched experts, and warranty service and inspection.	Bilateral agreement	115	d-portal (2022by)
112	Senegal - South Korea	2017 - 2018	South Korea committed \$106,000,000 KRW to a multilateral project that would supply refrigerated trucks, transfer refrigeration technology related to refrigerated trucks, provide training and education, and support inspection.	Multilateral agreement	115	d-portal (2022bz)
113	Senegal - New Zealand	2017 - 2018	New Zealand committed \$12,616 USD to a funding scheme, "Senegal Illegal, Unregulated and Unreported Fisheries Cooperation", which supported one-off, small-scale international development activities within the fishing sector of Senegal.	Bilateral agreement	-	d-portal (2022ca)
114	Senegal - China	2018	Senegal joined China's Belt and Road Initiative	Bilateral agreement	-	Bai (2018)
115	Senegal - China	2018	112 vessels from China's distant water fleet were registered in Senegal in 2018.	Direct licensing	-	Li (2018)
116	Senegal - Japan	2018 - 2023	Japan committed \$11.6 million USD to a project in M'bour Department, Senegal which aimed to improve its advanced fishing landing facilities for adding value to fishery products.	Bilateral agreement	109, 110	d-portal (2022cb)
117	Senegal - Netherlands	2019 - 2023	The Netherlands committed \$201,377 USD to a bilateral project, "Senegal Fish", which aims to bring the fish exporting sector of Senegal together to improve the sustainability of the value chain with a focus on fish exported to Europe. The programme will focus on increasing the value of each captured product including less waste and improving working conditions in the chain	Bilateral agreement	-	d-portal (2022bc)

118	Senegal - Canada	2020	Canada committed \$1.5 million USD to a bilateral project that aims to enhance the economic, social and environmental development of three Senegal local villages in a sustainable way and to improve the living, working and health conditions of the inhabitants. The two main areas of focus of the project are: 1) the governance of the shellfish resources processing units, a more inclusive access to the units, the creation of micro-businesses, and sustainability, and 2) innovative product commercialisation, sustainable use of resources and competencies reinforcement.	Bilateral agreement	-	d-portal (2022cd)
119	Senegal - China	2020	Senegal issued 54 foreign fishing licences with a majority of them being Chinese vessels. The licensing of these fishing licences caused a lot of backlash from the local community as the vessels that were given licences had records of IUU fishing. This has resulted in the Ministry publicly stating the rejection of the licences. However, it was later found that some of the vessels involved were still secretly given licences afterwards.	Direct licensing	98, 99, 100, 101, 102, 106	APRAPAM (2020), AFP (2020), Philippe (2020), Nwoye (2022)
120	Senegal - FAO	2021 - 2022	FAO invested \$46,000 USD in a project that aimed to identify innovative and sustainable mechanisms for financing fisheries management.	International assistance	-	d-portal (2022ce)
121	Senegal - Netherlands	2022	The Netherlands committed to contributing \$654,628 USD to Senegal for developing a business plan for a fingerling production facility in Senegal.	Bilateral agreement	-	d-portal (2022cf)
122	Solomon Islands - Micronesia, Kiribati, Marshall Islands, Nauru, Palau, Papua New Guinea (and Tokelau and Tuvalu later)	Starting from 1982	The Solomon Islands and several other Pacific Island countries co-created and joined the Nauru Agreement, which is a regional effort among those countries to conserve fisheries resources, especially tuna. Later, all countries in the agreement co-adopted the "Vessel Day Scheme", which limits the maximum amount of catch through the countries selling "number of days" when fishing is allowed to foreign fleets. The number of days each country can sell is determined by all of the countries together.	Multilateral agreement	-	Bernadett (2014), The Parties to the Nauru Agreement (2022)
123	Solomon Islands - EU	2009 - 2015	The EU signed a fisheries partnership agreement covering tuna fisheries with the Solomons Islands in 2009 and was renewed in 2012 for another 3 years.	Bilateral agreement	-	European Commission (2022e)
124	Solomon Islands - Australia	2009-2011	The Australian government provided close to \$900,000 AUD to Solomon Islands over the course of 3 years to fund research to improve resilience and adaptive capacity of fisheries-dependent communities in the country.	Bilateral agreement	-	D-portal (2022cg)
125	Solomon Islands - Australia	2009-2011	Australia provided just over \$24,000 AUD to Solomon Islands as assistance for sustainable fisheries aiming to decrease poverty and strengthen food security, also to provide better monitoring, control, and surveillance of fisheries resource.	Bilateral agreement	-	D-portal (2022ch)
126	Solomon Islands - Australia	2009-2018	As part of the AusAID - Non-Government Organisations Cooperation Programme (ANCP), over \$26 million AUD was provided to 10 different sectors in Solomon Islands through Australian NGOs. In total, 5% of that funding went to fishery development and fishing policy and administrative management sector.	Bilateral agreement	-	d-portal (2022ci-ck)
127	Solomon Islands - Australia	2010-2016	Through the Direct Aid Programme (DAP) of the Department of Foreign Affairs and Trade of Australia, over \$160,000 AUD were provided to Solomon Islands for the development of 9 different sectors. Within the sectors, fishery education/ training, and fishery services, which include fishing harbours, fish markets, fishery transport, and cold storage, was one of the focus sectors.	Bilateral agreement	129	d-portal (2022cl)
128	Solomon Islands - Australia	2010-Now	Australia has provided fisheries development assistance in funding, technical support, and scientific advice to Solomon Islands through funding organisations like Forum Fisheries Agency (FFA), Secretariate of the Pacific Community's (SPC) Fisheries Division, and the Australian Centre for International Agricultural Research (ACIAR). The assistance aims to promote sustainable fisheries development and reducing poverty. The funding has aided in the increase of fisheries productivity in the area, development of mariculture and aquaculture, and enhancing the monitoring of tuna stocks in the area.	Bilateral agreement	-	D-portal (2022cm-co)

129	Solomon Islands- New Zealand	2010-Now	New Zealand's Ministry of Foreign affairs and Trade has provided over \$20 million NZD in funding and technical support since 2010 to Solomon Islands for the development of fisheries and marine resource, fishery policy, and fishery education/training through its Solomon Islands Fisheries Development initiative and implementing programmes like the "Solomon Islands fisheries programme" and the "Mekem Strong Solomon Islands Fisheries programme"	Bilateral	126	d-portal (2022cp, 2022cq, 2022cr, 2022cs)
130	Solomon Islands - Australia	2011-2015	Through the Community-Based Marine Resource Governance project, Australia has provided aid to the Government of Solomon Islands for their initiative in improving fishing policy and administrative management for sustainable inshore fisheries.	Bilateral agreement	-	d-portal (2022ct)
131	Solomon Islands - China	2012	The Chinese state-owned company CNFC Overseas Fisheries and Shanghai Fisheries obtained fishing rights and operated around 20 and 6 vessels in the Solomon Islands water respectively.	Direct licensing	-	Shanghai Fisheries Group Co Ltd. (2012)
132	Solomon Islands- Japan	2012-2013	Through the support of the Fisheries Development Assistance for Pacific Islands Nations by the Japan International Cooperation Agency (JICA), the Overseas Fisheries Cooperation Foundation (OFCF) of Japan sends fisheries technical experts with equipment and materials to transfer technology of repair and maintenance of fisheries related facilities and other experts for fisheries related organisation to improve management.	Bilateral agreement	-	D-portal (2022cu)
133	Solomon Islands- Japan	2012-2013	Japan sends experts to give technical advice to Pacific Island Forum Fisheries Agency (FFA) countries regarding the Tuna industry.	Bilateral agreement	-	D-portal (2022cv)
134	Solomon Islands- Australia	2013-2018	Through the government partnership for development programme (GPDF), the Australian government has provided funding and support for the Solomon Islands in fishing policy and administrative management.	Bilateral agreement	-	d-portal (2022cw)
135	Solomon Islands-World Bank	2014 - 2021	Solomon Islands has received over \$4 million USD through the Pacific Islands Regional Oceanscape Programme from the World Bank. The programme aims to strengthen the joint management of specific Pacific Island oceanic and coastal fisheries and the habitat it relies on.	Bilateral agreement	-	d-portal (2022cx)
136	Solomon Islands - China	2019	The Solomon Islands joined China's Belt and Road Initiative and the Maritime Silk Road. Both countries agreed to strengthen cooperation in the fisheries sector.	Bilateral agreement	-	International Investment and Trading Network (2019)
137	Solomon Islands - New Zealand	2020 - Now	New Zealand's Ministry of Foreign Affairs and Trade provides funding for establishing and continual operation of Bina Harbour and Cannery project at the request of the Solomon Islands government. This includes support for the operation of harbours and docks, fish stock protection, aquaculture, and integrated fishery projects.	Bilateral agreement	138	D-portal (2022cy, cz)
138	Solomon Islands - Japan, Korea, the Philippines, Taiwan, Vanuatu, Fiji, Kiribati, and China	As of 2021	It was known that Japan, Korea, the Philippines, Taiwan, Vanuatu, Fiji, Kiribati, and China have made some types of arrangements or agreements with the Solomon Islands that have allowed those countries to gain fishing access to its waters.	Bilateral agreement	-	Western And Central Pacific Fisheries Commission (2022)
139	Solomon Islands - China	2022	The Solomon Islands signed an undisclosed agreement with China on strengthening their cooperation in the fisheries sector. In particular, both countries agreed to cooperate on building a deep-sea fishing base and a "blue economy cooperation base", as well as new fishing vessels and shipyards	Bilateral agreement	136	Packham (2022)

This study reviews China's mariculture and marine fisheries with emphasis on the operations of its Distant Water Fleets (DWF). China's DWF are analysed with some emphasis on the subsidies they receive from their government, their Illegal, Unreported and Unregulated catches and practices, the challenges they represent to international agreements, and to competing fleets from the EU, particularly in six focal countries, i.e., Mauritania, Senegal, Madagascar, Mauritius, Ecuador and the Solomon Islands. Finally, the trade of Chinese fishery and mariculture products is reviewed with some emphasis on the import of fish feed by China, which may increasingly impact some food-deficient countries.

PE 733.101
IP/B/PECH/IC/2022-011

Print ISBN 978-92-846-9979-7 | doi:10.2861/36964 | QA-09-22-667-EN-C
PDF ISBN 978-92-846-9980-3 | doi:10.2861/572 | QA-09-22-667-EN-N