



Despite Progress, Illegal Catch Continues to Reach the Market

Gaps persist in adherence to and implementation of Port State Measures Agreement

Overview

Illegal, unreported and unregulated (IUU) fishing is one of the biggest threats to global ocean sustainability. Researchers estimate that at least 1 in 5 fish caught globally are caught illegally, with a total cost to coastal nations between U.S. \$10 billion and \$23 billion a year.¹

The United Nations Food and Agriculture Organization's Port State Measures Agreement (PSMA), in force since 2016, is the only legally binding international treaty specifically designed to prevent, deter and eliminate IUU-caught fish from entering the market.² Parties to the PSMA must implement controls sufficient to minimize that risk to ensure that foreign fishing vessels landing or transshipping—that is, transferring fish or other marine wildlife between a fishing vessel and a carrier vessel—in ports do so legally. The agreement also requires that parties adopt similar controls for oversight of domestic fleets.

To identify gaps in PSMA implementation, The Pew Charitable Trusts commissioned a peer-reviewed study by researchers from Poseidon Aquatic Resource Management and Global Fishing Watch that was published in the journal *Marine Policy* in 2023.³ The research team used 2020 fishing and carrier vessel positional data from the Automatic Identification System (AIS) and other publicly available information to rank coastal State fishing ports by various measures—including foreign vessel visits, fishing vessel hold size and carrier vessel hold size—and determine which States had the most risk of illegally caught fish entering the marketplace to identify the ports where effective PSMA implementation would have the greatest impact.

This research builds on a first-of-its-kind 2019 study that used 2017 AIS data to better understand fishing and carrier vessel movements and to identify the most-used ports and the risks for IUU-caught fish to be landed at them. That analysis also yielded a peer-reviewed paper published in the *Journal of Ocean and Coastal Economics* in 2019.⁴ Now, this updated study includes an additional analysis of the use of designated ports—landing ports to which States direct foreign vessels to ensure application of sufficient controls—which is a key requirement of the PSMA.⁵

The latest findings demonstrate significant changes in the ranking of ports between the study years, mainly better AIS detection and track assessments, particularly of domestic fleets, changes in adoption and implementation of PSMA and port State measures (PSMs), and the impact of COVID-19-related port closures.⁶

The key findings were:

1. Global port State risk has improved—but by less than 1%.
2. The gap is widening between countries that are and are not implementing port State measures.
3. More high-risk vessels, or those likely to be operating illegally, targeted ports with no PSMs in place, increasing the risk of IUU-caught fish entering the market.
4. Foreign vessels account for less than 3% of vessel visits, highlighting a need for more domestic port controls.
5. Developed States use designated ports less than developing States, which undermines one of the fundamental provisions of the PSMA.

Overall, the study shows that simply being a party to the PSMA is highly effective in closing ports to illegal catch, and the analysis makes a strong case for more States to adopt the agreement.

This brief provides a summary of the study findings and lays out key recommendations to help States implement the PSMA.

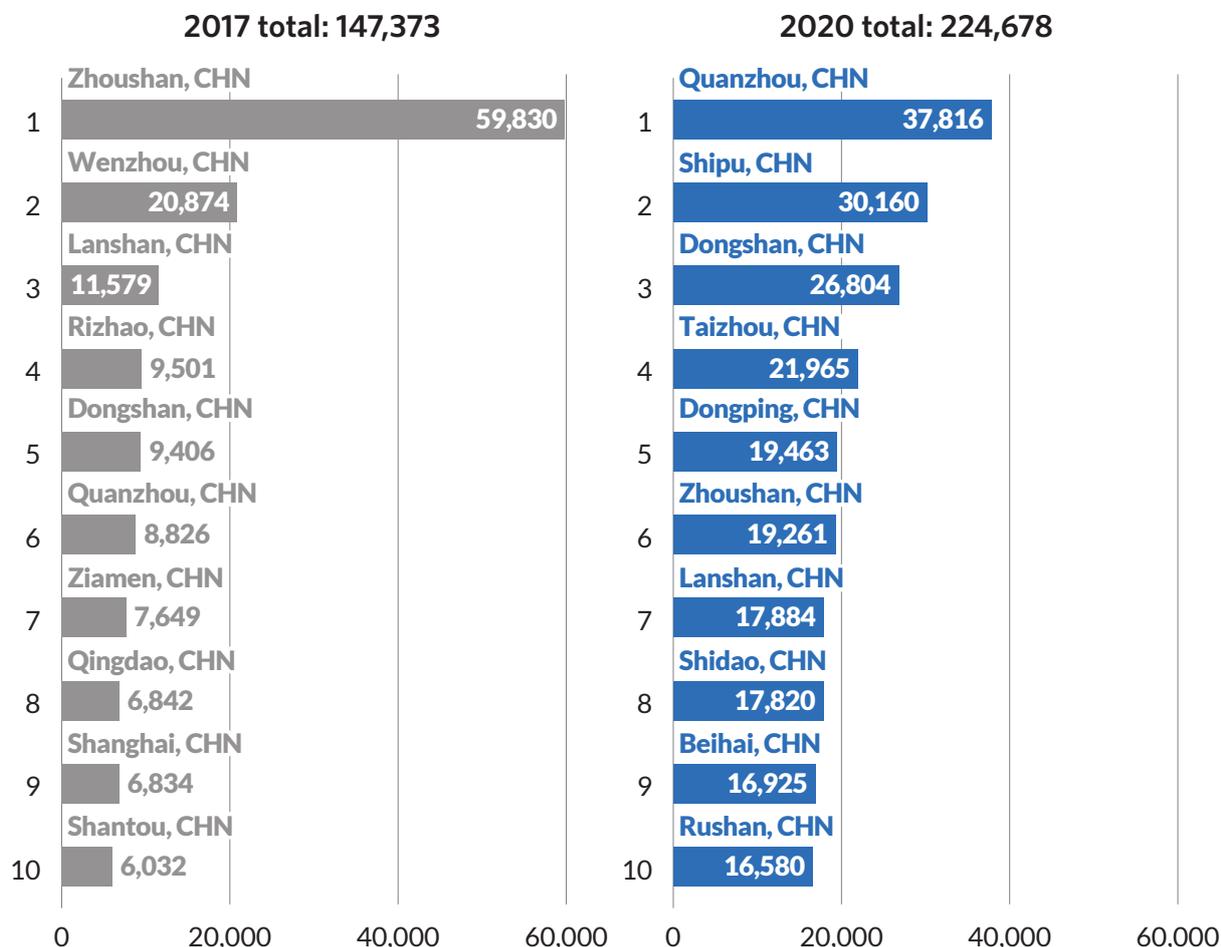
Port rankings by vessel visits and hold sizes

In 2020, as in 2017, China was home to the top 10 ports in the world based on the total number of fishing and carrier vessel visits, with domestic vessels accounting for the majority of landings. (See Figure 1.) However, between those years, the ports used in China changed, and total vessel traffic increased 50%—most likely because AIS detection algorithms improved and the researchers used a different AIS provider that delivered more inshore data.

Figure 1

China Still Hosts the World’s Busiest Ports Despite Mainly Serving Domestic Vessels

Top 10 global ports by total vessel visits, 2017 and 2020



Sources: G. Hosch et al., “Any Port in a Storm: Vessel Activity and the Risk of IUU-Caught Fish Passing Through the World’s Most Important Fishing Ports” (2019), <https://cbe.miis.edu/cgi/viewcontent.cgi?article=1097&context=jocoe>; G. Hosch et al., “IUU Safe Havens or PSMA Ports: A Global Assessment of Port State Performance and Risk” (2023), <https://doi.org/10.1016/j.marpol.2023.105751>

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The main focus of the PSMA is for States to place tighter controls on foreign-flagged vessels seeking to enter and use their ports to land or transship fish. So, in addition to analysing which ports had the highest overall vessel visits, the study identified where most foreign vessels may be landing their catch and which States have the largest fish capture capacity for fishing vessels and carrier vessels. The findings should help PSMA parties provide more targeted assistance to States seeking to implement effective port measures and minimize the risk of IUU fish entering the market.

This analysis found that since the first study, the overall number of foreign vessel visits increased, and the ports visited changed significantly. (See Figure 2.) For instance, Nouadhibou, Mauritania, experienced a more than 100% increase in foreign vessel visits, changing the port’s ranking from fifth in 2017 to first in 2020. Most foreign fishing vessels landing in Nouadhibou were flagged to Turkey (930 visits), China (299), Spain (293) and Cameroon (183). Elsewhere, visits to Busan, South Korea, declined by slightly more than 10%, and

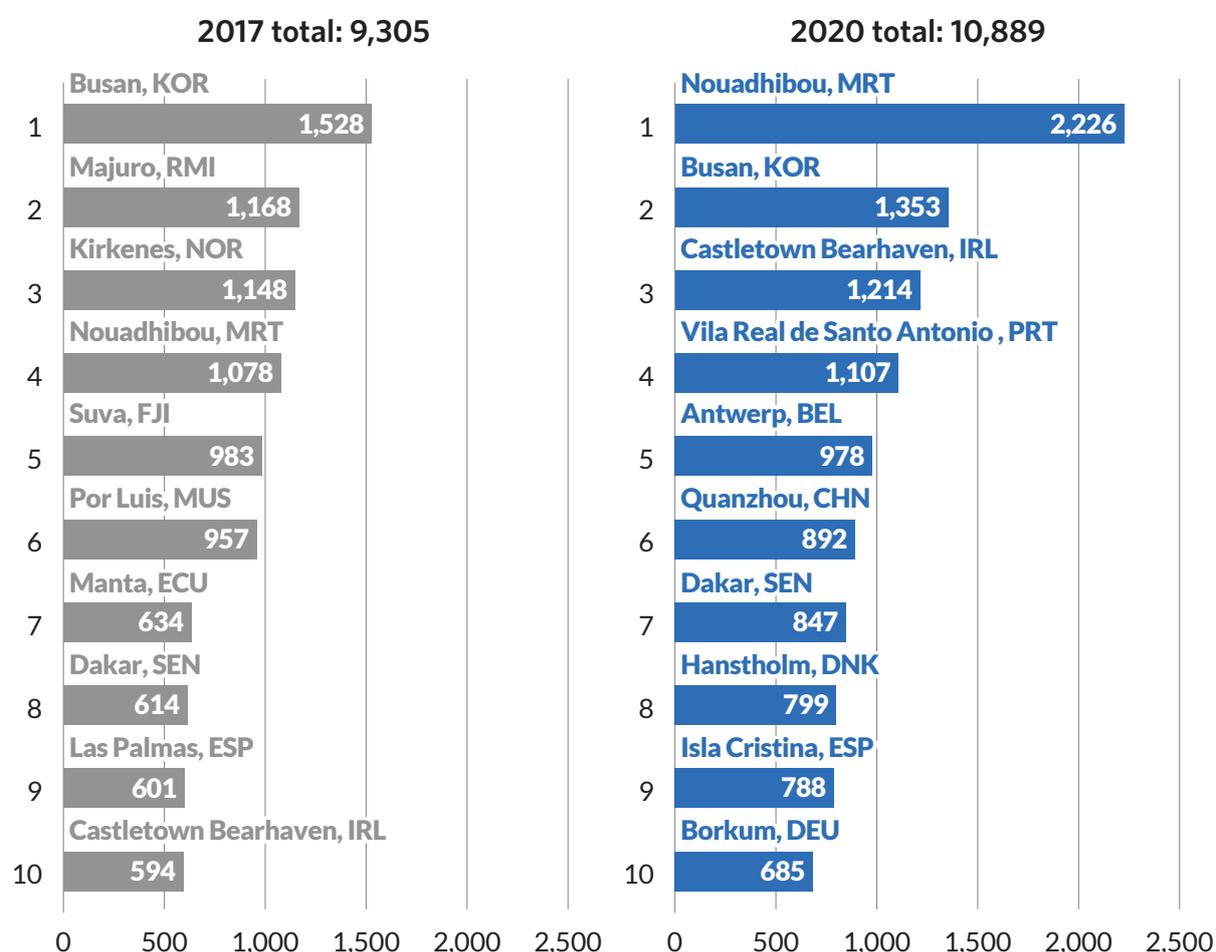
the port dropped from first to second in the rankings, with the majority of visits from Russia, both fishing and carrier vessels (837 visits), China (178) and Panama (146).

In addition, many Pacific ports experienced significant decreases in vessel visits between 2017 and 2020 because of pandemic-related closures or restrictions. Foreign vessel visits fell by more than 40% in Majuro, Republic of the Marshall Islands, and over 50% in Suva, Fiji, dropping both ports out of the top 10. Other ports with significant decreases in visits that were probably driven by the pandemic include Manta, Ecuador (-78.4%), Kirkenes, Norway (-73.3%), Walvis Bay, Namibia (-51.3%), Port Louis, Mauritius (-48.7%), Abidjan, Côte d'Ivoire (-35.9%) and Pohnpei, Federated States of Micronesia (-43.8%).

Figure 2

Ports Receiving the Most Foreign Vessels Changed in the First Pandemic Year Versus 3 Years Earlier

Top 10 ports by foreign vessel visits, 2017 and 2020



Source: G. Hosch et al., "Any Port in a Storm: Vessel Activity and the Risk of IUU-Caught Fish Passing Through the World's Most Important Fishing Ports" (2019), <https://cbe.miis.edu/cgi/viewcontent.cgi?article=1097&context=jocoe>; G. Hosch et al., "IUU Safe Havens or PSMA Ports: A Global Assessment of Port State Performance and Risk" (2023), <https://doi.org/10.1016/j.marpol.2023.105751>

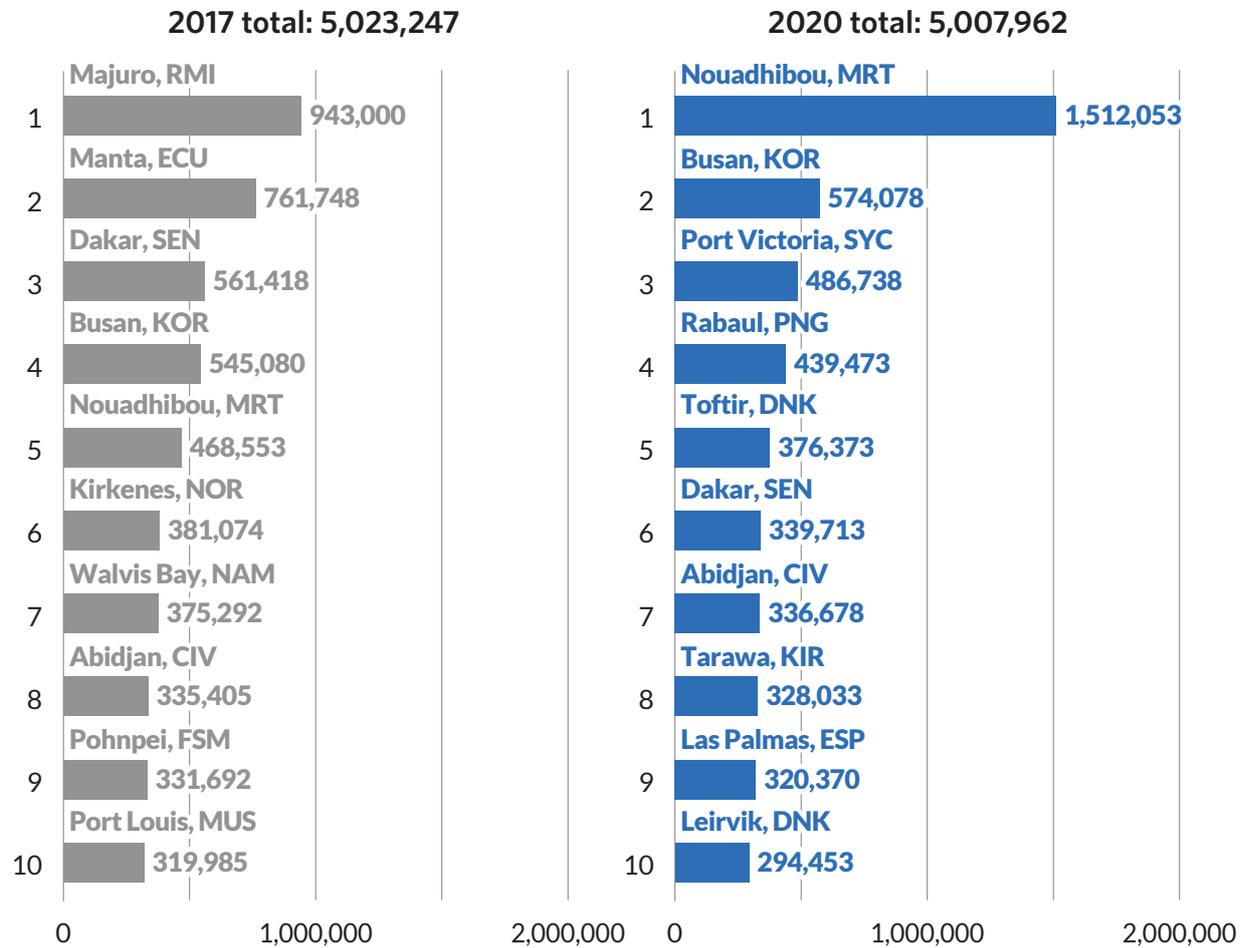
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The shifts in vessel visits were largely paralleled by changes in the hold sizes of visiting foreign fishing vessels between the two studies. (See Figure 3.) For instance, hold sizes of vessels visiting Nouadhibou increased three-fold in 2020 compared with 2017, while in Majuro, hold sizes declined by at least 60%.

Figure 3

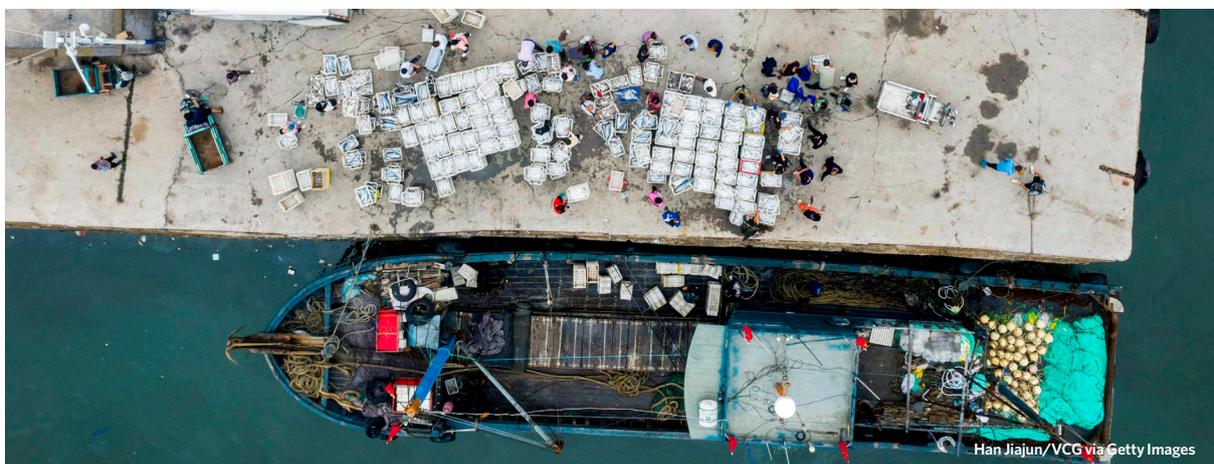
Many Ports Received Smaller Foreign Fishing Vessels in the First Pandemic Year Than Previously

Top 10 ports by foreign fishing vessel hold size in cubic meters, 2017 and 2020



Sources: G. Hosch et al., "Any Port in a Storm: Vessel Activity and the Risk of IUU-Caught Fish Passing Through the World's Most Important Fishing Ports" (2019), <https://cbe.miis.edu/cgi/viewcontent.cgi?article=1097&context=jocoe>; G. Hosch et al., "IUU Safe Havens or PSMA Ports: A Global Assessment of Port State Performance and Risk" (2023), <https://doi.org/10.1016/j.marpol.2023.105751>

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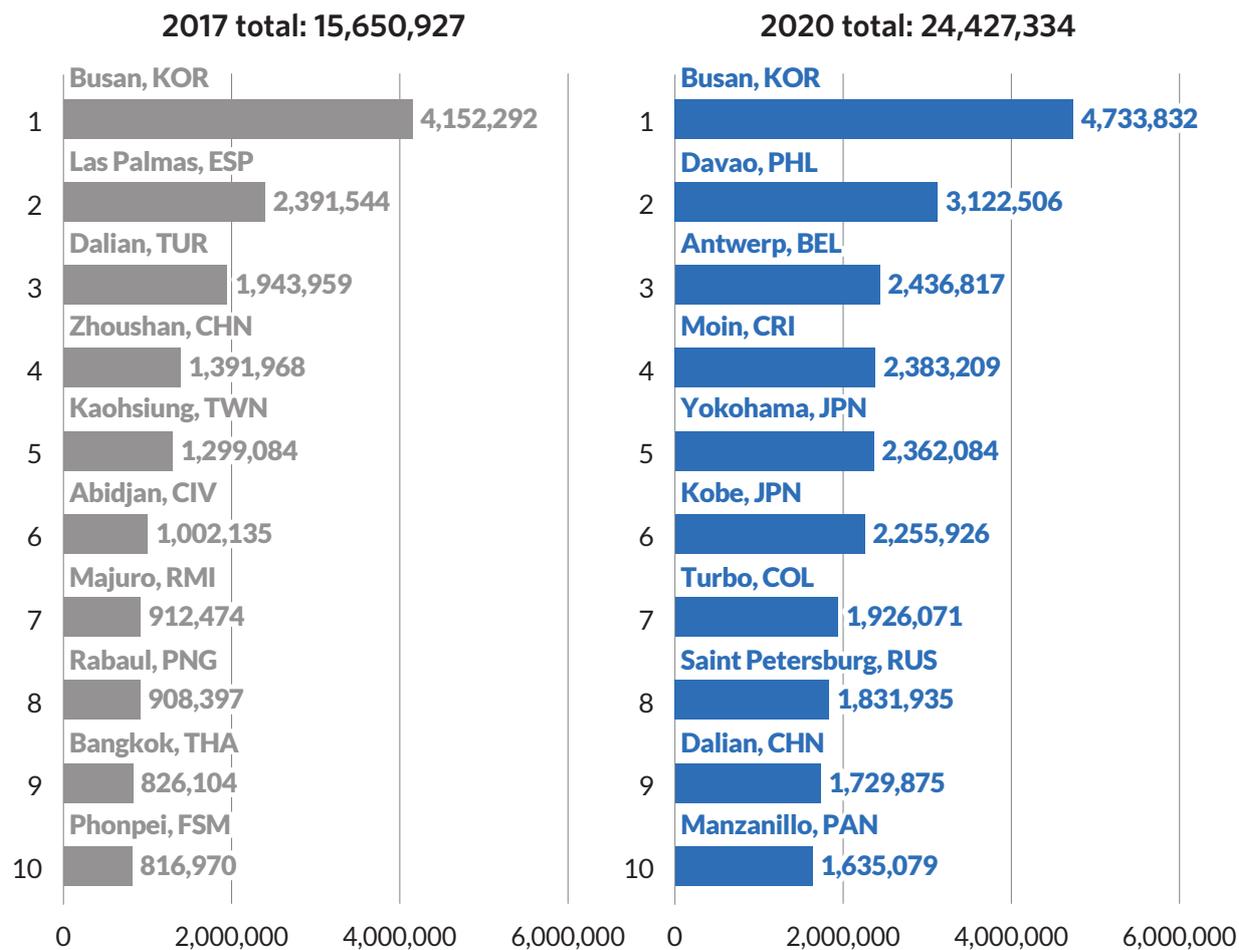


Port rankings by foreign carrier vessel hold size also changed considerably between the study years, although Busan remained number one. Several ports that were listed in 2017, mainly in the Pacific, fell out of the top rankings in 2020 because of pandemic-related restrictions, while ports in the Philippines, Europe and Japan joined the top 10 in 2020. Additionally, total carrier hold size increased by 56.8% between the study years. (See Figure 4.)

Figure 4

Busan Remained the Top Port for Visits by Large Carrier Vessels

Top 10 ports by foreign carrier vessel hold size in cubic meters, 2017 and 2020



Sources: G. Hosch et al., "Any Port in a Storm: Vessel Activity and the Risk of IUU-Caught Fish Passing Through the World's Most Important Fishing Ports" (2019), <https://cbe.miis.edu/cgi/viewcontent.cgi?article=1097&context=joce>; G. Hosch et al., "IUU Safe Havens or PSMA Ports: A Global Assessment of Port State Performance and Risk" (2023), <https://doi.org/10.1016/j.marpol.2023.105751>

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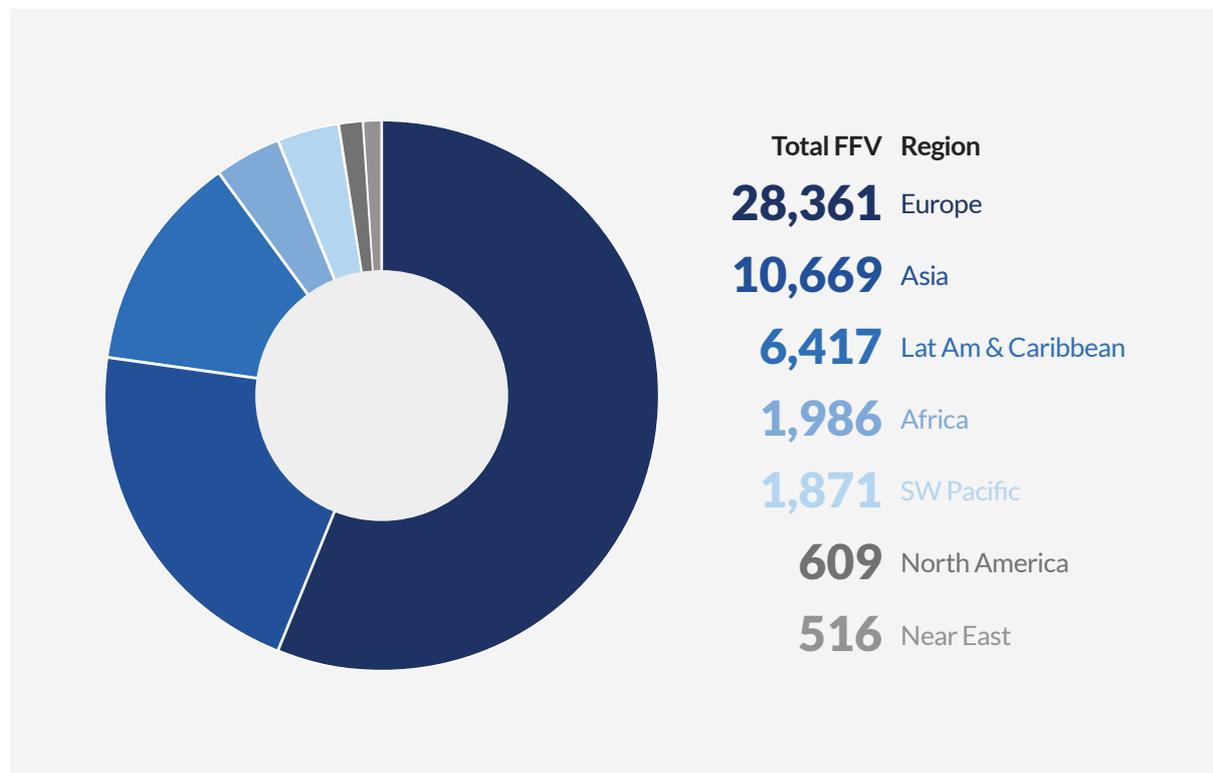
Of the total vessel visits to ports (1,705,358) in 2020, most involved vessels entering domestic ports (1,655,429); only a small proportion (49,929) were vessels landing in foreign ports. The total vessel visit figure increased considerably from the 775,453 in the first study, probably as a result of advancements in AIS algorithm detection, particularly for domestic visits, which accounted for the vast majority of visits in both years, totalling 40,992 in 2017. As a result, just 2.9% of all 2020 port visits fell under the main provisions of the PSMA—which target foreign vessels—such as requiring the use of designated ports, advance notification of entry into port and risk assessment.⁷

Globally, European vessels made the most visits to foreign ports. Vessels from Asia and Latin America and the Caribbean made the second- and third-most foreign visits, respectively. (See Figure 5.) Vessels from the remaining regions made up less than 10% of the overall visits to foreign ports.

Figure 5

European and Asian Vessels Accounted for More Than Three-Quarters of Calls to Foreign Ports

Global distribution of foreign visits by region, 2020



Source: G. Hosch et al., "IUU Safe Havens or PSMA Ports: A Global Assessment of Port State Performance and Risk" (2023), <https://doi.org/10.1016/j.marpol.2023.105751>

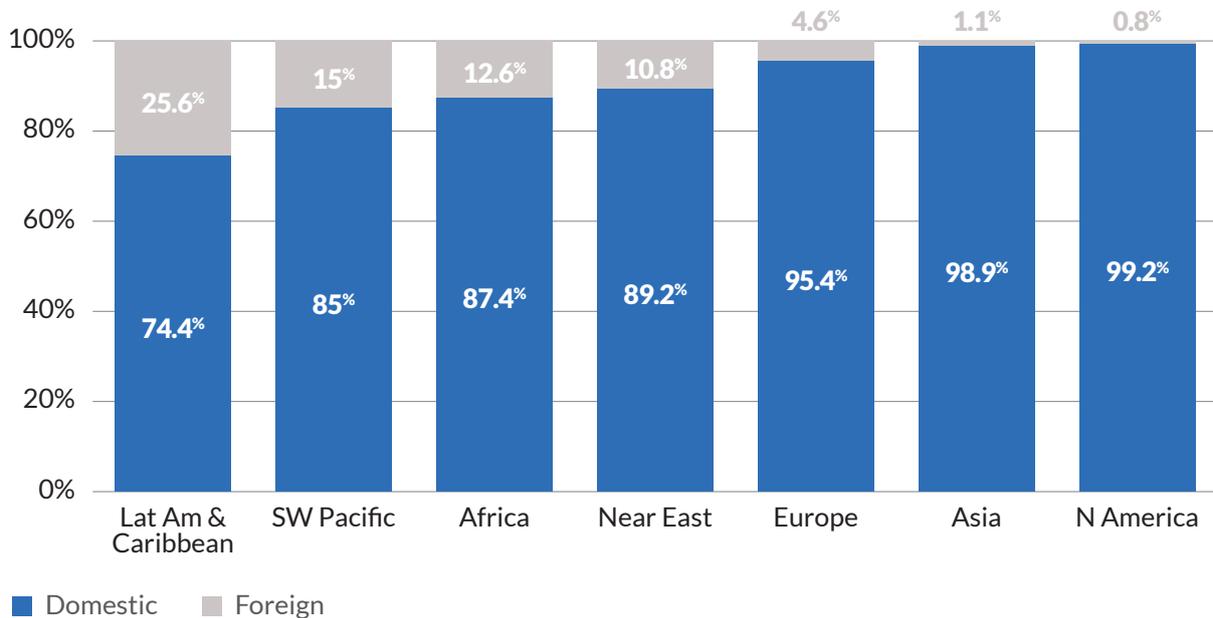
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In relative terms, when considering foreign versus domestic visits by region, vessels from Latin America and the Caribbean (25.6%) made the most foreign port visits as a share of total visits, followed by those from the Southwest Pacific (15%), Africa (12.6%), the Near East (10.8%) and Europe (4.6%). (See Figure 6.) Asian (1.1%) and North American (0.8%) vessels had the lowest shares of foreign visits.

Figure 6

Vessels From Latin America and the Caribbean Made the Most Visits to Foreign Ports as a Share of Total Port Entries

Domestic versus foreign port visits by region, 2020



Source: G. Hosch et al., "IUU Safe Havens or PSMA Ports: A Global Assessment of Port State Performance and Risk" (2023), <https://doi.org/10.1016/j.marpol.2023.105751>

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Port State risk analysis

To assess the risk of IUU-caught fish passing through ports in each of the 140 coastal States, the researchers created an index that combines the level of vessel traffic at each port, as detected by AIS, with indicators of internal and external risk. (See Table 1.) For example, one indicator of internal risk is perceived levels of corruption, while visits by vessels likely to be engaged in IUU fishing is an indicator of external risk.



Table 1

A Diverse Set of Internal and External Factors Inform Risk at Port

Underlying indicators for the Port State IUU Risk Index

Category	AIS-based	Priority	Indicator
General	Yes	n/a	1. Operates commercial ports in which fishing vessels do business
Internal	Yes	High	2. Number of commercial fishing ports
	No	Medium	3. Party to the PSMA
	No	Medium	4. Contracting party of cooperating non-contracting party of a regional fisheries management organization (RFMO) with a binding port State measures resolution and transparent compliance monitoring
	No	High	5. Compliance record with binding RFMO port State conservation and management measures
	No	Medium	6. Transparency International's Corruption Perceptions Index ranking
	No	Low	7. Status of the port State, identified by the EU*
	No	Low	8. Status of the port State, identified by the U.S.*
	No	Medium	9. Status of the port State, within any RFMO*
External	Yes	Medium	10. Port visits by foreign fishing vessels
	Yes	High	11. Flag of Convenience State fishing vessels entering ports (plus vessels with an unknown Maritime Mobile Service Identity)
	Yes	High	12. Average flag State governance index of fishing vessels entering ports [†]
	Yes	High	13. IUU-listed fishing vessels entering ports
	Yes	Medium	14. EU-carded flag State fishing vessels entering ports
	Yes	Medium	15. U.S.-carded flag State fishing vessels entering ports
	Yes	Medium	16. Average internal port State risk of fishing vessels entering ports (indicators 1-9)

Note: "Fishing vessels" refers to fishing and carrier vessels.

* Status indicates whether the European Union (EU), United States (U.S.), or an RFMO mechanism has identified the port State as underperforming or issued a warning to that effect.

† Average Transparency International Corruption Perception Index scores for the flag States of foreign vessels that entered given ports.

Source: G. Hosch et al., "IUU Safe Havens or PSMA Ports: A Global Assessment of Port State Performance and Risk" (2023), <https://doi.org/10.1016/j.marpol.2023.105751>

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The analysis scores and ranks port States based on internal, external and overall risk levels, with lower scores indicating lower risk. Internal risk scores capture the extent to which each country has measures in place to mitigate IUU risks, such as being a party to the PSMA. External risk scores reflect the IUU fishing histories of the vessels landing in each port. The overall risk score is an average of the internal and external scores.

The trend from 2017 to 2020 shows increasing risk in non-PSMA ports, which are experiencing more visits from foreign vessels flagged to States that are not parties to the agreement. Future analyses will better indicate whether the trends are significant.

- Overall global port State risk decreased slightly (-0.5%) from 2017 to 2020, primarily because of a decline in internal risk, suggesting that more States have measures in place to mitigate IUU risks. However, external risk increased by nearly 1%, which may be the result of higher-risk vessel movement changes during the pandemic. (See Table 2.)
- The Latin America and Caribbean region had the only increase in internal risk in 2020, compared with 2017, while the Southwest Pacific, Latin America and the Caribbean, and the Near East had higher external risk. The Near East was 2020's riskiest region in all categories, while Latin America and the Caribbean dropped three places to second-riskiest in the latest study. These regions are most at risk of IUU fish landing in port, because the analysis found that higher-risk vessels tended to use their ports. Europe and North America were the the lowest-risk regions overall. (See Table 3.)
- The States with the highest overall risk in Asia, Africa and Europe largely held steady across the study years: China, Democratic Republic of the Congo and Russia, respectively, and in the Southwest Pacific, Kiribati, Papua New Guinea and Solomon Islands. In Asia, Sri Lanka remained the lowest risk state in 2020. (See Table 4.)

Table 2

Global Port State Risk Declined as PSMA Measures Expanded, but Higher-Risk Vessels Pose Threats

Global port State risk by type, year and percentage change, 2017 to 2020

	Internal risk score	External risk score	Overall risk score
2017	2.299	2.479	2.404
2020	2.226	2.517	2.383
Difference (in %)	-1.8%	+1.0%	-0.5%

Note: The overall risk score improved slightly (-0.5%) between studies, mainly because of improvements by States in mitigating the risk of IUU-caught fish landing in port (internal risk), while an increase in higher-risk vessel movements (external risk) posed the biggest threat.

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Table 3

The Latin America and Caribbean Region Saw the Largest Spike in Risk Level Over 3 Years

Risk level rankings, scores by risk type and region, 2017 and 2020

	Rank	Internal risk score	External risk score	Overall risk score
2017	1	Europe (2.06)	Southwest Pacific (2.31)	North America (2.24)
	2	North America (2.06)	North America (2.41)	Europe (2.27)
	3	Africa (2.22)	Latin America & Caribbean (2.42)	Latin America & Caribbean (2.35)
	4	Latin America & Caribbean (2.26)	Near East (2.47)	Africa (2.40)
	5	Asia (2.48)	Europe (2.48)	Southwest Pacific (2.41)
	6	Southwest Pacific (2.51)	Africa (2.54)	Asia (2.54)
	7	Near East (2.68)	Asia (2.59)	Near East (2.65)
2020	1	North America (1.88)	Europe (2.34)	Europe (2.12)
	2	Europe (1.89)	Southwest Pacific (2.36)	North America (2.13)
	3	Africa (2.19)	North America (2.38)	Africa (2.36)
	4	Asia (2.29)	Africa (2.54)	Southwest Pacific (2.40)
	5	Latin America & Caribbean (2.38)	Asia (2.58)	Asia (2.43)
	6	Southwest Pacific (2.44)	Latin America & Caribbean (2.64)	Latin America & Caribbean (2.53)
	7	Near East (2.53)	Near East (2.74)	Near East (2.72)

Notes: Risk varied between the 2017 and 2020 studies. Latin America and the Caribbean had the biggest change as a result of reduced mitigation measures at the State level (internal risk) and more high-risk vessels (external risk) landing in their ports. As of 2020, the Near East had the highest IUU risk in all risk categories. The internal risk score evaluates whether a country has measures in place to mitigate IUU risks. The external risk score evaluates risks associated with IUU fish-carrying vessels attempting to enter port.

Source: G. Hosch et al., "Any Port in a Storm: Vessel Activity and the Risk of IUU-Caught Fish Passing Through the World's Most Important Fishing Ports" (2019), <https://cbe.miis.edu/cgi/viewcontent.cgi?article=1097&context=jocje>; G. Hosch et al., "IUU Safe Havens or PSMA Ports: A Global Assessment of Port State Performance and Risk" (2023), <https://doi.org/10.1016/j.marpol.2023.105751>

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Table 4

Regional Risks Reflect a Combination of Internal and External Factors

Top 3 highest- and lowest-risk port States within each region by risk type, 2020

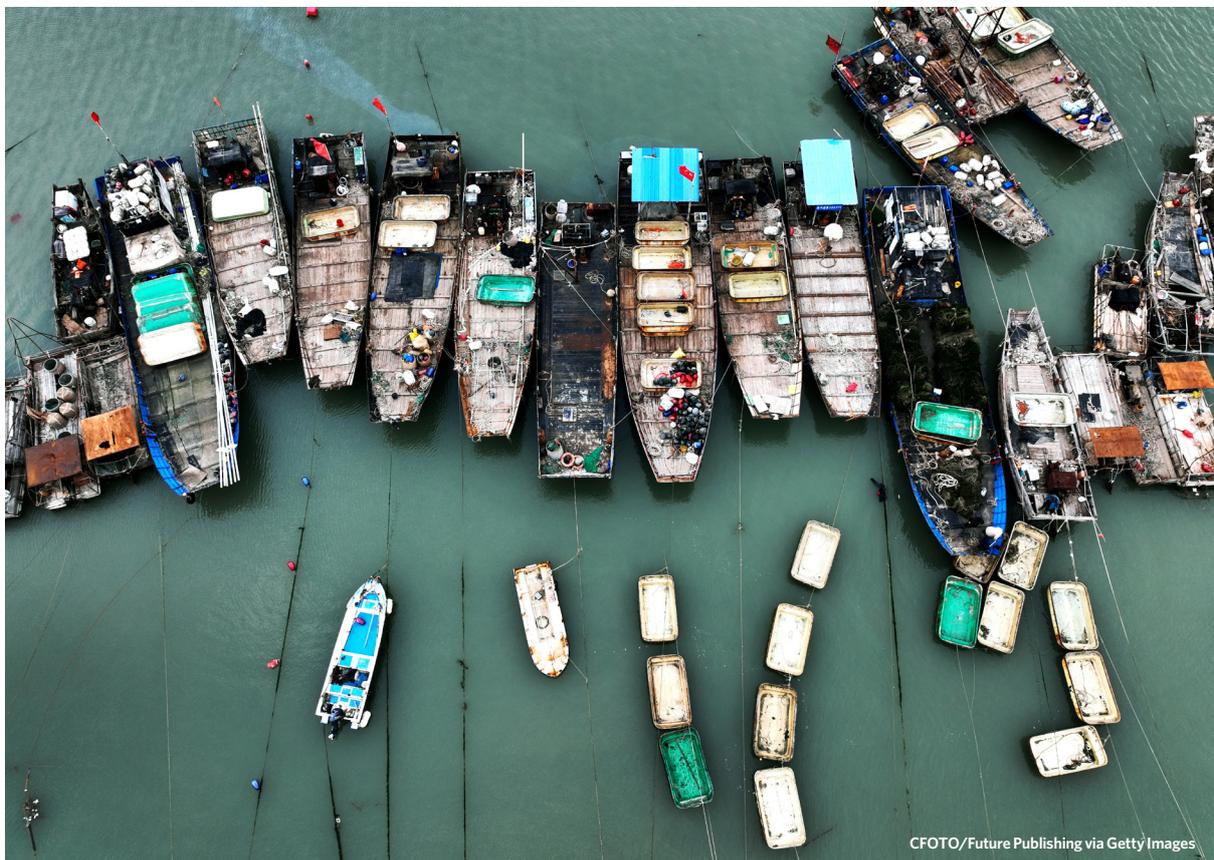
	Region	Internal risk score	External risk score	Overall risk score
Top 3 (starting with the strongest)	Africa	São Tomé e Príncipe	Kenya	Gambia
		Senegal	Gambia	Kenya
		Gambia	Tanzania	Cape Verde
	Asia	Maldives	Sri Lanka	Sri Lanka
		Sri Lanka	Myanmar	Maldives
		Japan and Singapore	North Korea	Singapore
	Europe	Lithuania	Finland	Finland
		Belgium	Estonia	Belgium
		Finland	Cyprus and Germany	Cyprus and Estonia
	Latin America & the Caribbean	Barbados	Bahamas	Bahamas
		Bahamas	Mexico	Nicaragua
		Cuba	Brazil and Trinidad and Tobago	Trinidad and Tobago
	Near East	Oman	Djibouti	Djibouti
		Libya	Iran	Oman
		Egypt and Lebanon	Lebanon and UAE	Libya
North America	Canada	Canada	Canada	
Southwest Pacific	Cook Islands	Cook Islands	Cook Islands	
	Australia	Palau	Palau	
	New Zealand	Tonga and Vanuatu	Tonga and Vanuatu	
Bottom 3 (starting with the weakest)	Africa	Democratic Republic of Congo (DRC)	Sudan	DRC
		Cameroon	São Tomé e Príncipe	Nigeria
		Republic of Congo	Ghana	Guinea-Bissau
	Asia	North Korea	China	China
		China	Thailand	Vietnam
		Vietnam	Philippines	Malaysia
	Europe	Russia	Montenegro	Russia
		France	Russia	Israel
		Israel	Croatia	Montenegro

	Region	Internal risk score	External risk score	Overall risk score
Bottom 3 (starting with the weakest)	Latin America & the Caribbean	Suriname	El Salvador	Dominican Rep.
		Dominican Republic	Saint Kitts and Nevis	Columbia
		Columbia	Barbados, Dominican Republic, Guyana and Saint Lucia	Saint Lucia
	Near East	Bahrain	Kuwait	Qatar
		UAE	Qatar	Bahrain
		Qatar	Saudi Arabia	Kuwait
	North America	USA	USA	USA
	Southwest Pacific	Papua New Guinea (PNG)	Samoa	Kiribati
		Kiribati	Kiribati	PNG
		Federated States of Micronesia (FSM) and Solomon Islands	Tuvalu and New Zealand	Solomon Islands and FSM

Notes: State rankings apply only within individual regions. Where more than one State is listed, the scores for all listed States were equal.

Sources: G. Hosch et al., "Any Port in a Storm: Vessel Activity and the Risk of IUU-Caught Fish Passing Through the World's Most Important Fishing Ports" (2019), <https://cbe.miis.edu/cgi/viewcontent.cgi?article=1097&context=jocoe>; G. Hosch et al., "IUU Safe Havens or PSMA Ports: A Global Assessment of Port State Performance and Risk" (2023), <https://doi.org/10.1016/j.marpol.2023.105751>

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Supplemental risk analysis

The researchers used the 2020 risk score data to conduct a statistical analysis of potentially significant relationships between key variables: internal and external port State risk, internal and external risk scores between parties and non-parties to the PSMA, port States' risk and their Corruption Perceptions Index (CPI) scores, vessel flag State and port State CPI scores, and the overall port State IUU risk and per capita gross national income. Their analysis found that:

- **Simply being a party to the PSMA lowers internal risk scores and appears to effectively reduce other IUU risks.**
- **As more states adopt the PSMA, higher-risk vessels are being pushed to non-PSMA ports, which drives changes in global external risk scores.** This suggests that adoption of the PSMA alone is a useful deterrent to the landing of IUU catch.
- **More than 60% of port States adopted the PSMA by 2020.** High-risk vessels targeting ports with weaker PSMs will have fewer options as more States adopt the PSMA.
- **Global governance quality is a stronger determining factor of port State performance than national income.** High-risk vessels seek to land in port States with high CPI scores, based on the perception among industry that those States have weaker PSMs than States with lower CPI scores.
- **At a regional level, national income is an important factor in port State performance.** Except for countries in the Near East, higher-income nations generally implement more effective port controls to prevent IUU-caught fish from entering port.

Use of designated ports

A key provision within the PSMA is for parties to designate ports where foreign vessels must land their catch. Designated ports have the appropriate facilities to conduct a risk assessment of foreign vessels requesting entry and require that vessels wishing to land supply all the information necessary to substantiate their catch.



The U.N. Food and Agriculture Organization’s database of publicly hosted PSMA applications for designated ports showed that 32 States, including 18 in the EU, had selected and listed their designated ports as of 2020. For this study, the researchers analyzed those States’ designated port use and found that implementation varied substantially.⁸

The percentage of foreign vessels calling to non-designated EU ports in 2020 was 46.6%, or nearly 1 in 2. (See Table 5.) The lowest visits to designated ports were in Belgium (1.4%), France (16.8%), Greece (17.4%) and Portugal (25%). By comparison, Bulgaria and Lithuania used designated ports 100% of the time.

Table 5

Use of Designated Ports Varied Throughout the EU but Was Below 55% Overall

Designated port entry statistics for 18 EU countries, 2020

EU port State	Total no. of foreign (non-EU) vessel visits	No. of foreign (non-EU) vessel visits to designated ports	(Non-EU) foreign vessel visits to designated ports (in %)
Belgium	147	2	1.4%
Bulgaria	1	1	100.0%
Croatia	2	1	50.0%
Cyprus	0	-	-
Denmark	1,167	510	43.7%
Finland	0	-	-
France	95	16	16.8%
Germany	45	23	51.1%
Greece	23	4	17.4%
Ireland	27	26	96.3%
Italy	28	26	92.9%
Latvia	9	8	88.9%
Lithuania	43	43	100.0%
Netherlands	275	269	97.8%
Poland	126	118	93.7%
Portugal	8	2	25.0%
Romania	0	-	-
Sweden	107	95	88.8%
Total	2,103	1,144	54.4%

Note: European Union law does not require vessels from EU States to use designated ports.

Source: G. Hosch et al., “IUU Safe Havens or PSMA Ports: A Global Assessment of Port State Performance and Risk” (2023), <https://doi.org/10.1016/j.marpol.2023.105751>

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Among non-EU port States, 39.6% of foreign vessels did not use designated ports, with the lowest use of designated ports in Japan (38.1%), Norway (50.9%) and Iceland (66.5%), and the highest (100%) in Republic of The Gambia, Ghana, Kenya, Republic of The Maldives, São Tomé e Príncipe, Seychelles and Togo. (See Table 6.)

These findings suggest that developing states are implementing the designated port provision more consistently and effectively than developed nations. However, developing countries may also have fewer facilities for offloading catch and lower levels of visits, which may be a factor in their higher use of designated ports.

Table 6

More Developing States Directed 100% of Foreign Vessels to Designated Ports Than Developed States

Designated port entry statistics for 14 non-EU States, 2020

Port State	No. of FVV	To designated ports	%
Australia	63	55	87.3%
Chile	282	261	92.6%
Republic of The Gambia	30	30	100.0%
Ghana	170	170	100.0%
Iceland	258	217	66.5%
Japan	1,554	528	38.1%
Kenya	10	10	100.0%
Republic of The Maldives	16	16	100.0%
New Zealand	134	123	91.8%
Norway	1,738	1,059	60.9%
São Tomé e Príncipe	2	2	100.0%
Seychelles	343	343	100.0%
Togo	58	58	100.0%
Vanuatu	59	49	83.1%
Total	4,717	2,849	60.4%

Notes: Designated port use outside of the EU improved slightly over the time covered by the 2020 data set, from 54.4% to 60.4%, with most developing States using them 100% of the time.

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Recommendations

Parties to the PSMA have made progress minimizing the risk of IUU-caught fish landing in port. However, countries that either are not parties to the PSMA or have no PSMs in place face growing pressure as foreign vessels flagged to non-party nations increasingly seek access to ports with no controls. To better limit high-risk vessels' access to their ports, lower-performing nations that already adhere to the PSMA must more stringently apply its provisions, and more non-party States must adopt and implement the agreement. In support of this goal, Pew offers four recommendations:

- PSMA parties must ensure that States equitably and effectively implement measures on domestic as well as foreign vessels, as required by the agreement.⁹ This is particularly important because just over 97% of visits are made domestically.
- Developed States should adhere to provisions made in the PSMA to provide more support to developing States in improving their quality of governance, which is a key driver of port State performance and of successful implementation of international obligations, such as the PSMA.
- States should prioritize becoming parties to the PSMA because doing so deters high-risk vessels from visiting their ports and reduces the likelihood of IUU catch landing in port.
- Parties to the PSMA should develop a mechanism to monitor the effectiveness of PSMA implementation at the regional and global levels, identify gaps, and target assistance. Regional PSMA implementation varies considerably and must become more consistent and transparent, especially for designated ports.

Conclusion

Although global port State risk improved slightly in 2020 compared with 2017, more progress is needed to implement PSMA provisions, especially designated port use, more effectively. As high-risk vessels seek ports with lax port controls, the tracking of vessels flagged to non-parties to the PSMA is important for assessing risk.

Additionally, domestic checks are vital because foreign vessel visits make up less than 3% of total visits. States need to prioritize more effective port controls for domestic fleets that meet the same standards applied to foreign vessels. Finally, being party to the PSMA or implementing effective PSMs is a useful deterrent against the risk of IUU-caught fish entering the market. Overall, this study demonstrates that the PSMA is highly effective and highlights the need for full global implementation of the agreement to minimize high-risk vessels' opportunities to land illegal catch—and ultimately to end IUU fishing around the world.

Appendix: Methodology

This study builds on two previous assessments: Poseidon's 2015, "Fish Landings at the World's Commercial Fishing Ports," which ranked the world's top 100 ports by volume of commercial fish landed by industrial-scale vessels, and the 2019 study by OceanMind and Poseidon, "Any Port in a Storm: Vessel Activity and the Risk of IUU-Caught Fish Passing Through the World's Most Important Fishing Ports," which combined AIS and other data to develop indicators of port risk.

For this latest study, Poseidon and Global Fishing Watch analysed AIS records from 2020 and created a global data set of 166,514 anchorage points. They then aggregated those points into ports and identified when a fishing vessel and a carrier vessel "enters" an anchorage—having an AIS position within 3 km of an anchorage point—and "exits"—having a position more than 4 km from an anchorage point. To avoid recording port entries in cases when vessels simply transited near anchorages (meeting the basic entry and exit criteria), two additional events were recorded: anchorage stops and anchorage gaps. A port stop begins when a vessel is within 3 km of an anchorage point ("in port") with a speed less than 0.2 knots and ends when the vessel speed exceeds 0.5 knots. These stops were algorithmically grouped to represent port visits and linked to locations that represent commonly used ports and anchorages.

AIS data considerations

- Larger vessels are more likely to carry AIS transmitters and be detected by AIS receivers. This bias increases the confidence of the findings related to foreign visits but underestimates domestic port arrivals by smaller, local vessels.

- Although AIS is not compulsory in all States, some countries and regions—for example, the U.S. and Europe—flag more fishing vessels operating on AIS because of regulations requiring AIS for certain vessel sizes.
- Several regions frequently generate poor AIS data because of limited terrestrial receivers and high traffic density (e.g., the Strait of Malacca and the English Channel) or because vessel operators turn off AIS to reduce the risk of pirate attacks (e.g., near Somalia).
- The researchers excluded some transmitted AIS data from the analysis because of poor quality (e.g., invalid positions, multiple vessels sharing a single AIS identity, and insufficient identity information to distinguish vessels as harvesters or carriers). AIS data quality problems are more common in Asia.

Given the variable satellite coverage and AIS use and data quality, this analysis does not capture every fishing vessel or even all of those fitted with functioning AIS transponders.

Trygg Mat Tracking carried out a quality assurance review of a subset of the data for ports and anchorages. That review identified that some events were inappropriately associated with a specific anchorage or port, and researchers may have overcounted port visits at the State level. The research team corrected some of these errors, but overall, the issues probably had a minimal impact on the global analysis because their effects tend to cancel out over larger areas.

The ranking of ports, especially those based on vessel hold sizes, must be used carefully and for comparative purposes only, because the values are estimates. The rankings based on hold size are of great interest because they represent the aggregate potential for loading, unloading or transshipment of fish, but they should not be interpreted as estimates of the volume of landings or transshipment in port.

Of the 153 coastal States initially selected for this study, researchers eliminated 13 because they detected no AIS-fitted fishing vessels entering ports: Belize, Bosnia and Herzegovina, Brunei Darussalam, Cambodia, Comoros, Eritrea, Haiti, Jordan, Monaco, Nauru, Niue, Syria and Timor-Leste. Of the 140 coastal States identified as operating fishing ports based on AIS data, two did not have any visits by foreign AIS-detected vessels (Bahrain and Nicaragua). Some of the eliminated coastal States—for example, Cambodia and Comoros—are clearly port States, and their exclusion demonstrates some of the limitations associated with the low rate of AIS technology use throughout fishing fleets globally.

The non-AIS source data used for the risk indicators is of reliable quality, as determined by the processes applied by the individual organizations producing and hosting the data. When the researchers found discrepancies between the style or content of information from different sources, they took a conservative bias to ensure that countries received the most accurate possible scores.

Endnotes

- 1 D.J. Agnew et al., "Estimating the Worldwide Extent of Illegal Fishing," *PLOS ONE* 4, no. 2 (2009): e4570, <https://doi.org/10.1371/journal.pone.0004570>.
- 2 Food and Agriculture Organization of the United Nations, Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (2009), <https://www.fao.org/3/i5469t/i5469T.pdf>.
- 3 G. Hosch et al., "IUU Safe Havens or PSMA Ports: A Global Assessment of Port State Performance and Risk," *Marine Policy* 155, no. 105751 (2023), <https://doi.org/10.1016/j.marpol.2023.105751>.
- 4 G. Hosch et al., "Any Port in a Storm: Vessel Activity and the Risk of IUU-Caught Fish Passing Through the World's Most Important Fishing Ports," *Journal of Ocean and Coastal Economics* 6, no. 1 (2019), <https://cbe.miis.edu/cgi/viewcontent.cgi?article=1097&context=jocce>.
- 5 Food and Agriculture Organization of the United Nations, "Designated Ports App," accessed March 13, 2023, <https://www.fao.org/fishery/port-state-measures/psmaapp/?locale=en&action=qry>. The FAO hosts this portal where parties to the PSMA upload their designated ports, and foreign vessels can then request entry into port.
- 6 States that have implemented stricter port controls and are not a party to the PSMA are referred to as having implemented port State measures (PSMs).
- 7 Food and Agriculture Organization of the United Nations, Agreement on Port State Measures. "Each Party shall ensure that measures applied to vessels entitled to fly its flag are at least as effective in preventing, deterring, and eliminating IUU fishing and fishing-related activities in support of such fishing as measures applied to vessels referred to in paragraph 1 of Article 3 (Each Party shall, in its capacity as a port State, apply this Agreement in respect of vessels not entitled to fly its flag that are seeking entry to its ports or are in one of its ports)."
- 8 Food and Agriculture Organization of the United Nations, "Designated Ports App." The EU is a party to PSMA and represents the 27 EU member States.
- 9 Food and Agriculture Organization of the United Nations, Agreement on Port State Measures. "Each Party shall ensure that measures applied to vessels entitled to fly its flag are at least as effective in preventing, deterring, and eliminating IUU fishing and fishing-related activities in support of such fishing as measures applied to vessels referred to in paragraph 1 of Article 3."

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