

ILLUMINATING IUU FISHING

With AI-Driven Analysis & Insights

JULY, 2022

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Executive Summary

This white paper features Windward's proprietary, artificial intelligence (AI)-driven data and behavioral insights to help you better understand the world of illegal, unreported, and unregulated (IUU) fishing. The aim is for you to reach higher levels of awareness and preparedness, and to assist your organization in protecting your nation's EEZ, intersecting jurisdictions, and international waters (where applicable) from illicit activities and environmental crimes.

Windward has provided satellite imagery, fused data points, and graphs in this document to explain who is likely to engage in IUU fishing, the areas most likely to be affected, the methods used to engage in and mask IUU fishing, and the significant economic impact.

Our analysis includes general global data and insights, as well as a recurring focus on the Pacific Ocean, to show the scale and effect of IUU fishing on a specific area. Looking at a random day in April, 2022, for instance, we identified more than **2,000 Chinese fishing vessels** that conducted fishing operations in the Pacific Ocean, outside of China's EEZ.

Windward's Maritime AI[™] technology was leveraged to discover and quantify IUU fishing "hot zones" and it has uncovered the traditionally unexamined and critical role of supporting fleets. This white paper also identifies hubs that support these fleets and vessels, and includes a brief example of IUU's economic impact on a specific country.

Quantifying the Damage of IUU

“IUU fishing has replaced piracy as the leading global maritime security threat. If IUU fishing continues unchecked, we can expect deterioration of fragile coastal States and increased tension among foreign-fishing Nations, threatening geo-political stability around the world.”

– [United States Coast Guard](#) in 2020

Approximately **11-19% of reported global fisheries production** results from illegal, unreported, and unregulated (IUU) fishing and it leads to **losses of roughly \$10-23.5 billion in value**, according to the World Wide Fund ([WWF](#)) for Nature. The [EU IUU Fishing Coalition](#) states that almost **30% of the world’s fisheries are overexploited** and **over 60% are already fully exploited**.

This is just one aspect of the problem. The [International Maritime Organization](#) does a good job of framing how IUU fishing goes beyond the significant ecological damage it causes:

IUU fishing possesses a “potent ability to undermine national and regional efforts to conserve and manage fish stocks and, as a consequence, inhibits progress towards achieving the goals of long-term sustainability and responsibility. IUU fishing takes advantage of corruption and exploits weak management regimes...IUU fishing threatens marine biodiversity, livelihoods, exacerbates poverty, and augments food insecurity. The focus of the international community remains on IUU fishing as a serious issue for the global fishing sector that impacts negatively on safety, on environmental issues, on conservation and on sustainability.”

IUU vessels and their crews are often used to advance a great power competition between leading countries, and for criminal activities – such as forced labor, smuggling, pollution, and establishing a permanent presence despite the seasonal limitations – and both IUU and other threatening behaviors were addressed in the [Quad’s statement](#) delivered in May 2022.

Flagging Bad Actors

Windward's Maritime AI™ technology quickly and automatically detects deceptive fishing practices. Our IUU behavioral model was created by studying known IUU fishing cases, analyzing the behavioral components, and then taking commonly repeated indicators and using them to build an artificial intelligence behavioral model. For instance, ship-to-ship operations are not uncommon, of course, but the majority occur close to shore. STS operations far from shore, along with vessel classes, and additional behavioral indicators, are often a sign of clandestine/illicit behavior.

Who do we mostly observe engaging in IUU fishing? When looking at fishing vessels that were flagged by Windward's model as likely to be engaged in IUU fishing operations, the numbers are glaring:

- 53% of them sail under the Chinese flag
- 22% under the Taiwanese flag

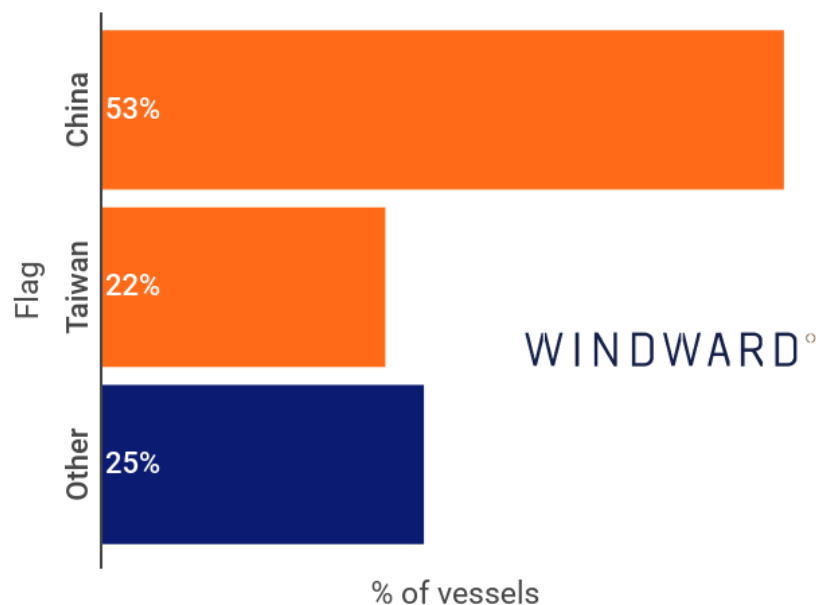


Figure 1: Chinese-flagged vessels are a major IUU concern

To showcase the scale of such IUU fishing fleets on an average day, we zoomed in on the Pacific Ocean – an area known for its vast fishing activities. Windward identified more than 2,000 Chinese fishing vessels that conducted fishing operations in the Pacific Ocean, outside of China's EEZ, on April 3, 2022 .

After cross-referencing [WCPFC records](#), [IATTC](#) and [SPRFMO's databases](#), we found that the vessels listed there represent only **75%** of the total number of Chinese fishing vessels that operate in the Pacific at any given time. This suggests **that at least 25% of Chinese vessels in the Pacific are likely operating without a permit**. This is just one fishing area...how many more such areas exist?

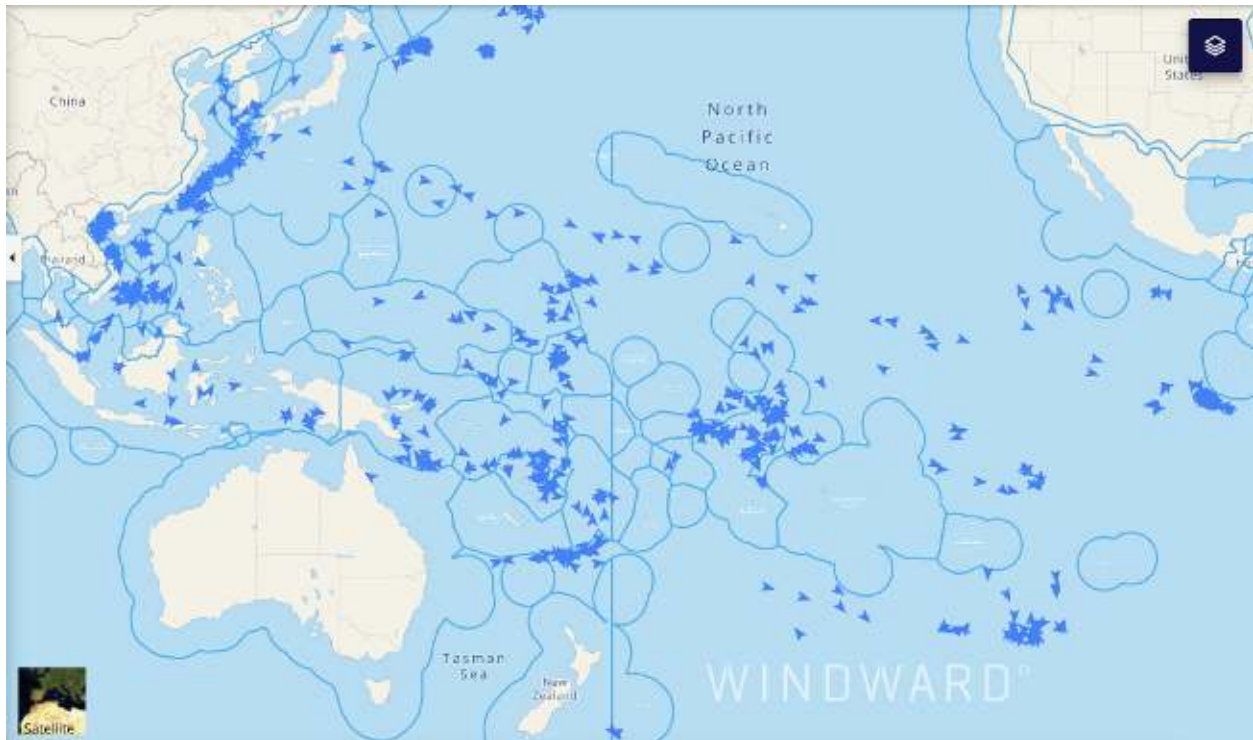


Figure 2: Chinese fishing vessels conducted operations in the Pacific, in and around China's EEZ, on April 3, 2022

Mapping Out the Hot Zones

Hot zones are areas identified by the Windward IUU behavioral model as activity clusters for long distance fishing fleets. How do hot zones develop and why are they important?

First, it is important to state that fish/seafood are a valuable and lucrative resource around the globe. The [global market](#) for seafood is projected to reach U.S. \$138.7 billion by 2027. Seasonality is also a major consideration – migration and weather patterns play an outsized role in determining the destinations of fishing vessels. But in the last couple of years, it has become clear that IUU fishing is about more than the fish. Maritime jurisdictions also play a role, with China progressively staking claims to "historic rights" in neighboring EEZs and expanding its influence throughout other continents, establishing naval footholds worldwide.

A Stanford University-led [paper](#) published in April 2022 in Nature Communications identified the regions and ports at highest risk for labor abuse and illegal fishing: "Of more than 750 ports assessed around the world, more than half are associated with risk of labor abuse or IUU fishing...For fishing vessels, **coastal regions off West Africa, Peru, the Azores, Argentina and the Falkland Islands had higher risks for labor abuse and IUU fishing.** The (study's) model also revealed that vessels registered to countries that have poor control of corruption, vessels owned by countries other than the flag state and vessels registered to China have a higher risk of engaging in illegal activities."

Windward's AI models and technology corroborate many of the above conclusions, particularly regarding "hot zones" for IUU incidents.



Figure 3: July 2021-June 2022: percentage of IUU fishing cases by hot zone

Identifying IUU Support Hubs

Where do these long distance fishing fleets go when operations at hot zones are complete?

Windward's Maritime AITM technology has identified **support hubs** in the vicinity of the fishing hot zones that are used to optimize these operations. For example, when not meeting at sea, 41.5% of fishing fleets that were likely involved in IUU incidents sailed to China/Taiwan, 10.7% sailed to Mauritius, and 3.4% sailed to Uruguay.

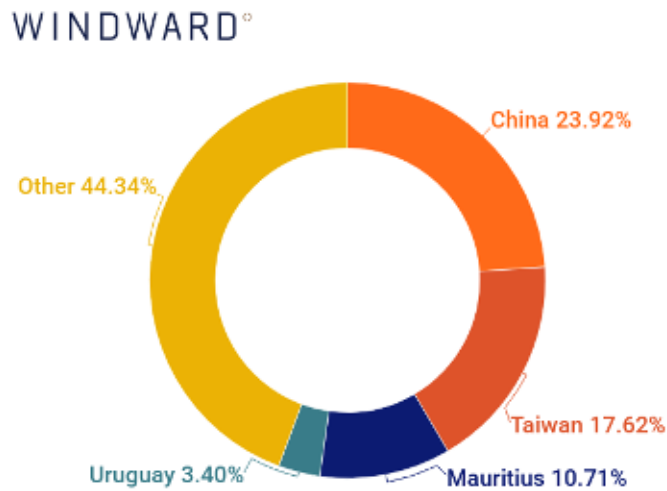


Figure 4: Breakdown of IUU supporting vessels' flags, based on Windward's data

Both Mauritius and Uruguay are suspected of acting as hubs to support China's long-distance fishing fleets, together with Peru and Fiji. These hubs are critical for accomplishing the geopolitical aims of the countries mostly responsible for IUU fishing. Without the hubs, geographical and seasonal constraints would seriously limit the staying power of the bad actors.

Chinese vessels are proliferating year-round, regardless of season, and presumably using these hubs for power projection and expansion, highlighting the geopolitical impact of IUU fishing. If this continues unabated, or accelerates, it could upset the fragile international order.

Writing in [Forbes](#), Jill Goldenziel warns of a potentially dark future:

"China's illicit fishing is sowing the seeds of geopolitical strife around the globe. Its incursions into other countries' EEZs, and its theft of livelihoods, GDP, and protein could easily spark conflict. Its use of fishing vessels for lawfare and power projection endangers the environment and human lives. If China's IUU Fishing continues unchecked, fragile coastal states will deteriorate from environmental damage, leading to further instability."

Governments must go beyond merely looking at IUU fishing and start investigating the security risks posed by IUU fishing operations.



Figure 5: Chinese supporting fishing vessels in a Mauritius hub (source: Windward's partner, Planet Labs)

The image below shows the trade flows between IUU hot zones and the supporting hubs the fleets connect to:

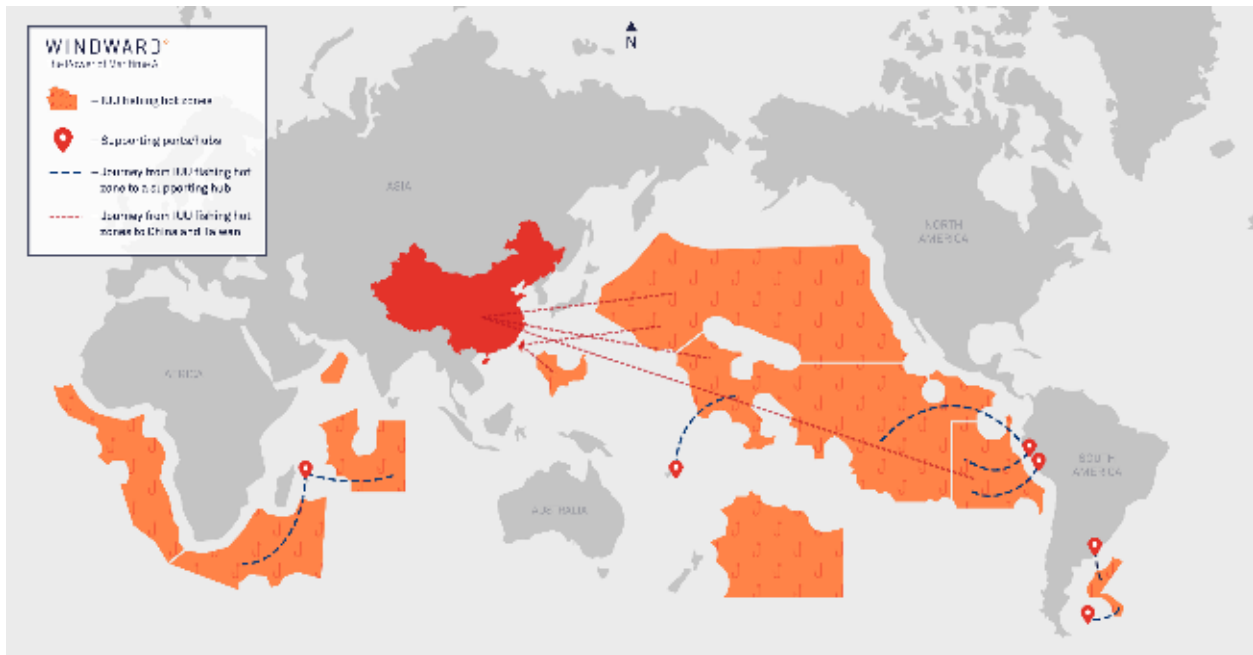


Figure 6: IUU fishing supply chain between Windward-identified IUU hot zones and supporting hubs, as well as China and Taiwan

Understanding How IUU Vessels Operate: Supporting Fleets

It seems like the support hubs are just the tip of the iceberg. To enable prolonged, seasonally-independent operations, Windward identified a behavioral trend of fishing fleets turning to reefers and oil bunkering tankers for support.

Through STS operations in the open sea, the long-distance fishing fleets are able to offload their catch, and fuel up to continue their operations without having to properly call port and register their catches.

When we look at the global picture, what are the percentages of the different types of supporting fleet vessels and which flags are they operating under?

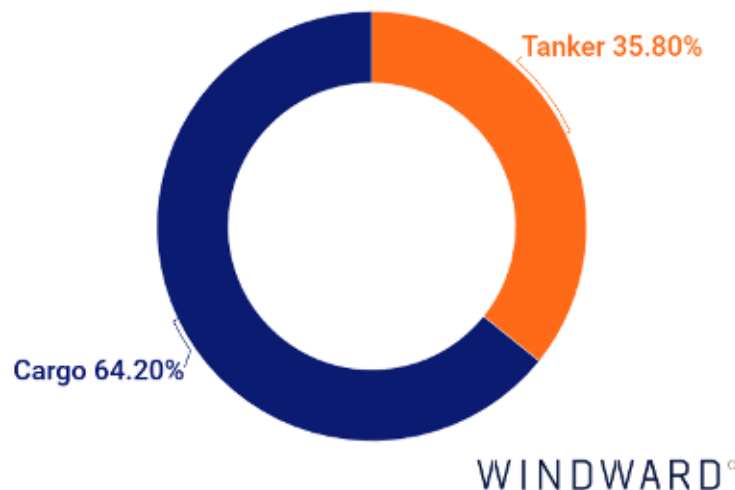


Figure 7: Breakdown of IUU supporting vessels, based on Windward's data

Of the +2,000 vessels actively fishing in the Pacific, **50%** were **involved in STS operations** in the open sea, including the aforementioned vessels not conducting port calls in the past year. Meaning 50% of fishing vessels get the supplies they need and discharge their catch without ever having to call port, or formally report on their activities. Approximately **60%** of recorded meetings were with **reefers** and the rest (**40%**) involved **oil bunkering vessels**. The first are mainly used to get the catch back to land, while the latter keep them fueled while at sea.

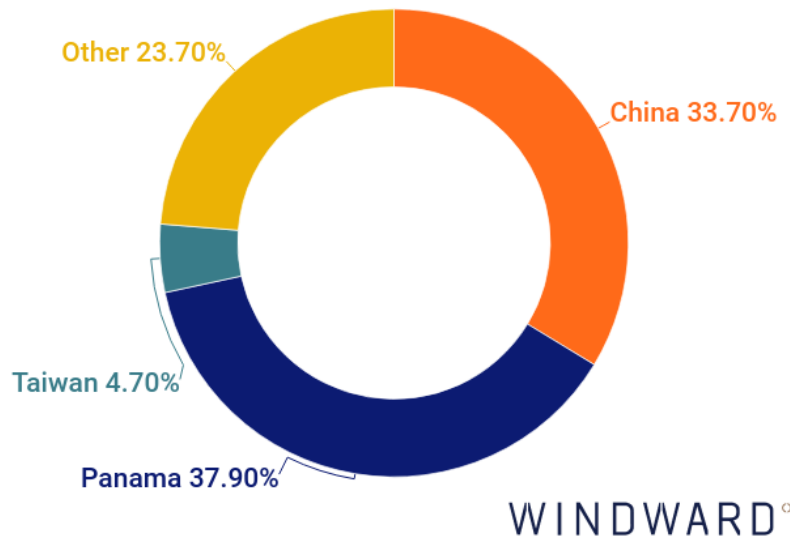


Figure 8: Breakdown of IUU supporting vessels' flags, based on Windward's data

The majority of the vessels that have been identified by Windward as supporting vessels fly under the flags of Panama, a [flag of convenience](#), and China. As mentioned above, a whopping 75% of fishing vessels likely to engage in IUU fishing are flying either the Chinese or Taiwanese flags. But only 38.4% of supporting fleet vessels are flying under those same flags – how do we account for the discrepancy?

Three possible explanations based on reasonable assumptions:

1. It would be quite easy for Chinese-owned vessels to sail under the Panamanian flag – they could even do so via [online registration](#).
2. The catch from these fishing operations does not always go back to China and a non-Chinese flag allows for easier trade and business opportunities in Western countries.
3. Certain flag registries, such as Panama, are much less strict about employee protections, enabling long voyages with continuous operations, without labor law concerns.

Prolonged voyages worldwide are associated with ecological damage, but also human rights violations. Let's take a look at the Pacific Ocean again, as it offers interesting data.

Of the **+2,000 Chinese fishing vessels** that operate in the Pacific Ocean, at least **38%** were **not observed by Windward in any port for at least six months**, and **23% of them were**

not seen in any port over the past year. [Stanford's Center for Ocean Solutions](#) has addressed these types of long voyages and the accompanying abuse:

“Fishing vessels engaged in IUU fishing often engage in labor abuses including, exploitation, forced labor, debt bondage, human trafficking, and modern slavery. Crews can be trapped at sea for months or years at a time, working in grueling conditions and sometimes facing wanton brutality. Wages are withheld or simply never paid. While there are not reliable global statistics on the extent of labor abuse in the seafood sector, civil society organizations, researchers and investigative journalists are increasingly demonstrating that abuse is more widespread than previously thought.”

From Environmental to Economic Impact – Zoom in on Argentina

The environmental impact of IUU fishing is intuitive: too much fishing in a concentrated area causes depletion of the local stocks and disruption of the food chain. But as described previously, domestic and long-distance fishing fleets, powered by the support hubs that allow them to ignore boundaries year-round and swarm strategically valuable areas, are used for more than just maximizing the catch from each fishing zone. They enable economic disruption.

Let's take a look at one of the IUU fishing hot zones Windward has identified – Argentina.

According to [Oceana](#), a non-profit focused on oceans, “Argentina’s extensive coastline boasts a tremendous abundance and diversity of marine life, including more than 330 types of finfish, nearly 120 deep-sea species, and a variety of invertebrates. The country’s commercial fishing industry produces **\$2.7 billion in economic impact and constitutes 3.4% of its gross domestic product.**”

Windward analyzed fishing activities lasting more than four hours from July 2021 to June 2022, within the legal and monitored Argentina EEZ, and the hot zone that is directly adjacent to it.



Figure 9: Argentina hot zone vs. EEZ this past year (July 2021-June 2022)

In figure 9 above, the gray area represents the official EEZ and the orange outline shows a hot zone in international waters identified by Windward's platform.

While **408 Argentinian-flagged vessels** engaged in only **+28,000 activities within the Argentinian EEZ**, **444 Chinese and Taiwanese-flagged vessels** participated in **+60,000 fishing activities** – all occurring in the hot zones flagged by Windward.

This kind of activity exposes Argentina to potential economic (and other types of) harm:

“The vessels that disappear along the edge of the national waters of Argentina could be pillaging its waters illegally,’ said [Oceana’s](#) deputy vice president of U.S. campaigns, Beth Lowell... ‘IUU fishing is wreaking havoc on our oceans, coastal communities, and **people who depend on the oceans for their livelihoods**.’...As part of (its) analysis (from January 1, 2018-April 25, 2021), Oceana documented more than 6,000 gap events, instances where AIS transmissions are not broadcast for more than 24 hours, which can indicate where vessels potentially disable their public tracking devices. These vessels were invisible for more than 600,000 total hours, hiding fishing vessel locations and masking potentially illegal behavior, such as crossing into Argentina’s national waters to fish...Interactions between the Argentine Coast Guard and suspected illegal fishing vessels have escalated to violence, with some deeming the conflict ‘a literal war.’”

In line with our supporting hubs analysis, Windward's data showed that most of these Chinese and Taiwanese vessels use a few of our identified supporting hubs – **Montevideo, Uruguay** (10% as the origin port, 39% as the destination port) for Chinese vessels and **Stanley Harbor, Falkland Islands** (4% as the origin port, 4% as the destination port) for Taiwanese vessels – to continue their operations and discharge their illegal catch for sales.

Next Steps...

By better understanding where the overwhelming majority of IUU fishing vessels are originating from, where the hot zones and support hubs are located, and how support fleets are put together and coordinated, organizations can enhance their plans to combat IUU, or at least prevent its harms.

Organizations throughout the maritime ecosystem are concerned with related and additional issues. Vessels flying under the Chinese and other flags are engaged in deceptive shipping practices that may not be for the purpose of IUU fishing, such as GNSS manipulation, ID tampering, and more.

The new Indo-Pacific Partnership for Maritime Domain Awareness (IPMDA) program described in the Quad's relatively recent statement will share commercially-available satellite data to alert Southeast Asian countries about possible intrusions. A [Financial Times](#) article notes that the program would: "...monitor radio frequencies and radar signals that would allow countries to track vessels that have turned off AIS (automatic identification systems) transponders to avoid detection."

Windward's multi-source approach fully supports the usage of satellite data and imagery, along with AIS monitoring and tracking of dark activities, to begin tackling IUU, associated issues, and other deceptive shipping practices. This is a strong first step and it is encouraging to see Quad leaders taking these issues and their partnership seriously.

Organizations within the maritime ecosystem can go a step further and benefit from predictive intelligence, based on over a decade of proprietary data and machine learning technology. Near real-time information is helpful, but vessels could be on the move after plundering the local marine ecosystem by the time it is relayed. Predictive intelligence and insights enable organizations to operate proactively.

[Contact Windward](#) if you have any questions, or for more IUU fishing information.