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Transparency at Sea: The United States Lags Behind

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Executive Summary

The public tracking of vessels using systems like the automatic identification system (AIS) is occurring on a global scale and shines a light on what is happening on our oceans. The high seas — areas outside any national jurisdiction — and the far edges of a nation's exclusive economic zones (EEZs) were once out of sight where suspicious behaviors like illegal, unreported, and unregulated (IUU) fishing could hide. AIS now provides more visibility of fishing activities wherever a ship operates. Despite the technological developments of these devices, the United States is falling behind on global standards of transparency in the commercial fishing sector. Current U.S. regulations on the use of AIS devices limit the visibility and accountability of vessels on the open ocean. The United States has the opportunity to be a leader in maritime security by expanding transparency to protect the oceans by increasing the number of vessels required to broadcast AIS for their entire time at sea in the U.S. EEZ and on the high seas.

AIS was originally developed to increase maritime safety, reduce vessel collisions, and enhance awareness of vessel locations at sea, but it has recently become an invaluable tool for monitoring fishing vessel activity at sea. These devices broadcast a vessel's location, speed, country of origin, and other identifying information, providing key details that, when analyzed, can demonstrate when a vessel is fishing and infer what type of fishing it is engaged in. As AIS is an inexpensive, easy-to-implement technology, it should be required on more U.S. fishing vessels, and the United States should require similar transparency of seafood imports. Expanding transparency will help bring to light suspicious behaviors, protect ocean habitats and wildlife, and discourage illicit activity like illegal fishing and human rights abuses.

The limited requirements for AIS use in the United States fall far behind other fishing nations.[1,2] Currently, only U.S. fishing vessels 65 feet or longer are required to carry AIS devices, and they are only required to broadcast their signal when they are within 12 nautical miles from shore. U.S. fishing vessels can also use Class B devices with weaker signals. There are two types of AIS devices, Class A and Class B, with Class A transmitting data more frequently and with a more powerful signal. Oceana found U.S. AIS requirements only apply to approximately 12% of the more than 19,000 registered commercial fishing vessels in the U.S. fleet. By comparison, the European Union requires vessels 49 feet (15 meters) or longer to carry more powerful AIS devices and to continually broadcast signals when at sea. Nearly 65% more vessels would be required to carry AIS in the U.S. if we mirrored the EU, covering more than 1,500 additional vessels.

Oceana recommends that the current U.S. AIS requirements be expanded to all vessels 49 feet or longer and mandate that these vessels continuously transmit their AIS signal for the entire duration of their trip. Expanding AIS requirements would provide more transparency of fishing vessel activities. By

embracing transparency in domestic fisheries, the United States can demand more transparency globally and enhance the suite of tools the United States can use to combat IUU fishing. Expanded transparency will help ensure that only safe, legally caught, responsibly sourced, and honestly labeled seafood enters the U.S. domestic market.

Transparency at Sea

Seafood is one of the most traded food commodities in the world. The United States imports more seafood than any other nation and is one of the top five seafood exporters.[3] The constant movement of seafood across borders and between hands, coupled with a lack of visibility in vessel activity and limited traceability requirements, makes it difficult to trace fish from the boat to the dinner plate.

The United States imported an estimated $2.4 billion worth of seafood derived from illegal, unreported, and unregulated (IUU) fishing in 2019.[4] IUU fishing can include fishing without authorization, ignoring catch limits, operating in closed areas, and fishing with prohibited gear or for prohibited fish or wildlife. These actions not only contribute to overfishing; they also give illegal fishers an unfair advantage over those who play by the rules, while undermining the responsible management of commercial fish species. The lack of comprehensive catch documentation and traceability requirements applied to all imported seafood continue to allow illegally sourced products to enter the United States. Requiring fishing vessels to use automatic identification system (AIS) would result in more transparency in vessel behavior and could be used to validate information reported on the origins of the catch, as reported for the Seafood Import Monitoring Program (SIMP) and inform risk-based screening approaches. Catch documentation, seafood traceability, and transparency are critical to ensure that only safe, legally caught, responsibly sourced, and honestly labeled seafood is making its way into the U.S. domestic market.

AIS is an emerging tool for monitoring fishing vessel behavior, which enables the monitoring of fishing vessels at sea using terrestrial and satellite receivers. The public tracking of vessels — paired with catch documentation, traceability, and other measures — are powerful tools in combatting IUU fishing. While AIS was originally developed to reduce vessel collisions, it has more recently become essential for monitoring fishing vessel behavior at sea through machine-learning algorithms. By using AIS data, enforcement officers can respond in near real-time to not only vessels in distress, but also instances of suspected IUU fishing. While AIS is essential for safe, transparent, and sustainable fishing around the world, these benefits are only as strong as the laws and regulations pertaining to its use.

Strengthening AIS requirements will help shine a light on fishing activity at sea and give more tools to fisheries managers and seafood importers. When vessels are required to transmit AIS, potential IUU activities can be exposed to governments and to the public. Users can see information from vessels using AIS on publicly accessible websites such as Marine Traffic and Global Fishing Watch. This greater transparency allows fisheries managers to more effectively focus their enforcement and inspection actions on higher-risk vessels like those that disable their AIS or appear to be fishing in closed areas.[5]

This report introduces AIS technology and outlines the policy landscape for AIS use in the United States. Oceana conducted an analysis of AIS usage by fishing vessels authorized to fish in the U.S. EEZ to examine how current and proposed AIS rules would affect the commercial fishing vessel industry. Based

on the analysis, Oceana recommends that the current U.S. AIS requirements be expanded to all vessels 49 feet or longer and require these vessels to continuously transmit their AIS signal for the entire duration of their trip in both the U.S. EEZ and on the high seas. The expansion of domestic AIS rules would allow the United States to make transparency a condition of import through the Seafood Import Monitoring Program for seafood caught outside of U.S. waters and enhance the suite of tools the United States can use to combat IUU fishing.

What is AIS?

AIS was invented in the mid-1990s following the *Exxon Valdez* oil spill of 1989.[6] The incident inspired the U.S. Congress to pass the Oil Pollution Act, which called for the creation of a vessel tracking system for tankers transiting the Prince William Sound in Alaska.[7,8] The goal was to design a vessel safety mechanism that could be used for collision avoidance, vessel traffic monitoring, and coastal surveillance. Similar tracking technologies were being tested around the world, and eventually the international community came together through the International Maritime Organization (IMO) and International Telecommunications Union to develop a single system to be adopted worldwide: AIS.[9]

The AIS device on a ship is a transponder that is made up of two parts: a GPS receiver and a very high frequency (VHF) radio. The GPS receiver identifies the vessel's position, and the VHF radio transmits the information on frequencies dedicated to AIS (161.975 MHz and 162.025 MHz).[10] A vessel equipped with an AIS transponder automatically broadcasts a signal with vessel information as often as once every few seconds. These "information packets" include the vessel's identity in the form of a unique, nine-digit number called a Maritime Mobile Service Identity (MMSI), and other information like vessel name, position, speed, and direction. AIS signals broadcasted by a ship can be received by other ships, orbiting satellites, and land-based receivers. Signals broadcasted from ship to ship alert vessels to nearby marine traffic, while signals broadcasted to satellites and land-based receivers are used by third parties, such as governments, to monitor and track vessel activity. Vessel operators are able to turn off their AIS transmission if they believe broadcasting their position may endanger their safety — for example, in areas where piracy has occurred. In such cases, Oceana recommends that those vessels immediately contact their fishery management agencies and Coast Guard or equivalent to inform them they are at risk in a particular area during a discrete part of their trip.

AIS devices fall into one of three categories: Class A, Class B, or Class B+. While cheaper, the capabilities of the AIS devices diminish with class, including reduced strength of transmissions, slower transmission rates, and fewer data categories transmitted. Class A devices are the strongest, and the IMO requires most large, commercial vessels to be fitted with Class A transponders.[11] Class A transponders can capture detailed maneuvers by transmitting more data than other devices with higher resolution.[12] The Class B transponders were first developed as a less expensive alternative for smaller commercial vessels that fall outside of the IMO AIS requirement. Class B+ transponders are a more recent development in AIS technology that close the performance gap between Class A and Class B devices. For both Class A and Class B+ devices, the transmission rate increases with vessel speed.[10]

Comparison of AIS Transponder Class			
	Class A	**Class B+**	**Class B**
Wattage	**12.5 watts**	**5 watts**	**2 watts**
Position Data Transmission Rate	**Every 2 to 10 seconds** • Every 2 seconds when traveling faster than 23 knots; • Every 3.33 seconds when engaged in a course change of more than 5°; • Every 6 seconds when traveling at a speed of 14 to 23 knots; or • Every 10 seconds when traveling at a speed of 2 to 14 knots.	**Every 5 to 30 seconds** • Every 5 seconds when traveling faster than 23 knots; • Every 15 seconds when traveling at a speed of 14 to 23 knots; or • Every 30 seconds when traveling at a speed of 2 to 14 knots.	**Every 30 seconds** (depending on time slot availability)
Position Data Broadcast	MMSI, Timestamp, Position, Course Over Ground, Speed Over Ground, True Heading, Rate of Turn, Navigation Status	MMSI, Timestamp, Position, Course Over Ground, Speed Over Ground, True Heading	MMSI, Timestamp, Position, Course Over Ground, Speed Over Ground, True Heading
Static Voyage Data Broadcast (every 6 minutes)	MMSI, Vessel Name, Callsign, IMO Number, Type of Vessel, Vessel Dimensions, Estimated Time of Arrival, Destination, Draught	MMSI, Vessel Name, Callsign, Type of Vessel, Vessel Dimensions	MMSI, Vessel Name, Callsign, Type of Vessel, Vessel Dimensions
Estimated One-Time Cost	**$2,600 to $4,000**	**$2,000**	**$700 to $1,600**

Table 1: Comparison of AIS transponders by class.[10,13]

International AIS Regulations

International maritime law is largely regulated under the United Nations Convention of the Law of the Sea (UNCLOS). UNCLOS granted each coastal nation rights over the waters around their shoreline, extending 200 nautical miles, known as the exclusive economic zone (EEZ).[14] All vessels are required to sail under the flag of the nation where they are registered, also referred to as the "flag state." Flag states are responsible for making rules to ensure their registered vessels act safely at sea.

The International Convention for the Safety of Life at Sea (SOLAS) is an important international treaty concerning vessel safety that nations following UNCLOS must comply with.[15,16] Chapter V of the SOLAS convention requires AIS carriage on:
- All vessels over 300 gross tonnage on an international voyage — both on the high seas and in the EEZ of a foreign nation;
- All cargo vessels over 500 gross tonnage, regardless of their area of operation; and
- All passenger vessels, regardless of size or their area of operation.[11]

Few coastal fishing vessels fall under these requirements, which leaves AIS requirements for fishing vessels up to individual countries and management organizations. Several countries have enacted legislation that require additional vessels in their fleet to carry AIS. In addition to the EU, Liberia and the United Kingdom also require vessels longer than 15 meters to carry AIS.[1,2,17] As of 2019, Indonesia requires all vessels, both domestic and foreign-flagged, to install and activate AIS in Indonesian waters.[18] Strong AIS requirements are also arising in smaller fishing nations, including in countries that often serve as a flag of convenience for international vessels. Mauritius requires all fishing vessels over 12 meters (approximately 39 feet) in length to carry AIS, and fishing vessels longer than 24 meters to carry Class A AIS.[19] The United States' limited AIS requirements compared to other nations around the world highlight how far the United States is lagging behind. As a top fishing nation, the United States has the opportunity to join other major fishing nations mandating strong AIS provisions, as well as become a global leader in increasing transparency at sea by expanding U.S. AIS requirements to all fishing vessels.

U.S. AIS Regulations

To regulate commercial activity by foreign and domestic vessels in federal waters, Congress passed the Maritime Transportation Security Act of 2002, which requires AIS use on:
- All self-propelled commercial vessels 65 feet or longer;
- All vessels carrying more than 150 passengers;
- All commercial towing vessels 26 feet or longer with more than 600 horsepower; and
- Any other vessel when the Coast Guard determines that AIS is essential to its safe navigation — typically due to poor weather, visibility, or sea conditions and/or high port congestion.[20,21]

All vessels that have AIS are required to keep it turned on and transmitting while within 12 nautical miles from shore.[21] Not doing so can result in a fine to the vessel owner of up to $25,000 per day.[22]

Fishing vessels were originally exempt from the U.S. AIS requirements due to concerns over cost and the potential for the technology to reveal fishing spots to competitors.[12] The Coast Guard later removed

the exemption for fishing vessels in 2015, determining that "[e]ven if analysis of AIS data would somehow attract vessels to the same spot, this situation would not supersede the importance of AIS in providing fishing vessels and other operators with situational awareness to help safely navigate while in close proximity to other vessels."[12,20] Further, Dr. Gregory Stunz, a fisheries professor at Texas A&M University, stated in his testimony to the House Committee on Natural Resources on Oct. 14, 2021, "There are no longer 'secret fishing spots,' and our entire exclusive economic zone can be easily accessed."[23]

Limitations of U.S. AIS Regulations for Fishing Vessels

Commercial fishing is the deadliest job in America, with 145 deaths annually per 100,000 workers compared to the national average of just 3.5.[24] AIS can reduce some of the hazards at sea by enabling vessels to see each other and prevent collisions — especially when weather conditions are poor. Between 2015 and 2016, every fishing vessel in the United States that sunk or was abandoned due to a collision was too small to fall under the AIS requirement.[25] While the vessels they collided with may have been transmitting AIS, the technology is only useful for collision avoidance if both parties are broadcasting their signals. For AIS to be an effective tool to improve safety at sea, even small vessels must be broadcasting AIS.

Oceana's Findings

The value of AIS data is inextricably linked to the strength of AIS requirements.[26]

The strength of U.S. AIS requirements is limited in three major ways:
- The majority (~88%) of registered U.S. fishing vessels are not required to use AIS based on vessel length;
- The U.S. fishing vessels that are equipped with AIS are only required to transmit while operating in U.S. navigable waters, which extend only 12 nautical miles from shore; and
- The U.S. does not require the stronger Class A AIS devices, allowing vessels to opt for the less expensive and weaker Class B AIS transponder.

Despite the well-known safety benefits of AIS, Oceana's analysis found that:
- Only 12% of the over 19,100 U.S. commercial fishing vessels registered and authorized to fish in 2020 were required to broadcast AIS; and
- Nearly one-quarter of the fishing vessels (approximately 1,500) between 49 and 65 feet are already voluntarily broadcasting AIS.

To assess AIS usage by the U.S. fleet, this analysis used data from Global Fishing Watch* (GFW), an independent nonprofit founded by Oceana in partnership with Google and SkyTruth. GFW uses AIS data, machine learning, and vessel registries to allow anyone with an internet connection to see where and when a vessel is fishing.** In the context of GFW, the analysis quantified how many U.S. fishing vessels were visible broadcasting AIS.

In the European Union, vessels 49 feet (15 meters) or longer must continually broadcast AIS at sea.[27] That means more EU vessels are visible for longer periods of time, generating significantly more data

and a more complete picture of vessel activity in national and international waters compared to the United States. Shifting the requirement to vessels measuring 49 feet and greater would increase the number of U.S. commercial fishing vessels required to use AIS by 65%, covering an additional 1,534 vessels.

What is VMS?

Vessel monitoring system (VMS) devices are satellite-based monitoring systems that automatically transmit secure position data from the fishing vessel to the respective management authority (i.e., NOAA Fisheries).[28,29] Position messages include information about vessel identification, as well as its spatial and temporal location.[29] Vessel operators are typically financially responsible for the transmission of all required position messages on an ongoing basis. The combined cost of the VMS transponder and all incurred reporting fees can amount to thousands of dollars per year.[30,31]

Unlike AIS, VMS is a closed-source tracking system. This circumvents some of the issues associated with AIS, such as self-reported information, which vessel operators can accidentally enter incorrectly or omit to hide dishonest and illegal activities. Additionally, AIS devices can be tampered with to broadcast incorrect positions or to turn off transmission completely. VMS devices are much more difficult to tamper with. However, because VMS is closed-source, its data are not publicly accessible unless the national or regional authority that owns it decides to grant public access (Table 2).[32] Some countries have chosen to openly share their VMS data: Brazil, Costa Rica, Ecuador, Peru, Chile, Indonesia, Panama, and Belize. Only those authorities with access to a vessel's VMS feed can see that vessel's location information. Countries that allow foreign vessels to fish in their EEZ may not have access to VMS data even when a licensed vessel is fishing within their national waters. VMS and AIS devices also differ in terms of transmission rates. While AIS devices autonomously broadcast their signal every few seconds when a vessel is at sea, VMS devices typically broadcast hourly, making it more challenging to track and identify fine-scale vessel movements. VMS requirements vary by region in the United States and are largely determined by the species the vessel is fishing for. According to NOAA, the United States currently monitors over 4,000 vessels across at least 27 fisheries through VMS.[29,33] VMS and AIS used together are not duplicative and complement each other, providing robust and comprehensive tools to monitor fishing activity from the near shore to large swaths of ocean beyond national jurisdictions.[34]

Snapshot of AIS versus VMS		
	Automatic Identification System (AIS)	**Vessel Monitoring System (VMS)**
Data Accessibility	Open-source, non-propriety data	Closed-source, proprietary data
Transmission Structure	Autonomous, near real-time data continually broadcasted from ship to ship, ship to satellite, and ship to shore	Scheduled broadcasts to satellite receivers, forwarded on to ground stations
Transmission Rate	As frequently as every few seconds	Typically once per hour
Estimated Cost of Device	$700 to $4,000 (one-time fee)	$1,000-$5,000 initially with upward of $50 per month in service fees

Table 2: Comparison of AIS and VMS devices.[32,35,36]

Maritime Domain Awareness

AIS technology expands our understanding of activities at sea that impact maritime domain awareness (MDA), which includes national security, the economy, and the environment. With tens of thousands of ships operating daily in U.S. waters, AIS technology is a vital tool in maintaining maritime domain awareness. AIS sends identity information, as well as position and transit information, informing the Coast Guard who is in U.S. waters, where they have been, and which other ships they may have met up with. Fishing vessels that engage in IUU activities also often evade laws, regulations, and oversight to gain higher profits and have been connected to other illicit activities.[37] The opaque nature of the fishing industry makes it a target for large criminal organizations drawn to the industry by the promise of profits with a low risk of detection if engaging in illegal activity.[38] IUU fishing has been linked to incidents of document forgery, money laundering, and human, drug, and wildlife trafficking.[39,40] Fishing vessels may even be used to commit terrorist acts, like the 2008 attacks in Mumbai where fishing vessels were hijacked and used to transport terrorists.[41]

MDA is achieved by combining data from several sources to characterize patterns in marine traffic in near real-time. AIS data encompasses a wide range of vessels, from oil tankers and cargo vessels to fishing vessels and tugboats. Once this massive source of data is fused into the MDA landscape, it can be used by researchers, fisheries managers, enforcement officials, and policymakers to develop spatial planning solutions to protect marine biodiversity, analyze industry best practices to maximize economic gains, and minimize vessel carbon emissions, as well as identify suspicious behaviors.[26,42] While AIS data already plays a large role in supplementing MDA, limited AIS requirements for fishing vessels introduce a significant blind spot. The maritime domain cannot be secured if we cannot see the threat, and under current U.S. AIS regulations, many fishing vessels remain undetected at sea.

Beyond Vessel Tracking

The ability of AIS data to increase fishing vessel transparency relies, in part, on open-access vessel registry data. While some portions of the U.S. vessel registry are available to the public, the data is kept regionally — often in different formats — and the registries for certain fisheries are not available for public download. The United States needs an open-access, combined vessel registry that includes general vessel information, a unique vessel identifier that is consistent across all regions, MMSI when available, and all vessel authorizations and ownership information. A public vessel registry would highlight who is permitted to fish where and when, and allow that information to be cross-referenced with near real-time AIS data, which would encourage accountability in the commercial fishing industry.

Recommendations

Increased transparency of fishing is critically important. The United States should adopt stronger AIS requirements, make AIS a condition of import, and support global adoption of fisheries transparency measures. While AIS enhances transparency and safety in the commercial fishing industry, current AIS requirements only apply to a small portion of the U.S commercial fishing fleet and do not extend beyond 12 nautical miles from shore. Many U.S. fishers value transparency, as over 1,500 vessels below the

length requirement already broadcast AIS voluntarily, including more than 1 in 5 vessels between 49 and 65 feet. Oceana is calling on the United States and other management bodies to take the following steps:

Vessel Transparency

- **Expand existing AIS requirements to transmit for the duration of the voyage:** Amend the requirements to explicitly require AIS transmission throughout the vessels' entire time at sea.
- **Require fishing vessels 49 feet or longer to transmit AIS using Class A devices:** Following the EU requirements, require all U.S. fishing vessels 49 feet (15 meters) or longer to carry and transmit AIS in the U.S. EEZ and on the high seas.
- **Require transparency for seafood imports:** AIS data provides information about a vessel's location and behavior that should be used to identify high-risk shipments of seafood. By requiring AIS as a condition of import, NOAA and partner government agencies can use the vessel track to enhance catch documentation and traceability data and improve verification and audits.

AIS Technology

- **Notification of all AIS-off events:** Require U.S. vessels to notify the Coast Guard when a fishing vessel operator stops transmitting AIS within four hours of the halt in transmission.
- **Require all U.S. fishing vessels to be equipped with Class A AIS devices:** Because of coverage gaps with Class B AIS devices, the United States should remove the exemption in 33 C.F.R. § 164.46(b)(2)(i) in order to facilitate enhanced vessel monitoring with the stronger Class A device.

Vessel Registry

- **Establish an open-access, combined vessel registry:** Call for the creation of a publicly accessible, combined U.S. vessel registry with information, including beneficial ownership, on all vessels with active commercial fishing permits in any state or region of the United States.

*Global Fishing Watch, a provider of open data for use in this report, is an international nonprofit organization dedicated to advancing ocean governance through increased transparency of human activity at sea. The views and opinions expressed in this report are those of the authors, which are not connected with or sponsored, endorsed, or granted official status by Global Fishing Watch. By creating and publicly sharing map visualizations, data, and analysis tools, Global Fishing Watch aims to enable scientific research and transform the way our ocean is managed. Global Fishing Watch's public data was used in the production of this publication.

**Any and all references to "fishing" should be understood in the context of Global Fishing Watch's (GFW) fishing detection algorithm, which is a best effort to determine "apparent fishing effort" based on vessel speed and direction data from the automatic identification system (AIS) collected via satellites and terrestrial receivers. As AIS data varies in completeness, accuracy, and quality, and the fishing detection algorithm is a statistical estimate of apparent fishing activity, it is possible that some fishing effort is not identified and, conversely, that some fishing effort identified is not fishing. For these reasons, GFW qualifies all designations of vessel fishing effort, including synonyms of the term "fishing effort," such as "fishing" or "fishing activity," as "apparent" rather than certain. Any/all GFW information about "apparent fishing effort" should be considered

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