

Considerations when using automatic identification system (AIS) data

Background

Global Fishing Watch is advancing ocean governance through increased transparency of human activity at sea. By creating and publicly sharing map visualizations, data and analysis tools, we enable scientific research and drive a transformation in how we manage our ocean. By 2030, we aim to monitor and visualize the impact of ocean-going vessels, both industrial and small-scale, that are responsible for the vast majority of the global seafood catch.

Considerations

Global Fishing Watch has demonstrated the application of AIS data to model fishing and other activities at sea, including fishing effort, transshipments and port visits. AIS is most effective as a tool for tracking vessel activity when satellite reception is strong, the vessel consistently and accurately transmits its identifiers, and other resources, such as registry records are available. However, consistent satellite and vessel data are not always available, and therefore when analyzing AIS data several factors should be considered.

Distribution of vessel activity may vary due to several factors



AIS isn't adopted equally around the world

The International Maritime Organization (IMO) and other management bodies require large ships, including many commercial fishing vessels, to broadcast their position with AIS in order to avoid collisions. Each year, more than 400,000 AIS devices broadcast vessel location, identity, course and speed information. Ground stations and satellites pick up this information, making vessels trackable even in the most remote areas of the ocean. While only two percent of the world's roughly 2.9 million fishing vessels carry AIS, they are responsible for over half of commercial fishing effort that takes place more than 100 nautical miles from shore, and as much as 80 percent of the fishing that occurs on the high seas.



AIS transmitters vary - differences between Class A and B

Most AIS devices fall into one of three "classes": Class A, Class B, and Class B+. Class A devices broadcast at a stronger power and they broadcast a vessel's position more frequently. Lower wattage Class B and B+ devices are detected less frequently by satellites, and therefore it may seem there is less fishing activity in areas where they are predominantly used. AIS device class often depends on flag State regulations, vessel length and vessel purpose.

[Learn more about the differences in AIS transmitters >](#) | [Read more about Global Fishing Watch technology >](#)



Global satellite coverage to detect AIS varies

AIS satellite companies aggregate data from both satellite and terrestrial AIS receivers. A single satellite can monitor approximately 5 percent of the earth's surface at a given time. These satellites travel quickly and each satellite will receive messages only from a given location on earth for only a few minutes before passing out of range. For these reasons, a constellation of many satellites is used to obtain coverage of the world's ocean. Many satellite and terrestrial providers also do not record every AIS message that they receive. As a result, those using downloaded data should not assume uniform satellite coverage.

[Learn more about satellite coverage and reception quality >](#)



High density areas of vessel traffic can lead to lower activity estimates

In addition to areas with low satellite coverage, areas with a high density of vessel traffic can also limit the number of signals processed, particularly related to Class B (or B+) AIS systems. This may lead to reduced or underestimated vessel activity in the Global Fishing Watch map or data in such areas. [Learn more >](#)



Other considerations - ports and manual identification

Fishing effort and vessel activity may be disrupted close to ports due to changes in vessel movements. Identification must be manually entered to AIS transmitters which can lead to errors and complexity. Vessels may have turned their transmitters off for security or other reasons, alongside an intention to avoid detection. [Learn more >](#)

Vessel classification and identification may change over time



Global Fishing Watch activity and vessel identity data may change over time

Changing vessel identity information can make it difficult to track a vessel consistently over time. [Raw AIS data](#) needs significant processing before it can be used to understand patterns in human activity. We rely on [cloud infrastructure and machine learning](#) models to identify patterns. We filter out noisy or duplicated data, and group positions into logical segments. We combine multiple vessel registry database sources with the predictions from a machine learning model to classify vessels. No algorithm is perfect, so occasional misclassifications will occur (e.g. non-fishing mistakenly identified as fishing). As Global Fishing Watch is constantly adding information to our models and improving how vessels are classified and mapped, vessel identity and activity heatmaps may change over time.

For example, if new vessel identity information is found showing that two vessels that were previously thought to be separate are actually the same vessel, this update may lead to changes in how these vessel track segments are formed. This may lead to changes in how vessel movements or fishing is recorded. Additionally, if a vessel is determined to be a fishing vessel, when there was previously insufficient information, the update will cause fishing effort to be displayed when there may not have been previously. [Learn more >](#)



Use of AIS transmitters has increased over time, as has number of satellites

The number of fishing vessels using AIS transmitters is increasing [by 10 to 30 percent each year](#). The number of satellites able to detect AIS launched has also increased between 2012 to present day. This increase in detectability of fishing vessels disrupts our ability to infer changes over time. As a result, any increases in fishing activity since 2012 should be interpreted with caution. Analysts and researchers can mitigate these impacts by focusing on more recent years (e.g. 2017 onwards) or by selecting for vessels that were present in both the initial and subsequent times of interest.



Factors driving changes in human activity can be difficult to identify

Patterns in human activity at sea can often be attributed to multiple factors that are not always easy to detect or isolate. When viewing changes in activity, managers and researchers should ensure that as many factors as possible (e.g. socioeconomic, environmental etc.) are considered and seek relevant stakeholder input to determine the main drivers. The annual calendar of human events should be considered when viewing distribution and patterns in global human activity, particularly large scale cultural events that may impact our presence on the ocean. Notably, cultural events that don't occur on the same date each year should be reviewed as they may impact results or conclusions.

Mitigating impacts of AIS data considerations



Using Global Fishing Watch AIS data in your work or research

Global Fishing Watch is harnessing innovative technology to turn transparent data into actionable information and drive tangible change in the way that our ocean is governed. Data accessed through the Global Fishing Watch platform is as accurate as possible, but should be used with the above considerations in mind. When using Global Fishing Watch AIS data in your work or research:

- Always read the attached readme file alongside any downloaded data, and take note of the data version.
- Use multiple sources of data to corroborate any conclusions drawn or decisions.
- Use more than one field when searching for vessels e.g. MMSI, name and IMO number.
- When completing time series analyses, ensure that mitigation approaches are used to reduce likelihood of false assumptions e.g. factor in increased satellite coverage, use of AIS, and human events calendar.
- Review the Global Fishing Watch resources and contact information below.



Global Fishing Watch resources and contact information

Further supporting Global Fishing Watch resources:

- [Read the FAO global atlas of AIS-based fishing activity >](#)
- [Read the Global Fishing Watch AIS-based fishing activity methodology paper >](#)
- Read these articles about: [vessels reporting false locations >](#) & [vessels sharing one identity >](#)
- [Review the Global Fishing Watch FAQs >](#) | [Watch the Global Fishing Watch tutorials >](#)

Global Fishing Watch is constantly looking to improve the data in our products, to share any feedback on our data:

- Share feedback through the built-in feedback form in the left sidebar on the [Global Fishing Watch map >](#)
- Email any data inquiries to support@globalfishingwatch.org >