



Overview of Technology Use Against Illegal Fishing Using AIS Data

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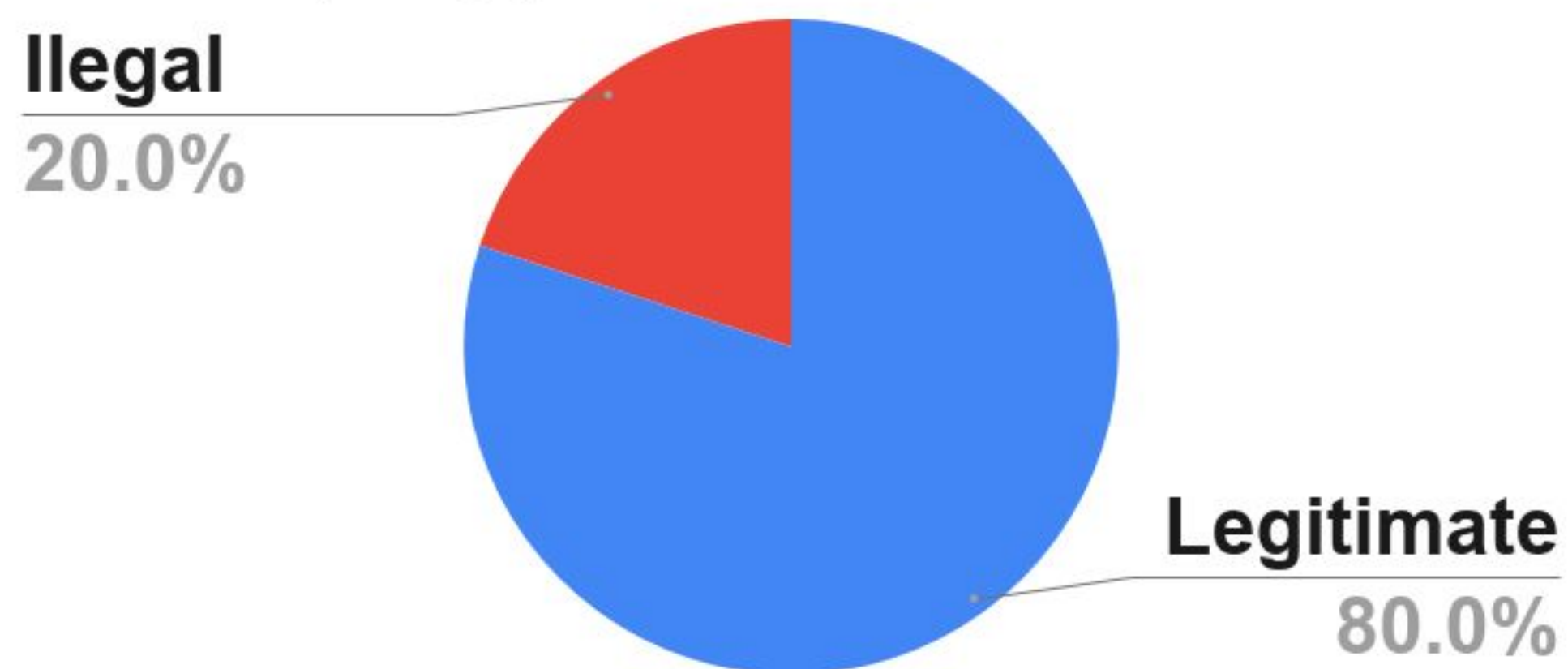
Abstract

Illegal Fishing is a criminal industry that costs over \$23 billion annually. The severity of this impact is compounded by the ecological and socioeconomic imbalances that this activity entails worldwide. Our research proposes to summarize the current efforts in combating this activity, as well as provide insight for future directions in this field.

Illegal Fishing and its Impacts

Illegal fishing corresponds to 20% of the global seafood catch.

Market share by fishing type



32% of fish imported into the U.S. comes from illegal sources

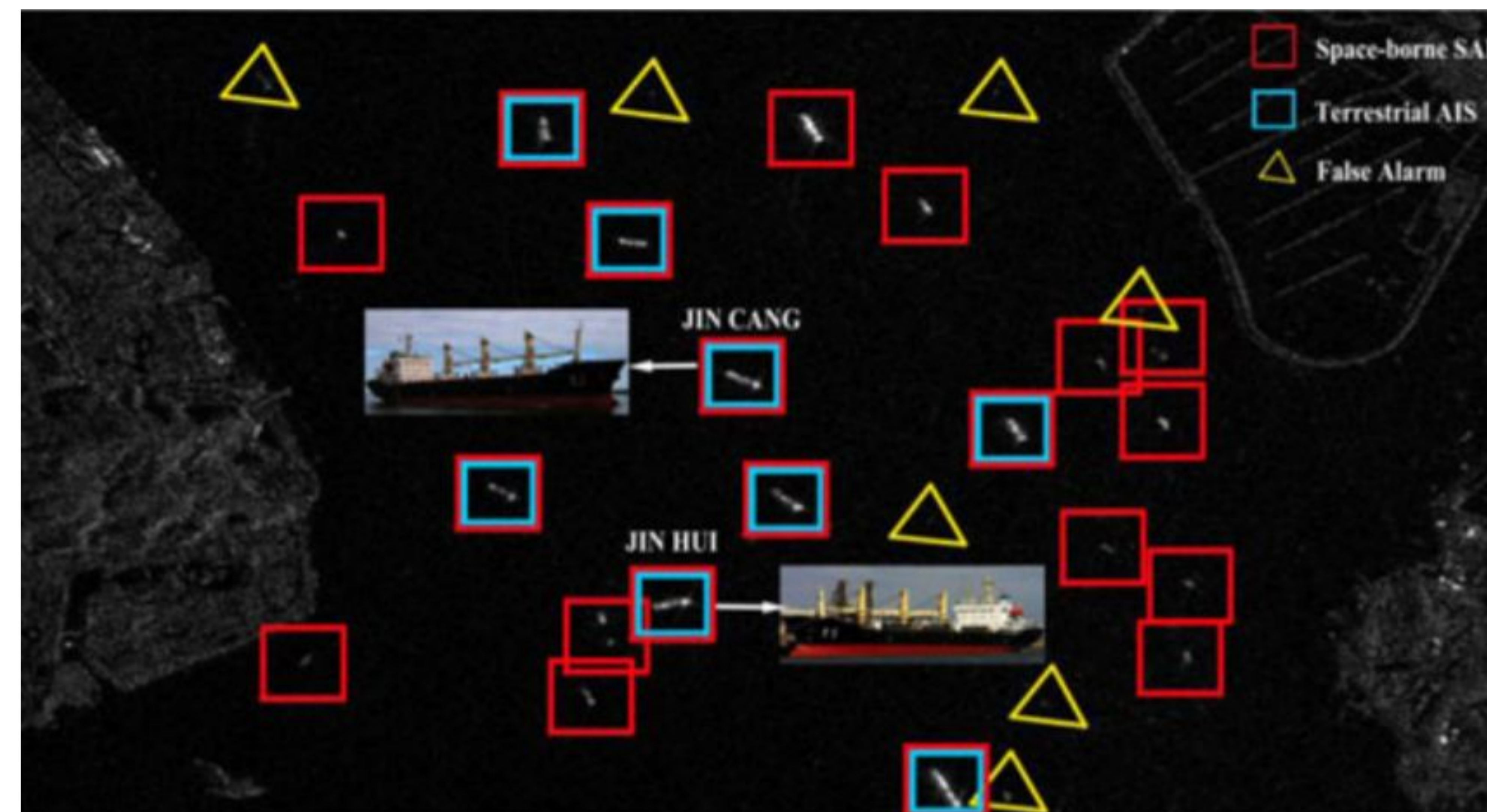
Illegal fishing contributes to the overexploitation of fish stocks, and causes imbalances in ecosystems.

This practices take the opportunity to earn money away from vulnerable communities that rely on commercial fishing as their primary form of income.

Current state of technology use

Efforts to combat illegal fishing rely on two main data sources:

AIS	SAR
The <i>Automatic Identification System</i> provides frequent data points on a vessel, its voyage and position at any given time. This is used as a baseline for the observations.	<i>Synthetic Aperture Radar</i> is a satellite imaging tool that allows researchers to observe all of the vessels in an area, whether they broadcast to the AIS or not.



Cross-referencing AIS and SAR observations, Zhao Z. (2013)

The image above depicts the current use of technology to combat Illegal Fishing. Researchers observe the vessels in an area using SAR satellite imaging (red boxes). Then, they look at AIS data points at the same time as the observation, correlating the reported positions to observed vessels (blue boxes). In this case, they can tell which vessels are operating in the area without disclosing their activities (vessels in red boxes without blue boxes). Though not evidence of illegal activities, this enables law enforcement to direct inspection efforts towards the vessels that aren't broadcasting their AIS data, thus increasing the efficiency of their operations. The yellow triangles represent false-alarms in the SAR observations.

Key insights

Current methods are able to leverage cutting edge machine learning and artificial intelligence technologies to interpret the very large amount of data involved in ocean surveillance. This has helped law enforcement reduce illegal fishing in areas where these activities were most frequent. However, the criminal organizations behind illegal fishing are much more flexible than the law enforcement agencies combating their activities. This means that criminals can adapt very quickly to these technologies. In some cases, there is a local decrease in illegal fishing vessels. However there is very little impact in these practices on a global scale. In the future, directing vessel inspections and apprehensions towards those that most significantly impact these criminal organizations could yield better results in this domain.

References

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Zhao, Z., Ji, K., Xing, X., Zou, H., & Zhou, S. (2013). Ship Surveillance by Integration of Space-borne SAR and AIS – Further Research. *Journal of Navigation*, 67(2), 295–309. doi: 10.1017/s0373463313000702

Up to 1 in 5 Fish Sold Is Caught Illegally-and Other Surprising Illegal Fishing Facts. (n.d.). Retrieved from <https://www.pewtrusts.org/en/research-and-analysis/articles/2017/11/13/up-to-1-in-5-fish-sold-is-caught-illegally-and-other-surprising-illegal-fishing-facts>