Earth & Space

No longer a secret: advanced satellite technologies monitor illegal 'dark vessels'

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This Break was edited by Akira Ohkubo, Associate Editor - TheScienceBreaker

The activity of 'dark vessels' – vessels that do not share their locations – hampers nations' efforts to make fisheries transparent and accountable. Using cutting-edge satellite technologies, we uncovered the largest illegal fishing in history conducted by dark vessels in North Korea.
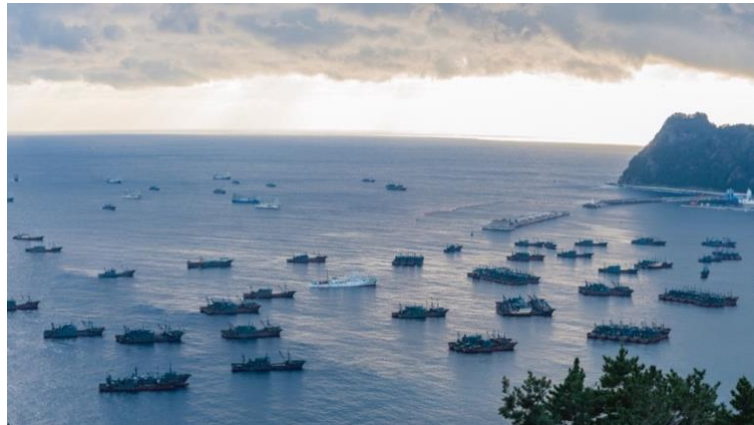
Chinese vessels anchored in Sadong port, Ulleung-do, South Korea
Image credits: Ulleung-gun County Office

Illegal, unreported, and unregulated fishing threatens the equity and sustainability of fisheries across the globe. It accounts for up to one in every five fish sold at market, and is often carried out by "dark vessels" – vessels that cannot be tracked as they do not share their locations. Dark vessels that circumvent regulations increasingly make it challenging to systematically manage global fisheries. In a new study, we sought to develop a comprehensive approach to detecting these illegal vessels.

Over the last several years, scientists have suspected the sea between the Koreas, Japan, and Russia to be a "hotspot" for dark vessels. This sea is known for its rich fishing grounds of Pacific flying squid – a beloved, economically important seafood. Despite conservation efforts by South Korea and Japan, the amount of Pacific flying squid catch in both nations' waters has declined by about 80% compared to 15 years ago. This implies a rapid increase in the number of dark vessels operating in these waters. However, due to their secretive nature, providing evidence of dark vessels' activity has been challenging.

To monitor dark vessels' activity in these waters, Global Fishing Watch and its partners use multiple advanced satellite technologies. Each of these technologies sheds light on dark vessels' activity in a unique manner: high-resolution optical imagery (which offers the best visual evidence of vessel activity and type), satellite radar (which identifies large metal vessels regardless of weather conditions), nighttime optical imaging (which detects

vessels that use lights for fishing operation at night), and automatic identification systems (which communicates a vessel's unique identification, position, course, and speed via satellites).

While each of these technologies has technical limitations, when combined, they can offer a more comprehensive picture of fishing activity. We thus set out to integrate these technologies for the first time to publicly expose the activities of dark vessels. We analyzed two major groups of dark vessels: the pair trawler group (which operate in teams of two, towing a large trawl net between them) and the lighting group (which use bright lights to lure squid to the surface of the water). We captured pair trawler vessels by using the high-resolution optical imagery, then cross-checked the results (vessel count and location) by radar imagery. We next identified lighting vessels in the same sea by using nighttime optical imaging. We overlaid these images with automatic identification system data and identified dark vessels' ports of origin and destination.

Considering all these analyses, we identified over 900 dark vessels originating from China in 2017 as well as over 700 vessels in 2018 that fished in North Korean waters. Using the number of vessels in operation over time and catch per unit effort by each type of vessel, we estimate that these dark vessels caught over 160,000 tons of Pacific flying squid that is worth at least 440 million dollars. This represents roughly the same amount of squid caught in the waters of South Korea and Japan combined. Based on the number of identified dark vessels, we believe this is the largest illegal fishing in history, perpetrated by vessels from one nation operating in another nation's waters.

This study demonstrated that these technologies, together with local expertise, allow us to expose

potential hotspots of illegal, unreported, and unregulated fishing across the world and improve fisheries transparency.

Our results highlight a significant challenge in transboundary stock management. Political disputes over maritime boundaries have prevented nations from forging international collaborations, which are essential to limiting dark vessels' activities. When it comes to legal implications, the United Nations Security Council adopted resolutions in 2017 to prohibit fishing in North Korean waters by foreign states. While China has banned its vessels from fishing in North Korea in response to these new regulations, our data highlights undeniably illegal activities.

Our data also revealed that about 3,000 small North Korean dark vessels fished in neighboring Russian waters in 2018. This suggests that competition from industrial fleets is likely pushing North Korean artisanal fishers towards neighboring Russian waters, resulting in a number of North Korean fishing boats washing up on Japanese shores. These ghost boats are found battered, often carrying human remains on board, representing serious humanitarian consequences.

Global Fishing Watch continues to monitor fishing activity in these waters. Recent analyses show that dark vessels' activity in 2019 was similar to previous years, but significantly declined in 2020. This may reflect the consequences of the COVID-19 pandemic as well as increased satellite monitoring. Data sharing and international collaboration are essential for accelerating the implementation of emerging technologies and for potential breakthroughs. This way, in turn, we will gain a truly comprehensive view of global fishing and manage sustainable fisheries.