

Science for Environment Policy

Shark 'hotspots' and fishing activities overlap in the North Atlantic Ocean

Sharks aggregate in 'hotspots' in the North Atlantic Ocean and are at risk from overfishing by longliner vessels that target the same areas for fishing, a recent study has concluded. Researchers found that the shark and fishing-fleet ranges overlapped by 80% in the North Atlantic and call for international regulation of shark catches to protect at-risk shark populations.

Pelagic sharks (those that live in the open sea) are top predators, whose populations around the world are threatened by overexploitation. This is of concern, as declining shark populations are expected to significantly affect the structure and functioning of marine ecosystems.

Longliner fishing vessels (greater than 15 metres in length) use baited lines (typically between 80 and 100 kilometres long, carrying thousands of hooks) to catch fish such as tuna and swordfish, but also sharks, principally for their fins. Non-target species (including some non-target sharks) are also indiscriminately caught on the longlines.

Longliners are likely to target ocean areas which are the preferred habitats of sharks, but the extent of overlap between longliner fishing and shark ranges has not been well known.

A greater understanding of the migratory patterns of sharks, their habitat preferences and the degree of overlap with longliner fisheries is therefore needed to improve conservation efforts to adequately [protect sharks](#). Partly funded by the [European Regional Development Fund](#)¹, this study is the first to look at this overlap at the ocean basin scale with such a high resolution of shark and fishing vessel movements.

Using satellite tracking, the researchers followed the movements of 96 tagged sharks belonging to four pelagic shark species: *Prionace glauca* (blue sharks), *Isurus* species (makos), *Galeocerdo cuvier* (tiger sharks) and *Sphyrna* species (hammerhead sharks) across the North Atlantic Ocean for seven years.

They also tracked the movements of two important commercial fisheries in the North Atlantic — the Portuguese and Spanish fishing fleets — by satellite over nine years. They used Global Positioning System (GPS) data from the Vessel Monitoring System on 186 longliner vessels to identify the locations where fishing activity occurred.

For both sharks and fishing fleets, the researchers used the tracking data and satellite sensor data of the ocean environment (such as sea surface temperature) to model the sharks' preferred habitats and the fleets' preferred fishing locations.

Although individual sharks ranged over vast distances, they tended to aggregate at 'hotspots', mainly in the Gulf Stream, the North Atlantic Current/Labrador Current convergence zone (NLCZ), Azores Islands, Mid-Atlantic Ridge (MAR) southwest of the Azores, and the Iberian Peninsula. These hotspots occur, for example, where two water body masses with different sea surface temperatures meet — and typically support highly productive food webs.

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<http://www.pnas.org/content/113/6/1582.abstract>

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1. European Development Fund
http://ec.europa.eu/regional_policy/en/funding/erdf/

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The researchers were not surprised to find that the longliners targeted similar habitats. For blue and shortfin mako sharks, (species which together make up 95% of pelagic sharks caught, and which are classified by the IUCN as 'near-threatened' and 'vulnerable' respectively), the overlap between shark and longliner ranges was 80%.

Furthermore, similar patterns of overlap were seen between years and for different seasons, indicating that the extent of overlap was repeated each year. The persistence of overlap between shark hotspots and preferred fishing locations suggests that sharks are at risk from fishing exploitation.

However, the researchers say their results are likely to underestimate the problem, as they did not have access to data for the other significant longliner fleets from the United States, Canada and Japan that fish extensively in the western and northwestern North Atlantic Ocean.

Since this research was carried out, the EU has introduced a strict fins-naturally-attached policy to ensure caught sharks are not 'finned' — where only the fin is removed, and the body thrown back into the sea.² The European Commission also promotes sustainable management and conservation measures in Regional Fisheries Management Organisations (RFMO), such as [ICCAT](#) or [NEAFC](#) — the latter of which was the first RFMO to adopt an exclusive fins-attached [policy](#) to ban shark finning. But the Commission also supports, for example, the UN General Assembly Resolutions [A/RES/62/177](#) and [A/RES/66/68](#), and the protection of endangered shark species through their listing in the annexes of relevant conventions, such as [CITES](#) and [CMS](#).

Of the possible actions that could be taken to protect sharks from overexploitation in international waters, the researchers highlight the use of fine-scale tracking of fish and fishing fleets by satellite to inform the management of fisheries at the ocean scale; they also argue that catch quotas or shark size limits would be the easiest to regulate. Despite a possible increase in the discard rate, they say sharks have around a 65% survival rate if they are released from longline hooks. They, therefore, call for coordinated efforts at the international level to implement regulations to limit shark catches, to ensure that longliner fisheries are sustainable.



2. The new 'fins-naturally-attached' policy was introduced in 2013: <http://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX:32013R0605>