

With too little to eat, 'massive number' of reef sharks depend on delivery

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Grey reef sharks. Credit: Guillaume Funrock

It stands to reason in a healthy environment that prey should always vastly outnumber the predators that eat them. But researchers reporting in the Cell Press journal *Current Biology* on July 28 have found that sometimes, even in the most untouched environments on the planet, that food pyramid can be turned upside down.

"Our findings confirm that in pristine remote coral reefs, [sharks](#) can be numerous, sometimes even outnumbering their prey at local scales," says Johann Mourier (@SharkMourier), now at Macquarie University in Sydney, Australia.

Researchers based at the Centre de Recherches Insulaires et Observatoire de l'Environnement (CRIOBE) in Perpignan, France made this discovery in the southern pass of Fakarava atoll, a reserve in French Polynesia that hosts as many as 900 reef sharks. French Polynesia is unusual in that targeted shark fishing has never taken place there. The sharks in that part of the world have also been protected since 2006 in what is now the biggest shark sanctuary in the world.

Fishes living in the pass don't provide all those sharks enough to eat. The new study shows the sharks get by thanks to spawning aggregations of fish that concentrate prey from multiple reefs, conveniently delivering themselves directly to the sharks.

In fact, it was the spawning fish that brought Mourier and his CRIOBE colleagues to Fakarava in the first place. The channel is renowned for its grouper spawning aggregations, which take place every year in June and July. When the researchers got there, they were surprised by what they found.



A school of groupers gathering to spawn. Credit: Laurent Ballesta/[Andromede Oceanologie](#) et [Blancpain Ocean Commitment](#)

"We noticed the massive number of sharks in this channel, especially gray reef sharks, and questioned how such a large number of sharks can be maintained and where they find their food," he recalls. The researchers decided to expand the scope of their study, to jointly study the shark and spawning grouper populations and their interactions.

The researchers used underwater surveys and acoustic telemetry to assess the number of sharks living in the pass and their feeding behavior.

While sharks had been known to target fish spawning aggregations, the findings are the first to suggest that this strategy plays such an essential

role, the researchers say. The discovery also has important conservation implications.

"Implementing strong shark protection laws is unlikely to be sufficient to maintain high numbers of sharks if not jointly implemented with conservation of fish spawning aggregation," Mourier says. If overfishing leads to a loss of those aggregations, sharks "will have no other choice than undertaking energetically costly, wider-range foraging to meet energy requirements."

The findings suggest that the natural abundance of sharks living on coral reefs might have been lost in many places due to human influence. Conservation of fish spawning aggregations together with shark fishing bans might help to bring the predators back.

The researchers say they'd now like to follow long-term trends on this extraordinarily remote coral reef. They are also using novel data-loggers and animal-borne video cameras to better characterize predator-prey interactions between sharks and their prey over the course of a year.

More information: Current Biology: Mourier et al.: "Extreme Inverted Trophic Pyramid of Reef Sharks Supported by Spawning Groupers" [www.cell.com/current-biology/f ... 0960-9822\(16\)30555-3](http://www.cell.com/current-biology/fulltext/S0960-9822(16)30555-3) , DOI: [10.1016/j.cub.2016.05.058](https://doi.org/10.1016/j.cub.2016.05.058)

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