

Fish lightly to keep snapper on the reef

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Snapper on the reef. Credit: Nick Graham

Fishing is fundamentally altering the food chain in coral reefs and putting extra pressure on top-level predator fish, according to new research.

Fish such as Snapper and Grouper sit at the top of the [food chain](#) and are highly sought-after in restaurants the world over, commanding a high price in fish markets and supporting the livelihoods of many fishing communities across the Tropics - but the [coral reefs](#) they inhabit are under threat.

Scientists have looked at 253 coral reef sites across nine countries or jurisdictions in the Indian Ocean, from heavily fished reefs in Kenya to unfished reefs in the remote Chagos Archipelago.

They found that top-level predator fish were easily overfished and require a different approach if they are to be conserved, or are to be part of long-term fish catches.

Their findings published in the journal *Current Biology*, show that these food chains are altered the most in heavily-fished areas because even low level fish, such as parrotfish, are heavily exploited. In these systems, researchers found sea urchins were replacing fish at the bottom of the food web, bolstering food for mid-tier species of fish. Fisheries in these situations struggle to maintain yields, and the ecosystem is fundamentally altered.

However, in coral reefs that are lightly fished, the typical ecosystem pyramid develops an hourglass shape implying that energy may pass from the bottom to the top of the food chain rapidly. This suggests lightly fished systems are well placed to both conserve top level fish, and support carefully regulated fisheries targeting these species.

These insights cast a new light on fisheries management and conservation policy, filling an important gap in our understanding of fisheries targets on coral reefs.

Lead author, Professor Nick Graham of the Lancaster Environment

Centre, Lancaster University, said: "Given the fragile state of the world's coral reefs it is important to understand how human activity, such as fishing, impacts upon coral reef ecology. Coral reefs are home to 30 percent of marine species, they play a key role in food security in the Tropics and are iconic, fascinating ecosystems in their own right."

"Our study has shown these top-level predatory fish are only likely to be viable in overall lightly fished reefs, for example the Great Barrier Reef. To both conserve these top-of-the-food-chain fish, and to maintain the fisheries which depend upon them, overall fish biomass on the coral reef needs to remain high."

"Previous research by our team has identified target levels of biomass which sustain fisheries for a diverse array of species, while maintaining ecosystem structure. This current work identifies a higher target for fisheries that aim to target predatory fish. Key to these targets is the objective of maintaining the ecosystem at the same time as supporting [fisheries](#) and livelihoods."

Dr Aaron MacNeil of the Australian Institute of Marine Science, and Dalhousie University said: "These results give us better insight into how we can maintain the integrity of reef ecosystems while sustaining the livelihoods of local fishers. Understanding how humans alter energy flows within coral reefs gives us another tool for deciding how much [fish](#) we can safely take for ourselves. And by accounting for the energy stored in the system, we can choose to allocate effort to different parts of the [food](#) web and maximise overall catch and function."

More information: Nicholas A. J. et al.: "Human disruption of coral reef trophic structure" *Current Biology*, [DOI: 10.1016/j.cub.2016.10.062](https://doi.org/10.1016/j.cub.2016.10.062)

Provided by Lancaster University

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