

# Weed-eating fish 'help protect jobs, livelihoods'

May 8 2012

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Jobs, livelihoods and ecotourism industries can benefit from having a diverse supply of weed-eating fish on the world's coral reefs, marine researchers say.

Despite their small size, relative to the [sharks](#), [whales](#), and [turtles](#) that often get more attention, herbivorous fish play a vital role in maintaining the health of coral reefs, which support the livelihoods of 500 million people worldwide, say researchers from the ARC Centre of Excellence for Coral [Reef Studies](#) at James Cook University, and the Australian Institute of Marine Science.

"Herbivorous fishes protect coral reefs by limiting the growth of [algae](#), or [seaweed](#)," says Loïc Thibaut, lead researcher of a new study that has been published in the journal *Ecology*. "Seaweeds grow rapidly and compete with corals for space. If left unchecked, they can smother the corals and take over the reefs. This shift, once it happens, is extremely difficult to reverse."

The study shows that having high biodiversity of herbivorous fishes provides strong "insurance" for [coral reefs](#). A diverse set of herbivores ensures that seaweeds are kept under control, because when some species take a hit and decline, others increase to fill the gap. This makes seaweed control more stable over time, something researchers call the "portfolio effect".

"It's like having a diverse stock portfolio – you wouldn't put all your

money into one particular stock, because if that company goes down, so will your life savings," says Professor Sean Connolly, a Chief Investigator at the Centre. "A very similar principle works in ecosystems."

An example of the disastrous effects of having only one herbivore as 'gatekeeper' is the extensive coral loss in the Caribbean in the 1980s.

"In the 80s, overfishing left a species of sea urchin as the only animal controlling seaweed growth on Caribbean reefs. When a disease broke out, the sea urchin population collapsed - and there was nothing to keep the weeds in check. This was followed by an explosion of seaweeds, which smothered the coral and hit tourism pretty hard," says Prof. Connolly.

The study, which applied cutting-edge analyses designed by the JCU researchers to and data from the Australian Institute of Marine Science's 15-years of surveys across the Great Barrier Reef, found that protection was provided by having a diversity of fish that perform a similar function – chomping down seaweed – because different fishes respond differently to different pressures.

"There are three main groups of herbivorous fishes: territorial grazers that bite at the algae and are site-attached and actively defend a small patch of reef, roving grazers that feed in the same way but move around the reefs, and scrapers who range widely and feed by biting the algae back to the limestone surface of the reef, making clear patches where corals can establish. All are critically important," says study co-author Dr Hugh Sweatman, a Senior Research Scientist at the Australian Institute of Marine Science.

"These groups all play a similar role in keeping weeds in check, but each type responds differently to environmental fluctuations."

"In this research, we measured how strong the 'portfolio effect' was in different reef locations. We found that high biodiversity makes seaweed control twice as stable as it would be if we relied on one super-abundant species, like the sea urchin in the Caribbean," says Prof. Connolly.

"Biodiversity reduces the risk that environmental fluctuations will push overall herbivory below the threshold that might trigger a regime shift towards seaweed-dominated reefs."

The finding highlights the importance of maintaining biodiversity in the coral ecosystem, the researchers say.

"The more diversity you have, the lower the risk that all the [fish](#) that play a particular role on the reef – like controlling seaweeds – will crash at the same time. This is greatly beneficial for the health of any type of ecosystem. And it is also beneficial to the people whose jobs and livelihoods depend on that system," says Mr Thibaut.

**More information:** The paper "Diversity and stability of herbivorous fishes on coral reefs" by Loïc M. Thibaut, Sean R. Connolly and Hugh P.A. Sweatman is published in the latest issue of *Ecology*.

[bit.ly/Kj4QmT](http://bit.ly/Kj4QmT)

Provided by ARC Centre of Excellence in Coral Reef Studies

Citation: Weed-eating fish 'help protect jobs, livelihoods' (2012, May 8) retrieved 27 April 2024 from <https://phys.org/news/2012-05-weed-eating-fish-jobs-livelihoods.html>

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