Extinction predictor 'will help protect coral reefs'

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A new way of calculating the vulnerability of coral reef fish has revealed more than a third of species are in jeopardy of local extinction from the impacts of climate change.

Local extinction refers to the loss of species from individual locations, while they continue to persist elsewhere across their range.

New research carried out by an international team of marine scientists has found that a third of reef fishes studied across the Indian Ocean are vulnerable to increasing stresses on the reefs due to climate change.

Developing a new method of predicting the demise of these important species, the study – which involved Newcastle University's Professor of Marine Environmental Science, Nick Polunin – provides coral reef managers with a vital tool for better protecting and managing the world's coral reefs.

Publishing their findings today in the academic journal *Ecology Letters,* the team applied their 'extinction risk index' to determine both local and global vulnerability to climate change and human impacts.

They tested the method by comparing fish populations before and after the major 1998 El Nino climate event which caused massive coral death and disruption across the Indian Ocean.

In all, 56 of the 134 coral fish species studied were found to be at risk

from loss of their habitat, shelter and food sources caused by climate change. Those most in jeopardy were the smaller fishes with specialised eating and sheltering habits. Because most of these species have wide geographic ranges and often quite large local populations, few were at particular risk of global extinction.

“The loss of particular species can have a critical effect on the stability of an entire ecosystem – and our ability to look after coral reefs depends on being able to predict which species or groups of fish are most at risk,” explains lead author Dr Nick Graham of the ARC Centre of Excellence in Coral Reef Studies and James Cook University, who did his PhD at Newcastle University, UK.

“Until now, the ability to do this in the ocean has been fairly weak. For example, we know that the loss of seaweed-eating grazing fishes can lead to coral reefs which have suffered some other form of disturbance being replaced by weeds. Protecting these fish, on the other hand, gives the corals a much better chance to recover.

“Where there is a widespread death of corals from a climate-driven event such as bleaching, the fish most affected are the ones that feed or shelter almost exclusively on coral. However when corals die off and the reef structure collapses, small reef fish generally are much more exposed to predators.

“By understanding which species and groups of fish are most at risk, we can better manage coral reefs and fish populations to ensure their survival in times of increasing human and climate pressure.”

Professor Nick Polunin, of Newcastle University, UK, added: “Every ecosystem has its Achilles heel, be it coral cover, availability of nutrients or temperature. Understanding what that is can help us to protect these important communities.

“Coral reefs are a striking example of what can go wrong in an ecosystem because they are particularly sensitive to environmental change. This new index gives us a way of determining which factor is having the most detrimental impact and look at ways of minimizing that risk.”

The study does, however, offer encouragement by showing that the fish most at risk from climate change are seldom those most at risk from overfishing or other direct human impacts, pointing to scope to manage reef systems and fishing effort in ways that will protect a desirable mix of fish species that promote ecosystem stability.

“Critically, the species of fish that are important in controlling seaweeds and outbreaks of deleterious invertebrate species are more vulnerable to fishing than they are to climate change disturbances on coral reefs. This is encouraging, since local and regional commitment to fisheries management action can promote coral recovery between disturbances such as storms and coral bleaching events," explains Professor Polunin.

The team concludes that identifying the fish species most at risk and most important to ecosystem stability and then managing coral reefs to maintain their populations will help ‘buy time’ while the world grapples with the challenge of limiting carbon emissions and the resulting climate change.

They add that their novel approach to calculating extinction risk has wider application to conservation management beyond coral reef ecosystems and can readily apply to other living organisms and sources of stress.

Provided by Newcastle University