

Ningaloo

WAMSI Node 3

Ecosystem interactions at Ningaloo Marine Park

Researchers are investigating whether evidence exists for indirect cascading effects on the reef ecosystem caused by the removal of top predators.

Background

The Ningaloo Marine Park is a multiple-use marine park where one of the key uses is recreational fishing.

Zoning is a tool typically used in marine park management to protect relatively undisturbed and representative areas of the marine environment to ensure the long-term sustainability of biodiversity and the processes and interactions that support it. This can include recovery of some populations from pressures elsewhere in the park.

In other parts of the world, overfishing has been thought to have led to changes in the structure and function of reef ecosystems. This can occur if fishing reduces the density and size of large predatory fish, for example sharks, large cod or emperor, allowing populations of their prey to grow out of control and upsetting the balance of the ecosystem.

However, not all ecosystems behave in the same way and the nature of a system's response to a given pressure, such as fishing, can be strongly dependent on the characteristics of the ecosystem in question.



Field surveys

Surveys of key organisms from several different trophic levels such as fish (predators and grazers), urchins and snails (grazers), and corals and macroalgae (primary producers) were conducted in the reef flat habitat at 48 sites, evenly split between sanctuary (non-fished) and recreation (fished) zones at Mandu, Osprey and Maud regions of the Ningaloo Marine Park.

Surveys were designed to contrast sanctuary and recreation zones in each area, and also to take into account any random variations in reef organisms that might be present.

Some of the survey findings are:

- some fish species, such as predatory emperors and black wrasse and grazing parrot fish, were more common in sanctuary zones
- there was no difference in the number or density of urchins, snails, algae or corals between recreational and sanctuary zones even though these species are ones that might be affected directly or indirectly by grazing or predation
- fish communities outside sanctuary zones tended to include more of prey species, such as moon wrasses and damselfish, potentially due to reduced levels of predation
- the biomass (total weight) of wrasses and emperors at each location was positively related to the percent cover of live coral, while the biomass of urchins was highest at places with intermediate coral cover
- there was less algae where herbivorous grazing fish were larger and/or more abundant.



Impacts and outcomes

This project has shown that although populations of some target species are affected by fishing, the indirect effects of fishing on the Ningaloo Reef ecosystem are relatively minor, if present at all, and that the system appears to be close to some original state, at least in terms of food web function.

Ongoing monitoring and research is needed to follow up this project and to enable its full value to be realised. For example, we need to understand the reason why there are more grazing fish in marine sanctuaries if we are to use this effect as a management tool to increase system resilience.

Contact

Dr Russ Babcock
CSIRO Wealth from Oceans Flagship
Phone: +61 8 9333 6535
or +61 7 3833 5904
Email: russ.babcock@csiro.au