

Earth & Space

Making the coral reef 'A-list'

by **Joshua Cinner**¹ | Professor

doi.org/10.25250/thescbr.brk486

¹: ARC Centre of Excellence for Coral Reef Studies, Queensland, Australia

This Break was edited by Ayala Sela, Scientific Editor - TheScienceBreaker

The world's coral reefs are embattled by increasing human pressures. My colleagues and I explored which coral reefs could still simultaneously meet key fisheries, biodiversity, and ecosystem function goals, and how conservation efforts could be strategically placed to maximise these. We found that no-fishing reserves in locations far from people were critical to sustaining coral reefs.



Image credits: Pixabay

Coral reefs around the world are in crisis. Climate change, overfishing, and pollution are devastating coral reefs. The Great Barrier Reef in Australia, the largest coral reef in the World, has had three major coral bleaching events in just 5 years, which have killed nearly half the corals. Avoiding reef degradation would not only improve the wellbeing of millions of people who depend on reefs for their livelihoods, nutrition, and cultural identity, but also protect an invaluable ecosystem.

Sick of writing obituaries for coral reefs, my colleagues and I wanted to investigate solutions. Specifically, we wanted to know the context under which local conservation efforts helped sustain coral reefs. We wanted to find out how to help reefs meet multiple goals. You see, people have different goals

for sustaining coral reefs - some want to promote the conservation of fish stocks, some want to preserve biodiversity, and some want to maintain key ecological functions. Managing even one of these goals is extremely difficult, but we wanted to find out whether some reefs can have it all. For this purpose, we investigated nearly 1800 tropical coral reefs around the world to identify the coral reefs that "have it all" - they are like the Hollywood A-listers of reefs. In addition, we highlighted the challenges and opportunities that could lead other reefs to get on the A-list.

To do so, we established a high, medium, and low target for each of the three key goals: number of fish, biodiversity, and ecological function. For example, were there lots of fish there? A medium amount? Or

not so much? Sites that met the most stringent target for all three goals at the same time were on our A-list. The ones that met the middle target for all three goals were our B-listers, and the ones that met our least stringent targets for all three goals were our C-listers - these were like our reality TV stars.

Our main focus was not in finding who the A-listers were, but in helping other reefs get on the A list. We wanted to find the context under which which local conservation efforts such as no-fishing marine reserves, could help reefs get on the A-list. With this goal in mind, we measured the human pressure and its effects on fish in the world's reefs. The 'human gravity' scale calculates factors such as human population size, distance to reefs, and the transport infrastructure on land – which can determine reefs' accessibility to fishermen and markets.

There are two important results from our study. First is that A-listers are rare, but geographically widespread. Only 5% of openly fished reefs were A-listers, but these were all over- in about one-third of the countries we studied. About 12% of reefs met out medium targets across all three goals (B-listers), and about one-third of reefs met the least stringent targets across the three goals (C-listers). More than half of our reefs didn't even make the C-list.

The second important result is the old real estate adage: location, location, location! Local conservation efforts can help coral reefs sustain multiple goals, but only in the right location, which varied depending on our target. For the most stringent targets (our A-list), we found that marine reserves made the biggest difference in locations with low human pressure. As our targets became less stringent (our B- and C-list), marine reserves made the biggest difference in locations with intermediate human pressure. However, local conservation efforts were ineffective where human pressure is most extreme - in these locations, degradation is too severe and local conservation efforts aren't enough.

Our study makes clear the pros and cons of placing reserves in different locations. We show which reefs will benefit most from different local conservation efforts to simultaneously meet multiple goals, such as fisheries, biodiversity, and ecosystem function, and which reefs require a different approach. As a society, we're hardly slowing down the pressures we put on reefs, so it is important to understand where conservation can have the biggest impact. It appears that remote reserves - those furthest from human impacts - are critical to supporting multiple goals.

Local conservation efforts can help coral reefs meet fisheries, ecosystem function and biodiversity goals, but they have to be strategically placed to do so.