

Biases found in coral reef research

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Coral reefs support approximately 25% of marine species, and are essential to coastal economies, such as the fishing and tourism industries, to name a few. But coral reefs worldwide are at risk due to climate

change and are on the brink of collapse.

The [global decline of coral reefs](#) has encouraged extensive research. Now, scientists from UNSW Sydney have assessed the current landscape of coral health research to reveal biases in the field.

The team discovered that most papers on coral [reef](#) research are published from within the U.S. and Australia, while researchers from countries with large [coral reefs](#), such as The Maldives and Papua New Guinea, are underrepresented. As these reefs are also on the brink of collapse, the UNSW research team emphasizes the importance of including local experts.

They also identified key topic areas that are underrepresented within the existing literature, including coral bioerosion and the microbiome, both of which are important for painting a more complete picture of the state of our reefs.

The team hope the findings [published](#) Oct. 23 in *Ecological Solutions and Evidence* will help inform marine ecologists on the understudied areas of coral research, increase funding in underrepresented countries and raise public trust in science.

"The idea behind this research was to take stock of what information we have, like a bird's eye view of the research," says Samantha Burke, a Ph.D. candidate and lead author on the study from the UNSW School of Biological, Earth & Environmental Sciences (BEES).

"We wanted to provide clear data on the topic areas that we've looked at, as well as the areas that require further research, and also to provide some ideas and evidence-backed directions for where we can improve coral health research as a whole."

Taking a holistic view of the research

For the study, the team synthesized 335 literature papers on coral health and documented a number of key characteristics, such as details of the authors—including affiliated country—the key themes explored in the papers, the methods used in each publication and the research integrity of the study. They also used systematic maps to report the state of knowledge within the field, identifying research gaps, most studied themes, and timelines of when topics gained popularity.

"By weaving together these different techniques, we can get a more holistic view of what's missing, and perhaps some explanations as to why there are certain biases within the field," says Burke.

The final part of the methodology is a critical appraisal using a set of predetermined criteria for transparency and rigor within research. For example, whether these studies openly share the data and type of analysis they used.

"I think it's important for people to be held accountable," says Burke. "We want to push this research area into a better place, not just within the field itself, but also in terms of public trust in science as a whole."

Highlighting biases in the field

Key study topics identified were [climate change](#) and coral resilience, at 50% and 42%, respectively. Bioerosion of corals—the removal of coral material by other living reef organisms—was the least studied.

"Through this analysis, we have revealed key gaps in coral health topics for further review, particularly when considering conservation policy," says Burke. "Bio-erosion and the coral microbiome—the bacteria that

lives in its tissues—are not fully understood yet. These two facets, particularly the coral microbiome, could drastically change our understanding of how coral health is affected by climate change and human activities."

While their analysis found that the authors of these papers are highly interconnected, they discovered that authors from countries such as Maldives and Papua New Guinea, are not as represented within the literature as they should be for the amount of coral reefs within those ocean territories.

This bias, referred to as academic colonialism, omits the knowledge base of the researchers who live and breathe the threats to and benefits of these major coral reef systems. The team warn that this could leave certain threats unaddressed and certain reefs unprotected from the stressors that lead to reef decline.

"So, for example, as we had seen that most of the researchers are coming from America, it might explain why we have so much research on coral bleaching, because there have been lots of coral bleaching events that have been well documented in the Caribbean and Hawaii, compared to events that are happening in other coral reefs, for example, disease outbreaks in the Coral Sea, right off the coast of Indonesia."

Additionally, using citation information and alternative metrics of impact, the data also provide a sense of the reach of the research within and outside of academia, for example, whether work has been used in policymaking or conservation practices.

The team found that more than 80% of papers stated that the review's primary purpose was to inform coral conservation. However, data the team collected from a citation repository also revealed that the reviews were only cited in policy 0.565 times, on average.

"We were surprised to find that very little of the research was actually reaching outside of academia. Incorporating research in policy could be improved through greater research accessibility and continuing to gather public interest in coral reefs."

Increasing public trust in science

The researchers hope that in being transparent about the current research landscape, they can encourage higher standards of research integrity.

"Identifying areas where we can make science more accessible to the public is definitely going to improve how we can engage with our intended audiences as researchers."

By highlighting countries with large coral reef ecosystems, such as The Maldives and Indonesia, which are underrepresented in the literature, Burke hopes that these biases can be addressed with changes in funding.

"These local researchers provide a wealth of knowledge and are intimately familiar with the community's relationship with coral reefs. When we include these researchers in studies of coral health, we tap into a great source of information and encourage a passion for coral reef conservation in the public."

Importantly, the methods used in the study are very reproducible, systematic processes that scientists in other areas of research can use to conduct similar assessments in their field of interest.

"These methods are relatively new to ecology, and especially new in terms of marine ecology," says Burke. "So, seeing these techniques get picked up in other topics could provide a better picture of what's going on in our reefs and what's going on in our oceans."

Ultimately, the team hope that this research will push coral health

research in a new direction—one that produces research of higher quality, collaboration, and efficiency.

"As coral reefs decline, we should also aim to rebuild [public trust](#) in research and strengthen the evidence base for the imperative conservation of our reefs."

More information: Samantha Burke et al, Mapping literature reviews on coral health: A review map, critical appraisal and bibliometric analysis, *Ecological Solutions and Evidence* (2023). [DOI: 10.1002/2688-8319.12287](#)

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