

# High diversity on coral reefs—a very big game of rock-paper-scissors

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Competition among corals for light and space: *Acropora hyacinthus* (center bottom to upper left) with damaged edge partially surrounding *Platygyra daedalea* (center), at Sesoko-jima, Okinawa, Japan. Credit: Macquarie University

For a long time, scientists have wondered how a large number of species can live together while competing for a single, limiting resource. Why doesn't a single species that is better at competing for the resource crowd out all the others? According to new findings by Macquarie University, the answer to this question on coral reefs is like a very big game of rock-paper-scissors.

"More than one hundred coral [species](#) can coexist in a single patch of [reef](#), using multiple strategies to compete with each other for sunlight and living space," explains lead author Dr Kristin Precoda. "We found that no one species can outcompete all the rest."

The study presents evidence that, in the highly diverse world of [coral reefs](#), competitions between coral species are generally not hierarchical.

"While researchers have long recognised that non-hierarchical interactions can allow for high species diversity in theory, so far, very few studies have attempted to test this idea empirically using field data," says contributing author Dr Andrew Allen.

The researchers gathered a list of wins, losses, and ties between pairs of species from regions around the world, including the Great Barrier Reef, the Caribbean, Taiwan, Hawai'i, and the Red Sea.

"We linked each species to traits that could influence its competitive abilities," says Dr Precoda. "For example, the tentacles of [coral species](#) with larger polyps may have a longer 'reach,' and corals that grow upward and outward may shade flatter species."

Several traits helped predict which species were likely to win, especially when the competitors were not closely related. However, the outcome for any particular species pair was strongly influenced by factors not yet explained, and the same species in a given pair may not always win.

"The results suggest that the outcome of competition in these species-rich communities is nuanced," says Dr Joshua Madin. "Essentially, being better at one thing means being worse at another, and therefore no one species can win in all situations."

**More information:** Kristin Precoda et al. Using Traits to Assess Nontransitivity of Interactions among Coral Species, *The American Naturalist* (2017). [DOI: 10.1086/692758](https://doi.org/10.1086/692758)

Provided by Macquarie University

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