Turf wars: Sand and corals don't mix

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When reef fish get a mouthful of sand, coral reefs can drown. That's the latest startling evidence to emerge from research into the likely fate of reefs under climate change and rising sea levels, at the ARC Centre of Excellence for Coral Reef Studies (CoECRS).

"We've known for a while that having a lot of sediment in the water is bad for corals and can smother them. What we didn't realize is how permanent this state of affairs can become, to the point where it may prevent the corals ever re-establishing," says Professor David Bellwood of CoECRS and James Cook University.

The killer blow for a degraded coral reef is a thick mat of sand and weeds that shrouds the rocky surfaces on which the corals would normally grow, preventing them from re-establishing. This gritty algal 'turf' has shown itself to be remarkably hardy and, once in place, makes it almost impossible for the corals to return.

If sea levels rise, then the smothered reef 'drowns' and never recovers, Prof, Bellwood says. "We know this from geological history, at the time of previous sea level rises. The reason we are doing the work is to see whether or not coral reefs will be able to keep up with rising sea levels under climate change."

But Prof. Bellwood and colleague Dr Chris Fulton from the Australian National University have also uncovered a remarkable link in the chain which explains why the algal turf can win in its 'turf war' with the corals.

When the water is thick with sediment and it settles on the seaweeds, herbivorous reef fish turn up their noses at the gritty food, much as humans disdain a sandwich that has been dropped on a sandy beach.

"Remarkably we found that when there is little sediment around and plenty of fish, the fish 'mowed' the weeds very fast, eating two thirds of their length in about 4 hours. This action by fish in keeping the algal turf down gives the corals a chance to re-establish" said Dr Fulton.

"But if there is a lot of sediment in the water, the fish go off their feed, the weeds grow, more sand settles – and the murky shroud that smothers the reef becomes more stable, often permanent. Then, when sea levels rise, the reef drowns."

Prof. Bellwood says that in many cases the sediment is generated naturally by the reef itself, particles are swept into its back lagoon and then stirred up by wind, tide and wave to settle on the turf-covered flats. "In those cases it is almost like the reef defecating onto itself," he adds.

In other cases the sediment is released from the land, often as a result of human activity such as farming, grazing, land clearing or construction.

In either case, if there is enough sediment in the water to settle on the seaweed, it turns the weed-eating fish off their meal. "We're not entirely sure why this is - it may be that the sediment acts as an antacid and gives the fish indigestion by preventing their stomach acids digesting their food. Or it may simply be that fish, like people, don't appreciate a mouthful of sand and mud."

There is not a lot that humans can do to disrupt the natural processes that cause reefs to smother under stable algal turfs, then drown as sea levels rise, Prof. Bellwood says.

However, he adds, there is plenty we can do to reduce our own impact on the process by checking the flow of erosion off the land onto coral reefs, and by ensuring that populations of weed-eating fish are maintained at levels high enough to control the weeds - and give the corals an even chance of making a comeback.

Source: ARC Centre of Excellence in Coral Reef Studies

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