

Ancient coral reefs at risk from deforestation and land use practices

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(Phys.org) -- A team of international scientists, including a researcher from The University of Western Australia, has found that soil erosion, land degradation and climate change pose a mounting threat to coastal reefs and their ecosystems in the western Indian Ocean. The study examined sediment and freshwater discharge over recent decades in two catchments in Madagascar's Antongil Bay and the island nation's Great Barrier Reef of Tulear, and the climatic processes that drive them.

The unique study incorporated hydrological catchment modeling as well as coral data over the past 60 years.

This was possible because Madagascar's giant Porites corals have grown

continuously over several centuries at 1-2cm annually and record the changes in their environment by absorbing trace elements into their skeleton.

Deforestation is often linked with degradation of [terrestrial ecosystems](#) but until now no study has revealed its impact on adjacent [coral reefs](#).

"Results from the study suggest that changes in land use - primarily the removal of forests - and Madagascar's increased population density are the key drivers of long-term reef sedimentation trends but that these are slow processes," said study co-leader Dr Jens Zinke, of UWA's Oceans Institute.

Dr Zinke said those factors combined with climate changes - including hinterland rainfall, temperature and El Niño-Southern Oscillation - to influence the amount of sediment transported through river run-off, which is subsequently deposited in coastal waters and reflected in elevated geochemical indicators in corals.

"This is the first direct evidence that catchment activity in Madagascar through deforestation and land use practices affects near-shore reef ecosystems," Dr Zinke said.

"Just as importantly, these results reinforce the need to incorporate terrestrial land-use management in the design of coral reef protection networks in the region."

Dr Zinke, who is also with UWA's School of Earth and Environment and the Australian Institute of Marine Science (AIMS), said Madagascar was a biodiversity hotspot affected by massive 20th Century deforestation.

"There is a dire need to combine efforts on terrestrial and marine conservation in unison to sustain Madagascar's biodiversity," he said.

"The study proposes that the reduction of sediment and nutrients loads during floods and cyclones - for example through better control of hinterland [soil erosion](#) - should be a priority in marine conservation planning.

"Water quality in near-shore coral reefs is critically important for a healthy ecosystem and sustaining livelihoods in small-scale fisheries communities across the globe.

"When water quality deteriorates, we see deterioration of important habitats, including coral reefs that are home to many species of reef fish, crustaceans and marine mammals."

Dr Zinke was the leader of the research, along with Professors Jan Vermaat and Hans de Moel from the Institute for Environmental Studies at VU University Amsterdam, and Dr Craig Grove of the Royal Netherlands Institute for Sea Research. The lead author was PhD student Joseph Maina from Macquarie University.

The study, Linking coral river runoff proxies with climate variability, hydrology and land-use in Madagascar catchments, is published in the [Marine Pollution Bulletin](#).

Provided by University of Western Australia

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