

Reduced salinity of seawater wreaks havoc on coral chemistry

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New research finds that extreme and sudden changes in salinity cause a biochemical response in corals (*Acropora millepora*) that is similar to marine heatwaves, but in some ways, more damaging to their cells. Credit: ARC Centre of Excellence for Coral Reef Studies/Greg Torda

New research confirms that drastic changes in ocean salinity from, for example, severe freshwater flooding, as recently experienced off the coast of north-east Queensland from abnormal monsoonal conditions, provoke a similar stress response in corals as extreme heating, resulting in "freshwater bleaching" and if unabated, coral death.

Researchers from the ARC Centre of Excellence for Coral Reef Studies at James Cook University (Coral CoE) and University of Technology Sydney (UTS) report that extreme and sudden changes in salinity, or the ocean salt concentration, cause a

biochemical response in corals that is similar to marine heatwaves, but in some ways, more damaging to their cells ability to function.

"Corals are sensitive organisms, known to only tolerate slight changes in their environment. Thriving in clear, sunlit waters—the majority of [reef](#)-building corals are found in tropical and [subtropical waters](#) with a salinity between 32 to 42 parts per thousand," said senior author Prof David Miller of Coral CoE.

"During the recent flooding, there are reports that nearshore reefs were exposed to roughly half the normal [ocean salinity](#)."

"Our research shows that this kind of environmental change causes a shock response in corals that prevents normal cell function."

The researchers used the sequenced genome—a biological blueprint—of the common reef-building [coral](#), *Acropora millepora* to detect changes in the coral's biology.

"Using the sophisticated labs at the National Sea Simulator, we put both young and adult corals under a salinity stress test to see how they respond to differing salinity concentrations," said co-author Dr. Jean-Baptiste Raina of UTS.

"We found that there was a common response between both coral life-stages—with the younger corals being more sensitive to low salinity conditions, but faring slightly better with exposure over time."

"In general, we found that the coral's cells launch a similar chemical response to reduced salinity as they do for heat stress," Prof Miller explained.

"However, unlike the heat stress response, corals exposed to reduced [salinity](#) experience a complete collapse of their internal cellular protein balance,

suggesting that their cells are in deep trouble."

Although the central Great Barrier Reef may have been spared mass thermal bleaching due to higher-than-normal ocean temperatures this summer, there are many coastal reefs left battling dramatic changes in water conditions from the massive plumes of floodwater.

With the frequency and severity of heavy rainfall and runoff events predicted to increase by 2050, management interventions to increase the resilience of reefs are needed now more than ever.

More information: Catalina Aguilar et al, Transcriptomic analysis reveals protein homeostasis breakdown in the coral *Acropora millepora* during hypo-saline stress, *BMC Genomics* (2019). [DOI: 10.1186/s12864-019-5527-2](https://doi.org/10.1186/s12864-019-5527-2)

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