

EFFECTS OF ELEVATED TEMPERATURE ON THE MORTALITY AND METABOLISM OF PACIFIC REEF CORALS

by

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ABSTRACT

The upper thermal tolerance limits of subtropical (Hawaiian) and tropical (Enewetak) reef corals were determined both in the field and under laboratory conditions. Enewetak corals routinely withstand temperatures up to 34°C whereas similar exposure time at 32°C kill their Hawaiian congeners. These differing upper thermal limits correspond to increases of +4 - 5°C above the annual water temperature maxima at each location. Reef coral temperature tolerance is therefore closely adapted to the ambient ocean temperature conditions of a geographic location.

Studies of temperature effect on reef coral photosynthesis (P) and respiration (R) also showed different patterns between locations. Same species showed greater autotrophic capability at elevated temperatures in Enewetak than Hawaii. Critical temperatures estimated as coinciding with P:R ratio values minimal to support long term functional autotrophy were 2-5°C higher for Enewetak than Hawaiian specimens, closely corresponding to observed differences in upper thermal tolerance. Results support a hypothesis of temperature adaptation capability for reef corals and suggest that short term physiological tests can predict relative differences in temperature tolerance among coral species.

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