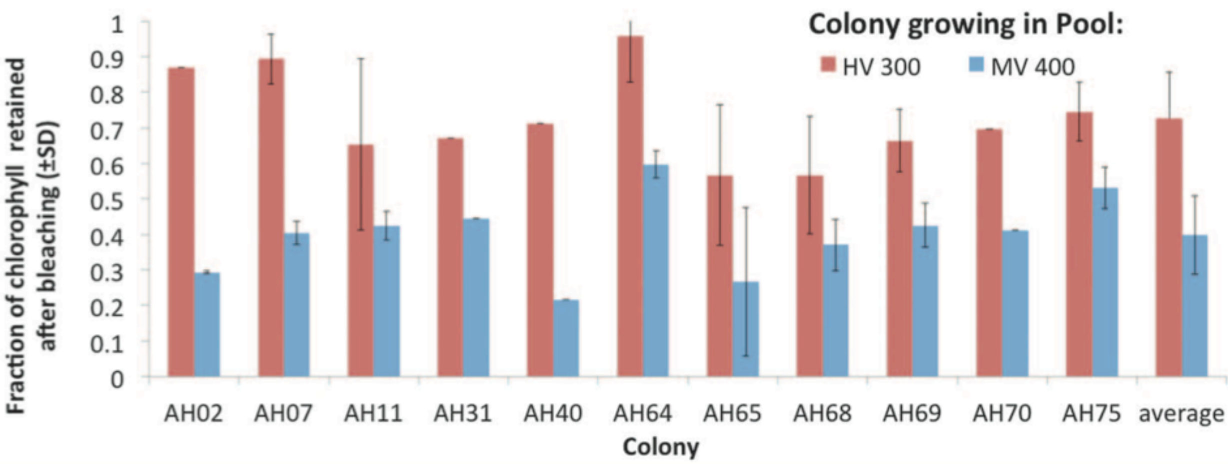

Caption: Eleven samples of a coral species (**Acropora hyacinthus*****) were reciprocally transplanted from their native pool to a moderately variable heat pool (MV, in blue) or a highly variable heat pool (HV, in red). After the corals spent a period of time in their new environments, they were exposed to heat stress. The degree of resistance to bleaching by a coral colony is measured by the ratio of chlorophyll that remains in the corals after heat stress compared to non-heat stressed controls.***

BACKGROUND INFORMATION

Reef-building corals are sensitive to heat and can bleach when they experience temperatures above the normal range for their given location for a prolonged period of time. Bleaching occurs when the symbiotic algae and the chlorophyll they contain are ejected from coral cells. The algae give the corals their color, so when they are ejected, the coral turns white. Corals can survive short-term bleaching events, but become more at risk of disease and death.

To test whether corals can become more resistant to bleaching, Dr. Steve Palumbi and colleagues performed a series of experiments in the U.S. National Park of American Samoa off of Ofu Island. In these waters, corals tend to bleach around 30°C. The researchers first had to establish a baseline for bleaching. To do this they took coral samples from two different shallow pools: a highly variable pool (HV) that regularly experiences temperatures between 30 and 35°C, and a moderately variable (MV) pool where temperatures rarely exceed 32°C. They then exposed the samples to a heat stress protocol in a laboratory consisting of a steady increase in water temperature from 29°C to 34°C over 3 hours, followed by steady exposure to 34°C water for 3 hours, which mimicked conditions of a low tide cycle in an HV pool. They determined the baseline of bleaching by measuring the ratio of chlorophyll present before and after the heat stress. In this experiment, corals from the HV pool retained 80% of their chlorophyll, while corals from the MV pools retained 45%.

They next tested the ability of corals to acclimate to frequent heat stress. (*Acclimation* or *acclimatization* is the process by which an individual adjusts to changes in its environment.) The researchers took branches from 11 colonies (3 from the HV pool, 8 from the MV pool), split the samples, and grew one sample in each of the MV and HV pools. They let them grow in their new environment for 12, 19, or 27 months and then tested them for heat resistance using the heat stress protocol. In the graph above, the red bars represent data from each of the 11 colonies that grew in the HV pool and the blue bars represent data from each of the 11 colonies that grew in the MV pool. The graph shows average data from all heat exposure trials.