Sediment-mediated suppression of herbivory on coral reefs: Decreasing resilience to rising sea-levels and climate change?

Bellwood, David R., Christopher J. Fulton

Limnol. Oceanogr., 53(6), 2008, 2695-2701 | DOI: 10.4319/lo.2008.53.6.2695

ABSTRACT: We describe a mechanistic basis for maintaining an alternative degraded stable state on coral reefs: sediment-laden algal turfs. Using remote underwater video cameras we quantified rates of herbivory by coral reef fishes on epilithic algal turfs with natural and experimentally reduced sediment loads. Removal of sediment increased overall fish feeding rates 3.8-fold, and resulted in a decrease in mean algal turf length of 64% within 4 h. After 4 h, sediment accumulated in the treatment plots, but only returned to 41% of the original depth. A total of 20 species actively fed on the sediment removal plots, compared with 12 species in control plots. Of the five numerically abundant herbivorous fish species, all increased feeding by at least 225% in the absence of sediment. Only juvenile Scarus spp. fed to any extent (28% of bites) on control plots. We suggest that naturally occurring sediment loads in epilithic algal turfs can suppress herbivory and that sediment-laden algal turfs may be an alternative stable state on coral reefs. This may provide a mechanistic basis for the geological evidence of a sediment-induced turn-off of coral reef growth. With projected global sea-level rises due to climate change, reef-based sediment loads may be a critical factor in differentiating the relative resilience of coral reefs and identifying reef ecosystems that are at highest risk to rising sea levels.