Fishing degrades size structure of coral reef fish communities

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Abstract

Fishing pressure on coral reef ecosystems has been frequently linked to reductions of large fishes and reef fish biomass. Associated impacts on overall community structure are, however, less clear. In size-structured aquatic ecosystems, fishing impacts are commonly quantified using size spectra, which describe the distribution of individual body sizes within a community. We examined the size spectra and biomass of coral reef fish communities at 38 US-affiliated Pacific islands that ranged in human presence from near pristine to human population centers. Size spectra 'steepened' steadily with increasing human population and proximity to market due to a reduction in the relative biomass of large fishes and an increase in the dominance of small fishes. Reef fish biomass was substantially lower on inhabited islands than uninhabited ones, even at inhabited islands with the lowest levels of human presence. We found that on populated islands size spectra exponents decreased (analogous to size spectra steepening) linearly with declining biomass, whereas on uninhabited islands there was no relationship. Size spectra were steeper in regions of low sea surface temperature but were insensitive to variation in other environmental and geomorphic covariates. In contrast, reef fish biomass was highly sensitive to oceanographic conditions, being influenced by both oceanic productivity and sea surface temperature. Our results suggest that community size structure may be a more robust indicator than fish biomass to increasing human presence and that size spectra are reliable indicators of exploitation impacts across regions of different fish community compositions, environmental drivers, and fisheries types. Size-based approaches that link directly to functional properties of fish communities, and are relatively insensitive to abiotic variation across biogeographic regions, offer great potential for developing our understanding of fishing impacts in coral reef ecosystems.

Read the full article in *Global Change Biology*. [1] [2]

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