

Sizing up the reef fish communities of Haida Gwaii to understand fishing impacts and theoretical ecosystem baselines

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Marine food webs are strongly size-structured, with trophic level typically increasing and abundance decreasing with increasing body size class across communities and ecosystems^{1,2}. This size-structuring, along with the strongly size-selective nature of fisheries means that fisheries can fundamentally alter the trophic structure of communities, and also makes size-based analyses highly informative for understanding community structure and fishing impacts. In particular, size spectra – the community relationship between body size and abundance (on log scales) – have become popular as a way to describe overall community structure³. As the slopes of size spectra typically become steeper as fishing removes large-bodied fish, size spectra slopes provide useful information to guide conservation and management⁴. The utility of size spectra slopes for informing conservation and management has been further increased by the incorporation of metabolic scaling theory in to size spectrum models, enabling baseline expectations for slopes to be calculated. This provides a way to overcome the shifting baseline syndrome and develop theoretical ecosystem baselines to underpin conservation⁵.

To date, size-based approaches have received little attention on temperate reefs, where the prevailing paradigm is to describe communities and evaluate impacts in terms of the abundances of species and trophic guilds. Size spectra for reef fish communities and the community relationship between trophic level and body size have not been characterized. Using visual surveys of reef fish on Haida Gwaii (northern BC), combined with stable isotope data, we have evaluated community-level relationships between body size, abundance and trophic position. Preliminary results indicate that trophic level increase with body size across the fish community and that linear size spectra can be described, the slopes of which are steeper than theoretical baseline expectations. This suggests that fishing has had community-scale impacts in these relatively pristine reef communities.

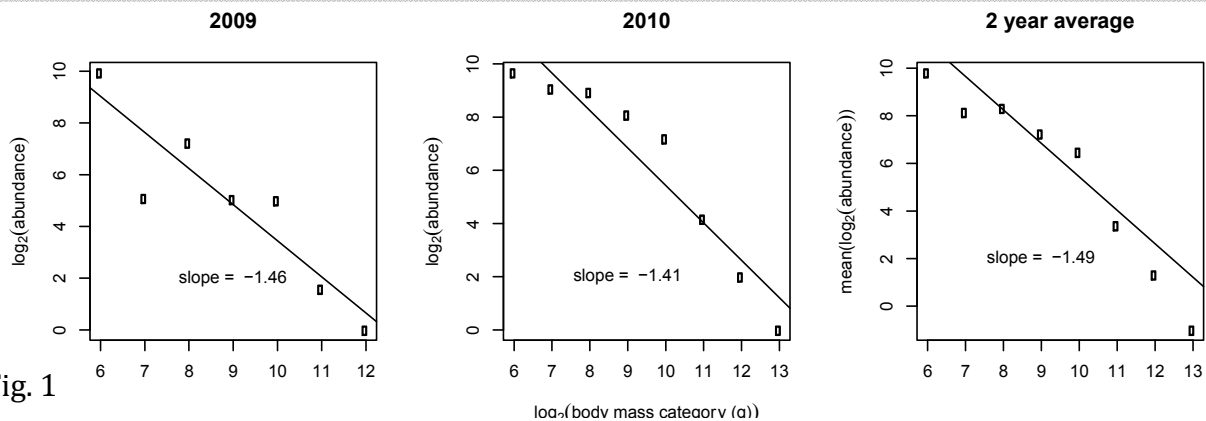


Fig. 1

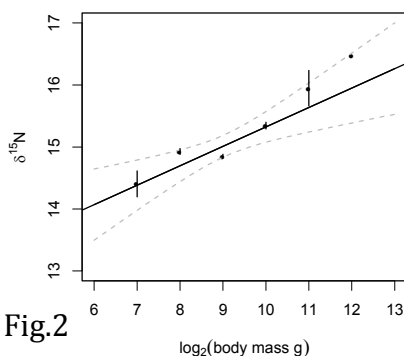


Fig.2

Fig. 1: Community size-spectra (summed across 6 sites at Louise and Lyell Islands) have slopes steeper than the baseline expectations of (~ -1.2 would be expected in an un-fished community).

Fig.2: Trophic level increases with body mass across the fish community.

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