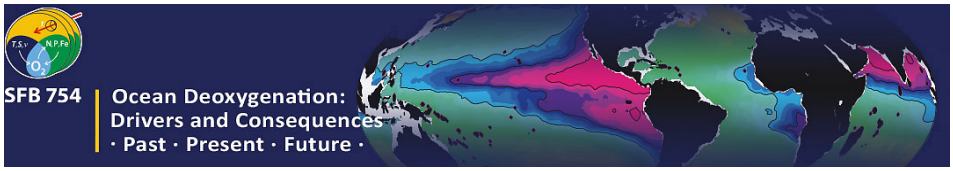

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Food web functioning in Oxygen minimum zones: insights from worldwide isotopic data

Oxygen minimum zones (OMZs) are defined as water masses where O2 concentrations are <0.5 mL L-1 (<22µM). Permanent OMZs cover over 1 million Km2 of seafloor and intersect the continental margins of the Pacific, Indian and Atlantic Oceans. OMZs are predicted to expand in response to global warming. OMZ expansion has implications for food webs and ecosystem function through reorganization and compression of faunal communities. Understanding faunal responses and ecosystem processes in permanent OMZs is becoming increasingly important given the undetermined and potentially adverse consequences of OMZ expansion and increasing ocean deoxygenation. Naturally occurring OMZs provide an excellent in situ laboratory to test hypotheses, which can be related to increasing ocean deoxygenation and OMZ expansion.

Stable isotopes provide a powerful framework for studying metabolic and nutritional pathways in food webs. This is because both carbon and nitrogen isotopes have distinct isotopic values associated with different metabolic pathways. OMZs are microbial biogeochemical reactors with complex and diverse microbial communities utililsing a variety of metabolic pathways. In this study we used stable isotopes to investigate the trophic structure of infaunal benthic food webs across OMZs in the: Indian, Pacific and South East Atlantic Oceans. We compare these results with food webs at continental margins, which are not impacted by OMZs. Our data reveal a broad range in mean consumer δ15N values ranging from: 4‰ - 14‰ for OMZ margins and 7.9‰ to 11.6‰ for other margins. Ranges in consumer δ13C values were smaller, ranging: -15.6‰ to -19.9‰ for OMZ margins and -19.5‰ to -22.7‰ for other margins. We calculated sample size corrected Bayesian food web metrics to analyse trophic niche width. OMZ food webs had larger trophic niche widths compared to other margins. This suggests the presence of a diverse range of food sources and metabolic pathways in benthic OMZ food webs.

Position

Senior Scientist

Affiliation

University of Liverpool

Email Address

rachel.jeffreys@liv.ac.uk

Are you a SFB 754 / Future Ocean member?

No

Primary author(s) : Dr JEFFREYS, Rachel (University of Liverpool)

Co-author(s) : LEVIN, Lisa; Dr SPERLING, Erik (Stanford University); Dr GONZALEZ, Jennifer (Scripps Institute of Oceanography)

Presenter(s) : Dr JEFFREYS, Rachel (University of Liverpool)

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