ONE Planet
Doctoral Training Partnership

Natural Environment Research Council

Project title: Effects of climate change and contaminants on oxygen availability for marine biota

Ref: OP2446

Keywords: Predictability, Fluctuations, Oxygen dynamics

One Planet Research Theme:
Climate & Climate Change ☒ | Earth System Processes ☐ | Anthropocene ☒ | Environmental Informatics ☒

Lead Supervisor:
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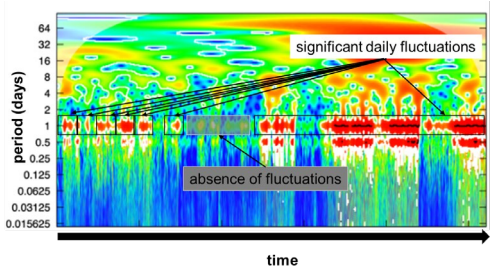
Key Research Gaps and Questions:

1) How do climate change and anthropogenic stressors such as eutrophication and coastal development change circadian oxygen fluctuation in marine coastal habitats?

2) How do changes in oxygen fluctuation affect the physiology, community structure and species interaction living in marine coastal habitats?

3) How can integrating oxygen fluctuation inform the assessment of ecosystem status?



Wavelet analysis for periodicity and predictability of oxygen fluctuation.

Project Description:

Productive marine coastal ecosystems such as coral reefs, seagrass meadows, kelp forests and mangroves are characterised by circadian fluctuation of oxygen controlled by the photosynthesis and respiration of the primary producers. In pristine ecosystems, oxygen fluctuations are highly predictable at a daily scale and marine biota has evolved and adapted to these baseline conditions (Giomi et al., 2023 Nat.Geosci. 16:560–566). The predictability of oxygen fluctuation is important for shaping the ecophysiology and ecological dynamics of marine species (Bitter et al., 2021 Proc.RoyalSoc B, 288:20210727), but the eco-physiological and ecological consequences of changes to oxygen fluctuations are not yet understood. This project will generate and analyse time series of oxygen fluctuations for several marine productive habitats and analysed. Subsequent laboratory experiments, informed by these data, will test the consequences of changes in oxygen fluctuations at both the individual and ecosystem level, using ecophysiological and molecular methods.

While developing ecophysiological, molecular, and modelling methods to help predict marine biota responses to different oxygen fluctuation scenarios the student will benefit from collaborations with Dr Baldanzi (University of Valparaiso, Chile), Dr Bani (University of Derby, UK) and Prof. Diele (Edinburgh Napier University).

The information generated by this project will inform the development of new approaches to assess ecosystem quality and resilience towards environmental change. In collaboration with JNCC (Joint Nature Conservation Committee) the student will be able to translate the new empirical evidence into marine indicator measures of good environmental status.

Prerequisites:

A degree in Environmental or Natural Science or related field with good knowledge of statistical analysis for ecology

For more information, please contact Marco Fusi (marco.fusi@kaust.edu.sa).

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