

Opportunity for a MSc project in Biological Oceanography, Zoology or Bioinformatics at GEOMAR Helmholtz Centre for Ocean Research Kiel

Cephalopods are abundant marine molluscs that are particularly diverse in the deep sea where they sustain populations of predators including deep-diving whales. Deep-sea cephalopods are hard to study since their highly developed senses allow them to avoid nets. As a result, deep-sea cephalopod diversity and distribution, their interannual variation in community dynamics and their interaction with predators remain poorly documented.

Metabarcoding of environmental DNA (eDNA) is a powerful tool that is increasingly applied in marine habitats to document biodiversity including rare and elusive species. Cephalopods can be detected in deep-sea water and sediment samples by sequencing the DNA regions of the 18S and 16S gene, which is targeted by cephalopod specific primers with metabarcoding. This approach has successfully documented cephalopod diversity and distributions in the tropical and polar regions of the Atlantic. Off the Atlantic island archipelago of the Azores, Cuvier's beaked whales and Risso's dolphins hunt for deep-sea squid in close proximity. Since 2018, GEOMAR's Deep-sea Biology Working Group in collaboration with Kelp Marine Research and the Royal NIOZ has sampled and sequenced environmental DNA from the foraging habitats of co-occurring cetaceans species off the island of Terceira (Azores) on an annual basis. This rich cephalopod sequence dataset (18S and 16S) is ready for a comparative analysis.

The overall goal of this project is to test the hypothesis that cephalopod communities off Terceira are consistent in time and space and hence are an efficient gateway between lower and higher trophic levels in the Azorean pelagic foodweb. To test this hypothesis this project aims to:

- 1) investigate the annual variability in cephalopod community composition
- 2) investigate annual variability in cephalopod vertical community structure
- 3) reveal novel identities of previously unidentified cephalopod sequences

We are looking for a student who has skills and interest in bioinformatics and analysis of large datasets, as well as ecological interpretation of eDNA results. The project will be co-supervised by Dr. Henk-Jan Hoving (Deep-Sea Biology Working Group), Dr. Till Bayer (Marine Evolutionary Ecology, GEOMAR), as well as Dr. Fleur Visser (NIOZ, the Netherlands).

This project is based on existing sequence data, there is no fieldwork but additional labwork could be discussed. The project can start anytime but no sooner than September 1.

If you are interested, please send an email to hhoving@geomar.de

