

PhD proposal: Multi-scale characterization of seamount biodiversity in the Coral Sea Natural Park (New Caledonia)

New Caledonia, located at the South-Eastern end of the golden triangle of marine biodiversity, has an exceptional biological diversity. The Coral Sea Natural Park (CSNP), one of the largest Marine Protected Areas in the world was created in 2014 to preserve the coastal and deep-sea ecosystems of the entire Exclusive Economic Zone, including coral reefs and seamounts. These structures, of which about 100 have been identified in the park, host ecosystems generally described as unique, diverse and productive, and potentially subject to the impact of fishing and the exploitation of new mineral resources. However, the ecological paradigms currently being debated require further research effort, both in a regional framework and at a smaller scale, taking into account the multi-scale heterogeneity of the habitat. Seamounts are also places of strong interactions between benthic and pelagic compartments, which are still very little studied by research programs.

The thesis proposes to characterize the benthic and mesopelagic biodiversity of several seamounts where preliminary results have shown, for these two compartments, a strong regional and local variability. The methodology combines the analysis (manual or semi-automatic) of images acquired along transects by ROV and will integrate data acquired by baited cameras, from acoustic echo sounders, bottom sampling and mesopelagic trawls. The integrated analysis of these datasets will test the following hypotheses: (1) benthic and mesopelagic community structure (density, biomass, diversity) exhibit co-variations at regional and possibly local scales; (2) these biological variables respond to environmental forcings in the water column and on the bottom that act at multiple scales and in 3-dimensional seamount space. This work will help identify the scales of variability of seamount biological communities and the environmental variables that structure them, necessary for the establishment of management plans, and propose stratified, standardized, least invasive and reproducible protocols for the acquisition of essential biological variables (EBVs). If the dataset and the time available allow it, the predictive potential of spatial biodiversity patterns will be assessed together with the complementary acquisitions, spatial or temporal, that would be necessary to allow or improve this prediction.

These protocols will be implemented in the new project of long-term observation of seamounts (SciObs for Science, Innovations and Undersea Observatories) led by Ifremer in collaboration with JAMSTEC (Japanese Institute for the Study of the Ocean), various French institutes including the IRD and the MNHN. The first campaigns are planned during the thesis.

Profile: Master 2 in biological oceanography or marine ecology. Experience or interest in image analysis, deep and/or mesopelagic ecosystems. Skills and if possible experience in data analysis in ecology. Mastery of computer tools including R and GIS are preferred.

The thesis is financed under an agreement between AFD and Ifremer. The PhD contract will be awarded to a candidate from a Pacific island country or territory (except French overseas territories) or from another country eligible for development aid.

Location and organization of work: mainly in Brest (France). Annual stays in Noumea (New Caledonia) (1 month minimum).

Supervisors: Dr Karine Olu, Ifremer, UMR6197 BEEP (Biology and Ecology of deep-sea marine Ecosystems). Anne Lebourges-Dhaussy, IRD, UMR 6539 LEMAR.

Contact/ Application : Applications should be sent to Karine Olu (karine.olu@ifremer.fr) before 15 May 2022, with a CV, a letter of interest and professional references (contact information).