

**Title:** Evolution of marine vertebrate morphotypes in the context of global change

**Research unit, team:** LEMAR, PANORAMA

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**Scientific context and objectives:**

In the context of environmental changes of anthropogenic origin, it is important to **evaluate processes that are implicated in populations' evolutionary history** of living organisms to predict their population trajectories. Two processes that can contribute to the response of organisms to environmental changes are phenotypic plasticity, which allows species to acclimate quickly to these changes, and genetic adaptation in response to natural selection.

**The population adaptive potential** will depend on the genetic variability on which natural selection can act. Since evolutionary responses through genetic changes take more time than plastic responses, it is **crucial to quantify the respective role of these processes, particularly in long-lived species** that will take more time to adapt to changes. **This doctoral project aims at evaluating the adaptive potential of different morphotypes in long-lived marine vertebrates.**

**Project summary:**

This doctoral project will include empirical studies of three model systems that occupy subantarctic islands, as well as a meta-analysis. The first two models are seabirds residing around the Kerguelen archipelago, which present among the largest intraspecific size variations in seabirds. These morphometric differences among colonies are coupled with differences in foraging depth. The third model is a dolphin species that occupies shallow coastal zones and includes two morphotypes; one in waters off South America and one around Kerguelen.

The doctoral project will address the following questions: What is the importance of natural and sexual selection in the evolutionary history of different morphotypes of long-lived vertebrates? What is the adaptive potential of these morphotypes against environmental changes?

The processes involved in the origin of the different morphotypes will be studied by:

- evaluating molecular signatures of natural selection thanks to different types of genetic data (SNPs obtained by RADsequencing and mitochondrial DNA sequences)

- comparing phenotypic and genetic differentiation to evaluate whether diverging selection acted on these morphotypes
- evaluating the intensity of sexual selection in different morphotypes by comparing genetic diversity of loci on autosomes and on sexual chromosomes

The meta-analysis will evaluate the importance of positive selection in long-lived marine vertebrates by analyzing available sequences in Genbank.

### **Collaborations**

This project will involve a national scientific collaboration with Charles-André Bost, DR CNRS au CEBC (UMR 7372) who has studied the spatial and foraging ecology of seabirds in Kerguelen for thirty years. His knowledge and the phenotypic data he has collected on these models will be a considerable asset to have a deep and global understanding of factors implicated in the evolution of these populations.

The study on the divergence between morphotypes of Commerson's dolphins is part of a long-term collaborative project conducted with the national Natural Reserve of French southern territories and will also involve a scientific collaboration with Elie Poulin, Professor at the University of Chile in Santiago (Laboratorio de Ecología Molecular) and molecular ecologist working on the same taxon.