Biodiversity and evolutionary ecology of myctophids: an abundant and extraordinarily diverse clade of deep-sea fishes

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Project description: Myctophid fishes are the most abundant fishes in the global oceans, comprising some 50% of all fish larvae in oceanic planktonic tows, and an estimated 20% of ocean fish biomass. They are also the most species-rich group of mesopelagic fish, with at least 325 species within the 33 genera currently recognised. Myctophids are a key component of the diet of many marine organisms, including seabirds, seals and cetaceans. They have wide importance in marine fisheries, forming the main prey to many major commercially fished species, including salmon, rockfish and squid. In the Southern Ocean, they are prey to the commercially-fished Patagonian toothfish and mackerel icefish as well as to large populations of seals, penguins and flighted sea-birds. Their role in Southern Ocean ecology is central, both in terms of the food web and the carbon cycle, where they are a major conduit for carbon export into the ocean interior. Certain parts of the Southern Ocean have already experienced rapid thermal shifts and these are predicted to continue over the next 50 years. The effect on the prevailing pelagic communities remains unclear but Antarctic krill are expected to retreat south to be replaced by an alternative food web in which myctophids are more dominant. This project is designed to provide core information on the biodiversity and thermal ecology of myctophid species, with a focus on those of the Southern Ocean. The studentship will involve three components. 1) Development of DNA barcoding approaches to accurately identify myctophid biodiversity of regional seas, especially in the Southern Ocean. The barcoding approach will be used to test the efficacy of morphological methods for delimiting congeneric species, and for identification of larval fishes collected in plankton tows. 2) Identification of ecological correlates of myctophid species distributions, and an assessment of future distributions of myctophid species under future global change, 3) Use of molecular phylogenies to test hypotheses regarding the processes that have driven myctophid evolutionary diversification, including specific tests of the role of vicariance, ecological divergence, and the role of sexual selection based on photophore positioning. The project has potential to inform management and future policy by: a) providing fundamental information on the ecology and biodiversity of this important group of species, b) providing tools for biodiversity assessment, including monitoring of change, and c) helping to predict future responses of myctophid species to projected global warming.