Postdoctoral position in marine ecosystem modeling

We are advertising one 24-months post-doctoral position in the framework of the H2020 project TRIATLAS (*South and tropical Atlantic climate-based marine ecosystem prediction for sustainable management*, https://triatlas.w.uib.no). We seek one talented scientist in marine population and ecosystem modeling. The position will be located in Sète, in the South of France, in the MARine Biodiversity, Exploitation and Conservation (MARBEC) laboratory (http://www.umr-marbec.fr/en/) and will include trips in Cape Town in South Africa to work with the DAFF scientists involved in the project.

Assessing the predictive capabilities of coupled climate to population, ecosystem and fisheries (E2E) models from seasonal to multi-decadal timescales, providing predictions at these scales and scenario-based projections at the centennial timescale are important objectives of the TRIATLAS project. For these purposes, different ecosystem models are being implemented in three tropical and south Atlantic case study regions that support regionally and globally important fisheries: the tropical Atlantic, the northeastern Brazil and the Southern Benguela.

In this perspective, the present postdoc position will focus on modeling the Benguela small pelagic (anchovy, sardine and round herring) populations using the integrated ecosystem model APECOSM[1]. This will involve applying the APECOSM model, using it to address specific ecological questions and potentially contributing to its development.

The small pelagic fishery is the largest fishery in South Africa. Initially targeting sardines in the 1960s, the fishery started to exploit anchovies when the sardine stock declined in the mid 60s (Augustyn et al., 2018). Anchovy have most of the time dominated catches since then. Small pelagics in South Africa are mostly fished for fishmeal and oil but adult sardine are canned or frozen for human consumption. The small pelagic fishery has a yearly value of around US$65 million (Hutchings et al., 2010).

[1] APECOSM (Maury, 2010) is a eulerian ecosystem model that represents mechanistically the 3D dynamics of size-structured pelagic populations and communities. It integrates individual, population and community levels mechanistically. APECOSM articulates a very detailed description of individual focus species to a more aggregated representation of generic communities including the effects of life-history diversity with a trait-based approach (Maury & Poggiale, 2013). In APECOSM the uptake and use of energy for individual growth, maintenance and reproduction are modelled according to the DEB theory (Kooijman, 2010), modified as in Maury et al. (2019). The model considers important ecological processes such as opportunistic size-structured trophic interactions and competition for food, key physiological aspects such as vision and respiration, as well as essential behaviours such as 3D habitat-based movements and migrations, schooling and swarming. In APECOSM, physical drivers from the OGCM NEMO (3D fields of temperature and horizontal currents, vertical mixing) as well as biogeochemical drivers from the OGBM PISCES (3D fields of primary and secondary production -small and large phytoplankton, small and large zooplankton-, detritus, light and oxygen) control the biological and ecological dynamics at various levels.

Small pelagic fish are planktivorous and have a short-lived and high fecundity life-history. That makes their recruitment, abundance, productivity and spatial distribution highly responsive to environmental variability. But due to differences in trophic ecology, physiology and behavior, every species reacts differently, sometimes in apparently opposite ways (van der Lingen et al., 2006; Augustyn et al., 2018; van der Sleen et al., 2018).

Description of the position:

The postdoctoral researcher will represent the Cape anchovy (*Engraulis encrasicolus*), sardine (*Sardinops sagax*) and round herring (*Etrumeus whiteheadi*) populations in the Benguela as focus species in APECOSM and compare the model's outputs to available data (commercial CPUEs, acoustic campaigns, growth and reproduction schedules, spatial structures, diet, etc). He/she will start by fitting the DEB model modified by Maury et al. (2019) to growth and reproduction data for the three species, considering the effects of protein turnover on metabolism. He/she will include into the DEB analysis a detailed mechanistic description of larval growth and development as the survival of early life stages is a critical factor of population recruitment and its connection to the environment. The DEB parameters estimated and the developments made at the individual level will then be used in APECOSM that will be configured to run on a ¼° grid covering the Benguela upwelling region. A particular attention will be given to the representation of schools' size dynamics in the model, as it might control population dynamics (Maury, 2017). The ecological importance of schooling will be investigated with both simulations and the analysis of the acoustic observations available in the project. Finally, the model will be used to study climate-driven changes in anchovy, sardine and round herring spatial distribution and abundance that have occurred over the past 4 decades and compare their ecology and capacity to adapt to climate fluctuations and changes.

Duration, salary: The successful candidate will be hired by IRD for 24 month with a salary depending on experience. A 12 to 24 months extension of the position will be considered if funding allows. The position is available to begin as soon as possible.

Required Experience: A PhD is required, with an experience in oceanography, fishery science or marine ecology as well as good quantitative skills (applied mathematics) and a strong interest for numerical modeling. Ease in using linux and programming languages (python, C/C++) is necessary.

Contact for applications: Applications should be sent as soon as possible to Olivier Maury (Olivier.Maury@ird.fr). They should include a CV with publication record, a statement of research interests and the names of two referees. Review of applications will begin as soon as received, and the position will remain open until filled.

References:

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