Postdoctoral position in marine ecosystem modelling (36 months)

Summary: A 36-month postdoctoral position is available at the Institut Agro (Rennes, France), in the field of tropho-dynamic modelling of marine ecosystems. The objective is to represent carbon flows in marine food webs, in order to quantify the fishing impacts on carbon storage in the ocean, and to assess the sensitivity of these processes to various scenarios of climate change and ecosystem-based fisheries management. This Postdoc is part of the European H2020 project Ocean-ICU Improving carbon understanding, led by NORCE, a Norwegian Research Centre, in partnership with 23 research institutes from 14 European countries. We seek a specialist in marine ecosystem modelling (MEM) with good theoretical basis in trophic ecology, climate change and ocean physics. Excellent programming skills, especially in R, are required. Experience in using EwE and in coupling MEMs and global or regional ocean models (e.g., Earth System Model) would be appreciated, as well as knowledge on European marine ecosystems and fisheries.

Context: The European Ocean-ICU project (https://cordis.europa.eu/project/id/101083922/gb) addresses the crucial role the ocean carbon (C) cycle plays in regulating global climate, taking up approximately 25% of the CO_2 emitted to the atmosphere and storing massive quantities of carbon in the interior, much of it via a series of processes known as the Biological Carbon Pump (BCP). The future trajectory of this sink will affect the timing and intensity of the modifications to human processes that we need to undertake in order to stabilize atmospheric CO_2 at 450ppm.

Our ability to measure and model this sink is limited (evidenced by significant discrepancies between measured and modelled C uptake) with the current frontier area of research being a suite of biological processes related to higher trophic level behavior within the so-called biological C pump. This involvement of higher organisms suggests that human activities (fishing, energy and mineral extraction) has the capacity to affect the ocean C sink, however we lack the ability to quantitatively link direct human pressures and ocean C storage. Ocean ICU will measure these key processes and evaluate their overall significance, transferring those that are important into models that inform the IPCC process and, in this way, contribute to resolving the observed model data mismatch of Ocean C sink estimates.

Work-package 5 of the project, where the postdoctoral work will take place, focuses on the impact on carbon transport of human extraction activities, principally fishing and seabed mining/dredging. Using a variety of MEMs (EwE, EcoTroph, Feisty, StraithE2E, Seapodym), the main objective will be to identify the scale and importance of these activities in modifying carbon sequestration, either positively or negatively. In particular, task 3 aims to determine the scale and impacts of on-shelf fishery removals directly on carbon sequestration, and indirectly via food web changes, and including relevant impacts on the seabed and its role in the carbon cycle.

Description of the position: The postdoctoral researcher will investigate the implications of fishing for carbon sequestration, and what improvement could be attained with changes in fisheries management. In a first step, the Celtic Sea will be considered as a case study, adapting the preexisting EwE model (Hernvann et al. 2020, Potier et al. in prep) to better represent carbon flows between trophic boxes and towards detritus and sediments. A new version of the EcoTroph modelling framework (Gascuel et al. 2008, du Pontavice et al. 2021) will be developed. Elaborating on the PhD. thesis of du Pontavice (2020) and recent research advancement (du Pontavice et al., under review), this version will quantify the two interlinked pathways of trophic flow (pelagic and demersal) surging up the food web from low to high trophic levels. A specific flow to detritus, from feces or dead animals, and remineralization will be added to the model. In this approach, the initial EwE model should be used to adequately specified and calibrate the various flow represented in the EcoTroph model and to analyze the impacts of fishing on the processes of carbon storage (pelagic-benthic linkages, flow to detritus …). In a second step, the EcoTroph Celtic Sea model will be forced by a regional high resolution coupled hydrodynamic-ecosystem model (POLCOMS-ERSEM), in order to investigate the effect of various fishing scenarios on carbon storage, in the context of climate change. Finally, the same model should be applied at the global scale, forced by outputs of available ESMs. In parallel, the postdoc will participate to the Fish-MIP international network dedicated the projection of climate change effects on marine biomass and catch, at global scale (Tittensor et al. 2021).

Working environment: The postdoctoral researcher will be in close interaction with Didier Gascuel, who developed the EcoTroph model and supervised recent PhD on the topic (P-Y. Hernvann 2020 H. du Pontavice 2020, Potier in prep.). He/she will by part of the DECOD laboratory, a join research unit which aggregate almost one hundred scientists from Ifremer, Inrae and Institut Agro, working on the Dynamics and sustainability of ecosystems: from source to sea (www.umr-decod.fr/fr). The successful candidate will be fully involved in the Ocean-ICU project and will especially collaborate with partners of the WP5 (led by David Reid from the Marine Institute) who are working on the impacts of fishing on carbon sequestration in the on-shelf ecosystem (Strathclyde University, Natural England) and in the off-shelf ecosystem (DTU-Aqua, Mercator Ocean). He/she will also collaborate with Hubert du Pontavice (Princeton university/NOAA) and with the members of the international Fish-MIP network. Thus, he/she will be in close interaction with world recognized researchers in marine ecology, fisheries sciences and ecosystem modelling.

Duration and salary: The successful applicant will be hired in mid-2023 (ideally in May depending on the candidate availability) for a period of 12 months with secured funding for 2 extensions of 12 months, for a total of 36 months. Gross monthly salary will depend on the experience and should vary between 2800 and 3000€. By joining Institut Agro, he/she will benefit from 45 days annual leave or equivalent, parenting support (can apply for specific daycare spots) and sponsored collective catering.

Training and skills required: A doctoral degree is required with a preference in ecosystem modelling, quantitative ecology, fisheries sciences or a related field. A strong interest for marine ecology and numerical modeling is necessary, and programming skills is a prerequisite.

HOW TO APPLY?

Send before the 20th of March 2023 a motivation letter and a CV to:

didier.gascuel@institut-agro.fr

References

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