Effects of fishing and climate changes on the demersal and pelagic ecosystems of the Gulf of Lions (NW Mediterranean Sea): an end-to-end modeling approach

1 year post-doc position starting from 1st September 2011 or 1st January 2012

Location- LMGEM, LOPB, Centre d'Océanologie de Marseille, Université de la Méditerranée (Aix-Marseille II) Campus de Luminy, Marseille, France

Context- The postdoctoral position is proposed in the context of the **EMIBIOS** project (End-to-end Modelling and Indicators for BIOdiversity Scenarios) in collaboration with researchers from COM (LMGEM-LOPB), Ifremer (UMR EME Sète, Boulogne sur Mer, Brest), IRD (UMR EME Sète, University of Cape Town) and Plymouth Marine Laboratory – UK.
The **EMIBIOS** project (2011-2014), founded by "Fondation pour la recherche sur la Biodiversité" (www.fondationbiodiversite.fr/scenarios), proposes an innovative end-to-end modeling approach to project future trajectories of marine biodiversity and associated ecosystem services under a combination of IPCC-SRES (climate scenarios) and fisheries management scenarios in six marine ecosystems (Gulf of Lions, English Channel, Adriatic Sea, gulf of Gabes, Southern Benguela and Northern Humboldt).
The end-to-end modeling approach ensures integration of the main components of the marine ecosystem from the physics, biogeochemistry, exploited fish species up to the fishes and associated management and socio-economic contexts, while taking into account feedbacks within the environment-human system. This type of models enables to better understand the complex ecosystem effects of key drivers such as fishing and climate in simulating how the future may unfold under various scenarios (Shin et al., 2010). These models produce various ecosystem indicators used for supporting ecosystem and fisheries management. For example, they contribute to analyze the influence of climate change and fishing pressure on the species composition, growth, reproduction, spatial and size distribution of fish and plankton.

Scientific objective- to study the effects of fishing and climate changes on the demersal and pelagic ecosystems of the Gulf of Lions (NW Mediterranean Sea).

Methodology & tools- To fulfill the scientific objective an end-to-end (E2E) modeling approach will be used (Travers et al., 2009, Shin et al., 2010). The first part will consist in building the E2E model. A true –2-ways– coupling will be made between a biogeochemical low trophic level model implemented in the **Eco3M** platform and the individual-based high trophic level (HTL) **OSMOSE** model. This technical part will benefit from works in progress on the coupling between HTL Ecopath and Ecosim models (Banaru et al., in review) and the implementation of a one-way forcing of the OSMOSE model by the LTL food fields from Eco3M in the Gulf of Lions (Banaru, Campbell & Diaz, in prep).
The **Eco3M** ***(Ecological Modular Mechanistic Model)*** numerical platform for biogeochemical modelling developed at LOPB (Baklouti et al., 2006a,b) is a modular tool that handles multi-element multi-functional group biogeochemical models. Regional studies on effects of mesoscale physical structures on the plankton distributions (Campbell et al., submitted; Eisenhauer et al. 2009) and on the origin of the accumulation of dissolved organic carbon in the stratified layer of Med. Sea (Mauriac et al., 2011) have used models of major biogenic elements (C, N, P, Si) and non-redfieldian functional types of plankton implemented in the Eco3M platform. The HTL model **OSMOSE** (**O**bject-oriented **S**imulator of **M**arine ec**OS**ystems **E**xploitation) is currently developed at IRD-IFREMER by Y.-J. SHIN and this is a multispecies, spatial, dynamic, individual-based model focused on fish species (fisheries perspective), details their life cycle (growth, predation, starvation, reproduction, migration) (Shin et al., 2004).

Once the tool technically operationnal, the candidate will validate the coupled model with field data (catches and biomasses) and perform sensitivity, responsiveness and specificity properties of biodiversity indicators (Travers et al., 2006). Global change scenarios will be tested and analyzed: climate, overfishing and marine protected areas implementation scenarios.

Requested skills:
Programming & Softwares: R, Matlab, Java, Fortran 90, SPSS/R/Statistica (statistics).
Experience in using ECO3M, OSMOSE and Ecopath with Ecosim will be appreciated.

Languages:
English (and French)

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