



UNIVERSITÉ DE NANTES

## **2-year postdoctoral position in shellfish ecophysiology and numerical ecology: coupling oyster and mussel Dynamic Energy Budget models with Earth Observation data and marine ecosystem model simulations**

We are seeking a postdoctoral research fellow with experience in shellfish ecophysiology and numerical ecology to join the European H2020 funded project TAPAS (Tools for Assessment and Planning of Aquaculture Sustainability). The TAPAS project (<http://tapas-h2020.eu/>), led by the University of Stirling, will create cost-efficient management tools and practices for the European aquaculture sector to investigate the limits to fish and shellfish farming activities in location, social interactions, potential environmental impacts and any future risks. With concerns around sustainability of food security continuing to rise, a team of European aquaculture experts have begun a four-year study worth almost €7 million to establish new strategies and models for sustainable growth in the industry. The TAPAS project will specifically address coastal and offshore aquaculture segments, operating from regional ecosystem scale to pan-European scale. Existing approaches to combine Earth Observation (EO) and shellfish and ecosystem modelling will be developed and implemented in the TAPAS toolbox for the environmental sustainability of aquaculture.

The main objective of the postdoc will be to couple bivalve ecophysiological models with EO data to analyse the potential of off-shore shellfish farming over a wide range of spatial scales, from a single mudflat ecosystem case study to the whole European western coastal ocean.

Existing Dynamic Energy Budget (DEB) models for oyster (Pouvreau et al., 2006) and mussel (Flye Sainte Marie et al., 2009) will be updated and coupled to EO data such as sea surface temperature (SST), chlorophyll-*a* (Chl) and suspended particulate matter (SPM) concentration to simulate bivalve's growth and reproduction (Thomas et al., 2011, 2016). A large dataset of satellite SST, Chl and SPM data will be provided, including CCI products<sup>1</sup> from the merged SeaWiFS/MODIS/MERIS/VIIRS ocean color time series (1998–2015) at 1 km spatial resolution, the whole MERIS archive (2002 – 2012) at 300 m spatial resolution, as well as on-going Sentinel3-OLCI (300 m) and Sentinel2-MSI (10 m) data series. Modelled spatial maps of shellfish growth potential will then be used to investigate the sustainability of offshore shellfish farming at both near field and far field levels.

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<sup>1</sup>[http://www.esa-oceancolour-cci.org/?q=webfm\\_send/531](http://www.esa-oceancolour-cci.org/?q=webfm_send/531)

At near field level (defined as farm level to water-body scale), the postdoctoral fellow will work on a case study site located in southern Brittany along the French Atlantic coast (namely Bourgneuf Bay and Mor Braz) for which in situ oyster growth data are available to validate the model outputs in both intertidal and offshore environments. In collaboration with the University of Stirling, the outcomes of the near field case study will be incorporated into a GIS site selection model (Ross et al. 2010) and implemented in a generic marine spatial planning framework. These outcomes may also be connected to carrying capacity approaches (Filgueira et al. 2015), such as the physical carrying capacity which takes into account hydrodynamical constraints for farm siting (McKinsey et al. 2006). Collaboration with the Danish Hydraulic Institute (DHI), a TAPAS partner, is envisaged.

EO-DEB results will then be up-scaled at far field level, corresponding here to pan-European scale from Portugal to UK and Norway. In addition to EO satellite data, simulation outputs from the European Regional Seas Ecosystem Model (ERSEM, Ciavatta et al., 2016) will be provided by partners from the Plymouth Marine Laboratory (PML), and the postdoctoral researcher will couple EO/ERSEM environmental data with the oyster- and mussel-DEB models to study shellfish physiological responses and growth potential at pan-European scale. Regional climatologies will be derived from long-term EO and model data (1998 – present), from which multi-indicator time-series trajectories will be analysed in the framework of aquaculture environmental sustainability. Knowledge from the past will be used to envision the future, and large-scale physical-biological model projections ( $0.1^\circ$  scale) will be coupled with shellfish DEB models to identify which segments may support new or enhanced aquaculture activities, or will be beyond their optimal window by 2050 and 2100.

The candidate should have a solid background and a good publications record in numerical ecology, shellfish ecophysiology and coastal oceanography. Large datasets from EO and ERSEM will be coupled with DEB oyster and mussel models, and the candidate should show a keen interest and demonstrate efficiency in the processing, analysis and interpretation of large-scale environmental and biological time-series data. Previous experience in the processing of satellite data would be appreciated. Experience in DEB modelling of marine species is required. Working experience in inter-disciplinary teams is strongly desirable.

The successful applicant will work at the University of Nantes (France) under the direction of Pierre Gernez (<http://www.univ-nantes.fr/gernez-p>) and Laurent Barillé (<http://www.univ-nantes.fr/barille-l>) in collaborations with other participants of the TAPAS project including scientists from the University of Stirling, DHI, and Plymouth Marine Laboratory (PML). Informal enquiries may be made to Pierre Gernez ([pierre.gernez@univ-nantes.fr](mailto:pierre.gernez@univ-nantes.fr)) and Laurent Barillé ([laurent.barille@univ-nantes.fr](mailto:laurent.barille@univ-nantes.fr)). The deadline for the receipt of applications is the 31

January 2017. The position will start at the beginning of 2017. The basic salary (2250 Euros net per month) could be negotiated depending on the professional experience. The salary will include full health insurance and social benefits.

### **Complementary information**

*TAPAS press release:*

<http://www.marine.ie/Home/site-area/news-events/press-releases/%E2%82%AC7-million-project-support-sustainable-growth-aquaculture>

*Bibliographical references*

- Ciavatta et al., 2016
- Filgueira et al. 2015
- Flye Sainte Marie et al., 2009
- McKindsey et al. 2006
- Pouvreau et al., 2006
- Ross et al., 2010
- Thomas et al., 2011
- Thomas et al., 2016