

Starting September 2019

PhD Thesis topic proposal

ARED - ISblue - UBO

project

Acronym : IPARD

Title: Effects of human-induced disturbances on the resource allocation at different steps of bivalves' life cycle

Host institution

Université de Bretagne Occidentale - Brest University

Doctoral School : Sciences de la Mer et du Littoral (SDML)

Thesis environment

Research Laboratory : Laboratoire des Sciences de l'Environnement Marin - UMR6539 - LEMAR

Director: Dr. Luis Tito de MORAIS

Research Team: International Laboratory - Benthic Biodiversity, Ecology, Science and Technology, led by Dr. Laurent Chauvaud.

Thesis director (HDR), contact : Guarini, Jean-Marc

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- **5 recent publications:**

54 articles Rank A:

[50] Guarini, J.-M., Coston-Guarini, J., Deprez, T., and Chauvaud, L. 2017. An inference procedure for behavioral studies combining numerical simulations, statistics and experimental results. J. of the Marine Biological Association U.K. 1-7. doi:10.1017/S0025315417001783.

[51] Wilson, J., Hinz, S., Coston-Guarini, J., Mazé, C., Guarini, J.-M. and Chauvaud, L. 2017. System Based Assessments – improving the confidence in the EIA process. Environments. v. 4(4) 95; doi:10.3390/environments4040095.

[52] Charles, F., Coston-Guarini, J., Guarini, J.-M., and Lantoine, F. 2018. It's what's inside that counts: computer aided tomography for evaluating the rate and extent of wood consumption by shipworms. Journal of Wood Science. In press.

[53] Jézéquel, Y., Bonnel, J., Coston-Guarini, J., Guarini, J.-M., and Chauvaud, L. 2018 Sound characterization of the European lobster *Homarus gammarus* (L.) Aquatic Biology. In press.

[54] Coston-Guarini, J., Guarini, J-M, Boehm, F.R., Kerkhove, T.R.H., Rivera, F.C., Erzini, K., Charles, F., Deprez, T., and Chauvaud, L. 2018. Estimating Muricid abundances from trapping methods used in Mediterranean Tyrian Purple industry. Marine Ecology In press.

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Synopsis of the project

The proposed topic is based on the explicit complementarity between mathematical modelling and experimentation in controlled and *in situ*. environments; the main objective is to understand how mechanisms associated with the allocation of energy resources can determine the selective value of bivalves individuals and how this conditions the adaptability of benthic species that sustain human-induced disturbances created by Marines Renewable Energy infrastructures implemented in off-shore environments. The project aims at considering long term effects beyond proximal impact (Environmental Impact Assessment *per se*).

A large part of the benthic invertebrate species have separated development stages, larval, often pelagic, Juvenile and adult, always benthic. Energy allocation differs from one stage to another with sometimes unexpected consequences. It was demonstrated in our research team that ambient sound can trigger larval settlement and metamorphosis for the blue mussel, however no associated study was performed to determine what selective effect this phenomenon could have on the species. Besides, an effect on one stage does not preclude the effect for the next. And finally, studies on adaptive dynamics are mainly phenomenological and empirical and are largely disconnected from actual mechanisms, taking place at the level of the individual, as those of the resource allocation.

In this framework, the proposed project will rest on the development of mathematical models to describe resource allocation at the individual scale, and this for all developmental stages of the organism. The model will have to take into account the variability within and between individuals, in the range of variation of the average trait. The mathematical properties of the model will guide experiments.

This thesis is supported by the project CNRS/Ailes-Marines IMPAIC, as a long-term perspective to identified effect of MRE infrastructures on exploited species. The Research Team, in the Laboratory of Marine Environment LEMAR, is an international laboratory, LIA BeBEST, encompassing staff from French and Canadian University and institutes. Both are collaborating in the project IMPAIC. The topic is also strongly embedded in theoretical quantitative ecology, which is a new discipline in the laboratory.