

BIOLOGIE DES ORGANISMES ET DES ECOSYSTEMES AQUATIQUES

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SKILLS

Key words:

- Molluscs, bivalves, cephalopods, macroalgae, phytoplankton, microphytobenthos, diatoms, growth, differentiation, reproductive biology, aquaculture, shellfish, environment, marine biology, biodiversity, population dynamics, modeling ecosystems, ecophysiology, ecotoxicology, environmental stresses, primary producers

Expertise:

- Physiology of Marine Molluscs:
 - Histology, immunohistology, image processing in histology;
 - Development of *in vivo* and *in vitro* biological assays;
 - Analysis of genomes and gene expressions analyses (real-time PCR, DNA microarrays, in situ hybridization, DNA methylation);
 - Development of functional tools (gene knock out, inverse endocrinology);
 - Peptide characterization (HPLC, mass spectrometry);
 - Adaptive strategies of Molluscs to environmental stresses;
 - Biochemistry assays.
- Ecophysiology of primary producers, trophic interactions and marine resources:
 - Phytoplankton: characterization, cultures, life cycles of phytoplankton species including toxic species (diatoms *Pseudo-nitzschia* spp), carbon excretion characterization, blooms dynamics;
 - Macroalgae: characterization, cell culture;
 - Isotopic signatures ($\delta^{15}\text{N}$, $\delta^{34}\text{S}$, $\delta^{13}\text{C}$);
 - Benthic biofilms;
 - Modeling of shellfish ecosystems.

RESEARCH AREAS

The main scientific axes of the unit are focused on:

- **The physiology of Marine Molluscs** with the study of development of the gonad in the oyster *Crassostrea gigas* during development and adult cycle by characterizing the molecular determinants of early markers of gametogenesis and transcriptome, the study of energy metabolism associated with reproduction and characterization of regulatory peptides involved

in the reproductive success in the oyster *Crassostrea gigas* and in the cuttlefish *Sepia officinalis*;

- **Coastal ecosystems functioning and resources** with a multi-levels study of ecophysiology of primary producers, of trophic interactions, of the modeling of environmental factors effects on bioenergetic flows and the study of marine resources. All this work is developed on three axes concerning primary producers (micro and macro-algae), trophic interactions with exploited species (oyster, cuttlefish, macroalgae), and the effect of human pressure (toxicity of chemicals on various species, shell repair and host-pathogen interactions, global changes).

BOREA has also developed its strategy in applied research through partnerships with the industry of seafood products and marine biotechnology, cosmetics and biomedical products

PARTNERSHIPS

- International outside Europe:
 - Chair of excellence from the Regional council Professor GUO Ximing (Rutgers, the State University of New Jersey, USA): adaptability of the Pacific oyster to its environment. (Région Basse-Normandie – FEDER);
- European
 - REPROSEED - FP7 (2010-2013). "Research to improve Production of seed of established and emerging bivalve species in European hatcheries";
 - CHARM 3 (Interreg IV A 2009-2012) "Phyto-Manche - Channel integrated Approach for marine Resource Management";
 - CRESH (Interreg IV a 2009-2012) : "Cephalopod Recruitment from English Channel Spawning Habitats";
 - CHRONEXPO (Interreg IV A 2010-2014) Studies on the effects of chronic exposure of marine organisms to contaminants from industry in the English Channel;
 - RECIF (Interreg IVA 2013-2015) "REuse of byproducts in Concrete artificial reef".
- National :
 - GDR IFREMER-Polynésie Française ADEQUA (2008-2012) Improvement of pearl quality of *Pinctada margaritifera* in French Polynesia;
 - LEFE, CNRS INSU -CROCOCYCLE (2009-2012). "Metabolic regulations of nitrogen (N₂) fixation, carbon acquisition and their dependence on the cell cycle in unicellular cyanobacteria";
 - ANR « Gametogenes » (2009-2012) « Genomic of the gametogenesis in the pacific oyster *Crassostrea gigas* »;
 - FLUMES 2 (Seine Aval 2010-2011) « Material flows in the Seine estuary»
 - ANR Pharm@Ecotox (2010-2014) « Pharmaceutical residues and marine ecotoxicology »;
 - ANR Systerra COMANCHE (2011-2014). « Ecosystem interactions and anthropogenic impacts in populations of scallops in CHANNEL»;
 - LITEAU (national & AESN) (2013-2015). « Toxic phytoplankton blooms in Channel » (FLAM);
 - ANR GIMEPEC (2012-2015). « Genotoxicity, immunotoxicity and reproductive toxicity of pesticides in *Crassostrea gigas* »;
 - ANR IPOC (2013/2016) «Interactions between POLLution and Climate changes: Development of an improved monitoring strategy ».

TECHNICS AND EQUIPMENTS

- Histology/Cytology: microtome, cryotome, inclusion automat, microscopes (fluorescent, inverted), histological scanner;
- Animal and algae cell culture: culture rooms, incubators, cell culture hoods;
- Separation techniques : 2D-electrophoresis, HPLC/quadrupole analyzer, gas phase chromatography (GPC), low pressure chromatography;
- Molecular biology: electrophoresis, PCR hoods, real-time PCR, GM room;
- Ecophysiology: modeling computer system, pulse amplitude modulated fluorometer (PAM), érodimètre.

BOREA (Caen) is a member of the marine station of Luc-Sur-Mer and benefits from access to the sea resources and breeding structures in seawater.

BOREA (Caen) belongs to the research federation ICORE (Cell-Cell Interactions Organisms-Environment Interactions) and benefits from access to technical platforms: microscopy center applied to biology (CMABio), PROTEOGEN platform (MALDI TOF/TOF, microarray station, sample preparation automat, protein electrophoresis ...), isotopic mass spectrometry, flow cytometry, IMOGERE (implementation and management of radionuclides) ...