Project title:

Evolutionary and environmental aspects of phenotypic plasticity in *Moronidae*: Comparing the European seabass (*Dicentrarchus labrax*) to the American striped bass (*Morone saxatilis*).

Project time frame: start and finish dates, milestones and deadlines:

Semester	Jul à Sept 2015	Oct to Dec	Jan to Mar	Apr to Jun	Jul to Sept	Oct to Dec 2016	Jan to Mar	Apr to Jun	Jul to Sept	Oct to Dec 2017	Jan to Mar	Apr to Jun	Jul à Sept 2018
Literature review													
Rearing *D. labrax*													
Early conditioning and tagging													
Challenge tests (population)													
Respirometry													
Acute stress response													
Rearing *M. saxatilis*													
Early conditioning and tagging													
Challenge tests (population)													
Respirometry													
Acute stress response													
Dissemination and Reporting: • Project meeting (PM) • Scientific meetings (SM) • Scientific papers (P) • PhD Thesis (T)		PM			PM SM		P		PM SM		P	SM, P, T	PM T

Project partner(s) including name, description of the role of each international partner role in the project and how the proposed project will strengthen international collaboration:

France

- Guy CLAIREAUX, Université de Bretagne Occidentale. Environmental physiology and energetics.
- José ZAMBONINO, Ifremer. Larval development and physiology
- David MAZURAIS, Ifremer. Molecular biology
- Ariana SERVILI, Ifremer. Endocrinology

Canada

- Céline AUDET, Université du Québec à Rimouski. Environmental physiology, Aquaculture, Fisheries
- Pascal SIROIS, Université du Québec à Chicoutimi. Ecology, recruitment, populations' connectivity

Strengthening international collaboration

The current partnership has a long history of collaboration and the proposed project aims at strengthening this network by combining resources and expertises. Noteworthy is the recruitment and co-supervising of a PhD student. Half of the salary is already secured (Céline Audet) and an application for the balance funding is currently under review (Ifremer).

Project description

Bass have a circumglobal distribution and they include the genus *Morone and Dicentrarchus* (*Moronidae*) as well as the genus *Lateolabrax* (*Percichthyidae*). The genus *Morone* includes 4 species from North America, *Morone saxatilis*, *Morone chrysops*, *Morone mississippiensis* and *Morone americana*. The genus *Dicentrarchus* consists of 2 species of the Western European and African coasts, *D. labrax* and *D. punctatus*. The Japanese bass (*Lateolabrax japonicus*) is found along the coasts of Japan, China and Korea. The presence of bass on both sides of the Atlantic and in the Pacific is an unresolved issue, similar to that posed by the Anguillidae. Using a molecular approach, Tsukamoto and Aoyama (1998) have suggested that until its closure, 30 million years ago, the Tethys Sea functioned as a channel that allowed the dispersal of the genus *Anguilla* across the Pacific, Indian and Atlantic Oceans. The same process has been proposed to explain the dispersion and speciation of bass (Secord, 2002; Nolf and Stringer, 1996).

The European bass (*D. Labrax*) and North American striped bass (*M. saxatilis*) are the result of a long process of speciation from a common ancestor. These two species have, however, maintained common physiological and ecological features. To understand the sources of phenotypic diversity and, thereof, better understand the determinants of fish populations' capacity to respond to climate change, the objectives of the current project are to:

- Compare inter-individual variability in key performance traits (hypoxia tolerance, thermal susceptibility, swimming capacity, aerobic and anaerobic metabolic scopes);
- Compare the influence of early environmental conditions (interaction G×E) upon phenotypic diversity and life history trajectories;
- Built an index of phenotypic robustness indicating the capacity of a fish population to respond to environmental variability.

Experiments on the European bass will be conducted at Ifremer Research Center in Brest (France) while those involving the striped bass will take place at ISMER Aquaculture Station, UQAR, Rimouski (Canada). Fertilized eggs issued from wild breeders of *D. labrax* and *M. saxatilis* (noted L and S on Fig.1) will be obtained locally. At 30 days post hatch (dph), populations will be divided in 2 groups. One group will be exposed to a combination of elevated temperature (*D. labrax*: 20°C; *M. saxatilis*: 15°C) and hypoxia (40 % air saturation) during 2 weeks, mimicking one of IPCC climate change scenario (noted L_{CC} and S_{cc} on Fig.1). The second group will be reared under standard conditions (*D. labrax:* 15°C; *M. saxatilis*: 10°C and normoxia; noted L_s and S_s on Fig.1). Following the 2-week conditioning period, experimental populations will be reared under standard conditions. At 60-80 dph fish will be tagged, allowing a longitudinal monitoring of their condition. As indicated on Fig.1, our protocol includes 4 experimental stages corresponding to the larval stage (<45 dph), early juvenile (<120 dph), intermediary (<240dph) and pre-mature (<400 dph). At each of these stages, growth and survival will be evaluated as well as tolerance to reduced oxygen availability and tolerance to increased water temperature (Rozes et al., 2013). Moreover, multi-parametric analysis of animals' response to acute environmental stress (rapid change in temperature, salinity or disturbance) will be conducted to provide an integrated perception of individuals' capacity to face natural contingencies. Individuals presenting the most contrasted responses will be used to characterize phenotypes using molecular, biochemical and genomic approaches.

Appendix 1: Figure 1

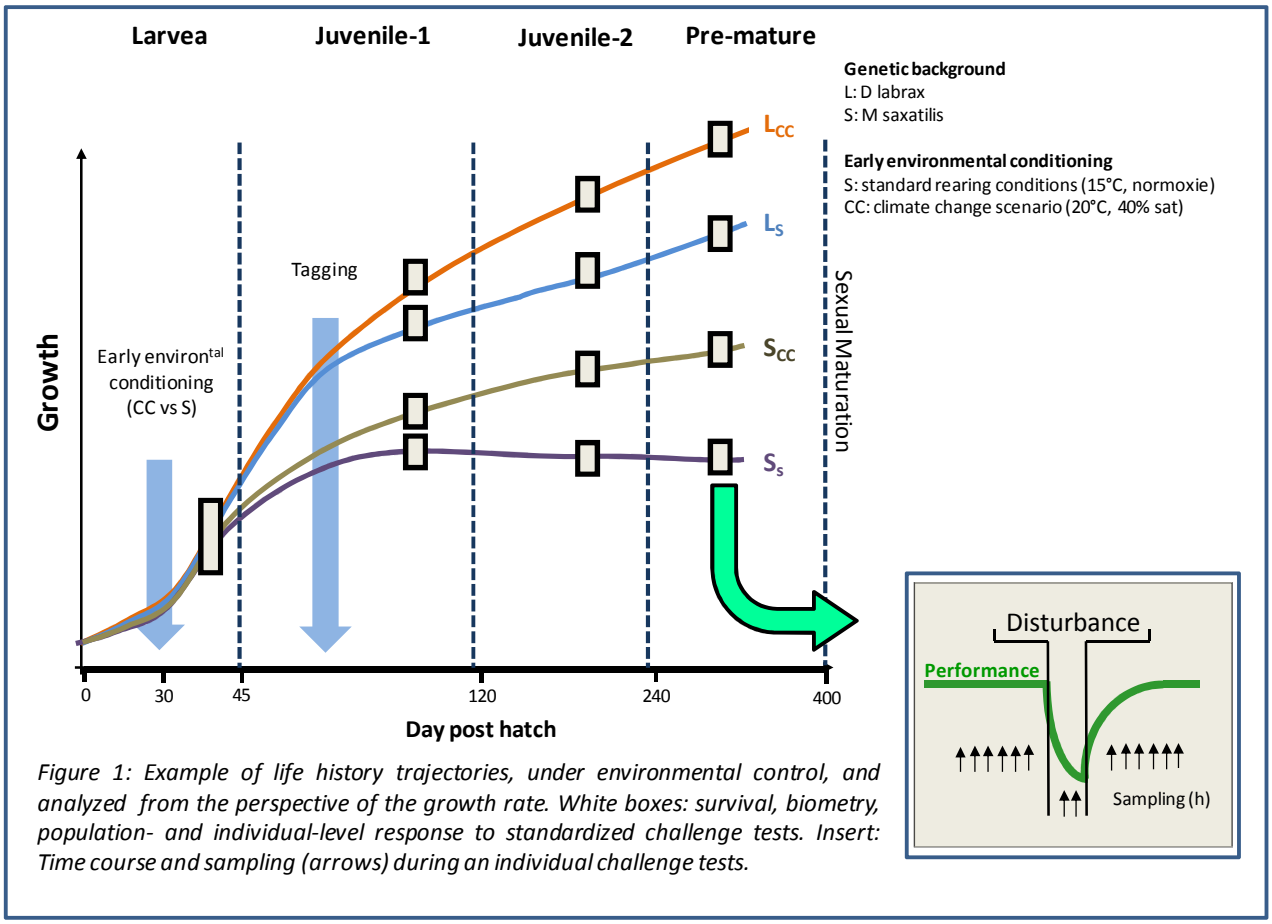

Figure 1: Example of life history trajectories, under environmental control, and analyzed from the perspective of the growth rate. White boxes: survival, biometry, population- and individual-level response to standardized challenge tests. Insert: Time course and sampling (arrows) during an individual challenge tests.