ANR CESA

Devenir et effets de polluants organiques persistants (PCB, PBDE) sur la reproduction des poissons, le développement et la survie de la descendance

Acronyme: FISH'&'POP

Date de démarrage: janvier 2012. Durée: 3 ans

Résumé

Aquatic ecosystems in general and littoral areas in particular are submitted to ever growing anthropic pressures. Coastal ecosystems have a high economical and ecological value as they host a large number of species for some parts of or all their life. Such species are thus exposed to anthropogenic aggression during early highly sensitive stages. This is the case of common sole which reaches coastal nurseries 1 month after hatching, settles and stays at least 1 to 2 year(s). Our previous work has demonstrated that juvenile sole caught in the Seine Estuary are indeed highly contaminated by polychlorinated biphenyls (PCBs) in particular, which could explained why observed sole density is lower than models' prediction. In previous projects, we have shown that sole or zebrafish fed diets spiked with selected persistent organic pollutants (POPs), i.e. PCBs or polybrominated diphenyl ethers (PBDEs), display several physiological disruptions and that these POPs are transferred. However, questions remain, in particular about the effects on reproduction, underlying mechanisms, consequences on progeny fitness and long-term consequences on populations. The goal of Fish'N'POPs project is to tackle this set of questions.

This will be accomplished by combining in situ sampling, to further refine our knowledge of the relationships between environmental actual doses and physiological status in the wild, and a thorough experimental approach. Experimental exposure will be performed through diet, the major route for fish contamination, using environmentally relevant PCBs and PBDEs mixtures. We will use two fish species: common sole (Solea solea) and zebrafish (Danio rerio). Sole, as the first landed value in France, is an economically important species. In addition, we have, from a previous project, an invaluable stock of genitors exposed to POPs for 5 years. We therefore have a unique opportunity to assess POPs effects on reproduction in a long-lived species. Zebrafish is a renowned model for developmental biology, physiology and ecotoxicology. Its short time generation and amenability will allow us specifying the effects of exposure on reproduction and their underlying mechanisms but also to tackle the question of progeny fitness and to explore the transmission of effects over several generations. In Fish'N'POPs, we will monitor the effects of chronic long-term exposures to PCBs and PBDEs mixtures on both fish species' physiology with a particular focus on reproduction. We will first monitor endocrine (steroid and thyroid) status of fish during reproductive cycles as well as the expression of genes involved in the central control of reproduction. We will then analyze expression of gonadal genes to monitor gonad differentiation and gametogenesis. Thereafter, functionality of reproduction will be assessed by evaluating gonad histopathology, gamete quality and reproduction

descriptors. We will monitor progeny abilities for survival, growth and adaptation to challenging situations with a particular focus on behavior which is known to be affected by POPs. This monitoring will allow us evaluating the ability of an individual to contribute to recruitment (i.e. to participate to next generation production). In parallel, we will study POPs distribution in the body and how they are transferred to progeny via eggs. At the end, we will evaluate using both experiments and modeling how these effects can induce changes in population dynamics and trait evolutionary dynamics. Fish'N'POPs will improve our knowledge on the effects of POPs on vertebrates physiology in general and on fish in particular, at molecular, individual and population levels. Modeling will provide concepts and prognostic tools for evaluating population effects of PCBs and PBDEs but also for any kind of molecule sharing similar mechanisms of action. At the same time, Fish'N'POPs will contribute to the enrichment of exposure and effects indicators panoply.

Partenaires

Ifremer (unités BE/LEX+LBCO; PFOM/ARN; BOME; HMMN); **LEMA** (Université Le Havre), **UR-INRA 1037/LPGP**, **UMR703 INRA/APEX ONIRIS**, **UMR7232 CNRS-INSB-UPMC**,

Contact LEMAR: J. Zambonino