



IDENTIFYING EARLY MARKERS OF SKELETAL DEFORMATIONS IN *DANIO RERIO* AND *ORYZIAS LATIPES*

PhD Student: Claudia Di Biagio / *Supervisor:* Dr. Clara Boglione / *Co-supervisor:* Dr. Martine Cohen-Solal (INSERM, Paris)

34th Cycle - A.Y. 2018/2019

This PhD project is part of *Biomedaqu*, a Marie Skłodowska-Curie ITN that aims to promote crosstalk between aquaculture and biomedical research to reciprocally profit from diverse expertise and experimental approaches. Skeletal anomalies have a strong impact on both aquaculture and human health. On the medical side, musculoskeletal diseases are the most common cause of chronic disorders, affect about 120 million people in Europe and represent a burden through disability, work loss and early retirement [1]. On the European aquaculture side, in 2009 it was estimated that skeletal deformations cause a minimum annual loss of more than 50M € [2] and entail animal welfare issues: deformed fishes grow less and slower and are more likely to be affected by pathologies than healthy individuals. All this causes a general negative perception of the aquaculture industry leading to failure in the reduction of pressure on wild stocks. Despite the presence of skeletal anomalies has been reported in several reared fish species, to date it has not been possible to find solutions to reduce their incidence [3]. In this scenario, it would be particularly useful to have tools for the early identification of skeletal anomalies and to conduct studies on larvae and juveniles to fill the knowledge gap in the processes of normal and abnormal skeletogenesis. This PhD has therefore a dual intention. In the *Biomedaqu* network, the aim is establishing a strategy to identify skeletal anomalies at the earliest possible stage of development in *Danio rerio* and *Oryzias latipes* reared in standard conditions, follow up the development of malformations and design a model to predict the occurrence, type and future destiny of these defects. Secondly, because the incidence of skeletal malformations in standard conditions is not reported for medaka, the effect of external stressors (density and volume) on the skeletal system will be tested in *O. latipes*. The choice of zebrafish and medaka, besides all the advantages offered by these two experimental model species, is aimed at obtaining information on the ontogeny of skeletal defects in humans and salmonids (*D. rerio*) and marine reared species (*O. latipes*). In the first part of the project, the individuals will be sampled at the achievement of four fundamental skeletogenic steps and the deformed skeletal elements characterized at anatomical, morphological, histological, and biomolecular level. For what concerns the investigation of stressors, only the adult stage will be sampled for investigating the effects of the overcrowding on the morphology and skeletal tissues.

Sources: [1] Migliore, A. (2012); Editorial of the European Journal of Musculoskeletal Diseases Vol. 1, no. 1 [2] Hough, C. (2009); FINEFISH Final Workshop at Larvi, Ghent University, Belgium [3] Boglione C., Gisbert E., Gavaia P., Witten P. E., Moren M., Fontagné S., and Koumoundouros G. (2013); "Skeletal anomalies in reared European fish larvae and juveniles. Part 2: main typologies, occurrences and causative factors" in *Reviews in Aquaculture*, 5(s1), S121-S167.