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DO MAR
PHD PROGRAM IN MARINE SCIENCE, TECHNOLOGY AND MANAGEMENT

PhD project: **Neural Regulation of Bone Mineral Homeostasis: new insights from fish**

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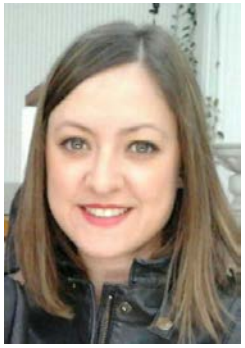

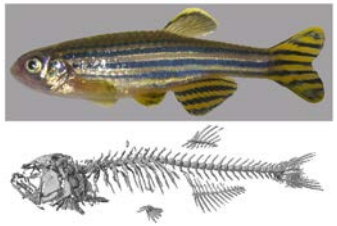

Summary: Diseases and malformations are ones of the major hurdles for the developing aquaculture industry. Thus, despite the improved methodologies for farming of marine and fresh water fish species, egg and larval viability in some species is still very low as a consequence of a high incidence of dystrophies. Often skeletal pathologies may be a combination of several deformities, however, neck, vertebral, and spinal disorders are most prevalent. Many times the dystrophies are not immediately apparent (or detected) leading to wasteful use of food, energy, space and human resources until dystrophic fish are graded and removed. Previous studies suggest that malformations are induced in early stages during the embryonic and larval periods of life, although the causes and mechanisms responsible are not well understood. It has been proposed that alteration of skeletal development is probably a result of complex interactions between genetic, nutritional and environmental factors. In fish farming, phosphorus deficiencies have reported a wide variety of skeletal malformations and physiological disorders. Phosphorus, in the form of inorganic phosphate (Pi), is one of the most important macronutrients for all organisms. In fish, most of the whole-body phosphate crystalizes, along with calcium, to give rise to hydroxyapatite, which hardens the extracellular bone matrix and acts as an internal mineral store. Pi is scarce in water and fish obtain it only from the diet. The physiology of Pi uptake is poorly understood and in culture systems Pi-enriched feeds are generally used to avoid skeletal malformations, ensure health and increase growth. However excess Pi has deleterious consequences and eventually death. Additionally, the excess of unused and/or excreted phosphate in the effluents from fish farming affect water quality and cause eutrophication in aquatic systems. In these circumstances, one of the main concerns to long-term sustainability of world aquaculture is to minimize the phosphate discharges in natural waters without compromising fish health and welfare. Therefore, in order to understand the animal requirements and establish new feed formulations under changing environments it is essential to characterize the regulation of bone mineral homeostasis in fish. Specifically, PTH family is involved in mineral homeostasis and bone remodeling in vertebrates. A new member, pth-like (pth-l) has recently been identified in fish (*Takifugu rubripes*) but, however, information on its function and mechanisms of regulation is very scarce. Therefore, the main objective of this thesis is to investigate pth-l gene (here renamed pth4) in the fish model *Danio rerio* (zebrafish) and its involvement in bone mineral homeostasis.