



UNIVERSITÀ DEGLI STUDI DI ROMA "TOR VERGATA"

DOTTORATO DI RICERCA IN BIOLOGIA EVOLUZIONISTICA ED ECOLOGIA

PhD PROGRAM IN ECOLOGY AND EVOLUTIONARY BIOLOGY



Provisory title: REARING CONDITIONS MODULATING SKELETAL ONTOGENESIS AND GROWTH IN MARINE REARED FISH

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34th Cycle - A.Y. 2018/2019

Aquaculture is an industrial sector whose success in producing high quality fish with sustainable practices will greatly contribute to lower fisheries' pressure on wild stocks. In order to achieve this goal, some challenges must be faced, even in commercial species (i.e. Sea bass *Dicentrarchus labrax* and Gilthead seabream, *Sparus aurata*) consolidated for European aquaculture. Improving the morphological quality of commercially reared fish is a priority in tackling the challenge of skeletal anomalies' onset and repair in Gilthead seabream. Skeletal anomalies should be thoroughly investigated in order to optimize commercial rearing, improve animal welfare and increase profit margins in the aquaculture industry. Physical stress, in particular, plays an important role in the formation of skeletal anomalies: in particular, Large Volumes or Mesocosm technologies based on the use of both large volume tanks and low-density rearing tanks, have been demonstrated to drastically lower the deformation rate in Gilthead seabream. For the farmer, high rearing densities and small tanks are the preferred strategy for maximize profits. This study aims to elucidate the effects of rearing density and of tank volumes, separately, on skeletal processes (larval ontogenesis, modelling and remodeling) in Gilthead seabream, "from the cradle to the grave". Three different densities (larval rearing: 20-100-200 larvae/L; pre-fattening and fattening: 3.5-20-35 kg/m³) and two volumes (tanks; larval rearing: 500-1000 L; pre-fattening and fattening: 750-1500 L) will be tested on just hatched larvae up to 80-100g adults. Fish will be sampled at the end of the larval rearing (<2g) and at commercial size (≈100g). External shapes, skin pigmentation, skeletal anatomy, bone microarchitecture and skeletal tissue histology will be analyzed in malformed and normal fish. The overall goals of the study is to (1) Determine the skeletal formation processes and how they are impacted by different rearing conditions; (2) Experimentally support the best practice for commercial rearing considering animal welfare and economic profit-margins.

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