Preface

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The 9th International Congress on the Biology of Fish, organized by the Physiology Section of the American Fisheries Society, was celebrated in Barcelona (Spain) during July 2010. In this meeting, a special Symposium entitled “The physiology of fish in aquaculture” was organized by Dr. Marco Saroglia (University of Insubria, Italy) and Dr. Juan Miguel Mancera (University of Cádiz, Spain). In addition, the Journal Aquaculture International offered to publish a Special Issue title “Physiology in Aquaculture” with the most important contributions of this Symposium.

Physiology is a core discipline for all aquaculture development and is a key parameter in the production of aquaculture species. For this reason, it is necessary to impulse several researches on different aspects of *fish physiology* in order to fill the knowledge gap on the physiological requirements of the species involved and finally the *development of aquaculture* systems that utilize the newly gained physiological insight into the production process.

In the present Special Issue “Physiology in Aquaculture”, we collected contributions that cover different aspects of fish physiology, as well as its application to aquaculture activity.

The application of probiotics in aquaculture industry is increasing in the last years. The use of these compounds improved animal welfare as well as a healthy environment, resulting in a better production and higher profits. In this Special Issue, the contribution of Moriñigo et al. focused on the employ of the probiotics *Shewanella putrefaciens* Pdp11 in marine farmed fish (*Solea senegalensis* and *Sparus aurata*), suggesting that this probiotic, due to its beneficial effects, could be used in the aquaculture activity of both species.

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In the aquaculture activity, stocking density is also a key matter of concern for fish culture. The contribution of Herrera et al. assessed the effects of stocking density on growth and metabolic parameters in the brill (*Scophthalmus rhombus*), a flatfish species candidate for aquaculture, concluding that brill specimens showed a clear secondary response to crowding stress through the mobilization of energy substrates to tissues, evoking a reduction in the growth and other biometric parameters.

Nutritional studies in aquaculture have focussed on the use of different plant proteins or other meal animal source for fish meal replacement. The manuscript of Rodiles et al. evaluated the effect of dietary protein level and protein source on growth and proteolytic activity of juvenile *Solea senegalensis*, a promising flatfish species for intensive aquaculture in Southern European countries. The study established that in this species level of replacement is depending on vegetal protein source used.

In farmed fish (i.e. the sea bass *Dicentrarchus labrax*), precocious maturation is a common problem because induced a general decrease in their somatic growth affecting production parameters. Rodríguez et al. identified a photolabile period suitable for reducing precocious gonadal maturation in juvenile male of this species by means of a continuous light. The results demonstrate that the time interval including the month of September is the most sensitive photolabile period.

Different physiological processes are under control of circadian rhythms, and the knowledge of these rhythms is essential to improve some key aspects of aquaculture such as food optimization and fish welfare. In its contribution, López-Olmeda et al. described for the first time the daily rhythms of digestive physiology, metabolism and behaviour in the European eel (*Anguilla anguilla*) that could be taken into account to improve feeding methods and welfare assessment.

Environmental salinity is a critical factor for euryhaline species. Several studies have focused on salinity tolerance and osmoregulatory capacities of juvenile and adult specimens of different sturgeon species. However, limited information on environmental salinity and fertilization as well as early ontogenesis in these species is available. In the contribution of Mardaneh Khatooni et al., the salinity effects on the fertilization rate and rearing of the Persian sturgeon (*Acipenser persicus*) larvae have been assessed, showing that salinity tolerance for larvae of this species is less than 4ppt.

During the past three decades, fundamental improvements on the knowledge about environmental factors and water chemistry influences on fish physiology have been achieved. When nitrites are concerning, three realizations have been developed with respect to fish culture in fresh water. First, the widespread understanding that environmental nitrite at concentrations found in production systems can be toxic to many fishes. Second, nitrite toxicity to some freshwater species can be inhibited by addition of chloride to the culture water. Elevated environmental chloride levels competitively inhibit nitrite uptake by the chloride uptake mechanisms of the gills. The third realization is that many species are not susceptible to the toxic effects of nitrite. Surprisingly, this is because many freshwater fishes apparently do not pump chloride inward across the gills. The paper from Joe Tomasso reviews and discusses the range of sensitivity to environmental nitrite by freshwater fishes, the efficacy to selected species of environmental chloride in preventing nitrite toxicity, and how nitrite uptake studies may be a simple and useful surrogate for determining whether a species pumps chloride inward across the gills.

In fish farm rainbow trout *Oncorhynchus mykiss*, triploids are regularly produced because its incapacity to develop gonads during the reproductive cycle that induced growth enhancement in these specimens. Ribeiro et al. assessed tissue fatty acid allocations in triploid and diploid *O. mykiss* females during the reproductive cycle to determine whether

the ploidy influences the fatty acid profile of fish produced in aquaculture. The results showed as the lack of ovary development altered the hepatic synthesis of some fatty acids, mainly monounsaturated and polyunsaturated fatty acids, decreasing the content of the main fatty acids in the white muscle and, consequently, the mobilization of these specific fatty acids to the ovaries.

The study of modifications in fatty acids metabolism in order to assess different aspects related to reproduction and larval development is common in the physiological studies. Dr. Moreira group used this approach to compare larvae early development of cachara (*Pseudoplatystoma reticulatum*) and the hybrid between cachara and pintado (*Pseudoplatystoma corruscans* $\times$ *Pseudoplatystoma reticulatum*) that showed a better perform in captivity (see manuscript of Mello et al.). In addition, the changes in fatty acid profiles of *Salminus hilarii* eggs and larvae of wild and domesticated specimens were assessed (see manuscript of Araújo et al.).