SUMMARY

Despite the wide number of studies showing the influence of broodstock diet on lipid and fatty acid (FA) composition of fish tissues and eggs, and its effect on the reproductive process, there is a lack of nutritional studies on greater amberjack (*Seriola dumerili*) broodstock. Thus, this Thesis was conducted to assess the essential FA (EFA) requirements of *S. dumerili* broodstock, in order to obtain qualitative and quantitative information to formulate a diet that satisfies the nutritional requirements of this species. In addition, it was also intended to establish the degree of relatedness of the cultured broodstock (F1) and consider its effect on their reproductive success, given the potential influence of the genetic background on fitness and reproduction.

To obtain basic information for the formulation of an experimental diet that better suits *S. dumerili* broodstock FA requirements, the lipid composition (total lipid (TL) content, lipid class (LC) composition and FA profile) of several tissues (muscle, liver and ovary) of mature wild females and cultured greater amberjack females fed a non-specific commercial diet (nsCD) was compared. The TL content in cultured fish muscle and liver was higher than in wild fish, mainly due to triacylglycerides (TG) accumulation. Unlike muscle and liver, the ovary TL content was higher in wild fish. Significant differences in percentages of oleic (18:1n-9), linoleic (18:2n-6), arachidonic acid (20:4n-6, ARA), and eicosapentaenoic acid (20:5n−3, EPA) were found between both groups of fish, with lower percentages of 18:1n-9 and ARA, and higher percentages of 18:2n-6 and EPA being detected in cultured fish with respect to wild ones for all tissues in either TL or LC analyzed. In contrast, differences in the proportion of docosahexaenoic acid (22:6n-3, DHA) between both groups of fish were found exclusively in some specific LC of certain tissues, being in all cases higher in wild fish. Consequently, cultured fish presented a lower DHA/EPA ratio and a higher EPA/ARA ratio than their wild counterparts. These results suggest that EFA proportions, especially the EPA/ARA ratio supplied on the nsCD to the cultured broodstock could be inappropriate, negatively affecting the reproductive performance of this species. Furthermore, the differences in 18:1n-9 levels between wild and cultured fish suggest that also this FA was not provided in the proper amount on the diet. Based on the FA profile of wild specimens, and on the "deficiencies" observed in cultured fish, an experimental diet with higher levels of 18:1n-9 and lower EPA/ARA was designed. The effect of the experimental diet (ED) on the FA profile of ovary and eggs of *S.dumerili* broodstock was compared with the results obtained with a non-specific commercial diet (nsCD), taking wild fish lipid composition as a positive reference. Two groups of Seriola broodstock born in captivity, that had not spawn previously, were fed with either the ED or the nsCD during two consecutive spawning seasons (21 months). After seven months of feeding, fish fed the ED displayed an ovary FA profile much closer to wild fish, with higher proportions of 18:1n-9 and ARA, and lower proportions of EPA than those from fish fed the nsCD. In fact, ovary from ED fish did not show significant differences for the mentioned FAs, and for the EPA/ARA ratio with respect to ovary from wild animals. However 18:2n-6 was still higher in ED fish, reflecting diet composition. During the second spawning season, only the group fed ED released eggs. Egg FA composition experienced some minor changes

throughout the spawning season, being a marginal reduction of EPA in the late season the most striking variation. Overall, the use of the ED showed some positive results, which could favour spontaneous egg releasing of females born in captivity. However, the lack of fertilization and the high level of 18:2n-6 in ovary tissue and eggs may indicate that further improvements are needed in *Seriola dumerili* broodstock diet formulation in order to mimic wild composition and to enhance the reproductive performance of this species in captivity.

The group of broodstock (F1) used in this study is the resulting offspring of 11 wild broodstock of unknown genotypes captured in 1996 and kept under captivity in the Canary Islands experimental culture facilities of the Spanish Institute of Oceanography (IEO). The degree of relatedness of the cultured fish used in the experiments and their possible influence on their reproductive success was assessed, getting information that will enable to optimize the group formation in order to minimize inbreeding in future experiments. Eight highly variable microsatellite markers and three different assignment methods were used to reconstruct the most likely genotypes of the parental group of wild-captured *Seriola dumerili* fish based on the genotypes of six cohorts of their offspring (to assess their relative contributions to the offspring). A combination of the 4 most variable microsatellites was enough to identify the number of parents and their relative contribution to the offspring, suggesting that the variability of the markers is more critical than the number of markers. Estimated effective population sizes were lower than the number of breeders and variable among years. The results suggest unequal parental contribution. Although the parental stock showed a rather skewed sex ratio, with 3 individuals of one sex and 7 of the other, all individuals appear to have contributed to the progeny to varying degrees during the period considered in this study (2002-2007). However, there is a marked difference in the relative contribution of each parent to the offspring, with one individual having a much higher contribution than the rest of the specimens of that sex group. It could be due to a different parental actual contribution, to differential offspring survival, or to a combination of both circumstances. This resulted in a high degree of relatedness into the cultured stock (F1), with almost 80 % sharing at least one parent. The high relatedness observed could have had a negative effect on the reproductive potential of the cultured broodstock.