BROODSTOCK MANAGEMENT AND SPAWNING INDUCTION OF GREATER AMBERJACK *Seriola dumerili* REARED IN TANKS AND SEA CAGES IN GREECE

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Introduction

Proper broodstock management is essential for the successful reproductive maturation of fish maintained in captivity, and the production of eggs of high fecundity and quality. The greater amberjack (*Seriola dumerili*) is a species with a great potential for the Mediterranean aquaculture, due to its excellent flesh quality and worldwide high consumer acceptability. However, this species does not reproduce reliably in captivity, and there is a need to develop broodstock management methods that are suitable for this large, pelagic fish. The present study describes the broodstock management and spawning induction of greater amberjack broodstocks maintained both in tanks and sea cages, that was carried out during the implementation of the DIVERSIFY project (www.diversifyfish.gr) in Greece.

Materials and methods

Broodstocks of wild captive-reared individuals (Table I) were maintained under two different conditions (sea cages or land-based tanks) in different locations around Greece (ARGO: Argosaronikos Fishfarms SA, Salamina Island; GMF: Galaxidi Marine Farms SA, Galaxidi; SOUDA: Hellenic Centre for Marine Research, pilot sea-cage farm, Chania, Crete; AQUALABS: Hellenic Centre for Marine Research, Herakleion, Crete; FORKYS: Forkys Aquacultures SA, Siteia, Crete). Broodstock were fed with (a) live fish, (b) raw fish and squid, or (c) dry or moist (Skretting Vitalis CAL, 22mm), or a combination of the above, 3 to 5 times a week to apparent satiation. Females were considered eligible for spawning induction if they contained fully vitellogenic oocytes (650 μm in oocyte diameter) and were treated with GnRHa implants. Fish from sea cages were either moved back to their sea cage for spawning (cage-spawning) or were transferred to land based tanks (tank-spawning). An egg collection device consisting of a two-piece curtain was deployed around the perimeter of the cages during the spawning experiments. Females were implanted with 64±17μg kg^{-1} GnRHa and males with 48±12μg kg^{-1}. Eggs were collected every morning from either the tanks or cages, and fecundity and fertilization success were estimated using a sub-sample of the collected eggs. At the end of the experiment fish were transferred to their original location, until the next spawning season, when the experiments were repeated (2014-2016).

Table I. Details of the greater amberjack broodstocks maintained in Greece.

Stock	Location	Number of Individuals	Size at sampling (range in kg)	Feeding
AQ/LABS	tanks	27	8.6-23.8	moist/dry pellet, fish
FORKYS	tanks	21	9.4-15.9	fish, squid
SOUDA	sea cages	13	9.9-18.4	moist/dry pellet
ARGO	sea cages	28	10.7-19.5	moist/dry pellet, fish
GMF	sea cages	28	9.0-18.0	live fish

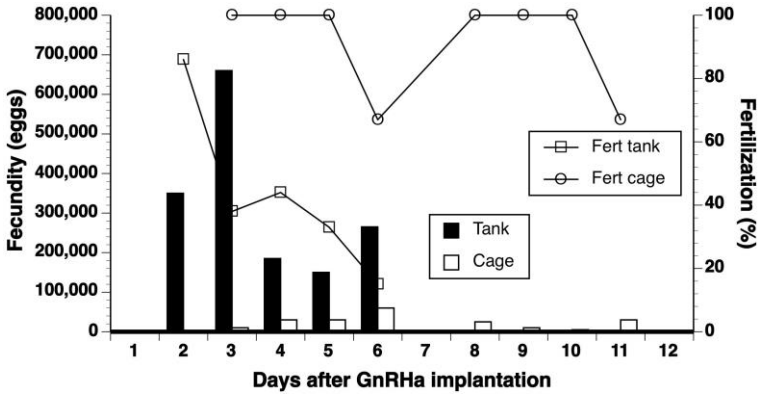

Fig.1. Daily fecundity (bars) and fertilization success (lines) of greater amberjack maintained in sea cages during the year and treated with GnRHa to induce spawning. Some fish were then transferred to tanks for spawning or they remained in the sea cage, which was fitted with an egg collector.

Results and discussion

Temperature did not seem to be crucial for greater amberjack spawning, since fish were in oocyte maturation and pre-ovulation stage at <20°C and spawning induction was successful after GnRHa implantation. Reproductive maturation with the potential to spawn was observed in females as small as 6kg in body weight. Broodstocks held in tanks throughout the year did not undergo gametogenesis reliably and females were mostly in early vitellogenesis, with <20% of the females being in full vitellogenesis (oocytes of 542±70μm) and also with with apparent atresia. On the other hand, in sea cages almost all females (73%) were in full vitellogenesis and a small percentage of the fish were undergoing maturation and ovulation spontaneously in all rearing facilities. Egg collection in sea cages was not very successful, and a relatively small amount of eggs was collected over the three years of the experiments (Fig. 1), we believe because of the relatively low buoyancy of the eggs, confirmed with laboratory observations. On the contrary, the method of maintaining the broodstock in cages during the year, and then transferring them to land-based tanks for spawning after GnRHa therapy was proven very effective, with more than 50 million greater amberjack eggs with good quality characteristics being produced in 2016. Over the course of the three years, the maturation status of the fish was improved, as was the fecundity and quality of the produced eggs.

Males during the three years of the study were not releasing sperm with abdominal pressure, but in most of the cases collection of sperm was possible using a catheter. Concerning sperm quality parameters of all captive-reared greater amberjack, sperm motility was 77±3%, motility duration was 3.7±0.2min, sperm density was 30±2 10^9 szoa ml^{-1} and sperm survival was 8±1days, values that are considered appropriate for good fertilization success.

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