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Enhancement of oogenesis/spermatogenesis in meagre *Argyrosomus regius* using a combination of temperature control and GnRHa treatments

Constantinos C. Mylonas [a,*], Sara Salone [a,b], Tommaso Biglino [a,c], Paulo H. de Mello [a,d], Ioannis Fakriadis [a], Irini Sigelaki [a], Neil Duncan [e]

[a] Institute of Marine Biology, Biotechnology and Aquaculture, Hellenic Center for Marine Research, P.O. Box 2214, Iraklion, Crete 71003, Greece
[b] University of Bologna, School of Agriculture and Veterinary Medicine, 40064 Ozzano dell'Emilia, Bologna, Italy
[c] Lund University, Department of Biology, SE-223, 62 Lund, Sweden
[d] University of São Paolo, Institute of Biosciences, Cidade Universitária, São Paolo 05508-090, SP, Brazil
[e] IRTA, Sant Carles de la Rapita, 43540, Sant Carles de la Rapita, Tarragona, Spain

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ABSTRACT

A multiple GnRHa injection method for inducing spawning of high fecundity and quality in meagre was optimized. Specifically, the study (a) examined how long females would continue spawning in response to consecutive, weekly GnRHa injections, if maintained at the natural spawning temperature, and (b) evaluated whether males can produce adequate amounts of good quality sperm for the same period, with the assistance of a GnRHa therapy. Combined with stable temperatures (19–20 °C) that are prevalent during the early spawning season (April–May) in the Mediterranean Sea, each weekly GnRHa injection induced ~2 consecutive spawns per week for a period of 17 weeks. Fish spawned consistently 2 days after treatment and produced high fecundity and egg quality (*i.e.* fertilization, hatching and early larval development). Maximum mean total fecundity (±S.D.) obtained was 1,415,000 ± 149,000 eggs kg^{-1} in 32 spawns, being the highest total season fecundity reported for meagre, and significantly higher than the estimated maximum potential fecundity for the species. At the same time, sperm of consistently high quality (*i.e.* initial motility, duration of motility and storage survival) was produced in response to treatment with multiple GnRHa implants, though towards the end of the experiment a significant reduction (ANOVA, $P \leq 0.05$) in spermatozoa density was observed. This protocol is expected to enhance greatly commercial production of meagre.

Statement of relevance: The present study reports on an optimized protocol for the induction of consistent and repeated spawning in meagre, based on the use of weekly GnRHa injections combined with stable temperatures that are prevalent at the early spawning season in the Mediterranean Sea. This protocol produced eggs of high fecundity and quality (*i.e.* fertilization, hatching and early larval development) for a period of >4 months, and it is expected to enhance greatly commercial production of meagre.

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1. Introduction

The aquaculture production of meagre *Argyrosomus regius* (Sciaenidae) has increased rapidly in the last decade, in part due to the development of effective spawning induction methods (Duncan et al., 2012; Duncan et al., 2013; Fernández-Palacios et al., 2014; Mylonas et al., 2015), since meagre rarely undergo spontaneous oocyte maturation, ovulation and spawning in captivity (Duncan et al., 2013; Gil et al., 2013; Mylonas et al., 2013b; Soares et al., 2015). Meagre exhibit an asynchronous or group-synchronous oocyte development pattern (Duncan et al., 2012; Gil et al., 2013; Schiavone et al., 2006) with a spawning season in the wild extending from late spring to early fall, depending on geographic location (Abou Shabana et al., 2012; González-Quirós et al., 2011). In aquaculture, experiments with GnRHa treatments were effective in inducing maturation of both wild-caught (Duncan et al., 2012) and hatchery-produced broodstocks (Fernández-Palacios et al., 2014; Mylonas et al., 2013a; Mylonas et al., 2015).

Both liquid injections and controlled-release delivery systems that release GnRHa for a prolonged period of time (Mylonas and Zohar, 2001) have been shown to be effective in inducing maturation and multiple spawns in females, and GnRHa injections are especially useful in species such as meagre, which rarely undergo spontaneous final maturation in captivity (Duncan et al., 2012; Duncan et al., 2013;

* Corresponding author.
E-mail address: mylonas@hcmr.gr (C.C. Mylonas).

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