

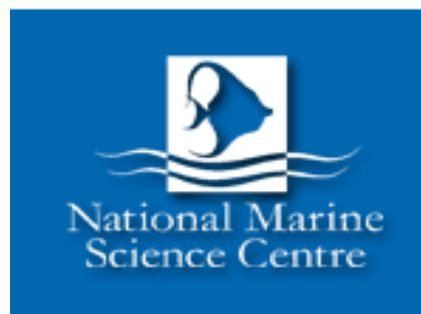
**Hormone Treatment Efficacy for Induction of Spawning Captive
Yellowfin Bream (*Acanthopagrus australis*) and the Effect of Salinity
on Egg Fertilization, Hatching and Early Larval Development**

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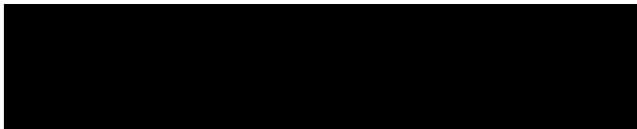
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DECLARATION AND AUTHORITY OF ACCESS

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Benjamin James Black

Abstract

*This study assessed the efficacy of two exogenous hormones, gonadotropin releasing-hormone analogue (GnRHa) and human chorionic gonadotropin (hCG) to induce spermiation and spontaneous spawning in captive yellowfin bream *Acanthopagrus australis* (Sparidae). The effect of activating gametes at different salinity levels on egg fertilization, hatching, larval development and survival was also examined to determine the feasible salinity range of water that could potentially be used by hatchery operators for spawning in captivity, egg incubation and early larval rearing until the time of first feed.*

Adult yellowfin bream underwent gametogenesis in captivity and by the onset of the natural spawning season males were spermiating and females had developed vitellogenic oocytes. Males and females were injected on a body weight (bw) basis with either saline (control) or a single dose of either GnRHa (25, 50, 75, 100 $\mu\text{g kg}^{-1}$) or hCG (250, 500, 750, 1000 IU kg^{-1}). Milt and blood samples were collected from males to assess the effects of hormone treatment. Males did not respond to saline or treatment with hCG. Whereas, treatment with GnRHa at a dose of 100 $\mu\text{g kg}^{-1}$ bw significantly increased milt volume at 48 hours post injection (h p.i.). The cumulative number of sperm produced by the 100 $\mu\text{g kg}^{-1}$ bw over the 48 h sample period was also significantly elevated. In contrast to saline and hCG treated males, all GnRHa treatment groups had elevated plasma levels of and 11-ketotestosterone (11-KT) by 24 and 48 h p.i. Levels of testosterone were not elevated among treatment groups. These results suggest that as for other teleosts, gonadotropin-dependent production of 11-KT is the major mediator of spermatogenesis in the yellowfin bream.

Saline treated females did not spawn, whereas, treatment with either hCG or GnRHa induced spontaneous spawning. However, treatment with GnRHa was more efficacious than hCG. Fifteen out of 16 females (94%) spawned following treatment with GnRHa, whereas, only 10 out of 16 females (63%) spawned following treatment with hCG. GnRHa treated fish spawned a total of 32 times; whereas, hCG treated females spawned a total of 14 times. Treatment with GnRHa at a dose of 75 $\mu\text{g kg}^{-1}$ bw resulted the most consistent spawning response with all four females spawning three times. The number of eggs spawned was also highest in the 75 $\mu\text{g kg}^{-1}$ bw group; however, the quality of spawns from all GnRHa treatment groups was highly variable. When a 3:1 male to female spawning ratio was used, the proportion of

fertilized eggs spawned improved over females spawned with a single male.

Gametes were manually stripped from tank-held brood fish following induced maturation by injection of 100 and 75 $\mu\text{g kg}^{-1}$ body weight GnRH α (Des-Gly¹⁰, D-Trp⁶-pro⁹-ethylamide LHRH acetate) for males and females, respectively. The gametes were then exposed to filtered seawater 37 ‰ (control) and to prepared salinities, at 5 ‰ intervals, between 0 (distilled water) and 50 ‰ at 20 $\pm$ 0.5°C. Fertilization of ova, hatching of larvae and larval deformity at hatching, together with the pattern of larval growth and survival were subsequently examined. There was no significant difference in fertilization rates between 20 and 50 ‰. However, fertilized eggs sank at salinities less than 35 ‰ resulting in low hatch and high deformity rates of larvae. Keeping fertilized eggs incubated at salinities less than 35 ‰ suspended off the bottom and constantly exposed to a flow of aerated water, improved hatch and lowered larval deformity rates. No significant difference in hatch or larval deformity rates occurring between 25-50 ‰.

Larvae hatching at 20, 25 and 30 ‰ were significantly longer than those hatching at higher salinities. Larvae incubated at 45 and 50 ‰ were significantly shorter, had reduced yolk-sac area and normal growth was retarded. Larvae at 20 ‰ grew faster than those incubated at 40 ‰, achieving the majority of their body area by 36 hours post hatch (h p.h). In comparison, larvae incubated at 40 ‰ grew slower, attaining a body area comparable to larvae at lower salinities by 72 h p.h. The growth of larvae at salinities between 25 and 37 ‰ was relatively uniform and by 72 h p.h. there was no difference in the size of the larvae incubated at salinities between 25 and 40 ‰. The pattern of yolk resorption was largely unaffected between 20 and 40 ‰. However, yolk utilization efficiency during the first 36 h of growth followed a strong inverse curvilinear relationship with salinity. The median survival time of unfed larvae formed an inverse curvilinear relationship with salinity. These results suggest that mass production of larval yellowfin bream from fertilization to the time of first feeding would be feasible provided salinities were kept between 25-40 ‰.

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