

SPAWNING KINETICS OF GREATER AMBERJACK *Seriola dumerili* IN RESPONSE TO MULTIPLE GnRH α INJECTIONS OR IMPLANTS

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Introduction

The greater amberjack (*Seriola dumerili*) is a species with high potential for the diversification of the aquaculture production, due to its excellent flesh quality and high worldwide consumer acceptability. One of the main obstacles for its aquaculture production is the lack of reliable reproduction of fish maintained in captivity. Agonists of gonadotropin-releasing hormone (GnRH α) have been used to overcome these problems in many fishes, and the present study compared hormonal spawning induction methods with GnRH α using either injections or implants.

Materials and methods

Wild-captured breeders (mean weight 17.0 ± 2.6 kg) were kept in Argosaronikos Fish Farm S.A. in a $1,000\text{m}^3$ cage during the year and were fed with a broodstock diet (Skretting, Vitalis Cal, 22mm). The spawning trial was conducted between 7-28 June 2016. Females were treated with a GnRH α injection ($20\text{-}25\mu\text{g GnRH}\alpha\text{ kg}^{-1}$) or with Ethyl-Vinyl Acetate copolymer (EVAc) GnRH α implant (Mylonas and Zohar, 2001), with an effective dose of $49\text{-}69\mu\text{g GnRH}\alpha\text{ kg}^{-1}$. To enhance spermiation and ensure adequate sperm production, all males were treated on 7 June 2016 with a GnRH α implant at a dose of $45\text{-}70\mu\text{g GnRH}\alpha\text{ kg}^{-1}$. After being treated for spawning, fish were transferred to the inland facility into each of four 23m^3 flow-through round tanks ($n=3\text{-}4$ females), in a 1:1 sex ratio. Females in the injected group were given a GnRH α injection every week for 3 weeks, whereas the implanted group was given a second implant after two weeks (a total of 3 injections and 2 implants). Tank overflow egg collectors were examined three times a day, and fecundity and fertilization success were estimated immediately after egg collection. Egg and larval quality parameters were estimated using the microtiter plate method (Panini et al., 2001) with some modifications.

Results and discussion

Spawning started 1d after the 1st application, as some females had oocytes already undergoing maturation. Implanted fish spawned for 9-10 times after the 1st implant and only 4 times after the 2nd implant. Injected fish spawned 7, 3-5 and 1-3 times after the 1st, 2nd and 3rd injection, respectively. The highest fecundity was produced by the GnRH α implanted fish and was $4\,242\,000\text{eggs tank}^{-1}$ two days after the 1st treatment, while in the injected fish the highest fecundity was $2\,454\,000\text{eggs tank}^{-1}$.

Mean daily relative fecundity was higher in implanted fish ($15\,170 \pm 2\,738\text{eggs kg}^{-1}\text{day}^{-1}$) compared to the injected fish ($6\,119 \pm 2\,790\text{eggs kg}^{-1}\text{day}^{-1}$) (Fig.1A). Total relative fecundity was also higher in implanted fish ($102\,402 \pm 20\,337\text{eggs kg}^{-1}\text{tank}^{-1}$) compared to the injected ($26\,517 \pm 9\,938\text{eggs kg}^{-1}\text{tank}^{-1}$) ($P=0.003$) (Fig.1B). Total egg production was decreasing in injected fish after consecutive GnRH α treatments ($P=0.005$), while in implanted fish no statistical differences were observed between the subsequent treatments ($P=0.17$) (Fig.1B).

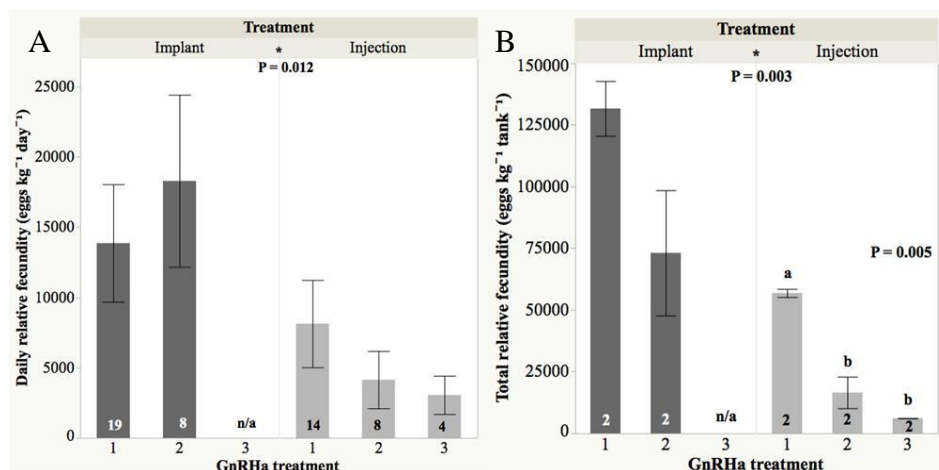


Fig.1. Mean daily relative fecundity (\pm SEM)(A) and mean total relative fecundity (\pm SEM)(B) of GnRH_a implanted (dark grey) or injected (light grey) greater amberjack *Seriola dumerili*. Numbers in bars are the spawns (A) or the number of tanks (B) constituting each mean. Asterisks indicate differences between treatment methods (t test, $P = 0.012$ or $P = 0.003$) and lowercase letters between treatment number (ANOVA, Tukey HSD, $P = 0.005$).

Fertilization success, 24-h embryo survival, hatching and 5-d larval survival was similar between the two GnRH_a treatment methods, while no statistical differences were observed among different treatment numbers. Mean fertilization success was $36 \pm 5\%$ and 24-h embryo survival $53 \pm 7\%$ for both treatment methods. Additionally, hatching was $70 \pm 4\%$ and 5-d larval survival was $20 \pm 4\%$ over the course of the study.

Conclusions

The GnRH_a implanted fish produced 2.5X more eggs than the injected fish, with the same number of spawns. On the other hand, no differences were observed among the two treatment methods in terms of fertilization success, embryo survival, hatching and 5-d larval survival.

References

- Mylonas C.C., and Y. Zohar. 2001. Use of GnRH_a-delivery systems for the control of reproduction in fish. *Rev. Fish Biol. Fish* 10: 463-491.
- Panini E., C.C. Mylonas, S. Zanuy, M. Carrillo, J. Ramos, and M. Bruce. 2001. Incubation of embryos and larvae of marine fish using microtiter plates, *Aquaculture International* 9:189-196.

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