

Spawning and larval rearing of goldlined seabream, *Rhabdosargus sarba* on Abu Al Abyad Island, United Arab Emirates

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The goldlined seabream, *Rhabdosargus sarba*, a carnivorous and euryhaline sparid, is widely distributed in subtropical and tropical waters throughout the Indo-West Pacific including the Red Sea, East Africa, Madagascar, Australia, China and Japan (Leu 1994, Mihelakakis and Kitajima 1995, Radebe *et al.* 2002). It is a shallow-water species that is usually found around reefs with sandy bottoms. In some regions of the world, such as the waters of Hong Kong and South Africa, the fish is a protandrous hermaphrodite, but in other environments, including Western Australia, it is described as a rudimentary hermaphrodite (Hesp *et al.* 2004). In the United Arab Emirates (UAE), the fish is a potential candidate for aquaculture because it has high commercial value in the local market. In the wild, *R. sarba* spawns from early December to late January, when water temperature is around 21 °C. We studied the spawning and larviculture of goldlined seabream.

Broodstock Acquisition and Spawning

Broodstock were captured from channels surrounding Abu Al Abyad Island during early December 2009 and transported to the Aquaculture Center where they were immediately given a 0.15 ppm formalin (42 percent) bath for one hour, and then placed in 4-m³ indoor fiberglass tanks filled with seawater (51 ppt). Two days later, fish were acclimatized to hatchery conditions by reducing salinity to 37 ppt over two days. After seven days, fish were weighed, measured and cannulated with a 2-mm polyethylene cannula. Females were 270 ± 18 g and 23.1 ± 0.6 cm in length, while males averaged 265 ± 16 g and 23.4 ± 0.9 cm. During the acclimation period and all through the spawning period, broodstock were fed fresh squid and sardines daily to satiation, supplemented with clam meat three times per week. Every other day the fresh food was fortified with vitamins and oil.

On 12 December 2009, ripe females with average cannulated oocyte diameter of 406 µm and ripe males with running milt were randomly distributed into three identical 40-m³ indoor circular concrete tanks at 25 females and 25 males in each tank. Fish in one tank (group A) were given a priming injection of 1000 IU HCG/kg body weight followed 24 hours later by a resolving dose of 200 µg LH-RHa/kg body weight. Fish in a second tank (group B) were given only one



Fig. 1. Female *Rhabdosargus sarba* cannulation.

dose of 1000 IU HCG/kg body weight while fish in the third tank (group C) were not injected and left to spawn naturally. In group A, spawning occurred 24 hours after the second injection, with a total release of 3,710,000 eggs. The fertilization rate in this group was 71 percent. In the second group (group B), spawning occurred 48 hours after receiving the only HCG injection with a total release of 3,410,000 eggs released. The fertilization rate in this group was 66 percent. Fish in group C failed to spawn naturally within 36 days from 12 December 2009 to 17 January 2010. It is probable that handling stress of wild fish during the short period of time from acquisition to introduction for spawning inhibited the development and final maturation of gonads in group C fish.

Every morning, buoyant eggs with a diameter of 920 ± 1 µm were skimmed from the water surface of the spawning tanks using a fine dip mesh net (100-µm mesh size). Immediately after egg collection spawning tank bottoms were siphoned to remove sinking eggs and 50 percent of the tank water was changed. Collected eggs were rinsed with filtered seawater, separated and counted using a graduated cylinder and transferred into 600 µm cylindrical incubation baskets. Incubators were placed in a 5-m³ rectangular fiberglass tank that was provided with gentle aeration and continuous gen-

Table 1. Spawning performance of *Rhabdosargus sarba* and hatching rates.

| Group | Treatment (x 1000) | Total eggs (x10 ⁶) | No. eggs/kg ♀ (x1000) | fertilized eggs (%) | Hatching rate (%) |
|-------|--------------------|--------------------------------|-----------------------|---------------------|-------------------|
| A | HCG + LH-RHa | 3,710 | 594 | 71 | 55 |
| B | HCG | 3,410 | 574 | 66 | 57 |

tle flow of 37 ppt seawater. Water temperature during egg incubation was $21.7 \pm 0.8^\circ \text{C}$. Hatching rates attained after 30-36 hours for group A (55.3 percent) and group B (56.8 percent) were similar (Table 1).

Larval Rearing

Hatched larvae, averaging $1.9 \pm 0.1 \text{ mm}$ in total length, were stocked in indoor 4-m³ concrete rectangular larval rearing tanks (LRTs) at 40 larvae/L. Green algae, *Nannochloropsis* (1.8 million cells/mL), was added to LRTs from day 3 to day 22 after hatching at a daily rate of 400-600 L/tank. Beginning day 3 to day 20 after hatching, larvae were fed rotifers (66-146 μm). Rotifers were added to rearing tanks twice daily from cultures fed baker's yeast, *Saccharomyces cerevisiae*, plus *Nannochloropsis*, and enriched six hours before feeding to fish larvae with HUFA at 0.25-0.35 mL/million rotifers. The density of rotifers in LRTs was always maintained at 15 individuals/mL. Beginning day 15 until day 25 after hatching, fish larvae were fed newly hatched and enriched *Artemia* nauplii at 0.5-1 nauplii/mL twice daily. The enrichment of *Artemia* followed the same protocol for rotifer enrichment. From day 11 to day 25 after hatching, small-size (198 μm) artificial feed was served. From day 20 to day 35 after hatching a medium-size (<200 μm) feed was added, and from day 30 until weaning (day 45) larvae were fed a larger-size feed (200-300 μm).

Water exchange in LRTs beginning day 1 after hatching until day 33 was carried out at night by flow-through of 37 ppt seawater. In the first two days after hatching, the daily water exchange rate was 60-80 percent and from day 3 to day 33 it was 80-100 percent. From day 34 up to weaning (day 45), seawater was continuously supplied to provide 200 percent water exchange per day. During the administration of artificial feed, water flow was stopped for 30 minutes.

Rearing water temperature ranged between 22.5 and 24.0 $^\circ\text{C}$ and the dissolved oxygen was maintained at $5.2 \pm 0.2 \text{ ppm}$. The photoperiod was maintained at 14 h light and 10 h darkness. On day 30 after hatching, mortality was observed in some LRTs and tests of the dead larvae revealed the presence of monogenean parasites. All tanks with fish infected with this parasite were successfully treated with copper sulfate pentahydrate at 0.05 mg/L for seven days.

After 45 days, all surviving juveniles were harvested. The total number of juveniles collected (150,000) amounted to 5.5 percent survival. The average weight of 45-day juveniles was $46 \pm 35 \text{ mg}$ and the average fork length was $1.4 \pm 0.4 \text{ cm}$.

All harvested juveniles were transferred to 40-m³ indoor concrete circular tanks for nursing at a stocking density of 1 fish/L. In the first 25 days the fish were cultured at 37 ppt



Fig. 2. Female *Rhabdosargus sarba*.



Fig. 3. Male *Rhabdosargus sarba* with running milt.

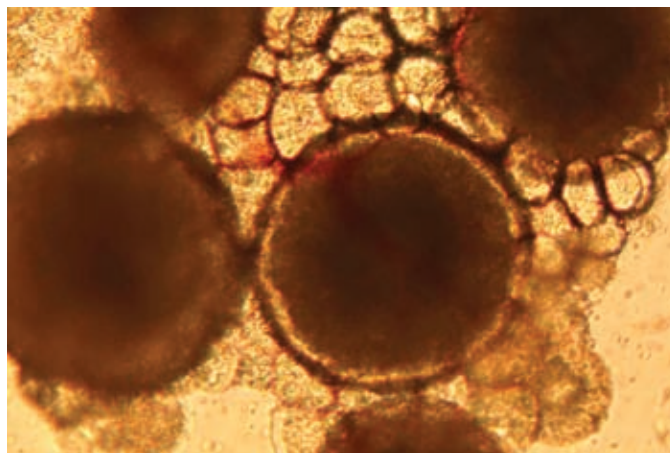


Fig. 4. 406- μm cannulated oocytes.



Fig. 5. *Rhabdosargus sarba* floating egg collection.

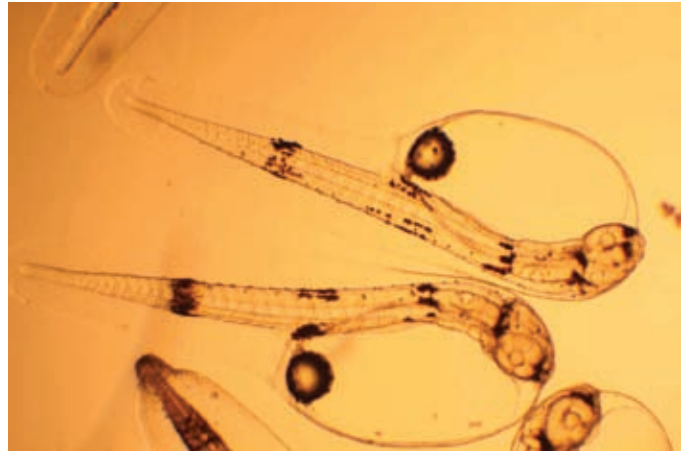


Fig. 6. 1.8-mm hatchlings after 24 h.

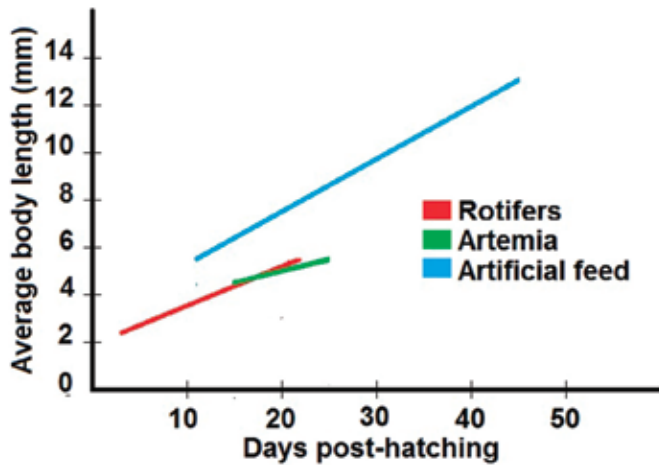


Fig. 7. Growth of *Rhabdosargus sarba* as related to food type.



Fig. 8. *Rhabdosargus sarba* fingerling grading.

and then salinity was increased to the natural level of Abu Al Abyad Island (51 ppt) within seven days (2 ppt/day). Mortality was recorded during this acclimation period. In nursery tanks, fish were fed daily to satiation with sinking 0.3-0.9 mm fish feed (crude protein 50 percent, crude lipid 6 percent, crude fiber 6 percent, ash 10 percent, moisture 11 percent) for 60 days. After the nursing period, fish were harvested and the total number collected from the nursing tanks (125,685) reflected a survival rate of 84 percent. The greatest mortality in this culture phase was caused by monogenean parasites in the first week in one of the nursing tanks and it was controlled by copper sulfate pentahydrate at 0.05 mg/L for seven days.

All harvested fish were graded using a stainless bowl-shaped 12-mm mesh sieve and two size groups were obtained. The small size group, averaging 0.4 ± 0.1 g in weight and 2.5 ± 0.2 cm in length, amounted to 26 percent of the fish harvested and the larger size group, averaging 5.0 ± 1.6 g and 5.1 ± 0.7 cm in length, amounted to 74 percent of the total number harvested.

Notes

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