Successful spawning and rearing of silver biddy, *Gerres oyena* in Abu Al Abyad Island, Abu Dhabi, United Arab Emirates

John Antony F., Balamurgan Vadivel, Eiman M. Alrashdi, Rauda S. Alderei, Krishnakumar Menon, Vetrivel Vedhagiri, Pandithrai Jayaraman and Omer M. Yousif*

The Aquaculture and Marine Studies Center, Abu Al Abyad Island, The Private Department of the President, Abu Dhabi, UAE.
Email: omar.m@dopa.ae

Gerres oyena (silver biddy), locally known as *badah*, belongs to the family Gerreidae. It is widely distributed across the Indo-West Pacific region, from the eastern coast of Africa to the Red Sea and the Arabian Gulf, through southern Asia, Polynesia, Australia, and China, supporting significant commercial fisheries (Lieske & Myers, 1994; Froese and Pauly, 2000). In the Arabian Gulf, it is mostly found on sand or mud bottoms and near coral reefs. It is also common in grass meadows in Umm Al Quwain lagoons (Tamaei, 1999) and in mangrove swamps in Abu Dhabi, Umm Al Quwain, and Ras Al Khaimah, where it is one of the dominant species (Al-Ghais, 1993). The species feeds mainly on small organisms and benthic invertebrates, including polychaetes living on sandy substrates, making it a vital part of its ecosystem (Randall, 1995; Lieske & Myers, 2004). Although not caught in large quantities, it has significant economic value as a low-cost commodity, mainly taken by bottom trawls and seines (Shallard, 2003). As badah is an important commercial fish, the Environmental Agency Abu Dhabi (EAD) has introduced management measures to address declining stocks and ensure sustainability (EAD, 2020). In the UAE, the species remains under-researched in age, growth, and reproduction.

The Aquaculture and Marine Studies Center (AMSC) on Abu Al Abyad Island conducted induced spawning trials for Gerres oyena, with the primary aim of developing methods for successful fingerling production. This work could contribute to the sustainable management and conservation of the species in the Arabian Gulf, reverse declining catch trends, ensure the species' long-term viability, and support regional aquaculture development.

Broodstock source and maintenance

Staff collected 230 females and 120 males of Silver biddy, ranging from 0.1 kg to 0.14 kg, from waters surrounding Abu Al Abyad Island. The fish were kept in circular indoor quarantine tanks with a capacity of 20 tonnes each. Staff treated the fish with 50 ppm formalin for five consecutive days. The fish were fed ad libitum with sardines and squid.

After three days, staff began feeding the brooders a supplemented diet three days a week for one year. This consisted of 3% BW Vitals Cal pellets soaked in fresh water (1:1.5 ratio for 24 hours), with 1 g MCP, 2 g vitamin C, 2 g vitamin E, 10 ml fish oil, and 2 g β-glucan (GL300) per kg, prepared over 24-30 hours. The soft pellets were stuffed inside squid before feeding. On the remaining two days, staff fed headless fresh sardines. The fish adapted quickly to captivity and accepted both fresh fish and pelleted feed. Staff maintained salinity between 35-40 ppt and temperature between 23-26°C.

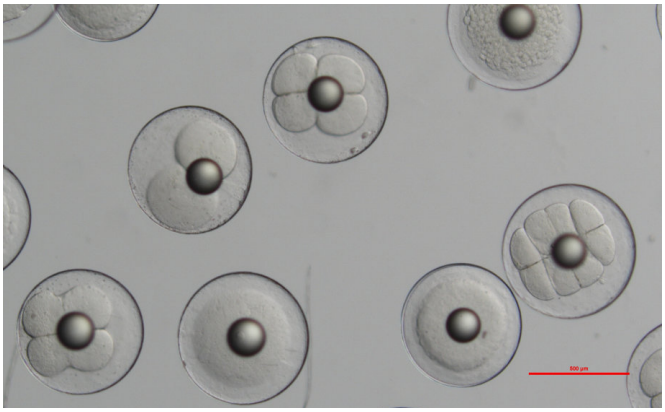
After quarantine, staff transferred the Silver biddy brood stock to the Centre's brood stock cages in Abu Al Abyad waters, where the salinity was 50 ppt, and fed them appropriately before spawning.

Spawning induction and larval development

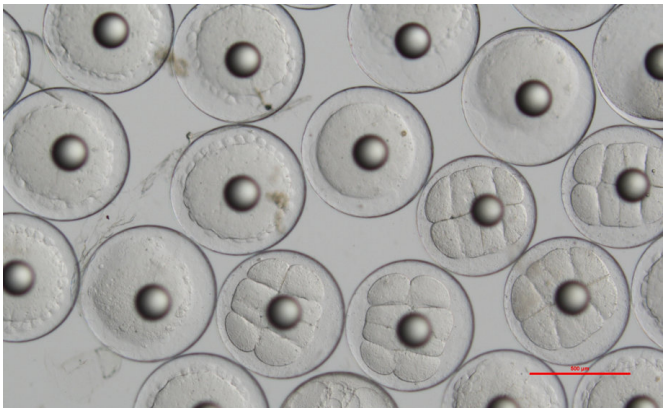
Staff assessed brood stock maturity through ovarian biopsy using a polyethylene cannula. They examined and measured the collected oocytes under a microscope. Females with oocytes measuring 400 ± 50 µm in diameter were selected for spawning induction.

On 17 April 2025, staff segregated 120 males weighing 0.1 kg each that were exhibiting running milt. Staff transferred 230 females and 120 males to four indoor spawning tanks (15-tonne

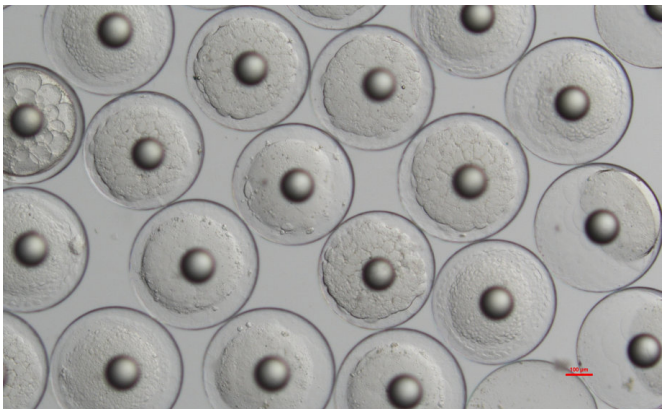
Embryonic development of *Gerres oyena*.



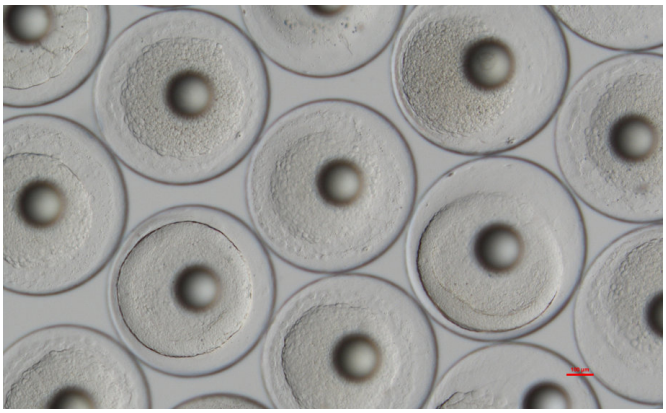
A: 2 and 4 cell stage.



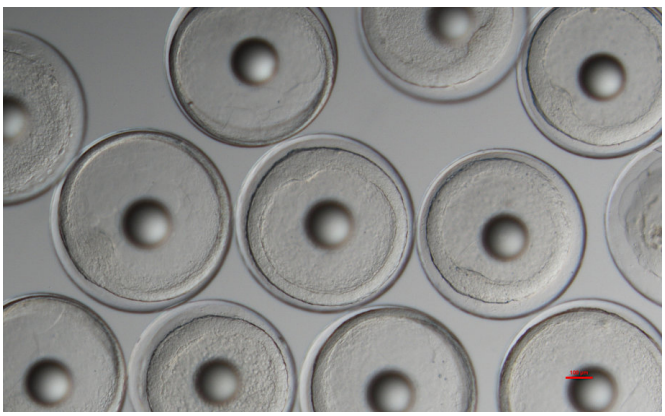
B: 8 cell stage.



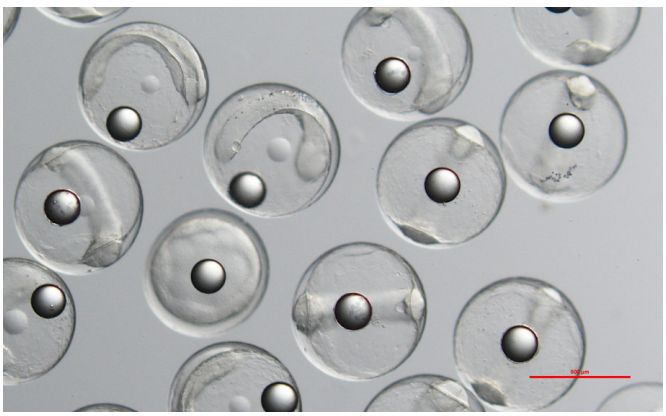
C: Morula and blastula.



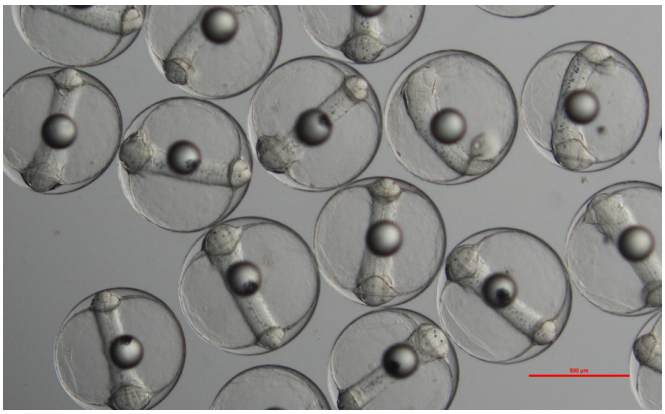
D: Gastrula.



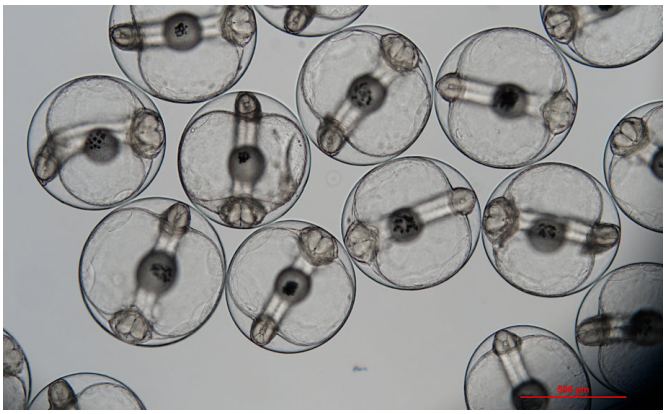
E: Neurula.



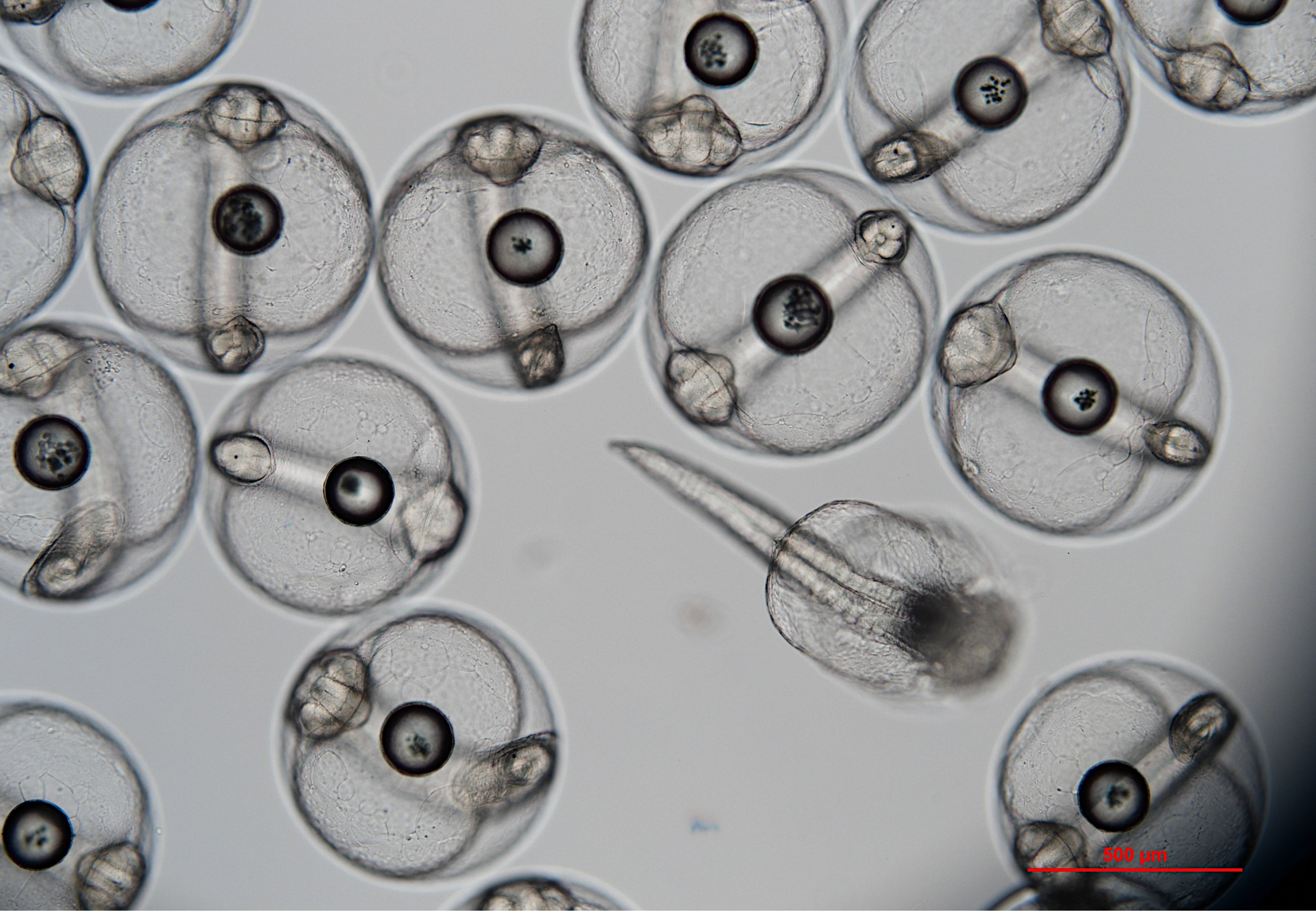
F: 6 somites.



G: 20 somites.



H: Active embryo.



I: Newly hatched larvae.

capacity each), at a stocking density of 50-150 fish per tank (1♀:1♂), after administering HCG at 400 IU/kg to the females. Water temperature was maintained at 28-29°C. After hormone administration, batch-by-batch spawning was observed from 20 April to 31 May. Staff collected 1.71 litres of eggs in total. The 1.45 litres of floating eggs yielded 2.9 million fertilised eggs (table 1).

Staff transferred the fertilised eggs to 200-µm mesh cylindrical incubation baskets in tanks supplied with gently flowing 35 ppt filtered seawater and aeration. The eggs hatched approximately 24 hours later at 28°C. The tanks produced 2.29 million newly hatched larvae, a hatching rate of 76.9%. Staff then stocked the larvae in larval rearing tanks.

Larval rearing

Staff stocked 2.229 million hatched larvae measuring 1.5 ± 0.15 mm in body length in four larval rearing tanks at a density of 15-56 larvae per litre. Staff adjusted water parameters in the larval rearing tanks to match those of the egg hatching tanks. Temperature was maintained at 28-29°C from stocking until harvest and monitored every two hours for stability. Staff added probiotic (Bactosafe) daily at 3 ppm.

From the first day post hatching, staff added mass-cultured algae to maintain green water conditions, checked every four hours to ensure a mild green colour (10,000 cells/ml). Staff introduced screened rotifers as the initial feed at 48 hours post-hatching, after confirming under a microscope that the larvae's mouths had opened. From days 2 to 6 post hatching, continuous lighting was maintained. From day 12 post hatching, staff fed unscreened rotifers at 3-5 rotifers/ml, three times daily at 7:00 am, 11:00 am, and 5:00 pm.

From 18 days post hatching, staff provided newly hatched *Artemia* at 0.1-0.5 individuals/ml, adjusted the photoperiod to 16 hours light and 8 hours dark, and renewed water flow at 100% to remove uneaten rotifers. Staff introduced artificial feed from 25 to 44 days post hatching. Staff harvested 0.423 million fry at 30-44 days post hatching, a survival rate of about 19% (Table 2).

Larval rearing protocol adopted for *Gerres oyena*.

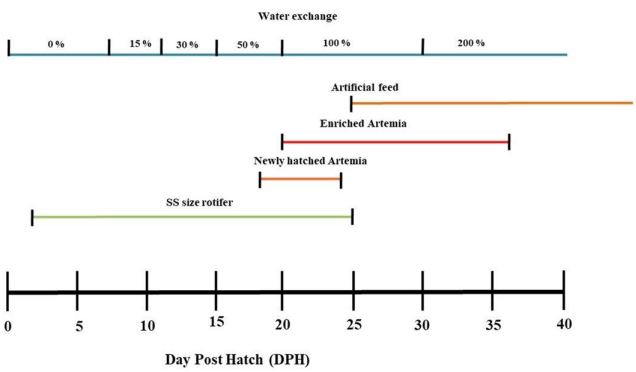


Table 1. Spawning and hatching performance of silver biddy from 19th April to 30th May 2025.

Item	Value
No of females and Males used for spawning	254: 224
No of spawning trials conducted	4
Female: Male ratio in the spawning tank	1:1
Water temperature (°C)	
minimum	26.8
maximum	29.5
Salinity (ppt)	35
Number of eggs collected (x10^3):	
Total	3620
Fertilised	2900
Unfertilised	720
Fertilisation rate (%)	80
Incubation period (hrs)	24
Number of larvae hatched (x106)	2229
Hatching rate (%)	76.9

Juvenile development and growth in the nursery

Staff harvested *Gerres oyena* fry by plankton dragnet. After harvesting, staff counted the fry and transferred them to the 14-tonne nursery rearing tank at a stocking density of 3-4 fish per cubic metre. On the first day in the nursery, staff hand-fed the fry to satiation with a formulated feed containing 58% crude protein and 15% crude fat. From the second day onward, feeding was set at 6-8% of total estimated biomass throughout the nursery period. The feeding regime used a combination of diets with the same high-quality nutritional profile. Staff distributed feed every three hours from 6:00 am to 6:00 pm.

Daily water exchange of 200-300% was maintained to remove metabolic waste quickly. Each evening, staff siphoned uneaten feed and faeces from the tank bottom to maintain water quality.

Throughout the nursery phase, staff recorded mean water quality parameters: temperature 29 ± 2°C, dissolved oxygen 6.5 ± 0.5 mg/L, pH 7.5 ± 0.2, ammonia 0.5 ± 0.2 mg/L, and nitrite 0.3 ± 0.1 mg/L.

Staff sampled fish every 15 days to assess growth performance and adjusted feeding rates and management as needed. This monitoring ensured rearing conditions remained optimal. By 100 days post-hatch, juveniles had reached an average weight of 1.8 g, representing a daily weight gain of 1.96%. Survival during the nursery phase was 80%, reflecting the effectiveness of the rearing protocols.

Gerres oyena fingerlings 100 days post hatch DPH (1.8g).

Conclusion

The reproductive peak recorded at Abu Al Abyad during April and May aligns with observations from the Gulf of Suez, Red Sea (Osman M.A. et al., 2020). This successful spawning and larval rearing trial represents a significant milestone for *Gerres oyena* aquaculture in the Arabian Gulf. Given increasing commercial interest in the species and evidence of declining wild populations, establishing a hatchery-based production system is essential for both conservation and economic resilience. To ensure long-term sustainability, further research is needed on larval weaning protocols, health management, and maintaining genetic diversity within brood stock. This achievement is expected to provide a strong foundation for regional aquaculture development and the Centre's stock enhancement programmes.

References

Al-Ghais SM (1993) Distribution of fish in mangrove swamp located along UAE coast of Arabian Gulf. J King Abdulaziz Univ 17:45-55

EAD 2020. Fisheries and Aquaculture Bulletin 2020.

Froese, R. and D. Pauly (ed.). 2000. Fish Base 2000: Concepts, design and data sources. ICLARM, Los Banos, Laguna, Philippines. 344 p.

Lieske, E., and Myers, R. 1994. Coral reef fishes. Indo-Pacific and Caribbean including the Red Sea. Collins Pocket Guide. Harper Collins Publishers. 400 pp.

Osman M.A., Azza A.A. El Ganainy, and Hafez H.M. Khouriba. 2020. Some reproductive aspects of the common silver biddy, *Gerres oyena* (Forsskal, 1775) from the Gulf of Suez, Red Sea, Egypt. Egyptian Journal of Aquatic Biology & Fisheries. Vol. 24(4): 155-167.

Randall, J.E. 1995. Coastal Fishes of Oman. University of Hawaii Press, Honolulu. 439 pp.

Shallard, B. 2003. Distribution and abundance of demersal fish stocks in the UAE. Technical Report 1. Fish Resources Assessment Survey Project of Abu Dhabi and UAE Waters.

Tamaei, S. 1999. Operation manual of fish hatchery, aquarium and mangrove cultivation in UAE. Marine Resources Research Center-Ministry of Agriculture and Fisheries, UAE, 45 pp.

Table 2. *Gerres oyena* fry production results.

Date stocked	LRT No	No. stocked	Stocking density / litre	Age (days)	Number harvested	Survival (%)
19-Apr-25	33	840,000	56	44	169,600	20.2
22-Apr-25	34	239,000	16	42	36,400	15.2
22-Apr-25	21	690,000	46	43	146,600	21.2
2-May-25	22	240,000	16	44	46,400	19.3
31-May-25	20	220,000	15	30	24,000	10.9
Total		2,229,000			423,000	18.97