

Induced Breeding of Silver Pompano

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Breeding and seed production of marine fishes depend extensively on quality broodstocks, induced maturation, spawning, larval rearing, live feed culture, and the availability of good quality water. Following the successful seed production of Cobia, Silver pompano, Indian pompano, Vermiculated spine foot, Pink ear emperor, and Orange-spotted grouper and the farming demonstration of those species in marine cages and brackishwater cages/ponds, popularized the technology among the farmers about its suitability for aquaculture. Pompanos are marine fishes in the genus *Trachinotus* belongs to the family Carangidae. The genus *Trachinotus*, occurs in all tropical oceans and comprises 19 species (Fricke et al., 2019). *Trachinotus blochii* is a deep-bodied carangid usually found around shallow coastal waters over rocky and coral reefs. Occasionally they are in small schools. The availability of silver pompano in the commercial fishery is relatively scarce, and its high market demand raises the potential for culture along the Indian coast. Pompano aquaculture has been successfully established in many countries. Silver pompano aquaculture was done in Indo-Pacific countries, especially in China, Vietnam, Malaysia,



India, and the Philippines. In India, the Central Marine Fisheries Research Institute (CMFRI)

initiated aquaculture research on pompano at its Mandapam Regional Centre in 2007, and the first successful broodstock development, induced breeding, and seed production was achieved in July 2011 (Gopakumar et al., 2012).

Broodstock collection, Transportation and Quarantine

Wild collection and transportation of adult/sub-adult marine finfish have a pivotal role in developing the broodstock in captive conditions. All the silver pompano (*Trachinotus blochii*) broodfishes are collected by wild collection from the sea only. Wild collection done from Alappuzha, Vizhinjam, Kanyakumari, Tuticorin and Ramanathapuram areas along the southwest and southeast coast of India. Availability of the broodfishes from a particular area can be assessed by a short-term market survey or by interviewing fishermen who target the particular fish. Wild collection of fish is mainly done using Gill nets and Hook and line fishing.



Fig.2. Silver pompano fishes removing from the gill net operated off Alappuzha coast, Kerala, India

Handling

Handling of brood fishes during the collection process should be minimal to prevent physical injury and physiological stress. Damage to the slime (mucus) layer, scales, and skin of the fish can result in infection which leads to secondary infection and may lead to

mortality after the transportation. Knitted fine-mesh dip nets are recommended for handling fish to minimize injury and scale loss (Rottman *et al.*, 1991).

Transportation

Ideally, transporting tanks/packets should be filled with water from where the broodfish are collected. Silver pompano can be transported both in tank method and plastic bag method. Size of the plastic bag is crucial for transportation and the plastic bags should be filled with 3 parts oxygen to 1 part of water. If the fish weight is more than 200 gm, it is better to opt tank method for transportation. So as to maintain the water temperature levels in a controlled manner, it is better to keep the plastic bag with fish inside the insulated or air-conditioned chamber in the vehicle. The collection process of broodfish always leads to a high level of physiological stress in them. So as to resolve this, a high level of dissolved oxygen is necessary for them to recover from the oxygen debt situation.



Fig.3. Plastic bag with brood fish loading to the vehicle

In the tank method of transportation, one holding tank of Fibre glass or triple layered plastic tanks (Aquatech, India) of suitable capacity like 250 or 500 or 1000 L (according to the quantity needed to transport and capacity of the vehicle), Oxygen cylinder and a small air pump (battery operated) can be used to transport the fish. Tanks should be aerated. The

tank should be equipped with pure oxygen regulated to maintain dissolved oxygen concentrations at a minimum of 7 ppm (Kohler, 1997). A portable generator of 220-240 Voltage can be used as a stand by equipment to avoid critical conditions like air cut off etc. Warm water also reduces available oxygen and increases the metabolic rate of the fish, adding further physiological stress. The stocking density of fish is a critical factor which determines the survival of the brood fishes. A stocking density of 100 g/50 L is found advisable for the transportation of silver pompano. It is advisable to transport the fish during the early morning hours or night hours to avoid the temperature hike from sunlight. Ice blocks wrapped in plastic cover may be added to the holding tank during transportation to prevent an increase in water temperature.

Quarantine

After unloading the fish from the transporting vehicle, immediately transfer to the quarantine section. Quarantine tanks (fibre reinforced plastic) are of 3000 L capacity with 24 hr aeration facility. Stocking density inside the quarantine tanks is of crucial factor for the survival of wild fish transported to the hatchery. A stocking density of 100 gm/200 L with 200% water exchange was found optimum for the silver pompano quarantine facility.

Various treatment procedures can be used to limit the entry of external parasites in the hatchery system from the wild-caught fishes transported. The infected fishes were primarily treated with formalin at the rate of 10 ppm as bath treatment for 5 consecutive days which was found to be effective during the course of infection with 200 % water exchange (100 % two times) every day. Dip treatment with chloroquine phosphate (Lariago 250 mg tablets; Ipca Laboratories Pvt. Ltd.) at a dosage of 500 mg/100 L of water (Ramesh kumar *et al.*, 2015) was found effective for silver pompano fishes. Feeding during the treatment should be avoided in the daytime so as to maintain the water quality parameters in a stable condition. Short time exposure of brooders (maximum 5 minutes) in freshwater and treatment with 100 ppm formalin for 2- 5 min, were also found helpful in removing the external parasites. Once the quarantine period is over, they can be transferred to the

maturation tanks. It is advisable to do freshwater dip treatment quarterly for the silver pompano brooders.

Broodstock management of Silver pompano in RAS

Proper care should be given to broodstock in captivity (here RAS) to get successful spawning. The viability of the larvae is very much dependent on broodstock nutrition. The nutritional components in the diet, the feed intake rate or the feeding period can all affect spawning, egg and larval quality (Gopakumar *et al.*, 2012). Improper care may lead to disease outbreaks and mortality in maturation tanks. In the case of maturation of wild caught silver pompano in RAS, the male and female broodstock of above 1.5 Kg is an ideal size for successful captive breeding and hatchery production of good quality larvae. Stocked fishes were fed once daily at the rate of 5 % of their body weight with fresh cleaned sardines, and anchovies. Fresh squid was given every day along with vitamin C and vitamin E tablets once a week.

Maturation Tanks

After the fish are transferred to the maturation tanks with the recirculation facility, they are usually segregated by sex and kept in a sex ratio of 2:1 (male: female). Segregation of fishes has done by cannulation and tagging process. It is preferable to place round tanks as maturation tanks to ensure proper water circulation. Silver pompano is comparatively fast swimming fishes and any small disturbance may tend the fish to jump out of the tank and thereby tank should be covered with a net. The stocking density of broodstock maintained in RAS was 1 kg/1000 L. Pompano broodstock performed better in circular tanks with 10 Ton capacity. Excess broodstock can be maintained in coastal/open sea cages.

Water quality requirements

Seawater to be used in the facility should enter a storage tank where it should be treated with hypochlorite solution. Water quality requirements in the maturation tank system are a temperature of 27–29 °C, salinity of 27–32 ppt, ammonia of ≤ 0.02 and a pH of

7.8–8.5, permitting adequate feeding of the broodstock while maintaining optimal and stable water quality.



Fig. 4. Broodstock fish tanks

Feeding

Wild-caught pompano brooders can be trained to accept and maintain on trash fish, squid meat and formulated feed for over four years. Newly collected pompano should not be fed until all therapeutic treatments are completed. This delay assures the fish will be hungry when feed is first offered, and prevents habituating fish to ignore feed by presenting it to them when stress or disease agents impede their appetites (Kohler, 1997). Initially, fishes are fed with squid and trash fish by hand feeding. After a period of one month, mix squid meat (better to keep the formulated feed inside the end portion of squid) with formulated feed and train them to accept it.



Fig. 5. Feeding the Silver Pompano broodstock

It is very important to observe the broodfish during feeding, so that we can understand the feeding pattern and health profile of the broodstock. If there is any reluctance to feed, the fish should be shifted to the quarantine section as soon as possible and start the treatment.

Tagging

A Passive Integrated Transponder (PIT) tag, also known as a radio frequency device permanently marks fish internally. The tag is designed to last throughout the life of the fish, providing a reliable, long-term identification method. Passive Integrated Transponder (PIT) tags act as a lifetime barcode for an individual animal, analogous to a Social Security number, and, provided they can be scanned, are as reliable as a fingerprint (Gibbons & Andrews, 2004). In maturation tanks, PIT tagging can be used to answer questions regarding growth rates and maturation stages.



Fig.7 (a) PIT tags and tagging gun, (b) PIT tag reader, (c) PIT tagging of Pompano brooder fish,

(d) Reading the PIT tag in pompano brooder fish

Normally, intramuscular insertion is preferential (below the muscular region of dorsal fin) for pompano brooders. In normal cases, pit gag causes no mortality and little incidents of infection. The maturation stages of the fish can be assessed by cannulation of the particular fish and can be recorded in the register of the particular fish. Each tag represents a specific number which can be recorded in a register along with the growth measurements (and maturity stages) of the fish. After a definite period, fish can be recaptured, and PIT tag reading can be used to identify the particular fish. Various studies confirmed that pit tagging won't cause any serious impact on the survival or growth of the fish in hatchery conditions.

Ovarian biopsy to assess gonadal maturity (Cannulation)

Monitoring of oocyte development in fish was carried out at frequent intervals to determine its maturity. Oocytes collected via cannulation were observed under microscopes to analyze the diameter of the eggs. The procedure of Ovarian biopsy is given below

1. Female brooders have to be transferred to a small tank containing anaesthesia, the anaesthetic agent used is 2-phenoxy ethanol (standardized to 10ml for 100 L seawater).
2. Flexible, sterile catheters, an infant feeding tube with a total length of 520 mm and size 2.00 mm, (FG -06) are introduced through the genital pore into the oviduct for a few cm up to the ovary. A mild pressure will be applied to suck out the oocytes till a small sample of oocytes up into the catheter and placed the sample on a glass slide.
3. After sampling, release the animal into the tank, where recovery from sedation will take place. The fish will be recovered from the sedation within 2-3 minutes. Take care to hold the fish in the tank till it recovers from sedation to avoid bleeding in the fish due to a slap at the tank due to anaesthesia
4. The biopsy sample is then examined under the microscope; the diameter of the oocytes is measured, and the different stages of gonad development are also noted.

The different maturity stages are;

- a) Early developing stage-** Immature ovaries are relatively small with a size of 80-120 μ in diameter. Ovarian tissue was dominated by previtellogenic oocytes and strands of stromal tissue. Ovary with different stages of previtellogenic oocytes visible in the early developing stage ie; pre perinuclear oocyte, early perinuclear oocyte, and late perinuclear oocyte.
- b) Maturing stage-** Vitellogenesis begins with the appearance of oil droplets, yolk vesicles, and cortical alveoli vesicles surrounding the nucleus stage. Oocytes increase in size with a diameter of 350- 450 μ .



Fig.8: Cannulation

- c) Mature egg stage:-** The wall becomes thin due to the expansion of the ovary as it ripens and oocytes mature. Induce breeding is carried out at this stage with an egg diameter of >500 μ .
- d) Spent/Artesia stage-** Characterized by the presence of previtellogenic atretic oocytes without yolk granules and vitellogenic atretic oocytes with yolk granules.

Microscopes connected to a system with ZEN software, a modular image-processing and analysis software for image acquisition, processing, analysis and documentation for ova diameter studies.

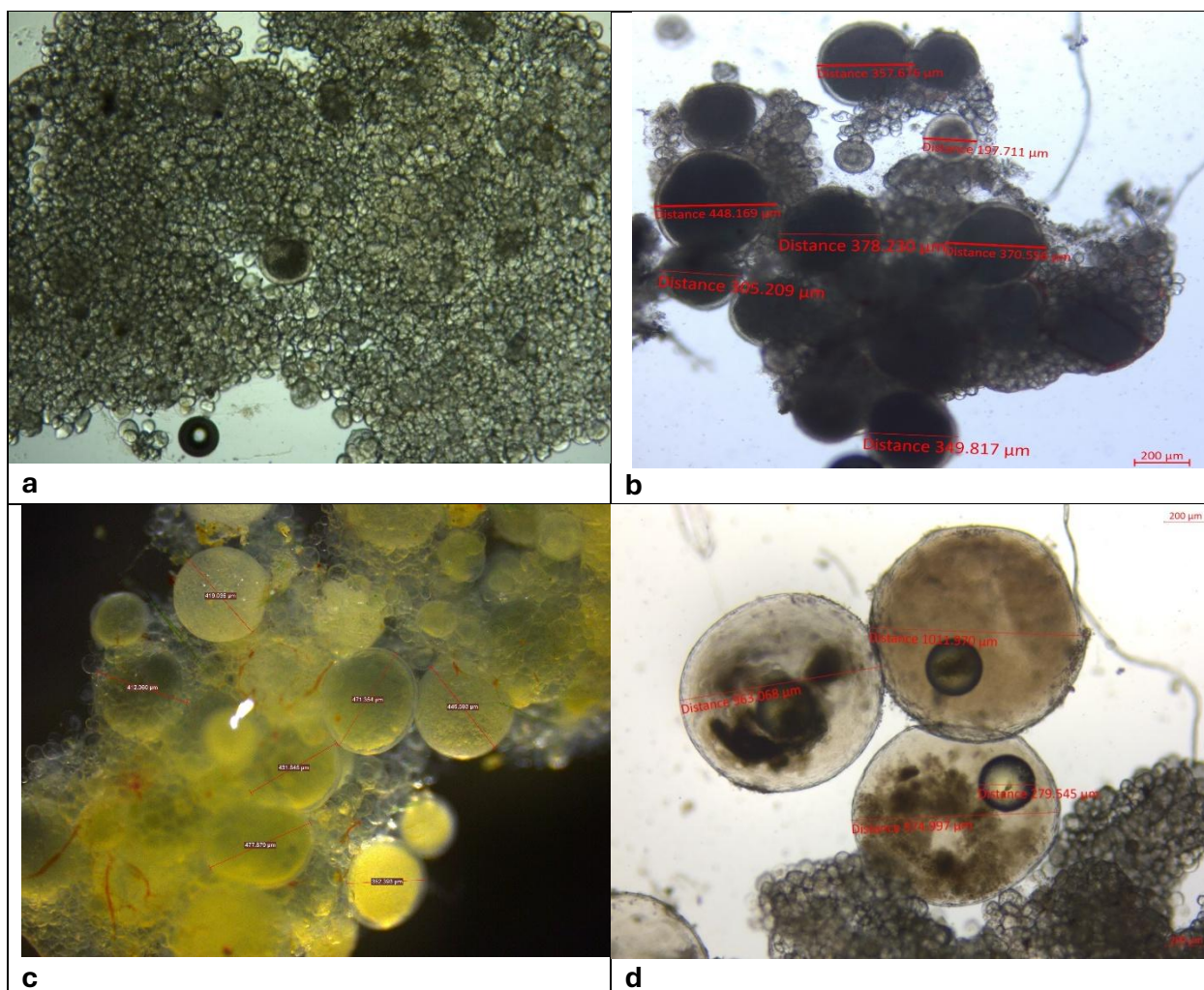


Fig.9. Developmental stages of oocytes a; immature/ honeycomb stage, b; Maturing stage, c; Mature, d; Spent/Artesia

Hormonal Induction

In captivity, natural spawning is rare due to the absence of environmental cues such as seasonal variations, currents, or photoperiods. To overcome this, hormonal induction is employed to stimulate the final phase of oocyte development and ovulation.

Criteria for Induction:

- Oocyte diameter must exceed 450 μm .
- Fish selected should be healthy and mature, preferably weighing between 1.5–5 kg.
- Common sex ratios include 1:2 or 1:3 (female: male).

Hormonal Agents and Dosages:

- *Human Chorionic Gonadotropin (hCG)*: 350 IU/kg body weight, administered as a single dose intramuscularly.
- *LHRHa Analogue*: Initially trialed at 100 µL/kg for females and 50 µL/kg for males, later standardized to 150 µL/kg for females and 75 µL/kg for males.



Fig.10: Hormonal inducement of Silver pompano

Egg collection

Once spawning has occurred, egg collection must be handled carefully to preserve egg viability. Aeration in the spawning tanks is turned off to allow non-viable eggs to settle. Floating, fertilized eggs are gently collected using a scoop net with 500 µm mesh. These are then transferred to temporary containers for evaluation. Eggs are examined under a microscope to assess quality, quantity, and developmental stage. Only those at the appropriate stage of development and with a healthy appearance are selected. Egg collectors may also be used if set up properly, enabling the separation of floating (fertilized) eggs from those that sink (unfertilized or poor-quality). Frequent monitoring helps prevent collector clogging, which could damage the eggs.



Fig. 11: Collected Pompano eggs

Larval Rearing

Newly hatched larvae must be assessed for health before being stocked into larviculture tanks. Under microscopic observation, larvae are evaluated for body shape, pigmentation, internal organ visibility, and presence of deformities or parasites. A typical stocking density is 5–10 larvae per litre. At hatching, the larval mouth is closed, and the digestive tract is undeveloped; initial survival depends entirely on the yolk sac. Larvae are stocked in 5000 L tanks containing 4000 L of filtered seawater and green water at a microalgal density of 1×10^6 cells/mL. Mild aeration is maintained. By the third day post-hatch (dph), the larvae's mouth opens (approximately 230 μm in size), and external feeding begins. The feeding schedule is as follows:

- 3–14 dph: Enriched rotifers (5–8 rotifers/mL)
- 8–12 dph: Co-feeding with enriched *Artemia* nauplii

- 13–18 dph: *Artemia* nauplii (3–5/mL)
- From 19 dph onwards: Transition to inert larval diets

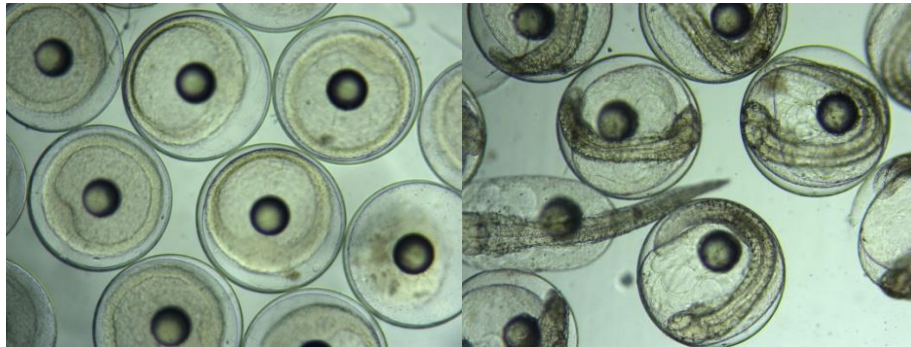
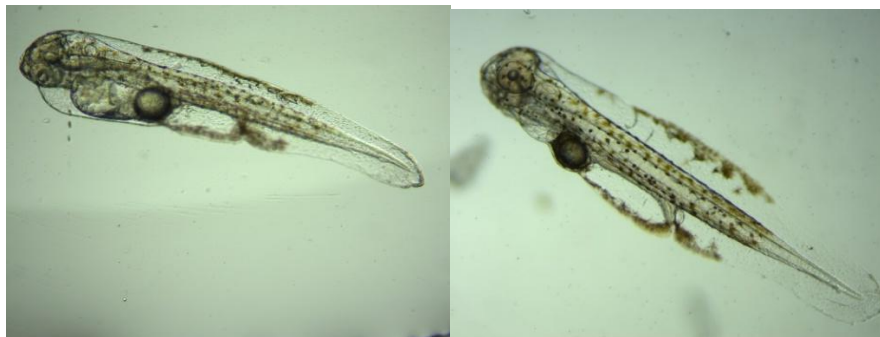


Fig 12. (a) Fertilized eggs

(b) Hatching started



(c) 1 dph

(d) 2 dph

Larval metamorphosis begins at 18 dph and is completed by 25 dph, by which point juveniles are formed. To prevent cannibalism, size grading is performed between 20 and 25 dph. The critical mortality window is between 3–5 dph, primarily due to developmental issues; beyond this, cannibalism becomes the main threat. Water exchange is carefully managed:

- Up to 7 dph: Minimal exchange
- 8–14 dph: Gradual increase from 10% to 100%
- Post 25–30 dph: Nursery phase begins with a daily 100% water exchange.

During this nursery phase, juveniles are transitioned to larger pellet feeds, starting with 800 μ m size, followed by floating larval diets of increasing size. Key water quality parameters, salinity, temperature, pH, oxygen, and ammonia, are continuously monitored. Juveniles

measuring 1–1.5 inches are suitable for transfer to grow-out systems in marine or brackish water cages for further rearing.

Summary

Silver pompano (*Trachinotus blochii*) has proven to be a highly promising species for sustainable mariculture in India, due to its rapid growth, broad salinity tolerance, high market demand, and excellent adaptability to captive conditions. Through significant advances in hatchery technology, broodstock management, and larval rearing protocols developed by ICAR-CMFRI, this species has transitioned from exploratory research to practical commercial farming. The successful establishment of breeding, larval rearing, and nursery rearing techniques has created a robust foundation for pompano seed production. With the standardised protocols now widely adopted across India's coastal regions, silver pompano cultivation offers a viable livelihood option for small-scale fishers, entrepreneurs, and coastal farming communities. The species' resilience and favourable economics make it a key contributor to India's blue economy and a benchmark model for the development of marine finfish aquaculture in the country.

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