

SEED PRODUCTION OF GREY MULLETS



Distribution and importance:

- Milk fish belongs to the family Mugilidae and Order Mugiliformes
- It is distributed in the Indo-Pacific region; commonly cultured in Indonesia, Philippines, Taiwan, etc.
- It is one of the most important brackishwater fishes cultured in freshwater and brackishwater.
- Found in both the coasts of India, but is more abundant in the east coast.
- Milk fish is hardy, highly resistant to diseases, euryhaline, herbivorous and easy to culture.
- Widely cultured in South-east Asian countries in brackishwater and marine waters.

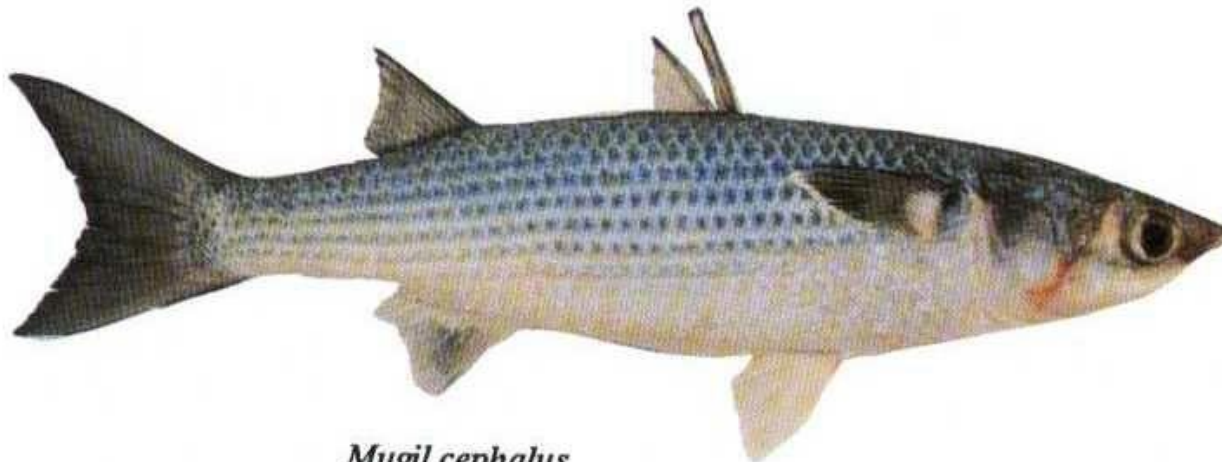
- Harvested from Indian estuaries and coastal waters.
- Forms an important fish in pokkali fields of Kerala
- It is a good food fish.
- *Mugil cephalus* (striped grey-mullet) is the most important species and has good growth rate.
- *M. cephalus* grows to comparatively to a large size (400-500g in 6-8 months).
- Grey mullets are euryhaline.
- Non-availability of seed is a major constraint



Figure: Grey mullet, *Mugil cephalus*

Identifying characters:

- *M. cephalus* has elongate and stout body, with emerginate caudal fin. Head moderate, concave between eyes
- Mouth ventral, protrusible. First dorsal fin inserted nearer to caudal fin.
- Dull brown superiorly, lighter along abdomen; dorsal and anal fins stained with gray. Eyes golden.



Mugil cephalus

Brood-stock development:

- *M. cephalus* broodstock is raised in rectangular cement tanks in the presence of benthic algae and plankton and artificial feed
- Female brooders are selected based on ova-diameter.
- Females that possess eggs having a diameter of 600 μm or more are selected for injection.
- Gonadal development is synchronous and six stages gonadal maturity are found.
- Mature brooders of 4-6 years are preferred.

- Does not spawn naturally in captivity.
- Spawns naturally in open sea during May-August.
- Difficult to identify ripe brooders based on morphological characters.
- Fecundity : one million/kg b.w.

Induced spawning

<u>Hormone</u>	<u>Dosage</u>	
	Female	Male
1. Carp pituitary homogenate (CPH)	20 mg/kg	1/3 dose
2. HCG	5,000-10,000 IU/kg	1/3 dose
3. mLHRH-a	200-400 µg/kg	-
4. Synahorin (HCG + CPH)	10 – 60 Rabbit units	-

- No. of injections – mostly two, interval between the two is 24 h
- Water quality requirements: Salinity – 32-38 ppt, temperature - 27-32°C
- After 2nd injection, 2-3 males are released with one female
- Dry method of fertilization is practiced, if necessary.
- Spawning occurs 12-18 h after injection.
- Hatching period : 16-30 h.

Larval rearing:

- Larvae are small, ranging from 2.5 to 3.5 mm and tend to avoid direct sunlight.
- Hatchlings are fed with *Artemia* nauplii and zooplankton.
- The larvae grow to fry stage in about a month and are ready for transfer to freshwater nursery pond.

Seed production of milkfish, *Chanos chanos*



Distribution and importance:

- Milk fish belongs to the family Chanidae and Order Clupeiformes
- Distributed in the Indo-Pacific region; commonly cultured in Indonesia, Taiwan, Philippines, etc.
- Found in both the coasts of India, but is more abundant the east coast.



Milkfish (*Chanos chanos*)

- Milk fish is hardy, highly resistant to diseases, euryhaline, herbivorous and easy to culture
- Can be cultured in freshwater, brackishwater and marine waters.
- It is not only an excellent food fish, but also an ideal bait fish for tuna.
- Grows to 400-500g in 5-6 months.

Identifying characters:

- Mouth small and inferior; dorsal origin midway between front border of eye and caudal base
- Anal small; Caudal deeply forked.
- Body bluish-grey above, sides and abdomen silvery
- Dorsal and caudal dusky. Pectoral, pelvic and anal dotted with black along with their margins



Brood-stock development:

- Milk fish is heterosexual (no incidence of hermaphroditism).
- Both wild and captive broodfish respond to hormone injection.
- Captive broodstock is managed in brackish-water earthen ponds/cement ponds/cages.
- Fed with supplementary diet.
- Gonadal development is synchronous and six stages gonadal maturity are found.

- Males mature at 4+ years, while females take 5+ years to mature.
- Does not spawn naturally in captivity. Spawns naturally in open sea during May-August.
- Difficult to identify ripe brooders based on morphological characters.
- Ova-diameter (0.70 - 0.89 mm) indicated ripe ova.
- Fecundity – 2-8 million/kg b.w.

Induced spawning

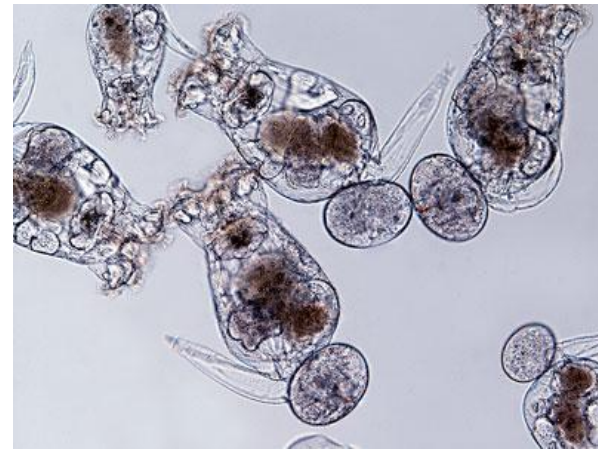
- Hormones and dosage are as follows:

<u>Hormone</u>	<u>Dosage</u>	
	Female	Male
1. Salmon Pituitary homogenate	6-10 mg/kg	1/3 dose
2. Carp Pituitary homogenate	5-25 mg/kg	1/3 dose
3. HCG	180-2500 IU/kg	1/3 dose
4. sGnRH-a/mLHRH-a	10-20 ug/kg	-

- No. of injections – mostly two, sometimes only one; interval between the two – 8-12 h
- Water quality requirements: Salinity – 14-34 ppt, temperature - 21-31°C
- Interval between injection and striping : 6-17 h; striping and artificial fertilization
- Natural spawning is preferred as it is very sensitive to handling; repeated spawning is possible.
- Hatching period : 20-25 h.

Larval rearing:

- One-day-old hatchlings are fed with *Chlorella* spp.
- From the 2nd day, rotifer (*Brachionus plicatilis*) and *Artemia* nauplii are given .
- In about 20 days, the larvae reach 12-18 mm, the stocking size for grow-out.



Brachionus plicatilis

Seed production of Asian seabass, *Lates calcarifer*



Distribution and importance:

- *L. calcarifer* belongs to the family Centropomidae and Order Perciformes.
- Good export market, esteemed fish in West Bengal.
- Carnivorous and highly predatory, cannibalistic when food is scarce.
- Grows to 300- 400 g in 3-4 months and 700-1200 g in 8-12 months. Maximum size recorded is 200 cm.
- Spends the growing phase in shallow brackish-water, estuaries and rivers.



L. calcarifer

Identifying characters:

- Elongate and compressed body, with a deep caudal peduncle.
- Head is pointed with a concave dorsal profile , becoming convex in front of the dorsal fin.
- Mouth large, slightly oblique and the lower edge of the pre-opercle is serrated, with a strong spine.
- Adults are greenish or bluish above and silvery below.
- Eyes are bright pink, glowing at night.



L. calcarifer

Food and feeding:

- Highly predatory, adult feeding on small fish and crustaceans.
- Juveniles are omnivorous.
- Fry feed on zooplankton, while fingerlings prefer small crustaceans, worms, mollusks, etc.

Breeding season:

- Breeds during April – August, migrates to deeper waters for breeding.
- Is a protandrous hermaphrodite (functions first as male and then turns to female after spawning, i.e. natural sex-reversal).
- Fish in the weight range 2 – 3.5 kg are males, whereas those in the size range 3.5 – 5.0 kg are females.
- Three to four year-old fish show 1:1 (M:F) sex ratio.
- Males mature at 25 cm length.

Brood-stock development:

- Maturing fish (2-7 kg) collected from fishermen is stocked in 100 ton capacity concrete tanks with clean running water pumped from sea (sand-filtered).
- Water exchange at 70% daily
- Optimum salinity 28-32 ppt
- Fed with trash fish (live/fresh/frozen) like tilapia, sadines, anchovies, etc.
- Feeding rate 5%
- Prophylactic treatment with 100 ppm formalin to control parasites.
- Water quality monitored regularly



Male and female *Lates calcarifer*

Spawning induction:

- Attains maturity in captivity, but doesnot spawn naturally
- Females with >0.45 mm ova-diameter selected for induced breeding
- Females are implanted with LH-RH at 60-70 $\mu\text{g}/\text{kg}$
- Males without milt are implanted with LH-RH (30 $\mu\text{g}/\text{kg}$) and 17 α -MT pellet
- Females respond to the hormone 30-35 hours after implantation

- Ripe females ooze ova with pressure on abdomen and have swollen abdomen and anal region
- Males ooze out milt with a slight pressure on abdomen and have anal region with thicker scales
- Males are stripped first and milt stored up to 4-5 days
- Females are stripped off their eggs and fertilized with stored milt using dry method of fertilization

ASIAN SEABASS (LATES CALCARIFER) SEED PRODUCTION – AT A GLANCE

INDIGENOUS SYSTEM



BROOD STOCK DEVELOPMENT

- ◆ Brood fish size 2-7 kg
- ◆ Water exchange @ 70% daily –good quality seawater (28-32 ppt)
- ◆ Feed trash fish @ 5% body weight
- ◆ Prophylactic treatment with 100 ppm formalin
- ◆ Monitor maturity regularly

SPAWNING AND INCUBATION

- ◆ Select gravid female (ova diameter > 0.45mm)
- ◆ Hormone LHRH @ 60-70 µg/kg for females and half the dose for males
- ◆ Spawning after 30-36 hr
- ◆ Egg density 500 numbers/litre
- ◆ Larvae hatch after 15-17 hrs



LARVAL REARING

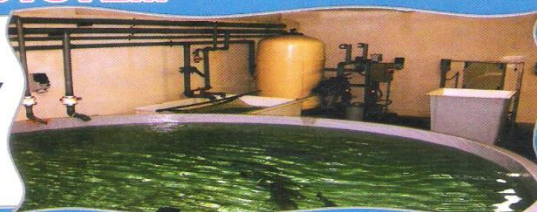
- ◆ Larval density @ 30/litre
- ◆ 3rd -10th day - feed rotifers @ 20-30/litre
- ◆ Water exchange @ 40% daily
- ◆ Add green water and quality seawater
- ◆ 11th -15th day - feed *Artemia* nauplii and rotifer
- ◆ 16th - 25th day - only *Artemia* nauplii
- ◆ Transfer larvae (15 mm) to nursery



IMPROVED SYSTEM

RECIRCULATORY FACILITY

- ◆ Water biosecurity & automation
- ◆ Broodstock maturation – recirculation, salinity and temperature manipulation
- ◆ Reduced stress & extended spawning period
- ◆ High larval density (100 larvae/litre)
- ◆ Quality seed (30mm) production



ECONOMICS (Rupees for 1 million production capacity)

INPUT	INDIGENOUS	IMPROVED
Hatchery construction (lakhs)	59.00	100.00
Running cost/year (lakhs)	12.38	20.00
Seed sale price (Rs/piece)	2.25	4.00
Gross income (lakhs)	22.50	40.00
Net income (lakhs)	10.12	20.00



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- Intermittent spawner and releases eggs in batches over a period of 2-5 days.
- Diameter of fertilized eggs : 0.8-0.85 mm
- Fecundity : 2-17 million/kg b.w.
- Fertilized eggs are pelagic and transparent
- Hatching period : 17-18 hours at 29-31 C.
- Eggs are hatched in 500 l capacity conico-cylindrical tanks at 100-200 eggs/l.
- Larvae depend on yolk for 3 days

Larval rearing:

- The hatchlings (1.2-1.4 mm) are transferred 2-4 ton capacity tanks and reared at 30-50 nos./l
- Rotifer (*Brachionus plicatilis*) is given from 3rd day at 20-30 nos./l, with 40% water exchange daily
- *Artemia* nauplii (2,000-3,000/l) and the rotifer are given during 11th -15th day
- Only *Artemia* (4,000-6,000/l) during 16th-25th day
- The larvae reach 1-1.5 cm after 25-30 days when they are transferred to outdoor nursery tanks.