

## Broodstock collection\*, Transportation and Maintenance of Marine finfishes

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### Introduction

Wild collection and transportation of adult/sub-adults of marine finfish have a pivotal role in developing the broodstock in captive conditions. Physiological stress and physical injury of a brood fish while transportation and handling may have a more detrimental effect on spawning success than any other factor (Rottman *et al.*, 1991). Mainly marine broodfishes are collected from the wild only. Wild collection can be done from Alappuzha, Vizhinjam, Kanyakumari, Tuticorin and Ramanathapuram areas along India's southwest and southeast coast.

The availability of broodfishes from a particular area can be assessed by a short-term market survey or by interviewing fishermen who target the particular fish. Experienced fishermen can confirm the presence of sub-adults of target fish around 200 meters from the high tide line during the post-monsoon period. Wild collection of fishes mainly done using Gill nets and Hook and line fishing.

### Gillnetting

Both stationary and drift gill nets can be used to collect broodfishes. They allow a large area of water to be fished to determine migratory routes and areas of brood fish concentration. The mesh size of the net depends upon the size of the target brood fish. The nets must be checked every 15 to 30 minutes to reduce the mortality and physical stress of the fish (Rottman *et al.*, 1991; Satterfield and Flickinger, 1996).

### Hook and line

Sub-adults or adults of fish can often be captured by hook and line in some areas where trawling like practices are not possible. Non-trawlable fishing grounds of coastal



Fishes removing from the gill net operated off Alappuzha coast, Kerala, India\*

\*Always check with your state conservation department to determine legal capture methods and obtain proper permits.

waters with coral or rocky outcrops which inhabit a more extensive variety of fish are much more suitable for hook and line fishing. Some fishes can be caught by hook and line only, and it is a selective fishing gear which completely cuts off the by-catch quantity.

The chance for physical injury is high in this method as compared with the Gill netting. Since the fish might be under high stress during the collection process, it is critical to minimize the handling time. When the targeted fish is captured in hook and line, it must be removed from the hook and transferred to the oxygenated water in a tank. Minimize the number of times the fish are lifted from the water, and work as quickly as possible when transferring fish to a holding tank. If there is any minor wound due to hooking, it can be treated using Betadine ointment during the quarantine treatment.

### Handling

Handling brood fishes during the collection process should be minimum to prevent physical injury and physiological stress. Damage to the slime (mucus) layer, scales, and skin of the fish can result in infection, leading to secondary infection and mortality after the transportation. Knitted fine-mesh dip nets are recommended for handling fish to minimize injury and scale loss (Rottman *et al.*, 1991).



Handling using fine mesh net



Transferring to holding tank,



Fishes inside the tank



Holding tank with fish transporting to the vehicle

### Transportation

Ideally, transporting tanks/packets should be filled with water from where the broodfish are collected. Marine finfish can be transported both in the tank method and plastic bag method. Size of the plastic bag is crucial for transportation and the plastic bags should be filled with three 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. To maintain the water temperature levels in a

controlled manner, it is better to keep the plastic bag with fish inside the air-conditioned chamber in the vehicle. The collection process of broodfish always leads to a high level of physiological stress in them. To resolve this, a high level of dissolved oxygen is necessary for them to recover from the oxygen debt situation.

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 standby equipment to avoid critical conditions like air cut-off. 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 advisable for transporting marine fish. Transporting the fish during the early morning hours or night hours is advisable 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.



Plastic bag with brood fish loading to the vehicle



(a) Transporting vehicle with two holding tanks, oxygen cylinder and air pump



(b) unloading the fish to the quarantine section in the hatchery.

## 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 a 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 to be optimum for the quarantine facility.



## Broodstock management 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 broodfishes (like silver pompano) in RAS, the male and female broodstock 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 daily along with vitamin C and vitamin E tablets once a week. (Anil *et al.*, 2019).

## Maturation Tanks

After the fishes 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 fish has been done by cannulation and tagging process. It is preferable to place round tanks as maturation tanks to ensure proper water circulation. Broodstock, like Silver pompano, is a comparatively fast swimming fish, and any minor disturbance may tend the fish to jump out of the tank thereby tank should be covered with a net. The stocking density of broodstock maintained in RAS was 1 kg/1000 L. Excess broodstock can be maintained in coastal/open sea cages.

## Water quality requirements

Seawater used in the facility should enter a storage tank and be treated with a hypochlorite solution. Water quality requirements in the maturation tank system are a temperature of 27–29 °C, a salinity of 27–32 ppt, ammonia of  $\leq 0.02$  and a pH of 7.8–8.5, permitting adequate feeding of the broodstock while maintaining optimal and stable water quality.



Brooder fishes in maturation tanks

## Disease control

Adult fishes captured from the wild or culture ponds are often infested with ciliated protozoans and/or monogenetic trematodes. Fungal infections or injuries sustained during collection and hauling are also common. Therapeutic treatments of formalin and Chloroquine phosphate at a standard concentration (Kohler, 1997; Ramesh Kumar *et al.*, 2015) are usually sufficient to treat these diseases.

## Feeding

Newly collected fish 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 from ignoring feed by presenting it to them when stress or disease agents impede their appetites (Kohler, 1997). Initially, fish can be 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.



Trash fish and squid ready to feed broodstock

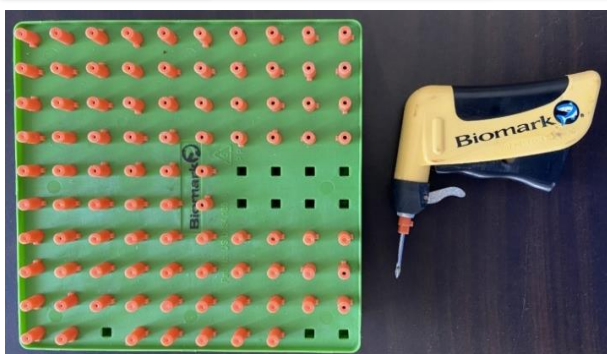
### Feeding Schedule maintained in Silver pompano brood bank

It is essential to observe the broodfishes during the feeding to 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 immediately as possible and start the treatment also.

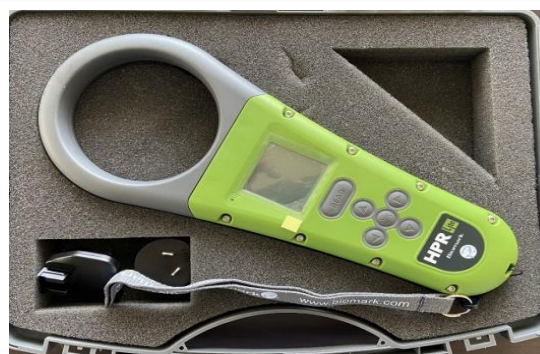
Sunday	Squid with pellets
Monday	Squid and fish
Tuesday	Squid with Vitamin C
Wednesday	Squid and fish
Thursday	Squid with Vitamin E
Friday	Squid with pellets
Saturday	Squid and fish

## Tagging

Passive Integrated Transponder (PIT) tag, also known as is a radio frequency device to permanently mark 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.



PIT tags and tagging gun



PIT tag reader



PIT tagging of brooder fish



Reading the PIT tag in brooder fish

Usually, intramuscular insertion is preferential (below the muscular region of the dorsal fin) for brooders. In standard cases, pit tag causes no mortality and few incidents of infection. The maturation stages of the fish can be assessed by cannulation of the particular fish and recorded in the particular fish's register. 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 wouldn't cause any severe impact on the survival or growth of the fish in hatchery conditions.

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