Marine Aquaculture 3

PhD. student

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Hatchery equipment and accessories

Water pump

There are two types of water pumps required for small-scale hatchery operation. A pump of 5 horse power (hp) is required to pump seawater to the hatchery's sand filter tank. A separate submersible pump is required to distribute water within the hatchery system if needed, such as transferring microalgae for rotifer culture.

Generator

A generator of 1 KVA is essential as a backup electricity supply for small-scale hatcheries. Even apparently reliable main electricity supplies can fail (e.g. during severe storms).

Aeration system

Air blowers are generally used to provide aeration in hatcheries. In small-scale hatcheries these are usually 100-watt air blowers with at least one back up unit while the other is running.

Small air blower

Hatchery equipment and accessories

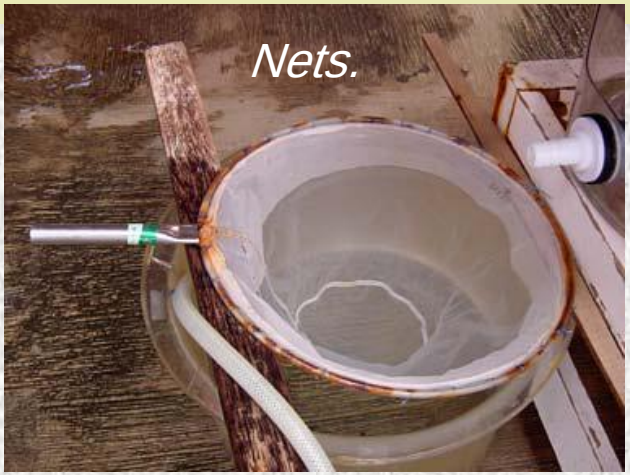
Temperature

The optimum water temperature for marine finfish hatcheries in tropical regions is around 26–30°C. In most parts of Southeast Asia, marine finfish hatcheries do not use heaters to elevate water temperature. However, most small-scale hatcheries are enclosed to reduce temperature variation.

Lighting

A 40-watt (or similar) fluorescent tube can be used for each larval rearing tank (6–10 m³ capacity). The fluorescent light is normally installed above the tank and about 30-60cm above the water. Light is necessary for the larvae to visually hunt for live prey and the use of artificial lighting helps keep a consistent rearing environment in the tanks.


Microscope


Nets.


Dipping buckets.

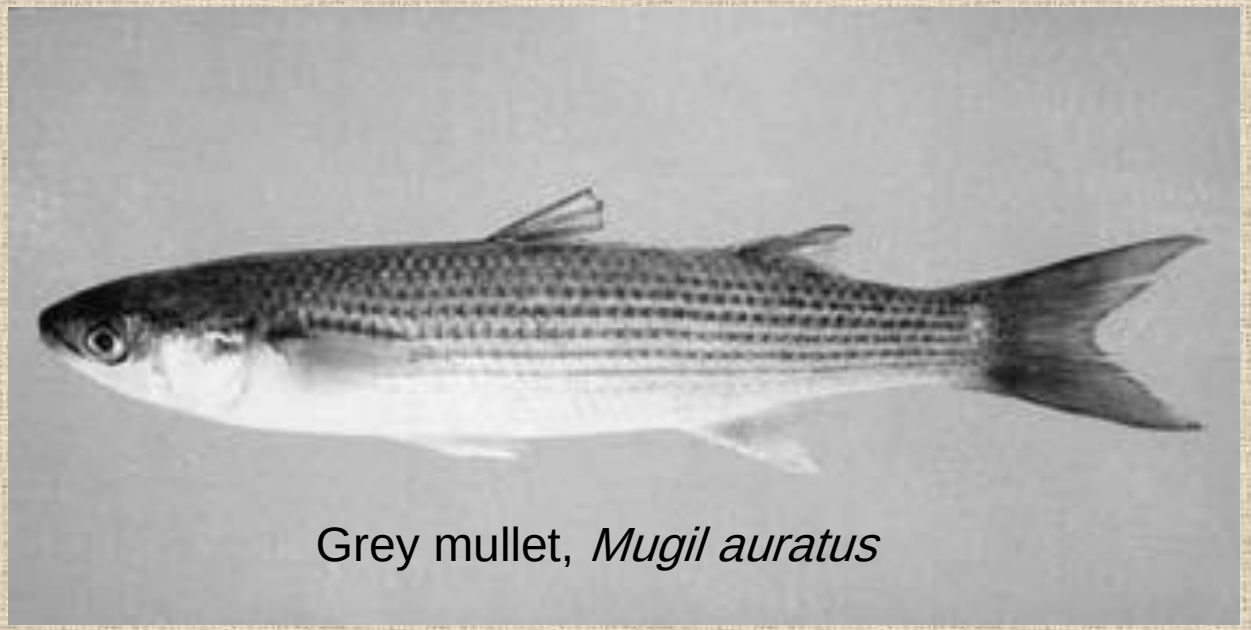
Grey mullets (family Mugilidae)

Though the popular name ‘mullets’ generally refers to the species of the family Mugilidae, the name grey mullet is used to distinguish them from the red mullets of the family Mullidae.The taxonomic classification of the grey mullets has been rather confusing, and the many revisions of the family have not made it any easier for aquaculturists to identify the various species. 13 valid species belonging to the genus *Mugil* and one species of the genus *Rhinomugil* which have been used in aquaculture.

The most widely distributed and well-known species of grey mullet is *Mugil cephalus*, sometimes referred to as the striped mullet. Because of the fast growth rate and the comparatively large size of the adults, this has been the species of choice in all areas. But fry and fingerlings of *M. cephalus* are not as abundantly available as those of the other species.

In the Mediterranean, *M. capito*, *M. auratus*, *M. saliens* and *M. chelo* are also utilized in extensive or intensive farming. Other species used in the Indo-Pacific region are *M. parsia* (= *dussumieri*), *M. tade*, *M. macrolepis*, *M. soiuy* and *R. corsula*. Additional species of importance in South America are *M. curema* and *M. brasiliensis*. Experimental work in West Africa has also included the species *M. falcipinnis* and *M. grandisquamis*.

Grey mullet, *Mugil cephalus*.



Grey mullet, *Mugil auratus*

Culture systems

The traditional extensive culture of mullets together with other euryhaline species in embanked brackish waters still continues to be an important culture system, accounting for a good proportion of present-day production.
Culture in more easily manageable ponds is an improvement on the traditional system. The mullets are generally raised together with other species; for example, in Hong Kong mullets are cultured in combination with Chinese carps, in Taiwan with Chinese carps and tilapia, in Israel with the common carp and tilapia, and in India with milkfish, and other estuarine species. The milkfish ponds of the Philippines and tambaks of Indonesia have a certain percentage of grey mullets, although there have been doubts about the suitability of the combination, due to the competing nature of their food habits.

Grey mullets have been transplanted to develop capture fisheries in certain areas. A notable example is the successful transplantation of mullets from the Black Sea into the Caspian Sea. Lake Quaroun and Lake Marut in Egypt have been successfully stocked with mullets. *M. capito* has been reported to breed in Lake Quaroun

An aerial view of a tambak system in Java, Indonesia.

Fry collection

Most of the fry or fingerlings used in grey mullet culture the world over are obtained from natural sources. In the extensive type of farming in impoundments like the bheris of India and the Mediterranean vallis,

most of the stocking is done by taking advantage of the tidal flow and the habit of mullets of swimming against currents. Very small fry may be brought in with the incoming high tide, but larger ones enter at low tide, when there is a slow flow of water from the impoundments. Suitable screens and traps are maintained at the sluice gates to prevent the escape of fish from the impoundments.

At present, most farmers supplement the stock obtained through tidal flow with fry caught from the estuaries. The more important species, including *M. cephalus*, breed in the sea and the fry and fingerlings migrate towards the shore and estuaries, where they can be found to congregate in schools. Only fry and small fingerlings below 25 cm in length school in large numbers. In any estuarine area there are certain locations where they congregate in large numbers, but variations in occurrence according to species and location have been observed. For example, *M. saliens* usually concentrate in the lower reaches of rivers, whereas *M. cephalus* and *M. capito* ascend to the higher reaches. On the east coast of India, fry of one or more species can be found in schools in the estuarine waters up to the tidal limits, throughout the year.

Fry collection

Grey mullets are difficult species to identify even when they reach the adult stage, and this is much more difficult in the fry and fingerling stages. Since some of the species are very slow growing, it is important to sort them before stocking in rearing facilities. The seasonality of occurrence of different species in the coastal areas can be of initial help in obtaining the desired species. the fry of each species of mullet appear regularly at the mouth of rivers on the coast in particular seasons. Similar seasonality in the occurrence of fry has been Observed on the east coast of India in West Bengal.

Different types of equipment are used for fry collection, the most common being seines and dip nets. Short-bagged drag nets and beach seines are the most usual equipment in Taiwan. Fry collectors normally acclimatize the fry through gradual decreases in salinity, when the fry are meant for rearing in fresh water. However, it has been shown experimentally that the fry can be directly transferred to fresh water without any special acclimatization. Fish farmers in Taiwan, and certain parts of India stock rearing ponds directly without any major mortality. It is believed that sudden changes in temperature and low pH affect the survival of fry more than salinity. If the fry are to be transported long distances, it is considered advisable to condition them for a day.

Fry collection

Generally the fry are stocked in production ponds, directly from the collection grounds or after a brief period of conditioning. The fry are first reared in small ponds for two to three months before stocking in larger production ponds. Mullet fry are stocked at the rate of about 30 000/ha, often with 200–300 young carp per ha to reduce the growth of filamentous algae. The mullets are stocked in larger ponds when they have reached a weight of around 3g.

Collecting fry with a scoop net

Artificial propagation

Considerable effort has been devoted to the artificial propagation of the grey mullets which do not breed in confined waters, especially *M. cephalus*. A number of species have been induced to breed by the administration of pituitary extracts or gonadotropins. Wild *M. cephalus* has been induced to spawn by the administration of mullet pituitary homogenate, often combined with Synahorin . Mature four-to-six-year-old females are injected intramuscularly with homogenates of two to five pituitaries from the same species, with 10–60 rabbit units of Synahorin (a mixture of chorionic gonadotropin and mammalian hypophyseal extract). Mature males do not require any injections, except towards the end of the breeding season. The best results are obtained by giving two injections at an interval of 24 hours. The treated fish can be stripped easily and a female *M. cephalus* of about 1.5kg weight is reported to yield 1–1.5 million eggs. The eggs measure 0.9–1mm in diameter, and are fertilized by the dry or the wet method. At temperatures of 20–24°C the eggs hatch out in 16–30 hours. The larvae are very small, ranging from 2.5–3.5 mm in size, and tend to avoid strong light.