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# Larviculture protocols for cobia

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**Methods vary in Asia versus the Americas**

In the Americas, cobia broodstock are often maintained in intensive recirculating tank systems with controlled photothermal cycles such as this system at U.T.-FAML in Port Aransas, Texas, USA.

With the global culture of cobia on the upswing, effective methods for large-scale seedstock production are required to meet the growing demand. Production systems for cobia larvae vary greatly around the world. While Asia's largely extensive approaches are effective, more intensive methods are used in the Americas.

## ***Broodstock management in Asia***

Several strategies for the management of cobia broodstock are applied in Asia. The simplest is to keep the breeders in net cages and then transfer matured/ovulated fish to cages lined with a fine-mesh net for egg collection. Hormone induction is sometimes used to facilitate this process. Broodstock stay for only a few days in the spawning cages and are quickly replaced with others after spawning. The number of broodstock in such lined cages can range from five to 20.

Spawning seasons vary depending on the climatic zone. At a fully tropical site, nine or 10 months of spawning can be achieved – only stopped by a possible monsoon. At a more subtropical site, a late-spring spawning peak is typically followed by a smaller autumn peak.

In Taiwan, broodfish are kept in large shore-based tanks. Even in cooler areas, this approach allows 8 to 10 months per year of egg production.

## ***Broodstock management in the Americas***

In the Americas, broodstock are maintained in intensive indoor recirculating tank systems with photothermal manipulation. Photothermal cycles typically range from four to six months, followed with as many months of spawning.

In temperate regions, some broodstock facilities maintain outdoor recirculating systems with natural photothermal cycling and spawning. The broodstock are combinations of wild-harvested fish up through f-2 generation captive brooders. Most facilities still rely heavily upon wild-capture brooders, with varying results from the f-1 and f-2 animals. The current trend is to forgo larger fish, emphasizing greater inventories of smaller broodstock in the 5- to 12-kg range.



In Vietnam, extensive fingerling production is achieved within hapas in shrimp ponds.

## ***Larviculture strategies in Asia***



Larviculture production tanks at VSAREC are connected in threes to an intensive recirculating system that combines filtration and sterilization with individualized temperature and flow controls.

In Asia, the range of culture strategies for cobia varies widely, from the very intensive “Western-style” to the more common use of induced natural production of copepods and rotifers in larger ponds. The most extensive method involves inducing an algae bloom in a simple earthen pond and stocking newly hatched cobia larvae in the pond as the bloom matures, resulting in extensive copepod production. Additional cope-pods are added from collection in nets suspended downstream from paddlewheels in operating shrimp ponds.

This method is clearly extensive and low-cost in nature, producing many thousands of fingerlings with minimal labor investment. It can give quite reproducible results of large volumes of fast-growing fingerlings for experienced operators. However, the fingerlings often suffer from infections caused by parasites, both due to host fauna in the earthen ponds and the common practice of final feeding or weaning with chopped trash fish.

A more controlled strategy simulates the aforementioned technique, but involves the use of large concrete tanks or ponds. These tanks can be cleared of parasite host animals and allow greater control of environmental parameters. The tanks are often used in conjunction with greenhouse roofing to avoid problems from rainfall or sudden low temperatures.

In this approach, copepods and rotifers are produced in separate large dedicated concrete ponds previously stocked with rotifers from intermediate cultures. The copepods still originate from natural blooms.

When the fry enter the weaning stage, they are transferred to smaller nursery-style tanks, where co-feeding is initiated in conjunction with artemia and commercial feeds. This strategy combines the nutritional advantages of the copepods from extensive production with enhanced health and safety in a more controlled environment.

## **Larviculture strategies in the Americas**

In the Americas, the majority of cobia larviculture is conducted in tanks. This tank production ranges from extensive outdoor applications to intensive indoor recirculating systems with complete environmental and biological control. Extensive larviculture production yields an average one to two fingerlings per liter, incorporating a range of live feed production from extensive to intensive. Intensive larviculture production yields three to five fingerlings per liter with all live feeds originating from intensive indoor, biosecure production systems.



At about 7 days posthatch, cobia larvae begin to receive *Artemia* in addition to rotifers.

The following is the present intensive larviculture production protocol developed by the International Initiative for Sustainable and Biosecure Aquafarming and currently in use at Virginia Tech's Virginia Seafood Agricultural Research and Extension Center (VSAREC) in Hampton, Virginia, USA. Larviculture production tanks of 300-l volume are connected in threes to an intensive recirculating system that combines biofiltration, mechanical filtration with bead and bag filters, ultraviolet sterilization, protein skimming, temperature control, aeration and flow control into each tank. Eight such systems can be operated individually or linked in varying configurations.

Tank turnover within each system depends upon the larviculture stage, ranging from 4 turnovers/day at the beginning to as high as 1 turnover/hour during the final cofeeding and weaning stage.

Each tank is initially stocked with 15, two-day-posthatch (dph) sac fry per liter. Feedings throughout the larviculture period are conducted every six hours. Rotifers are added 2-9 dph, starting at 1.0 per ml and increasing to 2.5 per ml. During the rotifer stage, Nannochloropsis algae are also added. At 7 to 10 dph, small-strain unenriched artemia are fed at 0.5 to 1.0 per ml. Enriched artemia are then fed at 0.5 to 3.5 per ml during the 10 to 20 dph period.

From 15 to 20 dph, cofeeding commences at 15-minute intervals beginning one hour before each live feeding event. For 20-23 dph, enriched artemia are reduced 1 per ml per day, while weaning diets are added at 30-minute intervals beginning three hours before each live feed event. At the completion of 23 dph, the fish are weaned, maintained on dry diets and ready for transfer to phase-rearing production systems.

Environmental parameters during larviculture include temperatures of 28 to 29 degrees-C and 24-hour light at 250-300 lux. Salinity of 34 ppt is reduced 1 ppt daily down to 22 ppt. Dissolved-oxygen concentrations are maintained at 7 to 8 ppm, with alkalinity at 150-200 mg/l. pH measures 8.1 to 8.2, and total ammonia nitrogen is kept below 0.01 mg per liter. Systems are backwashed daily, accounting for about 5 percent daily exchange.

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