Bait Fish Culture

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ABSTRACT

Bait fish culture is a specialized branch of aquaculture focused on the production of small fish species used as live or dead bait in commercial and recreational fisheries. It plays a significant role in supporting capture fisheries, ornamental fish culture, and the farming of carnivorous fish. Cultured baitfish reduce pressure on wild fish stocks and provide an additional livelihood option for small-scale farmers. Commonly cultured species include minnows, barbs, tilapia fry, mosquito fish, and climbing perch. Successful baitfish culture depends on appropriate pond management, balanced stocking, proper feeding, maintaining water quality, preventing disease, and careful harvesting. The culture of baitfish under controlled conditions ensures sustainable production, improved fish quality, and enhanced diversification of aquaculture.

INTRODUCTION

Bait fish culture is a specialised division of aquaculture that focuses on the production of small fish species used as bait in commercial and recreational fishing. Bait fish are small, fast-reproducing, often uneconomical fish usually used as live or dead bait in bigger predatory fishing operations. It plays an important role in capture fisheries and aquaculture operations (Løkkeborg *et al*., 2014). More than 20 wild-caught species were used as bait fish. Both freshwater and marine fish were used as bait. Anchovies, sardines, gudgeon, halfbacks such as ballyhoo and scad, some larger fish such as menhaden, flying fish or ladyfish are examples of marine bait fish, whereas, in freshwater, minnows, killifish, sculpin, sunfish and small carps are used. In India, species such as

Puntius sp., *Tilapia* fry, and *Gudusia chapra* are often used as bait fish. The increasing demand for food fish and recreational fishing has paved the way for the expansion of bait fish farming as a viable aquaculture enterprise (Stone and Thomforde, 2007).

Significance of Bait Fish Culture

Bait fish culture is an emerging component of inland aquaculture, supporting capture fisheries, recreational angling, the ornamental trade, and carnivorous fish farming. It reduces pressure on wild-stock bait fishing. It plays a vital role in commercial and recreational fishing by ensuring a constant supply of bait fish. In longline fishing, bait fish is the key factor that influences the catch since it entirely depends on the feeding behaviour of the target species (Løkkeborg *et al*., 2014). The cost of producing the bait fish at a farm may be less than that of seining in natural water bodies (Dobie, 1956). Baitfish raised on formulated farm diets are generally more nutritious than those caught in the wild. It also serves as an additional income and livelihood source for economically weaker fish farmers. It contributes to additional aquaculture diversification. Approximately 75% of freshwater sport fishing relies on the use of live baitfish. Earlier, all the bait fish were caught from the wild population, but it is often a mix of fish species. Using wild-caught exogenous baitfish affects indigenous natural water bodies. Farming of baitfish in natural seasonal water bodies in extensive or intensive conditions will reduce the pressure and over-exploitation of natural baitfish stocks.

Bait Fish Culture

Aquaculture refers to the farming of aquatic species such as finfish, shrimp, crab, mollusks and aquatic plants under controlled environmental conditions. Similarly, baitfish culture follows the same process of controlled breeding, hatching, larval rearing and nursery rearing under specific conditions. However, the main difference is that the final output is used as either live or dead bait to catch larger predatory fish in wild fishing activities, including recreational fishing operations or used as live feed for farmed fish. Most of the freshwater baitfish belong to the family Cyprinidae. Commonly cultured freshwater bait fishes are golden shiner (*Notemigonus crysoleucas*), fathead minnow (*Pimephales promelas*), sucker, creek shub and gold fish (*Carassius auratus*). Other small fishes and invertebrates (crawfish and shrimp) and amphibians are also used as bait fishes but the culture methods are underdeveloped (Stone and Thomforde, 2007). In India, Tilapia fry, Mosquito fish, Barbs and minnows (*Puntius sophore, Amblypharyngodon mola*) and climbing perch (*Anabas testudineus*) are widely used as live feed for murrel (*Channa spp*.), seabass (*Lates calcarifer*) and ornamental fish culture.

Ideal characteristics of Baitfish

- Ability to adapt well to the culture pond environment
- Tolerance to seining, handling, and transportation
- Fast growth rate
- Hardy nature
- Small adult size
- Readily accepts prepared/artificial feeds
- Easy propagation in ponds
- Extended spawning season
- Non-cannibalistic behavior
- Broad resistance to diseases
- Absence of spines and hard body parts (for suitability)

Culture Practices for Baitfish:

Culture Ponds

It can be cultured both in natural and artificial man-made structures. Artificial ponds are quite expensive to build and also use fertilisers, but the yields are higher than those of natural ponds. Whereas natural ponds can be leased for a lower rate and operated cheaply. Although it yields less than an artificial pond, the profit may be higher.

Natural water supplies such as creeks, lakes, rivers or ponds may be utilized but groundwater, spring and artesian wells are always preferred since it is permanently clear, free from pollutants and other weed fish. If surface water is used, the inlet should have a fine mesh net to exclude the weed fish and other unwanted organisms. Fertilizing the culture pond with organic fertilizers will help to enhance the fish food organisms such as water fleas and rotifers. As a source of nitrogen and phosphorus, inorganic fertilisers can also be added. Water should have a high temperature to increase the rapid growth of cultured fishes, and a pH of alkaline is always preferable for culture (Dobie *et al*., 1948).

Stocking

Size and sex ratio should be considered when stocking the culture ponds. For example, the male fathead and blunt- nose minnows and the female golden shiner are larger than the opposite sex. So, the selection of only larger fish will lead to an unbalanced sex ratio. A balanced sex ratio of 1:1 is preferred for all species to be cultured, but in the case of fathead minnows, a female-biased population is also considered satisfactory. Fertilised ponds and those ponds where artificial feeding is in practice can support larger numbers of fish than natural ones. Stocking density will vary depending on the species. For minnows, it is 1 - 3 lakh fries/ha, whereas for tilapia, it is 0.5 – 1 lakh/ha. Healthy disease-free fry can be used for culture practices.

Artificial feeding

Pond water should be periodically fertilized with organic manure and inorganic fertilizers to promote the growth of fish food organisms. Young fish feed upon only small organisms, but adults should be provided with an adequate amount of nutrients. Artificial feeding of the fish is an alternative to fertilization. It is also to be considered that temperature has a direct influence on the feeding and growth of fish. In warm water ponds, fish consume more feed, and rapid growth will occur. In cold water ponds, fish consume less food, thus the growth is slow. But when the water temperature exceeds the limit, feed intake declines, and growth is slow. A mixture of 15 % cottonseed meal and 85 % of meat scraps can be considered a successful artificial feed. Beef meat, whitefish meal and dry dog food mixed with water at the right consistency, and maggots can also be used as bait fish feed. Crayfish is considered an excellent minnow feed. A traditional feed mixture of rice bran and groundnut oil cake at a 1:1 ratio is given as feed at 3-6% of body weight. Feeding twice a day will improve the growth rate of stocked fish (Silva and Anderson, 1995).

Handling and maintenance

To avoid size disparity, sorting or grading is recommended in minnow culture by using a mechanical method. Regular monitoring for disease symptoms is required. Water quality maintenance is essential to avoid mortality. Optimum dissolved oxygen of 5 ppm, temperature of 25 – 30 ºC, and pH of 6.5 - 8.5 should be maintained. Regular water exchange of 10 – 20% can be done to maintain good water quality. Sampling should be done every 2-3 weeks, and feeding should be adjusted based on the biomass. A hand net is used to handle or transfer the fish. In small production

ponds, a special net called a bobbinet seine (a fine, soft net) can be used to move fish fingerlings to other ponds without damaging them. Net and other materials used should be disinfected after each use. Nets must be kept in a dry, cool place with good circulation of air. A weak chlorine solution can be used to sterilize nets after each use to prevent disease spread from one pond to another.

Harvesting

The time of harvesting will vary depending on the species and the size requirement. Seine harvesting can be preferred for partial harvesting, and in the case of total harvest, complete draining of the pond can be done. Seine net, dip net or drop nets can be used for harvesting the fish from the pond or culture system. The mesh size of the net and the type of net should suit the pond. Using an undesirable size makes the harvesting process difficult and harms the fish as well. In drainable ponds, it can be drained and concentrated to a small seining pool, from where fish can be hauled by using a small seine net, usually of around 30 feet, which is enough to handle easily. A net with too much length should be avoided since it causes injury to fish. The mesh size of the net should be at least ¼-inch to allow the small fish (minnows) to escape and grow. A drop net can be successfully operated over a seine net for harvesting ponds, since it won't damage the bottom, and fish won't get crowded and crushed in this method. After harvesting, fish should be kept in well-aerated containers. Maximum survival should be ensured during transportation and sales.

CONCLUSION

The culture of baitfish will reduce the pressure on wild stock and overexploitation. Bait fish culture is a profitable and sustainable aquaculture practice when managed efficiently. Proper pond preparation, stocking density, feeding, water quality management and maintenance are critical factors influencing productivity and profitability.

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