DEVELOPMENT OF INLAND FISHERIES IN PAKISTAN

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Introduction

The development of fisheries in Pakistan presents different problems according to the particular part of the country for which a scheme of development is laid out, and no generalisation applicable to all places can be made. In this short note are presented the broad principles which should be kept in view before inaugurating any programme for the development of fisheries in Pakistan, with emphasis on the inland type.

The development of fishery falls under the following heads : (a) inland fishery with emphasis on the culture and preservation of fishes of economic value ; and (b) coastal fishery.

Closely connected with these are the important problems of (1) marketing of fish ; (2) transport ; (3) fish products including fish oils, guano and others.

Since inland fisheries stand most in need of development, we shall consider these here.

Inland Fisheries

There are two important principles which should be borne in mind if a good crop of fish is expected. The first is that a pond, like any agricultural land cannot be expected to yield an indefinite supply of crop unless it is treated with proper fertilizers and secondly, careful attention must be paid to "cropping" if fishes of good size are to be obtained. If the fish population is allowed to grow excessively, no fish will have a chance of attaining a good size, because roughly speaking a pond capable of supporting 100 lbs. of fish may either contain 100 fish weighing 1 lb. each or 400 fish weighing $\frac{1}{4}$ lb. each.

Although it is generally believed that fishery development is possible only in provinces having a large number of perennial tanks, nevertheless, seasonal tanks (which dry up either entirely or to a large extent during the summer) can be made to yield a good crop of fish if the following suggestions are adopted :

1. Large fingerlings about 6 months old should be stocked.

2. Before the tank dries up all fish must be removed, the large specimens being sent to the market and small ones kept for the second season.

3. The surface layer of the tank bottom should be lightly manured. These seasonal tanks can be worked very economically, because in large perennial ponds it is far more difficult to control the number, ages, and types of the different fishes and consequently it is difficult to gather a rich crop of economic varieties.

Basic Requirements

To ensure a regular supply of fresh water fish at a moderate price the following general measures should be adopted :—

(*a*) Establishment of stocking tanks.
(*b*) Control of destructive methods for catching fishes.
(*c*) Control of the size of the mesh.
(*d*) Construction of suitable hatchery centres for distribution of fry on a co-operative basis.
(*e*) Arrangement for rapid and safe transport of fish from one part of the country to the other.

The following fishes are suitable for stocking : *Labeo rohita* (local name : rohu, rohee (Bengal)) ; *Barbus* (Tor) *puititora* (local name : mahaseer) ; *Cirrhina mrigala* (local name : narain or naini) ; *Labeo calbasu* (local name : calbose) ; *Catla Catla* (Day) (local name : catla) ; and *Hilsa ilishia* (local name : hilsa).

The above fishes are easily grown in tanks except hilsa, for which records are not available. Hilsa ascends up the rivers and is caught in very large numbers in Bengal and Sind, its flesh though spiny being very tasty and nutritious, so that in surplus areas a canning industry for this fish may be very profitable.

Suitable places for stocking are : (a) tanks ; (b) back-waters of canals and (c) large reservoirs. In tank stocking the following three factors should be kept in view : (1) nature of the tank ; (2) type of fish to be stocked ; and (3) supervision of the tank. These three factors are of vital importance because each of the operations is intimately linked with the other.

Types of Tanks

These are of two kinds :—

(a) *Seasonal tanks*.—These tanks start drying up in March and the entire crop must be taken out before they actually dry up. In June, they should be made ready for the next season by slightly manuring the surface, the manure consisting of decaying organic matter and lime. If new small tanks are laid for fry culture, they should have vertical sides and should not be more than 4 or 5 feet in depth. After four months the fry should be transferred to larger tanks for stocking. It is noteworthy that in East Pakistan fish cultivation has lately been started in paddy-fields with very encouraging results, and such paddy-cum-fish-culture should be easy to develop in similar regions of Assam.

(b) *Perennial tanks*.—These tanks are deep and contain water all the year round. They may be sub-divided into closed and open types, the latter being either temporarily or permanently connected with a river.

Closed tanks are just like agricultural fields which have to be manured and sown every year. They are good for stocking purposes and fry can be easily transferred into these and allowed to grow. Occasionally fish fauna of these tanks should de examined and predacious fishes should be netted out as far as possible.

Open tanks are connected with rivers and therefore offer a good breeding place for carps, which breed only in running water. During the monsoon, when connection is established between the tanks and a river, fishes of all sizes rush towards the tank and along with those come the brooders. Efforts should de made to divert the brooders to a side tank by erecting a mesh-barrier at the mouth of the main tank, the size of the mesh being 1 inch square. The fry when about 1 ″ long should be diverted to another shallow reservoir where it should be allowed to grow for 4 months and, after sorting, should be finally transferred to stocking tanks.

Methods of Increasing the Productivity of Pond Fishery

The crop of fish which can be produced from a pond can be increased either by supplying artificial food or increasing the natural food. Soya-bean, barley, and maize are good food for carps, while trout demands a fairly large proportion of animal food. The natural food supply can be appreciably increased by introducing chemical fertilisers and with proper application an increase of 100% in the yield is possible. A very important point is that, in lime-deficient soil, it is useless to add any chemical fertilisers until the requisite amount of this substance has been added. When this has been done, a dressing of organic or inorganic manure may be given to the tank bottom, the best inorganic manure being phosphate, to which the addition of calcium has been found to be profitable. In perennial tanks, manure should be spread as evenly as possible over the surface of water from a boat taking care to avoid local concentration.

The success of pisciculture depends to a large extent on the elimination of predacious forms like *Clarius*, *Macrones*, *Wallagonia*, *Ophiocephalus*, *Notopterus etc*. from tanks which have been stocked with carps. From the previous list of fishes suitable for stocking, it will be seen that the most suitable fish is the carp, but it should not be concluded that these are the only types that can grow in tanks. Shallow tanks with muddy water, which are unsuitable for carp-culture, should be stocked with the following fishes which can combat unfair weather more successfully than the carp because they are provided with air breathing apparatus : *Ophicephalus striatus*, (local names : murral, shol, Bengali lakhu marathi) ; *Anabas testudineus*, (local name : Kobhais Hindi, Coi Bengali Undee-Colhere, Malayelam) ; *Wallago attu*, (local names : Parhin Hindustani, Boyari Bihari, Shivada Marahathi) ; *Clarias batrachus*, (local names : Magur Bengali, Mangri Bihari).

Suitable tanks about 3 to 4 feet deep should be selected to introduce fry. The bottom should be well manured to produce plankton fauna which is a suitable diet for young fry. Artificial food like soya-bean, cereals, and slaughter house refuse can be given as an additional food. Tanks should be occassionally examined and all filth from the bottom should be removed as excess of carbon dioxide which is freely generated in the presence of filth, is injurious to fish.