



Fishing in progress at the sewage-fed ponds of the East Kolkata wetlands
(Courtesy: Mrs. Minal Pandey)

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Bengal Food Bowl Under Threat

Not many metropolises can claim to have a food bowl like the east Kolkata wetlands at their doorstep. The bulk of fish production of Bengal comes from the sewage-fed fish ponds of the east Kolkata wetlands, which are today under pressures of many kinds.

SITUATED at the eastern periphery of Kolkata and spread over an area of 12,500 hectares (approximate figure) lies the Ramsar site – the East Kolkata wetland. What is unique about these wetlands is that an area of around 4000 hectares is under wastewater-fed aquaculture system which is perhaps the largest in the world. Not only fishes, here at the wetlands vegetables and paddy are also produced in considerable quantity.

These wetlands are not only the primary source of absorbing the 360 billion litres of sewage generated daily by the Kolkata city but by naturally treating it saves the municipality a whopping amount in sewage treatment costs. No wonder it's often called the kidney of the city. The wetlands purify the sewage water through the natural processes of oxidation, radiation and biological breaking down of the organic water. In a

unique system of recycling methods that are not commonly heard, the fisheries located in these wetlands absorb nutrients from the wastewater before the naturally purified water is drained into the Bay of Bengal.

A considerable amount of fish consumed in Kolkata is produced from this system which is pegged at 13000 tonnes of fish annually. It is generally accepted that fish yields from wastewater-fed ponds are two to four times higher than ordinary fish culture practices. It also supports around 60000 residents through fishing, fish farming, fish processing and related activities.

Sewage-fed System

The sewage-fed ponds are locally called 'Bheries'. These ponds are usually big sometimes spreading forty hectares in area. The sewage-fed ponds are generally shallow and vary from 50 cm to 150 cm in depth. Though most of the sewage-fed

ponds are static in nature, with increase in size they tend to become lotic.

In general these ponds have five distinct phases which are as follows:

1. Pond preparation
2. Primary fertilisation
3. Fish stocking
4. Secondary fertilisation
5. Fish harvesting

The preparation of the ponds, as a general rule, is undertaken during the cooler months of November to February because the growth of carps during this time is generally slow. Whenever possible the ponds are drained and dried, silt is removed from the silt traps (perimeter canal dug along pond dyke), the pond bottom is tilled and dykes are prepared.

Aquatic weeds like water hyacinth and duck weed are grown along the pond dykes of large ponds in order to prevent damage to dykes and also to break the waves. Moreover, these weeded



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areas provide shelter to fish when the temperature rises and serve as filters to extract pollutants like metals from the system.

To keep the growth of weeds in check they are periodically removed and are left to decompose in the pond to increase the fertility of the water. Surrounding these large ponds, silt traps 2-3 m wide and 30-40 cm deep are dug. These get filled with regular harvesting of fish. Fish farmers restrict themselves to cleaning of these silt traps instead of digging the entire pond. Silt rich in nutrients is used for various purposes including strengthening of dykes.

Madhumita Mukherjee in her work, *Waste fed fisheries in Peri-urban Kolkata*, says that this type of pond is not seasonal, but seasonal fluctuations in supply of wastewater from wastewater canals are observed. During dry season, wastewater inflow is very low and does not enter the remote ponds farthest away from the main wastewater canals. In monsoon (wet season) supply of water is huge but nutrient load is low.

The inflow of water is governed by local authorities allowing a certain amount of wastewater. There is no statutory regulation about this level and it is decided by agreement between the local authorities and the pond owners. The waste water is channelled through the inlet of the ponds. In most of the ponds, the inlet and outlet canals have well-developed lock gates. The outlet canals flow into wastewater sub-canals.

Sewage from the canal is drawn in to the pond and allowed to stabilise for 15 to 20 days. Photosynthetic activity in the pond is the basis for biological purification of the sewage. Once the water turns completely green, stocking of fish is initiated. Before stocking fish, some are kept in designated areas, locally called 'hapas', in the pond to test pond condition through survival. If the results are positive, large-scale stocking is undertaken. Fish stocking takes place several times in a year depending on the intensity of the operation.

Right: Plantation of water hyacinth at designated areas of the pond
(Courtesy: Mrs. Minal Pandey)



Periodic Fertilisation

After stocking of fish, sewage is drawn regularly from the canal albeit in small quantity. It is fed to ponds at doses varying from 1 to 10 % of the total volume of water in the pond at intervals throughout the culture period. In bigger ponds, continuous inflow and outflow are maintained by allowing the same level of water to flow out of the pond.

Water colour, transparency, temperature and depth are used as measures to decide on the amount of sewage to be introduced into the pond. Aerators are used when oxygen depletes. Fishes are generally not fed with any supplementary feed, except on occasions such as the monsoon season when there is difficulty in getting enough good quality sewage.

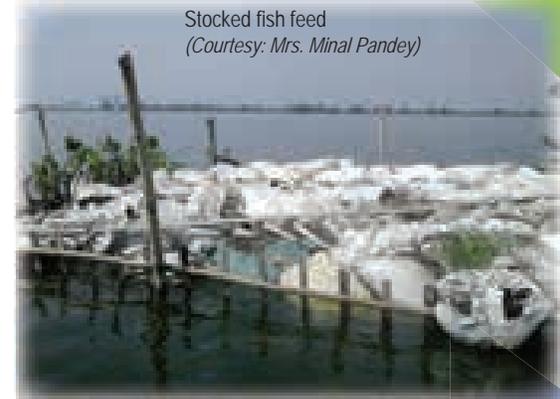
Rotational Cropping System

Fish farmers have come up with culture systems that are responsive to market demand. Fish are stocked and harvested throughout the culture period leading to periodical stocking and regular harvest. In larger ponds, harvesting takes place continuously for almost fifteen days in a month. After completion of a cycle of harvest in a large pond, fishes are restocked at the rate of one kilogramme of fingerlings for every five kilogramme of fish harvested. After restocking, fishes are left undisturbed for the subsequent fortnight and harvesting starts again after that period.

Drag nets are commonly used for harvesting fishes through an encircling technique. However, for the bottom burrowing and difficult to catch species like common carp and tilapia, encircling with the net and hand picking are adopted as common techniques.

Fish Species Cultured in the Wetlands

Fish cultivation in the East Kolkata wetlands using sewage water is being carried out since the 1930's helping fish farmers eke out a living through generations. Fish culture in the wetlands is a composite system using different



species of fish, which utilise different ecological niches of the pond ecosystem.

Earlier, the fish fauna of the east Kolkata wetlands comprised both brackish and freshwater forms. But sadly down these years many of the fish species that were once cultivated here have vanished and now only a handful of fresh water fish species are cultivated. Today, species like Bekti, Parse, Chala, Singhi, Mourala, Kalbos, hybrid Magur, Chang, Lata, Kucho, Chanda, Rangachanda, Falui and Bhada are hardly cultivated.

At present, in the east Kolkata wetlands species of both Indian and exotic Carps are grown. But fish farmers prefer the Indian major Carps namely Catla (*Catla catla*), Rohu (*Labeo rohita*), Mrigal (*Cirrhinus mrigala*), and Bata (*Labeo bata*). The bulk of the stocking consists of Mrigal. Exotic fish like Silver carp (*Hypophthalmichthys molitrix*), Grass Carp (*Ctenopharyngodon idella*) and common carp (*Cyprinus carpio*) are stocked in a small percentage.

The popularity of tilapia is increasing because this fish thrives under cultivation and is a prolific breeder. The average production of tilapia is around 8172-9350 kg per hectare per annum in most of the farms. According to the proprietor of one of the largest bheries of the wetlands,



Extreme left:
Threat to the
wetland fish – the
crocodile fish
(Courtesy: Mrs.
Minal Pandey)

Left: An everyday
scene at the
wetlands
(Courtesy: Mrs.
Minal Pandey)

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the Sardar Bhery, Sonal Mondal, the popularity of Nile tilapia (*Oreochromis niloticus*) and Mozambique tilapia (*Oreochromis mossambicus*) is increasing and they constitute 5 to 30% of the species stocked with different fish farms.

There is also a tendency to stock iridescent shark or Cat fish (*Pangasius hypophthalmus*) to control mollusc populations. Some are attempting to culture high-value species like Giant freshwater prawn (*Macrobrachium rosenbergii*).

Unwanted Guest – Crocodile Fish

One of the major threats to the fish culture comes from an invasive species of fish of the genus of the catfish family. The Crocodile fish which is found in tropical America has made the wetlands its home.

The crocodile fish is an aquarium fish and was probably introduced in the wetlands by an errant aquarist or accidentally introduced due to seasonal flooding. Crocodile fish are a hardy fish. They have a low mortality rate. To make matters worse they breed round the year and comparatively reproduce 1-2 times more than the major Indian carps.

They compete with the native species for the same food i.e. algae but since they are comparatively bigger in size and aggressive by nature the native fish are not a match for them. They also like to feed on rotting items which is the main food source of fish species like mrigal or shol.

The male of the species digs tunnels sometimes spanning 20 to 30 feet along banks where the females like to lay their eggs. This digging habit leads to siltation and shoreline instability leading to soil erosion. The crocodile fish is threatening

the biodiversity of the wetlands and the farmers hate them to no extent. Whenever a crocodile fish is netted it's immediately thrown away.

Disease in Fishes

According to a newspaper report (*The Times of India*, 25 October 2014), West Bengal loses 20% of its fish production due to disease and over 60 forms of fish diseases have been identified in Bengal.

On the other hand, some studies conducted to understand the microbiological and chemical qualities of fish grown in sewage-fed ponds indicate that the fish are safe to consume. It is also a general belief that the fish grown in sewage-fed ponds taste better due to good nutrition obtained by the fish from the rich plankton growth in the ponds. In sewage-fed farms, bacterial diseases among the fishes are not common.

Even when there were problems with Epizootic Ulcerative Disease (EUS) in recent years with carps in other areas, carps in these sewage-fed ponds remained uninfected. However, parasitic infections by *Lernea* (anchor worm) and *Argulus* are common and there is a need to develop techniques for control of this problem.

Live Fish Marketing

The market price of the harvested fish varies between Rs 30-50 depending on variety and season. Live fish marketing is becoming more popular among the fisheries of the east Kolkata wetlands.

Fish are harvested and kept in a depuration pond for varying lengths of time. But as a general rule the fish are kept there at least for a day. Depurated fish are harvested and transported to the market

live using containers placed on bicycles, tricycles and trucks. Based on the market demand, fishes weighing more than 100 gm are generally harvested and sold. For example, if there are ten fishes in a kilogram, they are called 'hotel fish' as they serve the needs of the eateries that cater to the needs of the poor. Skilled people are employed for the transportation of fishes in live conditions for marketing using bicycles. They earn about Rs 40 to 50 for 3 to 4 hours of work.

Pressure from urbanisation is the greatest threat to these unique wetlands and its aquaculture practices. Poor people dependent on these wetlands are being greatly affected and are getting displaced. There are appeals to the Government to declare the sewage-fed aquaculture areas as sanctuaries and to prevent further encroachment.

West Bengal's total fish production is 16 lakh tonne per year, with fresh water fish accounting for 13 lakh tonne and the bulk comes from these sewage-fed fish ponds of the east Kolkata wetlands. The state still runs a deficit of 1 lakh tonne which is transported from other states.

It is high time that the wetlands and their ecological, economical, and human-friendly model are protected from the pressures of urbanisation. Otherwise Bengal will be a loser and really unfortunate because not many metropolises can claim to have a food bowl like the east Kolkata wetlands at their doorstep.

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