

WETLANDS are under tremendous threat and so are their dwellers. There are several factors responsible for this, such as fragmentation, encroachment, rehabilitation, conversion, urbanization, eutrophication, and pollution. Alarming, seasonal wetlands in India are also threatened and disappearing very fast because of the sandwich pressure of tremendous human intervention and climate changes, including erratic rainfall and global warming.

Loss of these wetlands is really a cause for worry; for they provide a colossal amount of easily available protein foods to those who eke out their livelihood from these wetlands by catching a wide range of wild fishes. But the populace living

around these wetlands have been treating these wetlands as their own 'Food Bank', catching much more fish than is being replenished.

What are Seasonal Wetlands?

Now, what are seasonal wetlands? Areas that remain submerged for 5-6 months, with water depth in the range of 0.25-1.0 meter in general, and up to 1.5 meter in certain regions during the post monsoon period are usually christened 'Seasonal Wetlands'. With particular reference to eastern parts of India, 40,000ha in North Bihar, 46,000ha in West Bengal, and the entire plain land about 1, 00,000ha in Assam turn into seasonal wetlands every year during the rainy season thanks to the South-west monsoon.

These seasonal wetlands are known by various names in different states, such as *beels*, *chaurs*, *hoars*, *baors*, *jheels*, *mans*, *tals*, *pats*, *karanjall*, and *dhars*. They mainly include floodplain areas, flash flood areas, back swamps, sloughs, etc., which are usually cut-off river meanders (oxbow lake) due to tectonic depressions. Submergence of these areas is prolonged because of three main reasons: (i) stagnation of rainwater, (ii) overflow of river water, and (iii) shallowness of the area.

With the arrival of the monsoon after prolonged summer months, saturated with rainwater, dry lands become converted into semi-aquatic environment that provides suitable habitat for a wide range of aquatic organisms such as microorganisms, microbes, phytoplankton, periphyton, benthos, macrophytic zooplankton, and macro fauna like

Seasonal wetlands need to be nurtured for the wealth of high quality nutrients they offer and also as future sources of freshwater.

Nurturing Wetlands

R. N. MANDAL





Wetlands are a good source of nourishment of high biological value

insects, snails, fish, etc, which find ideal conditions for breeding, spawning, rearing and maturation.

The areas where seasonal wetlands exist every year are witness to cyclical events performed by organisms. During dry months the life forms of biota existing in the same place reveal different habits as compared to those occurring in wet habitats.

In such context, seasonal wetlands usually contribute to the dynamics of trophic system leading to higher productivity because of certain reasons such as:

- (i) Flooding provides adequate water supply for the aquatic vegetation, which generates oxygen by way of photosynthesis.
- (ii) Nutrients are supplied and favorable alteration of soil chemistry occurs due to

dynamic system by water flow; these alterations include nitrification, sulfate reduction and nutrient mineralization.

(iii) Amount of nutrients increases attributed to litter decomposition and thus seasonal wetlands become nutrient-enriched.

(iv) Rapid leaching of soluble organic carbon occurs from existing soil bed and then erosion as well as transport of particulate organic carbon takes place by means of water flow.

(v) Flowing of water offers a sufficient amount of oxygenation since water flow carries away many waste products of soil and root metabolism such as carbon dioxide and methane.

Dissolved carbons are important source of energy for microorganisms, which, in turn, convert it to particulate form. This particulate carbon enhances wetland productivity. After flooding, chemical

features of water undergo gradual changes that continue until the water recedes. This includes availability of dissolved oxygen and the pH of the water, which in turn determine biological activities such as photosynthesis and respiration. Dissolved oxygen and pH of the water facilitate survival of fishes and other organisms in seasonal wetlands

Nitrogen, phosphorus and potassium as primary nutrients stimulate phytoplankton production. Significantly, phytoplankton is the base of energy production and also food source for other organisms, including fishes. Other trace elements such as sodium, calcium, magnesium and sulphur as secondary nutrients are produced during anaerobic reduction of soil from clay exchange sites. Therefore, more is the entry of rain and floodwater; more is the amount of these nutrients in seasonal wetlands.

The deficit of freshwater supply may be made up by harvesting rain and floodwater that are easily available and stored in seasonal wetlands.

Dynamics of Water Flow

The reproductive biology of different aquatic organisms synchronizes to get activated at the onset of monsoon rain. Entry of overflow and runoff water from catchment areas causes fishes to become induced to synchronize their reproductive cycle such as breeding, hatching and spawning. As the water flow increases the wetlands slowly become perfectly suited for fish rearing, as they are nourished by the plankton and huge amount of minerals and other substances that rush in with the water.

The different life stages of fishes such as spawn, fry, fingerlings, juveniles, adults, brooders, and breeders have specific feeding requirements, which they extract from different niches of the wetlands. Consequently, fish grow well, get nourished, increase in population and become healthy.

As recorded, about 180 indigenous freshwater fish species distributed in 84 genera and 29 families dwell in seasonal wetlands of the Ganga-Brahmaputra basin. Records indicate that monsoon-fed seasonal wetlands have been rich repository of gene pool of indigenous fish diversity, besides a variety of prawn species.



The day is not far when freshwater would be treated as an essential commodity on the same footing as other necessary goods.

let us save the precious monsoon-fed seasonal wetlands, else the crisis of freshwater is inevitable,

But all those indigenous fish species are hitherto under serious threat because of the present trend of injudicious fish catch, loss of wetlands, and excessive use of harmful chemicals during agriculture practice.



Food Resources and Livelihood

Irrespective of the economic class, people living around these wetlands collect a variety of aquatic resources, including wild fish. They get nourished by way of easily available major source of animal protein food of very high biological value. Submerged ecosystems thus play an important role in providing nutritional support for rural folk who benefit by way of easily available important micronutrients from fishes. These nutritious fish food substitute the vegetable food resources that remain scarce during post-monsoon period because of submergence of cropping areas and so vegetables become costly.

Freshwater Harvest

The climate change crisis in the future could seriously impact freshwater availability in the future. This is an alarming prospect for freshwater fish regeneration as well. Construction of reservoirs, tanks, small lakes, etc in order to conserve fresh water is a Herculean task. Rather, fresh

FOOD RESOURCES OF WETLANDS

Plant resources	Animal resources
Vegetables: petioles & thalamus of <i>Nymphaea</i> spp., <i>Nelumbo</i> sp., <i>Alocasia</i> spp., <i>Colocasia</i> spp. Leafy vegetables: <i>Ipomoea</i> sp., <i>Enhydra</i> sp., <i>Alocasia</i> spp., <i>Colocasia</i> spp., <i>Marsilea</i> sp., <i>Alternanthera</i> spp., <i>Hygrophila</i> sp., <i>Commelina</i> sp., <i>Hydrocotyle</i> sp. Rhizome: <i>Nymphaea</i> spp., <i>Nelumbo</i> sp., <i>Alocasia</i> spp., <i>Colocasia</i> spp. Fruit & seeds: <i>Nymphaea</i> spp., <i>Nelumbo</i> sp.	Crabs: <i>Paratelphusa</i> spp. Mollusks: <i>Pila</i> spp., <i>Gabbia</i> spp., <i>Indoplanorbis</i> spp., <i>Lamellidens</i> spp., <i>Bellamya</i> spp., <i>Gyraulus</i> spp. Fishes: 180 indigenous fish species, besides varieties of prawn species.



Human intervention has led to strangulation of wetlands

water stored in seasonal wetlands due to rain and flood is a much easier and better option.

Besides, there are growing concerns over already stocked fresh water in different sources like reservoirs, lakes, tanks, canals, and rivers that are either polluted or may not be suitable for fish culture. On the contrary, monsoon fed seasonal wetlands are reasonably clean sources of fresh water to harvest fish. The water quality of seasonal wetlands is very good.

Plight of Wetlands

Direct and indirect human intervention has led to the strangulation of wetlands. Here are a few instances that have led to drastic dwindling of wetlands.

- (i) Gradual increase of heavy metal, pesticides, herbicides, and other harmful chemicals deposited in sludge, water, plankton, benthos, periphyton, and aquatic animals. All these organic and inorganic substances affect human health, mostly through fish consumption.
- (ii) Flow of untreated wastewater emanating from industries and urban areas makes the water bodies extremely polluted leading to eutrophication while

passing through canals and river. Eventually, contamination engulfs the entire vicinity.

(iii) Rapid urbanization attributed to rehabilitation programmes is now rapidly encroaching the already fragmented wetlands. Brick industry is one such threat that has gradually encroached upon seasonal wetlands.

(iv) Erratic rainfall and temperature rise due to climate change make seasonal wetlands vulnerable.

Seasonal wetlands should be maintained on priority basis because of their phenomenal ecosystem services to human beings. The diverse gene pool of fishes can be protected through natural regeneration and that is possible only in the renewable monsoon-fed wetlands. Maintenance of diverse gene pool of fishes brings nutritional security for all, in general, and particularly for those who are economically depressed. Depletion of fish diversity, if not replenished mainly due to prolonged drought or over exploitation, may lead to inevitable problems like malnutrition of the rural poor for whom this ecosystem service is an integral part of their livelihood.

Both habitats and organisms, however, are seriously vulnerable due to habitat loss and fragmentation, injudicious exploitation, pollution from runoff of agricultural chemicals, climate change and global warming.

Apart from that, deficit of freshwater supply may be made up by harvesting rain and floodwater that are easily available and stored in seasonal wetlands. The day is not far when freshwater would be treated as an essential commodity on the same footing as other necessary goods. The most alarming situation is that wetlands like reservoirs, lakes, and tanks may get lost due to the high rate of evaporation due to global warming, human intervention, injudicious use of freshwater and eutrophication, but seasonal wetlands remain will survive as long as rain and flood waters are available.

So, let us save the precious monsoon-fed seasonal wetlands, else the crisis of freshwater is inevitable, boding ill for the entire human civilization.

Dr. R. N. Mandal is Senior Scientist, Wastewater Aquaculture Division, Central Institute of Freshwater Aquaculture, P.O. Rahara, Kolkata-700118; Email: rnmandal2003@yahoo.com