



INVASIVE ALIEN SPECIES

Threat to inland wetlands of India

Centre for Biodiversity Policy and Law (CEBPOL)



WETLANDS

○ IMPORTANCE

Wetland day press release 2016, of Convention on Biological Diversity (CBD), highlighted that wetlands are essential for human being to live and prosper. Globally, wetlands are considered as one of the most important biodiverse areas. Besides, more than one billion people depend on wetlands for their wellbeing. Wetland helps sustain the wide variety of life on our planet, protects our coastlines, acts as a natural sponges against river flooding, and stores carbon dioxide to regulate climate change. In a nutshell, CBD highlighted that wetlands are at the centre of livelihoods around the world and are a major source of employment globally. Close to a billion people in Asia, Africa and America depend on rice grown in wetlands for their livelihood, with 80 per cent of world production coming from small scale family farmers and consumed locally. Some 660 million people depend on fishing and aquaculture in wetlands for their main livelihood support. International tourism generates well over US \$1 trillion worldwide per year, accounting for about 9 percent of global employment and about half of these tourists seek relaxation in wetland areas. Furthermore, wetlands have also been providing a variety of ecological, biological and hydrological functions which offers economic, aesthetic, recreational, educational and other values to the society^{1&2}.

○ INDIAN WETLANDS

India supports unique geographical diversity and different climatic zones, which in turn supports diverse wetland habitats throughout the subcontinent and covers nearly 58.2 million hectares. Indian wetlands are classified into two major groups: Natural and Man-made. The natural wetlands in India, consist of the high altitude Himalayan lakes, wetlands in the flood plains of the major river, saline and temporary wetlands of the arid and semi-arid regions and coastal wetlands including lagoons, backwaters, estuaries, mangrove swamps and coral reefs. On the other side, the man-made wetlands includes inland lakes and traditional village ponds. According to IUCN wetland directory¹, the man-made wetlands in our country are about 1.8 times higher than the natural wetlands. The inland wetlands of India alone support 20% of the known range of biodiversity which harbours almost all taxonomic groups. Interestingly the coastal system also supports commendable diversity. For instance, mangrove ecosystem of India alone supports 4,011 species of flora and fauna³.



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THREATS

○ THREATS TO WETLANDS

Wetlands and its biodiversity are getting depleted alarmingly due to habitat destruction, pollution, overexploitation of aquatic resources, tourism and the introduction of invasive exotic species along with alien pathogens and parasites⁴. In particular the freshwater ecosystem which supports 40% of the globally recorded fish species is highly vulnerable to aforesaid anthropogenic pressures. In recent decades invasive alien species are considered as one of the major factors for the devastation of the freshwater ecosystem and have emerged as a great threat for the existing indigenous aquatic diversity, in particular fish species⁴.

○ INVASIVE ALIEN SPECIES

Alien species is a species, subspecies or lower taxon, introduced outside its natural past or present distribution, which includes any part, gametes, seeds, eggs, or propagules of such species that might survive and subsequently reproduce.

Invasive Alien Species refers to an alien species whose introduction and/or spread threaten biological diversity of the region/habitat (CBD, 2002)⁵.

In recent past, Invasive Alien Species have been emerging as the second biggest threat to global biodiversity after habitat destruction.

Wetlands, are highly prone to invasion of alien species. Several species of alien flora and fauna has been reported from Indian wetlands. Especially, plants like Water Hyacinth (*Eichhornia crassipes*), Giant Salvinia (*Salvinia molesta*), and water cabbage/ lettuce (*Pistia stratiotes*) caused severe damage to our wetland ecosystem. In recent times, Indian wetlands and its fish diversity faces a new risk due to the invasion of ornamental fishes.

○ INVASIVE ALIEN SPECIES IN WETLANDS

From time immemorial, number of alien plants and animals get introduced into Indian wetlands both accidentally and intentionally. Among the introduced, few species such as Water hyacinth (*Eichhornia crassipes*), Water cabbage/lettuce (*Pistia stratiotes*), Giant salvinia (*Salvinia molesta*), Nile/red tilapia (*Oreochromis niloticus*), African catfish (*Clarias gariepinus*), Thai pangus (*Pangasiandon hypophthalmus*) and common carp (*Cyprinus carpio*) have emerged as a great threat to Indian aquatic diversity and pose a serious threat to regional and local economy. Especially, the Indian fish diversity is highly affected due to this invasion. It is a fact that India is one of the regions which support unique and immense aquatic diversity. In particular, India is endowed with rich fish diversity of 2,319 finfish (838 freshwater, 113 brackish and 1,368 marine)⁴.



IMPACTS

○ IMPACTS OF INVASIVE ALIEN SPECIES IN INDIAN WETLANDS

Globally several studies have clearly emphasized that alien fishes frequently alter the aquatic ecology (changing water quality, water supply, water assimilation, nutrient cycling), causing the extinction of native fishes (predation in the form of destroying the eggs, larvae, sub adults and reduction of food availability due to competition), destruction of aquatic vegetation and pollutes the native gene pools through cross breeding⁴.

In India, so far 31 aquaculture species, 600 ornamental varieties and two species of larvicidal fish have been identified as exotic. Many native species especially Indian major carps in various riverine systems have been critically depleted due to the introduction of commercially important exotic species such as Nile/red tilapia (*Oreochromis niloticus*), African catfish (*Clarias gariepinus*), Thai pangus (*Pangasiandon hypophthalmus*) and common carp (*Cyprinus carpio*)⁴.

On the other hand, several exotic ornamental fishes ranging from the tiny guppy fish (*Poecilia reticulata*) to the large and aggressive red

piranha (*Pygocentrus nattereri*) have been recorded in rivers, lakes, traditional village ponds and other inland freshwater bodies in several states of India.

Aquatic species trade has been identified as a potential pathway for exotic pathogens and parasites. Introduction of these alien organisms with parasites and pathogens often leads to outbreak of diseases, resulting in huge biodiversity and economic losses.

○ A CASE STUDY OF SUCKER MOUTH ARMoured CATFISH

(*Pteryoplichthys multiradiatus*)


Suckermouth catfish has been identified as a great threat to global freshwater diversity. Occurrence of the species in the wild is reported to alter the habitat and has changed the physicochemical nature of water. Recent studies in India disclosed the invasion of this species in several inland waters. For instance, a constant decline of native species biomass due to high invasion of suckermouth fishes was



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reported in Thiruvananthapuram, Kerala. Interestingly another species of suckermouth catfish *P. pardalis* was reported to cause huge damage to the native species diversity of Vandiyur Lake, Madurai, Tamilnadu. The biomass of *P. pardalis* was statistically significant compared to the indigenous varieties⁴.

 Courtesy : Google Images



OTHER CASE STUDIES

- Studies from Ganga river have disclosed that there is a constant increase in the yield of alien varieties such as *Cyprinus carpio*, *Pangasianodon hypophthalmus*³.
- In Kerala, the high occurrence of tilapia species in inland waters was reported, due to which the native species such as *Puntius dubius* and *Labeo kontius* faces local extinction³.
- In Yamuna, the occurrence of tilapia, African catfish, Silver carp and Gambusia is higher and the biomass is spiralling every year³.
- Invasion of ornamental sucker mouth catfishes (*Pterygoplichthys multiradiatus* and *Pterygoplichthys pardalis*) resulted in the decline of commercially important inland native fish in Kerala and Tamil Nadu, respectively.
- Water hyacinth clogs several water ways of rivers and lakes which leads to flood during monsoon. Water hyacinth leads to eutrophication, affects fishing, outbreak of mosquito borne diseases and affects aesthetic value of inland wetlands.
- Water cabbage/lettuce (*Pistia stratiotes*), Giant salvinia (*Salvinia molesta*) invasion clogs the irrigation canals and agricultural fields. It also affects the aquaculture & agricultural yield.

PATHWAYS OF AQUATIC INVASION

- Accidental introduction by human being . eg., Hobbyists release the healthy ornamental fish when they get bored of them, or when they become too large to be accommodated in their aquaria.
- Natural calamities like flood introduces both flora and fauna into the new habitats. For instance, Invasive alien species escape during monsoon floods from the local breeding sites.
- The ever-increasing global trade in particular online trade of ornamental aquarium fishes & Plants

 Courtesy : Google Images



MANAGEMENT OF INVASIVE ALIEN SPECIES

Invasive Alien Species management is a herculean task, preventing the entry and periodical monitoring of the alien species in a new habitat are the important steps to be followed to get rid out of the Invasive Alien Species menace.

So far, successful control is established only in few species. Complete eradication of Invasive Alien Species is not possible in all cases. In case of aquatic invasion management, prevention is the only cost effective option available till date.

Steps to be followed for management of Invasive Alien Species:

- Strict implementation of the guidelines on devising and implementing measures to address the risks associated with the introduction of Alien species as pets, aquarium & terrarium species and as live bait and live food (CBD 2014; XII/16) and immediate investigation related to management /eradication of invaded exotic ornamental fish in the wild should be carried out.
- Stringent measures need to be taken to monitor the aquarium fish trade and the accidental release of exotic species into inland waters.
- Creating awareness among public and policy makers and to encourage research in management of Invasive Alien Species. In particular, awareness should be created on the ill effects of the introduction of aquarium fish species to the wild.
- A detailed and in-depth study needs to be designed to quantify the economic and biodiversity loss due to the invasion of ornamental fishes in inland waters
- Traders and hobbyists needs to be educated since they frequently breach the rules and have been introducing several ornamental fish species including notorious carnivorous like Piranha.
- Following a strict quarantine screening of exotic species is need of the hour.

CHALLENGES & WAY FORWARD

- New guidelines should be developed for post-quarantine follow-up.
- Awareness should be created among the policy makers, researchers, public and hobbyist on the introduction of the species into wild.
- Promoting research and strengthening the data base on Invasive Alien Species.

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