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Invasive fish species and their detrimental effects on the sustainability of endemic Indian fish species

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ABSTRACT

Invasive species are “non-indigenous species that spread from the point of introduction and become abundant.” The invasive species cause damage to the endemic species in the ecosystem. The invasive fish species cause direct and indirect harm to the native species. The direct harm includes the predation of the native species, competing with the native species for food and other resources, causing or carrying diseases, and preventing native species from reproducing or killing the young ones. The indirect threat of invasive species includes changing the food web in an ecosystem by destroying or replacing native food sources. Invasive species can also alter the abundance or diversity of species that are important in the habitat for native wildlife. The Zoological Survey of India reported that inland wetlands alone support 1027 species of fish with more biological, nutritional, and economic value. The National Biodiversity Authority of India has recognised 14 freshwater invasive species in Indian freshwater ecosystems. The invasive fish species are *Clarias gariepinus*, *Cyprinus carpio*, *Gambusia affinis*, *Gambusia holbrooki*, *Mylopharyngodon piceus*, *Oreochromis mossambicus*, *Oreochromis niloticus*, *Poecilia reticulata*, *Pterygoplichthys disjunctivus*, *Pterygoplichthys multiradiatus*, *Pterygoplichthys pardalis*, *Pterygoplichthys anisitsi*, *Pygocentrus nattereri*, *Aristichthys nobilis*. These 14 freshwater invasive species recognised by the National Biodiversity Authority of India in Indian freshwater ecosystems are exhibiting invasiveness elsewhere, rapid multiplication and spread in different ecosystems, multiple modes of reproduction, and multiple modes of dispersion. These are leading to effects on ecosystem functions and services, biodiversity loss, economic loss, health hazards, and also range extension. Looking into the seriousness of the issues, control and remedial measures should be implemented. Regulation must be brought on unauthorised culture. Aquaculturists and aquarists should take measures so that cultivable exotic food fish cannot enter the open water body. For the same, awareness programmes to educate aquaculturists and aquarists need to be conducted to educate them about not releasing the cultivable exotic food fish into natural waterbodies. Proper quarantine is urgently needed before introducing new species for any purpose, like aquaculture, ornamental, sports, or to control mosquito populations. These control measures will surely protect the Indian freshwater fish biodiversity against the detrimental effects of invasive freshwater fish species.

Key words: - Invasive, Freshwater, Exotic food fish, Dispersion, Native species, Biodiversity

Introduction

Invasive species are “non-indigenous species that spread from the point of introduction and become abundant.” The invasive species cause damage to

the endemic species in the ecosystem (Kolar and Lodge, 2001). India contributes about 7.7% of global fish diversity. Fish diversity has been documented in various riverine systems and their tributaries, such as Ganga, Yamuna, Narmada, Tapti, Krishna,

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Cauvery, Godavari, Brahmaputra, Ravi, Beas, Sutlej, etc., along with the distribution of fish fauna in the Himalaya and Western Ghat. Freshwater fish are also the most threatened group after amphibians because of constant pressure on their habitats by human activities like agricultural pesticides, herbicides, industrial waste, dam construction, invasive species, overfishing, etc. (Thakur Kushal, *et al.*, 2021). The Zoological Survey of India reported that Indian inland wetlands alone support 1027 species of fish with more biological, nutritional, and economic value (Uttam *et al.*, 2012) (Sandilyan, 2022).

The invasive fish species cause direct and indirect harm to the native species. The direct harm includes the predation of the native species, competing with the native species for food and other resources, causing or carrying diseases, and preventing native species from reproducing or killing the young ones. The indirect threat of invasive species includes changing the food web in an ecosystem by destroying or replacing native food sources. Invasive species can also alter the abundance or diversity of species that are important in the habitat for native wildlife (Mahapatra and Mohanty, 2023).

As per the National Biodiversity Authority of India, 14 freshwater invasive species have been identified in the Indian freshwater ecosystems and are mentioned in Table 1. These 14 freshwater invasive species recognised by the National Biodiversity

Authority of India in Indian freshwater ecosystems are exhibiting invasiveness elsewhere, rapid multiplication and spread in different ecosystems, multiple modes of reproduction, and multiple modes of dispersion. These are leading to effects on ecosystem functions and services, biodiversity loss, economic loss, health hazards, and range extension (Sandilyan, 2023).

Discussion and Conclusion

The invasive freshwater fish species in the Indian freshwater ecosystem pose a serious threat to the native freshwater fish species. The invasive freshwater fish species are competing with the native species for food and resources. They are carrying diseases, preventing native species from reproducing, and killing the young ones of native species. These are leading to effects on ecosystem functions and services, biodiversity loss, economic loss, health hazards, and also range extension. Looking into the seriousness of the issues, control and remedial measures should be implemented. Regulation must be brought on unauthorised culture. Aquaculturists and aquarists should take measures so that cultivable exotic food fish cannot enter the open water body. The same awareness programmes to educate aquaculturists and aquarists need to be conducted to educate them about not releasing the cultivable

Table 1. List of Invasive fish species in the Indian fresh waters

Sr. No.	Scientific Name	Common Name	Reason for Introduction	Native Country / Region
1	<i>Clarias gariepinus</i>	African catfish	Aquaculture	South Africa
2	<i>Cyprinus carpio</i>	Common carp	Aquaculture	China
3	<i>Gambusia affinis</i>	Western Mosquito fish/ Topminnow	Mosquito Control	Italy
4	<i>Gambusia holbrooki</i>	Eastern Mosquito fish	Mosquito Control	South Eastern United States
5	<i>Mylopharyngodon piceus</i>	Black carp	Aquaculture	China
6	<i>Oreochromis mossambicus</i>	Mozambique tilapia	Aquaculture	Africa
7	<i>Oreochromis niloticus</i>	Nile tilapia	Aquaculture	Africa
8	<i>Poecilia reticulata</i>	Guppy	Mosquito Control	Venezuela
9	<i>Pterygoplichthys disjunctivus</i>	Vermiculated sailfin catfish	Exotic ornamental fish	South America
10	<i>Pterygoplichthys multiradiatus</i>	Sucker mouth armored cat fish	Accidental introduction in Indian waters	South America
11	<i>Pterygoplichthys pardalis</i>	Amazon sailfin catfish	Exotic ornamental fish	Amazon River
12	<i>Pterygoplichthys anisitsi</i>	Paraná Sailfin Catfish	Exotic ornamental fish	South America
13	<i>Pygocentrus nattereri</i>	Red Piranha	Exotic ornamental fish	Amazon River
14	<i>Aristichthys nobilis</i>	Bighead	Aquaculture	China

(Mahapatra and Mohanty, 2023), (Sandilyan, 2023)

exotic food fish into natural waterbodies. Proper quarantine is urgently needed before introducing new species for any purpose, like aquaculture, ornamental, sports, or to control mosquito populations. These control measures will surely protect the Indian freshwater fish biodiversity against the detrimental effects of invasive freshwater fish species.

Conflict of Interest- None

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