

Tilapia - An Invasive Alien Species : A Big Threat to Indian Waters

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ARTICLE INFO

ABSTRACT

Article History:

Accepted: 01 Nov 2023

Published: 20 Nov 2023

Publication Issue

Volume 10, Issue 6

November-December-2023

Page Number

581-585

"Tilapia" refers to several species of mostly freshwater fish belonging to the Cichlidae family. These fish are primarily found in tropical America, mainland Africa, Madagascar, and southern Asia. Over time, Tilapia have been introduced and farmed in over 135 countries worldwide. Mozambique tilapia (*Oreochromis mossambicus*), blue tilapia (*O. aureus*), Nile tilapia (*O. niloticus*), Zanzibar tilapia (*O. hornorum*), and the red belly tilapia (*O. zilli*) are some of the commercially important species of Tilapia. Farming of Nile Tilapia has been banned in India since 1959. The government lifted the ban on Nile tilapia culture in 2012, with strict guidelines addressing biosecurity and other issues. Remarkable tilapia catches are still being spotted in open waters like ponds, rivers, and reservoirs and subsequently in local fish markets in India. Fishermen, office bearers of fish farmers' societies, dealers, and retailers at the fish markets were interviewed to gather information on the availability of fish seed and its culture. The information obtained confirms the escape of Tilapia into the open waters of India, which may be proven a significant threat to the native fish fauna of India.

Keywords : Tilapia, Cichlids, Native Fish, Invasive Species, Alien, Threat

I. INTRODUCTION

The Tilapia is commonly known as "aquatic chicken" because it proliferates and is easy to cultivate. Tilapia is the world's second most important farmed fish and is also described as the most cultivable species of the 21st century. Tilapine fishes have a vast species diversity and are grouped into three main genera: *Oreochromis*, *Sarotherod*, Farming of Nile Tilapia was

banned in India since 1959. The government lifted *the ban on Nile tilapia culture in 2012, with strict guidelines addressing biosecurity and other issues on Tilapia*. Besides these, Genetically Improved Farmed Tilapia (GIFT) has been imported to India in conjunction with WorldFish. The term "Tilapia" refers to several species of mostly freshwater fish belonging to the family Cichlidae. They are native to freshwater habitats in tropical America, Mainland

Africa, Madagascar, and Southern Asia. Tilapia has been introduced to over 135 countries and is now farmed and distributed worldwide. Mozambique tilapia (*Oreochromis mossambicus*), blue tilapia (*O. aureus*), Nile tilapia (*O. niloticus*), Zanzibar tilapia (*O. hornorum*), and the red belly tilapia (*O. zilli*) are some of the commercially important species of Tilapia. Over the past thirty years, there have been substantial advancements in the global farming of Tilapia. They are farmed in approximately 85 countries worldwide [1], and roughly 98% of Tilapia produced in these countries are cultivated outside their original habitats [2]. Global tilapia aquaculture production in 2009 was 3.08 million mt, with China, Indonesia, Egypt and the Philippines being the top producers. Farming of Tilapia was banned in India in 1959. The ban was lifted in 2012 for the culture of Nile tilapia, with strict guidelines addressing biosecurity and other issues [3]. In India, nearly all of the introduced tilapias produced are consumed domestically; tilapias have contributed to basic food security for such societies. Many people consume Tilapia because it is relatively affordable and does not taste very fishy; hence, it is popularly known as 'aquatic chicken' and has provided socio-economic benefits for many poor people in the region. The threat of invasive alien species is similar to the emergence of new viruses that endanger our lives. Both are the negative fallout of the hyper-global world we live in. If invasive species become valuable, they may be introduced to new regions. This is a massive threat to the region's biodiversity and food security. These include the irreversible degradation of ecosystems, the silent extinction of native species, and, ultimately, the homogenization of our ecosystems and diets. Tilapia culture badly affects the cyprinid harvests in India [4] [5]. Reductions in other ecosystem services. Tilapia are associated with the loss of aquatic plants and the habitats they provide to native species [6], as well as undesirable biotic and abiotic changes associated with eutrophication [7]. In contrast, some tilapia fisheries may act to protect native species by removing fishing pressure from

natives [8]. Due to the variety of reported ecological impacts and the absence of a quantitative review considering the strength of inferences from different study designs, conflicting perceptions of the ecological implications of Tilapia have emerged. Assessments of tilapia impacts range from no adverse effects to extremely harmful [9][10]. Specifically, increasing tilapia production may cause a decrease in populations of harvestable native species, a decrease in habitat, or recreational and cultural ecosystem services linked to the native species harmed by Tilapia. [9]

Material and Methods:

An extensive survey was undertaken in the Akola and Washim districts of Maharashtra. Local fish markets and reservoirs taken on lease by fish farmers' societies were visited as planned. Fishermen generally used multi-meshed gill nets of mesh size ranging from 10–150 mm as well as cast nets, drag nets and hook-lines for fishing in the river. From commercial catches, fish were collected at the landing centres and were identified and weighed using a portable digital balance. Fish species were identified with the help of standard keys mentioned in the taxonomic literature [11][12][13]. The fish farmers, wholesalers and retailers of the local area were interviewed. The data was collected from all these stakeholders through the developed questionnaire.

Result and Discussion:

Nile Tilapia was abundant in the local fish markets and water bodies surveyed. The presence of Tilapia in Indian waters is primarily due to aquaculture practices. Tilapia farming has been promoted in India because it is relatively easy to farm, increase crops, and tolerate a wide range of water conditions. It is often cultivated in freshwater ponds, reservoirs, and brackish water areas. While tilapia farming has contributed to the availability of affordable fish

protein in India, there are concerns about its potential impact on native fish species and ecosystems.

Genetically Improved Farmed Tilapia (GIFT) is now allowed to, and sexually reversed Tilapia (SRT) is used for monosex culture in India. However, these natural and synthetic hormones, because of their high efficiency, low effect thresholds and potential for endocrine disruption, pose unambiguous impacts on aquatic organisms, including microorganisms, phytoplankton, plants, crustaceans, fish and insects, as well as on soil microorganisms and possibly humans [14]. Xenobiotics in the environment can cause harmful effects in animals and humans by disrupting endocrine functions. These effects include increased frequencies of sex hormone-dependent cancers such as breast, testicular, and prostate cancers, genital abnormalities, premature puberty in females, and increased occurrence of endometriosis in humans [15] [16].

Only four fish farmer groups, Aresen Bio-Tech, AP, Vijayawada; Ananda Aqua Exports, Bhimavaram, AP; Indepesca, Mumbai; CP Aqua (India), Chennai; and Rajiv Gandhi Centre for Aquaculture (RGCA), the R&D arm of the Marine Products Export Development Authority (MPEDA), are already permitted by the Government of India for the seed production and Tilapia (monosex and monoculture of Nile/GIFT/golden Tilapia) by the guidelines for the hatchery operation and Tilapia, developed by the Sub-Committee under the National Committee on Introduction of Exotic Aquatic Species into Indian waters. However, the occurrence of Tilapia in almost all the water bodies shows its propagation. This occurrence is the point of thorough research on India's freshwater resources. It is urgent to check to what extent the fish tilapia have acquired the ecological niches of Indian waters.



Figure 1: Occurrences of Tilapia in local fish markets

The introduction of Tilapia into non-native ecosystems can have several impacts on native fauna and local fish farmers.

1. **Competition for Resources:** Tilapia are known for their aggressive feeding habits and fast growth rates. When introduced to new environments, they can outcompete native fish species for food and habitat. This competition may decrease native fish populations, particularly those with similar ecological roles.
2. **Predation:** Tilapia may also prey on native fish eggs and juveniles, further impacting native fish populations. Their presence can upset the natural balance of predator-prey relationships in local ecosystems.
3. **Habitat Alteration:** Tilapia are often associated with changes in aquatic vegetation and sediment composition. Their feeding behaviours can disturb bottom sediments and increase turbidity in water bodies, affecting other aquatic organisms that rely on clear water and specific habitat conditions.
4. **Disease Transmission:** Introducing non-native species like Tilapia can also introduce new diseases or parasites to native fish populations, which may not have evolved defences against these pathogens.

5. Genetic Pollution: Hybridization between Tilapia and native species can sometimes occur, leading to genetic swamping of native populations and loss of genetic diversity.
6. Gear damaging: The local fish farmers want to get rid of the fish as it tears their nets by the spines of its dorsal fin. The cost of harvesting Tilapia is double that of carp.

Conclusion:

The catch obtained from local water bodies is not of SRT because both male and female stock are reported to have occurred in local fish markets. The seed of cyprinids obtained from West Bengal is not pure. Instead, it is manipulated with Tilapia. Fishery departments of every state should strictly check its culture practices and abundant stock in open water and local fish markets as well. There is no accurate information on their propagation and adverse ecological impacts; therefore, there is an urgent need to undertake a well-planned research program to assess their impacts.

Declaration of interest

The author declares that he has no known competing financial interest or personal relationships that could have appeared to influence the work reported in this paper. The author is not involved in editorial review or the decision to publish this article.

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