AGRIALLIS
Science for Agriculture and Allied Sector: A Monthly e Newsletter

Volume 3 – Issue 3
Online ISSN: 2582-368X
www.agriallis.com

IMPACTS OF BIO-INVASION BY NILE TILAPIA (*Oreochromis niloticus*) IN TELANGANA STATE

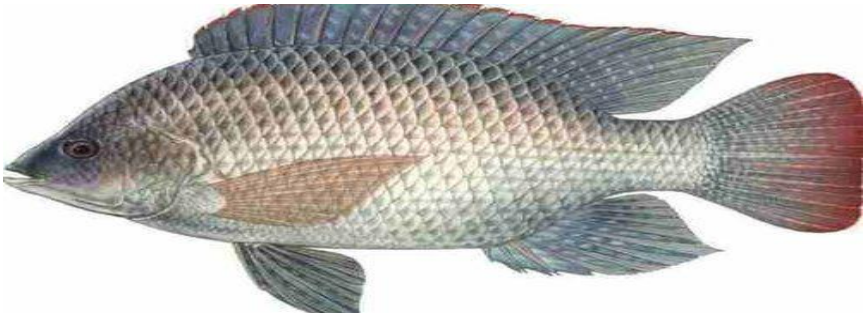
Article Id: AL202137

[1] Arun Konduri*, [2]Gora Shiva Prasad, [3] Elchelwar VR and [4] MohanaSwapna Narra

[1]ICAR-Central Institute of Fisheries Education, Versova, Mumbai – 400061, India
[2]Faculty of Fishery Sciences, Kolkata, West Bengal - 700094, India
[3]College of Fisheries Science, Veraval, Gujarat - 362266, India
[4]College of Fishery Science, Muthukur, Andhra Pradesh - 524344, India

Email: konduriarun001@gmail.com

Nowadays, the main environmental concern is Biological invasions. The bio invasions have great impacts on the native flora and fauna, and we are not aware of which introduced species will become invasive (Attayde et al., 2011). Invasion is a process done by human activities either accidentally or intentionally outside of its natural habitat (Kottelat and Whitten, 1996). Nile tilapia is an invasive species all over the world. Nile tilapia is a native species of Africa. From the upper Nile River southwards to the equator and west to the Atlantic coast, Nile tilapia is distributed naturally (Trewavas, 1983).



Oreochromis niloticus (Source: Fishbase.org)

Scientific Classification:

Kingdom: Animalia
Phylum: Chordata
Class: Actinopterygii
Order: Cichliformes
Family: Cichlidae
Genus: Oreochromis

Volume 3 – Issue 3
Online ISSN: 2582-368X
www.agriallis.com

Species: O. niloticus

In India, Nile tilapia was introduced in 1987 for the purpose of aquaculture. According to Singh and Lakra, 2006 a total of more than 7.17% is contributed by Nile tilapia to the inland fish production. In the global production of inland fishes, tilapias occupy second place after the carps (Ridha, 2006) and Tilapia is generally known as Aquatic Chicken. Because of its tolerance to the wide environmental conditions, Nile tilapia is a widely cultured species (Tsadik and Bart, 2007). Over the past three decades, the percentage and contribution of Nile tilapia were increased drastically to capture fisheries production and global aquaculture (De Silva et al.,2004).

On the other side, due to the introduction of species like tilapias, indigenous species were affected by poor growth rates and age structure (Sreenivasan, 1967; Dwivedi et al., 2016). Local aquatic biodiversity was degraded by appearance increased invasive alien species (Lakra *et al*., 2008). Local biodiversity (flora and fauna)is highly affected by the population of Nile tilapia, which is competing with other local population for food and shelter. Icthylogical diversity is greatly affected by Nile tilapia because of changing environmental conditions and lack of predation (Leveque, 2002; Vicente et al., 2011).

Habitat and Biology

The optimum temperature for Nile tilapia is from 31 to 36 °C. They used in life in shallow waters. Tilapia is highly tolerant to environmental parameters such as salinity, dissolved oxygen and temperature. Nile tilapia can filter feed by entrapping suspended particles, including phytoplankton and bacteria, on mucous in the buccal cavity, and also periphyton mats are the main source of nutrition. At the age of 5-6 months, it attains Sexual maturity in ponds. The temperature of the water is the main environmental factor in tilapia for spawning (24 °C). Male fish starts the breeding process by digging a crater-like spawning nest. This nest is the spawning place for a ripe female. Then male fish starts fertilization; after the fertilization, female fish carry the eggs into her mouth, and in the mouth, the eggs are incubated (Balarin and Hatton, 1979). There is a positive relationship between fecundity and female fish body mass.

Volume 3 – Issue 3
Online ISSN: 2582-368X
www.agriallis.com

Adaptive Characters for Invasion of Nile Tilapia

Nile tilapias, in particular, are highly successful invaders due to their environmental tolerance to water quality parameters such as salinity, dissolved oxygen, temperature and successful reproductive strategies and trophic plasticity (Lowe-McConnell, 1958; Leveque, 2002). This tolerance to environmental variability, along with their high fecundity, rapid growth rates and omnivorous feeding habits, further contribute to successful invasions in estuaries as well as freshwater bodies.

Occurrence of Nile tilapia in Telangana

Telangana state is endowed with vast and varied inland water bodies and diverse aquatic resources viz., tanks, canals, ponds, rivers and reservoirs. In Telangana, tilapias are distributed in all water bodies such as reservoirs, canals, ponds and tanks, and *Oreochromis niloticus* is the most occurring species of tilapia. Tilapia is the second most abundant species in the state of Telangana after the major carps. Compared to canals, ponds and tanks, the growth and abundance of tilapia are more in the reservoir due to the availability of food and enough space; also, they get sexual maturity earlier in reservoirs. Tilapia is not a culture species in Telangana, but they occupy the second position because of their prolific breeding nature and easy to acclimatize to changing environmental conditions. Recently, a study stated that 36-49 % of the catch was Nile Tilapia variety in Ameenpur Lake.

Impacts of Bio-Invasion

Each and Every aquatic ecosystem prone to some positive and negative impacts due to the bio invasion of alien species.

Positive Impacts by invasive Nile tilapia on Non-native Aquatic Ecosystem

Nile tilapia greatly reduces the water purification costs by eating aquatic vegetation and detritus matter, and therefore it is used for controlling aquatic weeds. Since the last thirty years, Nile tilapia is cultured as commercial aquaculture species. Generally, in stagnant waters, Chara sp. and Najas marina are a major problem; they could be controlled by introducing tilapia and some aquatic vegetative problems also solved by the invasion of tilapia. Most of the filamentous algae and floating plants are controlled by tilapia, such as

Volume 3 – Issue 3
Online ISSN: 2582-368X
www.agriallis.com

Lemna species and filamentous algae. Malaria causing mosquitos was greatly controlled by tilapia by eating mosquito eggs and larvae in many countries. The contribution of tilapias to global aquaculture production has increased over the past few years, with the production of 2.6 million tons in 2004 was and continued to rise up to 3.6 million tons in 2008 (FAO, 2010).

Negative Impacts by invasive on Non-native Aquatic Ecosystem

In many ways, tilapia can cause problems with native biodiversity (Indigenous species). They disrupt the ecological balance and negatively affect the local environment by competing for food and shelter with other species, and the intensive production of tilapia leads to Eutrophication of water. They gradually decrease the diversity and density of local plants, which are used for spawning and protection by the local fish species. Tilapia mostly feeds on the eggs of other species, which leads to the extinction of local species. Eating Not only local species but also they spread disease within the aquatic ecosystems. Along with commercial fisheries, recreational fisheries were also greatly affected by the invasion of Nile tilapia. In ponds and lakes, the primary productivity mainly depends on the phytoplankton and zooplankton composition. Production is reduced by the invasion of tilapia by grazing upon them. Phytoplankton and zooplankton number, composition and also biomass in tropical lakes and reservoirs can be reduced by Nile tilapia, but phytoplankton biomass and size-structure influence the magnitude of effects. Singh et al., 2010 stated that local recourses and native species suppressed by the invasion of Nile tilapia.

General Management Strategies

Ecology, morphology, phenology, reproductive biology and physiology are the essential and basic knowledge for the effective management of alien species. We can handle the problem of bio invasion in many ways. Strict quarantine, strictly controlled introductions and checking on imports are major ways to stop and suppress the invasion of new species from other geographical areas. Moreover, one of the best methods to control is preventing the establishment of alien species. The general public can also participate in alien species prevention by educating themselves about this problem.

Volume 3 – Issue 3
Online ISSN: 2582-368X
www.agriallis.com

Conclusion

As a consequence of its wide environmental tolerance, high reproductive rate, rapid population growth and ease of cultivation, the Nile tilapia has become a model of livestock farming in several countries. However, the same characteristics that make the species attractive for aquaculture render it highly invasive, with considerable potential for becoming a pest in aquatic environments where it is introduced. The risks of tilapia introduction must, therefore, be rigorously evaluated and weighed against the potential socio-economic benefits.

References

Attayde, J. L., Brasil, J., &Menescal, R. A. (2011). Impacts of introducing Nile tilapia on the fisheries of a tropical reservoir in North-eastern Brazil. *Fisheries Management and Ecology*, *18*(6), 437-443.

Balarin, J. D., & Hatton, J. P. (1979). Tilapia: A guide to their biology and culture in Africa.

De Silva, S.S., Subasinghe, R.P., Bartley, D.M.,&Lowther, A., (2004). Tilapias as Alien Aquatics in Asia and the Pacific: a Review. FAO Fisheries Technical Paper. Rome, No. 453.

Dwivedi, A. C., Mayank, P., & Tiwari, A. (2016). The River as transformed by human activities: the rise of the invader potential of Cyprinuscarpio and Oreochromis niloticus from the Yamuna River, India. *Journal of Earth Science & Climatic Change*, *7*(7), 361.

Kottelat, M., & Whitten, T. (1996). *Freshwater biodiversity in Asia: with special reference to fish*. The World Bank.

Leveque, C. (2002). Out of Africa: The Success Story of Tilapias. *Environmental Biology of Fishes*, *64*(4).

Lowe-McConnell, R. H. (1958). Observations on the biology of Tilapia niloticaLinné in East African waters. *Rev. Zool. Bot. Afr*, *57*, 129-170.

Volume 3 – Issue 3
Online ISSN: 2582-368X
www.agriallis.com

Ridha, M. T. (2006). Comparative study of growth performance of three strains of Nile tilapia, Oreochromis niloticus, L. at two stocking densities. *Aquaculture Research*, *37*(2), 172-179.

Singh, A. K., &Lakra, W. S. (2006). Alien fish species in India: impact and emerging scenario.

Singh, A. K., Pathak, A. K., &Lakra, W. S. (2010). Invasion of an exotic fish—common carp, cyprinuscarpio L.(actinopterygii: cypriniformes: cyprinidae) in the Ganga River, India and its impacts.

Sreenivasan, A. (1967). Tilapia mossambica: Its ecology and status in Madras state, India. *Madras J Fish*, *3*, 33-39.

Trewavas, E. (1983). *Tilapiine fishes of the genera Sarotherodon, Oreochromis and Danakilia*. British Museum (Natural History).

Tsadik, G. G., & Bart, A. N. (2007). Effects of feeding, stocking density and water-flow rate on fecundity, spawning frequency and egg quality of Nile tilapia, Oreochromis niloticus (L.). *Aquaculture*, *272*(1-4), 380-388.

Vicente, I.S.T., M.K.H.R. Rocha, B.S. Mendonca and L.R. Faria *et al*., (2011). Computed tomography in the evaluation of fish nutrition. Proceedings of the 4th International Symposium on Fish Nutrition and Health, September 26-27, 2012, Sao Paulo State University, pp: 20-24.