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Original Article

## Impact study of the feral population of alien fish species on growth of Indian major carp species in Chenugonipally Peddacheruvu tank of Mahabubnagar District, Telangana, India

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### Abstract

Alien fish species viz., Nile tilapia, *Oreochromis niloticus*, Mozambique tilapia *O. mossambicus* and African catfish, *Clarias gariepinus* has formed a feral population in the carp fish cultured Peddacheruvu (irrigational tank) of Chenugonipally village, Mahabubnagar district in India. Documentation of these species in irrigational tanks in the district is scanty. The study was carried out from April 2013 to June 2015. The paper describes occurrence, abundance and impact of alien species like *Oreochromis niloticus*, *O. mossambicus* and *Clarias gariepinus* on commercially important cultured carp species in the tank. This study showed significant increase of alien fish species population and its impact on decline of carp production in Peddacheruvu of Mahabubnagar district in India.

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**Key words:** Peddacheruvu, Tilapia, African catfish, Mahabubnagar District, Telangana.

### 1. Introduction

Alien fish species viz., tilapia, a native to Africa and Middle East has emerged as one of the most internationally traded food fishes in the world. The African mouth-brooder cichlid or the Mozambique tilapia, *Oreochromis mossambicus* is native to the eastward flowing rivers of central and southern Africa. Official records show that *O. mossambicus* was first introduced to India from Srilanka in 1952 and thereafter stocked in several reservoirs of southern India for production enhancement [1]. Nile tilapia, *Oreochromis niloticus* is a relatively large cichlid fish, which is introduced to several countries where its populations exist outside its natural range e.g. Brazil, Australia, Bangladesh, Srilanka, India [2, 3]. Tilapia now forms a part of fish fauna in the Godavari, Krishna, Cauvery, Yamuna and Ganga Rivers [4].

The African catfish, *Clarias gariepinus* is also native to Africa, was introduced into the state of West Bengal in India possibly during 1994 from neighboring Bangladesh

[5] and quickly spread throughout the country, including into cold regions as well as coastal areas. It is cultured clandestinely in the states of West Bengal, Punjab, Tamil Nadu, Karnataka, Assam, Maharashtra, Andhra Pradesh and Telangana in India.

Escapement of tilapia and African catfish from aquaculture facilities due to recurring floods or inadvertent releases frequently happened into the rivers in India. However, recent occurrence of tilapia and African catfish in the fishery of the irrigational tanks has been a concern. It was interesting to see a considerable quantity of in the fishery of the irrigational tanks. This scenario prompted us to study its population abundance and assess its possible impacts on the cultured fishery in the tanks.

### 2. Materials and methods

Mahabubnagar is the largest district in Telangana state of India in terms of the spread, with geographical area of 18,432 Sq. Km and about 100 Km away from the state capital Hyderabad city. About 6200 irrigational tanks exist in the district. These tanks are primarily used for

agriculture and fish culture is the secondary activity. Peddacheruvu tank of Chenugonipally village, Gadwal mandal was selected for the study in the district which is about 96 Km away from the district headquarters. This tank receives water from the Jurala Project canal and also receives sewage water directly from the Gadwal town (Table: 1 & Fig. 1 - 3). The fishermen stocks advanced size carp fish seed every year in the month of July or August and gives artificial feeding daily (Fig. 4). In order to increase the plankton growth, periodical fertilization was also done. Data was collected from this irrigational tank from April 2013 to June 2015 which was the fish harvesting time and calculated the abundance of both the tilapia and African catfish species (Table : 2, Image & Fig. 5 - 8).

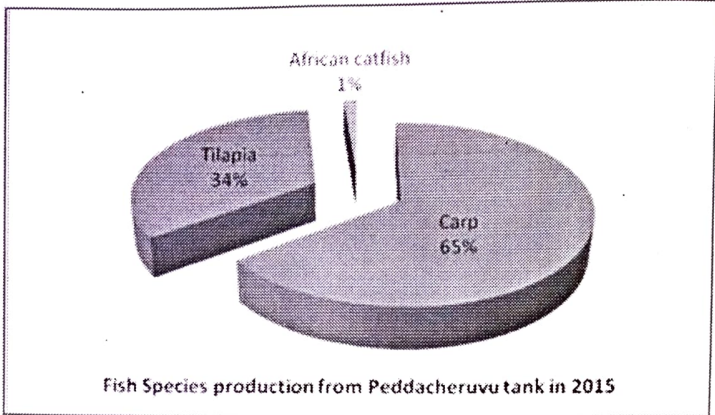


Image: Share of fish species production in Peddacheruvu tank from 2013 to 2015.

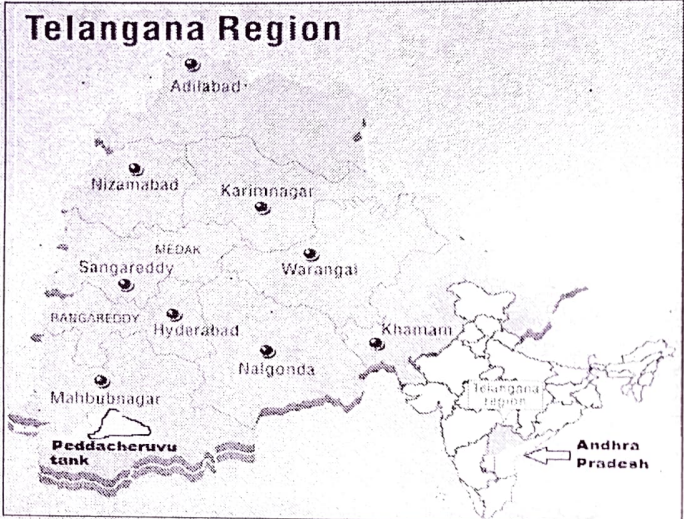


Fig. 1: Location of study tank in Mahabubnagar, India.

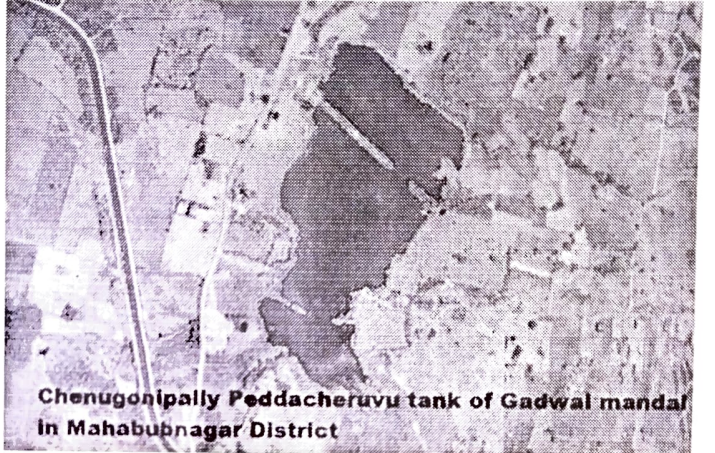


Fig. 2: Google satellite view of Chenugonipally Peddacheruvu tank.

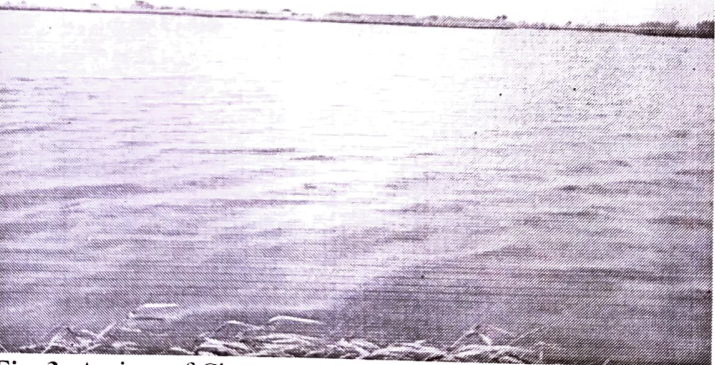
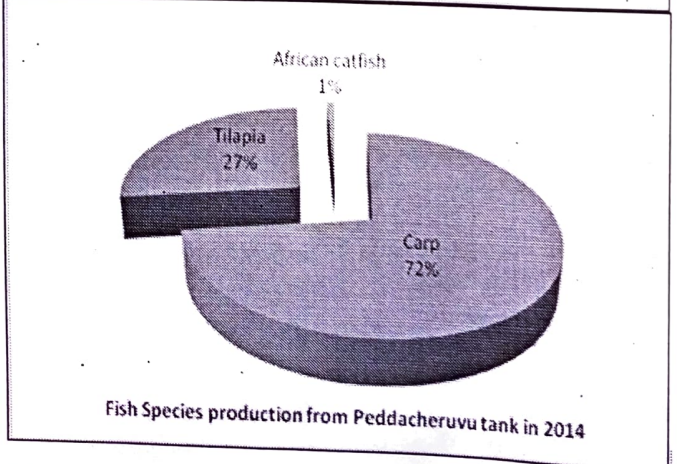
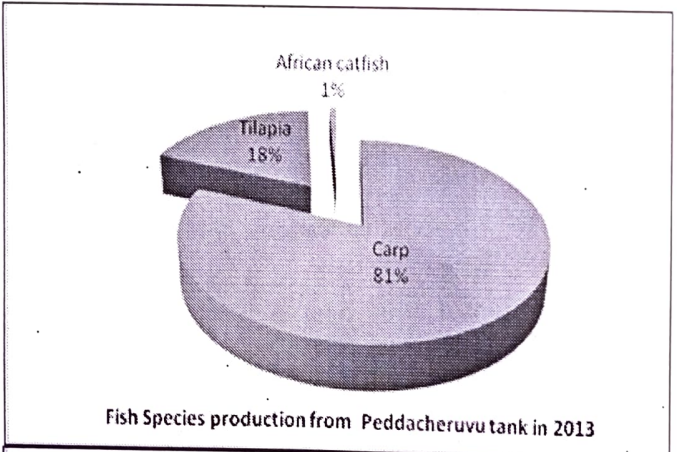


Fig. 3: A view of Chenugonipally Peddacheruvu tank.



Fig. 4: Filling supplementary feed in pored bags at tank site.



**Fig. 5:** Trail netting of fish from the tank.



**Fig. 6:** Harvesting of fish from the tank.



**Fig. 7:** Harvested fish with carp and tilapia species.



Fig. 8: Harvested fish with carp, tilapia and African catfish species.

Table 1: Salient features of Peddacheruvu tank in Mahabubnagar District.

SL No.	Attribute	Value
1	Location of the tank	Longitude : 77.8° E Latitude : 16.23° N
2	Water Spread Area at FTL	16 Ha.
3	Water level (Avg.)	3-5 feet
4	Water Source	Jurala canal + Sewage water
5	Seasonality of tank	Perennial
6	Purpose	Irrigation

### 3. Results and discussion

The fish species harvested from the Peddacheruvu tank was identified and commercially important fish were grouped as carps, tilapia, catfishes, and miscellaneous fishes. The carp species comprised of *Catla catla*, *Labeo rohita*, *Cirrhinus mrigala*, Common carp and Grass carp constituting 61% to 91% of the total catch. Tilapia was present in all the catches ranging from 20.90% to 31.81% and the African catfish, *Clarias gariepinus* was present from 0.84% to 1.30% (Table: 2). Other miscellaneous fishes were present i.e. minor carps, Murrels, *Etrophus suratensis*, *Mystus sp etc.*, representing less than 0.2% of total catch.

The abundance of the tilapia ranged from 20.90% to 31.81% in the tank. The weight of the tilapia fish ranged from 150 to 350 g in weight and the quantity of *O. niloticus* included high proportion than the *O. mossambicus* (Fig.7). The abundance of the African catfish, *Clarias gariepinus*

was also ranged from 0.84% to 1.30% and weight of the fish was 2-9 kg each (Fig. 8).

Among the alien fish species, *O. mossambicus* was introduced into India during 1952 for aquaculture purpose and the utilization of *O. mossambicus* gradually expanded for enhancing reservoir fishery production [3, 6]. *Oreochromis niloticus* was introduced into India during 1987 for aquaculture purpose and now it contributes more than 7.17% in total inland fish production [6]. Results of this study delineated increased abundance of these fishes in the fishery and have now established feral population in the irrigational tanks of reservoir / river fed water. Tilapia develops its own ecology for its survival and repopulating by competing with other fishes.

The African catfish, *Clarias gariepinus* was clandestinely introduced into the state of Andhra Pradesh in early 1990s from Bangladesh through West Bengal [8], created severe environmental problems including pollution of water and air in the vicinity of farm ponds. African catfish farming reported in the vicinity of the Priyadarshini Jurala Project (PJP) which is a major multipurpose project constructed across the river Krishna in Mahabubnagar district [9]. This reservoir/project supplies water to some irrigational tanks and other reservoirs including Chenugonipally Peddacheruvu tank in Mahabubnagar district.

The African catfish culture ponds are generally shallow and located in low lying areas adjoining the reservoir. Monsoon rains and associated flooding cause bunds and associated traditional sluice structures in the ponds to break frequently thereby facilitating the escape of the pond fish into the main water body of the reservoir.

The little or no management measures taken by farmers

especially in preventing such escape of pond reared individuals has now resulted in the species being distributed in many natural water bodies of the country. *C. gariepinus* is now being increasingly caught from many rivers including Ganga, Yamuna, Sutlej, Krishna and Godavari [9, 11, 12] and irrigational tanks [10]. Reported on the negative impacts of the introduction and culture of *C. gariepinus* on the native fish fauna of Manalur in Kerala [13]. They observed that African catfish escaped from rearing ponds in the area and got established in the larger community/village ponds subsequently wiping out the indigenous species. Apprehensions have been raised by local communities on the possible impacts to native fishes of the Kole-wetlands that lie adjacent to ponds stocked with *C. gariepinus* in the case of such escapes [13].

*C. gariepinus* is a slow-moving, omnivorous predatory fish, which feeds on a variety of food items from microscopic zooplankton, to fish half its length, or 10% of its own body weight. Another important aspect of predation by *C. gariepinus* is their ability to switch feeding from one type of prey to another [14]. This could indicate a grave threat to

all organisms that fall under the prey spectrum of *C. gariepinus* in case of a proliferation of population of this exotic catfish in water bodies.

Significant negative effects of tilapia and African catfish on the piscine diversity, cultured carp species have been reported [4, 10]. *O. niloticus* in India has already been reported to cause sharp decline in the catches of endemic fishes [4, 7]. The declining trend of Indian major carps in the Ganga River, Krishna River and increasing appearance of *O. niloticus* in the fishery is a warranting situation of biological invasion threatening ecological integrity. Consequently, the catches of local fish species have been adversely affected [15, 16] but invasion of exotic *O. niloticus* in the fishery of the Ganga River has been recent further aggravating the threats to the indigenous fish diversity including environmental problem [17]. The declining trend of Indian major carps and increasing appearance of *O. mossambicus* in the fishery of Veeranna tank is also an adverse effect on tank ecology [18]. Discussion with the fishermen of the tank also indicates

**Table 2:** Fish production trends in Peddacheruvu tank of Chenugonipally from 2013 to 2015.

Year	Total fish production in tonnes	Carp production in tonnes	Production %	Tilapia production in tonnes	Production %	African catfish production in tonnes	Production %
2013	45.13	41.16	91.20	9.43	20.90	0.38	0.84
2014	53.92	39.53	73.31	14.52	26.93	0.46	0.85
2015	57.65	35.12	60.92	18.34	31.81	0.75	1.30

Note: 1 tonne = 1000 Kg

that cultured carp species production decreased and tilapia and African catfish population catching increased significantly since last couple of years without stocking of these species seed in Peddacheruvu tank.

We positively believe that Tilapia and *C. gariepinus* has established a feral population in Jurala Reservoir and its associated wetlands. The extent of spread of *C. gariepinus* in various natural water bodies of Telangana especially those that are located near areas where farming of this species takes place require comprehensive investigations. Determining the biological, demographical and genetic impacts of the presence and possible colonization of this predatory species on native fish fauna is an immediate research priority. It would also be worthwhile to conduct studies to determine the best techniques for capture and control of this predator.

#### 4. Conclusion

Tilapia fish is a highly space and food competitor for cultured carp species. Thus there is an immediate need for all stakeholders involved to discuss and deliberate the potential impacts of this problem and chalk out efficient strategies to combat them. *C. gariepinus* is a highly carnivorous in nature and threat to native species. Effectual control of alien species can only be undertaken through understanding the pathways of introduction and dispersal. We expect that our present effort could be a start to more

studies in the future that could bring insights into the emerging issue and compel the authorities to act in a rational manner. The invasion of tilapia and African catfish has increasingly taken-over in irrigational tanks particularly canal fed tanks, which is considered serious in view of sustainability of indigenous fish diversity. Further investigations should be carried out to determine the extent of spread of these species in Krishna River fed tanks in the district and to understand its impact on native fish and fisheries.

#### 5. Acknowledgements

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