



Assessment of the Impact of Tilapia, (*Oreochromis niloticus*) on the Survival Percentage of Seed Stockings of Indian Major Carps, *Catla catla* (Katla), *Labeo rohita* (Rohu) and *Cirrhinus mrigala* (Mrigala), in Srirangapur Balancing Reservoir of Wanaparthy District in Telangana, India

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ABSTRACT

Fish is an indispensable source of food security. Indian Major carps (IMC) are contributing a major share in the fish farming industry and food markets. Evaluation of the impact of dominant fish species on cultivable fish species in open water ecosystems has been a necessary concern. Artificial stockings are necessary to increase the productivity and abundance of cultivable fish species in aquaculture. The present study was conducted from 2017 to 2021 for five years to assess the survival percentages of IMCs in Srirangapur Balancing Reservoir located in Wanaparthy district of Telangana State in India. The results indicated less than 5% of seed survival against a huge seed stocking of three species of IMC VIZ., *Catla catla* (Katla), *Labeo rohita* (Rohu) and *Cirrhinus mrigala* (Mrigala), suggesting that the survival percentage of these cultivable fish species was seriously affected in this reservoir by Tilapia (*Oreochromis niloticus*) which was dominating with 3-fold abundance than that of the stocked cultivable fish during the five-year study period.

Keywords: Indian Major Carps, Food security, Dominant species, Survival percentage, Srirangapur Reservoir, Telanagana State.



Introduction:

Fish is the rich food for the poor and is also often referred to as “Brain food”. Majority of population in Indian states like West Bengal, Odisha, Goa, Kerala and North-east states eat fish regularly. According to FAO in its Seventy-seventh report 2013, stated that, fish protein has greater safety effect than other sources of animal proteins like beef and chicken. In comparison to the other sources of dietary animal proteins, consumers have wide choice for fish as far as affordability is concerned as there are many varieties and species of fishes available, especially in the tropical countries. The biochemical composition of fish consists of 65-80 % of moisture, 15-20% of protein, 5-20% of fat and the Ash is less than 2%. (Mohanty B. P. 2011) (Srichandan, A.K. Das and D. Panda 2015). Fish has high quality of protein with low fat content providing superior quality of fatty acids Omega-3 fatty acids, the PUFAs VIZ; Eicosapentaenoic acid (EPA) and Docosapentaenoic acid (DHA) these are essential as antioxidants antithrombotic and antihypertensive molecules to maintain a healthy heart function, brain function, maintenance of pregnancy, lower the risk of depression, memory loss, etc. These fish oils, with long chain fatty acids which are highly unsaturated with 5-6 double bonds greatly differ from the oils of mammals. About 17 % of total animal source protein for human consumption comes from the aquaculture sector (FAO 2020). India accommodates huge water resources for aquaculture such as Rivers & Canals 1,95,210 km, Tanks & Ponds 24.14 (lakh ha), Reservoirs 31.50 (lakh ha), Flood plain / Derelict Water Bodies, 8-12 (lakh ha), Brackish water (lakh ha) 12.40 (lakh ha), Saline / Alkaline affected areas 12.00 (lakh ha), Cold Water Resources Rivers 8,253 km, Natural Lakes 21,900 (ha) and Reservoirs 29,700 (ha).

Tilapia is a cichlid fish. Native to Africa. Found in shallow waters of all kinds of freshwater habitats, this fish can be acclimatized to live under extreme/adverse ecological conditions. It is a successful tropical water fish, often called fresh water chicken in the food business. This species is notorious for escaping to other connected habitats. It is reported that this invader can spread diseases to the native ones. Once established, it is impossible to eradicate the invasive Tilapia from that habitat. The voracious nature of this fish can dominate and cause competitive exclusion of the local species (Jeffrey.2007). Nile tilapia is a tropical species that prefers to live in shallow water. It is an omnivorous grazer that feeds on phytoplankton, periphyton, aquatic plants, small invertebrates, benthic fauna, detritus and bacterial films associated with detritus. Sexual maturity in ponds is reached at an age of 5-6 months. Spawning begins when the water temperature reaches 24°C. The female incubates the eggs in her mouth and broods the fry after hatching until the yolk sac is absorbed. Fecundity is proportional to the body weight of the female. A 100 g female will produce about 100 eggs per spawn, while a female weighing 600-1000 g can produce 1000 to 1500 eggs. Nile tilapia can live longer than 10 years and reach a weight exceeding 5 kg. In populations of tilapia, males grow faster and are more uniform in size than females.

The present study is connected to understanding the impact of Tilapia (*Oreochromis niloticus*) and its competitive stress on the survival percentage of cultivable fish species in Srirangapur Balancing Reservoir fed by Priyadarshini Jurala Project built across River Krishna. in Telangana State in India.

Materials and Methods:

Study Area:

The study area is Srirangapur Balancing Reservoir, the Krishna River fed Reservoir located in Srirangapur village in the Wanaparthy district of Telangana state, also called as Rangasamudram as it hosts the famous Sri Ranganatha Swamy temple built by the dynasty of Wanaparthy samatan. Fishermen Cooperative Society Srirangapur manages fishing, seeding and marketing facilities here. 280 fisher folk of Srirangapur, Kamballapur villages are dependent on this reservoir. The morphometric features are shown in Table 1 and Fig.1&2.

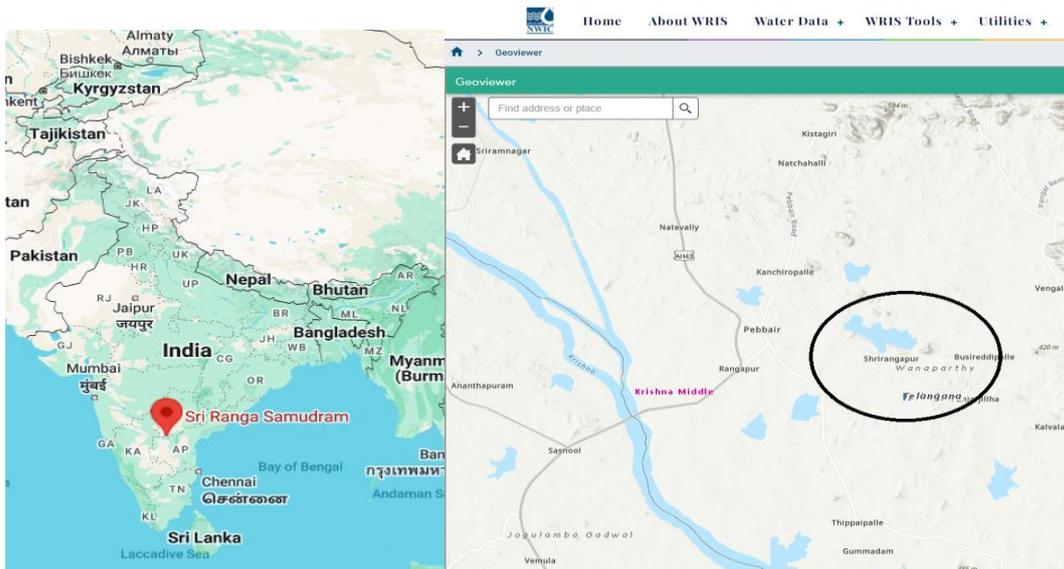


Fig.1: Srirangapur Balancing Reservoir Fig.2: Srirangapur Balancing Reservoir (Source: WRIS-India) (Source: Google maps)

Table 1: Morphometric features of Srirangapur Reservoir

S.No	Attribute Value	Srirangapur Reservoir
1	Location	77-03-0 E, 16-12-0 N
2	Name of the Dam	Ranga samudram
3	Nearest city	Srirangapur
4	District	Wanaparthy
5	State	Telangana
6	Basin name	Krishna
7	River	Vagu (Tributary of Krishna)
8	Size	Medium
9	Purpose	Irrigation
10	Year of completion	2017



11	Length of Dam(m)	5.91KM
12	Dam Type	Gravity/Masonry
13	Catchment area (Sq. Km)	129.69 Sq KM
14	Water spread area(ha)	911 ha
15	Water source	Monsoon run-off/By lift

(Source: Irrigation Department, Government. of Telangana)

Sampling Methods:

The baseline data regarding morphometric details the reservoirs, such as their inflow and outflow of the water, geo coordinates, water spread area etc., are collected from India-WRIS (India- Water Resources Information System) and Command Area Development division, Department of Fisheries Government of Telangana State in order to understand the topography of the reservoir selected as survey stations falling downstream of Priyadarshini Jurala Project (PJP) of the River Krishna. Local fishermen and Fishermen Cooperative Societies were contacted to obtain information on the abundance of fish varieties. As the available data on the abundance of cultivable fish species such as Indian Major Carps (IMC) VIZ., *Catla catla* (Local name: Katla), *Labeo rohita* (Local name: Rohu), *Cirrhinus mrigala* (Local name: Mrigala) indicated that there is constant decline, a sampling method was designed to assess the abundance of populations of Tilapia (*Oreochromis sp.*) along with the fish species that are cultivable in this reservoir associated with PJP. The selection of Survey stations was considered on the basis of discussions with the members of Fishermen Cooperative Societies of the area in order to minimize errors of samplings to establish the impact of Tilapia on the selected cultivable fish species.

Seed stocking methods

Seed stocking was done in study stations for the Indian Major Carps in coordination with the Department of Fisheries, Government of Telangana and Fishermen Cooperative Societies of concerned study stations. During this process, the fingerlings of 25 to 30 mm length of IMC were released into the reservoirs. The number of seed stockings varies year to year. Seed stockings were done in the beginning of the harvesting year, i.e., in the month of June. Like these seeding activities were carried out during the study period of five years. The fingerlings are released in all directions of the reservoirs in order to cover the uniform distribution. The fish seed stocking was done for the five years of the study period i.e., from 2017-18 to 2021-22. The data of these details was tabulated in Table 2. Tilapia (*Oreochromis sp.*) exists in all reservoirs of the study area without seed stock at any point of time during the study period. The harvesting year begins with the Monsoon season every year and ends with the summer season of the next year. In every year the harvest was done in three seasons i.e., the Monsoon (July to October), the winter (November to February) and the summer (March to June).



Survival Percentage of IMC and other cultivable fish:

The survival percentage of the cultivable fish such as Indian Major Carps (IMC) VIZ., *Catla catla*, *Labeo rohita*, *Cirrhinus mrigala*, was calculated based on the fish harvested during the end of each harvest year of the study period (2017-18 to 2021-22). Sampling was done with the help of local fisher community and Fishermen Cooperative Societies. The samples of the cultivable fish were drawn from the Srirangapur Balancing Reservoirs and were pooled together for obtaining the total abundance per year. Like this for all the five years there were 5 values for each species of the fish. These values were used for the calculation of survival percentage based on the respective species seed stocking values. The samples collected in the months of May, June of 2018 correspond to the seed that was stocked in the month of June 2017. In this manner the samples were collected to assess the survival percentage of each species.

The percentage of survival of the fingerlings of all species was calculated according to Sona Yengkokpam *et al* (2020).

Survival Percentage (%) = [Number of fish species harvested/Number of seeds of the fish species stocked] X100.

Results:

Table 2: Seed stocking details in study station during 2017-2022

Study station	Fish species	Seed Stocking of Fish Species during 2017-18 to 2021-22				
		2017-18	2018-19	2019-20	2020-21	2021-22
Srirangapur	Tilapia (<i>Oreochromis niloticus</i>)	0	0	0	0	0
	Katla (<i>Catla catla</i>)	300000	300000	300000	300000	300000
	Rohu (<i>Labeo rohita</i>)	300000	300000	300000	200000	250000
	Mrigala (<i>Cirrhinus mrigala</i>)	100000	100000	100000	100000	100000

Table 3: Dominance of Tilapia survival recorded in Srirangapur Balancing Reservoir during 2017-18 to 2021-22

Fish Species	2017-18	2018-19	2019-20	2020-21	2021-22
Tilapia (<i>Oreochromis niloticus</i>)	38853	39856	33599	40032	56197
Katla (<i>Catla catla</i>)	10999	12884	7357	6969	8758
Rohu (<i>Labeo rohita</i>)	11188	11123	8287	7824	10196
Mrigala (<i>Cirrhinus mrigala</i>)	822	791	512	615	1024

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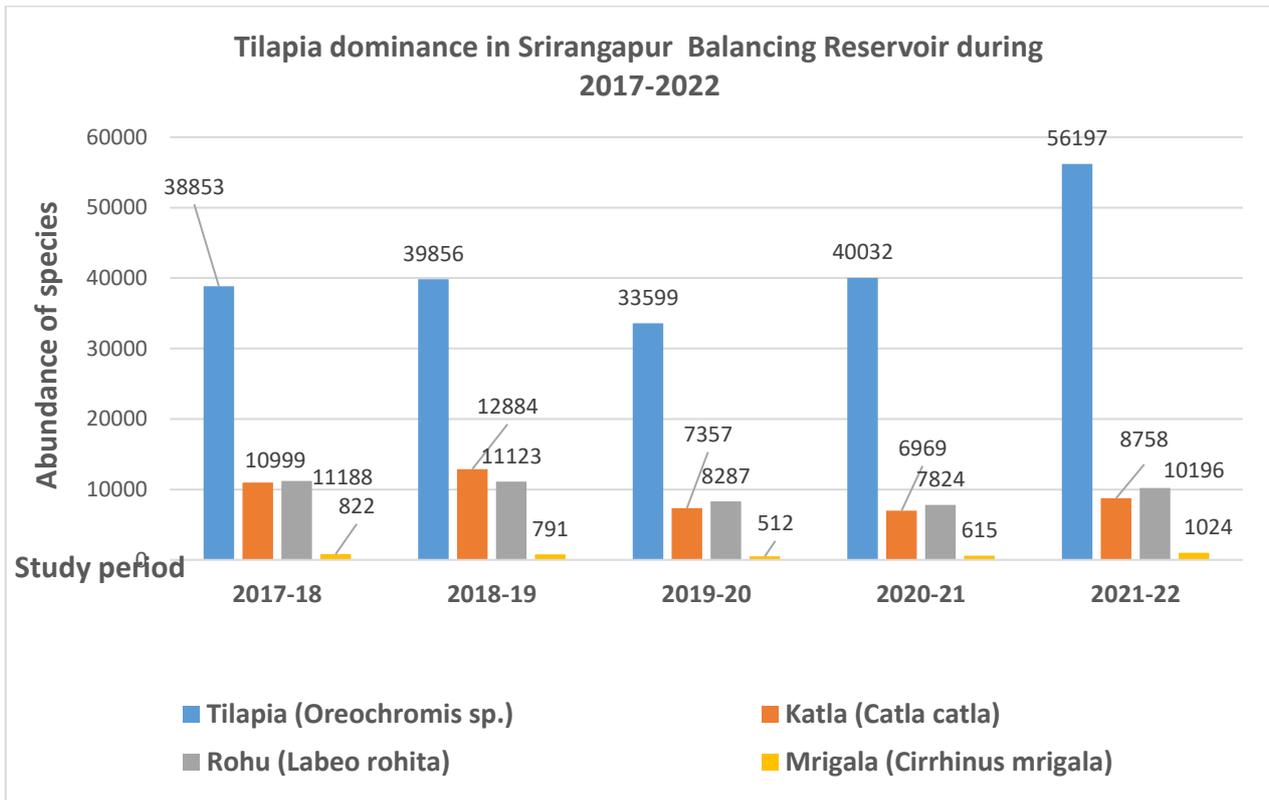


Fig.3: Tilapia dominance in Srirangapur Balancing Reservoir during 2017-2022

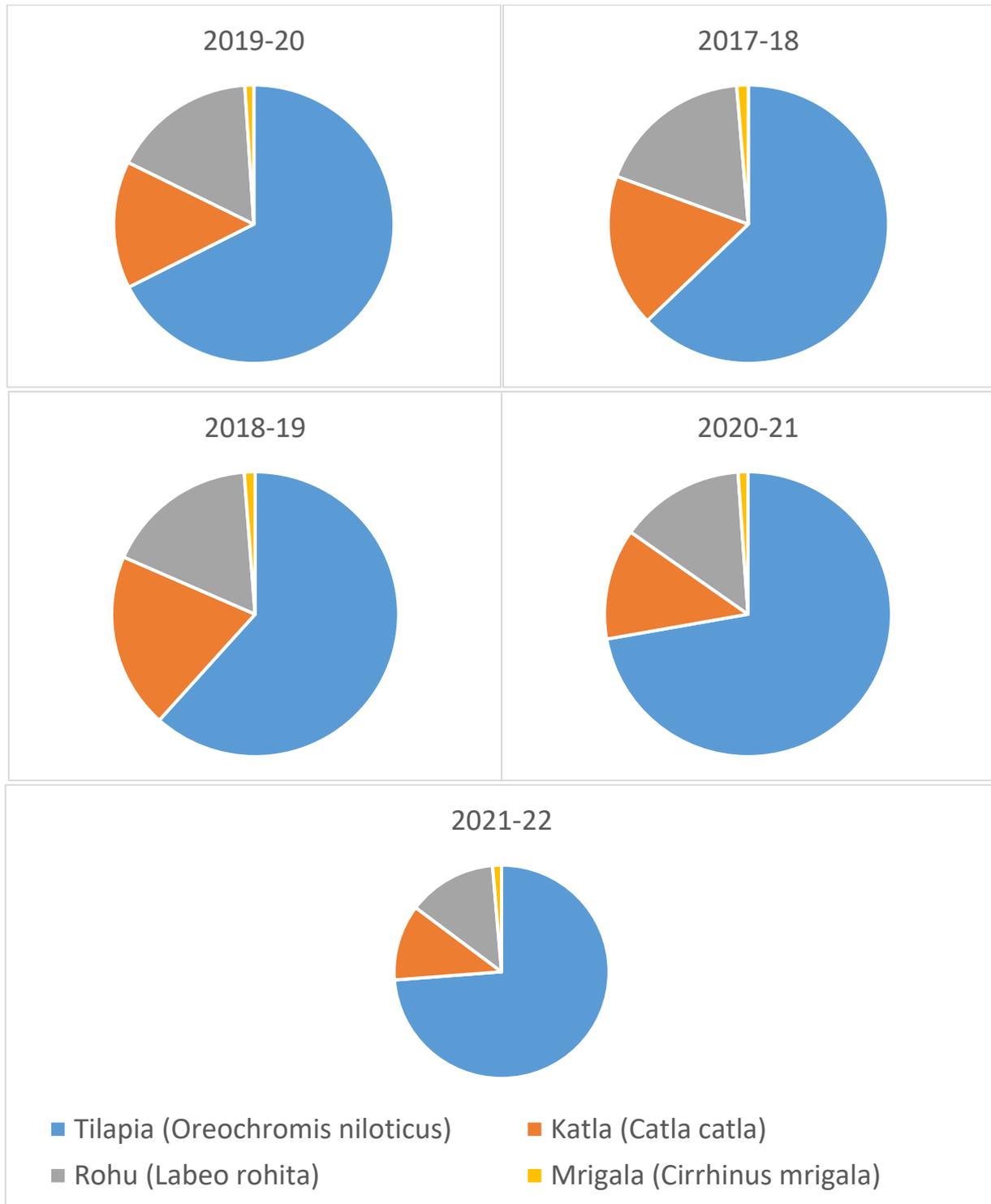


Fig.4: Tilapia dominance in Srirangapur Balancing Reservoir during the study period from 2017-2022

Table 4: IMC seed survival percentage in Srirangapur Balancing Reservoir, a Tilapia dominating habitat during 2017-18 to 2021-22

Study Station	Fish Species	Survival Percentage of Indian Major Carps in the study period in Srirangapur Balancing Reservoir				
		2017-18	2018-19	2019-20	2020-21	2021-22
Srirangapur Balancing Reservoir	Katla (<i>Catla catla</i>)	3.67%	4.29%	2.45%	2.32%	2.91%
	Rohu (<i>Labeo rohita</i>)	3.73%	3.70%	2.76%	3.91%	4.07%
	Mrigala (<i>Cirrhinus mrigala</i>)	0.82%	0.79%	0.51%	0.61%	1.02%

Discussion:

The Results indicated that, in Srirangapur Balancing reservoir, during the harvesting years from 2017 to 2020-21 the survival percentage of seed stockings of Indian Major Carps i.e., Katla (*Catla catla*), Rohu (*Labeo rohita*) and Mrigala (*Cirrhinus mrigala*) was significantly low against their huge stockings. The major reason for the lesser survival percentage of seed was strongly established populations of Tilapia (*Oreochromis niloticus*) as the data of samples collected from this reservoir clearly indicated the dominance of Tilapia (Table 3 & 4 and Fig. 3 & 4) during the study period. The abundance of Tilapia was exceptionally good without any seed stock and the cultivable fish species were seriously affected by Tilapia in the study area during the study period.

Statistical analysis of the data of fish samples during the study period of five years from 2017-2022 showed a significant difference of Tilapia from the cultivable fish species and showed a negative correlation to the cultivable fish. Many aquatic habitats in this area were with well-established Tilapia populations, seriously affecting the survival of local and cultivable food fish species. From the present study it can be concluded that the Tilapia (*Oreochromis sp.*) have been the dominant species in the abundance of populations impacting the survival and abundance of the cultivable fish species of Indian Major Carps (IMC) such as Katla, (*Catla catla*) Rohu, (*Labeo rohita*), Mrigala (*Cirrhinus mrigala*)

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