



Population Structure of Nile Tilapia, *Oreochromis niloticus* (Linnaeus 1758) from the Ken River, India

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Abstract

The Ken river arises in the Damoh district of the Madhya Pradesh, and flows between latitude 23° 59' to 25° 46' 54" N and longitude 80° 15' 45" to 82° 32' 08" East covering area 28,058 sq km and length 430 km. The random fish samples were collected monthly between January 2015 to February 2016 for estimation of population structure of *Oreochromis niloticus* from the Ken river, India. The samples were measuring from 85 to 472 mm in total length which was varied from 0+ to 7+ age groups. According to the percentage occurrence 2+ age group was most dominated with male (31.14%) and female (31.45%) of the total stocks. Male population was dominated in 0+, 3+, 4+, 6+ and 7+ age groups with percentage share as 6.59%, 26.35%, 13.17%, 1.79% and 0.60%, respectively. But, female population was dominated in 1+, 2+ and 5+ age groups and contributed 18.24%, 31.45% and 5.65%, respectively in total catch. It breeds twice or thrice per year. The frequency of the breeding is most suitable for the stabilization of the stocks. The 7+ age group indicated that the ecological condition was favorable for *O. niloticus* from the Ken river, India. It is believed that this healthy stock (0+ to 7+ age groups) of *O. niloticus* from the Ken river is due to habitat degradation and water quality of the river.

Keywords: Population structure, Nile tilapia, Ken river, *Oreochromis niloticus*, Age groups

Citation to This Article: Dwivedi AC, Jha DN, Das SCS, Mayank P. Population Structure of Nile Tilapia, *Oreochromis niloticus* (Linnaeus 1758) from the Ken River, India. Journal of Scientific Achievements, May 2017; 2 (5): 23-27.

INTRODUCTION

The Ken river is draining in the Bundelkhand region. The Bundelkhand region is well known for drought and poor community due to water availability. *Oreochromis niloticus* (Nile tilapia) is a deep bodied fish with have cycloid scales. Present time *O. niloticus* is a commercially exploited fish species in the Ken river at Banda. *O. niloticus* is an African native fish species. It is currently transplanted to numerous other countries of the globe especially the tropical and subtropical parts of the globe. It has become the top most frequently consumed farmed fish after carps [1, 2].

Fish stocks are alter, damaged and invaded by human activities like domestic, business, ornamental or trial purposes [3-7]. The Indian riverine fisheries are mostly disturbed by various stressors as like invasion of fishes, overexploitation and industrial effluents [8-11]. The Indian riverine catching phenomena is maintained by exotic species [6, 12-14]. Nile tilapia, *Oreochromis niloticus* has a vast potential for settlement to any complex environmental conditions in lotic and lentic water bodies [15-17]. The invasion of *O. niloticus* in any environment due to its physiological tolerance has been documented globally [18-20]. *O. niloticus* is a non-native fish species for India, commonly known as Nile tilapia or Tilapia, which had been introduced in natural waters into a large number of tropical and sub-tropical countries in over 100 countries in the world [21]. Invasive species have a nature, to alter size and age structure of indigenous species [22-25] and reproduction [26]. *O. niloticus* is one of the top ten introduced species of the world and it prefers shallow, still waters on the edge of lakes and wide rivers with sufficient vegetation [27-28].

O. niloticus landing formed 38.88% (54.76 tones) with *Cyprinus carpio* of total catch in the Yamuna river at Allahabad. It is also observed that in the last five years Tilapia catch increased by seven fold [6]. Knowledge on the population structure of this commercially exploited species is a prerequisite for a more detailed study on its biology and to manage its fisheries. This species is an important food and economical source from the Ken river basin for poor fishermen community, trader and retailer. To date, not many studies on its ecology and population structure have been carried out in this region except the invader capacity, size composition realized by [29] and landing by Anon [30-32]. Only one study was conducted about heavy metal accumulation capacity in its muscle, gills and livers from the Gomti river [33] (Dwivedi *et al.* 2015). The present study was thus undertaken to estimate population

structure of *O. niloticus* from the Ken river, India. This will help in formulating the fishery management policies of *O. niloticus* in the basin by policy makers, managers, researchers etc.

MATERIAL AND METHODS

Random fish samples of *Oreochromis niloticus* were collected from fish landing centre at Banda district, India. Monthly samples were collected during January 2015 to February 2016. A total of 326 specimens were collected from the landing centre. The cast netting, gill netting, drag netting and hook & line were used to catch. The drag net was the most suitable and beneficial for the catch of *O. niloticus* from the Ken river. It is locally known as name of “**Jalebi**”. The key scales were used for determination of the age of *O. niloticus*. Prior to age determination, it was essential to establish the fact that the fish scale radius increases with the length of fish or not, since the scale may be regenerated. Hence, establishment of the fact that the annual increment in length of the scales maintains a constant ratio with increase in length of the fish and that too throughout the years, is of great importance implying the suitability of their scales for age determination.

Key scales were removed from the row above lateral line and below dorsal fin region (34-37). The scales were cleaned in 5% KOH solution to remove adhering- tissues and finally washed in distilled water. The scales were then pressed between two glass plates while drying in order to avoid their curling. A total of 326 fish specimens (male and female) were analyzed. The total length (cm) from the tip of snout to the end of caudal fin rays was measured and key scales were taken from below the dorsal fin (3 or 4 rows) and above the lateral line. The annulus formation was determined according to the criterion suggested by [34-37]; widely spaced ridges follow a zone of closely spaced ridges. The annulus is usually considered to be at the outer border of the closely spaced ridges. The number of annuli for each scale was recorded. Age was determined on the basis of annuli and designated as 1+, 2+... A percentage frequency table was prepared on the basis of age and to compute in different sexes (male and female). Population structures of male and female fish were determined on the basis of age group.

RESULTS AND DISCUSSION

It is one of the most desirable fish species for food and commercial purposes by majority consumers in this region. Fish lengths and age groups were varied from 85 to 472 mm and 0+ to 7+, respectively. This species (e.g. *Oreochromis niloticus*) is of great socioeconomic importance for the region and keeps active a population of about 300 to 500 fishermen communities at Banda. In stock, male population comprised 51.33% and female population 48.77% of the total catches. But statistically, $\chi^2= 0.196$ and $p= 0.658$ values showed that the male and female population (e.g. stock) not significantly differ. According to the percentage occurrence 2+ age group was most dominated with male (31.14%) and female (31.45%) of the total stocks. Male population was dominated in 0+, 3+, 4+, 6+ and 7+ age groups with percentage share as 6.59%, 26.35%, 13.17%, 1.79% and 0.60%, respectively. But, female population was dominated in 1+, 2+ and 5+ age groups and contributed to 18.24%, 31.45% and 5.65%, respectively (Table 1). The age groups 5+, 7+ and 7+ of male fishes were contributed 4.79%, 1.79% and 0.60%, respectively while 5+ and 6+ female fishes shared only 5.65% and 1.26%, respectively (Table 1). The distribution of stocks was uneven between 1+ to 2+ age groups and difference was high very high with 15.57% and 13.21% for male and female, respectively. In the present study *O. niloticus* indicates that occurrences of males and females are difference in number; this is possibly caused by the incidence of fish pairs near to the nest area where females take care of their broods. It breeds twice or thrice per year. The frequency of the breeding is most suitable for the stabilization of the stocks in river. The 7+ age group indicated that the ecological condition was favorable for *O. niloticus* from the Ken river. It is believed that this healthy stock (0+ to 7+ age groups) of *O. niloticus* from the Ken river due to habitat degradation and water quality of the river.

Table 1. Population structure of exotic fish species, *Oreochromis niloticus* from Ken river

Age	Male	Percentage	Female	Percentage
0+	11	6.59	8	5.03
1+	26	15.57	29	18.24
2+	52	31.14	50	31.45
3+	44	26.35	41	25.79
4+	22	13.17	20	12.58
5+	8	4.79	9	5.65
6+	3	1.79	2	1.26
7+	1	0.60	0	
Total	167		159	

Novaes & Carvalho [38] recorded that the male *O. niloticus* shared 56.1% and female 43.9% of the catches in Barra reservoir, Brazil. Gomex-Marque *et al.* [39] also reported that male fishes dominated in to female fishes. Females were more numerous from July to November and the males from January to June, except April. Tilapias, in general, are known for their plasticity in growth,

reproduction, age and size-at-maturity that not only make them excellent aquaculture taxa but also allow them the ability to invade and become established in nonnative environments [28, 40]. Mayank and Dwivedi [28] (2015) also reported that male stock was higher than female. It grows up to a maximum length of 62 cm, weighing 3.65 kg (at an estimated 9 years of age) [41]. The average size (total length) of *O. niloticus* is 20 cm [42].

Size structure

The shared of maximum fishes in 261-320 mm size classes. The size classes 441-500 contributing small proportion (Fig. 1). Immature stock shared 9.20% only. In general, middle size classes contributing maximum percentage compared to lower and higher size classes [43-47].

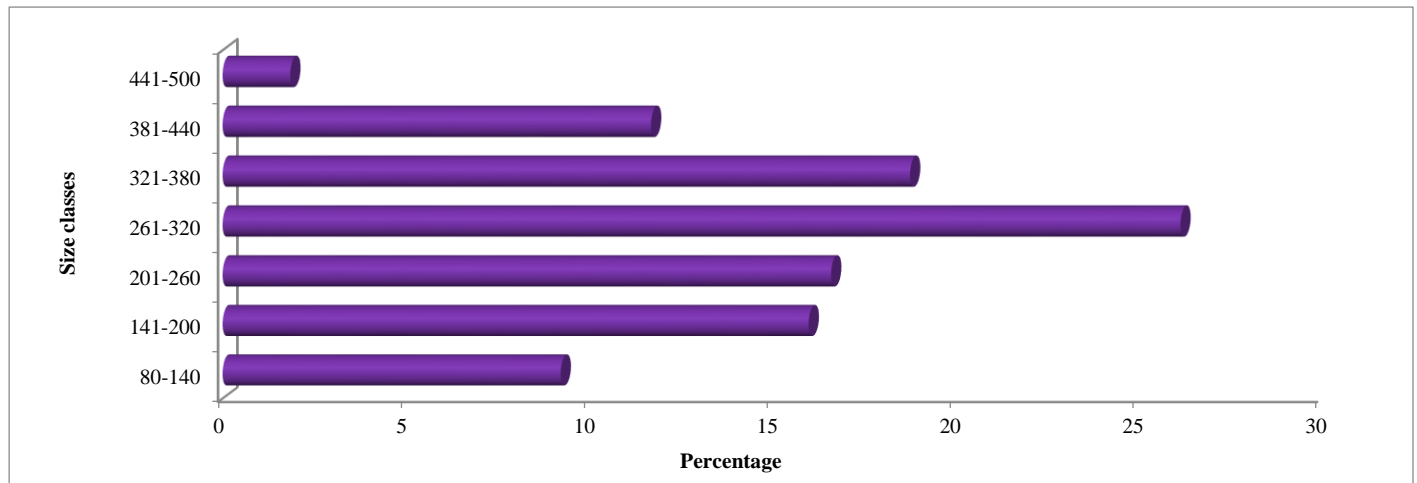


Fig. 1. Frequency of fishes within size classes from the Ken river

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