Life- History Traits and Decadal Trends in the Growth Parameters of Golden Mahseer *Tor putitora* (Hamilton 1822) from the Himalayan Stretch of the Ganga River System

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Abstract

Life-history traits such as age and body growth patterns of *Tor putitora* (Hamilton 1822), inhabiting the lesser Himalayan stretch of the Ganga river system in the Garhwal region were examined during 1994 and 1995. The maximum age was recorded to 17+ whereas harvestable size was 65.6 cm. The asymptotic length (L_∞) exhibited a relative decline from 272 cm (K = 0.035 $year^{-1}$) in 1980-81 to 216 cm (K = 0.041 $year^{-1}$) in 1994-95 resulting in the corresponding increase of the growth coefficient (K). The total, natural and fishing mortality coefficients also exhibited a similar pattern 0.366, 0.054 and 0.312 and 0.58, 0.063, 0.517 $year^{-1}$, respectively during 1980-81 and 1994-95. This was reflected in the exploitation rate and ratio also, 0.376 and 0.852 and 0.7 and 0.891 $year^{-1}$ respectively for 1980-81 and 1994-95

Key words: age, growth, asymptotic length, mortality, exploitation, decadal trends.

Introduction

Desai (2003) has listed 10 valid species of mahseer from Pakistan, India, China and Southeast Asia, though more species have been listed recently (Annexure 1). Dwivedi (2002) is of the opinion that the members of this group are found in rivers in the northern Plains of India and extend towards west through the river Indus in Pakistan and Euphrates and Tigris in Iraq and to north in China. A number of species are found in the southeast also (Kiat, 2004). Annexure 2 lists the countries and their locations compatible with distributional range of the Golden mahseer. It has been introduced in the southeast as far as New Papua Guinea. Mahseer is a spectacular game fish and it constitutes main fishery in the Sivalik Himalaya and uplands of the Deccan Plateau. Three species of the genus *Tor* occur in the Himalaya, *Tor putitora*, *T. tor* and *T. progenius*, the former is prevalent in Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Nepal and even the northeast, while latter two are restricted to Central and East Himalaya. The Himalayan species live in foothill section (Sivaliks) of glacierfed Ganga where waters are not ice-cold. The species of Peninsular India inhabit the rivers devoid of glaciers. Mahseer is known migrate into small tributaries during the breeding season (Beavan, 1877; Desai, 2003). For the Himalayan mahseer first flooding caused by snowmelt is a signal for upstream migration into the glacierfed tributaries. The migrants remain in them till the onset of monsoon when the brooders again ascend into the flooded spring fed streams for breeding while others (juveniles and adolescents) descend to the foothills. The brooders and new recruits (year-old juveniles) descend as the floods subside. *T. putitora* thus exhibits a tri-phased migration (Nautiyal and Lal, 1984; Nautiyal, 2002).

Among the various species of Mahseer in India *T. putitora*, familiarly known as the Golden or Himalayan mahseer attains the largest size, 275 cm (9 ft) in length and 54 kg (118 lb) in weight (Talwar and Jhingran, 1991; Wikipedia, 2006). The size was recorded by Hamilton in 1822. The first author (PN) recorded a size of 137.7 cm in 1980-81. Owing to its size, golden colour, beautiful appearance and flavour, the fish is exploited thereby constituting an important fishery along the Himalayan foothills. Exploitation as well as other factors (Nautiyal, 1984, 1989, 1990, 1994) has led to a decline in numbers in the Himalayan stretch of the Ganga. The following observation supports this view, "Qasim and Qayyum (1961) studied the breeding biology of *T. putitora* from the Ganga near Aligarh (far downstream of the foothills at Hardwar). Today, it is restricted to the foothills (Rishikesh-Hardwar)." In the face of high intraspecific competition, especially due to high density (density-dependent) it seems reasonable for individuals to disperse in the vicinity of ideal habitat. Large numbers would facilitate dispersal while decline would restrict the population to the most ideal part of the habitat. Two factors seem to be causing the decline, over fishing and habitat degradation – fragmentation. Hence, when (prior to 1960's) the Himalayan mahseer occurred in large numbers they were able to populate the then Ganga till Narora near Aligarh (the last limits of the upper stretch of the Ganga) far downstream of the foothills. But as they became few they got restricted to the foothills only. Decline has been observed in most of the Indo-

Gangetic drainages over the west (Sehgal *et al*., 1971; Joshi, 1988; Sunder and Joshi 1977; Sehgal, 1994) and central Himalaya (Shrestha, 1997).

The mahseer are considered as 'endangered' (Khan and Sinha, 2000). The decline of the mahseer (*T. putitora* and *T. tor*) population in the Lake Nainital was mentioned by Raj (1945). Das and Aloka (1978) found biological indicators of pollution in Lake Nainital and related it to the depletion of Mahseer fish (*T. putitora*). Das and Upadhyay (1979) studied the qualitative and quantitative fluctuations of plankton in two Kumaon lakes, Nainital and Bhimtal to determine the causes of the failure of the Mahseer (*T. tor* and *T. putitora*) fisheries in the Kumaon lakes. The 'endangered' status of the Himalayan mahseer population, however, is debatable as there are still some pockets where this species predominates. Mahseer has kept a steady profile in terms of average size in the reservoirs. For the last 22 years the average weight has ranged between 1.2 to 1.6 kg while the total landings have fluctuated between 10 to 102 tonnes during 1995-96 to 1997-98 and the average weight of mahseer was 1.2 kg (Himachal Pradesh Fisheries Department, 2007). The Himalayan mahseer has been largely studied for natural history, status and conservation practices in India and Nepal (Nautiyal, 1994; Shrestha, 1997). Barring recent attempts to investigate the population biology (Bhatt *et al.,* 1998a; 1998b; 2000) much remains to be known about the dynamics of *T. putitora*. FAO has produced estimates of population parameters from Nepal (Fishbase, 2003). There is no account of mortality and exploitation rate and ratio of this species. The information is considered a prerequisite for managing the fishery and conservation in case of threatened fish species. Hence, investigations were undertaken on age, growth parameters, mortality, exploitation rate and ratio.

Study Area

All specimens of *T. putitora* were obtained downstream of Ajeetpur (altitude 273 m; 29°52'50" N; 78°10'23" E) from the Ganga, Raiwala (altitude 340 m; 30°3'18" N; 78°13'54" E) from the Saung, Banghat (altitude 560 m; 29°57'12" N; 78°13'23" E) from the Nayar and Srinagar (altitude 550 m; 30°13'30"; 78°49'39" E) from the Alaknanda (Figure 1).

The adult population inhabits the foothill stretch of the Ganga and migrates upstream into the Saung and Nayar for spawning. Therefore, these two tributaries harbour the younger stages and were sampled to obtain them. Beside breeding (Sehgal, 1972) there may be other reasons for which the fish may migrate upstream which may involve factors like maintaining food supply, homing instinct and learning by reinforcing memory (Nautiyal *et al.,* 2001). This can be explained by the presence of migrants of varying sizes (10-137 cm, juveniles, adolescents both immature, maturing virgins and mature adults) in the Alaknanda for 3-4 months (February to June), whereas the Nayar and Saung largely invite the brooders (Figure 2). In fact the large size (>80 cm) can be obtained only during the migratory phase and

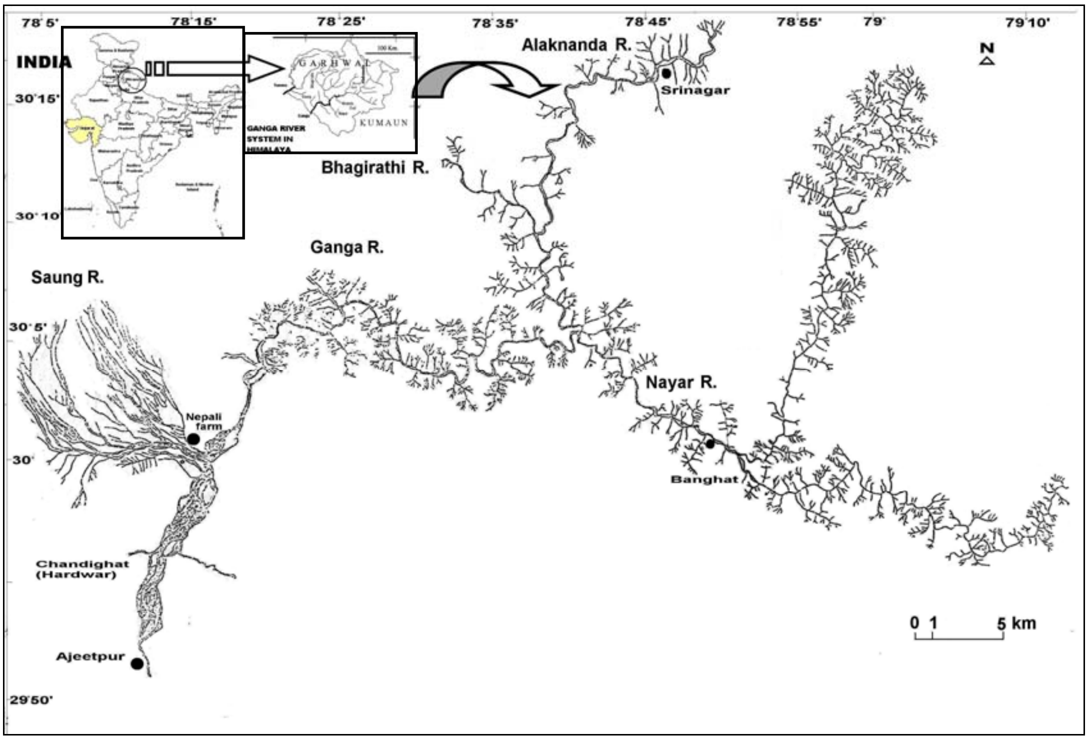

Figure 1. The study area of the Gangetic drainage in Himalaya.

were not found in the foothill stretch harbouring the major part of the mahseer population in the mountain section of the Ganga (Nautiyal, 2002).

Materials and Methods

Field Sampling

Random samples were obtained from the fish markets, landings sold off locally by fishermen or from those procured by the contractor at these stations. At all sites of collection, *T. putitora* were landed using gillnets (7-10 cm mesh size), cast nets and seines. Hook and line was the most effective method of catching adults. For each fish, total length was recorded to the nearest cm and weight in grams. The fish ranged from 4.9 to 137.7 cm during 1980-81 (sample size (n) = 132) and from 4.0 to 135.9 cm during 1994-95 (n = 815). Length at age frequency data obtained during 1980-81 and 1994-95 were grouped into size classes with 10 cm interval length in order to have adequate number of fish in each size class for growth study (Table 1).

Age and growth were computed from the data generated by using Carl Zeiss Jena Documenter to read the 'key scales' of *T. putitora*, obtained from the dorsal fin region above lateral line. The annulus formation was determined according to the criterion suggested by Begenal and Tesch (1978).

Data Analysis

The length frequency data obtained at monthly intervals during 1980-81 and 1994-95 were pooled and finally raised to the annual total catch of the species. The growth parameters L_∞ and K were estimated using the Gulland and Holt (1959) formula:

$$-\Delta L / \Delta t = K*L_\infty,$$

whereas to was calculated by the von Bertalanffy's plot.

The growth parameters computed were used to determine the natural mortality (M) using the methods of Srinath (1998) 1.532*K, where K is the growth coefficient. The total mortality (Z) was determined by using the Beverton and Holt (1956) method,

$$Z = K \frac{L_\infty - L_c}{L_c - L_c}$$

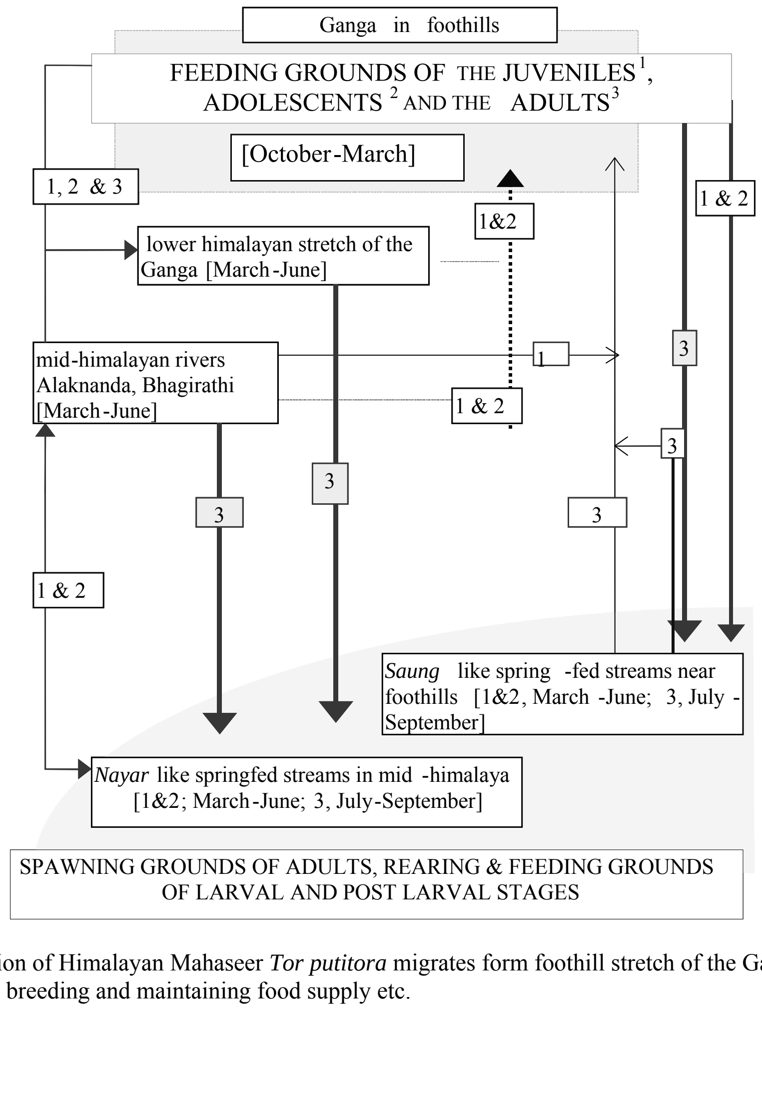

Figure 2. Adult population of Himalayan Mahaseer *Tor putitora* migrates form foothill stretch of the Ganga to upstream of the Saung and Nayar for breeding and maintaining food supply etc.

where L_c is the length at which 50% of the fish entering the gear are retained and L_c is the average length of the entire catch.

The Fishing mortality (F) was estimated by subtracting M by Z value obtained according to the Beverton and Holt (1956) method. Exploitation rate (U) and ratio (E) were obtained by the Beverton and Holt (1957) formula:

$$U= F/Z\ (1-e^{-Z}) \text{ and } E= F/Z.$$

Results

Age of 0+ to 17+ years was determined from the scales of *Tor putitora* population. The largest specimen of this species was measured as 137.7 and 135.9 cm for 1980-81 and 1994-95, respectively, the estimated age from length at age frequency data being 17.5 years (Table 1). Growth parameters obtained by the Gulland and Holt plot (1959) for 1980-81 and 1994-95 differed primarily with respect to L_∞ while the growth coefficient was 0.035 for 1981-82 and 0.041 for 1994-95 (Figure 3 and 4) during respective years. The t_o was calculated as 0.031 for year 1980-81 and 0.0153 year for 1994-95. The von Bertalanffy's (1938) equation for growth in length for this species could thus be written as,

$$Lt = 272.2\ (1- e^{-0.055\ (t- 0.031)})\ (1980\text{-}81)$$
$$Lt = 216\ (1- e^{-0.056\ (t- 0.015)})\ (1994\text{-}95)$$

The instantaneous rate of the total mortality coefficient (Z) was estimated to be 0.366 per year in 1980-81 while 0.58 per year in 1994-95. Similarly, the natural mortality coefficient (M) estimates were 0.054 per year for 1980-81 and 0.063 per year for 1994-95. The fishing mortality (F) estimated was 0.312 for 1980-81 and 0.517 for 1994-95. The estimated exploitation ratio (E) and rate (U) were 0.852 and 0.376 for 1980-81, and 0.891 and 0.7 for 1994-95.

Table 1. Length frequency key for studying growth parameters of *T. putitora* during 1980-81 and 1994-95.

Size interval (cm)	1980-81			1994-95		
	mean length (cm)	mean age	frequency	mean length (cm)	mean age	frequency
1-10	6.54	0.5	26	6.60	0.5	147
11-20	14	1.5	28	14.17	1.5	381
21-30	23.83	2.5	15	25.87	2.5	116
31-40	35.9	3.5	13	36.65	3.6	56
41-50	44.11	4.5	10	46.27	4.59	43
51-60	56.85	5.5	8	56.85	5.5	23
61-70	68.01	6.5	7	67	6.5	28
71-80	78.03	7.41	5	77.08	8.5	13
81-90	88.92	8.43	4	85.5	9.59	2
91-100	97.53	9.25	4	95.6	10.51	1
101-110	107.02	10.26	4	106.3	11.51	1
111-120	115.44	12.5	4	115.3	13.7	2
121-130	129	16.5	3	126.5	16.5	1
131-140	137.7	17.5	1	135.9	17.5	1

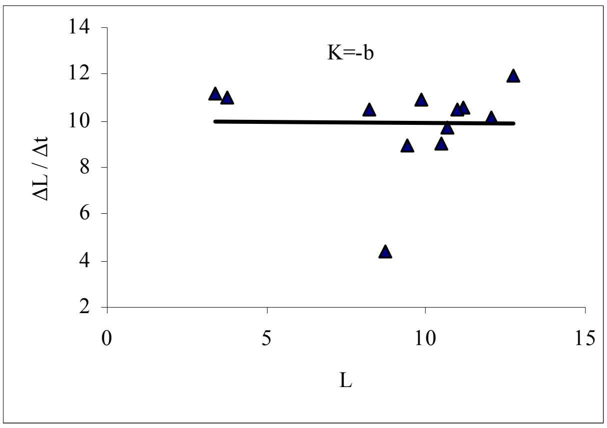

Figure 3. Gulland and Holt plot (1980-81) showing the length increment or growth rate $\Delta L/\Delta t$ in y-axis is plotted against mean length during the corresponding year. The regression line given intercept (a) = 9.637 and slope (b) = -0.0354 and the intersection point between the regression line in x-axis given L_∞.

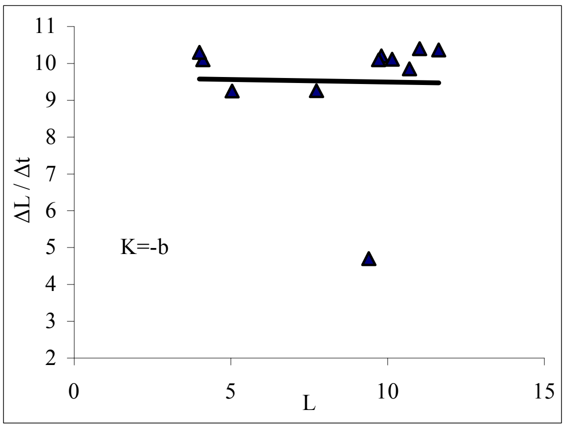

Figure 4. Gulland and Holt plot (1994-95) showing the length increment or growth rate $\Delta L/\Delta t$ in Y-axis is plotted against mean length during the corresponding year X-axis. The regression line given intercept (a) = 8.8699 and slope (b)=-0.0409 and the intersection point between the regression line in x-axis given $L\infty$.

Discussion

Stock identification is important because continuous fishing on a particular population, if homogenous, has a direct effect on the population of the same species in every other locality. Conversely, where a species consists of two or more stocks, fishing at any one locality, whatever its magnitude has no effect on the other unfished stock of the same species. The stock of *T. putitora* from the mountain stretch of the Gangetic system has been demonstrated to be homogeneous (Nautiyal and Lal, 1988; Bhatt *et al.*, 1998a; 1998b), implying the need to determine the features of the stock. The growth parameters have been determined from the actual data for the first time for this species.

Population Dynamics

Johal and Kingra (1989) using the Walford method obtained an estimate of 135 cm L_∞ for *T. putitora* from the Gobindsagar, which was quite smaller then for the Gangetic stock. The harvestable size was computed to be 65 cm (Nautiyal, 2006). The maximum attainable size computed for *Cirrhinus mrigala* (90 cm), *Catla catla* (120 cm), *Labeo rohita* (85 cm), *Cyprinus carpio* (95 cm) and *Hypophthalmichthys molitrix* (110 cm) are quite low (Johal and Tandon, 1987a; 1987b; Bhandari *et al.,* 1993) suggesting that the Himalayan mahseer has a longer life span. The Amur carp (common carp) is known to attain a size of 90 cm and an age of 16 years (Nikolskii, 1980).

Beverton and Holt (1957) pointed out that the two parameters of growth; asymptotic length (L_∞) and growth coefficient (K) are inversely proportional to each other. It implies that fishes with high L_∞ should have lower K values and vis-a-vis. *T. putitora*, a cold water inhabitant, with maximum observed sizes (L_{max}) of 137.7 cm and 135.9 cm, respectively in 1980-81 and 1994-95, had L_∞ = 272 cm and K = 0.035 year^{-1} compared with L_∞ of 216 cm and K of 0.041 year^{-1} for respective years. Since *T. putitora* sample for 1980-81 had a slightly larger size than 1994-95 it had relatively higher L_∞ and slightly lower K. Thus, the present estimate of asymptotic length and growth coefficient for *T. putitora* are justified. Growth parameters computed earlier (L_∞ = 275 cm, K = 0.070 year^{-1}, t_o = 0.25 year) for *T. putitora* were slightly higher than the present estimate. Since then such a size has not been reported for the Himalayan mahseer. A female measuring 148.0 cm from the Sarju River, Kumaun Himalaya India is the only report available over last two decades. A size less than that was reported in the early eighties (Nautiyal and Lal, 1981). The present sample with a still lesser length had lower K = 0.041 year^{-1} and t_o= 0.015 year. The L_∞ = 272 cm in 1980-81 and 216 cm in 1994-95 indicated tendency of decrease in size, the age groups being 17+ during respective years. With increasing exploitation ratio and fishing mortality in subsequent years, it seems to be under alarmingly high fishing pressure, which has damaged its fishery (Nautiyal *et al.*, 1998; Bhatt *et al.*, 2004).

The commercially exploited fish species seem to exhibit decline in the asymptotic length (L_∞) and may hence be related to excessive exploitation. *T. tor* the first cousin of *T. putitora*, as both sometime occur in the same rivers, performed better growth especially in the Yamuna basin rivers (northeast India). The estimates for *T. tor*; L_∞ = 787, 822 and 946 mm; K = 0.61, 0.78, 0.50 year^{-1}; F = 2.9, 3.44, 4.57 year^{-1} in the Paisuni, Ken and Tons, respectively, indicate low L_∞ in rivers with high fishing mortality. Similarly, the total mortality (Z) was quite high for *T. tor* (4.08 year^{-1} to 5.57 year^{-1}) if compared with *L. rohita* (3.2 year^{-1} to 4.19 year^{-1}) and *L. calbasu* (0.98 year^{-1} to 1.86 year^{-1}) in these rivers indicating greater fishing pressure on *T. tor* and *L. rohita,* as both are highly important and priced fish like *T. putitora*, *L. calbasu* being least priced (Dwivedi, Unpublished).

The natural mortality coefficient (M) of a fish is directly related to the growth coefficient 'K' and inversely related to the asymptotic length (L_∞) and the lifespan (Beverton and Holt, 1956). The natural mortality of *T. putitora* was relatively low (M = 0.054 year^{-1}, K = 0.035 year^{-1} in 1980-81 compared to M = 0.063 year^{-1}, K=0.041 year^{-1} in 1994-95). The mortality rate has thus increased. Among the three components of mortality (total, fishing, natural) computed in the present study, mortality was mainly due to fishing which points to heavy fishing pressure on them. This was also reflected in the exploitation rates and ratios, 0.376 and 0.852 and 0.7 and 0.891 year^{-1} respectively for 1980-81 and 1994-95.

Conclusions

T. putitora, inhabiting the mountain rivers, is a game and food fish with long life span. The Himalayan mahseer exhibited slow growth comparatively to its first cousin *T. tor* that is habiting in tropical waters. Analysis of the decadal trends revealed that asymptotic length (L_∞) decreased from 1980-81 (272 cm), to 1994-95 (216 cm). An increasing pattern was obtained for total, natural and fishing mortality coefficients 0.366 year^{-1}, 0.054 year^{-1} and 0.312 year^{-1} and 0.58 year^{-1}, 0.063 year^{-1}, 0.517 year^{-1}, respectively during 1980-81 and 1994-95. Increased mortality rate during the 1994-95 mentioned above be a sign of over exploitation rate and ratio 0.7 year^{-1} and 0.891 year^{-1} respectively compared to 0.376 year^{-1} and 0.852 year^{-1} respectively for 1980-81.Thus there is a need to manage the fishery of *T. putitora* to prevent a collapse of both the fishery and the population.

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Annexure I. Scientific names where genus equals *Tor* (Adopted from FishBase)

Scientific Name	Author	Valid Name	English Name
Tor arabicus	(Trewawas, 1941)	*Barbus arabicus*	
Tor ater	Roberts, 1999	*Tor ater*	
Tor blanci	(Pellegrin & Fang, 1940)	*Neolissochilus blanci*	
Tor brevifilis	(Peters, 1881)	*Tor brevifilis*	
Tor brevifilis brevifilis	(Peters, 1881)	*Tor brevifilis*	
Tor brevifilis hainanensis	Wu, 1977	*Tor brevifilis*	
Tor canis	(Valenciennes, 1842)	*Barbus canis*	
Tor chelynoides	(McClelland, 1839)	*Naziritor chelynoides*	Dark mahseer
Tor douronensis	(Valenciennes, 1842)	*Tor douronensis*	River carp
Tor hamiltoni	Gray, 1834	*Tor tor*	Mahseer
Tor hemispinus	Chen & Chu, 1985	*Tor hemispinus*	
Tor khudree	(Sykes, 1839)	*Tor khudree*	Deccan mahseer
Tor khudree longispinnis	(Günther, 1868)	*Tor khudree*	Deccan mahseer
Tor khudree malabaricus	Jerdon, 1849	*Tor khudree*	Deccan mahseer
Tor kulkarni	Menon, 1992	*Tor kulkarnii*	
Tor kulkarnii	Menon, 1992	*Tor kulkarnii*	
Tor laterivittatus	Zhou & Cui, 1996	*Tor laterivittatus*	
Tor longipinnis	(Weber & de Beaufort, 1916)	*Neolissochilus longipinnis*	
Tor manningsi	(de Beaufort , 1933)	*Barbus nanningsi*	
Tor mosal	(Hamilton, 1822)	*Tor putitora*	Putitor mahseer
Tor mosal mahanadicus	David, 1953	*Tor khudree*	Deccan mahseer
Tor mussullah	(Sykes, 1839)	*Tor mussullah*	High-backed mahseer
Tor musullah	(Sykes, 1839)	*Tor mussullah*	High-backed mahseer
Tor nedgia	(Rüppell, 1836)	*Barbus nedgia*	

Annexure I. (Continued)

Scientific Name	Author	Valid Name	English Name
Tor polylepis	Zhou & Cui, 1996	*Tor polylepis*	
Tor progeneius	(McClelland, 1839)	*Tor progeneius*	Jungha mahseer
Tor putitora	(Hamilton, 1822)	*Tor putitora*	Putitor mahseer
Tor qiaojiensis	Wu, 1977	*Tor qiaojiensis*	
Tor reinii	(Günther, 1874)	*Barbus reinii*	
Tor sinensis	Wu, 1977	*Tor sinensis*	
Tor soro	(Valenciennes, 1842)	*Tor*	

Annexure I. Occurrence records of *Tor putitora* (+ Compatible with distributional range; * requires matching against distributional range). (source FishBase, The original information has been modified by grouping catalog no,. for locations visited by one author)

Country	Year	Collector	Identifier, Catalog No.	Information
_	1940	_	BMNH 1940.3.25.1	Foothillo of Himalayas
_	1964	Meehean, O. L.	USNM 00257749	Meehean, O. L., W. PAKISTAN, 16 MI. E. OF PINDI
China Main	1995	Kullander, S O & F Fang	S.O. Kullander/ 1997 NRM 33258; 36115, 36116	Kullander, S O & F Fang, P R CHINA, Yunnan, Mengla County, Ying Jiang County+
India	1889	_	BMNH 1889.10.29.18-19	Dehra Dun, North West Provinces+
India	1889	_	BMNH 1889.10.29.16-17	Dehra Dun, North West Provinces +
India	1880	McClelland	BMNH 1880.2.2.5	McClelland, River of India +
India	1870		BMNH 1870.5.18.15	Malabar +
India	1868	Day, F.	BMNH 1868.10.27.18	Day, F., Bowany+
India	1843		BMNH 1843.2.25.29	Gumnah, Sehamapore+
India	1986		BMNH 1986.11.6.1	Almorah,+
India	1944		BMNH 1944.7.31.4	Ihelum, River Ihelum, India +
India	1932		BMNH 1932.2.20.11	Nagrota, Punjab +
India	no year	A. W. Herre.	CAS 134609	A. W. Herre., Nandhaur River. +
India	no year	A. W. HERRE	CAS 133965	A. W. HERRE, Dehra Dun, Eastern Doons; Uttar Pradesh, India +
India	1934	_	BMNH 1934.10.17.37	Bengal +
India	1932	_	BMNH 1932.2.20.13 1932.2.20.12	Ravi, Ravi River, Madhopur, Punjab +
India	1954	Menon, A.G.K.	BMNH 1954.5.20.7-8	Sarda, Menon, A.G.K., Sarda River, Tanakpur, Naital, United Provinces +
Myanmar	no year	Malaise, R	S.O. Kullander/1997 NRM 31609 31871, 31607	Malaise, R, MYANMAR, Bago Division, Kachin State, Bago Division *
Myanmar	1893	_	BMNH 1893.6.30.31-40	Nampandet
Myanmar	1935	Maung Lu Daw	S.O. Kullander/1997 NRM 18794	Maung Lu Daw, MYANMAR, Sagaing Division *
Myanmar	1997	Fang, F & A Roos	S.O. Kullander/ 1997 NRM 36309	Fang, F & A Roos, MYANMAR, Kachin State *
Myanmar	1934	Malaise, R	S.O. Kullander/1997 NRM 10407	Malaise, R, MYANMAR, Shan State *
Nepal	no year	A.C. Taft	H. DeWitt/1959, CAS 152925	A.C. Taft, Near Pokhra (Pokhara); purchased +
Nepal	no year	A.C. Taft	H. DeWitt/1959 CAS 152924	A.C. Taft, Inlet stream to Phewa Tal Lake, near Pokhra +
Nepal	1996	David Edds	David Edds KU 29597 29619 29535, 29530, 29520, 28668, 29033, 29537, 29458, 28806 29007, 29470 29119 29436, 29079, 29059, 29348, 29412 29484, 28999	David Edds, At Mulghat, on road from Dharan to Hile, Kachali river confluence, Kahare, Sabha river confluence, 1 hour walk south of Tu, Just east of Tumlingtar, Brahamadev, Andhi Mohan - Andhi river confluence, Piluwaa river confluence, Gorangi - about 4 km west of Chisapani, Just downstream from irrigation project along Raj, Khalte, Chapang, Purchased at Koshi barrage, Just east of Katasi, Khairenitar, Narayangarh, first feeder creek bridge south of Chatra on ro, Purchased at Chisapani , Kharkhareghat , Nimaa +
Pakistan	1908		BMNH 1908.12.28.101	Lahore
Sri Lanka	1929		BMNH 1929.7.2.5	Beira Lake, Colombo, Ceylon*