



Comparative accounts of Merestic Count and Morphometric Measurements of Golden Mahseer (*Tor putitora*) among Chenani hydroelectric dam, Jhajjar stream and Dansar stream. (J&K) India.

KEYWORDS

Reservoir, mahseer, merestic count, morphometric measurement.

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ABSTRACT

Present investigation was carried out in small man made Chenani hydroelectric reservoir and some water bodies of Jammu region viz river Tawi, Chenab and Jhajjar stream, to find out comparative account of merestic count and morphometric measurements and also to investigate the population structure and catch per unit effort of Golden Mahseer (*Tor putitora*) during study period from January 2012 to December 2012. A total of 64 specimens were collected from these three sampling zones and more than thirty five important morphometric and meristic parameters were selected for the study. Collected samples ranged from 9.4cm - 30.5cm in total length (TL) and 20.3 gm to 190 gm in body weight. The morphometric characters studied showed a proportional positive growth with the increasing length of the fish.

Introduction

Mahseer or Sahar (*Tor putitora*, Cyprinidae), one of highly valued, mighty and giant freshwater fish. The endangered *Tor putitora* is a commercially important freshwater cyprinid. Hamilton (1822) first classified mahseers and placed *Tor* species under the genus *Cyprinus*. He recognized three species of mahseers; *Cyprinus tor*, *C. putitora* and *C. mosal*. Later, Gray (1833) created genus *Tor* to accommodate these. In India, the group is well distributed right from the Himalayas up to the rivers of the Western Ghats. Most of the species belong to the genus *Tor*. Owing to their excellent sporting quality, the mahseers have been variously called as the 'king', 'lion', 'tiger', 'the great fighter', etc., by the anglers. In certain parts of the country, it has also been even given the status of a 'divine fish'. Langer et al. (2001) while compiling the bibliography of mahseers of the Indian sub-continent described this group as the 'King of Indian aquatic systems'. *Tor putitora*, being migratory like other mahseer fishes, ascends regularly from the main rivers to tributaries for spawning in monsoon months and descends back for feeding before the onset of the winter (Malik and Negi, 2007). The migration is in response to various physico-chemical and biological stimuli.

The golden mahseers (*Tor putitora*) is not only well known sport and food fish, but also our national heritage (Oliver et al. 2007). It is generally known to prefer cold, clear and swift flowing waters with stony, pebbly or rocky bottoms and intermittent deep pools (Dinesh et al. 2008). Several authors have observed that golden mahseer is declining in different parts of India owing to the indiscriminate fishing of bloodstock and juveniles, fast degradation of aquatic ecosystems, construction of dams, barrages and weirs and other anthropogenic interventions/intrusions (Sehgal, 1992; Tandon et al. 1992; Bhatt et al. 1998a; Nautiyal et al. 1998; 2007; Kumar, 2000; Menon et al. 2000; Ogale, 2002a; 2002b; Chalkoo et al. 2007; Dinesh and Nandeesha, 2007; Vinod et al. 2007; Oliver et al. 2007; Kalita et al. 2007). Because of the decline in the fishery, all the Indian mahseers have been listed as 'threatened' species (Oliver et al. 2007).

Morphometric study is a powerful tool for characterizing strains / stocks of the same species, which involves detection of subtle variation of shape, independent of size. The

complete set of measurements used to describe a form is a morphometric character set (Strauss and Bond, 1990). The studies of morphological and meristic characters of a fish give substantial information with regard to exact identification key of the species (Cavalcanti, 1999) and such identification is prerequisite for cytogenetic and molecular investigations. For the study, one year fish sampling was conducted in a small man made reservoir viz. Chenani hydroelectric dam and the meristic count and morphometric data so obtained was compared with same fish species collected from other water bodies viz. river Chenab, Dansar stream and Jhajjar stream to find out any difference in fish samples among these water bodies. Morphometric studies are not only essential to understand the taxonomy but the variation in its features are probably related to the habit and habitat among the variants in this species.

Material and Methods

Golden mahseer sampling was conducted from January 2012 to December 2012 in Chenani hydroelectric dam (fed by river Tawi though an artificial channel of 9km in Chenani, 25 km away from Udhampur city), Dansar stream and Jhajjar stream (Tributary of river Chenab) of Jammu. A total of 64 specimens of Mahseer (9.4 to 30.5 cm total length) were collected from Chenani hydroelectric dam, Dansar stream and Jhajjar stream. During this period monthly sampling of fishes was carried out with the help of cast net. The collected fish specimens were preserved in 10% formalin for further studies. All the characters were measured to the nearest millimetres and weighed on electric balance to nearest gram. The meristic and morphometric measurements were done with the help of magnifying glass model 50 m.m. dia (China), stage microscope, electric balance, scales, divider and vernier caliper etc. All counts and measurements are taken following Day and Jayaram (1981, 2003 and 2010)

Results and discussion

During the study, twenty six morphomeristic traits and eight meristic count were investigated among stocks of *Tor putitora* population from Chenani hydroelectric dam (river Tawi), Jhajjar stream and river Chenab to ascertain its comparative anatomy. During study period of one year from January 2012 to December 2012, a total of 64 specimens of *Tor putitora* were used for meristic and morphometric

analysis. Total length of specimens collected from Chenani hydroelectric dam (river Tawi) ranged between 12.17cm to 30.0cm and their weight ranged between 30 gm to 190 gm. A 9.5 kg fish measuring 82.11 cm (total length) was also recorded from river Tawi. Whereas the total length and weight ranged from 9.1cm to 19cm and 20.3gm to 42.5 gm in Jhajjar steam and from 8.0cm to 20 cm and 25.6gm to 61.4gm in Dansar stream respectively. Density of *Tor putitora* was higher in Dansar stream, then in Jhajjar stream and least in Chenani hydroelectric dam (river Tawi). High density of *Tor putitora* in Dansar stream was due to favourable conditions i.e. favourable abiotic and biotic factors, abundant food and also prohibition of its caching here in Dansar stream due to religious importance. CPUE (catch per unit effort) was higher in Dansar stream where it account for 6- 12 fish per catch, followed by 4- 11 fish per catch in Jhajjar stream and least in Chenani hydroelectric dam may be due to unfavourable conditions like stagnant water, blocking fish migration for breeding as it migrate upstream for breeding as shown in Table 1.

All the morphometric parameters of *Tor putitora* revealed a proportional increase in total length of fish under study as shown in table 2. The mean values of most of the morphometric characters viz. weight of preserved specimen, total length, fork length, standard length, pre-dorsal length, pre-pectoral length, head length, head depth/width, body depth, snout length, upper jaw length, lower jaw length, gape of mouth, rostral barbel length, maxillary barbel length, eye diameter, dorsal fin length, dorsal fin base, pectoral fin length, pectoral fin base, ventral fin length, ventral fin base, anal fin length, anal fin base, caudal fin length, caudal fin base, lateral line scales, pre-dorsal scales above lateral line scales, below lateral line scales, dorsal fin ray, pectoral fin ray, ventral fin ray, anal fin ray and caudal fin ray were observed within the Chenani hydroelectric dam stock and are not significantly different from those of freely flowing waters of Jhajjar stream and Dansar stream except that more increase in body weight of fish in comparison to total length was observed from sample collected from Chenani hydroelectric dam. This may be due to abundant food, long resident period in the same water body and also absence of any predator.

The meristic count including lateral line scales, pre-dorsal scales, lateral line transverse scales, dorsal fin rays, pectoral fin rays, ventral fin rays, anal fin rays and caudal fin rays were almost constant in all the length groups of fish with different body length, therefore conclude that meristic count is independent of body length as shown in table 3.

Correlation between total length and all other morphometric parameters were studied in the three selected stocks from Chenani hydroelectric dam, Jhajjar stream and Dansar stream. Total length (TL) showed positive and significant correlation with WW, FL, SL, PdL, PPL, HL, BD, SNL, UJL, LJL, GM, ED, DFL, VFL and CFL. Whereas negative correlation was seen with head depth (HD), ventral fin base (VFB) and anal fin base (AFB) table 4.

Population of *Tor putitora* was abundant in Dansar stream. However, the species is under severe threat from overfishing, loss of habitat, decline in quality of habitat resulting in loss of breeding grounds, and from other anthropogenic effects that have directly resulted in declines in harvest in several locations. In addition, with several dams planned for construction in the future in the Himalayan region, they could have a more drastic effect on tor populations blocking their migrations and affecting their

breeding. Inferring population declines from observed cases with that of the trends across the entire distribution range, the species is estimated to have declined by more than 50% in the past and if the current trends continue and with the new dams being built, the population may decline even up to 80% in the future. The species is therefore assessed as Endangered and is in need of urgent conservation efforts to save it from becoming locally extinct in several locations.

Table 1:- Monthly variation in CPUE (Catch per unit effort) of *Tor pitutora* from three water bodies viz. Chenani hydroelectric dam, Jhajjar stream and Dansar stream

S.NO.	Months	Chenani Dam (river Tawi)	Jhajjar Stream	Dansar stream
1	Jan.-Feb.	2.0	5.5	12
2	Mar.-Apr.	2.0	6.0	7.0
3	May-June	1.5	5.5	8.0
4	July-August	1.0	6.0	8.0
5	Sept.-Oct.	1.5	6.5	7.0
6	Nov.-Dec.	1.0	4.0	4.0

Table 2:- Morphometric characters of Mahseer (*Tor putitora*) from Chenani hydroelectric dam, Dansar stream and Jhajjar stream.

S. No	Body parameters	Abbr.	Chenani Dam		Dansar stream		Jhajjar Stream	
			Mean	SD	Mean	SD	Mean	SD
1	Weight of specimen	WWS	115.1	±8.11	45.14	±7.21	31.21	±6.9
2	Total length	TL	21.70	±2.03	15.19	±1.18	14.02	±1.03
3	Fork Length	FL	19.02	±1.45	14.24	±0.90	12.87	±0.83
4	Standard length	SL	16.18	±1.23	12.94	±0.96	11.58	±0.87
5	Pre-dorsal length	PdL	8.13	±0.87	7.12	±0.34	6.14	±0.27
6	Pre-pectoral length	PpL	8.42	±0.97	7.42	±0.72	6.27	±0.74
7	Head length	HL	4.90	±1.11	3.76	±1.26	3.11	±1.12
8	Head depth	HD	3.30	±0.41	2.98	±0.35	2.14	±0.31
9	Body depth	BD	4.48	±1.18	3.34	±1.25	2.90	±1.23
10	Snout length	SNL	2.01	±0.41	1.76	±0.51	1.40	±0.42
11	Upper jaw length	UJL	1.31	±0.14	1.23	±0.19	1.10	±0.12
12	Lower jaw length	LJL	1.12	±0.07	1.04	±0.05	0.90	±0.08
13	Gape of mouth	GM	1.19	±0.12	1.13	±0.12	1.0	±0.12
14	Rostral barbel length	RBL	1.02	±0.17	1.01	±0.15	0.90	±0.15
15	Maxillary-barbel length	MBL	1.13	±0.16	1.11	±0.12	1.00	±0.16

16	Eye diameter	ED	1.1	±0.06	0.77	±0.08	0.70	±0.07
17	Dorsal fin length	DFL	4.15	±0.38	3.35	±0.36	3.10	±0.31
18	Dorsal fin base	DFB	1.90	±0.11	1.85	±0.07	1.60	±0.06
19	Pectoral fin length	PFL	3.40	±0.13	2.47	±0.17	2.10	±0.13
20	Pectoral fin base	PFB	0.80	±0.03	0.76	±0.03	0.61	±0.02
21	Ventral fin length	VFL	2.31	±0.21	2.23	±0.12	2.10	±0.08
22	Ventral fin base	VFB	0.75	±0.18	0.71	±0.08	0.60	±0.07
23	Anal fin length	AFL	3.33	±0.08	2.41	±0.09	2.09	±0.08
24	Anal fin base	AFB	1.20	±0.63	1.24	±0.68	1.10	±0.63
25	Caudal fin length	CFL	5.15	±0.47	3.34	±0.47	3.00	±0.43
26	Caudal fin base	CFB	1.80	±0.16	1.67	±0.23	1.21	±0.18

Table 3:- Meristic characters of *Tor putitora* captured from Chenani hydroelectric dam, Dansar stream and Jhajjar stream.

S.NO	Meristic Count	Abbr.	Chenani Dam	Jhajjar	Dansar
1	Lateral line scales	LLS	26-27	26-27	26-27
2	Pre-dorsal scales	PdS	9	8-9	8-9
3	Above lateral line scales	ALLS	4.5	3.5/4.5	3.5/4.5

4	Below lateral line scales	BLLS	2.5	3.5/2.5	3.5/2.5
5	Dorsal fin ray	DFR	11(2/9)	11(2/9)	11(2/9)
6	Ventral fin ray	VFR	16	15-16	15-16
7	Pectoral fin ray	PFR	9	8-9	8-9
8	Anal fin ray	AFR	8	7-8	7-8
9	Caudal fin ray	CFR	24-26	23-26	23-26
Fin Formula:- D11(2/9)P14- 16V8-9A7(2/7) L124-29LI- Tr3.5/3.5-4.5/2.5					

Table 4:- Correlation analysis between total length and other external morphological features in three water bodies viz. Chenani hydroelectric dam, Dansar stream and Jhajjar stream.

Parameters	Chenani Dam	Jhajjar	Dansar
TL/WW	0.99	0.85	0.92
TL/FL	0.97	0.94	0.96
TL/SL	0.95	0.91	0.94
TL/PdL	0.96	0.95	0.96
TL/PpL	0.93	0.91	0.91
TL/HL	0.65	0.62	0.66
TL/HD	-0.25	-0.21	-0.27
TL/BD	0.87	0.82	0.83
TL/SNL	0.91	0.64	0.84
TL/UJL	0.92	0.87	0.90
TL/LJL	0.99	0.98	0.99
TL/GM	0.83	0.76	0.84
TL/RBL	0.43	0.37	0.41
TL/MBL	0.24	0.29	0.26
TL/ED	0.60	0.54	0.63
TL/DFL	0.93	0.91	0.90
TL/PFB	0.43	0.48	0.48
TL/LVFL	0.82	0.76	0.17
TL/VFB	-0.41	-0.40	-0.37
TL/AFL	0.47	0.46	0.49
TL/AFB	-0.31	-0.30	-0.34
TL/CFL	0.84	0.82	0.80
TL/CFB	0.86	0.84	0.86

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