Short communication

Length–weight relationship of clown knifefish *Chitala chitala* (Hamilton 1822) from the River Ganga basin, India

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Summary

This study describes the length–weight relationship (LWR) of the clown knifefish, *Chitala chitala,* in the River Ganga basin, India. A total of 221 specimens ranging from 31 to 120 cm total length (TL) and 550 to 12 000 g total weight (TW) were collected. *Chitala chitala* constitutes an important component of riverine fisheries of India and is considered one of the most commercially important and highly priced foods in addition to being an aquarium fish. The species has recently undergone heavy fishing pressure, leading to an alarming decline in natural populations and deserving of high conservation importance. Length–weight relationships of *C. chitala* from wild populations had not yet been studied. Hence, the study objective was to evaluate length–weight relations of *C. chitala* from eleven populations in order to help in conservation and management of the riverine population.

Introduction

The clown knifefish, *Chitala chitala*, is distributed in the Ganges-Brahmaputra and Mahanadi river basins of India. Reports from Thailand and Indo-China were based on *Chitala ornate*, and those from Malaysia and Indonesia on *Chitala lopis*. A bony fish belonging to the order Osteoglossiformes of the family Notopteridae, *C. chitala* is an important food and aquarium fish in India. Maturity in the male is at age 2^+ and the female at age 3^+. The species is subject to heavy fishing pressure, leading to an alarming decline in natural populations (Sarkar et al., 2006). In support of its conservation this species has been declared a state fish of Uttar Pradesh, India. Sarkar et al. (2006) successfully developed captive breeding and larval rearing of *C. chitala*.

Studies on length–weight relationships of threatened and commercially important fishes are highly significant for management and conservation of populations in natural waterbodies. No studies are available in the literature on the biological aspects, especially length–weight relationships, of *C. chitala* from different riverine populations of India. Aim of the study was therefore to investigate certain biometric characters with special reference to length–weight relationship from various drainages of the River Ganga basin, India.

Materials and methods

Specimens of *C. chitala* were collected from various drainages of the River Ganga basin, India during the period in 2000–2004 using different types of fishing gear (cast net, drag net, gill net). Sampling locations recorded by global positioning system and sample sizes are given in Table 1. Collections were made at random intervals because of their low population density and sporadic appearances. Altogether 221 specimens were collected, ranging from 31 cm to 120 cm length and 550 g to 12 000 g weight. As the gonad size is small in both sexes, external determination of sex is difficult even when the fish is fully mature. The authors observed that size at maturity and maturity percentage varied in male and female *C. chitala* throughout the rivers studied: males attain maturity a year earlier than females, which may be attributed to the faster growth of males than females. Specimens were preserved in 10% formalin, kept in plastic fish carriers and transported to the laboratory.

The L–W relationship of the fish was studied by linear regression of Log TW = Log a + b Log TL, where, TW was the total body weight in grams, TL total length in cm, and a and b are the parameters of the equation. To test for possible significant differences in both slope and intercept, analysis of co-variance was followed.

Results and discussion

Altogether 221 specimens of *C. chitala* were collected during the study period. Sample size, length, weight, parameters for a and b, standard error of the slope, r values and 95% confidence intervals are given for males and females in Table 2. Analysis of co-variance revealed significant differences in slope 'b' of the regression line (P < 0.001). The regression equation for the

Table 1
Length–weight relationship in *Chitala chitala*, Ganges River basin

St no.	Rivers / drainages	Sample size	Latitude (°N)	Longitude (°E)
1	Bhagirathi	30	24.05	88.06
2	Ganga (Farakka)	30	24. 53	88.10
3	KWS	20	28.21	81.25
4	Ganga (Kanpur)	10	25.82	81.26
5	Saryu	20	26.33	832.37
6	Ghagra	10	26.75	81.99
7	Samaspur Bird Sanctuary	25	25.97	81.67
8	Sutluj	16	31.09	74.56
9	Malda Farm	40	24.92	88.14
10	Kosi	20	24.31	87.82

Latitudes and longitudes of sampling sites. n, number of fish sampled; St. No., station number.

Table 2
Length–weight relationships for *Chitala chitala* from different sampling sites, River Ganga basin

Rivers / drainages	Females					Males					
	Length range (mm)	r	a	b	95% Cl of b	Length range (mm)	r	a	b	95% Cl of b	r
Bhagirathi	400–1080	0.99	−5.15	2.36	2.6–4.0	410–767	0.98	−5.30	3.50	2.69–3.49	0.99
Ganga (Farakkha)	465–1150	0.98	−4.20	2.19	2.6–3.06	460–870	0.99	−5.10	3.15	2.87–3.70	0.98
KWS	500–970	0.99	−5.21	3.10	2.55–2.9	300–970	0.98	−5.20	3.15	1.61–3.6	0.99
Ganga (Kanpur)	310–835	0.98	−5.03	2.32	2.4–3.4	300–845	0.98	−5.98	3.52	2.4–3.4	0.97
Saryu	310–1120	0.98	−4.18	2.35	2.4–3.9	340–727	0.96	−5.90	3.30	2.7–2.3	0.98
Ghagra	350–1200	0.98	−5.16	3.12	2.9–3.8	410–630	0.98	−5.16	3.12	2.1–3.8	0.98
SBS	310–835	0.99	−6.11	3.39	2.4–3.8	412–900	0.99	−5.52	3.50	2.6–3.8	0.99
Satluj	570–810	0.92	−7.12	3.10	3.0–3.8	575–900	0.95	−7.60	3.86	3.0–3.8	0.95
Malda Farm	366–620	0.97	−4.54	3.18	3.02–4.0	490–785	0.99	−5.51	3.41	2.9–4.0	0.99
Kosi	901–1200	0.99	−4.58	3.20	2.9–4.1	470–1005	0.97	−5.25	3.21	2.9–3.57	0.99

$r = 0.9758$.

allometric coefficient of *C. chitala* in each studied river is depicted in Table 2 and varied between 2.19 (Ganga, Farakka) to 3.39 (SBS) in females and 3.12 (Gomti) to 4.1 (Satluj) in males. The length–weight relationship of pooled data of males and females from 10 different geographical locations indicated that the value of 'b' was almost 3. The highest 'b' value was obtained in the River Satluj (3.86) sampling, with regression coefficient $r = 0.95$.

Observed variations in *C. chitala* L–W relationships from various populations may be attributed to the different habitats on which their biology depends, including the growth phase, degree of stomach fullness, gonadal development and health condition, etc. (Tarkan et al., 2006). Exponential value of the length–weight relationship 'b' in *C. chitala* followed the cube law, indicating an isometric pattern of fish growth. According to Hile (1936) and Martin (1949), the value of 'b' usually remains an ideal constant at 3.0. In the present study the data from both sexes showed slightly higher than 3 in certain drainages (Table 1). Mercy et al. (2002) reported 'b' value of 3.04 for *Puntius denisonii* from Kerala, and values above 3 are possible under certain conditions such as in fish farming and stress-free environments. Generally, the weight of the fish will be proportional to the cube of its length, based on its dimensional equality (Harish Kumar et al., 2006).

To the best of our knowledge, no previous references dealing with LWR for the studied species were available. In conclusion, this study provides basic information on L–W relationships useful for fishery biologists and conservation agencies to impose adequate regulations for sustainable fishery management and conservation in Indian waters in general and the River Ganga basin in particular.

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