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RESEARCH ARTICLE

Length–weight relationships and condition, of the asian striped catfish, mystus vittatus (bloch, 1794) from non-drainable perennial ponds from lucknow, up, india

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ABSTRACT

The present study describes the annual condition as well the length–weight (LWR) of the Asian striped catfish, *Mystus vittatus* (Bloch, 1794), an important fishery by the village poor Anglers. A total of 119 specimens (7.0–8.8 cm standard length, 8.0–10.9 cm total length) used in this study was caught with traditional fishing gear from July 2009 to August 2009. Overall, the allometric coefficient 'b' of the LWR was close to the isometric value (b = 2.88). The results further indicated that the LWRs were highly correlated (r^2 = 0.826296, P < 0.01). The aim of the present paper was to carry out the comprehensive description of the LWRs and condition of the *M. vittatus.* In conclusion, this study has provided basic information on LWR, and condition. These results will be useful for fishery biologists and managers to impose adequate regulations for sustainable fishery management in the non-drainable ponds in India.

INTRODUCTION

The Asian striped catfish, *Mystus vittaus* (Bloch, 1794) is a fish from Bagridae (Siluriformes) family that occurs through-out the Indian sub-continent (Froese and Pauly, 2006). The Asian striped catfish *Mystus vittatus* (Bloch, 1794) occurs widely throughout the Indian subcontinent including Bangladesh, India, Pakistan, Sri Lanka, Nepal and Bhutan, but it has been also reported from Myanmar, Malaysia, Laos, Vietnam and Combodia (Froese and Pauly, 2006). Also found in canals and irrigation channels, this species usually inhabits marginal vegetation in lakes and swamps with muddy substrates and feeds on plants, shrimps, insects, mollusks and fishes (Bhatt, 1971; Pethiyagoda, 1991). It is found in rivers, canals irrigation channels, non-drainable ponds. This species usually inhabits in marginal vegetation in swamps, lakes, non-drainable ponds with muddy substances and feeds on molluscks, small shrimp, plants and fishes (Bhatt, 1971; Pethiyagoda, 1991; Hossain *et al*., 2006). *Mystus vittauts* is an important target fish for small–scale fisherman (Craig.*et al*.., 2004; Kibria and Ahmad, 2005; Hossain *et al*.., 2006). This fish is indigenous and abundant in non-drainable small ponds and in India and are very rich in protein, vitamin and minerals (Hossain *et al*.., 2006). Length-weight relationships (LWR) has both basic and applied users (Pitcher and Hart , 1982; Patgiri *et al*.., 2001; Kar *et al*.. 2005; Anna Mercy *et al*.., 2008; Kar & Barbhuiya, 2010) to estimate weight from length observations, calculate production and biomass of a fish population and provide information on stocks or organism condition at the corporal level. The sue of L-W relationship is to estimate length-weight observations to calculate biomass production of fish and to provide stocks or organism condition factor. The L-R relation is also important for fisheries management for comparative growth performance (Jhingran 1952, 1968; Montopoulus & Stergoius, 2002) the adequate local information for many sub-tropical fish is not available (Harrison,2001; Ecoutin *et al*., 2005). Length–length relationships (LLRs) are also important in fisheries management for comparative growth studies (Moutopoulos & Stergiou, 2002; Fafioye & Oluajo, 2005). Although LWR and LLR are readily available for most European and North American freshwater and marine fishes (e.g. Bagenal & Tesch, 1978; Petrakis & Stergiou, 1995; Koutrakis & Tsikliras, 2003; Sinovcic *et al*.., 2004; Oscoz *et al*.., 2005; Leunda *et al*.., 2006; Miranda *et al*.., 2006), adequate local information is still scarce for most tropical and subtropical fish species (Martin-Smith, 1996; Harrison, 2001; Ecoutin *et al*., 2005). The condition factor in natural fishery is quantitative parameters of the state of well-being of the fish. The condition of a fish reflects recent physical and biological circumstances, and fluctuates by interaction among feeding conditions, parasitic infections and physiological factors (Le Cren, 1951). A very limited work has been carried out on small fish of non-drainable ponds and specifically this high nutritional value fish in relation to L-W relationship, abundant in the perennial ponds in India. Thus, the present investigation has been undertaken for the demonstrating the L-W relation condition factor of *Mystus vittaus*, from non-drainable perennial pond.

MATERIAL AND METHODS

Asian striped catfish specimens were collected from the sampling site from non-drainable perennial ponds located in Lucknow between July 2009 to August 2011 by means of traditional cast net fishing gear (Kibria & Ahmed, 2005). Specimens (Photo-1)

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were preserved in 10% buffered Alcohol-formalin, packed in glass bottles and transported to the laboratory.

All specimens (119) were measured for total length (TL) and standard length (SL) with a milimeter scale to the nearest 1 mm, whilst body weight (BW) was determined with a digital balance to the nearest 0.01 g. The LWR for BW was calculated using the equation, $BW = a \cdot SL^b$, where coefficient a is the intercept in the y-axis, and the regression coefficient b is an exponent indicating isometric growth when equal to 3.

The statistical significance level of r^2 was estimated and the parameters a and b were estimated by linear regressionson the transformed equation. $\log BW = \log a + b \cdot \log SL$. To test for possible significant differences in both slope and intercept, we followed the analysis of covariance. All statistical analyses were considered significant at $P < 0.05$. The Fulton's condition factor (K) was calculated for each individual fish according to the equation $K = (BW/SL^3) \times 100$.

Table 1 Relationship between logarithms of standard length (Sl) and weight (w) in *Mystus vittatus*

S No.	SL(Cm)	TL(Cm)	W(g)	SL% of TL	a=W/L3	logW=loga +b*(logL)	b=(logW-loga)/logL	r2	K
1	6.5	9.5	5	68.42	0.0182	0.5682	2.84		1.821
2	7.7	9.7	11	79.38	0.0241	0.9232	2.87		2.409
3	8.4	10.3	9	81.55	0.0152	0.8820	2.92		1.518
4	8.3	10.1	7	82.18	0.0122	0.7767	2.93		1.224
5	7.9	9.8	7	80.61	0.0142	0.7586	2.90		1.420
6	8.2	9	7	91.11	0.0127	0.7723	2.92		1.270
7	8.6	10.3	8	83.50	0.0126	0.8439	2.94		1.258
8	8.4	10.2	11	82.35	0.0186	0.9625	2.91		1.856
9	7.4	9.3	9	79.57	0.0222	0.8295	2.86		2.221
10	7.8	9.6	7	81.25	0.0148	0.7539	2.90		1.475
11	7.8	9.2	8	84.78	0.0169	0.8056	2.89		1.686
12	7.1	8.2	7	86.59	0.0196	0.7194	2.85		1.956
13	7.2	9.1	8	79.12	0.0214	0.7742	2.85		2.143
14	7.3	9.2	7	79.35	0.0180	0.7296	2.87		1.799
15	8	10.1	9	79.21	0.0176	0.8618	2.90		1.758
16	8.1	10.1	9	80.20	0.0169	0.8669	2.90		1.694
17	6.8	8.6	5	79.07	0.0159	0.5819	2.86		1.590
18	7.1	9.2	6	77.17	0.0168	0.6624	2.86		1.676
19	7.3	9.2	6	79.35	0.0154	0.6718	2.88		1.542
20	7.2	9	7	80.00	0.0188	0.7245	2.86		1.875
21	8.1	10	8	81.00	0.0151	0.8204	2.91		1.505
22	8.4	10.5	9	80.00	0.0152	0.8820	2.92		1.518
23	7.2	9.1	6	79.12	0.0161	0.6671	2.87		1.608
24	7.1	9.9	8	71.72	0.0224	0.7688	2.84		2.235
25	6.9	8.4	6	82.14	0.0183	0.6528	2.85		1.826
26	6	7.5	4	80.00	0.0185	0.4685	2.83		1.852
27	6.8	8.7	5	78.16	0.0159	0.5819	2.86		1.590
28	7.9	10	10	79.00	0.0203	0.8976	2.89		2.028
29	7.9	9.2	10	85.87	0.0203	0.8976	2.89		2.028
30	7.2	9.2	7	78.26	0.0188	0.7245	2.86		1.875
31	7	8.9	7	78.65	0.0204	0.7142	2.85		2.041
32	6.9	8.8	6	78.41	0.0183	0.6528	2.85		1.826
33	7.2	9.4	8	76.60	0.0214	0.7742	2.85		2.143
34	7	9.2	7	76.09	0.0204	0.7142	2.85		2.041
35	6.9	8.5	7	81.18	0.0213	0.7089	2.84	0.826296	2.131
36	7.8	9.8	8	79.59	0.0169	0.8056	2.89		1.686
37	7	9	7	77.78	0.0204	0.7142	2.85		2.041
38	6.7	8.5	6	78.82	0.0199	0.6428	2.84		1.995
39	8.3	10.1	9	82.18	0.0157	0.8770	2.92		1.574
40	6.7	8.7	5	77.01	0.0166	0.5774	2.85		1.662
41	8	9.9	9	80.81	0.0176	0.8618	2.90		1.758
42	7	8.7	6	80.46	0.0175	0.6576	2.86		1.749
43	7.4	9.1	6	81.32	0.0148	0.6764	2.88		1.481
44	7	8.6	5	81.40	0.0146	0.5907	2.87		1.458
45	7.5	9.5	8	78.95	0.0190	0.7903	2.87		1.896
46	7.4	9.7	8	76.29	0.0197	0.7850	2.86		1.974
47	7.7	10	10	77.00	0.0219	0.8865	2.87		2.190
48	8.5	10.6	11	80.19	0.0179	0.9679	2.92		1.791
49	7.5	9.6	8	78.13	0.0190	0.7903	2.87		1.896
50	7.5	9.3	8	80.65	0.0190	0.7903	2.87		1.896
51	7	8.9	6	78.65	0.0175	0.6576	2.86		1.749
52	7.1	9.2	7	77.17	0.0196	0.7194	2.85		1.956
53	7.9	10	10	79.00	0.0203	0.8976	2.89		2.028
54	8.4	10.3	10	81.55	0.0169	0.9243	2.92		1.687
55	8.5	10.8	11	78.70	0.0179	0.9679	2.92		1.791
56	7.9	10.1	10	78.22	0.0203	0.8976	2.89		2.028
57	7.6	9.9	8	76.77	0.0182	0.7955	2.88		1.822

58	8	10.3	10	77.67	0.0195	0.9031	2.89	1.953
59	7.3	9.2	8	79.35	0.0206	0.7797	2.86	2.056
60	8	9.7	9	82.47	0.0176	0.8618	2.90	1.758
61	7.3	8.7	7	83.91	0.0180	0.7296	2.87	1.799
62	7.6	9.2	7	82.61	0.0159	0.7444	2.89	1.595
63	7.3	9	7	81.11	0.0180	0.7296	2.87	1.799
64	7.9	9.8	9	80.61	0.0183	0.8566	2.89	1.825
65	7.8	9	7	86.67	0.0148	0.7539	2.90	1.475
66	7.5	9.7	8	77.32	0.0190	0.7903	2.87	1.896
67	8.2	10	8	82.00	0.0145	0.8253	2.91	1.451
68	7.4	9.1	6	81.32	0.0148	0.6764	2.88	1.481
69	7.7	9.5	7	81.05	0.0153	0.7492	2.89	1.533
70	8.5	10.3	9	82.52	0.0147	0.8869	2.93	1.465
71	7.9	10.1	9	78.22	0.0183	0.8566	2.89	1.825
72	6.8	8.8	5	77.27	0.0159	0.5819	2.86	1.590
73	7.4	9.4	7	78.72	0.0173	0.7346	2.87	1.727
74	8	10	8	80.00	0.0156	0.8156	2.90	1.563
75	8.1	10	10	81.00	0.0188	0.9085	2.90	1.882
76	8.3	10.3	11	80.58	0.0192	0.9571	2.91	1.924
77	8.5	10.5	10	80.95	0.0163	0.9294	2.92	1.628
78	8.3	10.1	10	82.18	0.0175	0.9191	2.91	1.749
79	6.5	8.2	4	79.27	0.0146	0.4894	2.86	1.457
80	8.1	10	9	81.00	0.0169	0.8669	2.90	1.694
81	7.2	9.1	7	79.12	0.0188	0.7245	2.86	1.875
82	7.3	8.9	7	82.02	0.0180	0.7296	2.87	1.799
83	7.9	10.1	10	78.22	0.0203	0.8976	2.89	2.028
84	7.4	9.2	6	80.43	0.0148	0.6764	2.88	1.481
85	8.4	10.1	9	83.17	0.0152	0.8820	2.92	1.518
86	8	9.9	7	80.81	0.0137	0.7632	2.91	1.367
87	7.2	9.1	6	79.12	0.0161	0.6671	2.87	1.608
88	6.2	8.1	4	76.54	0.0168	0.4771	2.84	1.678
89	7.9	9.9	8	79.80	0.0162	0.8106	2.90	1.623
90	7.8	9.2	8	84.78	0.0169	0.8056	2.89	1.686
91	7.1	9.1	6	78.02	0.0168	0.6624	2.86	1.676
92	8	10	9	80.00	0.0176	0.8618	2.90	1.758
93	7.4	9.4	6	78.72	0.0148	0.6764	2.88	1.481
94	7.7	9.5	7	81.05	0.0153	0.7492	2.89	1.533
95	8.8	10.9	13	80.73	0.0191	1.0521	2.93	1.908
96	8	10	9	80.00	0.0176	0.8618	2.90	1.758
97	6.9	8.6	6	80.23	0.0183	0.6528	2.85	1.826
98	7.9	9.9	8	79.80	0.0162	0.8106	2.90	1.623
99	7.3	9.4	7	77.66	0.0180	0.7296	2.87	1.799
100	7.5	9.1	7	82.42	0.0166	0.7395	2.88	1.659
101	7.6	9.3	8	81.72	0.0182	0.7955	2.88	1.822
102	7.5	9.1	5	82.42	0.0119	0.6116	2.90	1.185
103	7.6	9.2	7	82.61	0.0159	0.7444	2.89	1.595
104	6.6	8.2	6	80.49	0.0209	0.6377	2.83	2.087
105	7.7	9.7	8	79.38	0.0175	0.8006	2.88	1.752
106	6.7	8.3	5	80.72	0.0166	0.5774	2.85	1.662
107	7	8	5	87.50	0.0146	0.5907	2.87	1.458
108	6.8	9.4	7	72.34	0.0223	0.7036	2.83	2.226
109	7.5	9.5	7	78.95	0.0166	0.7395	2.88	1.659
110	6.8	8.9	6	76.40	0.0191	0.6478	2.84	1.908
111	5.8	7.5	3	77.33	0.0154	0.3642	2.85	1.538
112	7.2	8.3	5	86.75	0.0134	0.5992	2.88	1.340
113	7.5	9.2	7	81.52	0.0166	0.7395	2.88	1.659
114	7.4	9.3	9	79.57	0.0222	0.8295	2.86	2.221
115	8.3	10.1	10	82.18	0.0175	0.9191	2.91	1.749
116	7.4	8.9	6	83.15	0.0148	0.6764	2.88	1.481
117	8.1	9.6	8	84.38	0.0151	0.8204	2.91	1.505
118	5.8	7.8	4	74.36	0.0205	0.4596	2.81	2.050
119	7.4	9.3	8	79.57	0.0197	0.7850	2.86	1.974
							av b =2.88	

RESULTS AND DISCUSSION

From the total of 119 specimens of *M. vittatus* collected during the study period, the LWRs indicated that the calculated allometric coefficients vary as shown in Table -1. The LWR can be obtained from length and weight measurements of the same fishes throughout their lives or from a sample of fish taken at a particular time (Wootton, 1990). The parameters of fish LWR are affected by a series of factors including season, habitat, gonad maturity, sex, diet, stomach fullness, health and preservation techniques (e.g. Tesch, 1971; Bagenal and Tesch, 1978).

Subsequently, if these LWRs were obtained monthly throughout a complete annual cycle as in the present study, then the simulated parameters would be more appropriate. This would apply as well as for the entire LWR data. All allometric coefficients (*b*) estimated in this studies were within the expected range of 2.5–3.5, but they can vary between 2 and 4 (Bagenal & Tesch, 1978). Even if specimens <30 mm SL are not used in LWR estimations to avoid potential bias of the inclusion of immature juveniles that had not yet attained adult shape (Bagenal & Tesch, 1978), the observed between-month differences in the LWR *b*-values could be affected by non-overlapping or narrow size ranges (Petrakis & Stergiou, 1995; Moutopoulos & Stergiou, 2002).

Photo -1 Live sample of *Mystus vittatus*

The Fulton's condition factor (*K*) ranged from 0.972 to 3.188. There was no significant difference in *K* between months ($P > 0.05$). The mean Fulton's condition factor in relation to size class (K_m) is shown in Table - 1. The K_m tends to be lower, between 5.5 and 7.0 cm SL. In this study the average *K* values of *M. vittatus* were recorded as an average of 1.750. As Bhatt (1971) reported for *M. cavasius*, this study shows that highest values of K_m occur in <4.5 cm SL, gradually decreasing from 5.0 cm SL to the lowest K_m values at 6.0 cm SL, when *M. vittatus* females showed spawning activity. The variation observed in LWR parameters and condition of *M. vittatus* may be attributed to the seasonality of the flooding cycle related to the monsoons that rule the reproductive cycle and growth of fish species (Craig *et al.*, 2004). In conclusion, this study has provided basic information on the LWR and *K* that would be useful for fishery biologists/managers to impose adequate regulations for sustainable fishery management in non-drainable pond system in India and/ or Indian sub-continent.

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