World Journal of Fish and Marine Sciences 7 (1): 01-04, 2015
ISSN 2078-4589

DOI: 10.5829/idosi.wjfms.2015.7.1.9274

# Morphometric and Meristic Characteristics of *Triplophysa marmorata* (Heckel, 1838) from Kashmir Valley, India

[1,2]*Amir Bashir,* [1]*Balwant Singh Bisht and* [2]*Rabindar Singh Patiyal*

[1]Department of Zoology, Tehri Campus, Hemwati Nandan Bahuguna Garhwal University, Srinagar Garhwal-246174, India
[2]Directorate of Coldwater Fisheries Research, Anusandhan Bhawan, Bhimtal 263136, India

**Abstract:** The Present Study provides morphometric and meristic characteristics of *Triplophysa marmorata* from Kashmir valley which can be used for the management and conservation of this fish species in the Jhelum River of valley. By using different fishing gears a total of 45 samples were collected. The meristic characters of all the samples were D. III-7, A. III-5, P. I-9, V. I-7, C. 17. The total length ranged from 7.4-14 cm whereas, total weight of body ranged from 2- 19.3g. With the total length all other morphometric characters showed positive correlation and highest correlation was shown by fork length (0.99), whereas least correlation (0.44) was shown by distance from anal fin to caudal fin base (DACB). Correlation between head length and other head morphometric characters also showed positive correlation with snout length (SnL) showing maximum (0.87) and eye diameter (ED) minimum (0.49) correlation.

**Key words:** Morphometry · *Triplophysa marmorata* · Isometric Growth · Wild Population · Kashmir Valley

## INTRODUCTION

Genus *Triplophysa* belongs to the family Balitoridea, subfamily Nemacheilinae. There are 112 nominal species in the genus *Triplophysa* all over the world [1, 2]. These are commonly called as Stone loaches. Most of them inhabit rivers and streams in hilly areas with rock beds. *Triplophysa* is uniquely distinguished by having a marked sexual dimorphism, males with an area of breeding tubercles between snout and eye on each side of head and a thickened tuberculate pad on the dorsal surface of the outer broadened pectoral-fin rays [3].

*Triplophysa marmorata* is benthoplagic which inhabits the Indus basin and river Jehlum of Kashmir valley famously known for its greenery and fresh waters all over the world [4, 5]. Its eyes are high on head, mouth is inferior, scales are absent and have three pairs of barbles-two rostral and one maxillary pair. The color of ground is pale yellowish or whitish [6]. The local name of this fish is "Aragurun" [6].

Morphological variability of fish is considered to be an important adaptive strategy for populations experiencing inconsistent environments [7]. Variability of environment could be explained by abiotic components such as physicochemical parameters of water, habitat and substrate types and biotic components like competition and predation, which serve as selective pressures [8]. Moreover fragmentation caused by the construction of dams might disrupt the connectivity of hydro-ecosystem and the gene flow between local fish populations [9-11]. Information on the morphometric measurements of fishes and the Study of Statistical relationship among them are essential for taxonomic works [12]. Since no data of morphometric and meristic characters is available in the previous literature of this fish, so this study was initiated to provide a base line data of this fish from Kashmir Valley India.

## MATERIALS AND METHODS

A total of 45 samples were collected from Jhelum River, a Tributary of Indus basin from Kashmir Valley from October 2013 to November 2014. The service of local fishermen was taken which used specially designed cast nets to capture large sized fishes, having 0.5cm mesh size to avoid capture of fry and fingerlings. Identification of

**Corresponding Author:** Rabindar Singh Patiyal, Directorate of Coldwater Fisheries Research, Anusandhan Bhawan, Bhimtal 263136, India. E-mail: rspatiyal1@gmail.com.

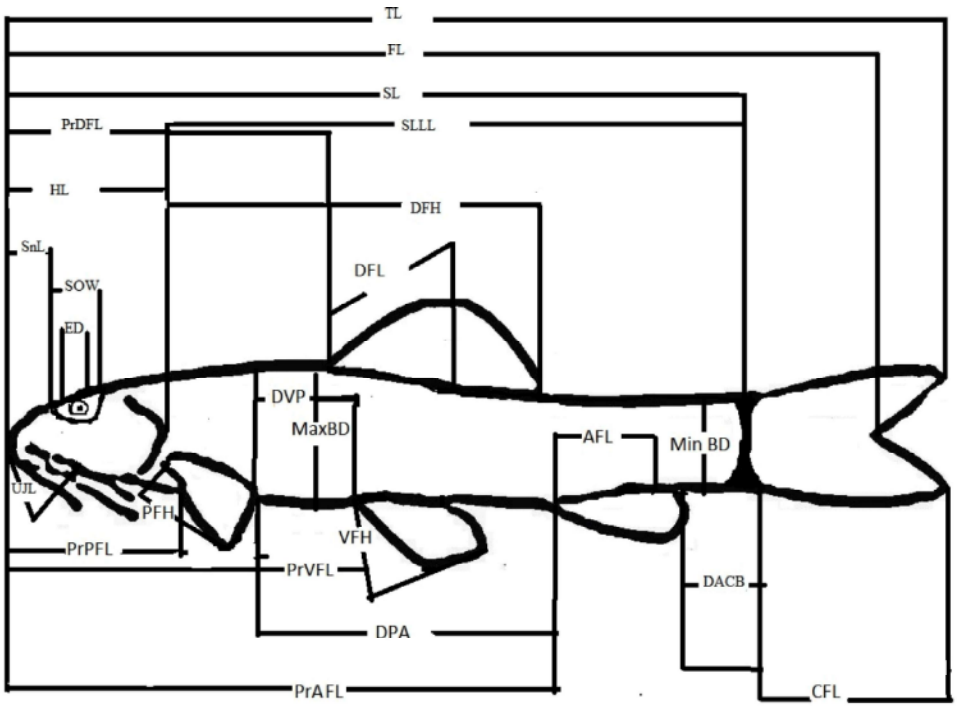


Fig. 1: Morphometric measurements of *Triplophysa marmorata* from Kashmir Valley, India. Explanations of acronyms in Table 2

fishes was done by following classification of Day [13] and Kullander [4]. All counts and measurements follow the methods of Kottelat [14] and Prokofiev [15]. Voucher specimen was preserved in 10% formaldehyde solution and was submitted to departmental museum. Total 25 morphometric measurements and 5 meristic counts were taken. Morphometric measurements were taken by digital slide caliper upto the nearest 0.1mm and the weight of fish were taken by digital balance upto the nearest of 0.1g (Fig. 1). Meristic characters were counted by using stereomicroscope. Excel 2007 and SPSS 16.0 were used to analyze all the data.

Table 1: Meristic Characters of the *Triplophysa marmorata* captured from Kashmir Valley.

| | |
|---|---|
| Pectoral fin rays: PFR | I- 9 |
| Dorsal fin rays: DFR | III- 7 |
| Caudal fin rays: CFR | 17 |
| Anal fin Rays: AFR | III- 5 |
| Ventral Fin rays VFR | I-7 |

## RESULT AND DISCUSSION

For morphometric and meristic characters 45 specimens of *Triplophysa marmorata* were used. The meristic characters were almost constant irrespective of fish size thus depicts that meristic counts are independent of fish length [14]. The meristic characters are presented in Table 1. Lateral line is incomplete. Caudal fin is truncated or sub-truncated and pelvic fin does not reach upto the origin of anal fin. All the morphometric characters with their statistical values are given in Table 2. Total length ranged from 7.4-14cm whereas, body weight ranged from 2- 19.3g. A relationship between total length and all other measured morphometric characters was established. All the measured morphometric characters showed positive correlation with respect to total length (Table 3) thus shows significant correlation. The correlation analysis shows that all morphometric characters change proportionally with the increase of the total length of fish; these results were consistent with the results of Sharma *et al.* [16]. In relation to total length, fork length shows highest correlation (0.99) whereas least correlation ((0.44) was shown by distance from anal fin to caudal fin base. Relationship of morphometric characters on head were measured with head length, all characters compared showed positive correlation. Maximum correlation was shown by snout length (0.87) and minimum by eye diameter (0.49).

The total maximum length of *Triplophysa marmorata* was higher (14cm) than reported by Talwar and Jhingran [17] and standard length (11.9cm) was higher than reported by Kullander [4]. All the meristic characters were

Table 2: Definition of morphometric measurements, maximum (cm), minimum (cm), mean and standard deviation (SD) examined in *Triplophysa marmorata from* Kashmir Valley.

| Morphometric character | Minimum | Maximum | Mean | SD |
|---|---|---|---|---|
| Total Length: TL | 7.4 | 14 | 9.78 | 1.40 |
| Fork Length: FL | 7.2 | 13.7 | 9.52 | 1.41 |
| Standard Length: SL | 6.3 | 11.9 | 8.35 | 1.25 |
| Maximum Body Depth: Max. BD | 0.75 | 11.3 | 1.51 | 1.51 |
| Body weight: BW | 2 | 19.3 | 6.66 | 3.53 |
| Snout Length: SnL | 0.59 | 1.2 | 0.82 | 0.14 |
| Head length: HL | 1.1 | 2.4 | 1.72 | 0.29 |
| Dorsal fin height: DFH | 1.1 | 2.1 | 1.58 | 0.23 |
| dorsal fin Length: DFL | 0.68 | 1.5 | 1.05 | 0.19 |
| Anal fin length: AFL | 0.4 | 1 | 0.65 | 0.14 |
| Pectoral fin height: PFH | 0.98 | 2.2 | 1.57 | 0.27 |
| Ventral fin height: VFH | 0.84 | 1.8 | 1.25 | 0.22 |
| Straight Lateral line Length: SLLL | 4.9 | 8.2 | 6.29 | 0.83 |
| Pre dorsal Length: PrDFL | 3.4 | 6.2 | 4.31 | 0.59 |
| pre Ventral Length: PrVFL | 3.5 | 6.1 | 4.60 | 0.62 |
| Pre Pectoral Length: PrPFL | 1.4 | 2.7 | 1.91 | 0.30 |
| Pre Anal Fin length :PrAFL | 4.6 | 8.3 | 6.05 | 0.86 |
| Minimum Body Depth: Min. BD | 0.42 | 1 | 0.60 | 0.11 |
| Caudal Fin Length: CFL | 1 | 2 | 1.54 | 0.25 |
| Upper Jaw Length: UJL | 0.3 | 0.9 | 0.49 | 0.13 |
| Sub Orbital Width: SOW | 0.17 | 0.5 | 0.27 | 0.07 |
| Eye Diameter: ED | 0.1 | 0.2 | 0.12 | 0.02 |
| Distance from anal fin to caudal fin base :DACB | 1 | 2.8 | 1.62 | 0.36 |
| Distance between pectoral and anal fin: DPA | 2.5 | 5.9 | 4.17 | 0.74 |
| Distance between ventral and Pectoral: DVP | 1.9 | 4 | 2.74 | 0.46 |

Table 3: Morphometric characters of *Triplophysa marmorata* in accordance with percent total length and head length of fish and correlation (r) of morphometric traits with total length and of head length with head morphometric characters from the Kashmir Valley.

| Morphometric characters | Minimum | Maximum | Mean | SD | r |
|---|---|---|---|---|---|
| Percent with respect to total length | | | | | |
| Fork Length: FL | 95.14 | 99.11 | 97.27 | 1.12 | 0.99 |
| Standard Length: SL | 81.52 | 89.09 | 85.33 | 1.82 | 0.98 |
| Maximum Body Depth: Max. BD | 10 | 16.30 | 13.13 | 1.51 | 0.82 |
| Snout Length: SnL | 6.99 | 9.90 | 8.41 | 0.68 | 0.88 |
| Head length: HL | 14.66 | 20.35 | 17.62 | 1.12 | 0.93 |
| Dorsal fin height: DFH | 14.13 | 20 | 16.26 | 1.23 | 0.87 |
| Dorsal fin Length: DFL | 8.43 | 13.46 | 10.76 | 1.19 | 0.80 |
| Anal fin length: AFL | 4.58 | 8.90 | 6.64 | 0.99 | 0.73 |
| Pectoral fin height: PFH | 11.80 | 19.88 | 16.08 | 1.60 | 0.83 |
| Ventral fin height: VFH | 10.09 | 15.45 | 12.80 | 1.13 | 0.87 |
| Straight Lateral line Length: SLLL | 58.57 | 68.88 | 64.41 | 2.27 | 0.96 |
| Pre dorsal Length: PrDFL | 40.40 | 50.66 | 44.20 | 2.16 | 0.94 |
| pre Ventral Length: PrVFL | 42.68 | 50.60 | 47.11 | 1.94 | 0.95 |
| Pre Pectoral Length: PrPFL | 16.66 | 22.89 | 19.56 | 1.33 | 0.90 |
| Pre Anal Fin length: PrAFL | 50.96 | 66.66 | 61.96 | 2.63 | 0.95 |
| Minimum Body Depth: Min. BD | 5.10 | 8.91 | 6.19 | 0.71 | 0.82 |
| Caudal Fin Length: CFL | 12.19 | 20.73 | 15.82 | 1.60 | 0.81 |
| Upper Jaw Length: UJL | 3.23 | 8.49 | 5.08 | 1.03 | 0.63 |
| Sub Orbital Width: SOW | 1.84 | 4.57 | 2.79 | 0.58 | 0.60 |
| Eye Diameter: ED | 0.85 | 1.92 | 1.30 | 0.24 | 0.47 |
| Distance from anal fin to caudal fin base :DACB | 12.19 | 33.75 | 16.68 | 3.61 | 0.44 |
| Distance between pectoral and anal fin: DPA | 23.89 | 50.90 | 42.75 | 4.66 | 0.75 |
| Distance between ventral and Pectoral: DVP | 16.81 | 34.11 | 28.11 | 3.39 | 0.68 |
| Percent with respect to head length | | | | | |
| Snout Length: SnL | 38.33 | 58.18 | 47.84 | 4.20 | 0.87 |
| Sub Orbital Width: SOW | 10.52 | 23.75 | 15.89 | 3.23 | 0.61 |
| Eye Diameter: ED | 4.76 | 10.52 | 7.42 | 1.42 | 0.49 |

similar as reported by Talwar and Jhingran [17] but caudal fin rays were 17, which is reported for the first time in the present investigation. This study has provided baseline data about the morphometric and meristic characters of the important fish, which will be helpful for the management and conservation of *Triplophysa marmorata* in Kashmir Valley.

## ACKNOWLEDGEMENT

We would like to acknowledge Director, Directorate of Cold Water Fisheries Research, Bhimtal for providing necessary facilities.

## REFERENCES

1. Chen, X.Y. and J.X. Yang, 2005. *Triplophysa rosa* sp. nov.; a new blind loach from China. J. Fish. Biol., 66: 599-608.
2. Froese, R. and D. Pauly, 2011. FishBase; World Wide Web electronic publication. Available from: http://www.fish base.org, version (09/2011).
3. Zhu, S.Q., 1989. The Loaches of the Subfamily Nemacheilinae in China (Cypriniformes: Cobitidae). Jiangsu Science and Technology Publishing House, Nanjing, pp: 150.
4. Kullander, S.O., F. Fang, B. Delling and E. Ahlander, 1999. The fishes of the Kashmir Valley. pp: 99-162. In River Jhelum, Kashmir Valley: Impact on the Aquatic Environment. (L. Nyman, ed.) Swedmar, Goteberg, Sewden, pp: 198.
5. Walker, K.F. and H.Z. Yang, 1999. Fish and fisheries in western China. FAO Fish. Tech. Pap., 385: 237-278.
6. Heckel, J.J., 1838. *Fischeaus Cashmirgesammelt und herausgegeben von Carl Freiherrn v. Hügel*. Mechitaristen, Wien. 110 pp: 13 pls.
7. Scheimer, S.M., 1993. Genetics and Evolution of Morphology. Phenotypic Plasticity. Annual Review of Ecology and Systematics, 24: 35-68.
8. Gharaei, A., 2012. Morphometric and Meristic Studies of Snow Trout *Schizothorax zarudnyi* (Nikolskii, 1897) as a Threatened Endemic Fish. World Journal of Fish and Marine Sciences, 4(4): 426-429.
9. Fu, C.Z., J.H. Wu, J.K. Chen, Q.H. Wu and G.C. Lei, 2003. Freshwater fish biodiversity in the Yangtze River basin of China: patterns, threats and conservation. Biodiver. Conserv., 12: 1649-1685.
10. Jiang, H., S.G. Xie, W.Q. Zhao and J.B. Chang, 2007. Changes of fish assemblages after construction of Eetan Reservoir in Yalong River. Acta Hydrobiol. Sin. 31: 532-539 (in Chinese).
11. Huang, F., Z.Q. Xia, N. Zhang and Z.H. Lu, 2011. Does hydrologic regime affect fish diversity? A case study of the Yangtze Basin (China). Environ. Biol. Fish., 92: 569-584.
12. Lawson, E.O., S.L. Akintola and F.A. Awe, 2013. Length-Weight Relationships and Morphometry for Eleven (11) Fish Species from Ogudu Creek, Lagos, Nigeria. Advances in Biological Research, 7(4): 122-128.
13. Day, F., 1878. The fishes of India: being a natural history of the fishes known to inhabit the seas and freshwaters of India, Burma and Ceylon. Fishes India. Part 4. Berdnard Quaritch, London, i-xx: 553-779.
14. Kottelat, M., 1990. *Indochinese Nemacheilines.* A revision of Nemacheilinae Loaches (Pisces: Cypriniformes) of Thailand, Burma, Laos, Cambodia and southern Viet Nam. Verlag Dr. Friedrich Pfeil, München, pp: 262.
15. Prokofiev, A.M., 2007. Materials towards the revision of the genus *Triplophysa* Rendahl, 1933 (Cobitoidea: Balitoridea: Nemacheilinae): a revision of nominal taxa of Herzenstein (1888) described within the species "*Nemachilus*" *stoliczkae* and "*N.*" *dorsonotatus*, with the description of the new species *T. scapanognatha* sp. nova. Journal of Ichthyology, 47: 1-20.
16. Sharma, N.K., J. I. Mir, N. Pandey and R. Singh, 2014. Morphometric and Meristic Characteristics of Birdi Loach, *Botia birdi* (Chaudhuri, 1909) from a Tributary of Indus Basin, Jammu and Kashmir, India. World Journal of Fish and Marine Sciences, 6(3): 262-266.
17. Talwar, P.K. and A.G. Jhingran, 1991. Inland Fishes of India and Adjacent Countries. Oxford and IBH publishing Co, N. Delhi, pp: 205.