Length-weight relationships of eighteen species of freshwater fishes from Panchet Reservoir in Ganges basin, Jharkhand, India

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ABSTRACT
The present study describes the length-weight relationships (LWRs) of 18 fish species from a large tropical reservoir, Panchet, in the Damodar River basin, one of the main tributary of the largest river Ganga in India. A total of 2419 individuals represented by 18 species belonging to 9 families were sampled between November 2014 and June 2016. The b values ranged from 2.469 for Trichogaster chuna to 3.428 for Ailia coila. All the regressions were highly significant (p<0.001). The results revealed positive allometric growth for seven species (b>3, p<0.05), negative allometric growth for seven species (b<3, p<0.05) and isometric growth for four species (b=3, p>0.05). This study represents the first reference on the length-weight relationship of Trichogaster chuna from a reservoir ecosystem. This is the first report on LWRs of five fish species viz., Puntius terio, Pethia conchonius, Sperata seenghala, Ailia coila and Trichogaster chuna from an Indian reservoir. This study provides basic data for future stock assessment studies and management programmes from Panchet Reservoir as well as for complementing the comparisons of LWRs from other ecosystems.

Keywords: Growth, Length-weight relationships, Panchet, Reservoir, Stock assessment

Introduction
Length-weight relationship (LWRs) has extensively been used in fisheries research as this enables the conversion of weight of fishes when only their size is known; indicate the type of weight gain and helps formulating management programmes for exploitation of commercial species (Le Cren, 1951; Bolger and Connolly, 1989; Pinheiro and Fiscarelli, 2009). Moreover, this tool also facilitates morphometric comparison between species and populations and life history comparisons between regions (Weatherley and Gill, 1987; Petrakis and Stergeou, 1995; King, 1996; Goncalves et al., 1997). The LWR is also used to define a population, where fish length is measured and the predicted average weight is assigned to all fish in a given length group (Oscoz et al., 2005). This is faster and more convenient than weighing fish individually, especially when large numbers of live fishes are sampled. In fishery biology studies, LWRs are required for conversion of growth-in-length equations to growth-in-weight for using in stock assessment models and to estimate stock biomass from limited sample sizes (Basusta et al., 2013). It is frequently used to track seasonal changes in fish growth (Richter et al., 2000).

Most of the studies in Indian reservoirs are mainly restricted to ecological aspects and fisheries management strategies through fingerling stocking (Sarkar et al., 2018; Lianthuamluaia et al., 2019). LWR studies from tropical inland waters are reported mostly from rivers. Such studies are scarce from Indian reservoirs which form an important inland fisheries resource in the country (Hassan et al., 2017; Sarkar and Mishal, 2017). Present study describes the length-weight relationships of 18 fish species from a tropical large reservoir, Panchet in India comprising commercially important species as well as some of the small indigenous fishes. Only a few fish faunal studies have been reported from this reservoir; mostly limited to catch, fish diversity and LWRs of very few species (Sarkar and Banerjee, 2010; Sandhya et al., 2016, 2017, 2019; Suman et al., 2018). Information on the length-weight relationship of Puntius terio, Pethia conchonius, Sperata seenghala, Ailia coila and Trichogaster chuna from Indian reservoirs is lacking. Hence the results from this study will provide basic data which would be useful for stock assessment and fisheries management of the species studied as well as for comparisons of LWRs from other ecosystems.
Materials and methods

Panchet, a large tropical reservoir along the basin of the river Damodar, one of the main tributary of river Ganga, the largest river in India. Data were collected between November 2014 and June 2016 from Panchet Reservoir (23° 41' 04"N and 86° 44' 56"E), situated in Dhanbad District in Jharkhand. Fish samples were collected bimonthly using gillnets of mesh size ranging from 25-120 mm and seine nets of mesh size 10-20 mm from various landing sites including upstream, middle and downstream zones of the reservoir. Fishes were identified to the species level and total length was measured to the nearest 0.1 cm and weighed individually with an accuracy of 0.01 g. The length-weight relationship was derived using the equation W = aLb where W = weight of fish in g; L = length of fish in cm; 'a' and 'b' are intercept and slope of the regression line respectively (Ricker, 1973). The log-log plots of length and weight of all fishes were made before regression analysis and outliers were removed following the recommendations of Froese (2006). Values of a and b were estimated by regression analysis based on log values: log W = log a + b log L. Box-Whiskers plots were prepared to describe the distribution of b values. The degree of association between the variables was computed by the determination coefficient, r². The Student’s t test was used to test whether the estimated b value was significantly different from the isometric value of 3 at 5% significance level (p<0.05) (Sokal and Rohlf, 1987). Comparison between the estimated values of b and respective critical values allowed the determination of statistical significance of b values and their inclusion in the isometric range (b=3) or allometric ranges, i.e., positive allometric (b>3) or negative allometric (b<3).

Results

The sample size, minimum and maximum lengths and weights, parameters of length-weight relationships, standard error of b values, coefficient of determination (r²) and growth type are shown in Table 1. Box-Whiskers plot showing distribution of b values is given in Fig. 1. A total of 2419 individuals represented by 18 species belonging to 9 families were sampled. The most diverse family was Cyprinidae with 6 species. The b values ranged from 2.469 for Trichogaster chuna to 3.428 for Ailia coila. The median value of b was 3.996 and 50% of b values ranged between 2.832 and 3.130 (Fig. 1). All regressions were highly significant (p<0.001) with the co-efficient of determination (r²) ranging from 0.908 for Parambassis lala to 0.998 for Oreochromis niloticus. The coefficient of determination was greater than 0.95 for 17 species and the remaining one species had r² of the order of 0.90. The results revealed positive allometric growth for seven species (b>3, p<0.05), negative allometric growth for seven species (b<3, p<0.05) and isometric growth for four species (b=3, p>0.05).

Discussion

This is the first report on the length-weight relationship of the species Trichogaster chuna from a reservoir ecosystem. The findings from this study also form first report on length-weight relationship parameters for 5 fish species viz., Puntius terio, Pethia conchonius, Sperata seenghala, Ailia coila and Trichogaster chuna from an Indian reservoir as most of the reports are from rivers and wetlands (Table 2). Of these, A. coila is in Near Threatened category (IUCN, 2017) which further highlights the importance of the study with respect to conservation aspects.

The b values in LWRs determine the growth pattern of the fish species. When b is equal to 3 or close to 3, growth in the fish is said to be isometric i.e., fish maintain their form with increasing length (Froese, 2006). Similarly when b is far less or greater than 3, growth in the fish is allometric i.e., the fish becomes thinner or fatter with increase in length (Froese, 2006). In our study, all species had b values within the expected range of 2.50-3.50 (Pauly and Gayanilo, 1997; Froese, 2006). All LWRs reported were highly significant with all r² values >0.900 and they were compared with the available literatures from various ecosystems. When comparing with studies from reservoir, for species such as Labeo calbasu, Puntius sophore, Pethia phutunio, Chanda nama, Parambassis lala, Parambassis ranga, Notopterus notopterus and Channa punctata, the growth type reported in the present study is similar to the findings from Hirakud Reservoir in Odisha, India (Subodh et al., 2018). Similarly, growth pattern of Oreochromis niloticus
reported from Ero Reservoir, Nigeria is in conformity with the present study (Adebola et al., 2016). In contrary, the species like Amblypharyngodon mola and Glossogobius giuris showed isometric growth in the present study whereas it was reported as negative allometric growth from Hirakud Reservoir. Also in our study, we observed positive allometry for Ompok bimaculatus whereas it was isometric growth from Hirakud Reservoir (Subodh et al., 2018). Some variations could be attributed to the combination of one or more factors such as number of specimens examined, area/seasonal effect, habitat, degree of stomach fullness, gonadal maturity, sex, health and general fish condition, preservation technique and differences in the observed length ranges of the specimens caught, ecological conditions of the habits or the physiology of animals (Le Cren, 1951; Wootton, 1999). Similarly, the parameter a may vary seasonally, daily and/or between different habitats whereas the parameter b which is characteristic of species usually does not vary significantly throughout the year (Bagenel and Tesch, 1978). Since samples have been collected over an extended period of time, these data are not representative of a particular season or time of the year and should be considered as mean annual values for comparisons as suggested by Goncalves et al. (1997).

The present study is the first to report on the length-weight relationship of Trichogaster chuna from a reservoir ecosystem as the previous report is from a wetland ecosystem (Borah et al., 2017). Most of the previous studies on the LWRs of the 18 species studied are from rivers, wetlands and a few from reservoirs. Hence the results in this study represented additional contribution to the available LWR data from other geographical areas and will be useful for the comparisons of LWRs from different ecosystems. To the best of our knowledge, this study presents the preliminary references on the LWR of 18 fish species from Panchet Reservoir in India. Information of individual body length-weight relationships in the

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**Table 1. Descriptive statistics and estimated parameters of length-weight relationship of 18 fish species from Panchet Reservoir**

| Species          | N   | Length (cm) | Weight (g) | Regression parameters | Growth type |
|------------------|-----|-------------|------------|-----------------------|-------------|
|                  |     | Min | Max | Min | Max | a   | b    | S.E. (b) | r² |     |
| **Cyprinidae**   |     |     |     |     |     |     |      |       |   |     |
| Amblypharyngodon mola | 84  | 2.5 | 9.4 | 0.19 | 8.03 | 0.0120 | 2.950 | 0.048 | 0.983 | I  |
| Labeo calbasu    | 92  | 4.8 | 48.5 | 2  | 1387.2 | 0.0122 | 3.009 | 0.077 | 0.986 | I  |
| Puntius terio    | 55  | 2.6 | 5.8 | 0.3 | 3.01  | 0.0115 | 3.147 | 0.054 | 0.974 | A+ |
| Puntius sophore  | 138 | 3.4 | 10.5 | 0.5 | 19.2  | 0.0094 | 3.223 | 0.033 | 0.987 | A+ |
| Pethia conchonius| 145 | 3.6 | 6.7 | 0.6 | 4.5   | 0.013  | 3.077 | 0.036 | 0.977 | A+ |
| Pethia phutunio  | 147 | 1.8 | 3.6 | 0.12 | 0.64  | 0.0219 | 2.677 | 0.036 | 0.950 | A- |
| **Ambassidae**   |     |     |     |     |     |     |      |       |   |     |
| Chanda nama      | 454 | 2.2 | 6.7 | 0.1 | 2.9   | 0.0114 | 2.827 | 0.052 | 0.960 | A- |
| Parambiasis lala | 330 | 1.7 | 3.7 | 0.12 | 0.78  | 0.0276 | 2.526 | 0.041 | 0.908 | A- |
| Parambiasis ranga| 305 | 1.6 | 8.9 | 0.1 | 10.9  | 0.0179 | 2.946 | 0.017 | 0.990 | A- |
| **Bagridae**     |     |     |     |     |     |     |      |       |   |     |
| Sperata seenghala| 85  | 12.1| 85.8 | 9.84 | 1250 | 0.0078 | 2.848 | 0.056 | 0.988 | A- |
| Sperata aor      | 63  | 8.5 | 65  | 4   | 1231 | 0.0124 | 2.743 | 0.049 | 0.995 | A- |
| **Gobidae**      |     |     |     |     |     |     |      |       |   |     |
| Glossogobius giuris| 158| 2.4 | 13.8 | 0.16 | 25.14 | 0.0091 | 2.983 | 0.065 | 0.989 | I  |
| **Schilbeidae**  |     |     |     |     |     |     |      |       |   |     |
| Ailia coila      | 121 | 7.2 | 15.8 | 0.86 | 14   | 0.0012 | 3.428 | 0.039 | 0.968 | A+ |
| **Cichlidae**    |     |     |     |     |     |     |      |       |   |     |
| Oreochromis niloticus | 57 | 10  | 44  | 17  | 1784 | 0.0146 | 3.130 | 0.039 | 0.998 | A+ |
| **Notopteridae** |     |     |     |     |     |     |      |       |   |     |
| Notopterus notopterus | 60 | 4.5 | 31  | 0.79 | 283.3 | 0.0046 | 3.202 | 0.064 | 0.989 | A+ |
| **Osphronemidae**|     |     |     |     |     |     |      |       |   |     |
| Trichogaster chuna | 55 | 2.5 | 13.7 | 0.2 | 25.4  | 0.0387 | 2.469 | 0.082 | 0.986 | A- |
| **Siluridae**    |     |     |     |     |     |     |      |       |   |     |
| Ompok bimaculatus | 62  | 11.6| 31.7 | 9.1 | 170.5 | 0.0038 | 3.131 | 0.042 | 0.982 | A+ |
| **Channidae**    |     |     |     |     |     |     |      |       |   |     |
| Channa punctata  | 68  | 3.6 | 23.1 | 0.5 | 135.9 | 0.0103 | 3.025 | 0.035 | 0.992 | I  |

N=sample size; a and b= parameters of length-weight relationship; S.E. = Standard error; r²= Co efficient of determination; I = Isometry; A+ = Positive allometry; A- = Negative allometry
Table 2. Length-weight relationships of freshwater fish species from previous studies

| Species            | N    | Total length range (cm) | Max. known length (Froese and Pauly, 2019) | Locality                  | r²    | Reference                  | Growth type |
|--------------------|------|-------------------------|------------------------------------------|--------------------------|-------|---------------------------|-------------|
| Cyprinidae         |      |                         |                                          |                          |       |                           |             |
| Amblypharyngodon mola | 184  | 4.8-7.4                 | 20                                       | Padma River, Bangladesh  | 0.951 | Hossain (2010)             | A +         |
|                    | 366  | 2.8-7.0                 | 20                                       | Mathabhunga River, Bangladesh | 0.947 | Hossain et al. (2006)     | A +         |
|                    | 297  | 2.5-9                   | 3.115                                    | Saguna Wetland, West Bengal, India | 0.9236 | Suresh et al. (2007)     | I           |
|                    | 305  | 2.5-7.2                 | 2.821                                    | Hirakud Reservoir, Odisha, India | 0.942 | Subodh et al. (2018)  | A -         |
|                    | 210  | 3.7-5.9                 | 3.34                                     | Ganga River, North-west Bangladesh | 0.975 | Hossain et al. (2009) | A +         |
|                    | 367  | 4.8-8.9                 | 3.25                                     | Balarampur Wetland, West Bengal, India | 0.923 | Gupta and Banerjee (2015) | A +         |
| Labeo calbasu      | 32   | 9.5-40.0                | 90.0                                     | Godavari River, India    | 0.98  | Lal et al. (2016)        | A +         |
|                    | 188  | 12.7-79                 | 2.831                                    | Brahmaputra River, Assam, India | 0.941 | Choudhury et al. (1982) |             |
|                    | 30   | 12.5-37                 | 2.940                                    | Betwa River, India       | 0.95  | Sani et al. (2010)       | A -         |
|                    | 283  | 3.169                   | 3.013                                    | Kali River, India        | 0.893 | Chatterji et al. (1980)  | I           |
|                    | 52   | 4.4-36.8                | 3.132                                    | Hirakud Reservoir, Odisha, India | 0.993 | Subodh et al. (2018)  | I           |
|                   | 1212 | 20.5-64                 | 3.132                                    | Kapati Lake, Bangladesh | 0.904 | Ahmed and Saha (1996)    |             |
| Puntius terio      | 317  | 2.7-8.7                 | 3.039                                    | Khalsi Wetland, West Bengal, India | 0.9212 | Sandhya et al. (2016) |             |
|                    | 16   | 4.3-9.4                 | 3.2                                      | Indus River, Pakistan   | 0.81  | Muhammad et al. (2016)   | A +         |
|                    |      |                         |                                          |                          |       | Hossain et al. (2006)   |             |
| Puntius sophore    | 441  | 3.1-10.2                | 20.0                                     | Mathabhunga River Bangladesh | 0.966 | Mohammad et al. (2016)  | A +         |
|                    | 372  | 4.0-10.2                | 3.027                                    | Rupsha River, Bangladesh | 0.927 | Hussain et al. (2013)    | I           |
|                    | 119  | 4.4-12.2                | 2.951                                    | Ganga River, India       | 0.926 | Gupta and Tripathi (2017)| A -         |
|                    | 90   | 4-10.9                  | 3.215                                    | Gomti River, India       | 0.955 | Hussain et al. (2017)    | A +         |
|                    | 91   | 5-12.1                  | 3.231                                    | Sai River, Uttar Pradesh, India | 0.941 | Gupta and Tripathi (2017)| A +         |
|                    | 29   | 6-10.7                  | 3.104                                    | Som River and Jaisamand Lake, India | 0.91  | Lal et al. (2016)       |             |
|                    | 301  | 2.5-10.8                | 3.2                                      | Hirakud Reservoir, Odisha, India | 0.982 | Subodh et al. (2018) | A +         |
|                    | 132  | 3-8.5                   | 3.18                                     | Indus River, Pakistan   | 0.84  | Mohammad et al. (2016)   |             |
|                    | 185  | 3.62-9.02               | 3.396                                    | Chalan Wetland, North Central Bangladesh | 0.945 | Rahman et al. (2012) | A +         |
| Pethia conchonius  | 175  | 7-11.1                  | 14                                       | Tetulia River, Southern Bangladesh | 0.969 | Hossain et al. (2015) |             |
|                    | 50   | 3.8-11                  | 2.548                                    | Ganga River, India       | 0.91 | Gupta and Tripathi (2017)| A -         |
|                    | 69   | 4.1-10.2                | 2.636                                    | Gomti River, India       | 0.912 | Gupta and Tripathi (2017)| A -         |
|                    | 38   | 4.5-10.2                | 2.665                                    | Dal Lake, Jammu and Kashmir, India | 0.87 | Shafi and Yousuf (2012)  |             |
|                   |      |                         |                                          | Sai River, Uttar Pradesh, India | 0.933 | Gupta and Tripathi (2017)| A -         |

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| Species               | N      | Total length Range (cm) | Max known length (Froese and Pauly, 2019) | b      | Locality                      | Reference                               | Growth type |
|-----------------------|--------|------------------------|------------------------------------------|--------|-------------------------------|-----------------------------------------|-------------|
| *Pethia phutnio*      | 30     | 1.8-3.9                | 3.9                                      | 2.82   | Gajner Floodplain Wetland, Bangladesh Khalsi Wetland, India | 0.98 Hossen et al. (2017)                        |             |
|                       | 117    | 1.98-3.3               |                                          | 2.8512 |                                | 0.9220 Sandhya et al. (2016)                       |             |
|                       | 96     | 1.9-3.7                |                                          | 2.623  | Hirakud Reservoir, Odisha, India | 0.937 Subodh et al. (2018) A -                      |             |
| Ambassidae *Chanda nama* | 443    | 1.6-10.10             |                                          | 2.858  | Hirakud Reservoir, Odisha, India | 0.98 Subodh et al. (2018) A -                      |             |
|                       |        | 4.5-6.8                |                                          | 2.845  | Pagla River, Bangladesh        | 0.933 Alam et al. (2013)                          |             |
|                       | 146    | 2.5-7                  |                                          | 2.799  | Deepor Wetland, Assam, India   | 0.94 Borah et al. (2017)                          |             |
|                       | 43     | 4-7.4                  |                                          | 2.869  | Bharamaputra River, Bangladesh | 0.963 Islam et al. (2017)                         |             |
| *Parambassis lala*    | 193    | 1.6-3.5                |                                          | 2.864  | Hirakud Reservoir, Odisha, India | 0.918 Subodh et al. (2018) A -                      |             |
|                       | 148    | 2.23-3.55              |                                          | 2.7026 | Khalsi Wetland, West Bengal, India | .9013 Sandhya et al. (2016)                       |             |
|                       | 101    | 2.5-4                  |                                          | 3.020  | Deepor Wetland, Assam, India   | 0.88 Borah et al. (2017)                          |             |
| *Parambassis ranga*   | 330    | 1.6-8.2                |                                          | 2.794  | Hirakud Reservoir, Odisha, India | 0.973 Subodh et al. (2018) A -                      |             |
|                       | 148    | 2.23-3.55              |                                          | 2.7026 | Khalsi Wetland, West Bengal, India | 0.9013 Sandhya et al. (2016)                       |             |
|                       | 595    | 2-5.2                  |                                          | 2.67   | East Kolkata Wetlands, West Bengal, India | 0.857 Mahaptra et al. (2014) A -                    |             |
| Bagridae *Sperata seenghala* | 131    | 46-113                 |                                          | 3.05   | Indus River, Pakistan          | 0.99 Jatoi et al. (2013) I                        |             |
|                       | 205    | 40-115                 |                                          | 2.866  | Ganga River, India             | 0.95 Khan et al. (2011) A -                        |             |
|                       | 20     | 21.0-68.0 150,0        |                                          | 3.302  | Som River and Jaisamand Lake, India | 0.99 Lal et al. (2016) A -                         |             |
|                       | 92     | 20-67                  |                                          | 3.07   | Gomti River, India             | 0.93 Sarkar et al. (2013)                         |             |
| *Sperata aor*         | 184    | 72-95                  | 180                                      | 3.249  | Ganga River, India Nagarjuna Sagar, Andhra Pradesh, India | 0.98 Khan et al. (2011) A + Ramkrishniah (1998) |             |
|                       | 300    | 29-68                  |                                          | 3.006  |                              | 0.98 Khan et al. (2011) A + Ramkrishniah (1998) |             |
| *Glossogobius guirs*  | 30     | 12.4-45                |                                          | 2.98   | Betwa River, India Ganga River, North-west Bangladesh | 0.97 Sani et al. (2010) Hossain et al. (2009)  |             |
|                       | 159    | 8.7-17.9               |                                          | 3.03   | Ganga River, North-west Bangladesh | 0.958 Hossain et al. (2009)                        |             |
|                       | 129    | 2.3-22.5               |                                          | 2.914  | Hirakud Reservoir, Odisha, India | 0.98 Subodh et al. (2018) A -                      |             |
|                       | 31     | 8.4-27.0 50.0          |                                          | 2.974  | Betwa River, India Bharamaputra River, Bangladesh  | 0.98 Lal et al. (2016)                              |             |
|                       | 49     | 5.5-9.7                |                                          | 2.682  | Bharamaputra River, Bangladesh | 0.867 Islam et al. (2017)                         |             |
| Schilbeidae *Allia coila* | 103    | 6.6-13                 |                                          | 3.01   | Ganga, North-west Bangladesh | 0.981 Hossain et al. (2009)                        |             |
|                       | 105    | 8.1-15.6               |                                          | 3.076  | Padma River, North-west Bangladesh | 0.986 Hossain (2010) I                             |             |

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| Species   | N   | Total length Range (cm) | Max known length (Froese and Pauly, 2019) | Locality                                                                 | Reference                      | Growth type |
|-----------|-----|-------------------------|-------------------------------------------|--------------------------------------------------------------------------|-------------------------------|-------------|
| **Cichlidae** |     |                         |                                           |                                                                          |                               |             |
| *Oreochromis niloticus* | 189 | 9.7-16                  | 2.313                                     | Barur Reservoir, Tamil Nadu, India                                       | Marx et al. (2014)            |             |
|           | 240 | 6.9-27.3                | 3.073                                     | White Nile River, Sudan Wadi Hanifah Valley, Saudi Arabia                | Karrar *et al.* (2016)        | A +         |
|           | 575 |                         | 3.08                                      | ERO Reservoir, Nigeria El-Farouk Canal, Al-Minufiya Province, Egypt       | Mortuza and Misned (2013)     |             |
|           | 4676| 4.1-26.1                | 3.43                                      | Barur Reservoir, Tamil Nadu, India                                       | Adebola *et al.* (2016)       | A +         |
|           |     |                         | 2.8006                                    | Godavari River, India                                                     | El- Kashief *et al.* (2015)   | A -         |
| **Notopteridae** |     |                         |                                           |                                                                          |                               |             |
| *Notopterus notopterus* | 300 | 8.1-36.0                | 60.0                                      | Tilaia Reservoir, Jharkhand, India                                       | Khan (2003)                   |             |
|           | 65  | 12-33                   | 3.326                                     | Godavari River, India                                                    | Lal *et al.* (2016)          | A +         |
|           | 76  | 7.8-30.1                | 3.368                                     | Hirakud Reservoir, Odisha, India                                        | Subodh *et al.* (2018)       | I           |
| **Osphronemidae** |     |                         |                                           |                                                                          |                               |             |
| *Trichogaster chuna* | 115 | 2.6-6.3                 | 3.215                                     | Deepor Wetland, Assam, India                                            | Borah *et al.* (2017)        |             |
| *Ompok bimaculatus* | 70  | 10.5-31.5               | 45.0                                      | Godavari River, India                                                    | Lal *et al.* (2016)          |             |
|           | 44  | 16.0-43.0               | 45.0                                      | Sonriver and Jaisalmer Lake, India                                       | Lal *et al.* (2016)          |             |
|           | 314 | 21.1-31.5               | 2.778                                     | Bhavanisagar Reservoir, Tamil Nadu, India                                | Sivakami (1987)              | A -         |
|           | 42  | 13-34.7                 | 3.117                                     | Hirakud Reservoir, Odisha, India                                        | Subodh *et al.* (2018)       | I           |
| **Channidae** |     |                         |                                           |                                                                          |                               |             |
| *Channa punctata* | 284 | 16.8-29.8               | 3.12                                      | Ganga River, India                                                       | Khan *et al.* (2011)         | A +         |
|           | 355 | 6-18.90                 | 3.037                                     | Mathabhanga River, Bangladesh Sugan Sugar Lake, Andhra Pradesh, India    | Hossain *et al.* (2006)      | A +         |
|           | 200 | 15-30                   | 2.621                                     | Andhra Pradesh, India                                                   | Kumari and Kumar (2015)      |             |
|           | 140 |                         | 3.01                                      | Gomti River, Lucknow, India                                            | Kashyap *et al.* (2014)      | I           |
|           | 17  | 12.0-21.5               | 31.0                                      | Som River and Jaisalmand Lake, India                                    | Lal *et al.* (2016)          |             |
|           | 42  | 13-34.7                 | 3.117                                     | Hirakud Reservoir, Odisha, India                                        | Subodh *et al.* (2018)       | I           |

N=Sample size; b = Growth parameters of length-weight relationship; $r^2$ = Co-efficient of determination; I = Isometry; A+ = Positive allometry; A- = Negative allometry

Population is often required for estimation of population size of a fish stock for the purpose of its rational exploitation (Dulcic and Kraljevic, 1996). Therefore the results from the present study could contribute to the knowledge of fish populations in this area and provide an important baseline for future studies in Panchet Reservoir in the Damodar River basin. The information generated from the study will be useful for formulating effective fisheries management strategies and in implementing regulations for conservation of the native fish stock.

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