

Morphometry And Length Weight Relationship Of *Panna heterolepis* (Trewavas, 1977) From Hoogly River , West Bengal, India.

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Abstract

Morphometric characteristics and length weight relation of *Panna heterolepis* (Trewavas, 1977) have been studied here. The fishes were captured from Hoogly river near Hanra in West Bengal. Fourteen morphometric characters have been studied in percentage of total fish length. Our result revealed that out of fourteen, seven characters were genetically controlled and other seven characters were intermediately and none of the character was environmentally controlled. Out of the fourteen characters six characters showed high values of correlation coefficient indicating that these characters are directly proportional to each other and four characters showed moderate correlation coefficient. The length weight relation of *Panna heterolepis* was also studied. The result indicates a significantly positive correlation between length and weight of *Panna heterolepis*. The present study generated data on morphometrics and length weight relationship of *Panna heterolepis* from eastern India.

Keywords: *Panna heterolepis*, morphometry, length weight relationship, correlation.

1 Introduction

Panna heterolepis (Trewavas, 1977) is a fish that belongs to the order Perciformes and family Sciaenidae. This group of fishes is also commonly known as croakers. *Panna heterolepis* is commonly known as Hoogly croaker. They have mostly been reported from India, Srilanka, Burma and

Bangladesh. *P heterolepis* inhabits shallow coastal and estuarine water. Young and juveniles occur in mangrove swamps (Sakshi 2001). *P heterolepis* is endemic to this region (Sakshi K 1995).

Panna heterolepis has slender body with terminal mouth. The body is light grayish above and paler near belly. *P heterolepis* have usually IX dorsal fin ray and this is one of the characters along with gill raker that distinguishes them from its related species *Panna microdon*. The caudal fin is pointed and pectoral fin is longer than the pelvic fin. The upper jaw have an outer well spaced enlarged teeth and an inner row of small conical teeth. Lower jaw also have teeth. *Panna heterolepis* show transition from cycloid to ctenoid scales. The largest specimen reported have cycloid scale and the smallest specimen reported have ctenoid scales. One of the main criteria of taxonomic classification of organism is to equate the anatomical features which may differ between two distinct population or interrelated species. These anatomical features are determined using differences in the body measurements (Morphometry) (Bagenal T.B. (1978). Bookstein F.L. (1991). Morphological systematic is a simple and rightful way of identification of fish stock from different region (Nayman (1965). The important requirement for taxonomic work is to study the statistical relationship among the morphometric measurements of fishes (Najero 2010).

The length weight relation is imperative to fish stock assessment model because it plays an important role in assessment as well as

conservation and management of the fish population.

The present study was aimed in understanding the morphometric character and length weight relationship of *Panna heterolepis* from West Bengal, India.

2 Materials and Methods:

Specimen collection site:

Specimen were collected from Hoogly river. The site of collection was Hanra, Sultanpur riverside at

South 24 Parganas, West bengal (Fig.1). The site is very near to the confluence of the river with Bay of bengal.

Fresh fish samples were identified and collected from the site over a period of six months (August 2017 to February 2018). Fresh samples were carried in ice to the laboratory without any physical damage. The morphometric measurements were taken using Scale and Vernier caliper. The fish were weighed by a digital balance. All the measurements were made on the left side of the fish.



Fig.1: Map of specimen collection site (modified image from google maps)

Fifteen morphometric parameters were analyzed. They are Total length (TL), standard length (SL), Head length (HL), Snout length (SnL), eye diameter (ED), pre dorsal length (PDL), pre pectoral length (PPL), pre anal length (PAL), pre pelvic length (PPvL), height of dorsal fin (HOD), anal fin length (AL), body depth (BD), caudal depth(CD), caudal length (CL) and gape of mouth. All the measurements were then calculated in percentage of total length and few in percentage of head length. The data obtained were then subjected to statistical analysis mainly, mean, standard error, range , range difference , correlation and regression. The linear regression equation was fit to the straight line equation :

$$Y = a + b X$$

Where Y is the dependent variable , a is the intercept, b is the slope of the regression line and is called as the regression coefficient and X is the independent variable. Whether the relation between the characters is allometric or isometric was determined based on the value of regression coefficient.

Based on the range difference the charecters thus studied were classified as genetically (<10%), intermediate (10-15%) and environmentally (>15%) controlled characters (Johal M.S. *et al.*1994). The correlation coefficient obtained for each character was used to access the inter-relationship,

To determine the length weight relationship Pearsons Correlation was calculated. All the statistical analysis was performed in Microsoft Excel

3 Results and Discussion:

Correlation between different morphometric parameters:

In the present study, 27 specimens of adult *Panna heterolepis* was studied . The descriptive statistics of the morphometric characters are given in Table.1. Linear regression of standard length, Head length, Snout length, eye diameter, pre dorsal

length, pre pectoral length, pre anal length, pre pelvic length, height of dorsal fin, anal fin length, body depth, caudal depth, caudal length and gape of mouth against the total length were calculated. The results indicate, 10 out of 14 characters were significantly correlated with the total length as indicated by the value of correlation coefficient. Out of these ten characters, standard length, pre-dorsal length, pre-anal length, body depth caudal depth and caudal length show very high degree of correlation with total length. All the characters are positively correlated to the total length of the fish. Head length, snout length, anal fin length and mouth gape were not correlated with the total length in the population of *Panna heterolepis* studied (Table 2). The linear relationship of the morphometric characters that are correlated with the total length are shown in Fig.2A-C.

It is interesting to note that the value of regression coefficient was less than 3.0 in all the cases indicating an allometric relation not an isometric one

Table .1 : Mean, Standard error and coefficient of variance of different morphometric character of *Panna heterolepis*

	Mean	Standard Error	COV
TOTAL LENGTH	12.78	0.36	11.9
STANDARD LENGTH (SL)	10.13	0.24	9.89
HEAD LENGTH (HL)	1.69	0.077	18.83
SNOUT LENGTH (SnL)	0.72	0.02	14.34
EYE DIAMETER (ED)	0.45	0.017	15.83
PREDORSAL LENGTH (PDL)	3.37	0.14	17.94
PRE PECTORAL LENGTH (PPL)	3.1	0.11	15
PRE PELVIC LENGTH (PPvL)	2.98	0.09	13.22
PRE ANAL LENGTH (PAL)	6.9	0.2	12.43
HEIGHT OF DORSAL FIN (HOD)	1.04	0.04	19.52
ANAL FIN LENGTH (AL)	0.88	0.02	12.8
BODY DEPTH (BD)	2.59	0.08	14.2
CAUDAL DEPTH (CD)	0.84	0.02	13.2
CAUDAL LENGTH (CL)	2.65	0.18	27.9
WEIGHT	15.29	1.32	35.6
GAPE	2.11	0.08	17.36

Table .2: Descriptive statistics and Regression parameters (total length on morphometric parameters) of *Panna heterolepis*

Parameters	Regression Equation	r	p Value
Standard Length (Y) on Total Length (X)	$Y=2.48701+0.598072X$	0.9078	0.00004*
Head Length (Y) on Total Length (X)	$Y=2.31156-0.04828X$	0.2303	0.37368
Snout Length (Y) on Total Length (X)	$Y=0.810116-0.00631X$	0.0918	0.726
Eye Diameter (Y) on Total Length (X)	$Y=0.159728+0.022928X$	0.4866	0.037*
Predorsal Length (Y) on Total Length (X)	$Y=-0.68472+0.31711X$	0.7982	0.00012*
Pre Pectoral Length (Y) on Total Length (X)	$Y=0.79383+0.18035X$	0.5904	0.0125*
Pre Pelvic Length (Y) on Total Length (X)	$Y=1.21378+0.13875X$	0.5347	0.026*
Pre Anal Length (Y) on Total Length (X)	$Y=0.408762+0.50989X$	0.90122	0.00007*
Height of Dorsal Fin (Y) on Total Length (X)	$Y=0.090362+0.074351X$	0.5569	0.0202*
Anal Fin length (Y) on Total Length (X)	$Y=0.56986+0.024435X$	0.3289	0.1973
Body Depth (Y) on Total Length (X)	$Y=0.102616+0.19492X$	0.8051	0.0005*
Caudal Depth (Y) on Total Length (X)	$Y=0.137142+0.55513X$	0.7516	0.0005*
Caudal Length (Y) on Total Length (X)	$Y=-2.48701+0.401928X$	0.8241	0.00005*
Gape (Y) on Total Length (X)	$Y=12.14191+0.071814X$	0.2381	0.3573
Snout Length (Y) on Total Length (X)	$Y=0.083032-0.05957X$	0.1816	0.4854
Eye Diameter (Y) on Total Length (X)	$Y=0.582599-0.07653X$	0.3404	0.1811
Gape (Y) on Total Length (X)	$Y=2.334152-0.1278X$	0.1108	0.67182

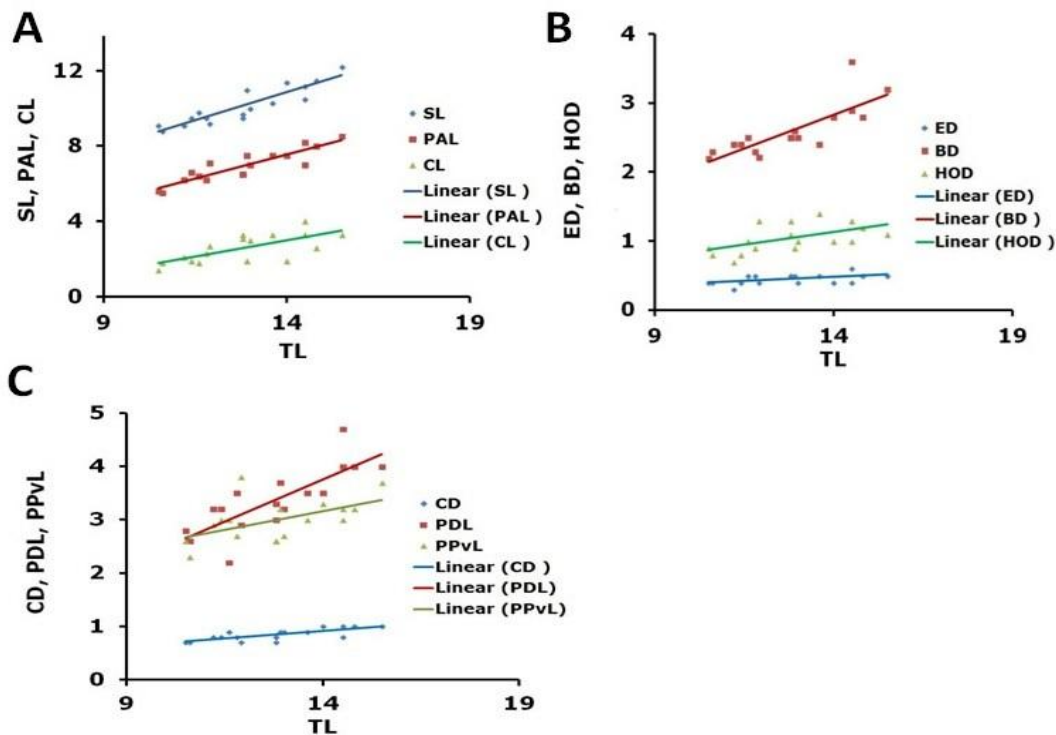


Fig.2: A. Graphical representation of relationship between total length (TL) and standard length (SL), pre anal length(PAL), caudal length (CL) of *Panna heterolepis*. B: Graphical representation of relationship between total length (TL) and eye diameter (ED), body depth(BD), height of dorsal fin (HOD) of *Panna heterolepis*. C: Graphical representation of relationship between total length (TL) and caudal depth (CD), pre dorsal length(PDL), pre pelvic length (PPvL) of *Panna heterolepis*.

Grouping characters as genetically, intermediate and environmentally controlled:

The descriptive statistics of morphometric characters of *Panna heterolepis* expressed in the percentage of total fish length along with the range difference is given in Table-3. The different body parts reveal range difference from 1.63 % to 14.3 % when compared with the total length. The lowest range difference was found in the eye diameter (1.63%) and the highest range difference (14.3%) was found in pre pectoral length in *Panna heterolepis*. Among all the characters studied, standard length, head length, pre dorsal length, pre pectoral length, pre pelvic length, pre caudal length and caudal length were intermediate controlled characters (10-15%). There were no environmentally controlled character (>15%) in the population of *Panna microdon* studied. Out of 14 characters, seven were recorded as genetically controlled (<10%).

Table .3: Range difference of morphometric characters expressed as percentage of total length of *Panna heterolepis*

	Mean	Standard error	Range	Range difference
Percentage of total length				
SL (STANDARD LENGTH)	79.19	0.88	72.41-84.4	12.06
HL (HEAD LENGTH)	13.46	0.8	8.47-19.8	11.35
SnL (SNOUT LENGTH)	5.76	0.27	3.57-7.6	4.04
ED (EYE DIAMETER)	3.55	0.12	2.6-4.3	1.63
PDL (PREDORSAL LENGTH)	26.28	0.712	18.966-32.4	13.44
PPL (PRE PECTORAL LENGTH)	26.19	0.74	19.3-33.6	14.3
PPvL (PRE PELVIC LENGTH)	23.488	0.714	20.6-31.9	11.24
PAL (PRE ANAL LENGTH)	54.21	0.69	48.27-59.6	11.38
HOD (HEIGHT OF DORSAL FIN)	8.144	0.32	6.25-10.9	4.67
AL (ANAL FIN LENGTH)	6.95	0.24	5.16-8.92	3.76
BD (BODY DEPTH)	20.3	0.38	17.6-24.8	7.18
CD (CAUDAL DEPTH)	6.63	0.14	5.47-7.75	2.284
CL (CAUDAL LENGTH)	20.46	1	13.33-27.58	14.25
Mouth gape	16.481	0.29	14.036-18.71	4.67

Length weight relation

The correlation between the total length and body weight of the *Panna heterolepis* was computed. The result shows a good correlation and a high degree of association between length and weight in

Panna heterolepis which is evident from the value Pearson's correlation coefficient (0.906). The correlation coefficient value was found to be highly significant ($p < 0.0001$). The length and weight of *Panna heterolepis* was found to be positively correlated. (table:4, Fig. 3)

Table .4: Correlation statistics of LWR of *Panna heterolepis*

	Length (in Cm)	Weight (in Gm)
Mean	12.78	15.29
Range	10.5-15.5	10.4-28.5
Standard error	0.56	1.32
Correlation coefficient	0.906409312	
p value	0.000216*	

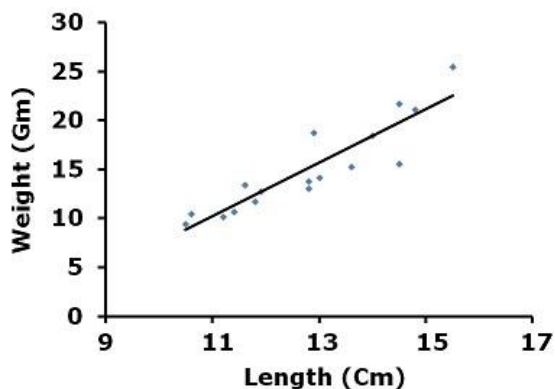


Fig.3: Graphical representation of relationship between total length and body weight of *Panna heterolepis*

In the present study the morphometric characters of *Panna heterolepis* was analysed. A total of 15 morphometric character was analysed. 10 out of 15 characters were correlated with the total length of the fish. In the studied population of *Panna heterolepis* standard length and pre anal length showed the highest degree of correlation with the total length. None of the characters studied seems to be correlated with the head length.

On the basis of the range difference morphometric characters were divided into genetically, intermediate or environmentally controlled. In the present study out of 14 characters 8 characters were genetically controlled and the rest were intermediately controlled compared to the total length. No environmentally controlled character was reported in the present study. The phenotypic plasticity of fish allows them to adapt to the environmental changes by modifying their behavior and physiology. This leads to their morphological changes which reflect the effect of environment.

(Edwinthangam p et al 2015). Our results show that environment have very less effect on *Panna heterolepis* as far as the morphometric characters are concerned.

The length weight relationship of *Panna heterolepis* was investigated. The length and weight of *Panna heterolepis* are significantly correlated as is evident from the Pearson's correlation coefficient.

4 Conclusion

The present study of morphometry and length weight relationship of *Panna heterolepis* revealed that there is an allometric relationship between various morphometric characters studied. Most of the morphometric characters studied in percentage of total length were genetically controlled and few were intermediately controlled.

In the population of *Panna heterolepis* studied, the length and weight are positively correlated. This study shades light on the detailed morphometry and LWRs of *Panna heterolepis* from eastern India and other parts of India.

References

- [1] Bagenal T.B.. Methods for Assessment of Fish Production in Freshwaters. 3rd, Edn., Blackwell Scientific Publication, Oxford, UK., 365. (1978)
- [2] Bagenal T.B. and Tesch F.W. Age and growth, Methods for Assessment of Fish Production in Fresh Waters. IBP Handbook No. 3, Blackwell Scientific Publications, 3rd edn, 101-136. (1978).
- [3] Bookstein F.L.. Morphometric Tools for Landmark Data: Geometry and Biology. Cambridge University Press, Cambridge, London, 465, (1991)
- [4] Edwinthangam P, Sabaridasan A, Palanikani R, Divya Sapphire M, Soranam R. Morphometric variation studies on Cypriniformes fish of *Devario aequipinnatus* from selected rivers/streams of the Southern Western Ghats, Tamil Nadu, India. Int. Res. J. Environment Sci. 4(10):77-86. (2015)
- [5] Hudu MS, Haque ME, Babul AS and Shil NC (ed.) Field guide to finfish of sundarbans , aquatic resource division, sunderban, boyar, Khulna, Bangladesh. 143(2003)
- [6] In K.E. Carpenter and V.H. Niem (eds.) FAO species identification guide for fishery

- purposes. The living marine resources of the Western Central Pacific. Volume 5. Bony fishes part 3 (Menidae to Pomacentridae). Rome, FAO. 2791-3380.
- [7] Johal M.S., Tandon K.K. and Sandhu G.S. Mahseer in Lacustrine Waters, Gobindsagar Reservoir. Morphometry of *Tor putitora*. P. Nautiyal (Eds.), Mahseer the Game Fish., Jagdamba, Prakashan Publisher, Srinagar, Garhwal, 67-85. (1994)
- [8] Martin-Smith K.H.. Length/weight relationships of fishes in a diverse tropical freshwater community, Sabah, Malaysia. *J. Fish Biol.*, 49:731-734. (1996)
- [9] Narejo N.T.. Morphometric characters and their relationship in *Gadusia chapra* (Hamilton) from Keenjhar lake (Distt: Thatta), Sindh. *Pak. J. Zool.*, 42(1), 101-104. (2010)
- [10] Nayman Growth and Ecology of Fish Population. *J Anim Ecol.*, 20: 201-219. (1965)
- [11] Petrakis G. and Stergiou K.I. Weight-length relationships for 33 fish species in Greek waters. *Fish. Res.*, 21: 465-469. (1995)
- [12] Rahaman AKA. Freshwater fishes of Bangladesh 2nd edition, Zoological society of Bangladesh, Department of Zoolgy, University of Dhaka, Dhaka-1000, 359 (2005)
- [13] Sasaki, K., A review of the Indo-West Pacific sciaenid genus *Panna* (Teleostei, Perciformes). *Jap. J. Ichthyol.* 42(1):27-37. (1995).
- [14] Sasaki, K., Sciaenidae. Croakers (drums). 3117-3174. (2001)
- [15] Talwar PK and Jhingran AG.. Inland fishes of india and adjacent countries, vol.2 oxford & IBH publishing Co. Pvt. Ltd. New delhi-calcutta 863-864 (1991)