Morphometric Analysis of Channa Strisatus

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Abstract

In the present investigation, collected random samples for the study of morphometric analysis of Channa striatus from the fisherman to find out whether the fish collected was homogenous or come from different racial stocks. These analysis were made by least square method by using the linear formula y=a + bx. The present study describes the morphometric characteristics of Head length, Width of the head through orbit , Depth of head through orbit , Width of the body through the pectoral-fin base, Depth of body through the pectoral-fin base, Width of the body through Dorsal fin base, Depth of body through Dorsal fin base, Width of the body through the pelvic-fin base , Depth of body through the pelvic-fin base, Length of body from Snout to Anus, Length of body from Anus to Caudal Peduncle and their mathematical relationship in fish species. For all these characters correlation coefficient and analysis of variance showed a high degree of correlation and growth in total length is highly significant for the increase in the various morphometric characters respectively.

Keywords

Channa striatus, Morphometry

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Introduction

Taxonomically *Channa striatus,* the striped snakehead, is a species of snakehead fish that constitute a very important group as regards their fishery and biology. It is native to south and southeast Asia and has been introduced to some Pacific Islands and grows to a maximum of 90cm and is found thought a widespread part of Asia including India, Pakistan , China, Korea, Iran and Southeast Asia country of Laos, Vietnam, Thailand, Malaysia, Cambodia and Indonesia (Adamson,et. Al., 2010, Lakra, et.al.,2010, Benziger, et. Al., 2011 and Coad ,2016). The morphometric analysis for the identification of their population is very important because they are widely distributed. Though some valuable work on these fishes has been done by various workers but findings on important aspects of their fishery biology are still scanty. A systematic study on zoology depends mainly upon the analysis of forms so a detailed study on the racial status of the fishes is very important (Lal (1969). Various populations of the same spp. of a fish are known to differ morphologically through genetic differences in ecological conditions (Hubbs, 1921., Vladykov, 1934., and McHugh ,1954., and Negi and Nautiyal, 2002.,),. The racial investigations are based on the hypothesis that certain morphometric and meristic characters are associated with the various autonomous populations. Bhatt,J.P.et .al .,1998) . The importance of racial studies are emphasized for the economic management of fish populations. If the spp. exploited belong to one stalk the fishing intensity at any one place is likely to have its effect in due course at other stalk too, hence it is very important to know about the nature and composition of the commercially exploited stalks. Keeping in view the importance of live fishes we have proposed to work on the morphometric analysis of the *Channa striatus*. Measuring the stock status of a fish species is crucial for fisheries management, as stocks with different life-history traits are essential to enhance yield as well as for stock management programs (Siddik, et. Al., 2016). Morphometry is a cost-effective technique frequently employed for describing fish body shape which is required to identify fish stocks, to delineate stock status, to discriminate between fish populations, and to link ontogeny with functional morphology of a fish (Hanif, et. al., 2019, Torres,et. Al .,2010). Research on morphological characters for cork fish has been done by Nguyen &Duong ,2016., and Boby, M.,2020.

Material and Method

Fish species of *Channa striatus* of varying lengths were collected from the fish market at Srinagar and they were preserved in 5% formalin solution for about 2 weeks for homogeneous preservation. About 11 morphometric characters were taken into consideration.

Independent Variable

Total length-TL

Dependent Variable

Head length- HL

Width of the head through orbit - WHO

Depth of head through orbit -DHO

Width of the body through pectoral-fin base-WPFB

Depth of body through the pectoral-fin base -PDF

Width of the body through Dorsal fin base WDFB

Depth of body through Dorsal fin base DDFB

Width of the body through pelvic-fin base-WPel.FB

Depth of body through the pelvic-fin base -DPel.FB

Length of body from Snout to Anus-LSA

Length of body from Anus to Caudal Peduncle-LACP

Morphometry characters were studied by adopting standard methods of Schneider 1956 Dwivedi& Menezes 1974, Acharya & Dwivedi 1985. The relationship between the above morphometric characters and the total length of the fishes was calculated by the Least square method using the straight-line formula.

$$Y=a+bx$$

Y=Body parts (DEPENDENT VARIABLE)

x= Total length (INDEPENDENT VARIABLE)

a= constant

b=Regression coefficient

The correlation coefficient (r) was calculated for knowing the correlation between total length and the body parameters. The significance of the linearity was tested by analysis of variance.

Result

The correlation coefficient showed that the growth in total length is highly correlated to the growth in HL ,r=0.99940(Table 1),Width of head through orbit ,r= 0.9944040 (Table 3),Depth of head through orbit, r= 0.98608 (Table 5),Width of body through pectoral fin base ,r=0.999255 (Table 7), Depth of body through Pectoral fin base ,r=0.99810 (Table 9), Width of body through dorsal fin base ,r=0.982 (Table 11),Depth of body through dorsal fin base, r=0.982936 (Table 13), Width of body through Pelvic fin base ,r=0.998332 (Table 15), Depth of body through Pelvic fin base ,r= 0.998480 (Table 1 7), Length of body from anus to snout r=0.999155 (Table 19),Length snout to caudal peduncle r=0.977830) (Table 21), were observed .Analysis of variance showed that the total length is highly significant for the increase in various body parts(Table2,4,6,8,10,12,14,16,18,20 ,22). When the calculated body measurments were plotted against respective body components,the relationship was found of straight line (Fig 1-11) . The regression equations of various Body measurments on total length were found as follows-

(A)Head component (Y_1)

Regression equation – Y=1.8801+0.15005x X

(B)Width of head through orbit (Y_2)

Regression equation– y= 0.20364+0.234598x X

(C)Depth of head through orbit (y_3)

Regression equation-- y=0.9278+0.149566xX

(D)Width of body through pectoral fin base (y_4)

Regression equation-- y=0.37455+0.14347xX

(E)Depth of body through Pectoral fin base (y_5)

Regression equation-- y=1.241424+0.107754xX

(F)Width of body through dorsal fin base (y_6)

Regression equation-- y= 0.1093+0.041431xX

(G)Depth of body through dorsal fin base (y_7)

Regression equation-- y= 0.01093+0.041431xX

(H)Width of body through Pelvic fin base (y_8)

Regression equation-- y= 00.604075+0.153470xX

(I)Depth of body through Pelvic fin base (y_9)

Regression equation-- y= 0.881148+0.128036xX

(J)Length of body from anus to snout (y_{10})

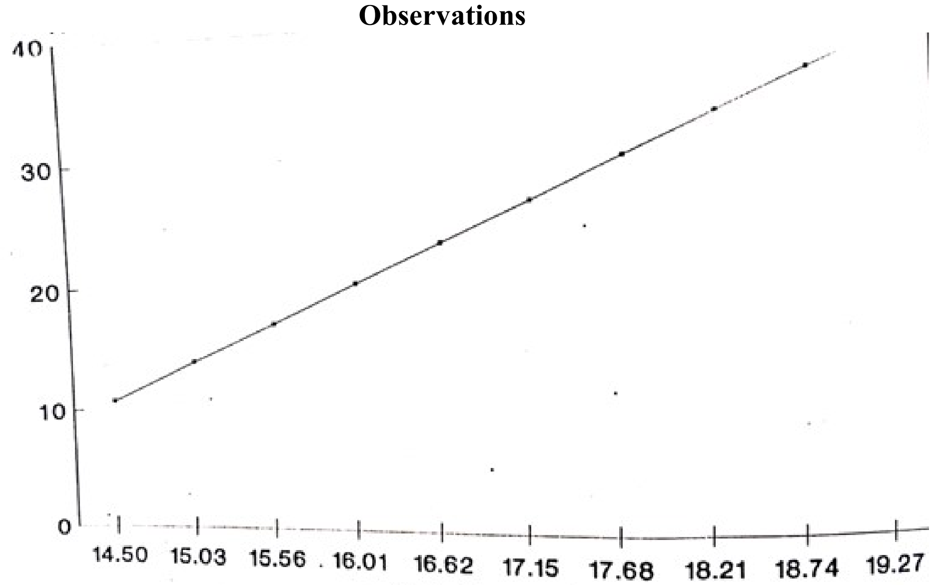
Regression equation-- y= 0.79680 +0.4004xX

(K)Length snout to caudal peduncle (Y_{11})

Regression equation-- y= -1.80316 +0.508514xX

The value of b ranged from 0.041431 (Depth of body through dorsal fin base, Table 13) to 0.508514 (Length snout to caudal peduncle,Table 21).The observed F varied from 27.124(Depth of body through dorsal fin base,Table 14) to 14273.33(Width of body through pectoral fin base ,Table 8).

Observations



**(Fig 1 - Total Length
Regression line of head length)**

Regression Data (Table 1)

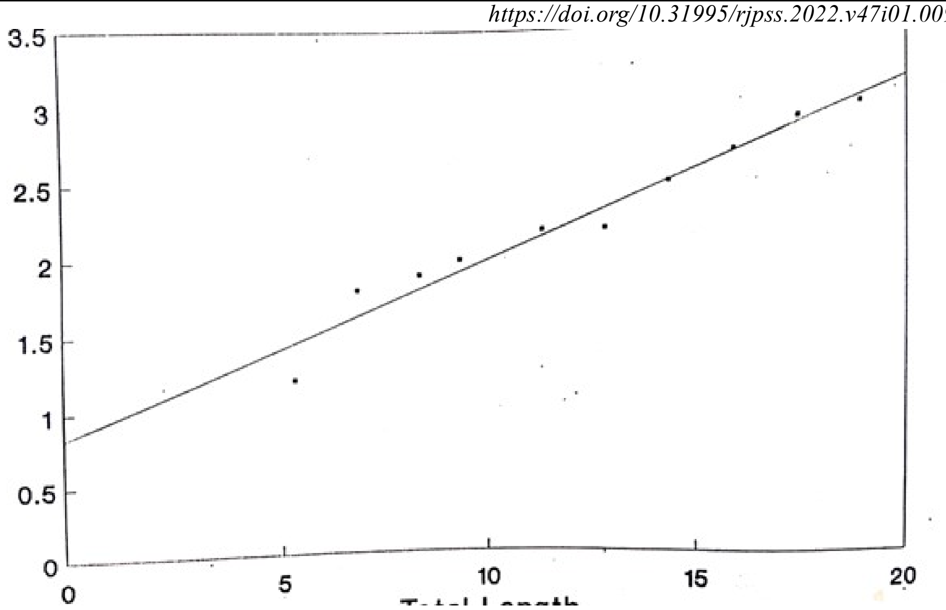
Head Length (Y_1)

Ex^2	Ey^2	Exy	a	b	r
6909.29	492.02	845.67	1.8801	0.15005	0.99940

Regression equation – Y=1.8801+0.15005x X

Analysis of Variance (Table 2)

Source	df	SS	MS	Obs. F	5% F	Significance
SS of Regression	1	477.34	477.34	5194.124	4.28	Highly Significant
Residual SS	23	2.115	0.0919			
Total SS	24	492.02				



**(Fig 2 - Total Length
Regression line of width of head through orbit)**

Regression Data (Table 3)

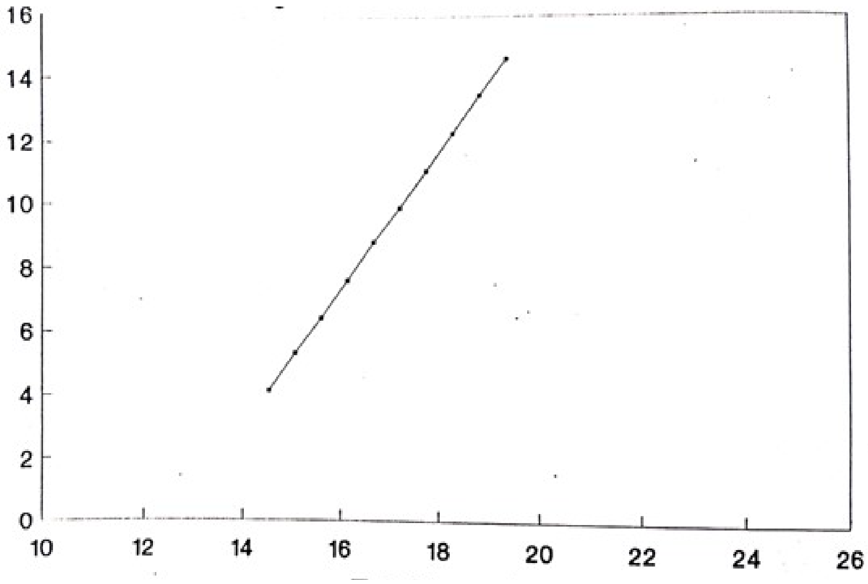
Width of the head through orbit (Y_2)

Ex^2	Ey^2	Exy	a	b	r
6909.29	104.65	845.57	0.20364	0.234598	0.994404

Regression equation – y= .20364+.234598x X

Analysis of Variance (Table 4)

Source	df	SS	MS	Obs. F	5% F	Significance
SS of Regression	1	103.48	103.48	2041.0256	4.28	Highly Significant
Residual SS	23	1.1677	.0507			
Total SS	24	104.65				



(Fig 3 - Total Length
Regression line of depth of head through orbit)

Regression Data (Table 5)

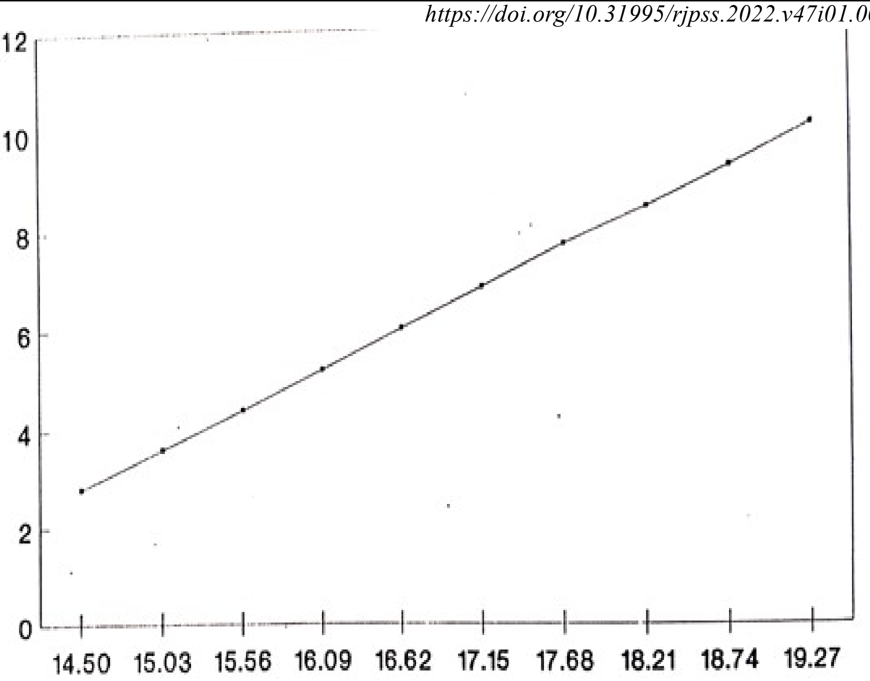
Depth of head through orbit (y_3)

Ex^2	Ey^2	Exy	a	b	r
6909.29	62.66	648.22	0.9278	0.149566	0.98608

Regression equation-- y=0.9278+0.149566xX

Analysis of Variance (Table 6)

Source	df	SS	MS	Obs. F	5% F	Significance
SS of Regression	1	60.93	60.93	1441.7889	4.28	Highly Significant
Residual SS	23	.927	.04226			
Total SS	24	62.66				



(Fig 4 - Total Length
Regression line of width of body through Pectoral fin)

Regression Data (Table 7)

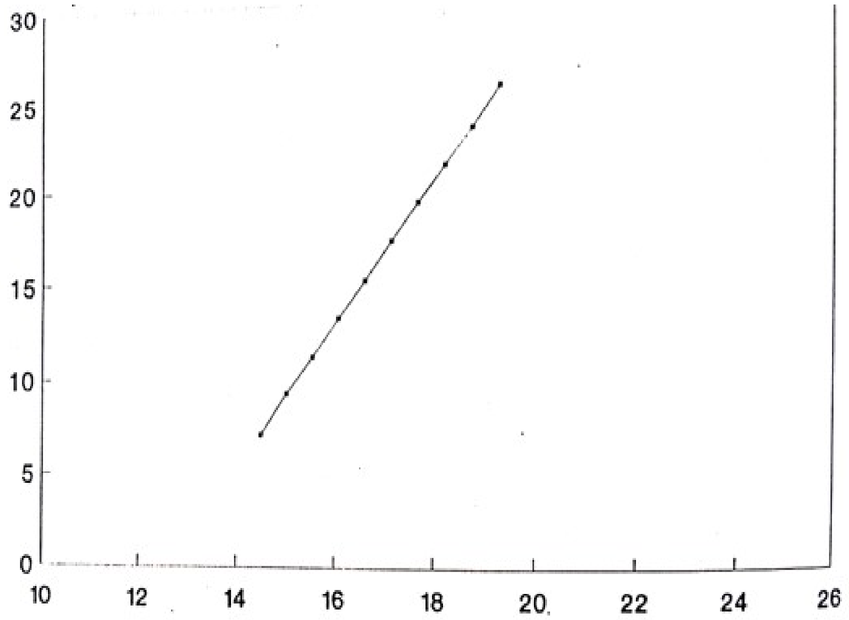
Width of the body through the pectoral-fin base (y_4)

Ex^2	Ey^2	Exy	a	b	r
6909.29	214.36	1216.00	0.37545	0.143470	0.999255

Regression equation-- y=0.37545+0.14347xX

Analysis of Variance (Table 8)

Source	df	SS	MS	Obs. F	5% F	Significance
SS of Regression	1	214.009	214.009	14273.33	4.28	Highly Significant
Residual SS	23	.3502	.015			
Total SS	24	214.36				



**(Fig 5 - Total Length
Regression line of depth of body through Pectoral fin)**

Regression Data (Table 9)

Depth of body through Pectoral fin base (y_5)

Ex^2	Ey^2	Exy	a	b	r
6909.29	230.31	1259.08	1.241424	0.107754	0.99810

Regression equation-- y=1.241424+0.107754xX

Analysis of Variance (Table 10)

Source	df	SS	MS	Obs. F	5% F	Significance
SS of Regression	1	229.44	229.44	2822.1	4.28	Highly Significant
Residual SS	23	1.87	.0813			
Total SS	24	230.31				

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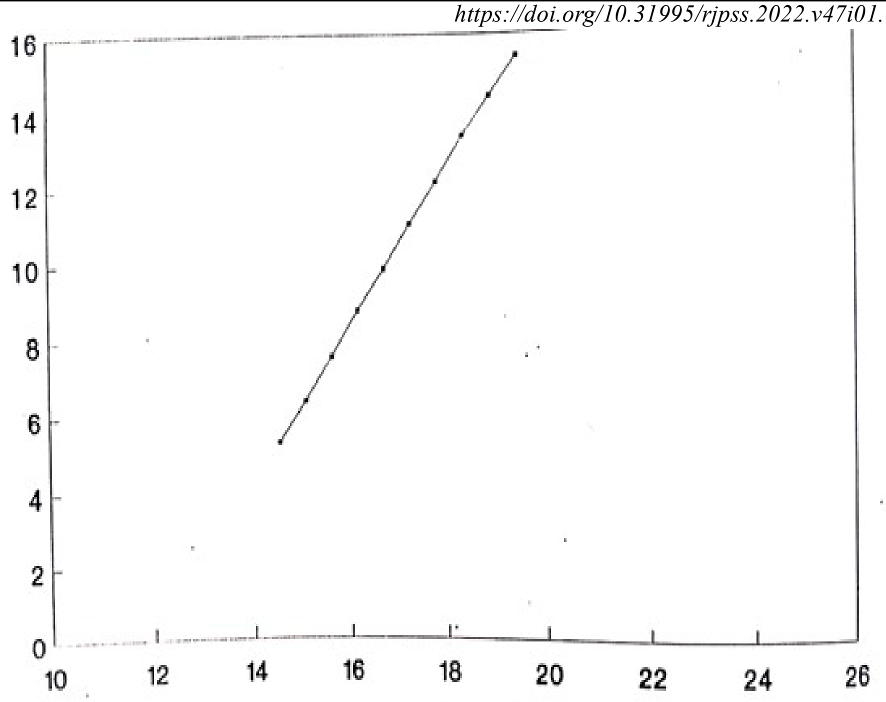


(Fig 6 - Total Length
Regression line of width of body through a dorsal fin)

Regression Data (Table 11)

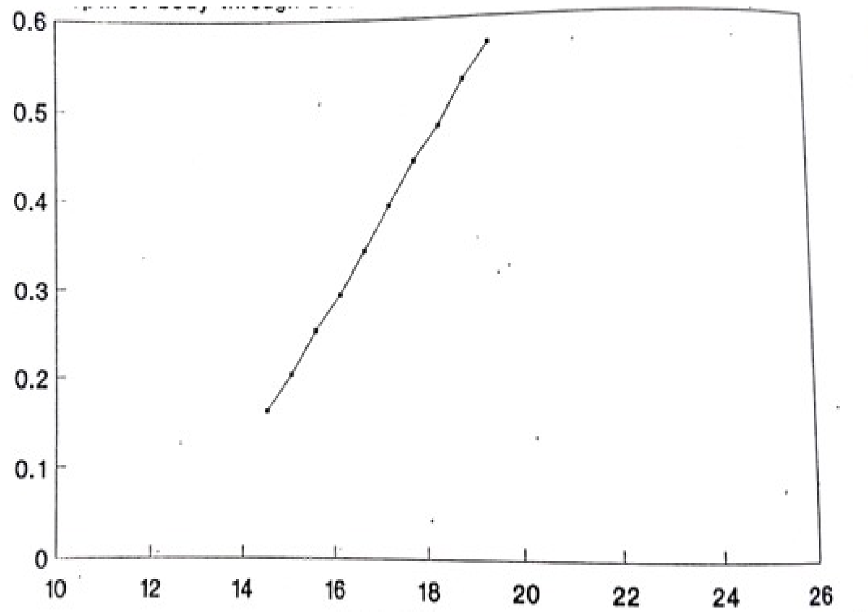
Width of the body through the dorsal-fin base (y_6)

Ex^2	Ey^2	Exy	a	b	r
6909.29	11.89	281.73	-0.01093	0.41431	0.982

Regression equation-- y= -0.1093+0.041431xX

Analysis of Variance(Table 12)

Source	df	SS	MS	Obs. F	5% F	Significance
SS of Regression	1	11.49	11.49	660.3448	4.28	Highly Significant
Residual SS	23	.49	.17392			
Total SS	24	11.89				



(Fig 7 - Total Length
Regression line of depth of body through Dorsal fin)

Regression Data (Table 13)

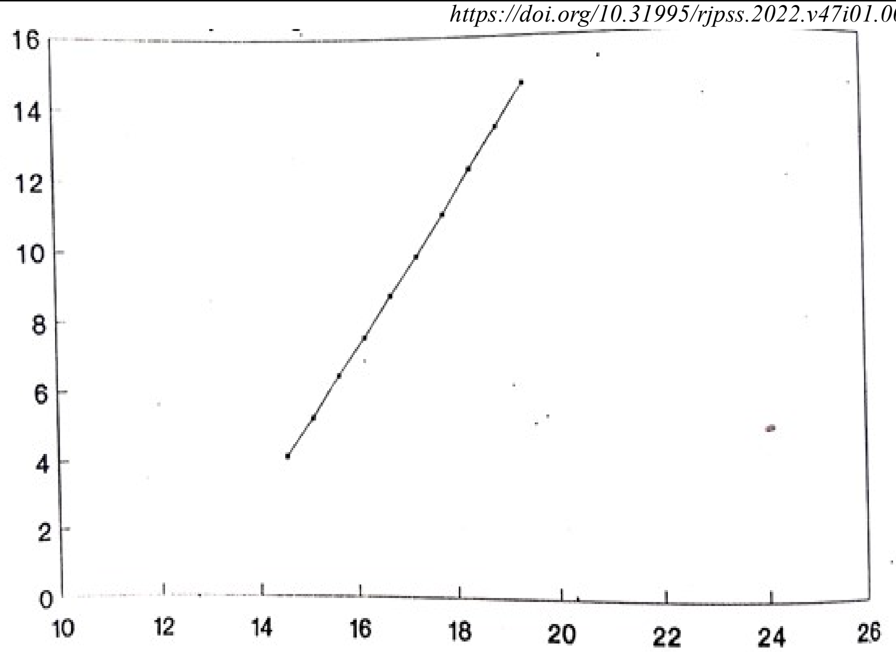
Depth of body through the dorsal-fin base (y_7)

Ex^2	Ey^2	Exy	a	b	r
6909.29	25.09	306.06	-0.01093	0.041431	0.982936

Regression equation-- y=- 0.01093+0.041431xX

Analysis of Variance (Table 14)

Source	df	SS	MS	Obs.F	5% F	Significance
SS of Regression	1	13.561	13.561	27.124	4.28	Significant
Residual SS	23	11.53	.50			
Total SS	24	492.02				



(Fig 8 - Total Length
Regression line of width of body through Pelvic fin)

Regression data (Table 15)

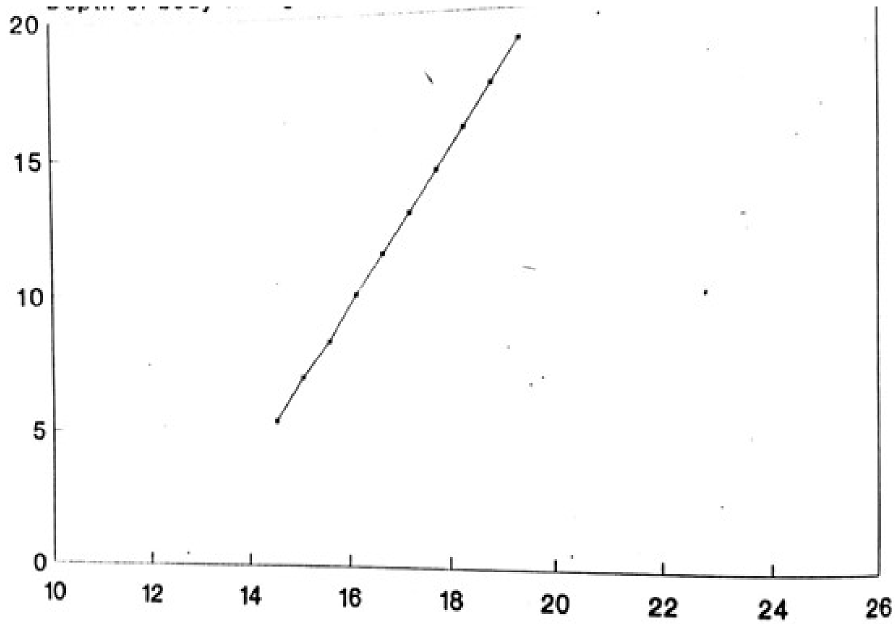
Width of the body through Pelvic fin base (y_8)

Ex^2	Ey^2	Exy	a	b	r
6909.29	163.31	1060.470	0.604075	0.153470	0.998332

Regression equation-- y= 0.604075+0.153470xX

Analysis of Variance (Table 16)

Source	df	SS	MS	Obs.F	5% F	Significance
SS of Regression	1	162.76	162.76	6781.66	4.28	Highly Significant
Residual SS	23	0.55	.024			
Total SS	24	163.31				



(Fig 9 - Total Length
Regression line of Depth of body through Pelvic fin)

Regression Data (Table 17)

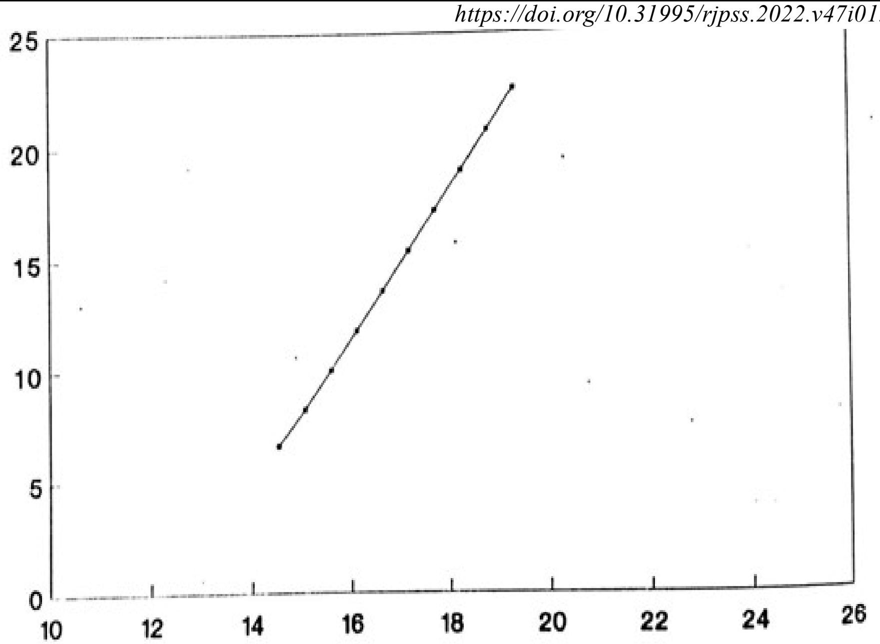
Depth of body through Pelvic fin base (y_9)

Ex^2	Ey^2	Exy	a	b	r
6909.29	226.79	1249.88	0.881148	0.128036	0.998480

Regression equation-- y= 0.881148+0.128036xX

Analysis of Variance (Table 18)

Source	df	SS	MS	Obs.F	5% F	Significance
SS of Regression	1	226.10	226.10	7536.10	4.28	Highly Significant
Residual SS	23	0.69	.03			
Total SS	24	225.79				



(Fig 10 - Total Length
Regression line of length from Snout to Anus)

Regression Data(Table 19)

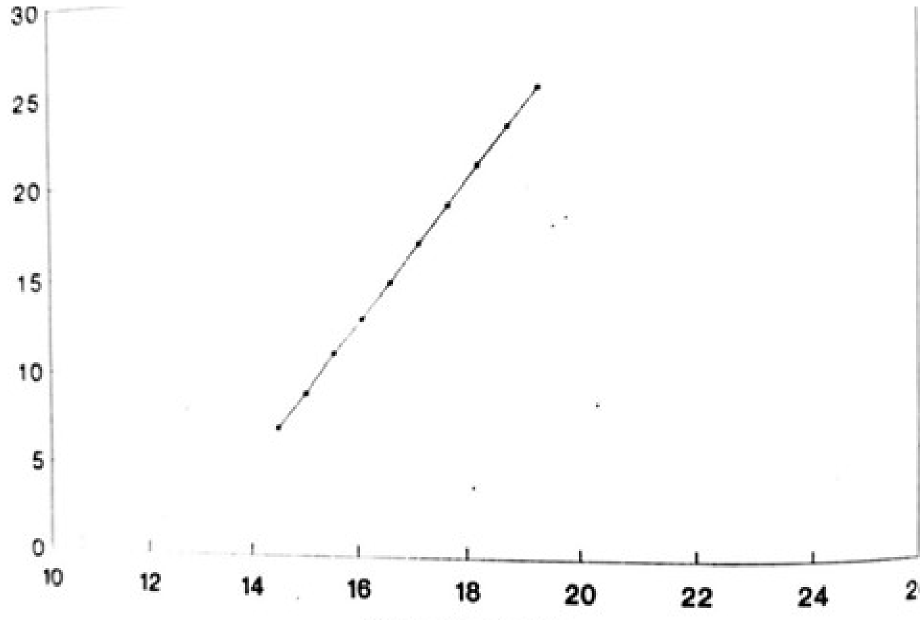
Length of body from anus to snout (y_{10})

Ex^2	Ey^2	Exy	a	b	r
6909.29	1390.53	3096.99	0.79680	0.4004	0.999155

Regression equation-- y= 0.79680 +0.4004xX

Analysis of Variance (Table 20)

Source	df	SS	MS	Obs.F	5% F	Significance
SS of Regression	1	1388.18	1388.18	13609.608	4.28	Highly Significant
Residual SS	23	2.35	.102			
Total SS	24	1390.53				



(Fig 11 - Total Length
Regression line of length from anus to caudal peduncle)

Regression Data (Table 21)

Length snout to caudal peduncle (Y_{11})

Ex^2	Ey^2	Exy	a	b	r
6909.29	1072.37	2661.66	-1.80316	0.508514	0.977830

Regression equation-- y= -1.80316 +0.508514xX

Analysis of Variance (Table 22)

Source	df	SS	MS	Obs.F	5% F	Significance
SS of Regression	1	1025.35	1025.35	501.639	4.28	Highly Significant
Residual SS	23	47.02	2.044			
Total SS	24	1072.37				

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Discussion

Morphometric analysis of several spp. has been done by several fishery biologists for testing the homogeneity of the populations, inhabiting in different maturity stages, seasons and places (Nautiyal and Lal.,1988, Bhatt, J.P.et. al., 1998, Hanif et.al., 2019. Pillay.,1957, has taken into account the morphometric characters of the *Hills Elisha.* Sarojini .,1957, have tested homogeneity of the populations of the *Mugil Gunness* collected from different places by morphometric characters, 'Bennet' have also done morphometric analysis for testing the homogeneity of *Oxyurichthys tentacular and Trachurusmediterraneus* have been tested byRemya and Williams, S.,2018 and Tarun .,2004, respectively by taking into account the various morphometric character and the total length and the growth of these characters have been found highly significant for the increase in the total length. As observations were also found in conformity to the findings of these workers. Engdaw. In,2014 studied morphometric parameters of *Labeo Barbus intermedius* in Lake Tana, Ethiopia and found a significant linear relationship between total length and standard length and between total length and total weight. Morphometric parameters of the fish show. a positive correlation between all the parameters of the fish shows a positive correlation with respect to Total Length. Veerpal, K. et.al., 2019, Makmur et. Al., 2014, estimated morphometric parameters of Hampala fish (*Hampala macrolepidota*) from Ranau Lake, Indonesia and observed that all the morphometric measurements showed a significant positive correlation (p>0.01). The correlation coefficient 'r' is significant at P>0.005 in all the variables except for the distance between Pectoral and anal fin and pre-anal distance during winter in relation to the total length. Bhatt et. Al., 1998. The correlation coefficient showed that the growth in total length is highly correlated to the growth in various morphometric characters and ranges from r=0.977830 (Length snout to caudal peduncle) to 'r'= 0.9944040(Width of the head through orbit). Analysis of variance showed that the total length is highly significant for the increase in various body parts. In the present When the calculated body measurements were plotted against respective body components, the relationship was found of straight line. Makmur et. Al. (2014) estimated morphometric parameters of Hampala fish (Hampala macrolepidota) from Ranau Lake, Indonesia and observed that all the morphometric measurements showed a significant positive correlation (p>0.01). . Linear relationship has been observed between all the independent and dependent characters. The significant differences in morphometric variations of cork fish were confirmed by 10 morphometric characters. The fish in river population had relatively similar morphometric characteristics to that in flood chain population Nguyen &Duong 2016, Boby M.,, et. Al.2020.

Conclusion

The samples collected belonged to a common stock.

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