قســـــــم : علم الحيوان - كلية العلوم - جامعة أسيوط.
رئيس القسم : أ.د / محمد خليل النفـــار.

دراسة مورفومترية على سمكة الستس باريموز فى منطقة أسيوط

عبد الحميد خليل ، عزت جرجس بواقيم ، امام مكاوى

١- يتضمن هذا البحث دراسة لبعض النسب المورفومترية لسمكة الستس باريموز ومـــــــــــدى تغير هذا النسب يتغير الطول الكلى للسمكة.

٢- بدراسة معنوية معاملات الانحدار وكذلك معنوية الأجزاء المقطوعة من محور الصادات بواسطة خط الانحدار لبعض القياسات المورفومترية أمكن تحديد الصفات المورفومترية ذات الأهميـــــة التقسيمية.

٣- قورنت نتائج هذا البحث مع نتائج مماثلة لبحث سابق عن سمكة الستس نيرس وأمكن تحديـــــد الصفات المورفومترية التى تساعد على التفريق بين هذين النوعين من الاسماك.

Dept. of Zoology,
Faculty of Science, Assiut University,
Head of Dept. Prof. Dr. M.K. El-Naffar.

BIOMETRIC STUDIES ON THE NILE CHARCOID FISH ALESTES BAREMOSE FROM ASSIUT

(With 4 Tables and 21 Figures)

By

A. KHALIL, E.G. YOAKIM and I.A. MEKKAWY

(Received at 2/5/1982)

SUMMARY

The ranges, means and mode of variation of certain morphometric indices of Alestes baremose were studied. Morphometric characters reliable for taxonomic purposes were determined according to the significance of differences between regression coefficients of some morphometric measurements and between Y-intercepts of the regression lines of such measurements from zero value. The data of the present investigation were compared with thsoe reported for Alestes nurse in a previous work.

INTRODUCTION

In his excellent review of the charcoid fishes, GERY (1977) mentioned that such fishes display many adaptations. According to him, those adaptations explain why the systematics of the charcoids have long been, and still are a difficult task. He also mentioned that some Alestes species from the Nile are siblings, being separable only by minor characteristics. KHALIL et al. (in press) reported on the morphometry of the Nile charcoid fish, Alestes nurse. In the present investigation, it is intended to give an account on the morphometry of the Nile charcoid fish, Alestes baremose from Assiut.

MATERIAL and METHODS

A total of 52 specimens of Alestes baremose (227-600 mm in total length) were randomly collected from Assiut fish markets during the period May 1977-June 1979. The comparatively small number of specimens was due to the rarity of their occurrence during the period of collection. Therefore, the specimens were investigated without consideration of sex.

For each fish, 19 morphometric measurements were made on the left side up to the nearest millimeter. Those morphometric measurements included the total length (T.L), fork lingth (F.L), standard length (S.L), pre-dorsal length (Pr.D), post-dorsal length (Pt.D), pre-ventral length (Pr.V), pre-anal (Pr.A), post-anal length (Pt.A), body depth (B.D), post-dorsal origin length (Pt.D.O), head length (H.L), eye diameter (E.D), snout length (Sn.L), post-orbital length (Pt.O), head depth (H.D), inter-orbital width (Io.W), inter-nasal width (In.W), caudal peduncle length (C.P.L) and caudal peduncle depth (C.P.D). The definition of those morphometric measurements and the calculation of the corresponding morphometric indices were carried out according to KHALIL et al. (in press).

The regression equations of S.L, Pr.D, Pr. V, Pr. A, B.D., C.P.L, E.D, Pt.D.O and H.L versus T.L; also those of H.D, Io.W and In.W versus H.L were calculated. Student's T-Test and analyses of Variance and covariance according to SIMPSON et al. (1960) were carried out to testify the significance of regression coefficients and differences of the Y-intercepts of regression lines of the morphometric measurements considered from zero. That test and those analyses were also used for comparison between regression coefficients considered for A. baremose with those of Assiut combined sex samples of A.nurse reported by KHALIL et al. (in press). Data concerned with the mode of variation of different morphometric indices and the significance of diferences of the Y-intercepts of their regression lines from zero of A.baremose were also compared with those of Assiut combined sex samples of A.nurse reported by KHALIL et al. (in press).

RESULTS

Table I summarises the ranges and means of different morphometric indices of A.baremose and the significance of variation of such indices according to the total length. From that table, it could be concluded that the Pt.D, Pr.V, Pr.A, C.P.L, Pt.D.O, Pt.O and H.D. indices did not vary significantly with the variation of total length, while the remainder of the indices considered varied significantly in that connection. The mode of variation of the morphometric indices according to the total length is represented graphically in Figs.1-8.

Table 2 presents a comparison between the mode of variation of morphometric indices of A. baremose according to the total length and that of the corresponding indices of Assiut combined sex samples of A.nurse as reported by KHALIL et al. (in press). From that table, the following could be concluded:

1- In both species, with increase of total length, the H.L and H.D indices increased significantly, whereas the Pt.A, B.D, Sn.L, Io.W, In.W and C.P.D indices revealed an opposite trend.
2- In both species, the Pt.D and Pt.O indices varied insignificantly with the variation of total length.
3- With increase of total length, the F.L, Pr.V, Pr.A and H.D indices of A.nurse decreased significantly, whereas those of A.baremose showed insignificant variation.
4- With increase of total length, the C.P.L and Pt.D.O indices of A.nurse increased significantly, whereas those of A.baremose revealed insignificant variation.
5- With increase of total length, the S.L index of A.nurse decreased significantly but that of A.baremose showed a significant increase.
6- With increase of total length, the Pr.D. index of A.nurse increased significantly but that of A.baremose showed a significant decrease.

Except for the S.L and Sn.L index means, all the morphometric index means of A.baremose considered in the present investigation were found to be statistically different ($P \leq 0.05$) from those of A.nurse previously reported by KHALIL et al. (in press).

The regressions of S.L, Pr.D, Pr.V, Pr.A, B.D, C.P.L, E.D, Pt.D.O and H.L versus T.L; also, those of H.D Io.W and In.W versus H.L were found to be linear. The respective regression equations were calculated and presented in Table 3. Figs.19-21 show the close fitness of the mean observed values on the straight lines, indicating that the regression equations expressing straight lines are correct and they best fit the morphometric characters in question. Table 3 also shows that the regression coefficients of the aforementioned morphometric characters were significantly different from zero value.

A comparison between the regression coefficients of morphometric characters of A.baremose considered in the present investigation with those of combined sex samples of A.nurse, previously reported by KHALIL et al. (in press), revealed that the regression coefficients of the S.L, Pr.V, Pr.A, H.L and E.D of A.baremose were significantly different from those of A.nurse ($P \leq 0.05$). The regression coefficients of the remainder morphometric characters of A.baremose considered were insignificantly different from those of A.nurse.

The significance of differences of Y-intercepts of the regression lines of the morphometric measurements considered for A.baremose from zero value is presented in Table 3. Although the present study showed linear relationship between the variables under consideration, that table shows that the ratios of the S.L, B.D and E.D to T.L and the ratio of In.W to H.L were not constant. In such cases the Y-intercepts of regression lines were significantly different form zero, which means that those ratios would change according to the size of the fish and consequently they are not reliable for taxonomic purposes. Other morphometric characters, the Y-intercepts of their regression lines differed insignificantly from zero, were considered to be reliable for taxonomic purposes.

Table 4 shows a comparison between the significance of differences of Y-intercepts of regression lines of differnt morphometric characters of A.baremose from zero value and that of Assiut combined sex samples of A.nurse as reported by KHALIL et al. (in press). From that table the following could be concluded:

1- In both species, the Y-intercepts of the regression lines of S.L, B.D and E.D were significantly different

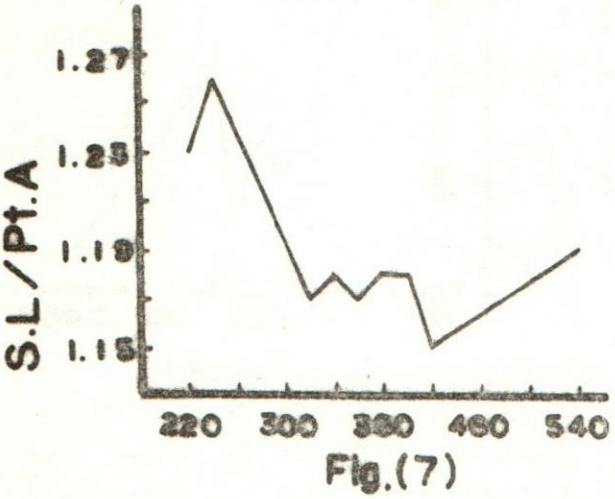

Fig.(7)

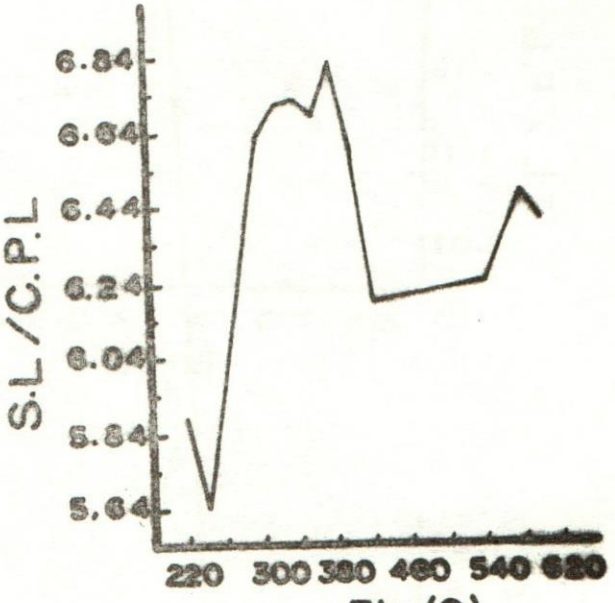

Fig.(9)

Fig.(8)

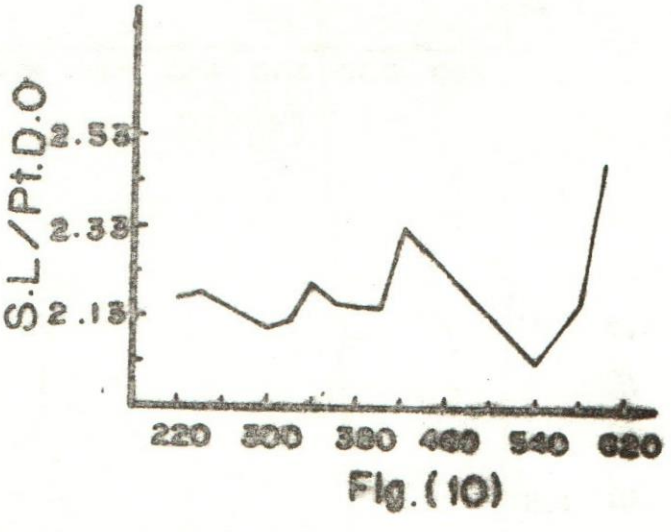

Fig.(10)

Total length group in mm

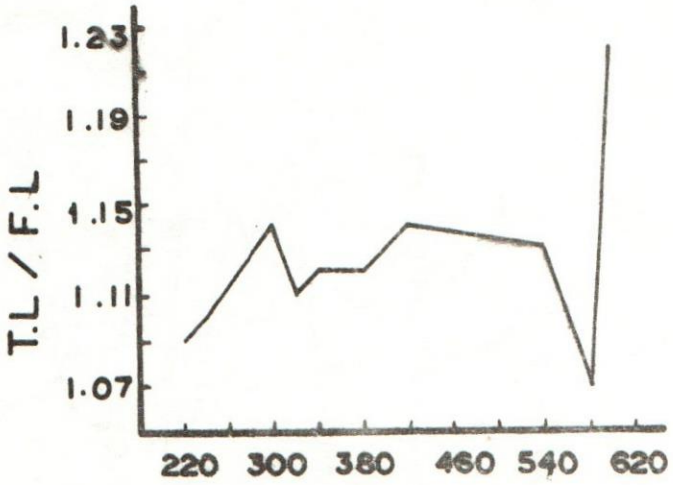

Fig.(1)

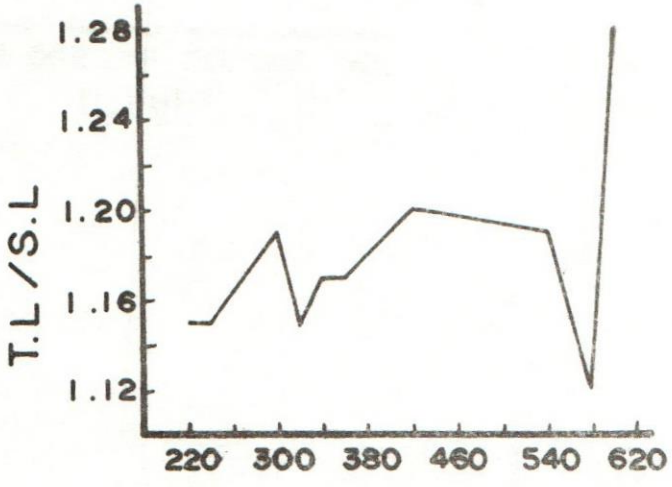

Fig.(2)

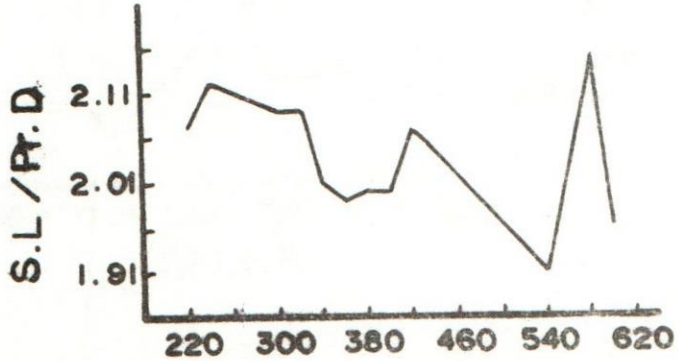

Fig.(3)

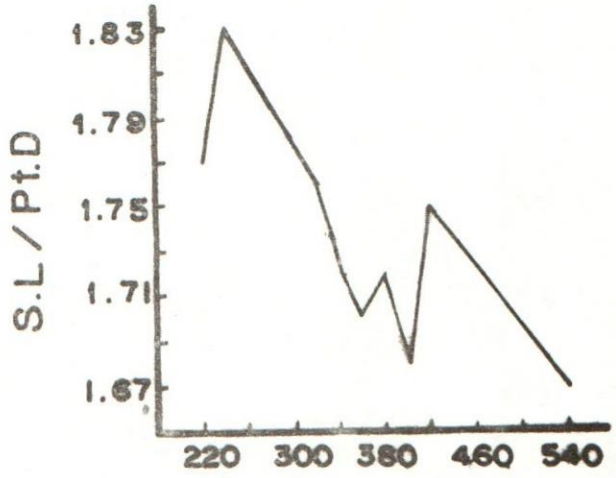

Fig.(4)

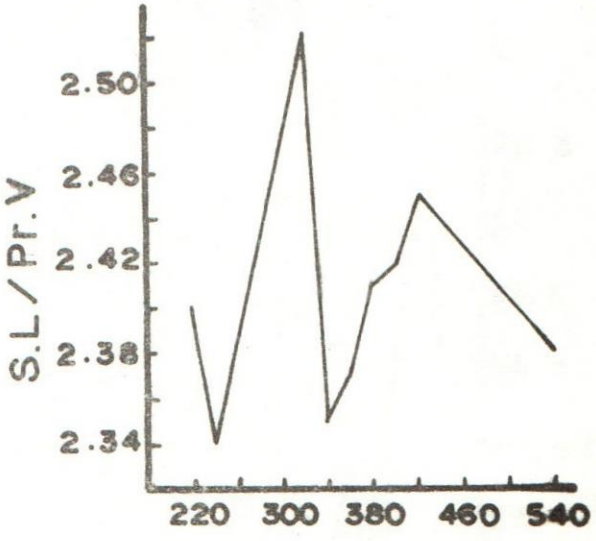

Fig.(5)

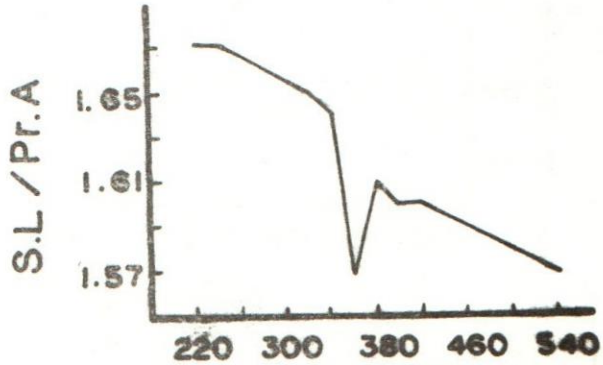

Fig.(6)

Total length group in mm

from zero, whereas those of Pr.D, Pr.V, Pt.D.O, H.D and Io.W were insignificantly so.

2- The Y-intercepts of the regression lines of Pr.A, C.P.L and H.L of A.baremose were insiginicantly different from zero, whereas those of A.nurse were significantly so.

3- The Y-intercept of the regression line of In.W of A.baremose was significantly different form zero, whereas that of A.nurse was insignificantly so.

DISCUSSION

In the present investigation, the differentiation between combined sex samples of A.baremose and A.nurse in terms of all the morphometric index means, except those of S.L and Sn.L, was possible. Also, the mode of variation of some morphometric indices was helpful in this connection. BOTROS et al. (1970) differentiated between Sardinella maderensis and Sardinella aurita collected from Alexandria by making use of the means of some morphometric indices. BISHARA (1973) differentiated between Tilapia aurea, Tilapia zillii, Tilapia nilotica and Tilapia galilaea collected from lake Manzalah on the same basis.

The comparison between combined sex samples of A.nurse and those of A.baremose was also possible on the basis of the significance of differences between the regression coefficients of some of their morphometric measurements. LACHNER & JENKINS (1971) were able to differentiate between the species of the Necomis biguttatus group on the same basis.

In the present investigation, it was possible to differentiate between Assiut combined sex samples of A. nurse and those of A.baremose by making use of the significance of differences of the Y-intercepts of regression lines of the morphometric characters considered from zero. SCHAEFER & WALFORD (1950) were able to differentiate between yellowfin tunas of Angola and those of Pacific coast of Central America on the same basis. Similarly, LACHNER and JENKINS (1971) differentiated between the species of Necomis biguttatus group.

REFERENCES

Bishara, N.F. (1973): Studies on the biology of Tilapia species in some lakes in U.A.R. Ph.D dissertation, Cairo University.

Botros, G.A.; El-Maghraby, A.M. and Soliman, A.M. (1970): Biometric studies on Sardinella maderensis Lowe and Sardinella aurita Cuv. and Val. from the Mediterranean Sea at Alexandria (U.A.R.). Bull. Inst. Ocean. Fish., 1: 83-128.

Gery, J. (1977): Charcoids of the world. Neptune city, T.F.H. Publications, Inc.

Khalil, A; Yoakim, E.G. & Mekkawy, I.A. (in press): Biometric studies on the Nile charcoid fish, Alestes nurse from Assiut and Aswan.

Lachner, E.A. & Jenkins, R.E. (1971): Systematics, distribution and evolution of the Necomis biguttatus species group (family Cyprinidae: Pisces) with a description of a new species from the Ozark Upland. Smithsonian contributions to Zoology, 91: 1-28.

Schaefer, M.B. and Walford, L.A., (1950): Biometric comparison between yellowfin tunas, Neothunnus, of Angola and of the Pacific Coast of Central America. Fishery Bulletin of the Fish. and Wildlife service, 51: 425-433.

Simpson, G.G.; Roe, A. & Lewontin, R.C. (1960): Quantitative Zoology. New York, Harcourt, Brace and World, Inc.

EXPLANATION OF FIGURES

Figs.1-18: Variation of morphometric indices of Assiut samples of A.baremose according to the total length.
Figs.19-20: Regressions of some morphometric measurements versus total length for Assiut samples of A.baremose.
Fig. 21: Regressions of some morphometric measurements versus head length for Assiut samples of A.baremose.

Table 1: The ranges and means of different morphometric indices of *A. baremose* and the significance of variation of such indices according to the total length.

Morphometric index	Index range	Index mean	Variation with T.L
T.L/F.L	1.07 - 1.22	$1.12 \pm 6.78 \times 10^{-4}$	++
T.L/S.L	1.15 - 1.28	$1.18 \pm 8.52 \times 10^{-4}$	++
S.L/Pr.D	1.91 - 2.15	$2.02 \pm 3.86 \times 10^{-3}$	++
S.L/Pt.D	1.67 - 1.83	$1.72 \pm 2.76 \times 10^{-3}$	-
S.L/Pr.V	2.34 - 2.52	$2.39 \pm 8.87 \times 10^{-3}$	-
S.L/Pr.A	1.57 - 1.67	$1.62 \pm 3.27 \times 10^{-3}$	-
S.L/Pt.A	1.15 - 1.26	$1.18 \pm 6.89 \times 10^{-3}$	++
S.L/B.D	3.72 - 5.50	4.41 ± 0.1135	++
S.L/C.P.L	5.64 - 6.82	6.59 ± 0.2771	-
S.L/Pt.D.O	2.03 - 2.48	2.19 ± 0.0139	-
S.L/H.L	5.31 - 6.00	5.59 ± 0.0931	++
H.L/E.D	3.69 - 5.35	4.52 ± 0.2314	++
H.L/Sn.L	3.03 - 3.72	3.52 ± 0.0726	+
H.L/Pt.O	1.76 - 2.13	1.96 ± 0.0141	-
H.L/H.D	1.24 - 1.56	1.48 ± 0.0156	-
H.L/Io.W	2.42 - 3.29	3.04 ± 0.0531	+
H.L/In.W	4.71 - 7.02	6.55 ± 0.3906	++
C.P.L/C.P.D	1.74 - 2.44	1.94 ± 0.0338	++

-($P > 0.05$) insignificant variation.

+($0.05 > P > 0.01$) significant variation.

++($P \leq 0.01$) significant variation.

Table 2: The variation of different morphometric indices with the variation of total length of A. nurse and A. baremose (combined sexes) off Assiut.

Morphometric index	A. nurse	A. baremose
T.L/F.L	++	-
T.L/S.L	++	+
S.L/Pr.D	+	++
S.L/Pt.D	-	-
S.L/Pr.V	++	-
S.L/Pr.A	++	-
S.L/Pt.A	++	++
S.L/B.D	++	++
S.L/C.P.L	+	-
S.L/Pt.D.O	+	-
S.L/H.L	+	+
H.L/E.D	+	+
H.L/Sn.L	++	++
H.L/Pt.O	-	-
H.L/H.D	++	-
H.L/Io.W	++	++
H.L/In.W	++	++
C.P.L/C.P.D	++	++

(-) The index shows insignificant variation with the variation of total length.

(+) The index increases significantly with increase of total length.

(++) The index decreases significantly with increase of total length.

Table 3: Regression equations of the morphometric characters of A. baremose and the significance of their regression coefficients and Y-intercepts.

Morphometric characters	Regression equations			Significance of regression coefficient	Significance of Y-intercepts
S.L	S.L	= 15.894+0.8064	T.L	++	+
Pr.D	Pr.D	= 3.475+0.4122	T.L	++	-
Pr.V	Pr.V	= 7.933+0.3324	T.L	++	-
Pr.A	Pr.A	= -4.042+0.5394	T.L	++	-
B.D	B.D	=-20.306+0.2495	T.L	++	++
C.P.L	C.P.L	= 2.803+0.1216	T.L	++	-
E.D	E.D	= 4.690+0.0209	T.L	++	++
Pt.D.O	Pt.D.O	= 12.778+0.3560	T.L	++	-
H.L	H.L	= 7.559+0.1318	T.L	++	-
H.D	H.D	= -4.268+0.7568	H.L	++	-
Io.W	Io.W	= -2.775+0.3796	H.L	++	-
In.W	In.W	= -2.343+0.1949	H.L	++	+

Table 4: Significance of Y-intercepts of different morphometric characters of A. baremose and Assiut combined sex samples of A. nurse.

Significance of Y-intercept \ Morphometric character	S.L	Pr.D	Pr.V	Pr.A	B.D	C.P.L	H.L	E.D	Ft.D.O	H.D	Io.W	In.W
A-baremose	+	-	-	-	++	-	-	++	-	-	-	+
A. nurse	++	-	-	++	++	+	++	++	-	-	-	-

-(P > 0.05) insignificantly different from zero.
+(0.05 > P > 0.01) significantly different from zero.
++(P < 0.01) significantly different from zero.

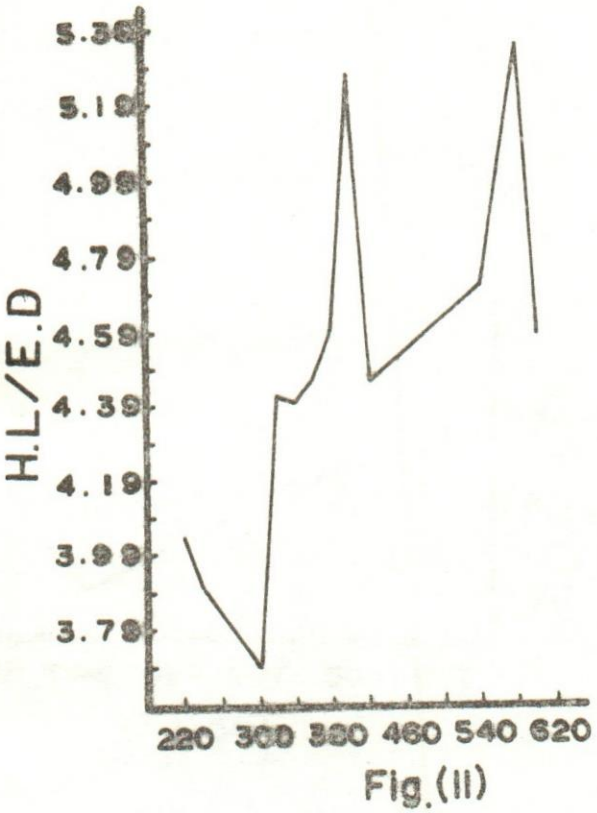

Fig.(11)

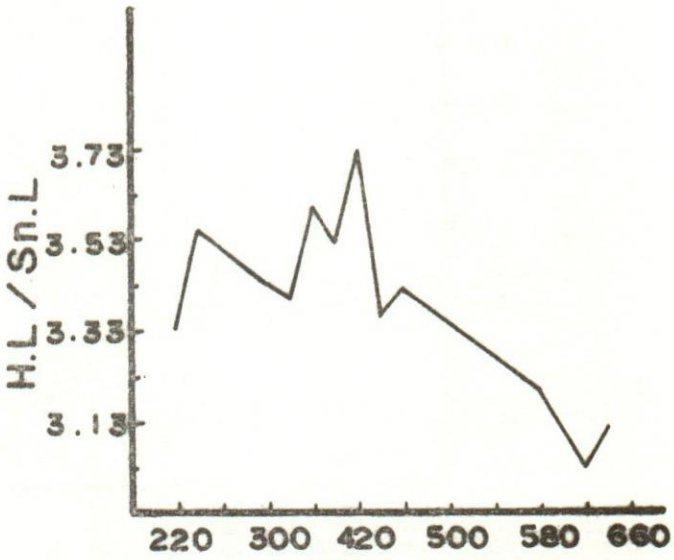

Fig.(13)

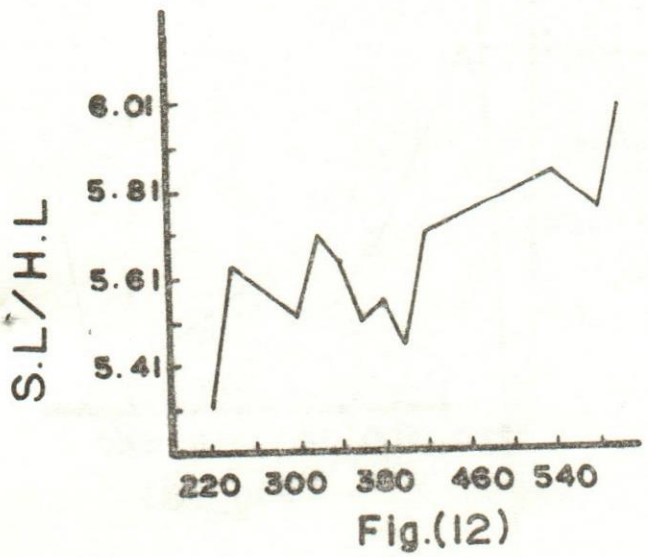

Fig.(12)

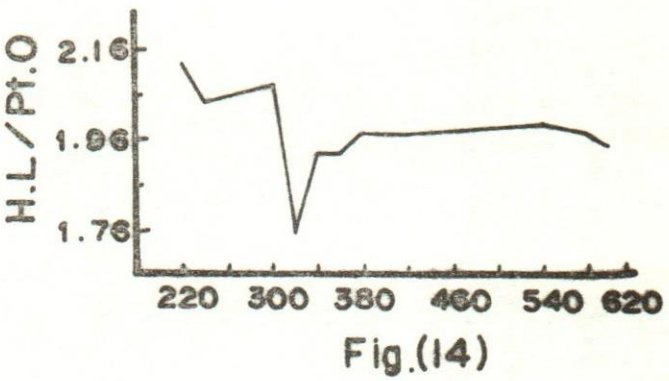

Fig.(14)

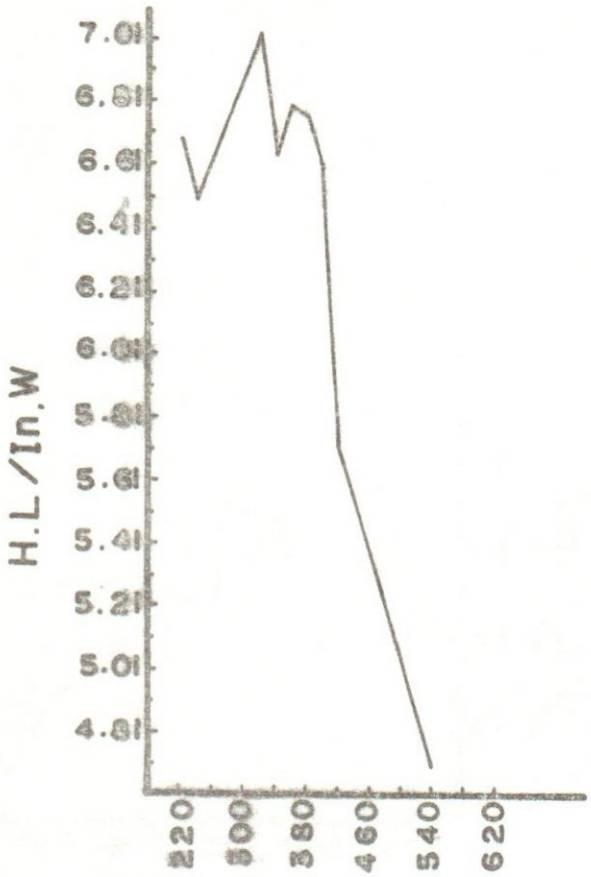

Fig.(15)

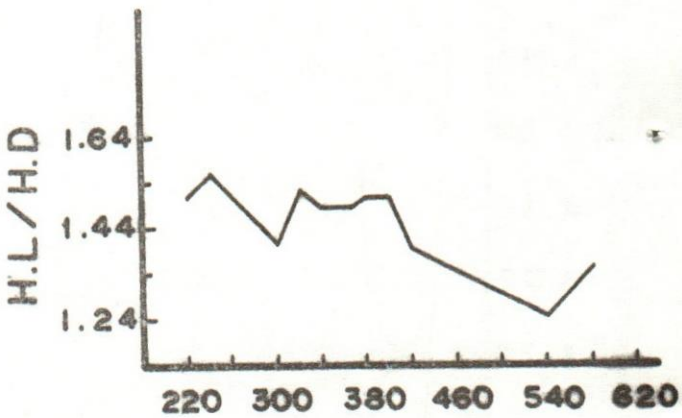

Fig.(17)

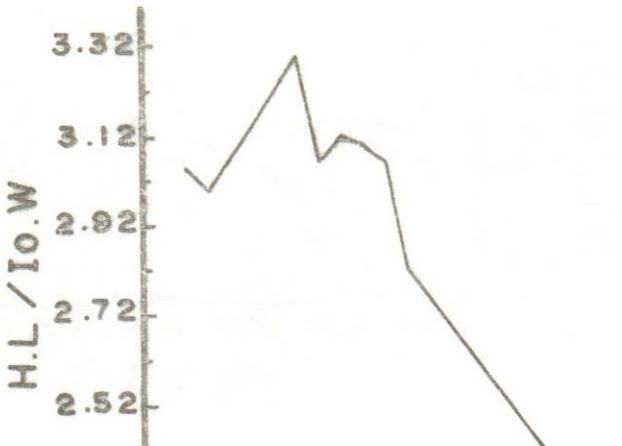

Fig.(16)

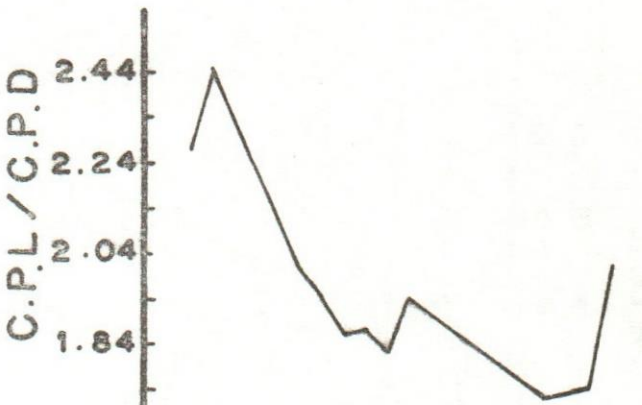

Fig.(18)

Total length group in mm

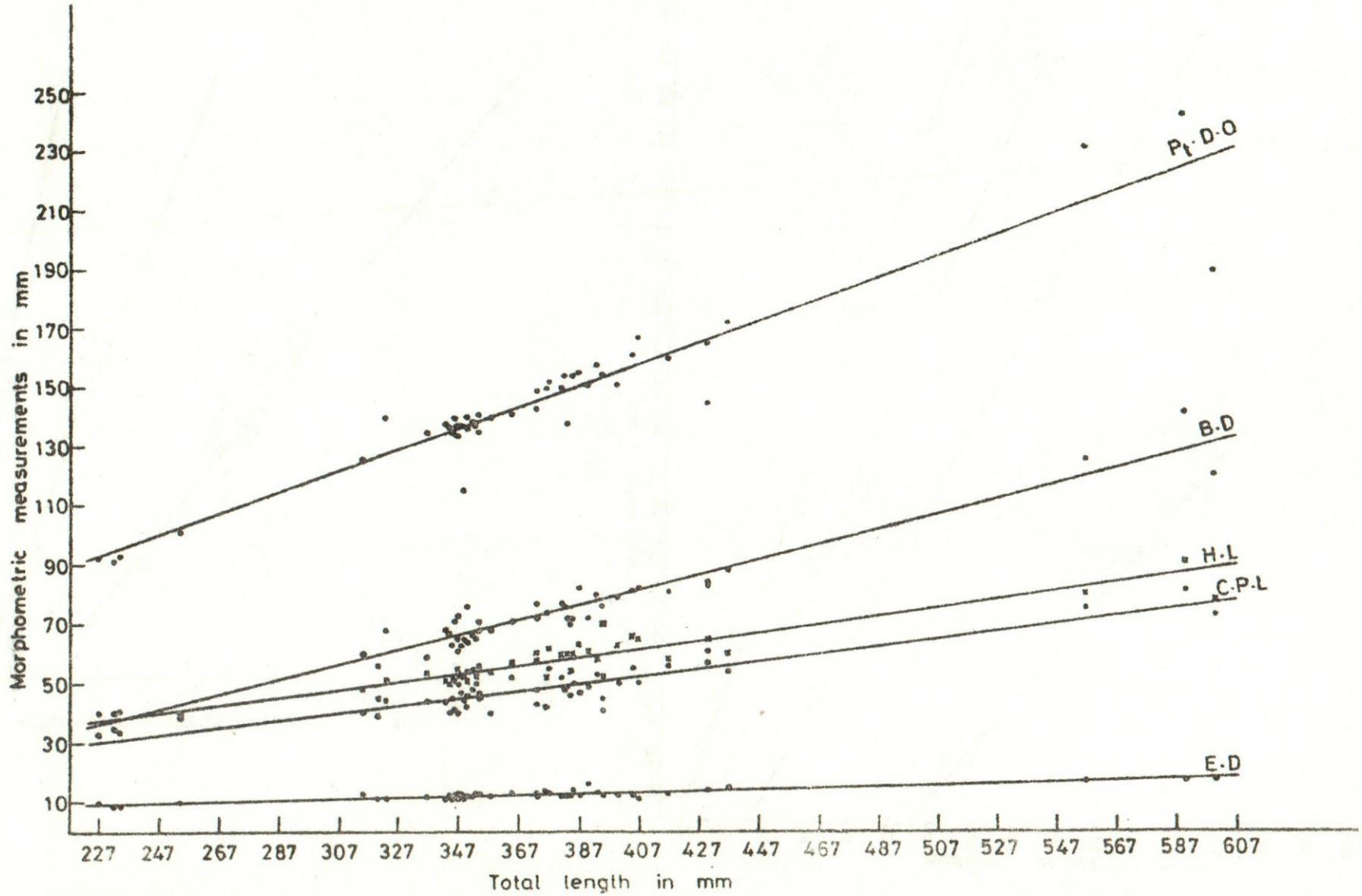
Morphometric measurements in mm
250
230
210
190
170
150
130
110
90
70
50
30
10
227 247 267 287 307 327 347 367 387 407 427 447 467 487 507 527 547 567 587 607
Total length in mm
Pt·D·O
B·D
H·L
C·P·L
E·D

Fig.(19)

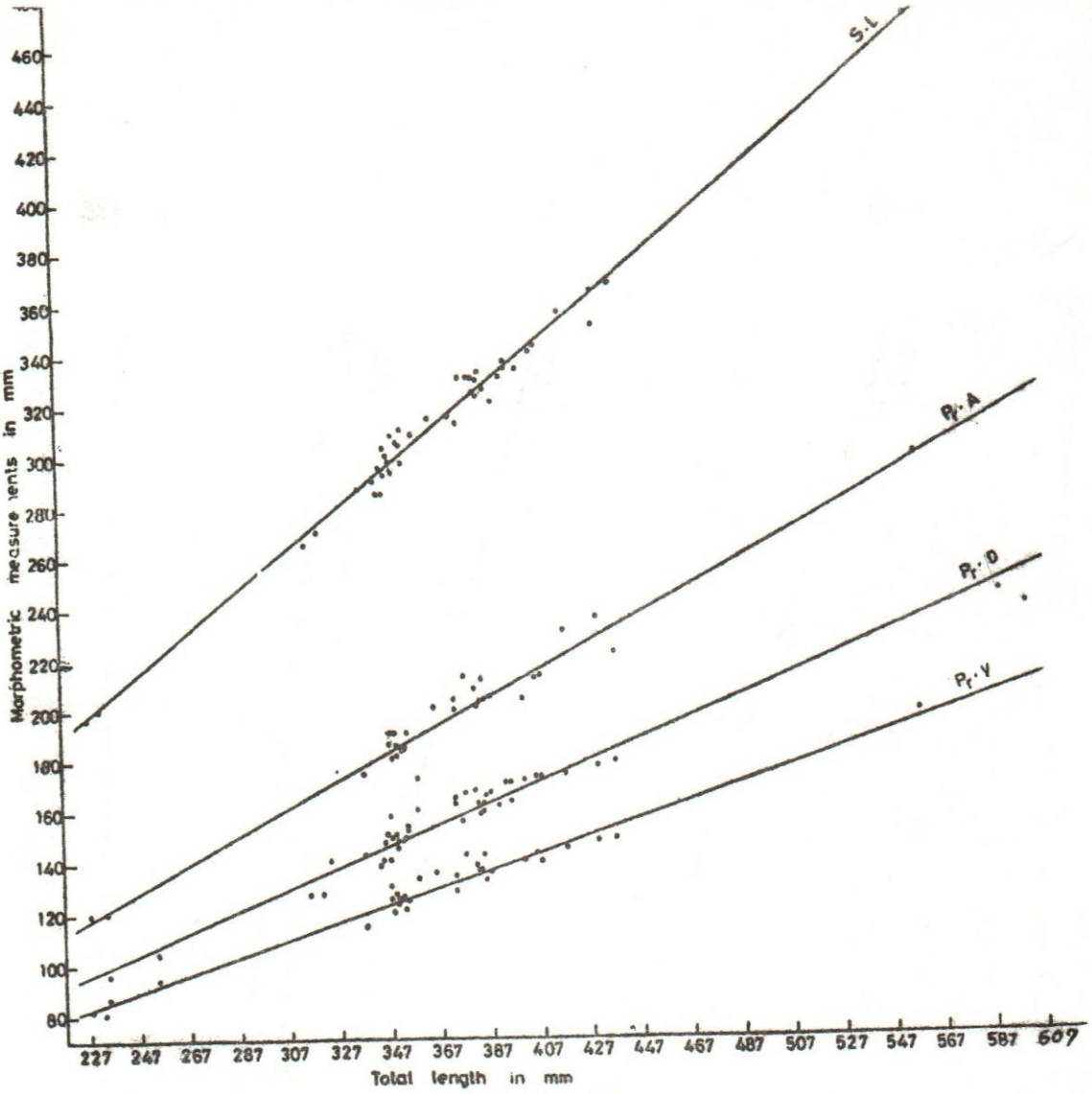
S.L
Pr. A
Pr. D
Pr. V
Morphometric measurements in mm
460
440
420
400
380
360
340
320
300
280
260
240
220
200
180
160
140
120
100
80
227 247 267 287 307 327 347 367 387 407 427 447 467 487 507 527 547 567 587 607
Total length in mm

Fig. (20)

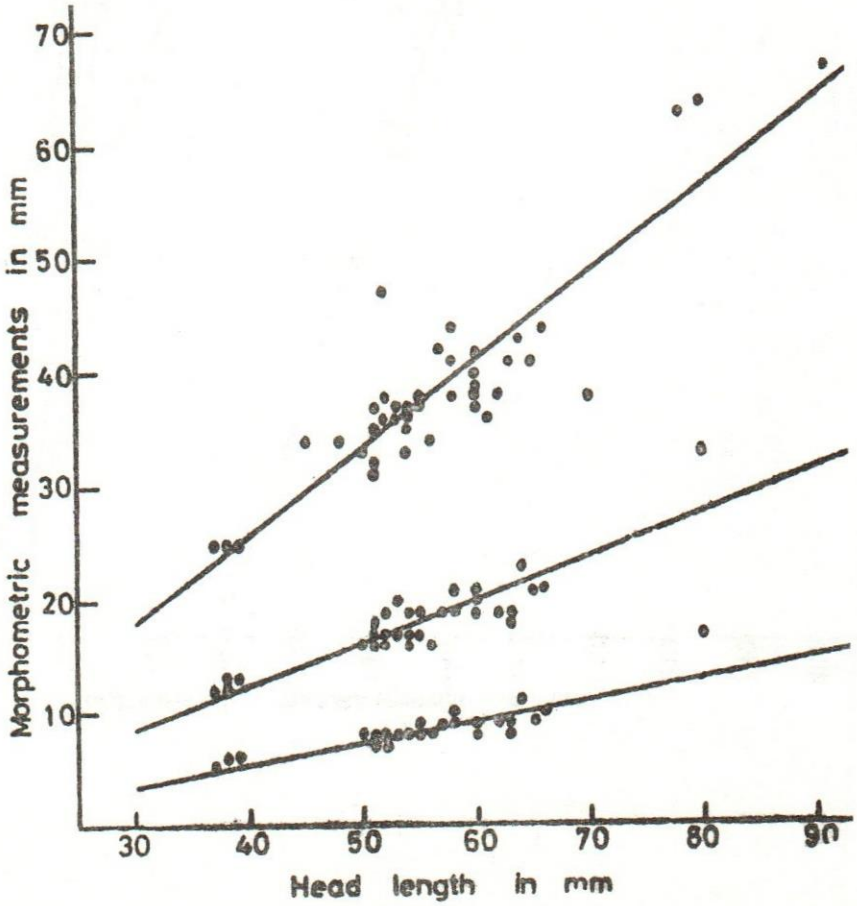
Morphometric measurements in mm
70
60
50
40
30
20
10
30 40 50 60 70 80 90
Head length in mm

Fig (21)