MERISTIC AND MORPHOMETRIC VARIATIONS BETWEEN TWO SPECIES OF CATFISH, CLARIAS LAZERA AND CLARIAS ANGUILLARIS, IN THE EGYPTIAN FRESHWATER.

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ABSTRACT

The present comparative study of samples of Clarias lazera, and Clarias anguillaris collected from the River Nile, lake Mariut and lake Edku between 1989 and 1991, revealed significant differences in two meristic characters and seventeen morphometric measurements. the two meristic characters, vertebral number and gill raker number reflect the environmental and genetical variation between catfish species.

INTRODUCTION

Catfish of genus Clarias are widely distributed in Egyptian freshwater, it was recorded firstly in Egyptian inlandwater by Boulenger (1907). He mentioned that, there are two species of catfish, Clarias lazera, and Clarias anguillaris. The aim of the present study is to determine the extent of variations between the two species in meristic and morphometric characters and to find the best characters used to separate the two fish species.

MATERIALS AND METHODS

Catfish used in the study were obtained from the River Nile, Lake Mariut and Lake Edku between 1989 and 1991. A total number of 185 specimens were examined, 98 of Clarias lazera and 87 of Clarias anguillaris (Fig. 1) The fish size of the two species ranged between 150-490 mm in total length.
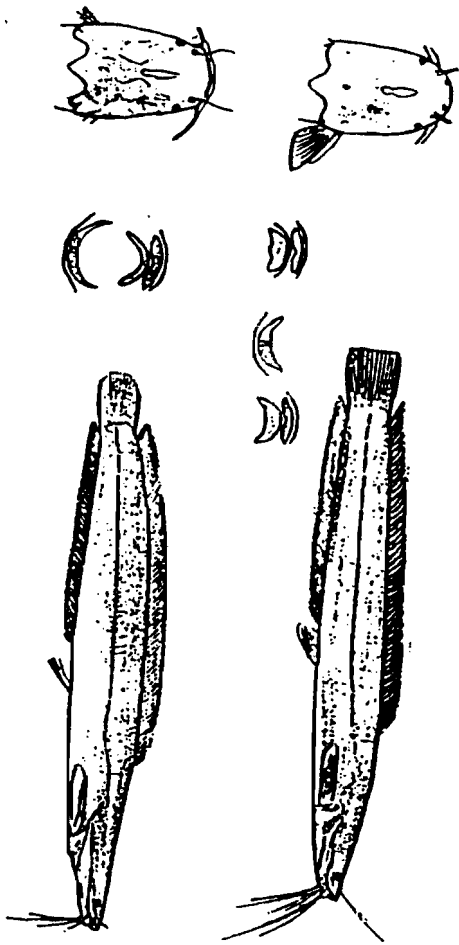
Figure 1: _Clarias lazera_ (top) head from above, oral & vomerine teeth and general shape. _Clarias anguillaris_ (bottom), head from above, oral & vomerine teeth and general shape.

Meristic and morphometric characters were analyzed separately as suggested by Ihssen et al. (1981) The significant difference of each morphometric and meristic character was considered at 5% and 1 % level.

Samples of both species were compared by the following methods:

I- Morphometric characters, were statistically analyzed by using analysis of covariance.

II- Meristic characters, were compared by using the analysis of variance.

A- Morphometric study:

In this study the total length and head length of fish were taken as independent variables and the other lengths as dependent ones. All measurements were taken to the nearest mm. The following morphometric measurements related to total length were: standard length, head length, pre-anal length, pre-dorsal length, pre-ventral length, distance between pectoral and ventral fin, distance between ventral and anal fin, length of dorsal fin and length of anal fin., whereas snout length, eye diameter, maxilla length, mandible length, interorbital width, head width, least depth of caudal peduncle, caudal peduncle length, mouth width, length of pectoral fin, length of ventral fin, length of caudal fin, maximum head depth, head depth passing through the middle of eye and distance between the end of eye to occipital process were related to the head length.

B- Meristic study:

The following meristic characters were taken:
(1) Number of rays in the dorsal fin.
(2) Number of rays in the anal fin.
(3) Number of rays in the pectoral fin.
(4) Total number of vertebrae.
(5) Number of gill rakers.

Before comparing the means of the various meristic characters for significant variation, consideration was given to the possibility that the number of meristic characters may be a function of the fish length. Therefore, for each meristic character, a correlation coefficient between the fish length and meristic characters was computed as suggested by Howard. (1954).

RESULTS

Morphometric characters:

Comparisons of the body proportions in total length of C. lazera and C. anguillaris are given in Table (1). It is clear that only three morphometric characters from nine show no difference between the two species. These are pre-dorsal length, pectoral to ventral fin distance and length of dorsal fin. Significant differences at 5% level are observed in pre-anal length and length of anal fin. Highly significant differences at 1% level are noticed in standard length, pre-ventral length, distance from the ventral to anal fin and head length.

Comparisons of the fifteen body proportions related to the head length are listed in Table (2). It is obvious that, four morphometric characters, interorbital width, head width, length of ventral fin and maximum head depth show no significant differences. Five morphometric characters, eye diameter, maxilla length, mandible length, mouth width and distance between the end eye to occipital process show significant differences at 5% level. Highly significant difference at 1% level is noticed in the following six morphometric characters: snout length, least depth of caudal peduncle, caudal peduncle length, length of pectoral fin, length of caudal fin and head depth passing through the middle of eye.

MERISTIC CHARACTERS:

Calculations of correlation coefficient between total length and the five meristic characters are given in Table (3). It is clear that, four meristic counts, anal fin rays, dorsal fin rays, pectoral fin rays and number of vertebrae show no significant differences whereas highly significant difference at 1% level is noticed in number of gill rakers. Therefore the number of gill rakers were analyzed by using analysis of covariance (Table 4). It is obvious that, number of gill rakers show significant difference at 5% level. On the other hand analysis of variance of the four meristic characters(number of vertebrae, dorsal fin rays, anal fin rays and pectoral fin rays) are given in Table (5). It is clear that, only the number of vertebrae from the four mentioned characters show significant difference.

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Table (1): Body proportions in total length of C. lazera and C. anguillaris.

Character Species	Mean	Range	Correlation coefficient (r)	Test of slope (FB)	Test of adjusted mean (FM)
In total length					
Standard length					
C.lazera	276.61	138 – 412	0.9996		
				0.03	18.53**
C.anguillaris	279.86	145 – 420	0.9998		
Pre—anal length					
C.Lazera	154.19	78 – 230	0.9988		
				5.31*	0.23
C.anguillaris	159.54	82 – 240	0.9979		
Pre—dorsal length					
C.lazera	95.09	50 – 140	0.9977		
				2.8	0.22
C.anguillaris	98.36	50 – 140	0.9954		
Pre—ventral length					
C.lazera	130.03	65 – 195	0.9975		
				0.01	8.42**
C.anguillaris	128.14	62 – 190	0.9992		
Pectoral to ventral fin					
C.lazera	74.48	34 – 120	0.9968		
				0.17	1.33
C.anguillaris	76.96	40 – 120	0.9980		
Ventral to anal fin					
C.lazera	28.58	14 – 42	0.9925		
				18.62**	7.21*
C.anguillaris	28.85	12 – 53	0.9747		
length of dorsal fin					
C.lazera	187.30	116 – 263	0.9981		
				3.81	0.06
C.anguillaris	182.07	99 – 270	0.9987		
length of anal fin					
C.lazera	122.85	71 – 175	0.9990		
				5.14*	3.23
C.angullaris	119.82	64 – 170	0.9980		
Head length					
C.lazera	78.99	43 – 115	0.9961		
				8.78**	0.17
C.anguillaris	79.3	42 – 115	0.9954		

* Significant at 5 % level   ** Significant at 1 % level

Table (2): Body proportion in head length of C. lazera and C. anguillaris.

Character species	Mean	Range	Correlation coefficient (r)	Test of slope (FB)	Test of adjusted mean (FM)
Snouth length					
C. lazera	22.22	15-30.5	0.9961		
				0.32	23.20**
C. anguillaris	21.28	14-29.5	0.9941		
Eye diameter					
C. lazera	5.21	4-6	0.927		
				0.16	5.48*
C. anguillaris	5.36	4-7	0.878		
Maxilla length					
C. lazera	32.50	23-42	0.9948		
				0.17	5.88*
C. anguillaris	32.07	21.43	0.9951		
Mandiable length					
C. lazera	29.48	20-40.5	0.9954		
				4.11*	5.00*
C. anguillaris	20.03	19-40	0.9938		
Interobital width					
C. lazera	29.81	20-41	0.9932		
				0.01	0.76
C. anguillaris	29.24	19-41	0.9947		
Head width					
C. lazera	47.35	33-66	0.9956		
				0.94	0.87
C. anguillaris	47.1	31-65	0.9962		
Least depth of caudal peduncle					
C. lazera	19.53	13-26.6	0.984		
				0.09	21.03**
C. anguillaris	18.59	11-26	0.9877		
Caudal peduncle length					
C. lazera	6.07	3-11	0.9194		
				1.15	10.98**
C. anguillaris	6.71	4-11	0.946		
Mouth width					
C. lazera	31.89	22-44	0.9859		
				0.22	6.54*
C. anguillaris	30.43	19-43	0.9926		

Table (2) Cont.

Character species	Mean	Range	Correlation coefficient (r)	Test of slope (FB)	Test of adjusted mean (FM)
Length of pectoral fin					
C. lazera	35.08	22-50	0.9908		
				4.00	28.60**
C. anguillaris	33.48	23-48	0.9917		
Length of ventral fin					
C. lazera	25.54	17-37.5	0.9874		
				1.19	1.20
C. anguillaris	25.23	17-34.5	0.9822		
Max. head depth					
C. lazera	25.62	20-35.5	0.9811		
				1.9	1.00
C. anguillaris	25.1	17-33	0.9901		
Head depth passing through the middle of eye					
C. lazera	13.98	10-19	0.9835		
				0.47	8.82**
C. anguillaris	13.33	10-18	0.9715		
Distance between end of eye to optical process					
C. lazera	49-68	31-70.5	0.9951		
				3.69	6.71*
C. anguillaris	48.84	31-68	0.995		

Table (3): Correlation coefficient between fish length and meristic characters C. lazera and C. anguillaris.

Characters	C. lazera		C. anguillaris	
	r	t-cal.	r	t-cal.
Anal fin rays	0.219	0.810	0.373	1.449
Dorsal fin rays	0.175	0.641	0.364	1.410
Pectoral fin rays	0.401	1.452	0.495	1.974
Vertebrae	0.254	0.872	0.430	1.506
Gill rakers	0.964	13.149**	0.948	11.192**

* Significant at 5% level   ** Significant at 1% level.

Table (4): Analysis of coveriance of gill raker counts of C. lazera and C. anguillaris.

Source of Variation	Degree of Freedom	Sum of Squares	Mean Square	F-cal.
Equality of Slopes	1	87.562	87.562	* 7.60
Residual Error	27	310.922	11.516	
Equality of Adj. mean	1	14.848	14.848	1.04
Residual Error	28	398.484	14.232	

* Significant at 5 % level.

Table (5): Analysis of variance in respect of meristic counts of C. lazera and C. anguillaris.

Meristic counts	Source of variation	Degree of freedom	Sum of squares	Mean square	F
Vertebrae	Between species	1	14.47	14.47	5.63*
	Within species	112	288.11	2.57	
Dorsal fin rays	Between species	1	0.15	0.15	0.01
	within species	131	1702.66	13	
Anal fin rays	Between species	1	4.11	4.11	0.46
	within species	127	1142.09	8.99	
Pectoral fin rays	between species	1	0.1	0.1	0.24
	within species	81	33.13	0.41	

* Significant at 5 % level.

DISCUSSION

In this study, statistical analysis for 24 morphometric and 5 meristic characters indicated that there are significant differences for 19 from 29 meristic and morphometric characters between the two catfish species Clarias lazera and Clarias anguillaris. This degree of morphological separation has been implied as a suitable criterion for distinguishing species (Smith 1973; Tood et al., 1981).

The present investigation gives significant differences in two meristic characters, number of vertebrae and number of gill rakers. The vertebral number is known to be influenced by environmental factors (Howard 1954; Lindsey and Arnason 1981). Gill raker number has long been used to study fish population structure because of its strong genetic basis (Howard 1954) . Although not immune to environmental modification (Lindsey, 1981 and Arnoson, 1981). These gill rakers differences probably affect genetic differences between the two catfish species. Thus the two meristic characters, vertebral number and gill raker number reflect the environmental and genetical variation between the two catfish species.

Some morphometric characters were found to show significant the variations at 1% level. These seem to be the best characters used to separate the two species. These are standard length, pre-ventral length, ventral to anal fin distance, head length, snout length, least depth of caudal peduncle, caudal peduncle length, pectoral fin length, caudal fin length and head depth passing through the middle of eye.

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