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Research Article

Morphometric characteristics of *Clarias garipeinus* from Lake Nubia (Sudan)

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Abstract

North African catfish *C. gariepinus* is of great commercial importance both in fisheries and aquaculture. In Sudan it is one of the most important species for over population control for tilapia *Oreochromis niloticus* farming . However this is one of the few detailed description of the north African catfish population in Sudan. The objective of the present work was to fill a gap in the knowledge on the African catfish by examining some morphometric characters.The material used to study morphometric characters consisted of 53 individuals collected from the commercial landings from Lake Nubia (Sudan), measuring from 90.0 to36.0 cm in total length (TL), the mean length being 56.37 cm. Taxonomic analysis involved 14 morphometric characters, including as well the relationships among them.

Keywords: *Clarias gariepinus*, morphometrics characters, commercial landings, Lake Nubia ,Sudan.

Introduction

C. *gariepinus* belong to the highest diversity of genus *Clarias*, the most genuses with 32 species, is found on the African continent (Legendre et al 1992) Some species, like *Clarias gariepinus* are of great commercial importance both in fisheries and aquaculture (Teugels,1986).

C. gariepinus has drawn attention of aquaculturists because of its biological attributes that include faster growth rate, resistance to diseases and possibility of high stocking density (Lal et al., 2003). It is native species of Africa and has an almost African distribution, and also naturally occurs in Minor Asia: Jordan, Israel, Lebanon, Syria and southern Turkey (Teugels,1986). This species has been introduced in Europe, America and south-east Asia for aquaculture purposes (Agnese et a., 1997).

In twenty countries aquaculture of this species is practiced with the total production of 3703 mt, out of which 94.7% is reported from four countries, the bulk of which is coming from the Netherlands (FAO, 2000). This species has been introduced in Europe, America and south-east Asia for aquaculture purposes. In Europe it was introduced in 1974 first in Cyprus and later in the Czech Republic, Slovakia and the Netherlands (Gavriloaie, and Chişamera, 2005).

The significance of the morphometric characteristics of this species is, due (especially in the Asian aquaculture) the hybrids of *C. gariepinus* with other species are cultured. Also, the closely related species like *C. anguillaris* or *C. macrocephalus* are cultured at a large scale, thus the detailed characteristics of the morphometric features may be needed to distinguish the different species and hybrids within the *Clarias* genus. Both hybrids of *C. gariepinus* and other species of *Clarias* in the close future are likely to be cultured all over the world (Nowak, 2088).

However the literature on its taxonomic status is still very scarce and the morphological characteristics of the species from the Sudanese fisheries is lacking.

The objective of the present work was to fill a gap in the knowledge on the north African catfish by examining in detail morphometric characters of *C. gariepinus* from River Nile waters (Lake Nubia).

Materials and Methods

Clarias gariepinus samples were collected in Elmorada fish market during February _ May 20011 All specimens were obtained from the catches of commercial landings from Wadi Halfa (Lake Nubia). In total, 53 specimens were collected 14 morphometric variables were studied in each specimen (Table 1). Morphometric measurements (cm) were taken from each specimen according to T e u g e l s (1986), total weight (g).

The lengths were converted to per cent fish standard length (SL) and fish head characters to per cent dorsal head length (HL).(Varvara et al ; 2001). The relations between different Metric characters were presented with their regression coefficients, slope (a) and coefficient of determination (R2).

All the data were subjected to statistical treatment involving standard deviation (SD), mean (M), standard error of the mean (m) and coefficient of variation (CV). coefficient of variation was statistically significant when it attained value of 10% (Przemysław; 2002)

Results

Total length Standard length Body depth, Length from tip of snout to first dorsal fin origin, Length from tip of snout to second dorsal fin origin, Length from tip of snout to pectoral fin insertion, Length from tip of snout to pelvic fin insertion, Length from tip of snout to anal fin origin, Pelvic fin length and Pectoral fin length are the most stable morphometric characters expressed as per cent of standard length in the whole sample (Table 2) whereas the most variable characters were those pertinent with the head are expressed as percent of head length(Table 2).

Table.3 shows the most stable morphometric characters expressed as per cent of standard length in the whole sample , were the total length, the preanal length and dorsal-fin base length, whereas the most variable characters were those pertinent with the head.

Discussion

The sample of fishes used in this study does not include juveniles or very small individuals, possibly due to the fishing gear size selectivity, or perhaps to the fishing depth and area, and therefore the estimated relations should be limited to the size range used in the estimation of the linear regression parameters (Petrakis and Stergiou 1995, Santos et al., 2002). Several authors have noted that it is particularly dangerous to extrapolate morphometric relations based on adult fish to fish larvae, younger or immature stages (Bagenal and Tesch 1978, Safran 1992).Moreover, given that the samples were collected during short period , the estimates should therefore be considered with caution (Petrakis and Stergiou 1995, Santos et al., 2002).

The catfish genus *Clarias* has a widespread distribution and is found in Africa and south-east Asia (Teugels 1996). The most important economically species, *C. gariepinus* has been introduced in Europe, America and south-east Asia for aquaculture purposes (Agnese et al., 1997). In 1997 the north African catfish was introduced to

Table 1. Morphometric variables.

No.	Name	Description
		Metric characters of the body
1	TL	Total length
2	S L	Standard length
3	BD	Body depth
4	PDL	Length from tip of snout to first dorsal fin origin (predorsal)
5	PPEL	Length from tip of snout to pectoral fin insertion (prepectoral)
6	PPL	Length from tip of snout to pelvic fin insertion(prepelvic)
7	PAL	Length from tip of snout to anal fin origin (preanal)
8	PvL	Pelvic fin length
9	PcL	Pectoral fin length
Metric characters of the head		
10	HL	Head length
11	DO	Diameter of orbit
12	IOL	Interorbital length
13	UJL	Upper jaw length
14	LJL	Lower jaw length

Table. 2 Metric characters of the sample studied, converted to per cent fish standard length and fish head characters to per cent head length.

Character and its symbol	Range	Mean ± Standard deviation	Standard deviation SD	Coefficient of variation CV
% of SL				
TL	108.64- 120.4 5	113.9 ± 2.61	2.61	2.29
HL	17.9 - 29.1	24.9± 2.39	2.392	9.61
BD	11.73 - 18.7	15.07 ±1.38	1.383	9.18
PDL	22.84- 44.69	33.457± 4.351	4.351	13.00
PPEL	13.95- 26.25	20.4± 2.423	2.423	11.88
PPL	30.0- 65.625	7.190 ±45.89	7.190	15.69
PAL	35.19- 75.94	54.12± 8.31	8.31	15.35
PvL	9.32 - 12.5	10.324 ±0.669	0.669	6.78
PcL	7.442 - 9.375	8.128±0.426	0.426	5.31
%of HL				
DO	- 1.2250.68 2	0.915± 0.116	0.116	12.68
IOL	4.65- 7.32	5.658± 0.526	0.526	9.30
UJL	4.88- 6.67	±0.4055.97	0.405	6.79
LJL	12.96- 21.25	17.16±1.56	1.56	9.11

Table 3. Relationship between the standard fish length and particular metric characters of *C. gariepinus* studied (P<0.05)

Character	Regression equation f(x)	R^2	R
TL	1.08 SL + 2.89	98.6	98.6
HL	0.115 SL + 6.38	78.2	78.8
BD	0.0838 SL + 3.17	87.9	87.7
PDL	0.0950 SL + 11.4	93.8	93.7
PPEL	0.0664 SL + 6.54	83.9	83.6
PPL	0.0793 SL + 18.0	93.6	93.4
PAL	0.0952 SL + 21.2	94.9	94.8
PvL	0.0779 SL + 1.20	95.8	95.8
PcL	0.0847 SL - 0.168	94.9	94.8
DO	0.00863 SL + 0.0261	72.5	72.00
IOL	0.0803 SL - 1.13	93.4	93.3
UJL	0.0686 SL - 0.425	94.2	94.1
LJL	0.0851 SL + 4.11	93.3	93.2

Table 4. Relationship between the head length and particular metric characters of *C. gariepinus* studied (P<0.05)

Character	Regression equation f(x)	R^2	R
DO	0.0700 hl - 0.392	80.9	80.5
IOL	0.513 hl - 3.36	64.6	63.9
UJL	0.489 hl - 2.94	81.2	80.9
LJL	0.644 hl + 0.543	90.6	90.4

Thailand and was successfully hybridized with *Clarias macrocephalus* for aquaculture (Nei 1978), so that the hybrids of *C. gariepinus* with other catfish species are also important economically . After Holčik (1991) and according to the Convention of European Wildlife and Natural Habitats (Gavriloaie & Chişamera , 2005) two clariid species are present in Europe: *C. gariepinus* and *C. Batrachus are* regarded as invasive species. More over population control of species at lower trophic levels (such a tilapia *Oreochromis niloticus*) by culture with predators, such as the north African (= Nile) catfish *C. gariepinus* has been practiced worldwide. The north African catfish is one of the most abundant and widely distributed fish in the river Nile and its tributaries, considered as the third important commercial fish in Egypt after tilapias and bagrids, cultivated under various systems (Tawwab 2005). Native Thai species of *Clarias* catfishes – *C. batrachus* and *C. gariepinus* which introduced to Thailand from Africa, can be easily distinguished by horizontal starch gel electrophoresis of allozymes(Nei 1978) .

Table 5. Comparative data on morphology of four north African catfish samples (in % of SL), from Turkey, Senegal from the heated water aquaculture, *Poland*, and the sample investigated in this study

Symbol of character	Turkey – Göksu Delta (Ergene et al 1998) n = 49			Senegal (Agnese et al1997) n = 49			heated water aquaculture, Poland Beata et al. (2010) n = 100			Present study , n = 53		
	Range	Mean	SD	Range	Mean	CV	Range	Mean	CV	Range	Mean	CV
TL (mm)	135–324	–	–	–	–	–	90–260	–	–	108.64-120.45	113.9 ± 2.61	2.29
% SL												
HL	20.80–32.50	28.90	2.04	30.8-32.9	31.6	0.6	28.2-35.8	31.0	3.3	17.9 - 29.1	24.9± 2.39	9.61
PPEL	15.30–31.54	21.46	2.23	22.7–25.9	23.9	0.8	22.1–26.6	24.4	3.8	13.95-26.25	20.4± 2.423	11.88
PDL	32.28–47.54	35.92	2.43	32.2–38.1	35.7	1.5	25.3–38.3	36.1	4.0	22.84-44.69	33.457± 4.351	13.00
PPL	21.41–54.16	45.75	4.86	46.1–51.4	48.8	1.8	43.8–54.2	47.5	3.0	30.0-65.625	7.190 ± 45.89	15.69
PAL	51.4–70.67	56.64	2.97	56.0–59.9	57.9	1.3	51.9–62.6	57.1	2.7	35.19-75.94	54.12± 8.31	15.35

The literature on the morphometric characters of the north African catfish in Sudan is very scarce, including as a rule characteristics only of few characters.

In the paper of Turan et al.,(2005) the study of *C. gariepinus* from the river systems of Turkey showed the significant linear correlations between all morphometric characters and the fish length and and the paper of Beata et al. (2010) the study of *C. Gariepinus* from the heated water aquaculture . The similar results were obtained in the present study. Table 5 shows a comparative data on the morphology of four samples (in % of standard length) of the north African catfish, from Senegal (Agnese et al., 1997), Turkey(Ergene et al., 1998)and (Beata et al., 2010). and this study. The catfishes from Sudan waters have a smaller head.

It is well known that morphometric characters can show high plasticity in response to differences in environmental conditions, such as food abundance and temperature (Turan et al., 2005). Also Turan et al., (2005) concluded, that such differences among the populations maybe related to different habitat characteristics, such as temperature, turbidity, food availability, water depth and flow, though it is a widely tolerant fish to extreme environmental conditions.

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