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NEOTYPE DESCRIPTION FOR THE AFRICAN CATFISH
CLARIAS GARIEPINUS (BURCHELL, 1822)
(PISCES: SILUROIDEI: CLARIIDAE)

by

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ABSTRACT

Skelton, Paul H. and Guy G. Teugels. 1992. Neotype description for the African catfish *Clarias gariepinus* (Burchell, 1822) (Pisces: Siluroidei: Clariidae). *Ichthyological Bulletin of the J.L.B. Smith Institute of Ichthyology*, No. 56, 7 pages.

A neotype for *Clarias gariepinus* (Burchell, 1822) is designated and described. Data from 41 specimens from the type locality are also presented. The geographical distribution of the species is discussed.

NEOTYPE DESCRIPTION FOR THE AFRICAN CATFISH *CLARIAS GARIEPINUS* (BURCHELL, 1822) (PISCES, SILUROIDEI, CLARIIDAE)

by

Paul H. Skelton¹ and Guy G. Teugels²

INTRODUCTION

Clarias gariepinus is one of the most widespread and well known African freshwater fish species. As a result of its extensive use in aquaculture in Africa and elsewhere, its economic importance has increased greatly in recent years. Burchell (1822: 424) originally described the species from the "Ky-Gariep" [Vaal] River under the name *Silurus* (*Heterobranchus*) *gariepinus*. He provides a vivid account of the capture of the specimen on which his original description is based, and subtly indicates that he ate the holotype:

"The two boys amused themselves in watching for fish, standing at the water's edge as motionless as herons. After patiently waiting for more than half an hour, one of the fishes came within their reach, and with unerring aim, was instantly pierced through with their hassagay. This is the fish that is already mentioned by the name of *plattekop* (Flat-head) a species of *Silurus*. It was nearly three feet long, entirely of a lead-color; but whitish underneath. The head was very broad and flat; the eyes pale yellow and extremely small; and the mouth was bearded with several very long strings. The skin was smooth, and, like that of an eel, without scales. The flesh was white, and in taste very much resembled the conger-eel, being rich and nutritious. ... Of this *Silurus* I completed two coloured drawings on the spot; of one of which, an engraving is given at the end of the chapter."

The original sketches of the specimen made by Burchell are held in the Africana Museum, Johannesburg (Fig. 1). There is no evidence to suggest that the specimen sketched and described was preserved, nor is there any indication of any *Clarias* species collected by Burchell in any museum fish collection.

Teugels (1982a; 1986) revised the genus *Clarias* on a Pan-African scale, and recognized only two valid species from some 28 nominal species considered by earlier authors in the subgenus *Clarias*, viz *C. anguillaris* (Linnaeus, 1758) and *C. gariepinus* (Burchell, 1822). The other nominal species were synonymised with one of these two species, or transferred to the genus *Dinotopterus* Boulenger, 1906, or to the rehabilitated *Clarias* subgenus (*Dinotopteroides*) Fowler, 1930.

In the interest of stability of nomenclature, and in view of the numerous and closely similar nominal species-group taxa, we designate and describe a neotype for *Silurus gariepinus*. New information on some synonyms of the species and its distribution is also presented.

METHODS

Measurements were taken according to the methods of Teugels (1986). The neotype and topotype material studied are deposited in the J.L.B. Smith Institute of Ichthyology. Lists of all other specimens examined are given in Teugels, (1986). Institutional abbreviations follow Leviton *et al.* (1985). Standard length is abbreviated as SL, head length as HL.

Clarias gariepinus

The neotype was collected from the vicinity where Burchell (1822) recorded the catching of a specimen on November 3rd, 1811 from which he made sketches and a description (see Introduction). The place where this occurred is probably site number 63 on map 4 in Mackay (1943). This site is labelled on Burchell's map as the "Second Hippopotamus Station" and by Mackay (1943) as "Hippopotamus Station [vicinity of Modderplaats]". The river is labelled on Burchell's map as the "Ky Gariep, Yellow R. or Vaal R." Burchell (1822: 391) explains the names of the river as follows: "The name Gariep, is now applied only to that part of the river below the confluence; while the branch which begins at the place where we were now stationed, is called the *Tky-gariep* or *Ky-gariep*, by the natives, and the *Vaal Rivier* by the Klaarwater Hottentots; which in English may here be rendered by *Yellow River*." The name Vaal River is currently used in both English and Afrikaans, and the early name *Ky-gariep* is no longer employed.

NEOTYPE (Fig. 2): RUSI 520, male, 600 mm SL. Vaal River, a tributary of the Orange River, at Smidtsdrift, above confluence with Riet River, Cape Province, South Africa (28°42' 10" S, 24°04' 29" E); collected by P.N.White and V.Yose, September, 1985.

TOPOTYPES: 41, all collected by P.N.White and V.Yose from same locality as neotype. RUSI 25175, 9 (411-610 mm SL), 11/9/1985; RUSI 25176, 7 (345-712 mm SL), 12/9/1985; RUSI 25177, 9 (446-1055 mm SL), 13/9/1985; RUSI 25178, 5 (486-743 mm SL), 14/9/1985; RUSI 25189, 6 (486-948 mm SL), 15/9/1985; RUSI 25180, 5 (488-654 mm SL), 16/9/1985.

DRY SKELETON: RUSI 25177, female, 506 mm SL, collected by P.N.White and V.Yose from the same locality as the neotype, 13 September, 1985.

DIAGNOSIS: A large-sized *Clarias* species with head length 3.1-3.5 times in SL; no adipose fin; pectoral fin spine serrated on outer (lateral) edge only; vomerine toothplate arched, narrow; teeth villiform; first gill arch with 24-110 closely set, slender, elongated gill-rakers. Dorsal fin rays 61-79; dorsal fin to caudal fin base distance less than 8% SL.

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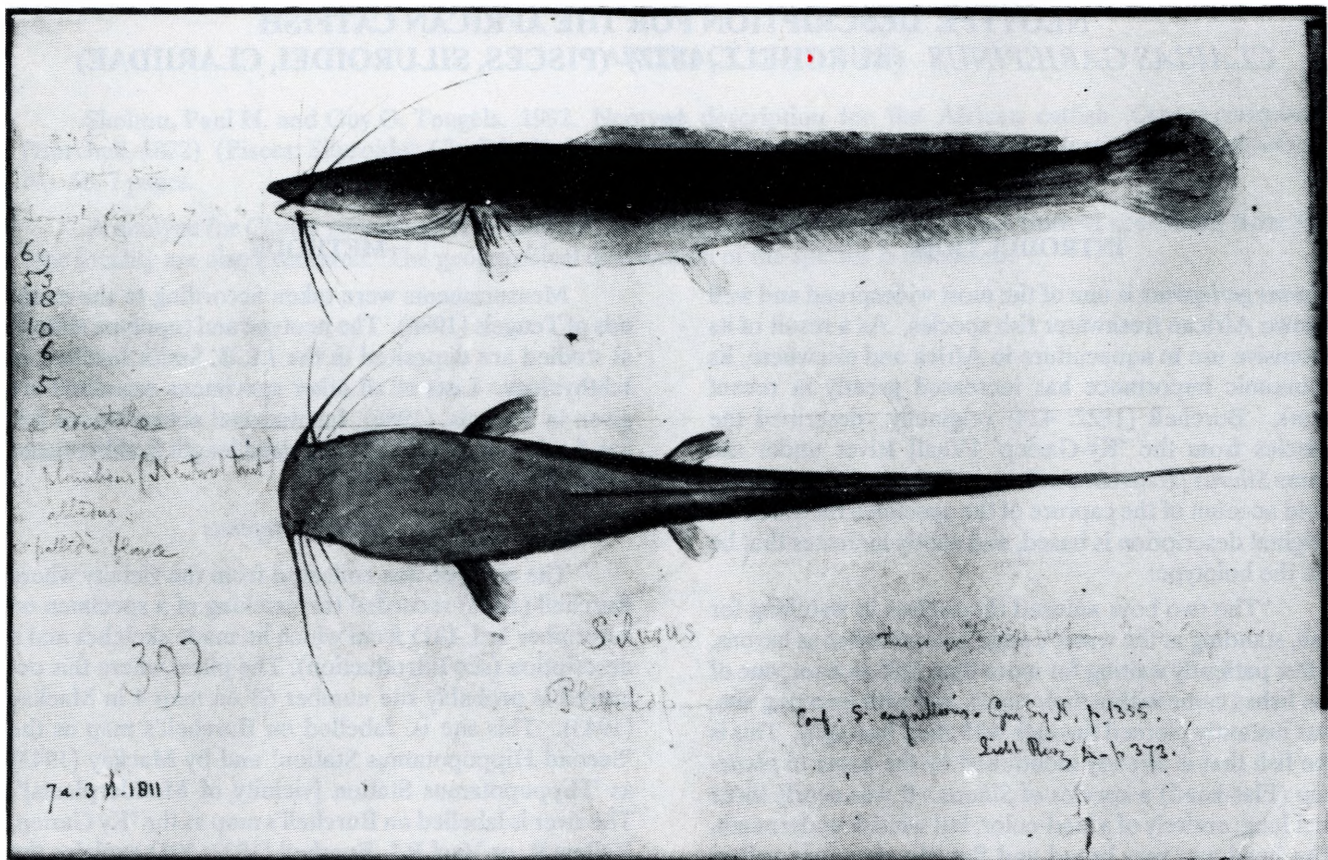


Figure 1. The original sketches of *Silurus (Heterobranchus) gariepinus* by W. Burchell, 3 November 1811. Courtesy of the Africana Museum, Johannesburg.

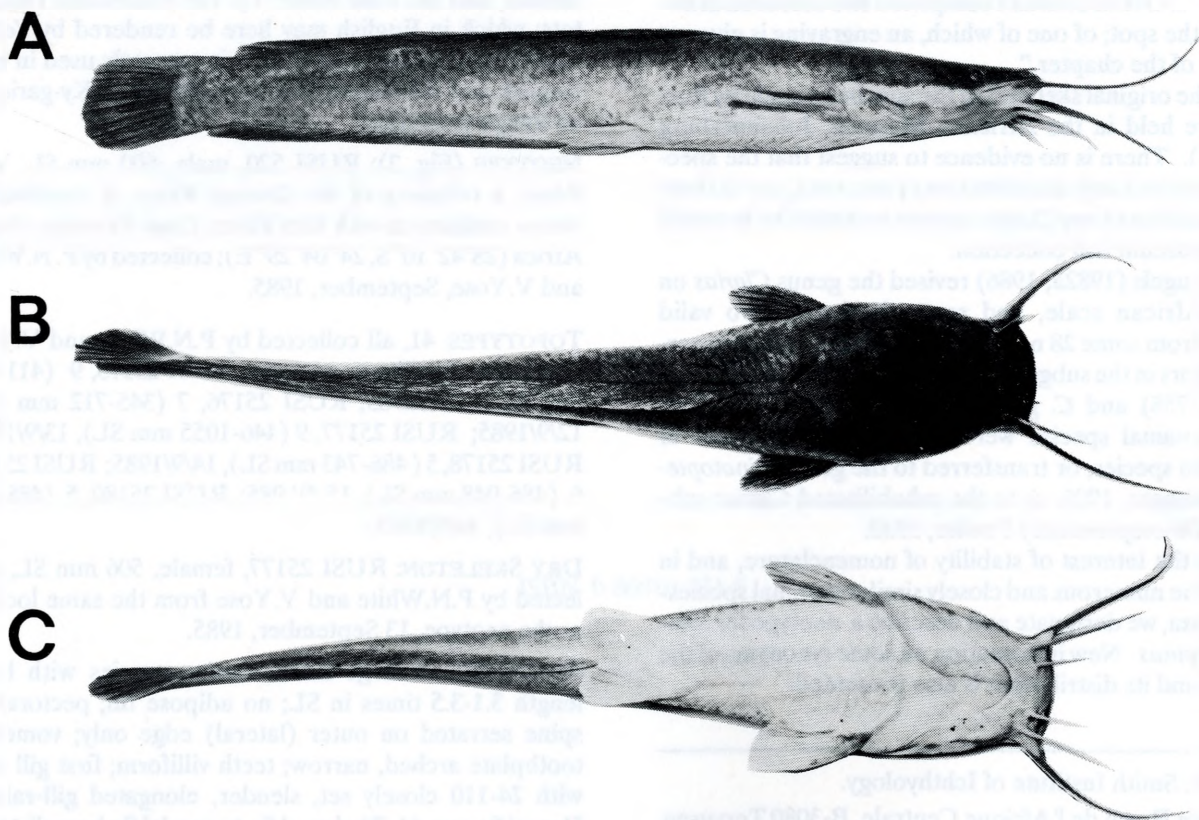


Figure 2. Neotype of *Silurus gariepinus* (Burchell, 1822). RUSI 520, SL 600 mm. A, lateral view; B, dorsal view; C, ventral view.

DESCRIPTION OF NEOTYPE: Measurements and counts of the neotype are given in Table 1. A frequency distribution of meristic data of the neotype and topotype series is given in Table 2.

Head length 3.4 times in SL, head depth 2.6 times in HL; head broadest across occipital region, the width 1.6 times in HL. Head generally depressed and rectangular in shape with snout width two thirds the maximum width; anterior end slightly curvilinear. Posterior dorsal margin of skull forms large bilateral scallops filled by epaxial musculature. Skull forms a casque of thick bony plates sculptured with bumps and grooves, giving the dorsal surface of head a rough texture. Frontal fontanel elongate, its anterior margin opposite the orbits. Supra-occipital fontanel small and round. Gular groove well-formed, U-shaped. Branchiostegal membranes free behind, separated by deep notch in the ventral midline; each extends laterally above anterior base of pectoral fins. Anterior rim of pectoral girdle (cleithrum) with a short notch and a large fleshy flap. Gill-rakers 87 (first arch, right side) long, slender and closely set.

Mouth terminal, broad, corners covered by velum from bases of maxillary barbels. Horizontal groove extends posteriad from corner of mouth to below orbit. Pre-maxillary toothplate gently curved, oblong, with numerous, fine, embedded, pointed teeth. Mandibular toothplates narrowly separated in midline, curved, slightly broader towards midline, numerous, fine, embedded, pointed teeth. Vomerine toothplate V-shaped, pointed posteriorly, with fine granular teeth. Snout length 4.5 times in HL. Eyes small, situated on supero-lateral edge of skull, about one fifth of HL from anterior end of head, dermal orbit free. Nostrils on anterior half of snout, widely separated; distance between anterior nares less than that between posterior nares; anterior nares form short tubules, posterior nares behind base of nasal barbels and protected by rim of skin. Four pairs of tapered flagella-like barbels: nasal barbels extend from anterior bases of posterior nares to behind the orbits; maxillary barbels stout at base, extending from corners of mouth past pectoral fin origin; inner mandibular barbels not reaching (in straight posterior direction) free edge of branchiostegal membrane, bases midway between midline and lateral edge of mouth on ventral surface of mandible; outer mandibular barbels reach free edge of branchiostegal membrane (in a direct posterior direction), each base behind and below corner of mouth.

Body behind head ovoid in transverse section, tapering and becoming strongly compressed caudad. Skin naked, smooth with superficial indications of myotomal blocks evident. Caudal peduncle short, relatively deep (depth 1.9 times caudal peduncle length), strongly compressed (width 5.6 times in depth). Body cavity extends to midway between tip of snout and base of caudal fin (end of hypurals). Anus and well developed conical genital papilla anterior to base of anal fin. Lateral line not clearly demarcated, complete, extends in straight line along mid-body to base of caudal fin; pores open from short ventral extensions off main canal; a series of 16 or 17 well-spaced secondary canals, evident as linear series of whitish pores, extend obliquely antero-dorsally at 80°

from the lateral line.

Occipital process triangular. Dorsal and anal fins soft rayed and covered in thick skin, separated by short gap from caudal fin. Dorsal fin origin distant by one fifth HL from head; anal fin origin closer to caudal base than to tip of snout. Caudal fin covered by fleshy skin. Pectoral fins obtusely pointed, extend to vertical at origin of dorsal fin; bony spine serrated on leading edge only. Pelvic fins paddle-shaped, reaching beyond origin of anal fin.

Colour (formalin fixed, propyl-alcohol preserved): marbled shades of grey and cream laterally and dorsally on body, dark grey on dorsal surface of head, median fins and the upper surface of pectoral and pelvic fins. Lighter grey band across base of caudal fin. Nasal and maxillary barbels grey, outer mandibular barbels grey on dorsal surface only, inner mandibular barbels cream. Ventral head, abdomen and paired fins creamy white, grey malar band on either side from below eyes to operculum. Boundary between creamy ventral and grey dorsal surfaces sharply drawn on head along line from post-oral groove across operculum to edge of branchiostegal membrane.

REMARKS

The number of gill-rakers on the first branchial arch serves to separate *Clarias gariepinus* from other *Clarias* species, including the closely similar *Clarias anguillaris* (Linnaeus). *Clarias gariepinus* have from 24 to 110 gill-rakers depending on the size of the specimens and to some extent the geographical location of the population (Teugels, 1986). In nine topotypes between 411 and 711 mm SL gill-rakers varied from 64 to 95. Given the relatively large size of these specimens their gill-raker numbers are relatively low on the range depicted on Teugels' (1986, Fig. 23) scattergraph, but do accord with the general trend of lower number of gill rakers in southern populations (Teugels, 1986).

As in other *Clarias* species the upper gill arches are modified for aerial respiration. The inner epibranchial gill filaments unite to form ribbed membranes (the so-called gill-fan) closing the ventral and anteroventral walls of the suprabranchial chamber. Arborescent suprabranchial organs, derived from the second and fourth epibranchs, branch to fill the suprabranchial chamber. The smaller anterior epibranch occupies the anterior third of suprabranchial chamber; the posterior epibranch fills the posterior two-thirds of the suprabranchial chamber.

The space between the dorsal and caudal fins varies between specimens. In the neotype and majority of topotypes this space is about equal to the distance between the origin of the dorsal fin and the head (see Fig. 2).

An adipose fin, as in *Clarias ngamensis* Castelnau, 1861 and *C. lamottei* Daget & Planquette, 1967, is absent. However in *C. gariepinus* a few pre-ural vertebrae (from 2-5 in the topotypes) do have extended neural spines.

DISTRIBUTION

The distribution of the *Clarias gariepinus* was not discussed in detail by Teugels (1986). Here we consider certain aspects of the distribution of the species. For convenience we will refer mainly to the ichthyofaunal provinces recognised by Roberts (1975). A summary of the distribution of *Clarias gariepinus* is given in Fig. 3.

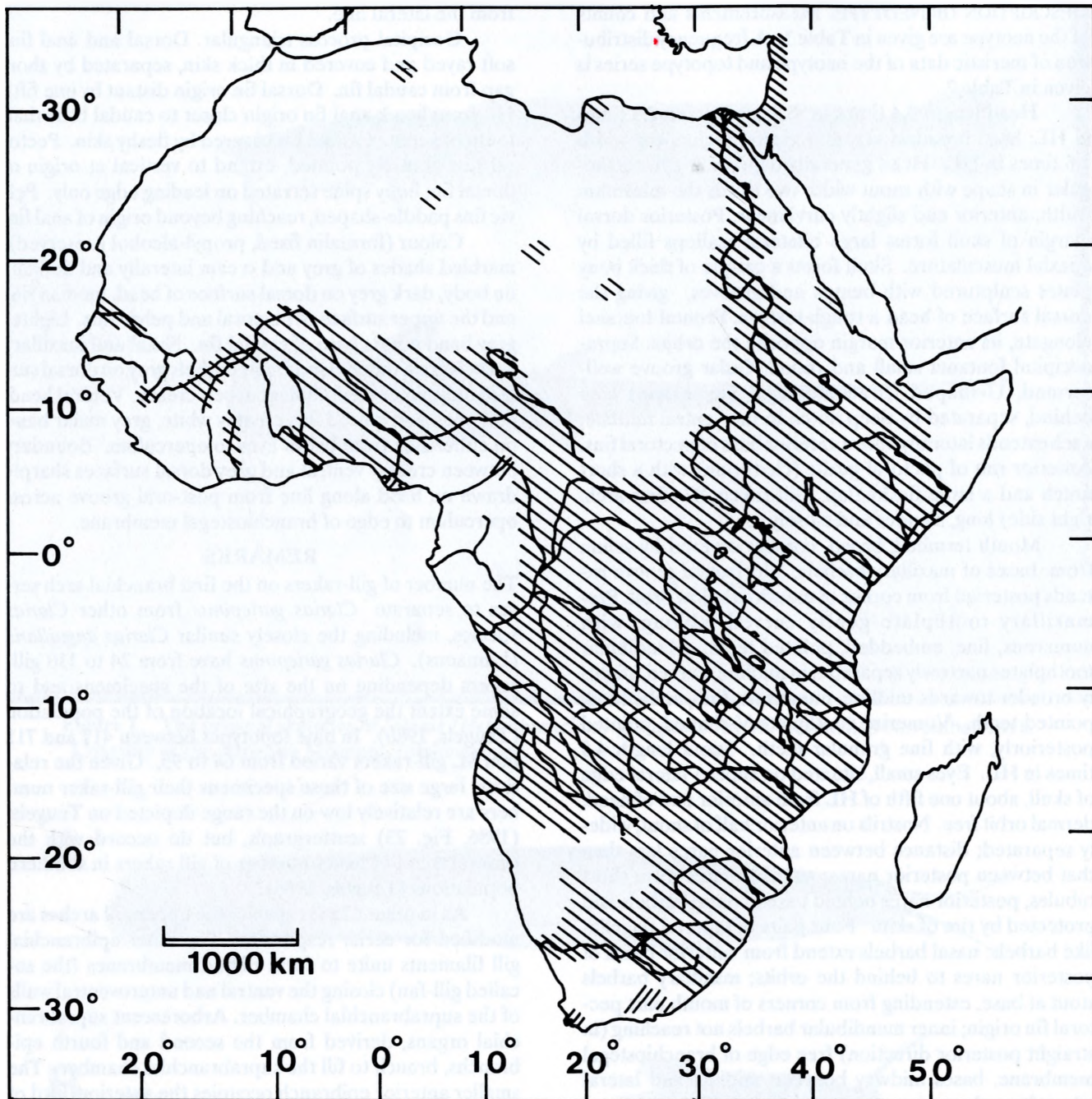


Figure 3. The distribution of *Clarias gariepinus* summarised from Teugels (1986), De Moor & Bruton (1988) and Skelton & Teugels (1991). T indicates type locality. Reversed cross hatching indicates introductions.

There are no records of the species from the Maghreb province, considered as the northern drainage of the Atlas Mountains. Lévêque (1990) records *C. gariepinus* from the southern divide of the Atlas Mountains as well as several populations in the Sahara which are considered relicts of a formerly more widespread Nilo-Sudanian fauna. Greenwood (1968) reported fossil *Clarias* remains from the Late Miocene of Tunisia. *Clarias gariepinus* is common throughout the Nilo-Sudanic Province which includes the basins of the Nile, Chad, Niger and the Sénégal rivers. The species has often been reported from the Chad Basin, and the records from northern Chad (Ennedi-Tibest) are considered as relicts (Lévêque, 1990) of a time when Lake Chad was far larger and the affluent

rivers more reliably connected.

Roberts (1975) included the Sassandra, the Bandama and the Comoe rivers (Ivory Coast) in the Nilo-Sudanic province. Howes & Teugels (1989) pointed out that the area indicated as the Baoule-V gap within the Sassandra-Bandama-Comoe region was formerly part of the tropical rain forest but has been replaced by savannah. *Clarias gariepinus* is characteristically a savannah species and its occurrence in this area would therefore not be surprising. There are unconfirmed reports of the species from man-made Lake Kossou on the Bandama River.

According to Poll (1973) the Gambia and the Sénégal rivers were formerly connected with the Niger River. *Clarias gariepinus* has only been reported from the

Gambia River by Johnels (1954), a record which is not confirmed by preserved specimens (Dr S.O. Kullander, NHRM, pers. comm.). From the Sénégal River, specimens are known only from the lower basin.

The species is essentially absent from rivers in the Upper and Lower Guinean Provinces. The river systems of the Lower Guinean Province are the coastal rivers of Cameroon and Gaboon situated between the Upper Cross River and the Chiloango system to the north of the the Zaïre mouth. *Clarias gariepinus* is present in the Chiloango area. Two specimens collected from the Djerem basin (Sanaga) in Cameroon are probably due to introduction from the Fisheries station at Yaounde (Southern Cameroon) of stocks originating from the Benue River (Northern Cameroon). A less likely alternative explanation is that they result from contacts between the Logone system and the Djerem system. Apart from these occurrences, the rarity of *Clarias gariepinus* in the Lower Guinean Province is probably related to its preference for savannah-type habitats which are uncommon in this area.

Clarias gariepinus occurs throughout the Zaïre Ichthyofaunal Province, but it appears to be mainly restricted to savannah areas. In particular, the species is abundant in the lower Zaïre, in the Malebo pool and in the upper Zaïre, including the Bangweulu and Moero lakes. In the middle Zaïre, this catfish is less common and is replaced by species with rain-forest ecological preferences.

Clarias gariepinus is found throughout the East Coast Province and also on Zanzibar Island. Its presence on Zanzibar may be natural, since the channel between the Wami River mouth and the island is less than 37 m deep, and Stockley (1937) considers that temporary sea level changes joined Zanzibar to the mainland in late Pleistocene and perhaps even more recent times. A possibility that the species was introduced by man has to be considered as well, although the oldest specimen preserved from Zanzibar dates from 1864 (BMNH 1864.2.10.7).

Clarias gariepinus is present in the Ethiopian or Abyssinian highlands, the Angolan coastal drainages north of the Cunene (the Quanza Province) and the the Zambezi Province. Skelton & Teugels (1991) provide details of its distribution in southern Africa based on museum records. Its southern-most natural distribution is the Orange River system in the West and the Umtamvuna River in the East. Recent translocations have extended the distribution range of the species to the coastal rivers of the eastern and south-western parts of the Cape Province (de Moor & Bruton, 1988).

Clarias gariepinus also occurs in Asia Minor. Specimens examined originate from the shore of the Dead Sea, near the mouth of the Zarka Main River in Jordan, from the Jordan Valley drainage in Jordan, from near Jaffa, from lakes Kinneret and Huleh (Israel) and from several localities on the Orontes River in Syria. Kosswig (1969) reported the species (as *Clarias lazera*) from various localities in southeastern Turkey (e.g. Lake Antiochia, Orontes basin) and one of the sources of the Ceyhan River, about 12 km south of Seyhan. The latter locality is, to our knowledge, the most northern distribution of *Clarias gariepinus*. According to Kosswig (1969) it is

likely that the species reached the modern Ceyhan by river capture.

DISCUSSION

As expected for a species with such a large distribution, there is much intraspecific variation in body proportions and counts (Teugels, 1986: Table 5, p 36). The barbels, for example, all show negative allometric growth: small specimens have relatively long barbels, while the barbel length decreases in larger specimens. In contrast to some other species (e.g. *Clarias stappersii* Boulenger, 1915 and *C. albopunctatus* Nichols & La Monte, 1953), *C. gariepinus* belongs to the group of species with relatively long barbels.

The frontal fontanel is long and small ("knife-shaped"): in specimens up to 20 cm TL, its anterior tip reaches to opposite the anterior border of the eyes; in specimens from about 30 cm TL, the anterior tip generally reaches to opposite the posterior border of the eyes.

In specimens up to 12 cm TL, the oval supraoccipital fontanel is partially situated on the occipital process; in larger specimens it occupies a more anterior position.

In small specimens (< 9 cm SL) the supraorbital and the 4th infraorbital (dermosphenotic or suprapreopercular bone of authors, e.g. Daget, 1964) are separated by a distinct gap; in larger fish they are sutured to the cranium.

The length of the vomerine toothplate decreases in specimens from north to south over the range of the species. Teugels (1986) reports a mean length of 5.9 % HL for the vomerine toothplate in specimens from north-east Africa, and in specimens from southern Africa 3.4 % HL (see also Teugels, 1982b). In all specimens examined, the premaxillary teeth are pointed. The vomerine teeth are generally granular to subgranular but in some specimens, throughout the distribution range, pointed teeth can be found at the tips of the vomerine band.

Two colour patterns are observed in living as well as in preserved specimens, a uniform and a marbled pattern. In the uniform pattern the dorsal surface and the flanks of the body and the dorsal parts of the pectoral and the pelvic fins are generally dark greyish-greenish black, while the belly and the ventral parts of the paired fins are pale. In the marbled pattern, characteristic of the neotype and topotypes, the specimens show irregular blotches on a light coloured background above and laterally.

Most specimens examined show a pigment band (malar stripe) on each side of the lower surface of the head. A series of light and dark bands may occur on the caudal fin; the basal third part of this fin is lightly coloured and the distal section is dark. Some specimens show irregular black spots on the caudal fin.

In living specimens the edges of the median fins are sometimes red. It seems likely that this colour in the fins is either ecophenotypical or a result of haemorrhage.

Details regarding the taxonomy of *C. gariepinus*, including various citations and synonyms, are given in Teugels (1986). A few additional comments on certain synonyms are in order here.

Clarias capensis Valenciennes, 1840 was described from a single specimen from the "Cape of Good Hope" in southern Africa. The type locality has sometimes been

queried, as no *Clarias* are found naturally south of the Orange and Umtamvuna rivers. In the early 19th century the term "Cape of Good Hope" was taken to be the entire southern African region occupied or explored by Europeans, including the Orange River, which is likely to have been the source of Valenciennes' specimen.

Valenciennes (1840) described the vomerine toothplate of *Clarias capensis* as consisting of two separate patches of teeth. The specific validity of this character has often been doubted, and various authors have accepted the synonymy of this nominal species with *C. gariepinus*, (e.g. Jubb, 1965, 1967). Teugels' (1982b) study of several hundred specimens shows that the shape of the vomerine toothplate varies with growth, hence it is not a reliable taxonomic character. The holotype of *C. capensis* (MNHN A.9431), a stuffed specimen, does not otherwise differ from *Clarias gariepinus*.

The synonymy of *Clarias mossambicus* Peters, 1852, also based on southern African specimens, has been discussed in detail by Teugels (1982b).

Clarias macracanthus Günther, 1864 was described from two specimens from the Nile (BMNH 1855.12.26.453 & BMNH 1862.6.17.51) where both *C. anguillaris* and *C. gariepinus* occur. These two species are separated on the basis of gill-raker number: *anguillaris* with 16 to 50 rakers, has fewer rakers at a given size than *gariepinus* (24 to 110) (Teugels, 1986). Boulenger (1901) synonymised *C. macracanthus* with *C. lazera*, which is now a junior synonym of *C. gariepinus* (Teugels, 1986). The number of gill rakers of the syntypes of *C. macracanthus* (95 for syntype 389 mm SL; 105 for syntype 503 mm SL) fall within the range of those for *C. gariepinus*, confirming this synonymy.

Twenty nominal species, described from specimens originating throughout tropical Africa and Asia Minor, are considered junior synonyms of *Clarias gariepinus* (Teugels, 1986). The conclusion that these 20 nominal species represent a single species ranging from the Cape Province of South Africa to Asia Minor was based on morphological and osteological observations. Recently, however, Ozouf-Costas *et al.* (1990) gave karyological data from three populations of *C. gariepinus* from the Ivory Coast, Central African Republic and Israel. The chromosome number (2N = 56) and the chromosome formula (males 8m + 24sm + 24a; females 8m + 25sm + 23a) are identical for all three populations, providing support for the taxonomic conclusion proposed by Teugels (1986).

ACKNOWLEDGEMENTS

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Table 1. Proportional measurements and counts of the neotype and topotypes of *Clarias gariepinus*

Measurement	Neotype	Topotypes (Range)
Total Length	685 mm	398 - 1194
Standard length	600 mm	345 - 1055
Proportions as % SL		
Head length	29.7	22 - 32
Predorsal	35.8	29 - 39
Preanal	54.2	50 - 59
Prepelvic	45.8	39 - 57
Dorsal fin	58.0	51 - 60
Anal fin	41.8	37 - 43
Pectoral fin	13.8	12 - 14
Pectoral spine	9.1	7 - 10
Pelvic fin	10.3	9 - 12
Caudal fin	13.4	
Dorsal to caudal fin	7.1	
Occip.process to dorsal fin	6.0	
Caudal peduncle length	4.4	
Caudal peduncle depth	8.3	7 - 9
Caudal peduncle width	1.5	
Body depth at anus	12.6	12 - 14
Proportions as % HL		
Head width	64.1	
Head depth	37.9	
Snout length	22.2	22 - 42
Interorbit	43.4	33 - 66
Orbit diameter	6.1	6 - 10
Inter-anterior nares	21.7	
Inter-posterior nares	31.9	
Ant. to post. naris	7.4	
Post. naris to orbit	9.3	
Nasal barbel	25.8	22 - 48
Maxillary barbel	80.9	33 - 109
Inner mandibular barbel	35.4	28 - 49
Outer mandibular barbel	57.3	46 - 78
Meristics		
Dorsal fin rays	72	64-76
Anal fin rays	62	48-59
Pectoral fin rays	I,11	I,10-11
Pelvic fin rays	i,5	i,5
Caudal fin rays	6 + (9 + 9) + 5	
Vertebrae	62 (W = 0; Pu1 + 1 = 1 unit)	59 - 63 (n = 7)
Abdominal vertebrae	19	16 - 21 (n = 6)
Caudal vertebrae	43	38 - 46 (n = 7)
Predorsal fin vertebrae	4	

Table 2. Counts of fin rays of the neotype and 41 topotypes of *Clarias gariepinus*

Dorsal fin rays												
64	65	66	67	68	69	70	71	72	73	74	75	76
2	-	2	4	4	6	5	5	5	4	2	2	1

Anal fin rays														
48	49	50	51	52	53	54	55	56	57	58	59	60	61	62
1	-	2	3	3	4	4	6	7	6	4	1	-	-	1

Pectoral fin rays		Pelvic fin rays	
I,10	I,11	i,5	i,6
33	9	28	14

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