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Fishes collected by the Zaïre River Expedition, 1974–75

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An annotated list of the fishes collected by the Zaïre River Expedition, October 1974 – January 1975, is presented, and five new species are described. The majority of the collections came from the River Lualaba and associated water bodies and provide new information on the distribution of the ichthyofauna in the Zaïre basin. A re-examination of the available geomorphological and zoogeographical evidence failed to substantiate the hypothesis that the upper Lualaba was formerly a tributary of the Nile.

KEY WORDS: – Zaïre – Lualaba River – Nile System – ichthyofauna – new species.

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INTRODUCTION

The Zaïre river (formerly the Congo) drains the largest expanse of lowland rain forest in Africa. Its catchment area lies between 7°N and 13°S and covers almost 4,000,000 sq km. This vast basin includes an extremely wide range of habitats; at the borders (especially in the southeast) there are small, cool, mountain streams, whilst through the lowest part of the basin flows the main river, sluggish and up to several kilometres in width. Between these two extremes there are swamps,

rapids, limpid jungle streams, muddy major tributaries, subterranean waters and shallow eutrophic lakes. As might be expected of a river basin offering such a wide variety of habitats its fish fauna is speciose, probably the most speciose in Africa. Poll (1973) considers there to be nearly 700 species in the Zaïre of which over 500 are endemic.

Within the basin, our knowledge of the distribution of fishes is poor and reflects little more than the distribution of the collectors. Large collections have been made and studied at only five sites; the rapids below Kinshasha (Roberts & Stewart, 1976), Stanley Pool (Pool Molebo) (Poll, 1959), Lake Tumba (Matthes, 1964), Yangambi (Poll & Gosse, 1963) and Upemba (Poll, 1976). The fishes in the rest of the system are known only from small, widely scattered collections. The incompleteness of the data presents great problems to zoogeographers. Questions yet to be answered relate to the validity of the apparently discontinuous distribution of certain species and to the specialized faunal assemblages. For example, the rapids below Kinshasha (Roberts & Stewart, 1976) and Pool Molebo (Poll, 1959) both have unique faunal assemblages but, as yet, it is not known whether similar assemblages occur in other rapids or river expansions elsewhere in the system. Similarly, the problems presented by the remarkable cichlids of the River Fwa (Poll, 1948) are not eased by the absence of collections from nearby localities.

A major gap in our knowledge was the distribution of fishes in the Lualaba (that part of the Zaïre upstream of Kisangani) where hardly any collecting had been done. The interest of the upper Lualaba in the context of fish distribution stems from Poll's (1963) argument that, as certain species of fish occur only in the upper Lualaba and the Nile system, the river was previously a tributary of the Nile and was later captured by the Zaïre at the Gates of Hell.

The Zaïre River Expedition (October 1974 – January 1975) provided us with a unique opportunity to collect fishes at many sites along the Lualaba. This paper gives an account of our collections and observations. Over 1250 fishes, collected at 52 sites, were brought back to England. One hundred and thirty-four species are represented; 5 are new and will be described below.

In the light of the information obtained, we have devoted the discussion to a re-examination of Poll's (1963) hypothesis that the upper Lualaba was formerly a tributary of the Nile.

METHODS

Fish sampling

Samples were obtained in a number of ways. The use of fleets of monofilament nylon gill nets (stretched mesh sizes, 20–120 mm) was supplemented, when appropriate, by bank seining. Occasional samples were caught by rod and line and a most effective method, especially in restricted habitats, was the use of an improvised mosquito-net seine. Additional collections of undamaged fishes were purchased from local fishermen.

Whenever possible, colour notes or photographs of fishes were made prior to their preservation in formalin.

Counts and measurements: abbreviations

The following abbreviations are used:

- Ab Length of the anterior barbel.
 BMNH British Museum (Natural History), register number.
 Cpd Least depth of the caudal peduncle.
 Cpl Length of the caudal peduncle.
 Cpsc Number of scales around the least circumference of the caudal peduncle.
 D Greatest depth of body.
 Dfin Length of the longest dorsal fin-ray.
 H Head length, from the tip of the snout to the posterior extremity of the opercular bone.
 I Horizontal diameter of the eye.
 IO Least bony interorbital width.
 LI Number of scales in the lateral line series. This count is taken from the first complete pore-bearing scale to the scale lateral to the hypural bones.
 MW Greatest width of the mouth.
 Pb Length of the posterior barbel.
 Pct Greatest length of the pectoral fin.
 s.d. Standard deviation.
 S-D Distance between a line perpendicular to the tip of the snout and the origin of the dorsal fin.
 SL Standard length.
 Snt Length of the snout, from the tip to the anterior border of the orbit.
 S-P Horizontal distance between a line perpendicular to the tip of the snout and the origin of the pelvic fins.
 UNP Upemba National Park.
 \bar{x} The mean.

The dorsal mid-line to lateral line scale count is taken from the scale immediately in front of the dorsal fin origin. The lateral line to ventral mid-line scale count is taken as that series that gives a mirror image of the dorsal mid-line to lateral line scale count.

For ostariophysans, the vertebral counts exclude the vertebrae comprising the Weberian mechanism and PU1 + U1.

THE COLLECTING SITES

The location of the main collecting sites in the River Lualaba and associated bodies of water are shown in Fig. 1. The full list is as follows.

The upper Lualaba and its tributaries above the Kamolondo Depression

1. River Lubudi at Kasofu, 9.x.1974, 10°03'S 24°45'E, altitude *c.* 860 m. The river was 40 m wide, <1.5 m deep, with clear water and moderate currents over a stony bed.
2. River Lufupa at Nasondoyo, 9.x.1974, 10°22'S 25°06'E, altitude *c.* 1050 m. The river was 25 m wide, <2 m deep, with clear water and moderate currents over a rocky bed.
3. River Lualaba, 11°20'S 25°30'E, altitude *c.* 1250 m.

4. Lake N'Zilo (Lac del Commune), 8.x.1974, 10°47'S 25°44'E, altitude 1200 m. The lake was formed by damming the Lualaba; it provides a water supply for the Kolwezi area.

The Upemba National Park

5. River Kalumengonga at the Kalumengonga Falls, 14.x.1974, 8°49'S 27°13'E, altitude 1800 m. The river was 6 m wide with deep pools widening into shallow rapids immediately above the falls. It had relatively cool water (19°C) with a pH of 7.0.
6. River Lufira at Kaswabilenga ferry, 15–18.x.1974, 8°49'S 26°43'E, altitude 680 m. The river was 60 m wide, deep and sluggish, with occasional rocks in the muddy bottom. About 1000 m below the ferry the river broke into extensive riffles over a stony bed. The water was warmer than at Site 5 (26°C), alkaline (pH 8.2) and brown in colour.
7. River Lufira at Kasanga ferry, 20–22.x.1974, 9°06'S 26°46'E, altitude 700 m. The river conditions were similar to those at site 6.
8. Kiwakizi caves, 18.x.1974, 9°09'S 27°12'E, altitude 1100 m. A small subterranean lake, c. 1 km from the cave entrance, was presumed to derive from the River Lukima to the south of the caves. Its visible dimensions were 16 × 12 m, the water was 1 m deep, relatively cool (22°C) and very clear.
9. River Kafwe at Mumbolo, 18.x.1974, 9°06'S 27°08'E, altitude 1700 m. The river was 4 m wide, <1.5 m deep, with a swift current.
10. River Lupiala, 20.x.1974, 8°38'S 26°53'E, altitude 1400 m. A tiny forest stream with small pools joined by miniature cascades. It had clear water over a rocky bed with considerable deposition of leaf litter in the pools.
11. River Muyé, 21.x.1974, 8°43'S 26°53'E, altitude 1400 m. A small open stream about 4 km from its source, with deep pools connected by miniature riffles.
12. River Munte, 23.x.1974, 8°43'S 26°51'E, altitude 1410 m. At the collecting site the river formed broken, shallow riffles of variable width, with stones and sand on the bottom.
13. River Munte, 23.x.1974, 1 km upstream from site 12. A deep pool in dense forest, with negligible flow and a thick layer of organic debris on the bottom.
14. River Zenze, about 500 m from its confluence with the River Lufira, 24.x.1974, 9°07'S 26°46'E, altitude 700 m. The river was 15 m wide, 1.5 m deep, clear and swiftly flowing over a stony bed.
15. Springs at Ganza, 21.x.1974, 9°14'S 26°42'E, altitude 860 m. Here, tiny trickles of water emerged from rocks to accumulate in a series of small, shallow, muddy pools. The water was green in colour, warm (35.5°C) and highly saline (>5000 mg l⁻¹ chloride).
16. River Lukoka at Ganza, 21.x.1974, just below site 15. The river was 10 m wide, <1 m deep with pools and riffles.

The River Lualaba from Mulongo to Kongolo

17. River Lualaba near Lake Mulenda, 8°45'S 26°01'E, altitude 600 m.
18. Lake Mulenda, 8°47'S 26°07'E, altitude 600 m. The collections were made between floating papyrus islands.
19. Lake Upemba, 8°36'S 26°20'E, altitude 585 m. The largest lake in the series. It is shallow, less than 3 m deep, eutrophic and enclosed by papyrus swamp.
20. Lake Kisale, 8°13'S 26°27'E, altitude 580 m.
21. Lake Zimbambo, 30.x.1974, 8°04'S 26°50'E, altitude 560 m. A shallow, swamp-enclosed lake, with blackish water overlying a thick organic ooze.
22. River Lualaba at Malemba Kulu, 30.x.1974, 8°02'S 26°48'E, altitude 560 m. The river was 150 m wide, deep and sluggish.

23. Lake Kabamba, at Mulongo, 28–29.x.1974, 7°51'S 27°00'E, altitude 550 m. The most northerly of the Upemba lakes; its waters were grey-black in colour, shallow and overlying a muddy bottom.

The River Lualaba from Mulongo to Konolo

24. River Lualaba, 3 km downstream from Mulongo, 25–30.x.1974, 7°49'S 26°58'E, altitude 550 m. The river was 200 m wide, deep and with moderate currents over a bed of silt and small stones. The water was grey-brown in colour with poor transparency. It had a pH of 8.0 and contained < 14 mg l⁻¹ calcium.
25. Lake Towe (L. Tomphwe), 1 km southeast of the Mayumba ferry, 2.xi.1974, 7°11'S 27°02'E, altitude 540 m. One of several small lakes in the flood plain of the River Lualaba, separated from it by a shallow levee. The lake was 2 m deep, grey-brown in colour, with a soft, muddy bottom and enclosed by a fringing reedswamp and lilies.
26. Confluence of the Rivers Lualaba and Luvua at Ankoro, 3–4.xi.1974, 6°45'S 26°57'E. The main river was c. 300 m wide, deep, with moderate currents; the Luvua was shallow, 1 m deep and braided by sand bars.
27. Confluence of the Rivers Lualaba and Lukuga at Kalenga Balima, 5–6.xi.1974, 5°39'S 26°55'E. Both rivers were fast flowing at this point. The Lukuga was highly mineralized (pH 8.7, < 21 mg l⁻¹ calcium, < 38 mg l⁻¹ magnesium) and grey-green in colour, in contrast to the Lualaba, which appeared to have changed very little in colour or chemical composition from site 24.
28. River Lukuga, about 2 km upstream from site 27.

The River Lualaba from the Gates of Hell to Kisangani

29. River Lualaba, 30 km below Kongolo, 9.xi.1974, 5°11'S 26°59'E.
30. River Lualaba, about 45 km below Kongolo, 10.xi.1974, 5°00'S 26°58'E.
31. Confluence of the Rivers Lualaba and Luama, 11.xi.1974, 4°46'S 26°53'E. The main river was c. 400 m wide, swiftly flowing over sand.
32. River Lualaba about 23 km above Kasongo, 11.xi.1974, 4°37'S 26°46'E. The collection was made in rapid water over rocks and stones at the bottom of a long cascade.
33. River Lualaba about 20 km above Nyangwe, 12.xi.1974, 4°24'S 26°25'E. The collection was made from sandbanks at the river's edge.
34. River Lualaba at Nyangwe, 13–14.xi.1974, 4°13'S 26°10'E. The river was 700 m wide, deep with moderate currents. The collections were made in a backwater between sandbanks, < 1.5 m deep, overlying muddy sand.
35. Small forest stream by Sciére village, 30 km southwest of Kindu, 3°10'S 25°49'E.
36. River Lualaba at Kindu, 16–20.xi.1974, 2°57'S 25°56'E, altitude 480 m. The river varied between 600 and 1000 m in width.
37. A marsh, 10 km southeast of Kindu, 13.xi.1974. Situated by the roadside, the marsh had open pools, < 1.5 m deep, with reddish-brown water.
38. Confluence of the Rivers Lualaba and Elila, 21.xi.1974, 2°44'S 25°52'E. The main river was about 1 km in width; the Elila was considerably narrower, < 200 m, with acidic water (pH 6.3). The collection was made between small islands in the main river.
39. River Lualaba at Monganga-Ilewa, 22.xi.1974, 2°17'S 25°47'E. The river was 700 m wide, very deep, with steep banks. Collections were made in sheltered water between islands.
40. River Lualaba about 28 km downstream from site 39, 22.xi.1974, 2°00'S 25°47'E.
41. Forest tributary of the River Lova, 6 km upstream from its confluence with the Lualaba, 24.xi.1974, 1°25'S 25°54'E. The water was brown in colour and acidic (pH 6.3).

42. River Lualaba at Lowa, 25.xi.1974, 1°23'S 25°51'E. The river was 1 km wide, very deep and fringed with reedswamp. The water was acidic (pH 6.3), brown in colour with poor transparency.
43. River Lualaba at Ubundu, 27.xi.1974, 0°22'S 25°26'E. The river was 1.5 km wide, very deep, blackish red in colour in the margins and brown in the centre.
44. River Lualaba at Bomanga village by the Tschungu rapids, 29.xi.1974, 0°17'S 25°30'E. Here, the river was very rocky with fast water and whirlpools. The collections came from palisade fish traps used by local fishermen at this point.
45. River Lualaba, 1 km downstream from site 44. Collections were made in relatively sluggish, inshore water.
46. Small tributary of the Lualaba at Songa, 30.xi.1974, 0°07'N 25°30'E. The stream was 3 m in width, <1 m deep with stony riffles and muddy pools. The water was slightly more highly mineralized than the main river, (<14 mg l⁻¹ calcium compared with <7 mg l⁻¹ calcium).
47. River Lualaba-Zaire at Kisangani, 4.xii.1974, 0°31'N 25°12'E. The river was c. 2 km wide, very deep and muddy brown in colour.

Miscellaneous localities

48. River Ituri at Nia-Nia (Nya-Nya) road bridge, 1°23'N 27°24'E.
49. River Isai, a tributary of the River Ituri at Babeki village, grid reference unknown.
50. River Zaire at Telephone Island near Kinshasha, 4°20'S 15°12'E.
51. River Zaire at Mwanza near Gombe-Matadi, 4°53'S 14°40'E.
52. Caves at Kanka near Mbanza-Ngungu (formerly Thysville), 5°18'S 14°50'E.

AN ANNOTATED LIST OF THE FISHES COLLECTED, WITH A DESCRIPTION OF FIVE NEW SPECIES

For each species, the site, standard lengths and British Museum (Natural History) registration numbers of the specimens collected are given, in that order.

Within each family, the genera and species are arranged alphabetically.

Family Polypteridae

Polypterus endlicheri congicus Boulenger, 1898

Site 26: SL 255 mm: 1975.6.20.1.

A further specimen was caught at site 31 but not retained.

Distribution. Upper and central Zaire basin.

Polypterus ornatipinnis Boulenger, 1902

Site 6: SL 410 mm: 1975.6.20.2.

Site 7: SL 250–440 mm: 1975.6.20.3–5; 1976.10.12.298.

Distribution. Upper and central Zaire basin.

Polypterus senegalus Cuvier, 1829

Site 20: SL 224 mm: 1975.6.20.11.

Site 21: SL 220 mm: 1975.6.20.12.

Site 22: SL 270 mm: 1975.6.20.9.

Site 24: SL 215 mm: 1975.6.20.10.

Site 25: SL 212, 215 mm: 1975.6.20.13,14.

Site 27: SL 255 mm: 1975.6.20.8.

Site 28: SL 215, 220 mm: 1975.6.20.6,7.

Further specimens up to 700 mm SL were caught at sites 31 and 39, but not retained.

Distribution. Widely distributed from West Africa to the River Nile and southwards into the Zaire basin (see discussion below).

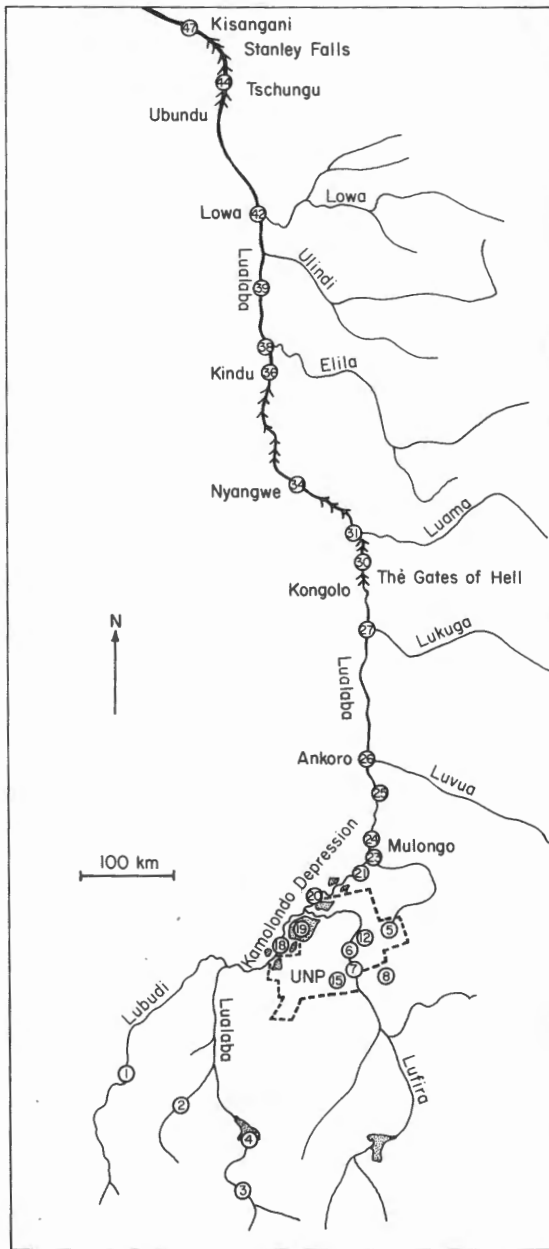


Figure 1. A map showing some of the more important collecting sites on the River Lualaba and associated bodies of water.

Specimens from the River Lualaba were given subspecific status (*Polypterus senegalus meridionalis*) by Poll (1942) who, at that time, was prevented from examining material from other localities. Subsequently, Daget (1948) was unable to corroborate the subspecific differentiation.

Family Clupeidae

Microthrissa royauxi Boulenger, 1902

Site 17: SL 44–55 mm: 1976.12.20.3–8.

Site 24: SL 55, 57 mm: 1976.12.20.1,2.

Distribution. Zaïre basin.

Odaxothrissa vittata Regan, 1917

Site 17: SL 48–66 mm: 1976.12.20.79–85.

Site 22: SL 74 mm: 1976.12.20.78.

Distribution. Zaïre basin.

Poecilothrissa congica Regan, 1917

Site 22: SL 52, 54 mm: 1976.12.20.26,27.

Site 24: SL 15–62 mm: 1976.12.20.9–24.

Site 30: SL 26–75 mm: 1976.12.20.42–77.

Site 44: SL 36–48 mm: 1976.12.20.28–41.

Site 48: SL 48 mm: 1976.12.20.25.

Distribution. Zaïre basin.

Potamothrissa obtusirostris (Boulenger, 1909)

Site 44: SL 53 mm: 1976.12.20.86.

Distribution. Upper Zaïre system.

Of the five clupeid species recorded from the upper Zaïre by Poll (1974), only *Potamothrissa acutirostris* (Boulenger) was not collected by the expedition.

Family Mormyridae

Brienomyrus tavernei Poll, 1972

Site 3: SL 145–153 mm: 1976.10.12.299–302.

Distribution. Upper Zaïre system (upper Lualaba river and Upemba National Park).

Although Poll (1976) regards this species as endemic to the River Lufira (UNP) he lists material from the upper Lualaba among the paratypes he examined.

Campylomormyrus mirus (Boulenger, 1898)

Site 27: SL 320 mm: 1975.6.20.15.

Distribution. Throughout the Zaïre basin.

Campylomormyrus rhynchophorus (Boulenger, 1898)

Site 43: SL 330 mm: 1975.6.20.16.

Site 44: SL 420 mm: 1975.6.20.17.

Site 48: SL 142 mm: 1975.6.20.18.

Distribution. Widespread in large rivers of the Zaïre basin.

Genyomyrus donnyi Boulenger, 1898

Site 44: SL 395 mm: 1975.8.15.241.

Distribution. Central and upper Zaïre basin.

Hippopotamyrus discorhynchus (Peters, 1852)

Site 18: SL 207 mm: 1975.6.20.21.

Site 31: SL 145 mm: 1975.6.20.24.

Site 44: SL 130, 226 mm: 1975.6.20.22,23.

Distribution. Upper Zaïre system, Lakes Tanganyika, Rukwa and Malawi, Zambezi system.

Hippopotamyrus macrops (Boulenger, 1909)

Site 26: SL 109 mm: 1976.10.12.1.

Site 34: SL 139 mm: 1975.6.20.47.

Distribution. Zaïre basin.

Hippopotamyrus psittacus (Boulenger, 1897)

Site 19: SL 162 mm: 1976.10.12.2.

Distribution. Zaïre basin, Nigeria.

Marcusenius greshoffi (Schilthuis, 1891)

Site 31: SL 82 mm : 1975.6.20.25.

Site 34: SL 105 mm : 1976.10.12.4.

Site 48: SL 145 mm : 1975.6.20.26.

Distribution. Central and upper Zaïre system.

Marcusenius macrolepidotus (Peters, 1852)

Site 25: SL 157 mm : 1975.6.20.27.

Site 31: SL 145, 160 mm : 1975.6.20.19,20.

Distribution. Zaïre basin and rivers of eastern Africa from the Tana to the Zambezi.

Marcusenius monteiri (Günther, 1873)

Site 17: SL 163 mm : 1975.6.20.28.

Site 51: SL 116 mm : 1976.12.6.1.

Distribution. Zaïre basin.

The specimen from site 51, an immature male, is referable to *M. monteiri* in all characteristics except in the depth of the body, which is shallower than in the larger specimen obtained.

Marcusenius stanleyanus (Boulenger, 1897)

Site 19: SL 185 mm : 1976.10.12.3.

Site 20: SL 215 mm : 1975.6.20.37.

Site 27: SL 275 mm : 1975.6.20.52.

Site 29: SL 205 mm : 1975.6.20.30.

Site 31: SL 95 mm : 1975.6.20.29.

Site 33: SL 112–115 mm : 1975.6.20.34–36.

Site 44: SL 310 mm : 1975.6.20.31.

Site 50: SL 135, 142 mm : 1975.6.20.32,33.

Distribution. Zaïre basin.

Mormyrops attenuatus Boulenger, 1898

Site 48: SL 230 mm : 1975.6.20.38.

Distribution. Central Zaïre basin.

Mormyrus caballus asinus Boulenger, 1920

Site 6: SL 330, 370 mm : 1975.6.20.39,40.

Distribution. Upper Zaïre system (Rivers Lufira and Luapula).

Mormyrus caballus lualabae Reizer, 1964

Site 27: SL 310 mm : 1975.6.20.51.

Distribution. Upper Zaïre system (River Lualaba).

The caudal peduncle of this specimen is deeper, relative to its length, than is the caudal peduncle in those specimens examined by Reizer (1964).

Mormyrus ovis Boulenger, 1898

Site 36: SL 185 mm : 1975.6.20.41.

Distribution. Central Zaïre basin. This record extends the known distribution of this species into the Lualaba.

Mormyrus rume proboscirostris Boulenger, 1898

Site 18: SL 260 mm : 1975.6.20.42.

Distribution. Zaïre basin.

Petrocephalus ballayi Sauvage, 1883

Site 36: SL 75 mm : 1976.10.12.128.

Site 44: SL 90 mm : 1975.6.20.43.

Distribution. Nigeria, Cameroons, lower and central Zaïre basin. This material extends the recorded distribution for this species into the Lualaba.

Petrocephalus sauvagei Boulenger, 1887

Site 34: SL 75–85 mm : 1975.6.20.44–46.

Distribution. Zaïre basin.

Pollimyrus plagiostoma (Boulenger, 1898)

Site 44: SL 135 mm : 1975.6.20.48.

Site 48: SL 102, 124 mm : 1975.6.20.49,50.

Distribution. Zaïre basin.

Family Kneriidae

Kneria katangae Poll, 1976

Site 12: SL 23–39 mm : 1976.10.20.116–137.

Site 13: 15–33 mm : 1976.10.20.1–115.

Distribution. Upper Zaïre basin (Upemba National Park).

Kneria wittei Poll, 1944

Site 10: SL 34–50 mm : 1976.10.20.142–160.

Site 11: SL 30, 46 mm : 1976.10.20.175,176.

Site 15: SL 29–35 mm : 1976.10.20.161–170.

Distribution. Upper Zaïre basin (Upemba National Park).

Family Characidae

We are aware that the genus *Alestes* as redefined by Boulenger (1909) is probably polyphyletic and we note that Poll (1976) has resurrected the genera *Myletes* and *Brycinus* to include *Alestes imberi* and *A. macrolepidotus* respectively. However, we consider that the characters used for this separation are gradal rather than cladistic features, and pending the completion of a full revision of the 'genus' we have retained the name *Alestes* for these species.

Alestes imberi Peters, 1852

Site 6: SL 131 mm : 1975.6.20.88.

Site 17: SL 91, 138 mm : 1975.6.20.84,85.

Site 18: SL 68 mm : 1975.6.20.74.

Site 25: SL 84–92 mm : 1975.6.20.119–122.

Site 26: SL 89 mm : 1975.6.20.163.

Site 27: SL 73–129 mm : 1975.6.20.71–73,107.

Site 28: SL 80, 86 mm : 1975.6.20.108,109.

Site 31: SL 81–130 mm : 1975.6.20.104–106.

Site 32: SL 73–87 mm : 1975.6.20.98–103; 1976.6.12.5.

Site 33: SL 34 mm : 1975.6.20.75.

Site 34: SL 89–127 mm : 1975.6.20.116–118.

Site 36: SL 70 mm : 1975.6.20.70.

Site 40: SL 61–74 mm : 1975.6.20.76–80.

Site 41: SL 40–85 mm : 1975.6.20.89–97.

Site 46: SL 77–82 mm : 1975.6.20.111–113.

Site 47: SL 76, 89 mm : 1975.6.20.86,87.

Site 48: SL 82,86 mm : 1975.6.20.81,82.

Site 50: SL 54 mm : 1975.6.20.83.

Distribution. Widespread in central and southern Africa.

Most specimens exhibit two separate dark marks on the sides of the body, a large blotch on the caudal peduncle and a small round spot originating two scales behind the operculum. In a variant condition (shown by some specimens among numbers 98–103 and 119–122), the caudal mark is smaller and linked by a conspicuous dark stripe to the shoulder spot, which starts four or five scales behind the operculum. Meristic counts are the same for both variants, but the striped fishes have a relatively greater interorbital width, and a shorter head and snout. The significance of these morphometric and colour differences is currently under investigation.

Alestes liebrechtii Boulenger, 1898

Distribution. West Africa, Chad, River Nile, Zaïre basin and River Zambezi.

Micralestes tualabae Poll, 1967

Site 24: SL 49–70 mm : 1975.6.20.199–208.

Site 30: SL 23–57 mm : 1976.10.12.12–15.

Distribution. Central and upper Zaïre basin.

Micralestes sardina Poll, 1938

Site 48: SL 49 mm : 1975.6.20.211.

Distribution. Central and upper Zaïre basin (Luapula catchment).

Micralestes stormsi Boulenger, 1902

Site 6: SL 48, 49 mm : 1975.6.20.209,210.

Site 33: SL all 34 mm : 1976.10.12.18,19.

Site 36: SL 54, 56 mm : 1976.10.12.16,17.

Distribution. Central and upper Zaïre basin.

Family Ichthyboridae

Eugnathichthys eetveldii Boulenger, 1898

Site 34: SL 158 mm : 1975.6.20.288.

Site 48: SL 138 mm : 1975.6.20.554.

Distribution. Central and upper Zaïre basin.

Eugnathichthys macroterolepsis Boulenger, 1899

Site 48: SL 80 mm : 1975.6.20.289.

Distribution. Central and upper Zaïre basin.

Ichthyoborus besse congolensis Giltay, 1930

Site 21: SL 122–155 mm : 1975.6.20.293,296–299.

Site 26: SL 133, 136 mm : 1975.6.20.291,292.

Site 28: SL 130 mm : 1975.6.20.295.

Site 34: SL 165 mm : 1975.6.20.294.

Site 50; SL 133 mm : 1975.6.20.290.

Distribution. Upper Zaïre basin. Specimen 290 from site 50 extends the known distribution of the species into the lower Zaïre basin. The significance of this record is discussed below.

Microstomatichthyoborus katangae David & Poll, 1937

Site 34: SL 34 mm : 1975.6.20.300.

Distribution. Upper Zaïre system.

Family Distichodontidae

Distichodus antonii Schilthuis, 1891

Site 20: SL 172 mm : 1975.6.20.233.

Site 28: SL 94 mm : 1975.6.20.234.

Site 31: SL 164, 166 mm : 1975.6.20.235,236.

Site 34: SL 69–120 mm : 1975.6.20.239–242.

Distribution. Zaïre basin.

Distichodus atroventralis Boulenger, 1898

Site 50: SL 114 mm : 1975.6.20.283.

Distribution. Lower Zaïre basin.

Distichodus fasciolatus Boulenger, 1898

Site 19: SL 108, 134 mm : 1975.6.20.249, 250.

Site 24: SL 65–166 mm : 1975.6.20.252–254.

Site 25: SL 74, 79 mm : 1975.6.20.246,247.

Site 28: SL 215 mm : 1975.6.20.255.

Site 31: SL 165 mm : 1975.6.20.245.

Site 32: SL 70–94 mm : 1975.6.20.256–263.

Site 39: SL 114 mm : 1975.6.20.251.

Site 48: SL 144, 194 mm : 1975.6.20.243,244.

Site 50: SL 127 mm : 1975.6.20.248.

Site 51: SL 88, 156 mm : 1975.6.20.237,238.

Distribution. Zaïre basin.

There are some marked differences in the preserved coloration of fishes in this sample. In all but five specimens there is a dark spot above the pectoral fin. In addition some fishes have a large dark spot on the caudal peduncle, prominent vertical bars on the body, black pelvic fins and a black edging to the anal fin. The modal counts of scale series and fin rays in the fishes with black pelvic fins are slightly higher than in the others but the samples are too small to attribute any significance to this correlation.

Distichodus lussusso Schilthuis, 1891

Site 6: SL 305 mm : 1975.6.20.264.

Site 26: SL 137 mm : 1975.6.20.265.

Site 28: SL 82 mm : 1975.6.20.272.

Site 34: SL 90, 100 mm : 1975.6.20.268,269.

Site 38: SL 79, 97 mm : 1975.6.20.266,267.

Site 48: SL 163 mm : 1975.6.20.273.

Site 50: SL 118 mm : 1975.6.20.271.

Site 51: SL 119 mm : 1975.6.20.270.

Distribution. Zaïre basin.

Distichodus maculatus Boulenger, 1898

Site 20: SL 192 mm : 1975.6.20.274.

Site 27: SL 102–122 mm : 1975.6.20.276–278.

Site 34: SL 103, 108 mm : 1975.6.20.279,280.

Site 36: SL 80 mm : 1975.6.20.286.

Site 39: SL 132 mm : 1975.6.20.275.

Distribution. Zaïre basin.

Distichodus sexfasciatus Boulenger, 1897

Site 26 : SL 353 mm : 1975.6.20.287.

Site 47: SL 86 mm : 1975.6.20.284.

Site 48: SL 138 mm : 1975.6.20.282.

Distribution. Zaïre basin.

Family Citharinidae

Citharinus congicus Boulenger, 1897

Site 24: SL 132 mm : 1975.6.20.212.

Site 34: SL 95–112 mm : 1975.6.20.213–216.

Distribution. Central and upper Zaïre basin.

Citharinus gibbosus Boulenger, 1899

Site 6: SL 175 mm : 1975.6.20.229.

Site 20: SL 138 mm : 1975.6.20.232.

Site 24: SL 185, 205 mm : 1975.6.20.228,699.

Site 25: SL 93, 108 mm : 1975.6.20.220,221.

Site 26: SL 53–112 mm : 1975.6.20.217,218,222,223.

Site 31: SL 92 mm : 1975.6.20.219.

Site 34: SL 80–95 mm : 1975.6.20.224–227.

Distribution. Central and upper Zaïre basin.

Citharinus macrolepis Boulenger, 1899

Site 25: SL 112 mm : 1975.6.20.230.

Site 43: SL 202 mm : 1975.6.20.231.

Distribution. Central and upper Zaïre basin.

Family Cyprinidae

Barbus candens Nichols & Griscom, 1917

Site 35: SL 12, 19 mm : 1975.6.20.439, 440.

Distribution. Central Zaïre basin. This specimen extends the recorded range into the Lualaba.

Barbus carens Boulenger, 1912

Site 46: SL 26, 32 mm : 1975.6.20.447, 448.

Distribution. West central Africa.

Barbus caudovittatus Boulenger, 1902

Site 1: SL 90 mm : 1975.6.20.444.

Site 14: SL 179, 212 mm : 1975.6.20.445, 446.

Site 16: SL 124, 151 mm : 1976.10.12.130, 131.

Site 46: SL 47–62 mm : 1975.6.20.441–443.

Distribution. Zaïre basin, Lake Tanganyika.

Barbus congicus Boulenger, 1899

Site 17: SL 29–38 mm : 1976.10.12.45–51.

Site 24: SL 20–23 mm : 1976.10.12.142–148.

Site 42: SL 29–33 mm : 1976.10.12.42–44.

Distribution. Zaïre basin.

Barbus eutaenia Boulenger, 1904

Site 8: SL 85 mm : 1976.10.12.99.

Site 9: SL 82–93 mm : 1975.6.20.449–455.

Site 16: SL 78–96 mm : 1975.6.20.456–460.

Distribution. Upper Zaïre basin, Lake Malawi, Zambezi basin and Transvaal.

Specimen 99 from the Kiwakizi caves (site 8) was similar in coloration to epigeal specimens and had presumably only recently entered the subterranean habitat.

***Barbus gestetneri* sp. nov.**

Holotype. The holotype, BMNH 1976.10.12.98, SL 249 mm, was caught by K. E. Banister on rod and line above the falls on the Kalumengonga river, Upemba National Park, Shaba, Zaïre (site 5).

Paratypes. A further twelve specimens, BMNH 1976.10.12.86–97, SL 104–229 mm, were caught in gill nets set by R. G. Bailey and R. Sweeting in the same locality.

Etymology. The specific name alludes to the boat 'David Gestetner' which was used by the fish team during the Zaïre River Expedition.

Description. Based on the thirteen specimens listed above.

	\bar{x}	s.d.	range
SL	—	—	104–249 (mm)
D	25.5	2.7	18.8–28.2
H	26.0	1.3	24.5–29.2
I	5.3	0.6	4.4–6.7
IO	7.0	0.9	5.7–8.4
MW	6.2	0.9	5.4–6.8
Pct	19.5	0.4	17.0–21.1
CPI	16.6	1.0	15.7–18.2
CPd	9.6	0.8	8.5–11.3
Snt	8.9	0.8	8.2–9.6
Ab	5.8	0.5	3.5–8.8
Pb	6.6	1.2	3.8–9.3
Dfin	23.7	1.5	19.6–29.8

All measurements are expressed as a percentage of the standard length.



Figure 2. *Barbus gestetneri*: the holotype.

The shape of the body can be seen in Fig. 2. The snout is long and conical in smaller fishes but somewhat more obtuse in larger specimens. The mouth is subterminal and markedly curved in ventral view. The lower lip is continuous (but without a mental lobe) or discontinuous medially. None of the specimens has a horny sheath on the lower jaw. Two pairs of barbels are present. The eye is superolateral in position. There are no tubercles on the head. The vertebrae number 17 + 19 (f2), 18 + 18 (f3), 18 + 19 (f2), 19 + 17 (f3), 19 + 18 (f2) or 20 + 17 (f1).

Fins. There are four simple rays in the dorsal fin (f13). The last is ossified to form a smooth spine. Its length shows negative allometry with the standard length, and in larger fishes, it becomes recurved distally. There are 8 (f12) or 9 (f1) branched dorsal rays. The origin of the pelvic fin is situated vertically below the second to fourth branched dorsal fin ray. The anal fin has 3 simple and 5 branched rays.

Squamation. In the lateral line series there are 36 (f5), 37 (f5), 38 (f2) or 39 (f1) scales. From the dorsal mid-line to the lateral line there are $6\frac{1}{2}$ (f3), or $5\frac{1}{2}$ (f10) scales, and between the lateral line and the ventral mid-line, $7\frac{1}{2}$ (f3), $6\frac{1}{2}$ (f3) or $5\frac{1}{2}$ (f4) scales in the specimens for which this count could be obtained. From the lateral line to the base of the pelvic fin there are 4 (f4), $3\frac{1}{2}$ (f6) or 3 (f3) rows of scales. The number of scales around the least circumference of the caudal peduncle varies considerably — 12 (f5), 14 (f5), 15 (f1) or 16 (f2). The scale striations are parallel and slightly sinuous (Fig. 3).

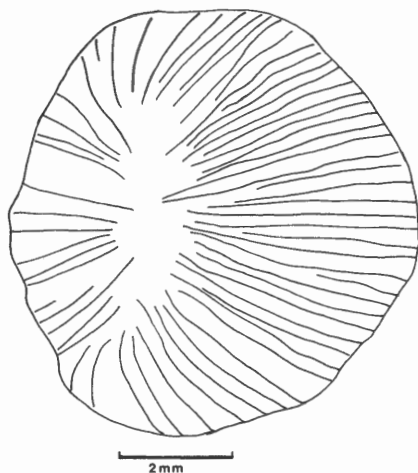


Figure 3. *Barbus gestetneri*, SL 168 mm: a scale to show the striations.

Pharyngeal bones and teeth. The pharyngeal teeth number 2.3.5–5.3.2 (f13); they, and the pharyngeal bone, do not differ significantly in shape from the example drawn in Fig. 4. *Gill rakers.* There are 8 (f5), 9 (f3), 10 (f3) or 11 (f1) gill rakers on the lower limb of the first gill arch. The gill rakers are simple in smaller fishes but become club-headed with lateral branches in larger specimens.

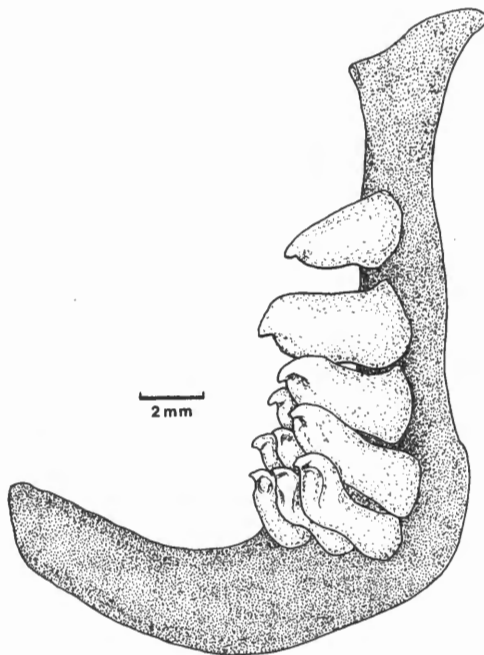


Figure 4. *Barbus gestetneri*, SL 225 mm: left pharyngeal bone.

Coloration. In freshly caught fishes the back was dark olive in colour, the flanks were silvery, but changed to salmon pink beneath the lateral line. The lateral line scales were dark, particularly on the caudal peduncle. The caudal fin was suffused with a dark red pigment. The iris was orange above and golden below the pupil.

Distribution. This species is known only from the type locality.

Diagnosis. *Barbus gestetneri* was caught in the company of *Varicorhinus upembensis* sp.nov. and *Barbus trachypterus* Boulenger. Although the coloration is very similar to that of *V. upembensis*, the presence of, modally, seven more lateral line scales and longer barbels in *B. gestetneri* will easily distinguish the two species. *Barbus trachypterus* has more gill rakers (11–16), fewer lateral line scales (27–31) and shorter barbels. *Barbus caudovittatus* Boulenger, which occurs in the same area, has a much weaker dorsal fin spine and fewer lateral line scales (24–30).

The affinities of *Barbus gestetneri* are unknown.

Barbus jansseni Poll, 1976

Site 24: SL 40 mm : 1976.10.12.228.

Distribution. Upper Zaïre basin (Kamolondo depression).

Barbus kamolondoensis Poll, 1938

Site 24: SL 47, 53 mm : 1976.10.12.167,168.

Distribution. Upper Zaïre basin (Kamolondo depression).

Our specimens and the holotype have scaled caudal fins, a character hitherto overlooked in this species.

Barbus lukusiensis David & Poll, 1937

Site 24: SL 34–46 mm : 1976.10.12.53–82.

Site 41: SL 35 mm : 1976.10.12.52.

Distribution. Upper Zaïre basin (River Lualaba).

All of our specimens have scales covering most of the caudal fin.

Barbus cf. *B. lukusiensis*

Site 30: SL all 33 mm : 1976.10.12.149–151.

Site 33: SL 29–33 mm : 1976.10.12.152–154.

There are two differences between these fishes and those referred to *B. lukusiensis* above; the apical mark on the dorsal fin is less intense and, more strikingly, both the upper and lower lips are dark orange-red in colour. The coloured lining of the lips can be peeled off in a strip and appears to be a superficial layer of pigmented skin rather than a 'horny' sheath of the sort found in the genus *Varicorhinus*. Because the gonad states of our specimens cannot be determined it is impossible to ascertain whether these differences are sexual characters of *B. lukusiensis*. However it may be noted that typical *B. lukusiensis* were not caught with the red-lipped fishes at sites 30 and 33, and that collections of *B. lukusiensis* from above and below these localities yielded no specimens with coloured lips.

Barbus mattozi Guimares, 1884

Site 3: SL 130, 150 mm : 1975.6.20.483,484.

Distribution. Angola, and the upper Zaïre, upper Zambezi and Limpopo systems.

Barbus paludinosus Peters, 1842

Site 3: SL 116 mm : 1975.6.20.485.

Site 9: SL 96–99 mm : 1975.6.20.489–491.

Distribution. Widely distributed from Ethiopia, southwards through East and Central Africa to Natal.

Barbus papilio sp.nov.

Holotype. A fish, SL 20.7 mm, BMNH 1976.10.12.255, caught in a forest stream at Sciére village (site 35) near Kindu, by Major M. Gallagher. The stream has no name but it is a tributary of the River Kasuku.

Paratypes. Two fishes, SL 16.7 and 19.8 mm, BMNH 1976.10.12.226,227, from the same locality.

Etymology. The specific name derives from the latin *papilio*, a butterfly, and alludes to the striking colour pattern, especially the dark fins.

Description. Based upon the three specimens listed above. The morphometric data for each specimen are given separately.

SL	20.7mm	19.8mm	16.7mm
D	34.8	33.3	33.6
H	26.6	28.3	30.0
I	9.7	9.5	8.4
IO	10.6	11.1	11.4
MW	6.8	6.6	6.0
Pct	18.8	20.7	19.3
CPl	24.2	21.7	24.6
CPd	15.4	17.2	16.2
Snt	5.8	6.1	6.0
Ab	—	—	—
Pb	+	+	+

All measurements are expressed as a percentage of the standard length.

The shape of the body is shown in Figs 5 and 6. The mouth is small, subterminal and horseshoe shaped in ventral view. The lips are covered with minute papillae. Only the posterior barbels are present and they are minute. The nasal capsule is rather unusual in that its anterior opening is greatly reduced and forms a thin tube with the distal opening

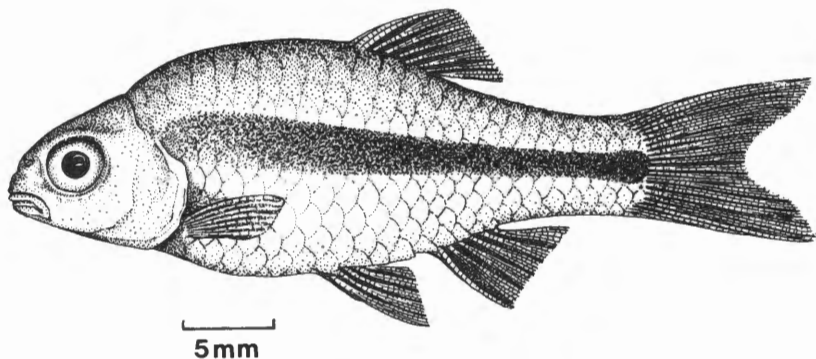


Figure 5. *Barbus papilio*: holotype. (Drawing by Mandy Holloway).

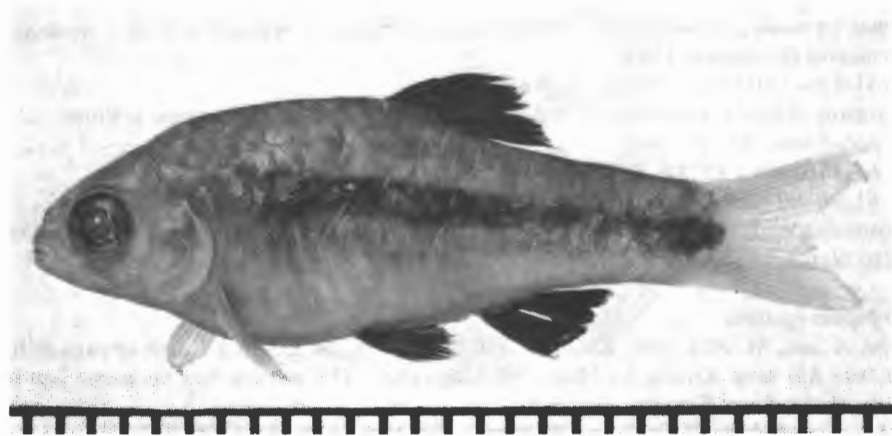


Figure 6. *Barbus papilio*: the holotype.

directed caudad (although the direction may be a *post mortem* artifact). The olfactory rosette is small with 11 or 12 thick folds. The larger paratype is a male approaching sexual maturity; the arrangement of the relatively large, white tubercles on its snout is shown in Fig. 7. The vertebrae number 10 + 17 (f1) or 11 + 17 (f2).

Fins. In the dorsal fin there are 3 simple and 7 branched rays. The last unbranched ray is slender, smooth, flexible and unossified. The anal fin has 3 simple and 5 branched rays. In the pectoral fin there are only 12 rays — a low number for the genus.

Squamation. There is a total lack of lateral line tubercles in all specimens. There are 22 (f1) or 23 (f2) scales in the lateral series. From the dorsal mid-line to the mid-lateral scale row there are $3\frac{1}{2}$ (f3) scales and from the mid-lateral row to the mid-ventral line $4\frac{1}{2}$ (f3) scales. Ten (f3) scales encircle the least circumference of the caudal peduncle. The striations on the scales are sparse and radiate (Fig. 8), but they are difficult to distinguish from the annuli.

Pharyngeal bones and teeth. The pharyngeal teeth number 2.3.4—4.3.2. The teeth are slender and sharply hooked. A composite drawing of the bone and teeth of the larger paratype is shown in Fig. 9.

Gill rakers. The gill rakers are minute and can only be seen after removal and desiccation of the gill arch. In the one specimen so treated, there are 6 simple gill rakers.

Coloration. The striking colour pattern of this species is shown in Figs 5 and 6. Not visible

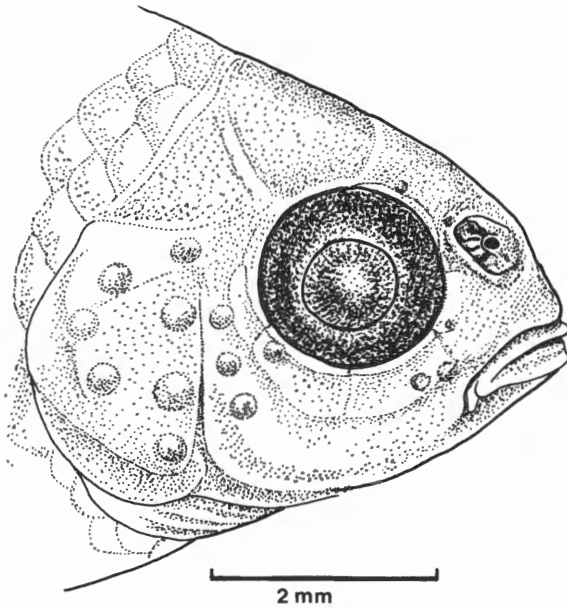


Figure 7. *Barbus papilio*: lateral view of the head of the larger paratype to show the nostril and the tubercles.

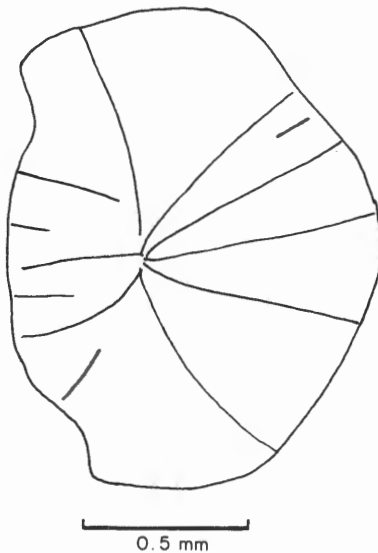


Figure 8. *Barbus papilio*: a scale to show the striations.

in lateral view is the small dark spot which overlies the supraoccipital bone. In life, the dark pigment was deep brown and the body colour was a pale sandy khaki. The caudal and pectoral fins are hyaline or but feebly pigmented.

Distribution. This species is known only from the type locality where it is syntopic with *Barbus candens*.

Diagnosis. *Barbus papilio* and two other dwarf barbids, *B. candens* Nichols & Griscom and *B. hulstaerti* Poll, share the following characters: striking colour pattern, small size, reduced

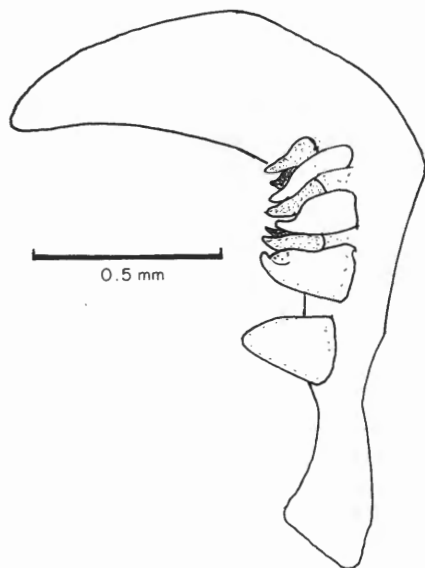


Figure 9. *Barbus papilio*: a composite drawing of the right pharyngeal bone of the larger paratype.

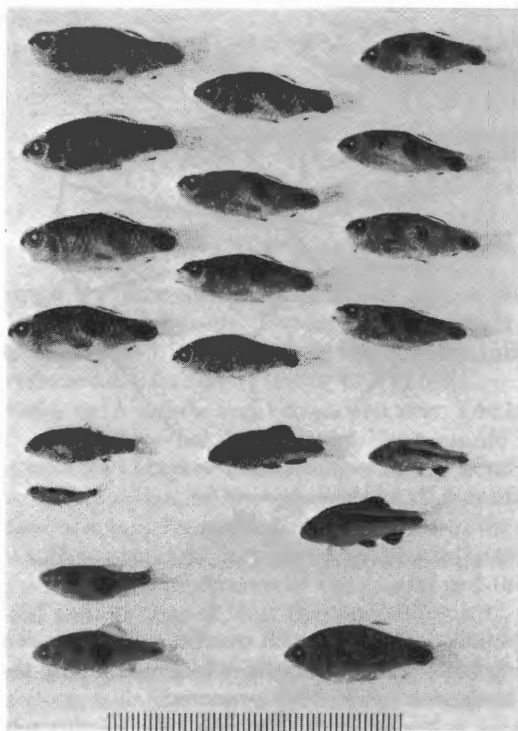


Figure 10. *Barbus candens*, paratypes (top four rows); *Barbus candens* from Kindu (centre left); *Barbus papilio*, paratypes and holotype (centre right); *Barbus hulstaerti*, syntypes (bottom left); *Barbus candens* holotype (bottom right).

anterior narial openings, great reduction or loss of lateral line tubules, low number of vertebrae and only 12 pectoral fin rays. *Barbus papilio* can be distinguished by its darkly pigmented dorsal, anal and pelvic fins and the presence of a dark lateral stripe (Fig. 10). The relationships among these dwarf species, or between them and their congeners, are unknown.

Barbus pleuropholis Boulenger, 1899

Site 46: SL 25–28 mm : 1975.6.20.461–473.

Distribution. Zaïre basin.

Barbus trachypterus Boulenger, 1915

Site 5: SL 104–165 mm : 1976.10.12.132–141.

Distribution. Upper Zaïre system.

Barilius lujae Boulenger, 1909

Site 26: SL 96 mm : 1975.6.20.419.

Site 27: SL 56–85 mm : 1975.6.20.407–418.

Site 30: SL 33–77 mm : 1975.6.20.422–428.

Site 32: SL 83–115 mm : 1975.6.20.429–433.

Site 40: SL 32, 45 mm : 1976.10.12.21,22.

Site 48: SL 81 mm : 1975.6.20.414.

Distribution. Lower and central Zaïre basin. Our collections extend the recorded distribution into the upper Zaïre system.

Barilius salmolucius Nichols & Griscom, 1917

Site 3: SL 86 mm : 1975.6.20.415.

Site 30: SL 67–113 mm : 1975.6.20.417,437,438.

Site 33: SL 79 mm : 1976.10.12.23.

Site 34: SL 71 mm : 1976.10.12.24.

Site 48: SL 107, 128 mm : 1975.6.20.420,421.

Distribution. Central Zaïre basin. Our collections extend the recorded distribution into the upper Zaïre system.

Barilius ubangensis Pellegrin, 1901

Site 16: SL 69 mm : 1975.6.20.416.

Distribution. Zaïre basin.

Barilius weynsii Boulenger, 1899

Site 32: SL 82–97 mm : 1975.6.20.434–436.

Site 33: SL 24–46 mm : 1976.10.12.25–40.

Site 41: SL 32 mm : 1976.10.12.41.

Site 48: SL 83 mm : 1975.6.20.418.

Distribution. Upper and central Zaïre basin.

Caecobarbus geertsi Boulenger, 1921

Site 52: SL 49–63 mm : 1975.6.20.492–495; 1976.10.12.304.

Distribution. Caves at Mbanza-Ngungu, lower Zaïre basin.

Chelaethiops elongatus Boulenger, 1899

Site 7: SL 33–53 mm : 1975.6.20.350–402.

Site 24: SL 52–61 mm : 1975.6.20.308–340.

Site 30: SL 39–57 mm : 1975.6.20.341–343.

Site 33: SL 34–54 mm : 1975.6.20.344–347.

Site 48: SL 58, 62 mm : 1975.6.20.348,349.

Distribution. Zaïre basin.

Labeo cf. *L. lukulae* Boulenger, 1902.

Site 7: SL 315 mm : 1975.6.20.496.

Distribution of *L. lukulae*. Zaïre basin and the Chad-Benue basin.

Labeo cyclorhynchus Boulenger, 1899

Site 41: SL 67 mm : 1975.6.20.551.

Site 50: SL 165 mm : 1976.6.15.1.

Distribution. Zaïre basin.

In life, specimen 551 (a juvenile) was strikingly coloured. The body had irregular dark violet blotches on a paler brownish violet background; the pectoral fins were reddish lilac and the pelvics brownish lilac in colour.

Labeo falcipinnis Boulenger, 1903

Site 7: SL 292 mm : 1975.6.20.542.

Site 29: SL 88 mm : 1975.6.20.499.

Distribution. Central and upper Zaïre basin.

Labeo greenii Boulenger, 1902

Site 47: SL 70, 108 mm : 1975.6.20.502,503.

Site 48: SL 187 mm : 1975.6.20.501.

Site 50: SL 117 mm : 1975.6.20.504.

Distribution. Central and lower Zaïre basin.

Labeo lineatus Boulenger, 1898

Site 27: SL 85, 235 mm : 1975.6.20.509,522.

Site 34: SL 94–145 mm : 1975.6.20.505–507.

Site 39: SL 101 mm : 1975.6.20.508.

Distribution. Zaïre basin.

Labeo longipinnis Boulenger, 1898

Site 7: SL 292 mm : 1975.6.20.542.

Site 24: SL 134 mm : 1975.6.20.549.

Site 27: SL 66–110 mm : 1975.6.20.545–547.

Site 31: SL 106, 132 mm : 1975.6.20.543,544.

Site 36: SL 114 mm : 1975.6.20.548.

Distribution. Central and upper Zaïre basin.

Labeo cf. *L. parvus* Boulenger, 1902

Site 16: SL 162, 180 mm : 1975.6.20.520,521.

Site 32: SL 110–124 mm : 1975.6.20.512–516.

Site 36: SL 108 mm : 1975.6.20.510.

Site 40: SL 60 mm : 1975.6.20.511.

Site 48: SL 113–126 mm : 1975.6.20.517–519.

Distribution. Zaïre basin, Angola.

Labeo weeksii Boulenger, 1909

Site 6: SL 270, 276 mm : 1975.6.20.540,541.

Site 24: SL 126 mm : 1975.6.20.527.

Site 26: SL 93–163 mm : 1975.6.20.530–537.

Site 31: SL 135 mm : 1975.6.20.529.

Site 32: SL 92 mm : 1975.6.20.526.

Site 33: SL 90 mm : 1975.6.20.525.

Site 34: SL 210 mm : 1975.6.20.539.

Site 40: SL 73 mm : 1975.6.20.523.

Site 47: SL 91 mm : 1975.6.20.528.

Site 50: SL 182 mm : 1975.6.20.538.

Distribution. Zaïre basin.

Specimen 539 is atypical in that the last simple and first branched rays in the dorsal fin are greatly elongated.

Labeo spp.

Site 2: SL 184–202 mm : 1975.6.20.498,552,553; 1976.10.12.300.

Two forms of *Labeo* are represented in this sample but it is currently impossible to refer them to known species.

Leptocypris modestus Boulenger, 1900

Site 24: SL 93 mm : 1975.6.20.404.

Site 32: SL 61 mm : 1975.6.20.403.

Site 43: SL 99 mm : 1975.6.20.405.

Distribution. Previously known only from the central Zaïre basin, our collections extend

the recorded distribution of the species into the River Lualaba as far upstream as the Kamolondo depression.

Varicorhinus lufupensis sp. nov.

Holotype. A fish, SL 194 mm, BMNH 1975.9.5.1. from Nasondoye, River Lufupa (site 2), Shaba, Zaïre.



Figure 11. *Varicorhinus lufupensis*: the holotype.

Paratype. A second fish, SL 177 mm, BMNH 1975.9.5.2, from the same locality.

Both specimens were purchased in fresh condition from local fishermen.

Description. Based on the two specimens listed above. The measurements, expressed as a percentage of the standard length, are as follows (holotype first).

D = 29.1,32.7; H = 19.9,22.0; I = 4.3,4.5; IO = 8.6,8.6; Mw = 6.5,6.4; Pct = 19.3,21.4; CPl = 15.7,17.5; CPd = 12.4,12.4; Snt = 6.8,7.6; Ab = 1.0,2.2; Pb = 1.5,2.2; Dfin = 22.3,22.0; S-D = 45.4,49.6; S-P = 50.5,52.0.

The body is compressed, with a flat or slightly convex natural profile. Its depth is noticeably greater than the head length. After preservation, the holotype has assumed a concave curvature in the vertical plane (Fig. 11). The snout is bluntly rounded and the rostral flap contacts the upper lip. The mouth is crescentic and the lower jaw has a sharp, horny cutting edge. Two pairs of barbels are present. Discrete, small tubercles, or their scars, are present on the cheeks and snout. The vertebrae number 18 + 17 in the holotype and 17 + 18 in the paratype.

Fins. There are four simple rays in the dorsal fin, the last of which is ossified and forms a stout, slightly curved, smooth spine. There are 9 or 10 branched rays, the longest of which are about half as long again as the spine. The dorsal margin of the fin is almost straight when the fin is erect. The vertical through the dorsal fin origin lies in front of the pelvic fin origin. The anal fin has 3 simple and 5 branched rays.

Squamation. In the lateral line series there are 25 or 26 scales. From the dorsal mid-line to the lateral line there are $3\frac{1}{2}$ scales, from the lateral line to the ventral mid-line there are $4\frac{1}{2}$ scales, and $2\frac{1}{2}$ between the lateral line and the base of the pelvic fin. Twelve scales encircle the least circumference of the caudal peduncle. The pattern of striations on the scales is shown in Fig. 12.

Pharyngeal bones and teeth. The pharyngeal teeth number 2.3.5–5.3.2. The teeth are small and closely packed. The anterior edentulous process of the pharyngeal bone is relatively short and thick (Fig. 13).

Gill rakers. There are 13 or 14 short, fine and curved gill rakers on the lower limb of the first gill arch.

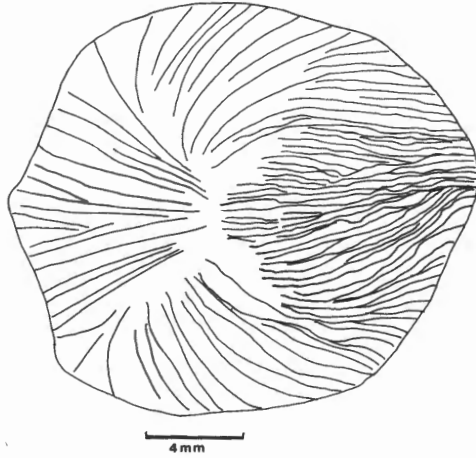


Figure 12. *Varicorhinus lufupensis*: a scale from the holotype to show the striations.

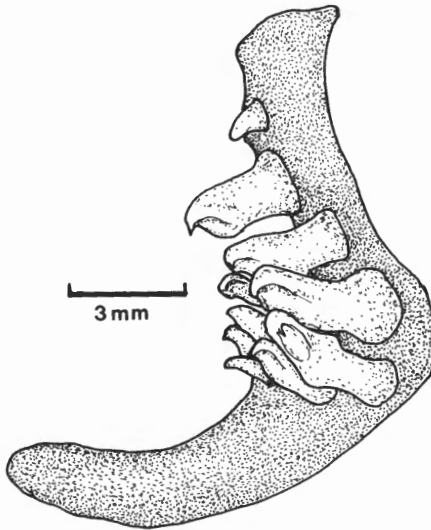


Figure 13. *Varicorhinus lufupensis*: the left pharyngeal bone of the paratype.

Coloration. In life this species has a brassy body, rather darker on the back than on the belly. The iris is red. The tubercles are pale grey and the fins are pale yellow brown. Preserved specimens are uniform brown in colour.

Distribution. This species is known only from the type locality. The River Lufupa lies to the west of the River Lualaba which it joins at the foot of the western edge of the Manyika plateau. Contact between the River Lufupa and Kasai to the west is possible, across a shallow swampy watershed.

Diagnosis. In its general body form this species most closely resembles *Varicorhinus macrolepidotus* Pellegrin. It can be distinguished by its shorter head ($\bar{x} = 21.0\%$ SL compared with 27.1 in *V. macrolepidotus*), longer caudal peduncle and the presence of an anterior pair of barbels. The only other *Varicorhinus* species currently known from the region should probably be referred to *V. macrolepidotus* (see below).

Varicorhinus sp. cf. *V. macrolepidotus* Pellegrin, 1928

Site 2: SL 164, 167 mm : 1975.9.5.3,4.

These specimens agree with *V. macrolepidotus* (which has not been recorded from the upper Lualaba) except in having a relatively shorter head (\bar{x} = 22.4% SL compared with 27.1).

The morphometric characteristics (expressed as a percentage of SL) and meristic counts of our specimens (specimen number 3 first) are as follows.

D=35.8,34.0; H=22.9,21.9; I=4.4,4.6; IO=10.0,10.9; MW=8.3,8.2; Pct=22.6, 23.0; CPI=14.2,12.9; CPd=13.8,13.1; Snt=8.1,7.8; Dfin=21.1,21.5; Ll=25 and 24; dorsal mid-line to Ll=3½ and 4½; Ll to ventral mid-line=4½; CPsc=12; GR=13 and 14; Dfin rays IV-10 and 12. The last simple ray of the dorsal fin is weak and flexible distally. Only the short posterior barbels are present. The shape of the snout and the size and distribution of the snout tubercles are as in *V. macrolepidotus*. The vertebrae number 17 + 18 and 16 + 18.

So far, all of the specimens of *V. macrolepidotus* that have been collected have come from the Kasai system and possibly the main Zaïre river below its junction with the Kasai. The watershed between the headwaters of the Kasai and Lualaba systems is low-lying and swampy in parts. It is possible that at some time in the past, this species has moved into the nearer tributaries of the upper Lualaba. However, for the time being, the specific allocation of our specimens must remain tentative, until more is known about the distribution and variability of *V. macrolepidotus* in this part of Zaïre.

These specimens can be distinguished from *V. lufupensis* by a deeper body, wider interorbital space, shorter caudal peduncle and the absence of anterior barbels.

Varicorhinus upembensis sp.nov.

Holotype. A fish, SL 195 mm, BMNH 1975.9.5.5, caught by K. E. Banister above the falls on the Kalumengonga River, Upemba National Park, Shaba, Zaïre, site 5.

Paratypes. A further 12 fishes, SL 102-203 mm, BMNH 1975.9.5.6-17, from the same locality.

Description. Based upon the 13 fishes listed above.

	\bar{x}	s.d.	range
SL	-	-	102 -203 (mm)
D	26.2	1.4	24.2- 29.8
H	23.3	1.6	20.6- 25.8
I	4.4	0.5	3.8- 5.4
IO	8.1	0.7	6.8- 9.2
MW	9.4	0.7	8.0- 10.7
Pct	19.9	0.9	18.3- 21.1
CPI	17.2	1.0	14.8- 18.6
CPd	9.5	0.4	8.8- 10.0
Snt	8.5	0.6	7.5- 9.7
Ab	1.0	0.3	0.5- 1.3
Pb	1.7	0.3	1.3- 2.1
Dfin	21.0	2.5	17.9- 26.2

All measurements are expressed as a percentage of the standard length.

The body is elongated and slightly compressed (Fig. 14). The snout is rounded, fleshy and protuberant in smaller fish (< c. 150 mm SL). A few, very small tubercles are present on the sides of the snout in four of the larger fish (SL 182 mm and above). The gonads of these, and a fifth large specimen, without tubercles, are in the early stages of maturation. Two pairs of short barbels are present. The mouth is ventral and the wide, anterior edge of the lower jaw is gently curved and covered with a sharp-edged, horny sheath. The vertebrae number 17 + 18 (f2), 17 + 19 (f6), 18 + 18 (f2), 18 + 19 (f1), 19 + 18 (f2).



Figure 14. *Varicorhinus upembensis*: the holotype.

Fins. The dorsal fin has four unbranched and 8 (f4) or 9 (f9) branched rays. The last unbranched ray forms a slightly curved, smooth, thin spine with persistent distal articulations. The dorsal margin of the fin is gently concave. The origin of the pelvic fins is vertically below the third or fourth branched dorsal fin-ray. The anal fin has 3 simple and 5 branched rays.

Squamation. In the lateral line series there are 29 (f7), 30 (f5) or 31 (f1) scales. From the dorsal mid-line to the lateral line there are $4\frac{1}{2}$ (f13) scale rows and from the lateral line to the ventral mid-line there are $4\frac{1}{2}$ (f6) or $5\frac{1}{2}$ (f7) rows. There are $2\frac{1}{2}$ (f7) or 3 (f6) scale rows from the lateral line to the base of the pelvic fin. Around the least circumference of the caudal peduncle there are 12 (f13) scales.

The scale striations are sinuous and more or less parallel. However, in larger fishes the striations begin to converge at the posterior edge of the scale (Fig. 15).

Pharyngeal bones and teeth. The pharyngeal bones are relatively short and thick, with crowded teeth (Fig. 16). The pharyngeal teeth number 2.3–5.3.2 (f13).

Gill rakers. On the lower limb of the anterior gill arch there are 13 (f1), 14 (f1), 15 (f3), 16 (f3), 17 (f4) or 18 (f1) slender, slightly curved gill rakers.

Coloration. In live fishes the back is a dark olive-blue, the flanks are silvery or may have a pale brassy sheen and the ventral surface is silvery with a salmon-pink iridescence. The scales of the lateral line, especially on the caudal peduncle, are darker than those of the row

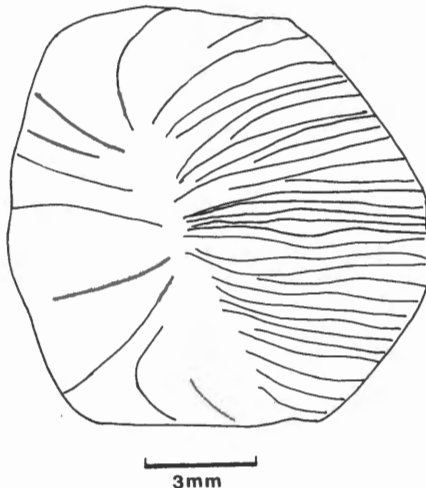


Figure 15. *Varicorhinus upembensis*, SL 198 mm: a scale to show the striations.

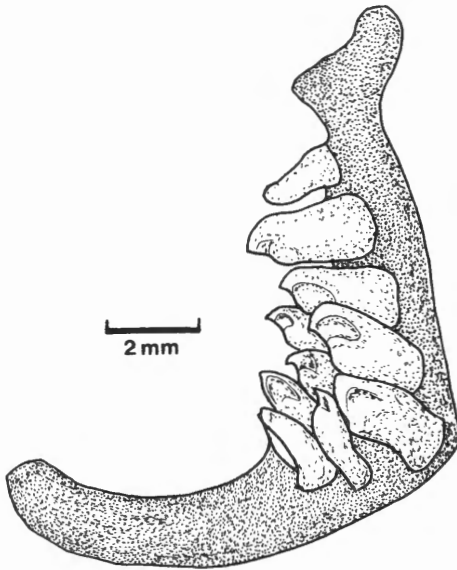


Figure 16. *Varicorhinus upembensis*, SL 198 mm: the left pharyngeal bone.

immediately above them. This dark band extends to about one and a half scale rows beneath the lateral line and on the caudal peduncle it extends on to the lower lobe of the caudal fin. The iris is golden below and orange above. The fins are dark red-brown except for the pectorals which are pale brown. In preserved specimens, the colours become a more uniform pale brown apart from the lateral band which, especially on the caudal peduncle, remains distinct.

Distribution. This species is known only from the type locality.

Diagnosis. *Varicorhinus upembensis* was caught in the company of *Barbus gestetneri* with which it shares a somewhat similar colour pattern. It is readily separable from *B. gestetneri*, however, by the wider mouth and horny sheath on the lower jaw, and, modally, seven fewer scales in the lateral line series.

Three other species of *Varicorhinus* are recorded from the Upemba region. *Varicorhinus iphthimostoma* Banister & Poll has longer barbels and fewer scales (25–26) in the lateral line series. *Varicorhinus altipinnis* Banister & Poll can be distinguished by its high dorsal fin, deep compressed body and many fewer scales (23–25) in the lateral line series. *Varicorhinus wittei* Banister & Poll has a much narrower mouth and 25–27 scales in the lateral line series.

The affinities of *Varicorhinus upembensis* are unknown.

Family Bagridae

Auchenoglanis occidentalis (Valenciennes, 1840)

Site 24: SL 300 mm : 1975.6.20.555.

Site 26: SL 150, 175 mm : 1975.6.20.557,558.

Site 27: SL 77 mm : 1975.6.20.556.

Distribution. Widespread, from West Africa and the River Nile southwards into central Africa.

A long-line fishery for this species was observed at Mulongo (site 24) and fishes up to 600 mm in length were seen on the landing beach.

Auchenoglanis punctatus Boulenger, 1902

Site 48: SL 142 mm : 1975.6.20.559.

Site 49: SL 168 mm : 1975.6.20.560.

Distribution. Lower and central Zaïre basin, Cameroons.

Bagrus ubangensis Boulenger, 1902

Site 36: SL 210 mm : 1975.6.20.564.

Site 48: SL 170 mm : 1975.6.20.565.

Distribution. Central and upper Zaïre basin.

Chrysichthys delhezi Boulenger, 1899

Site 6: SL 154, 205 mm : 1976.10.12.102,103.

Site 36: SL 127 mm : 1976.10.12.101.

Site 42: SL 205 mm : 1976.10.12.104.

Distribution. Central and upper Zaïre basin.

Chrysichthys habereri Steindachner, 1912

Site 48: SL 210 mm : 1975.6.20.561.

Distribution. Ja River, South Cameroons.

Chrysichthys longibarbis (Boulenger, 1898)

Site 44: SL 124, 173 mm : 1975.6.20.563; 1976.10.12.105.

Site 51: SL 132 mm : 1975.6.20.562.

Distribution. Lower and central Zaïre basin.

Chrysichthys thonneri Steindachner, 1912

Site 26: SL 82–143 mm : 1976.10.12.107–109.

Site 29: SL 135 mm : 1976.10.12.113.

Site 38: SL 100, 101 mm : 1976.10.12.110,111.

Site 50: SL 115 mm : 1976.10.12.112.

Distribution. Ja River, South Cameroons.

The inclusion of *Chrysichthys habereri* and *C. thonneri* in our collections has extended the recorded distribution of these species into the Zaïre basin. It must be noted however, that some difficulty was experienced with the identification of species in this genus, which at present are poorly defined.

Family Clariidae

Clarias buthupogon Sauvage, 1878

Site 36: SL 164 mm : 1975.6.20.597.

Distribution. Zaïre basin.

Clarias cf. *C. lazera* Valenciennes, 1840

Site 24: SL 300 mm : 1976.10.12.122.

Site 27: SL 54, 136 mm : 1975.6.20.598,599.

Site 51: SL 184 mm : 1975.6.20.600.

Distribution. From West Africa to the River Nile, Zaïre basin.

Clarias liocephalus Boulenger, 1898

Site 16: SL 118–242 : 1975.6.20.601–603.

Distribution. Zaïre basin, Lake Tanganyika.

Clarias spp. indet.

Site 8: SL 55–185 mm : 1976.10.12.123–127.

Site 48: SL 215 mm : 1975.6.20.604.

Site 49: SL 185 mm : 1976.10.12.121.

Species in the genus *Clarias* are poorly defined and it was impossible to identify material from these three collections. Specimens from the Kiwakizi caves (site 8) are pale grey in colour (probably a response to cave conditions) and the eyes are small and skin-covered. The teeth are fine and conical and the vomerine patch has a narrow crescentic shape.

Heterobranchius longifilis Valenciennes, 1840

Site 6: SL 436 mm : 1975.6.20.606.

Site 26: SL 134 mm : 1975.6.20.605.

Distribution. Widespread, West Africa, Nile, Zaïre and Zambezi basins, Lake Tanganyika.

Family Schilbeidae

Eutropius grenfelli Boulenger, 1900

Site 7: SL 240,275 mm : 1975.6.20.582; 1976.10.12.120.

Site 30: SL 139, 208 mm : 1975.6.20.583,584.

Site 39: SL 123 mm : 1975.6.20.585.

Site 41: SL 101 mm : 1976.10.12.119.

Site 44: SL 110, 148 mm : 1975.6.20.590,591.

Site 48: SL 126, 172 mm : 1975.6.20.588, 589.

Site 50: SL 160, 209 mm : 1975.6.20.586,587.

Distribution. Zaïre basin.

Parailia congica Boulenger, 1899

Site 18: SL 85, 90 mm : 1975.6.20.592,593.

Distribution. Central Zaïre basin, River Niger, West Africa.

Schilbe marmoratus Boulenger, 1911

Site 36: SL 136 mm : 1975.6.20.567.

Site 41: SL 97 mm : 1975.6.20.566.

Distribution. Central Zaïre basin (Sankuru River).

Schilbe mystus (Linn., 1762)

Site 19: SL 195 mm : 1975.6.20.568.

Site 24: SL 187 mm : 1975.6.20.571.

Site 26: SL 80–140 mm : 1975.6.20.572–576.

Site 28: SL 108–142 mm : 1975.6.20.577–581.

Site 34: SL 135 mm : 1975.6.20.569.

Site 50: SL 127 mm : 1975.6.20.570.

Distribution. Widespread, West Africa, Nile basin, East and Central Africa.

Boulenger (1916) distinguished *Schilbe marmoratus* from *S. mystus* by its mottled colouring, longer barbels and lack of a caudal peduncle. In our collections, some individuals of *S. mystus* have a colour pattern very like that of *S. marmoratus*, and the caudal peduncle is short and variable in both species. However, the maxillary barbel in *S. marmoratus* is about twice as long as it is in *S. mystus* of similar sizes (26.0, 28.2% compared with 13.9, 14.4% in SL), the head is shorter (20.7, 21.4% compared with 24.2% (f2) in SL) and the snout is more rounded in dorsal view.

Family Mochokidae

Atopochilus christyi Boulenger, 1920

Site 48: SL 68 mm : 1975.6.20.595.

Distribution. Zaïre basin (Pool Malebo).

Euchilichthys guentheri (Schilthuis, 1891)

Site 44: SL 195 mm : 1975.6.20.596.

Distribution. Central and upper Zaïre basin (Luapula-Mweru).

Synodontis acanthomias Boulenger, 1899

Site 6: SL 222 mm : 1975.6.20.608.

Site 44: SL 256 mm : 1975.6.20.607.

Site 50: SL 197 mm : 1975.6.20.647.

Site 51: SL 216 mm : 1975.6.20.609.

Distribution. Zaïre basin.

Specimen 647 differs from the others in having a relatively smaller eye and only a single prickle on the humeral process. Poll (1971: 285) notes that in this species the first prickle develops at about SL 130 mm and that above this size the number increases.

Synodontis alberti Schilthuis, 1891

Site 19: SL 182 mm : 1975.6.20.616.

Site 24: SL 110–129 mm : 1975.6.20.618–620.

Site 26: SL 113 mm : 1975.6.20.615.

Site 34: SL 65–85 mm : 1975.6.20.611–614.

Site 36: SL 109 mm : 1975.6.20.621.

Site 38: SL 77 mm : 1975.6.20.617.

Site 51: SL 65 mm : 1975.6.20.610.

Distribution. Zaïre basin.

Synodontis congicus Poll, 1971

Site 20: SL 184 mm : 1975.6.20.625.

Site 24: SL 116–136 mm : 1975.6.20.622–624.

Distribution. Zaïre basin.

Synodontis decorus Boulenger, 1899

Site 6: SL 194 mm : 1975.6.20.627.

Site 44: SL 174 mm : 1975.6.20.626.

Distribution. Zaïre basin.

In coloration both specimens have three chevrons on the caudal fin but specimen 627 is unusual in having four bold, dark, horizontal stripes on the body. Poll (1971: 294) records large spots as the common body colour pattern for this species.

Synodontis greshoffi Schilthuis, 1891

Site 31: SL 132 mm : 1975.6.20.629.

Site 48: SL 108 mm : 1975.6.20.628.

Distribution. Zaïre basin.

Synodontis notatus Vaillant, 1893

Site 18: SL 177 mm : 1975.6.20.630.

Site 26: SL 73 mm : 1975.6.20.631.

Site 31: SL 190 mm : 1975.6.20.634.

Site 34: SL 112 mm : 1975.6.20.633.

Site 51: SL 75, 124 mm : 1975.6.20.632,635.

Distribution. Zaïre basin.

The number of large dark spots on the body is highly variable, ranging from 1 to 5 in this sample.

Synodontis nummifer Boulenger, 1899

Site 26: SL 120 mm : 1975.6.20.636.

Site 39: SL 166 mm : 1975.6.20.637.

Distribution. Zaïre basin.

Synodontis pleurops Boulenger, 1897

Site 24: SL 181 mm : 1975.6.20.641.

Site 26: SL 126, 140 mm : 1975.6.20.639,640.

Site 29: SL 134 mm : 1975.6.20.638.

Site 42: SL 175 mm : 1975.6.20.642.

Distribution. Zaïre basin.

Synodontis schoutedeni David, 1936

Site 48: SL 79 mm : 1975.6.20.646.

Site 50: SL 96 mm : 1975.6.20.645.

Distribution. Central Zaïre basin.

Synodontis smiti Boulenger, 1902

Site 42: SL 113 mm : 1975.6.20.643.

Site 44: SL 112 mm : 1975.6.20.644.

Distribution. Central and upper Zaïre basin (River Ubangi and Lualaba).

*Family Malapteruridae**Malapterurus electricus* (Gmelin, 1789)

Site 6: SL 240 mm : 1975.6.20.648.

Site 23: SL 300 mm : 1975.6.20.649.

Distribution. West Africa, Nile and Zaïre basins.

*Family Centropomidae**Lates niloticus* (Linn. 1762)

Site 6: SL 222, 273 mm : 1975.6.20.655,656.

Site 18: SL 205 mm : 1975.6.20.654.

Site 20: SL 153 mm : 1975.6.20.657.

Site 27: SL 201 mm : 1976.10.12.231.

Distribution. Widely distributed. West Africa, Nile and Zaïre basins, Lakes Albert and Rudolf.

*Family Cichlidae**Haplochromis polyacanthus* (Boulenger, 1899)

Site 27: SL 28–50 mm : 1975.6.20.658–661.

Site 38: SL 77, 88 mm : 1975.6.20.662,663.

Site 40: SL 33 mm : 1976.10.12.261.

Distribution. Central and upper Zaïre basin.

A slight predorsal fin hump was apparent in the specimens from site 38.

Lamprologus mocquardii Pellegrin, 1903

Site 40: SL 35 mm : 1976.10.12.262.

Site 42: SL 42 mm : 1976.10.12.296.

Distribution. Central Zaïre basin.

Pseudocrenilabrus nicholsi (Pellegrin, 1928)Synonymy: *Paratilapia ventralis* Nichols, 1928.*Paratilapia nicholsi* Pellegrin, 1928.

Site 21: SL 63, 60 mm : 1976.10.12.268,269.

Distribution. Zaïre basin.

Pellegrin (1928) observed that Nichols' original name for this fish was a homonym of *Paratilapia ventralis* Boulenger (now placed in the genus *Ophthalmotilapia* Pellegrin — see Regan, 1920a), and accordingly he proposed the replacement specific name '*nicholsi*'. Using Trewavas' criteria (1973), this species should be assigned to the genus *Pseudocrenilabrus* Fowler, 1934. In this connection it may be noted that Nichols pointed to a resemblance between his fish and *Haplochromis moffati* (Castelnau) and *H. strigigena* (Pfeffer). *Haplochromis moffati* (*sensu* Boulenger, 1915) was later synonymized with *Pseudocrenilabrus philander* (as *H. philander* (Weber), see Trewavas, 1936). *Haplochromis strigigena* was synonymized with *H. bloeyi* (Sauvage) by Regan (1922), but it is probable that Nichols used Boulenger (1915) to identify his material and, in that work, *H. strigigena* was treated as synonymous with *H. multicolor* (Schoeller), a species now placed in the genus *Pseudocrenilabrus* (see Trewavas, 1973).

Our material agrees fully with Nichols' description and figure. *Pseudocrenilabrus nicholsi* is characterized by a marked elongation of the pelvic fins in which the first soft rays are drawn out into filaments which extend backwards, well beyond the origin of the anal fin. Fishes from the Upemba National Park identified by Poll (1976) as *P. philander* are, in our opinion, referable to *P. nicholsi* (compare Nichols, 1928: fig. 1, with Poll, 1976: fig. 63).

The specimens obtained were brightly coloured in life. The head was greenish-yellow dorsally and golden yellow on the cheeks and operculum, the lower lip was blue. On the flanks the scales were outlined in blue with red centres. There was a broad black margin to the dorsal fin with red striping beneath. The anal fin exhibited alternate streaks of blue

and red and the caudal fin was red-spotted. The pectoral fins were golden yellow and the leading edges of the pelvics were white, becoming black submarginally.

The distribution of *P. nicholsi* in the upper Zaïre basin, from the Upemba lakes northwards to Ankoro, is more restricted than, but complementary to, the distributions recorded for *P. philander* and *P. multicolor*.

Sarotherodon upembae (Thys van den Audenaerde, 1964)

Site 17: SL 55 mm : 1976.10.12.256.

Site 18: SL 145 mm : 1976.10.12.251.

Site 21: SL 73–74 mm : 1976.10.12.257–259.

Site 23: SL 100–153 mm : 1976.10.12.275–282.

Site 26: SL 58, 59 mm : 1976.10.12.238,239.

Site 27: SL 205 mm : 1976.10.12.232.

Distribution. Upper Zaïre basin (River Lualaba). This species formed the basis of the gill-net fisheries in the shallow lakes of the Kamolondo depression.

In freshly caught adult males, the body was dark grey-green above becoming yellowish on the flanks and suffused with black on the throat, chest and abdomen. The operculum was yellowish purple with a distinct opercular spot and there were three or four large, black mid-lateral blotches on the flanks. The proximal parts of the dorsal, caudal, anal and pelvic fins were grey-black in colour. The margin of the dorsal fin was crimson, becoming underlined in white posteriorly and the caudal fin was marked by a series of wavy, purple-red, vertical stripes and a red distal margin. A short, bifid, cream-coloured genital tassel is present.

Thys van den Audenaerde (1964) considered *S. upembae* to be a subspecies of *S. niloticus* (Linn.), separable from it on the basis of slightly different modal counts of dorsal fin-rays and lateral line scales. In coloration both share a striped caudal fin and in mature males, a black ventral surface and black dorsal, anal and pelvic fins. However in detail, many differences become apparent. The caudal stripes in *S. upembae* are typically less numerous than in *S. niloticus* and this character is in any case, found in several species of *Sarotherodon*, for example *S. urolepsis* (Norman) and *S. hornorum* (Trewavas). In breeding dress, males of *S. upembae* have red margins to the dorsal and caudal fins, and, importantly, a genital tassel develops. These characters are absent in *S. niloticus* which, in addition, may become suffused with red on the head and flanks.

We, therefore, support Dr E. Trewavas's contention (pers. comm.), that *S. upembae* is a separate species not immediately related to *S. niloticus*. The zoogeographical implications of this are discussed below.

Serranochromis sp.

Site 2: SL 188 mm : 1976.10.12.233.

Near *Serranochromis robustus* (Günther), the teeth of this single specimen are strong and well spaced, numbering about 40 in the outer series of the upper jaw, and the pectoral fin is relatively short, being 21.6% in standard length. However, the length of the pre-maxillary pedicel (36.7% in head length) lies outside of the range (30.0–36.5%) given for *S. robustus* by Trewavas (1964), and there are fewer rays in the dorsal (27 compared with 29–32) and anal (12 compared with 13–15) fins.

In life, the specimen, a female, was predominantly yellow in colour, with about 20 orange spots on the anal fin.

Tilapia rendalli Boulenger, 1896

Site 18: SL 112 mm : 1976.10.12.252.

Site 20: SL 113, 140 mm : 1976.12.20.87; 1975.6.20.670

Site 21: SL 95–135 mm : 1976.10.12.283–285.

Site 26: SL 54, 64 mm : 1976.10.12.236,237.

Site 27: SL 54, 57 mm : 1975.6.20.671,672.

Site 28: SL 75, 79 mm : 1976.10.12.249,250.

Site 34: SL 66 mm : 1976.10.12.260.

Distribution. Upper Zaïre basin (River Lualaba), Lakes Tanganyika and Malawi, Zambezi and Limpopo basins.

Tilapia tholloni tholloni (Sauvage, 1884)

Site 51: SL 133 mm : 1975.6.20.669.

Distribution. Lower Zaïre basin.

Tylochromis lateralis Boulenger, 1898

Site 6: SL 73–212 mm : 1975.6.20.684,685,692.

Site 6: SL 62–235 mm : 1976.10.12.242–246,271–274,293–295.

Site 14: SL 61–145 mm : 1975.6.20.673; 1976.10.12.234.

Site 18: SL 129 mm : 1975.6.20.674.

Site 19: SL 122, 142 mm : 1976.10.12.240,241.

Site 21: SL 62 mm : 1976.10.12.270.

Site 23: SL 95–136 mm : 1976.10.12.286–295.

Site 26: SL 71 mm : 1976.10.12.235.

Site 27: SL 27–88 mm : 1975.6.20.676–683; 1976.10.12.247.

Site 28: SL 108 mm : 1976.10.12.248.

Site 29: SL 79 mm : 1976.10.12.297.

Site 30: SL 113 mm : 1975.6.20.686.

Site 31: SL 116 mm : 1975.6.20.675.

Site 34: SL 115, 200 mm : 1975.6.20.689,690.

Site 46: SL 68 mm : 1975.6.20.687.

Site 49: SL 90–152 mm : 1976.10.12.253–255.

Distribution. Zaïre basin.

Two specimens from site 49 agree with *Tylochromis lateralis* except for the body depth which is contained almost three times in the standard length (cf. 2–2½ times).

Freshly caught fishes had a greenish-yellow body sometimes with reddish flecks on the lower flanks. In some specimens there was a scarlet red flash behind the angle of the jaws and a smaller red spot on the operculum. In adults the dorsal fin was spotted, with red lappets between the spines, and the caudal fin exhibited divided coloration, greenish above and reddish below. Black spots or streaks were present on the caudal fin in some fishes.

Variable pigmentation is apparent in preserved material. Scales are frequently spotted and in some there are 5 to 7 dark, vertical bars on the body. A prominent opercular spot is generally present.

In some of our larger specimens the distribution of molariform teeth on the lower pharyngeal bone extends forward beyond the mid-point into the anterior part of the toothed area, which is the character used by Regan (1920b) to separate *T. bangwelenensis* (Lake Banguelu-River Luapula drainage) from *T. lateralis*. However this development was very variable and rarely as distinct as in Regan's types (which we have examined), and it was absent in juveniles in our collections. Thus, for the time being we have referred all of our material to *T. lateralis* but note that Poll (1976) considered a few specimens in his large collection from the Upemba National Park to be *T. bangwelenensis*.

Family Anabantidae

Ctenopoma acutirostris Pellegrin, 1899

Site 50: SL 108 mm : 1975.6.20.650.

Distribution. Zaïre basin.

Ctenopoma ashbysmithi sp. nov.

Holotype. A fish, SL 39 mm, BMNH 1976.10.21.2, caught in an unnamed marsh, 10 km southwest of Kindu, Zaïre (site 37).

Paratypes. Nine fishes, SL 35–39 mm, BMNH 1976.10.21.3–11, from the same locality.

(A further 50, non-typical specimens, 16–35 mm SL, BMNH 1976.10.21.12–61, were also obtained from site 37.)

Etymology. This species is named in the memory of 2nd Lt. Adrian Ashby-Smith who helped the fish team for part of its stay in Zaïre. He was killed in 1976 whilst exploring a volcano in Ecuador.

Description. Based upon 10 fishes, SL 35–39 mm.

	\bar{x}	range
D	30.0	27.8–33.8
H	36.4	35.3–38.6
I	9.5	8.9–10.2
IO	9.0	8.9–11.3
CPI	7.7	6.6– 9.0
CPd	15.2	14.5–15.6

All measurements are expressed as percentages of the standard length.

The body is moderately compressed with a short but distinct caudal peduncle (Fig. 17). The subopercular margin is markedly serrate but that of the operculum is smooth apart from the spines on each edge of the opercular notch (Fig. 18). The vertebrae number 12 + 17 (f5), 12 + 18 (f1), 13 + 17 (f2), 13 + 18 (f1) (one count was unobtainable).

Squamation

Scales in longitudinal series: 31 (f1), 32 (f5), 33 (f4).

Perforated scales in upper lateral line: 18 (f5), 19 (f5).

Perforated scales in lower lateral line: 12 (f2), 13 (f5), 14 (f2), 15 (1).

Scales in transverse series from mid-dorsal to mid-ventral line: 13 (f1), 14 (f8), 15 (f1).

The scales on the posterior part of the body bear larger and stronger ctenii than those on the anterior part (Fig. 19); annuli are conspicuous.

Fins. The dorsal has 18 (f1), 19 (f8), or 20 (f1) spines and 10 (f2), 11 (f3) or 12 (f5) soft rays.

The anal has 8 (f9) or 9 (f1) spines and 10 (4), 11 (f5) or 12 (f1) soft rays.

Coloration. In preserved material the body colour is burnt umber dorsally paling to ochre brown ventrally. There is an elongated dark spot on the caudal peduncle which tends to become further lengthened rostrad in larger specimens. Anterior to the caudal peduncle there are 13 to 15 chain-like vertical bands, resulting from the concentration of dark pigment around the edges of a series of transverse scale rows. The paired fins are hyaline and the others mid-brown in colour. In life the same markings were apparent but the fishes had a bronze sheen.



Figure 17. *Ctenopoma ashbysmithi*: the holotype.

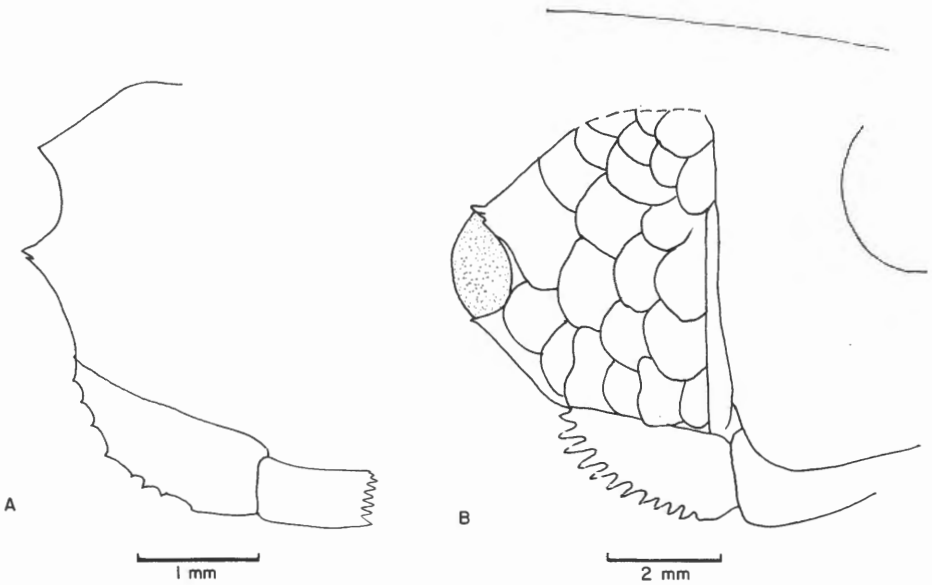


Figure 18. *Ctenopoma ashbysmithi*: the opercular region of (a) a specimen SL 22 mm and (b) a specimen SL 39 mm.

Distribution. This species is known only from the type locality where a local teacher informed us that "they hardly ever grew larger".

Diagnosis. There is considerable overlap in morphometric and meristic ranges between the various species of *Ctenopoma*. This is shown by the data in Table 1, which were obtained from fishes (including type specimens) of comparable size to our material wherever possible. In addition, the serrations on the bones of the opercular series in *C. ashbysmithi* have been compared with those of equivalent-sized examples of other species. It appears from Daget (1958: fig. 1) that these change relatively little with growth beyond the juvenile condition.

The *Ctenopoma* species of Zaïre may be divided conveniently into two groups on the basis of body depth. *Ctenopoma ashbysmithi* belongs to the shallow-bodied group, which immediately distinguishes it from *C. acutirostris* Pellegrin, *C. fasciolatus* Boulenger, *C. kingsleyae* Günther, *C. maculatus* Thomassin and *C. ocellata* Pellegrin.

Within the shallow-bodied group, the higher number of scales in the longitudinal series separates *C. ashbysmithi* from *C. ansorgi* Boulenger, *C. congicus* Boulenger, *C. ctenotis* Boulenger, *C. davidae* Poll, and *C. nanus* Günther. However, *C. nigropannosum* Reicher and *C. pellegrini* Boulenger are similar to *C. ashbysmithi* in many characters. Matthes (1964) notes that the two former species are frequently confused. He allocates a higher longitudinal scale count (30–33) to *C. pellegrini* than that given by Boulenger (1916), and the type specimen examined by us has 30 scales in the longitudinal series. The suboperculum of *C. pellegrini* has a different shape, with longer serrations than in *C. ashbysmithi* (Fig. 20), and there are four vertical scale rows on the operculum compared with three in the former species. *Ctenopoma nigropannosum* may be separated from *C. ashbysmithi* by its shorter head, spinier operculum (Fig. 21), and larger, caniniform teeth at the symphysis of the jaws. The colour pattern of *C. ashbysmithi* appears to be unique among African species.

The relationships of *C. ashbysmithi* are uncertain. If our informant concerning its size was correct then, like *C. nanus*, which occurred at the same site, it is a dwarf species. (It is impossible to say how much this dwarfism reflects a phyletic relationship since the two species are easily separable, Fig. 22.)

Table 1. Morphometric and meristic data for the species of *Ctenopoma* recorded from Zaïre. Morphometric data are expressed as a percentage of the standard length

		D	H	I	IO	Cpl	Cpd	L.Sc	U.Ll	L.Ll	T.Sc	D. Fin	A. Fin	GR	N	SL(mm)	Vert
<i>ashbysmithi</i>	sp.nov.	30.0	36.4	9.5	9.9	7.9	15.2	31-33	18-19	13-14	13-15	XVII-XX 10-12	VIII-IX 10-12	6-7	10	35-39	30(f5),31(f1)
<i>acutirostris</i>	Pell. 1899	43.0	42.1	10.1	9.3	+	15.1	23	16	?	?	XVII 8	IX 9	8	1	42	-
<i>ansorgii</i>	Blgr 1912	29.1	32.3	6.2	6.6	4.5	15.2	26-27	11-13	2-7	10-12	XVI-XIX 6-7	IX-XI 6-8	7-8	6	32-47	25(f1),26(f4)
<i>congicus</i>	Blgr 1887	35.6	33.3	7.6	9.0	4.5	17.0	24-26	13-15	9-10	11-13	XVI-XVIII 7-8	IX-XI 7-9	8	6	33-62	24(f1),25(f4)
<i>ctenotis</i>	Blgr 1919	33.6	36.2	7.5	8.9	3.2	16.3	25-26	14-15	9	13-14	XV-XVI 7	IX-X 7	8	2	53-55	24(f4),25(f2)
<i>davidae</i>	Poll 1939	-	-	-	-	-	-	27-28	4-9	5-9	11-12	XIX 6-7	XI-XII 8	6-7	2	45-47	-
<i>fasciolatus</i>	Blgr 1899	44.3	31.2	7.6	8.7	3.4	18.3	25-26	14-15	9-11	13-14	XVI 9	X 10-11	9	3	42-56	24(f1),25(f1)
<i>kingsleyae</i>	Gthr 1867	43.3	35.9	7.8	10.4	15.1	17.5	24-25	16	10	12	XVI-XVII 9	IX 9-10	8	3	48-119	24(f1)
<i>maculatus</i>	Thom. 1886	42.9	43.3	10.0	11.4	+	17.9	22	14	10	13	XV 10	IX 9	8	1	28	-
<i>nanus</i>	Gthr 1896	33.3	34.9	6.6	7.3	5.7	16.7	25-26	15-18	9-10	13-14	XV-XVI 9-10	VII-VIII 7-9	8-9	4	46-55	25(f2)
<i>nigropannosus</i>	Reich. 1875	32.0	31.0	6.2	10.2	6.0	15.6	28-30	15-17	12-13	12	XX-XXI 8-11	IX-XI 9	7	3	65-107	28(f2),29(f1)
<i>ocellatum</i>	Pell. 1899	42.2	37.4	9.0	10.0	+	16.4	25-26	15-16	8-11	12	XVII 8-10	IX-X 9-10	7-8	3	43-56	-
<i>oxyrhynchus</i>	Blgr 1902	40.0	33.3	7.2	-	3.6	16.7	28	14-16	9-12	11	XV 10	VIII 10	-	-	-	-
<i>pellegrini</i>	Blgr 1902	27.1	29.6	5.6	9.6	7.5	14.1	30	17	13	12	XIX 10	VII 9	6	1	80	30(f1)

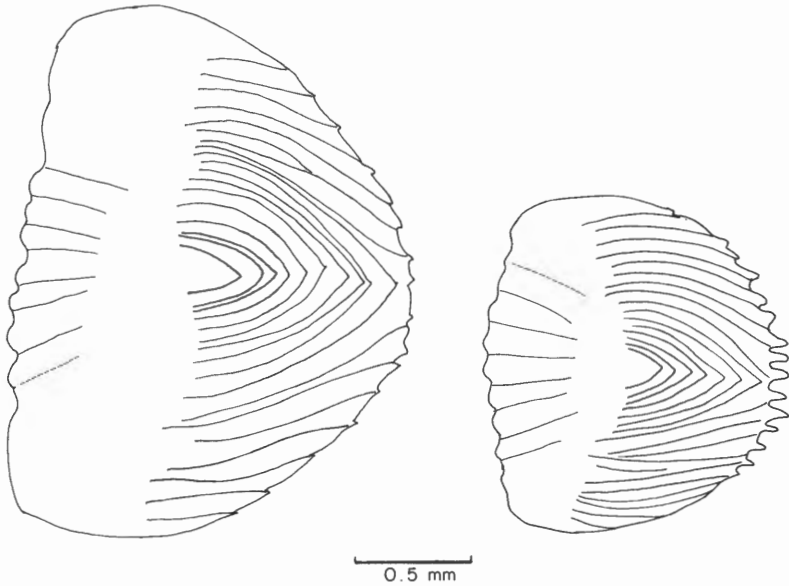


Figure 19. *Ctenopoma ashbysmithi*, SL 39 mm: the fourth scale of the row below the anterior line (left) and the seventh scale of the row below the posterior lateral line (right).



Figure 20. *Ctenopoma pellegrini*: the opercular region of the holotype.

Ctenopoma kingsleyae Günther, 1867

Site 50: SL 99 mm : 1975.6.20.651.

Distribution. West Africa and lower Zaïre basin.

Ctenopoma nana Günther, 1896

Site 37: SL 14 mm : 1976.10.21.62.

Distribution. Cameroons and Zaïre basin.

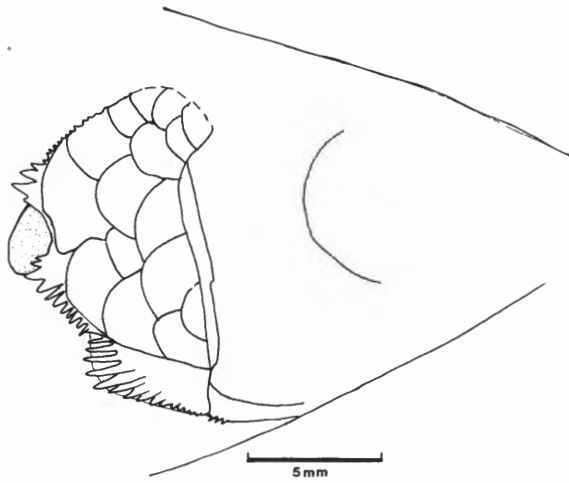


Figure 21. *Ctenopoma nigropannosum*: the opercular region of the holotype.

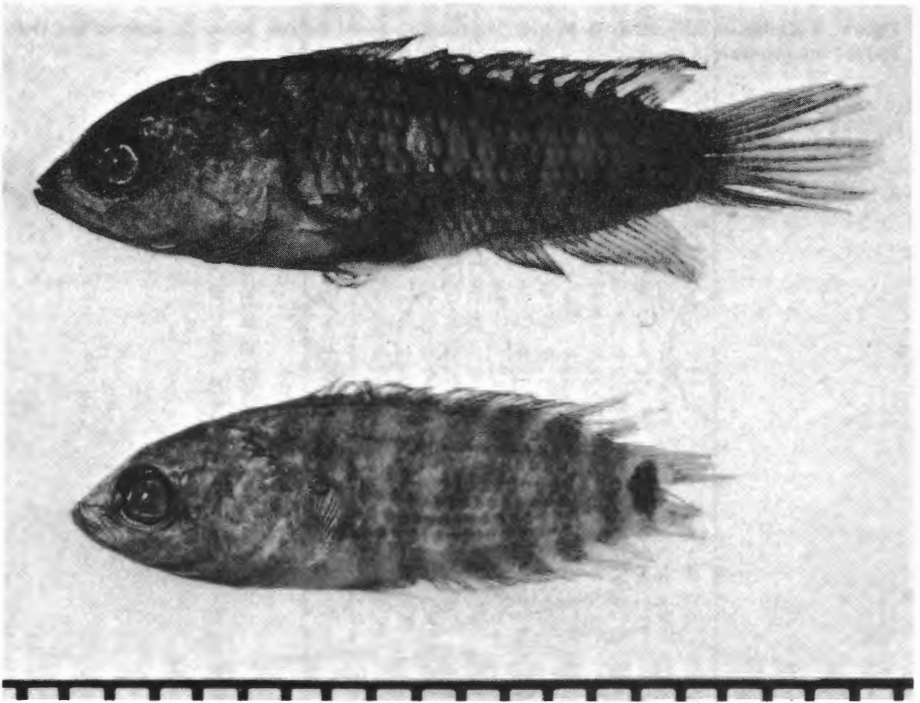


Figure 22. A juvenile *Ctenopoma ashbysmithi* (above) and a juvenile *Ctenopoma nanus*.

Family Channidae

Channa obscura (Günther, 1861)
 Site 20: SL 180 mm : 1975.6.20.652.
 Site 24: SL 370 mm : 1975.6.20.653.
 Distribution. Zaïre basin.

Family Mastacembelidae

Mastacembelus congicus Boulenger, 1896

Site 27: SL 99, 122 mm : 1975.6.20.696,697.

Distribution. Zaïre basin.

Mastacembelus sp.

Site 6: SL 250 mm : 1975.6.20.698.

We have been unable to identify this fish from the River Lufira. It possesses 3 preopercular spines but no preorbital spines; 28 dorsal spines and 3 anal spines. The anus is slightly nearer to the tail than the tip of the snout. The body coloration is brown overlain by white blotches, some of which have brown centres.

Family Tetraodontidae

Tetraodon mbu Boulenger, 1899

Site 7: SL 78 mm : 1975.6.20.695.

Site 14: SL 99 mm : 1975.6.20.694.

Site 24: SL 195 mm : 1975.6.20.693.

Distribution. Central and upper Zaïre basin; River Malagarasi.

DISCUSSION

Poll (1957, 1963) discussed the composition of the ichthyofauna in various regions of the Zaïre system and observed that the fishes of the upper Lualaba, and of the stretch between the Gates of Hell and Kisangani, were poorly known. He concluded, however, that the fauna above the Gates of Hell in the upper Lualaba had affinities not with the rest of the Zaïre system but with the Nile. Our collections, chiefly from the upper Lualaba, provided further information on the distribution of the ichthyofauna and have raised doubts about the alleged Nilotic affinities of the upper Lualaba fishes. We therefore proposed to examine the evidence for Poll's conclusion, which may be conveniently grouped into three headings.

Geomorphological; that the upper Lualaba was originally a tributary of the Nile and became captured by the Zaïre at the Gates of Hell

The idea of a northward flowing river from the Katanga – Lake Tanganyika area, joining the Nile system, is not new. Historically, for example, David Livingstone, on reaching the Lualaba at Nyangwe in 1871, believed that it was possibly a headwater of the Nile.

Giltay (1930), in his description of *Ichthyoborus besse congolensis*, drew attention to the fact that hitherto this species had been known only from the Nile to the Chad basin. Its presence in the upper Lualaba was regarded by Giltay as confirmation of the ancient Nile – Zaïre connection which he thought had been postulated by Nichols & Griscom (1917). However, this interpretation of Nichols and Griscom's hypothesis is incorrect. These authors wrote (p. 740) — “the fishes of the Nile basin and Ethiopia are either most closely related to northern or Asiatic forms or else to west tropical forms. For a considerable period of time there must have been a water connection of some sort between the Nile basin and west tropical Africa. In fact our collector, Mr Lang, states that in the extreme upper Congo near Garamba he found a swamp draining both ways during the height of

the rainy season. This fact must be borne in mind if the distribution of fish in Africa is to be understood, and it is well proved as follows: (a) There are nearly 100 species of fish common to the Nile basin and west tropical Africa. Very few species of these reach East Africa and none South Africa.”

To Nichols & Griscom, “west tropical Africa” included the Senegal, Niger and Chad basins as well as the Zaïre system, the Angolan rivers and the Okavango basin. Within an area thus defined one would expect to find “nearly 100 species of fish common to the Nile basin,” the great majority of them from the Niger and Chad basins. Furthermore, the Garamba river is close to the Sudan border and separated from the White Nile by a low watershed. An ichthyological connection in this area is not only possible but it is also all that Nichols & Griscom had suggested.

Robert (1942) described the history of Lake Tanganyika as (in translation) — “In the ancient region of subsidence, which was the forerunner of the present graben, there lay a lake which had an outlet towards the north and fed the Kivu valley, lakes Albert and Edward and, finally, the Nile. The barrier formed by the lava flows, to the south of the zone currently occupied by Lake Kivu, as well as the relatively recent subsidences which occurred locally in the Tanganyikan region, have modified the former state of things and have made Lake Tanganyika a lake without an outlet. Later, during the recent period, when the Mufumbiro volcanoes made a dam, a lake was formed which finally flowed southwards, via the Ruzizi into Lake Tanganyika.” However, as Brooks (1950 : 146–147) pointed out, no authority was cited for these statements, which were opposed to the data available at the time. Recent work has been unable to provide evidence of an outlet to the north. Prior to the Pliocene, there was a period of tectonic calm during which the Miocene peneplain was established. Cooke (1958) has shown that during the early Pliocene the region now occupied by Lake Victoria was drained to the west by tributaries of the Zaïre system. This drainage pattern persisted into the Pleistocene (Kendall, 1969) when the rift valley formation interrupted the westward flow and led, ultimately, to the modern topography. Kendall dates the formation of Lake Victoria as mid-Pleistocene, by which time the rift valley would have been formed. The date of the Mufumbiro and Virunga volcanic eruptions, which resulted in the formation of Lake Kivu, is unknown (Banister, 1973: 24), but if the tectonic activities were similar to those of the Rukwa rift, then the volcanicity was an accompaniment to the rift valley formation (Harkin, 1960). To summarize, the evidence cited above indicates that from pre-Miocene to early or Middle Pleistocene times, a westward drainage system (the Zaïre system) extended eastwards beyond the present basin of Lake Victoria. With such a hydrological system there could not have been a connection between the upper Lualaba or Lake Tanganyika and the Nile. Information is lacking about the situation prior to the formation of the Miocene peneplain.

Zoogeographical; the absence in the upper Lualaba of certain species from the cuvette centrale

The river Lualaba between the Stanley Falls at Kisangani and the Gates of Hell was regarded by Poll (1963) as a barrier between the *cuvette centrale* (central Zaïre basin) and the upper Lualaba. This 750 km stretch consists of shallows and rapids, including those at Wanie Rukula and Tschungu, separated by deeper,

navigable waters. It is difficult, however, to evaluate the significance of those *cuvette centrale* species which are listed by Poll (1963) as absent from the upper Lualaba, firstly because he rarely gives specific names and secondly because of some subsequent taxonomic revisions.

Three families typical of the *cuvette centrale* are absent from the upper Lualaba; the Notopteridae, Pantodontidae and Phractolaemidae. However, these families comprise only four species in total and representatives of each family and all genera are found outside the Zaïre system; *Pantodon* from Nigeria, *Phractolaemus* from Nigeria and Dahomey, *Papyrocranus* from Gambia southwards and *Xenomystus* across much of the Nilo-Soudanian region.

The dwarf characins, another group listed by Poll as having poor representation in the upper Lualaba, were revised in 1967 by the same author, but because of the lack of specific names in the original we can make few comments. *Hemigrammopetersius* and *Petersius* were redefined and are no longer considered to live in the Zaïre system. *Phenacogrammus aurantiacus* has been found in the upper Lualaba (Poll, 1967: map 8) and other members of the genus are found in rivers outside the Zaïre system (Poll, 1967: map 10).

Of considerable interest and importance was our capture of some species of fish in the upper Lualaba which had previously been recorded only in the *cuvette centrale*. In particular we would draw attention to our collections of *Leptocypris modestus* from several localities, of which Mulongo (site 24) was the most southerly. This monotypic genus had previously only been known from the Central Zaïre basin.

From what has been said above, it appears that the fish faunas of the *cuvette centrale* and the upper Lualaba are not as distinct as had previously been thought. However, it remains a fact that the upper Lualaba has a depauperate fauna compared with that of the central basin, although it occurs to us that this is not really surprising when the geographical aspects of these separate parts of the Zaïre river are compared.

Excluding the Luapula-Mweru system (the fauna of which has Zambezian affinities), the riverine catchment of the Lualaba above the Gates of Hell is relatively small. It is limited to the west by the parallel Lomami drainage (a part of the *cuvette centrale*) and to the east by the rift valley. Together with its tributaries, the rivers Lubudi and Lufira, the upper Lualaba drains the Kundelungu mountains and the Manyika plateau before meandering among the lakes of the Kamolondo to emerge into savannah country on its northward passage. The nature of the upland drainage, fed by swift, cool, torrential streams, militates against a speciose ichthyofauna. The Upemba lakes are broad, shallow and eutrophic bodies of water with margins rendered unstable from the alternate shifting and silting up of papyrus islands. Surprisingly, fewer species of fish were caught in the lakes than in the main river, a short distance to the north, i.e. at Mulongo, site 24.

In marked contrast, the catchment of the *cuvette centrale* covers a vast area; the main rivers alone are more than nine times the length of those of the upper Lualaba system (as measured from the 'Times' Atlas). Moreover, for much of their length, these rivers, and the streams which feed them, flow through tropical rainforest and offer a relatively stable environment containing many potential ecological niches (Lowe-McConnell, 1975).

On these grounds, therefore, it would seem reasonable to expect that the

upper Lualaba, a savannah river with tributaries draining high ground, would contain fewer species than the extensive aqueous network of the rainforested *cuvette centrale*.

Zoogeographical; the upper Lualaba shares species in common with the Nile

Poll (1963: 101) listed the alleged nilotic elements in the upper Lualaba in full: *Protopterus aethiopicus congicus* Poll; *Polypterus bichir katangae* Poll; *Polypterus senegalus meridionalis* Poll; *Mormyrus longirostris* Boulenger; *Mormyrus kannumae* Forskål; *Ichthyborus besse congolensis* Giltay; *Tilapia nilotica* (Linn.) and *Ctenopoma muriei* Boulenger.

So far as the mormyrids are concerned, except for Poll (1963) and those quoting him, we have been unable to find further references to the presence of *Mormyrus kannumae* in the Lualaba. Reizer (1964) limits the distribution of *M. kannumae* to the Nile, Webi-Shebéli and Athi systems, but regrettably makes no comment on its alleged occurrence in the Lualaba. *Mormyrus kannumae* is very similar to *Mormyrus longirostris* and it is possible that Poll was misled by a misidentification into including *M. kannumae* in his 1963 paper. It is omitted in his more recent list of Lualaba fishes (Poll, 1976).

We are unable to find evidence to support the concept that *Mormyrus longirostris* has Nilotic affinities. Indeed, many authors (e.g., Bell-Cross, 1976; Jackson, 1961; Jubb, 1967; Reizer, 1964) and the collections in the BMNH indicate that *Mormyrus longirostris* has a Zambezian distribution. Apart from the Zambezi, *M. longirostris* occurs in lakes Malawi and Tanganyika, the Malagarassi river, some east coast rivers, lake Mweru and the Luapula river and the upper Lualaba. It cannot therefore be used as a evidence for a Nile - Lualaba link. Its presence in the upper Lualaba could well be the result of movement along the Mweru - Luapula channel and/or movement along the Lukuga river from Lake Tanganyika.

As in the case of *Mormyrus kannumae*, *Ctenopoma muriei* has now been excluded from the Lualaba fauna by Poll (1976). The only reason we can discover for its earlier inclusion stems from Nichol's (1928) description of a new subspecies *Anabas muriei ocellifer* from Ankoro. In his revision, Daget (1958) omits comment on the status of this subspecies, but he does not record *Ctenopoma muriei* from the Lualaba. In our view, Nichol's subspecies is very similar to *Ctenopoma ctenotis*, an extended description of which is given by Poll (1976).

The problem of *Tilapia nilotica*, now *Sarotherodon niloticus*, has been discussed above (p. 236). There is no evidence that *S. niloticus* actually occurs in the Lualaba, and references to this species in that river are the result of a misidentification of *S. upembae* (Thys van den Audenaerde).

The two subspecies of *Ichthyborus besse* are widespread. The nominate subspecies occurs in the Nile, Benue, Shari and a tributary of the Niger. Poll (1973: map 3) also records this subspecies from a locality that is very close to the divide between the Gribingui and the Ubangui rivers. Within the Zaïre basin, *Ichthyborus besse congolensis* had been considered as endemic to the upper Lualaba. This presumed endemicity has been weakened, however, by our collecting a specimen at Kinshasha (site 50). From the pattern of markings on the caudal fin, there is no doubt that this specimen is correctly assigned to the subspecies *congolensis*. It remains for further collecting to show whether *I. besse congolensis* is

widespread in the lower Zaïre and has remained undetected, or whether it is localized and rare.

The presence of *Ichthyborus besse congolensis* at Kinshasha, and in the upper Lualaba, suggests that it exhibits a relict distribution. In the material available for study there are no apparent regional differences in either subspecies, despite the geographical isolation of populations (especially of the nominate subspecies). The distinction between the subspecies is clear and so far no intergrades have been found. We therefore suggest that the two subspecies have been isolated for a longer time than have the discrete populations of the nominate subspecies, and that their present distribution is a relict of a formerly much wider distribution. As such, the species is of no value in justifying a Nile – Lualaba link.

Protopterus aethiopicus is widely distributed. Apart from the Nile and the Lualaba, it has been found in the lower Zaïre and in the basins of Lakes Victoria and Tanganyika (Poll 1973: map 5). Each of the two *Polypterus* species, *P. bichir* and *P. senegalus*, has a similar distribution. Both are widespread throughout West Africa from Senegal to Gambia, through the Niger and Benue systems to Lake Chad and the Nile. Within the Zaïre system, however, they are confined to the upper Lualaba.

Both *Protopterus* and *Polypterus* are archaic fishes with a long fossil history in Africa. *Polypterus* remains are known from the middle Cretaceous to the Lower Eocene of Batarije (northeast Africa), and *Protopterus* fossils occur in the Oligocene deposits near Fayum in Egypt (Greenwood, 1974). The fossil record shows that both genera were formerly present in areas where they no longer live, for example, *Protopterus* from the Lower Pliocene of Lake Malawi, and *Polypterus* from the Miocene of Lake Victoria and the Pleistocene of Lake Edward (Greenwood, 1974).

Greenwood (1976) suggested that Poll's presumed 'Nilotic' fishes in the Lualaba exemplified a relict distribution. Poll (1976) in challenging this hypothesis argued not against the notion of a relict distribution, but rather (in translation) "One cannot imagine that these species reached the headwaters of the Zaïre by hydrographic connexions with the western basins, or even with Chad, without having colonised or left traces in other Zaïrean rivers, especially in the north, whereas the capture of a former headwater of the Nile by the Zaïre accounts perfectly for the presence of these ancient relicts solely in the Shaban tributaries of the Zaïre." It was not suggested by Greenwood (1976), nor is it suggested here, that the pertinent species of *Polypterus* and *Protopterus* arrived in the Lualaba from the north, but rather that an ancient, widespread distribution has now become discontinuous.

Both species of *Polypterus* may well have had a distribution similar to that currently shown by *Polypterus endlicheri* Heckel. However, they disappeared from the equatorial zone and were replaced by other species, hence their present amphiequatorial distribution. *Protopterus aethiopicus* is absent from the *cuvette centrale* where it is replaced by *Protopterus dolloi* Boulenger, but it is present in the lower Zaïre as well as in the Lualaba. In this respect its distribution is the same as that of *Ichthyborus besse congolensis*. However, Poll (1973: map 5) also records *P. aethiopicus* from the junction of the *cuvette centrale* and the Lualaba at Kisangani. This disjunct distribution can be interpreted as a relict one with the alternative possibility of a colonization (or even a recolonization) of the upper Lualaba via the Lukuga river from Lake Tanganyika.

To summarize, of the eight species originally used by Poll as ichthyogeographical evidence for a connection between the Lualaba and the Nile, we argue that the presence of three species (*Mormyrus kannumae*, *Ctenopoma muriei* and *Sarotherodon niloticus*) was based upon misidentifications, one species (*Mormyrus longirostris*) has a Zambebian and not a Nilotic distribution, whilst the remaining four, and archaic, species exhibit relict distributions.

In conclusion therefore, from this review of the geomorphological and zoogeographical evidence, we can find no support for the theory that the upper Lualaba was originally a tributary of the Nile.

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