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Description of a New *Neolebias* (Characiformes; Distichodontidae) from the Upper Zambezi Drainage of Zambia

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A new distichodontid fish from small streams on the fringes of the Upper Zambezi River floodplain, Zambia, is described. Individuals of the new species, *Neolebias lozii* n. sp., are small (maximum 18.0 mm SL) and distinguished from all other members of the genus by a series of tall, black vertical bars along the flanks, short caudal peduncle, and broadly rounded, caudal-fin lobes. *Neolebias lozii* appears to be most closely related to *Neolebias* (=*Dundocharax*) *bidentatus* (Poll, 1967) from the Chicapa River drainage (Zaire basin) of northern Angola. In addition to its unique pigmentation pattern, *Neolebias lozii* differs from *N. bidentatus* in having a taller body, a shorter blunter snout, a shorter postorbital head length, shorter predorsal and preanal lengths, broader dorsal and anal fins, and broadly rounded instead of acutely angled caudal-fin lobes. The new species is the only southern African representative of the genus known to occur outside of the Zaire River system.

SPECIES of the genus *Neolebias* Steindachner, 1894, are diminutive fishes of the African characiform family Distichodontidae (Teleostei, Characiformes) that inhabit small streams and swamps. According to Poll and Gosse (1963, 1982), the genus *Neolebias* contains eight nominal species. Based on a phylogenetic analysis of the Distichodontidae, Vari (1979) synonymized the genera *Congocharax* Matthes, 1964, and *Dundocharax* Poll, 1967 with *Neolebias* to eliminate polyphyletic taxa. Poll and Gosse (1982) challenged Vari's conclusion on the grounds that some skeletal and dentition characters were not given appropriate consideration in the analysis. Recently, Teugels and Roberts (1990) described an additional species, *Neolebias powelli*, from the Niger River delta.

If we accept Vari's taxonomy, *N. powelli* brings the number of *Neolebias* species to 11. Here we describe a new species of *Neolebias* from the Upper Zambezi River drainage of Zambia's Western Province. Prior to this discovery, representatives of the genus were known only from the Zaire and Niger River basins. The new species appears to be most closely allied to *Neolebias bidentatus* from Angola, a species originally described by Poll (1967) as the sole member of the genus *Dundocharax*.

METHODS

All fish lengths are standard length (SL) which were measured with vernier calipers to the nearest 0.1 mm. Other measures were made to the nearest 0.05 mm with a dissecting microscope fitted with an occular micrometer. Determinations of morphological and meristic characters follow the criteria in Hubbs and Lagler (1958), except that body depth was always the vertical distance from the dorsal-fin origin to the ventral midline. Fin-ray counts were made using a dissecting microscope with transmitted light. Patterns of pigmentation of freshly captured specimens were based on photographs and observations of live specimens in a glass jar. Museum acronyms follow Leviton et al. (1985).

Neolebias lozii sp. nov.
Fig. 1

Holotype.—USNM 320688, 15.1 mm, collected with dipnet by KOW from Kataba Creek, Upper Zambezi drainage, at the Mongu-Senanga highway, Western Province, Zambia, 15°30′30″S, 23°16′0″E, 27 Nov. 1989 (Fig. 2).

Paratypes.—USNM 320687, 14.5 mm, Siyanda Creek, at Mongu-Senanga highway, Western Province, Zambia, 27 Nov. 1989, KOW; TNHC 17558, 4 (15.3–18.0 mm), Siyanda Creek, 16 Sept. 1989, KOW.

Diagnosis.—*Neolebias lozii* is distinguished from all other species of *Neolebias* (Vari, 1979) by its distinctive pigmentation pattern of 9–12 tall, black vertical bars along the flanks of the body and caudal peduncle. The species is most similar overall to *N. bidentatus* but differs in a number of morphometric characters (Table 1). Following the relative dimensions given in Table 1, *Neolebias lozii* differs from *N. bidentatus* in having a taller body, a taller caudal peduncle, a shorter

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TABLE 1. MEASUREMENTS TAKEN ON SIX SPECIMENS OF *Neolebias lozii* n. sp. (HOLOTYPE AND FIVE PARATYPES) AND FOUR PARATYPES OF *N. bidentatus*.

	Neolebias lozii n. sp.			*N. bidentatus*	
	Holotype (USNM 320688)	Mean	Min.–max.	Mean	Min.–max.
Standard length (mm)	15.1	15.8	14.5–18.0	17.5	14.4–19.4
Peduncle length (%SL)	15.2	15.5	15.0–16.0	14.9	13.6–16.6
Peduncle height (%SL)	13.2	14.0	13.1–15.0	13.1	12.8–13.6
Peduncle width (%SL)	7.9	5.5	4.4–7.9	5.4	4.9–5.9
Body height (%SL)	30.1	30.9	30.1–31.5	28.3	27.6–28.9
Body width (%SL)	16.2	15.5	14.8–16.2	15.3	14.5–16.0
Head length (%SL)	31.1	29.6	28.1–31.4	29.4	27.9–31.2
Head depth (%SL)	17.2	17.4	16.4–18.3	17.1	16.0–18.0
Predorsal length (%SL)	47.0	49.0	47.0–51.0	53.2	51.3–54.9
Preanal length (%SL)	71.2	71.3	67.4–73.9	73.1	72.7–74.0
Dorsal fin base (%SL)	21.5	21.0	18.5–22.4	16.7	15.0–17.8
Anal fin base (%SL)	13.2	11.7	10.6–13.2	10.4	9.8–10.8
Snout length (%HL)	14.9	15.5	13.5–17.6	16.5	14.4–18.2
Orbit length (%HL)	40.4	37.4	36.3–40.4	36.1	34.3–38.3
Postorbit length (%HL)	44.7	46.2	43.6–49.3	49.0	46.1–49.5

Lateral line incomplete or absent, 0–30 pored lateral line scales; 30–32 ctenoid scales in longitudinal series to hypural joint, with 1–2 on base of caudal fin; scales ctenoid, except for a few cycloid scales on ventral region anterior to pelvic fins; 12 circumpeduncular scales; 9–10 scales between origins of dorsal and pelvic fins. Dermosphenotic and pterotic lacking sensory canal segments.

Mouth terminal; maxilla extends posteriorly to or just beyond anterior border of eye; premaxilla small; teeth small and difficult to see even with dissecting microscope; 12–14 bicuspid mandibular teeth in external series, undetermined number of tiny unicuspid teeth in internal series on lower jaws; 8–10 bicuspid premaxillary teeth; 4–5 bicuspid maxillary teeth; 7–8 gill rakers on first branchial arch.

Dorsal-fin origin approximately vertical to pelvic-fin origin; dorsal-fin length at base nearly equal to height; dorsal-fin rays 14–15, 3–4 anterior rays and ultimate ray unbranched, ultimate and penultimate rays separate at base; caudal fin bifurcate with broad rounded lobes; caudal-fin rays 28–32; anal rays 10–11, 2 anterior rays unbranched, ultimate, and penultimate separate at base; pectoral-fin rays 10–11, anterior 2–3 and ultimate 2–3 rays unbranched; pectoral fin not reaching pelvic-fin origin; pelvic fin not reaching anal-fin origin; adipose fin absent.

Color in life.—Ground body coloration light olive or olive-grey, darker dorsally, ventral surface lighter or white; 9–12 distinct, black, vertical bars along lateral body surface; bars extend from near dorsal midline to near ventral midline on caudal peduncle; bars extend from near dorsal midline to approximately one-fifth to one-third of the body depth above the ventral midline; vertical bars more diffuse dorsally and ventrally; some individuals have additional incomplete bars extending dorsally from ventral midline approximately one-sixth to one-third of body depth; iris silver-grey sometimes with faint orange tint and with darker pigmentation dorsally; pectoral fins colorless, all other fins transparent, faint orange; dorsal fin without distinct dark spots.

Color in alcohol.—Ground coloration tan or grey-tan; vertical bars black or dark brown; iris dark grey or black; fins transparent but sometimes appear dusky with diffuse points of pigment.

Etymology.—The species name, *lozii*, is for the Lozi tribe, the traditional caretakers of the Barotse floodplain and its fishery resources. We suggest "banded *Neolebias*" for the common name of this species.

Distribution.—Specimens are only known from the two sites, Kataba Creek and Siyanda Creek, in the Western Province of Zambia (Fig. 2). No individuals were encountered in 10 other streams we sampled on both the east and west margins of the Barotse floodplain between 14–17°S.

DISCUSSION

Relationships.—*Neolebias lozii* appears most similar to *Neolebias* (=*Dundocharax*) *bidentatus* (Poll, 1967). Notwithstanding a number of distinctive

diagnostic features that differentiate the two species, many meristic and morphometric measures show substantial overlap. In addition, some of the relatively unique pigmentation features observed in the two species may share a common origin (e.g., light, olive background body coloration, and the series of vertical black ovals in *N. bidentatus* versus a series of tall, vertical black bars in *N. lozii*). Geographically, *N. bidentatus* is the representative of the genus most proximate to *N. lozii* (i.e., the two type localities are in separate drainage basins approximately 700 km apart).

Vari (1979) and Poll and Gosse (1982), debated the status of the genera *Neolebias, Congocharax,* and *Dundocharax.* Vari (1979) synonymized *Congocharax* and *Dundocharax* with *Neolebias,* because they shared the distinguishing features of *Neolebias* and displayed no major, uniquely derived characters in relation to other taxa in the *Neolebias* clade. Believing that Vari had not given appropriate consideration to several features of head osteology and dentition, Poll and Gosse (1982) rehabilitated the genera *Congocharax* and *Dundocharax.* Even considering additional derived characters for *Congocharax* and *Dundocharax,* Teugels and Roberts (1990) and Vari (pers. comm.) have pointed out that recognition of these genera would make the genus *Neolebias* paraphyletic.

Dentition is extremely difficult to observe in these small fishes. We did not clear any of the six type specimens of *N. lozii,* but one additional specimen from Siyanda has been sent to G. G. Teugels who is performing a revision of the genus (Teugels and Roberts, 1990). Based on examination of external morphological features, it appears clear that *N. lozii* shares essentially all of the derived features for the genus *Dundocharax* (Poll, 1967; Poll and Gosse, 1982). Whereas the genus *Dundocharax* is not currently accepted, our evidence suggests that *N. lozii* and *N. bidentatus* are sister species within the *Neolebias* clade.

Ecology.—*Neolebias lozii* inhabits small streams associated with seasonally flooded plains on the upland margins of the Barotse floodplain. Streams of this region flow very slowly over sand substrates during the dry season and spill across broad grasslands during the rainy season (generally Dec. to April). *Neolebias lozii* were always captured from dense stands of submerged or emergent aquatic macrophytes adjacent to the stream margin. We collected the following fish species (n individuals >5) with *N. lozii* at Siyanda Creek on two dates during the dry season: *Pollimyrus castelnaui* (Mormyridae), *Barbus bifrenatus* (Cyprinidae), *B. eutaenia, B. multilineatus, B. puellus, B. thamalakanensis, Clarias theodorae* (Clariidae), *Aplocheilichthys katangae* (Cyprinodontidae), *Aplocheilichthys* sp., *Pseudocrenilabrus philander (Cichlidae), and Ctenopoma intermedius* (Anabantidae). Extensive collections from shallow vegetated habitats of the Barostse floodplain proper (Kelly, 1968; Bell-Cross and Minshull, 1988; Winemiller, 1991; KOW, unpubl.) indicate that the species may be rare or absent there. Morphological features (e.g., small adult size, small gape, dentition) suggest that *N. lozii* feeds on tiny aquatic invertebrates.

Because only a few *N. lozii* specimens were collected, virtually nothing is known about the life history of the species. Because all of our specimens were collected during the late dry season, the largest individuals are assumed to be adults. Dissections performed on the two largest paratypes (TNHC 17558) revealed a small ovary with transparent oocytes in an early stage of development (diameters <0.15 mm) in the largest individual (18.0 mm) and no easily discernable gonad in the other (16.5 mm). We did not capture this species in earlier collections at the two sites, and individuals were observed falling through the holes in our 3.2 mm mesh dipnets on the dates when we did capture specimens. Therefore, we suspect that the species (and perhaps the genus) has been overlooked in earlier field surveys and could be more widespread than is currently known.

Comparative Material Examined

Neolebias (=*Dundocharax*) *bidentatus* (Poll, 1967): MRAC 159974–975 Paratypes 2 (19.2, 19.4 mm), Lucoge River (Chicapa River drainage), Angola, April 1964; MRAC 159977–980 2 (14.4, 16.9 mm), Lucoge River (Chicapa River drainage), Angola, April 1964.

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