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Copeia, 1984(1), pp. 82–86

A New Species of Dwarf Cichlid Fish with Reversed Sexual Dichromatism from Lac Mai-ndombe, Zaïre

DONALD J. STEWART AND TYSON R. ROBERTS

Nanochromis transvestitus **new species, known only from lac Mai-ndombe, differs from previously described *Nanochromis* in its sexual dichromatism: mature females acquire striking coloration (vertical white bands on a dark-gray caudal fin) unlike that in females or males of any other species, while males retain relatively drab coloration. *N. transvestitus* is among the smallest of cichlids: standard length of our largest specimen, a male, is 33.8 mm; sexually mature females are 25.0–32.5 mm.**

DURING an ichthyological survey of parts of the Zaïre basin conducted in 1973 (Roberts and Stewart, 1976), we made a small collection of fishes in the southern end of lac Mai-ndombe. Mai-ndombe, formerly known as lac Inongo or lac Leopold II, is situated in the Cuvette Central of the Zaïre basin at 2° S. It is a shallow, dendritic lake, and drains from its southern end into the rivière Fimi (=rivière Lukenie), which then joins the Kasai, the largest southern tributary of the Zaïre River. The waters of Mai-ndombe are "black" or dark tea-colored and highly acidic; pH where we collected was 4.0, and one's hand could no longer be seen when thrust 20–30 cm below the surface. Much of the shoreline consists of large, porous rocks, and remains of large trees, presumably the debris resulting from fierce storms said to occur on the lake (Fig. 1). The bottom, where it is flat and not strewn with rocks, is a hard-packed fine sediment littered with finely divided vegetable debris. Trees and rocks near shore are extensively covered with a very hard, sharp-edged encrustation of *Spongilla*.

The Mai-ndombe ichthyofauna, hitherto known from collections made around the turn of the century (Boulenger, 1909–1916), is very poorly known but presumably similar in most respects to that of lac Tumba, reported on by Matthes (1964). Lac Tumba, smaller than Mai-ndombe but topographically and limnologically similar, lies only 80 km north. Mai-ndombe and Tumba could have been joined as part of a larger lake during pluvial periods since the area between them is mostly low and swampy. Our Mai-ndombe fish collection includes *Clupeopetersius*, a monotypic genus of small characins previously known only from Tumba. Matthes (1964) reported *Nanochromis nudiceps* in lac Tumba and *N. dimidiatus* in its tributary streams, but these identifications require verification.

Nanochromis ***transvestitus*** new species
Fig. 2

Holotype.—FMNH (Field Museum of Natural History) 93584, female, 30.7 mm standard length (SL), from lac Mai-ndombe near Ipeke, Republic of Zaïre; approx. lat. 2°32′S, long. 18°16′E; obtained with rotenone from shoreline to water depth of 1 m among large, porous rocks scattered along a sandy beach (Fig. 1); water dark tea-colored, pH 4.0, dissolved oxygen 6 mg/l, 30.5 C; 14 Sept. 1973, T. R. Roberts and D. J. Stewart.

Paratypes.—FMNH 93583, the male in Fig. 2, 32.5 mm SL, and FMNH 93595, 78:16.5–33.8 mm SL; and 10 specimens each in National Museum of Natural History (USNM 226427), California Academy of Sciences (CAS 47610), British Museum (Natural History) (BM 1981.3.1:1–10) and Musée Royal de l'Afrique Centrale (TM 81-14-P:1–10) all 118 taken with the holotype.

Generic assignment.—*Nanochromis* sensu stricto Pellegrin, a group of eight nominal species endemic to the Zaïre River basin (including *N. transvestitus*), is distinguished from all other African cichlids by the apparently autapomorphic feature of having the upper lateral line contiguous with the dorsal fin base along more than half its length (Roberts and Stewart, 1976). Within *Nanochromis* sensu stricto, *N. nudiceps* (Boulenger), type species by original designation, *N. transvestitus*, and four species described

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Fig. 1. Type locality of *Nanochromis transvestitus* in lac Mai-ndombe near Ipeke, Republic of Zaïre. The type series was collected among the rocks along shore. Most of the rocks, logs and sand in the foreground normally would be submerged, but according to local residents, the lake was exceptionally low during our visit. Photograph by D. J. Stewart.

by Roberts and Stewart (1976)—*N. parilus, N. splendens, N. consortus* and *N. minor*—all share a suite of features that may indicate common ancestry. These characters are: 1) only two infraorbital bones, a lacrimal with two lateralis canals extending to its lower rim and an elongate second infraorbital that projects posteriorly rather than follows the orbital rim, the infraorbital lateralis canal terminates posteriorly at a pore on the cheek (Fig. 3); 2) no predorsal bones; 3) cheek and nape scaleless (except in *N. consortus* where a few small nape scales may be embedded in the skin); and 4) five lateralis pores on the mandible and seven on the preopercle, including one on its dorsal tip (Fig. 3). The remaining two species of *Nanochromis* sensu stricto, *N. dimidiatus* and *N. squamiceps*, are readily distinguished from the foregoing *N. nudiceps*-group by having the plesiomorphic condition of well-developed nape and cheek scales.

We have not examined the types of *N. dimidiatus, N. squamiceps* or enough of the many other species potentially related to *Nanochromis* sensu stricto to develop a reasonable phylogenetic hypothesis of relationships. We offer the foregoing data to indicate the probable relationships of *N. transvestitus* and to provide a starting point for anyone who may wish to bring together the scattered (and often very scarce) material needed to attempt such an analysis. The infraorbital character, at least, is a complex apomorphy that could prove to be an excellent indicator of relationships. Among African cichlids, we have found it only in the six species of the *N. nudiceps*-group and a seventh species referred to as *Nanochromis* sp. undet. in Roberts and Stewart (1976).

Diagnosis.—*Nanochromis transvestitus* differs from all described *Nanochromis* in 1) striking coloration in sexually mature females (vertical white bands on a dark-gray caudal fin) and drab coloration in males unlike that in females and males of any other species; and 2) a subterminal mouth, the upper jaw projecting slightly beyond lower jaw. *N. transvestitus* is further characterized by: 3) upper pore lateral line scales 8–11; 4) midlateral scales 23–25; 5) total number of dorsal fin elements (spines plus rays) 23–24; 6) profile of spinous portion of dorsal fin relatively level, last 10 spines about equal in length; and 7) gill rakers on lower limb of first gill arch (excluding raker at angle of arch) 5–7.

Description.—Relative lengths and positions of the fins of *N. transvestitus* are indicated in Fig. 2; the rounded caudal fin is typical of that in all species of *Nanochromis* sensu stricto. Morphometric characteristics of *N. transvestitus* are given in Table 1, and a comparison of meristic characters in species of the *N. nudiceps*-group is presented in Table 2. Additional meristic data follow: D.XVII,6–7; A.III,5 (the posterior two dorsal and anal fin elements are joined at the

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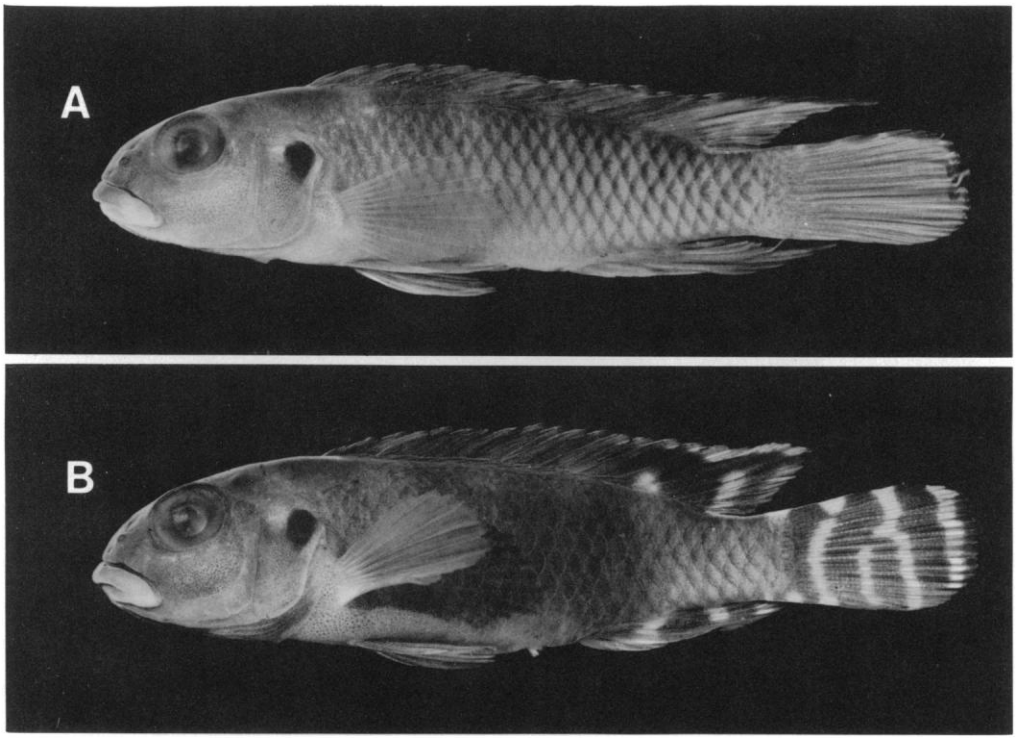

Fig. 2. *Nanochromis transvestitus* new species: A) paratype, 32.5 mm SL, male (FMNH 93583); B) holotype, 30.7 mm SL, female (FMNH 93584). Photographs by Al Coleman, Museum of Comparative Zoology, Harvard.

base and counted as one); pectoral fin rays 12–14; gill rakers 2–3 + 1 + 5–7, totals 8(1), 9(2), 10(10), 11(3), all relatively short and fleshy; transverse scale rows 7–9; circumpeduncular scale rows 12; precaudal vertebrae 12–13, caudal vertebrae 12–13, totals 25(17), 26(3) (the first caudal vertebra has a complete haemal arch and is in contact with or immediately posterior to the primary anal fin pterygiophore; vertebral counts do not include the fused PU_1 and U_1 centra).

Jaws with 2–3 rows of conical teeth with brown tips. Outer tooth row of upper jaw with 42–50 teeth in adults, juveniles with fewer teeth (counts include missing teeth indicated by tooth sockets). Pharyngeal teeth with large, slightly curved conical primary cusp and at least one small secondary cusp. Lower pharyngeal bone with about 3 tooth rows counting anteroposteriorly; 24–28 teeth in the posterior tooth row. The lower pharyngeal bone of a 31 mm SL female was 2.6 mm wide, including its articular arms, and 1.8 mm long, including the 0.9 mm anterior lamella. The pharyngeal apophysis is formed by the parasphenoid and basioccipital, and is closely similar to that of *N. parilus* (Museum of Comparative Zoology, MCZ 50475, 4 alizarin preparations), *N. splendens* (MCZ 50477, 4 alizarin preparations) and *Teleogramma gracile* (Greenwood, 1978: Fig. 18).

Cheek, pectoral fin base, breast and nape to level of fifth dorsal fin spine without scales. Belly

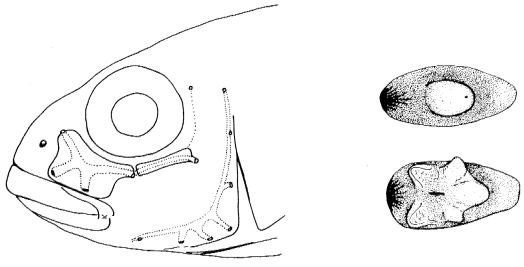

Fig. 3. (left) Lateral view of the head of *Nanochromis transvestitus* to show the lacrimal, elongate second infraorbital, and the seven lateralis pores on the preopercle; and (right) ventral view of male, above, and female, below, genitalia for mature *N. transvestitus* (FMNH 93595, paratypes, 32.0 mm SL male, 31.0 mm SL female; relative magnifications, head 12×, genitalia 50×).

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TABLE 1. MORPHOMETRIC CHARACTERISTICS OF *Nanochromis transvestitus*, BASED ON THE HOLOTYPE (FMNH 93584) AND 15 OF 118 PARATYPES.

Measurement	Holotype	Paratypes	
		Adults 5 ♀♀, 6 ♂♂	4 Juveniles
Standard length, mm	30.7	29.0–33.8	16.5–17.5
In percent standard length:			
Head length	36	35–37	37–38
Body depth	29	26–29	27–28
Caudal peduncle length	14	14–16	15
Caudal peduncle depth	13	12–14	12–13
Posterior dorsal fin spine	13	13–16	11–13
Longest dorsal fin ray	23	19–22 (♀♀) 27–40 (♂♂)	17–18
Posterior anal fin spine	13	14–17	14–16
Longest anal fin ray	21	19–21 (♀♀) 29–37 (♂♂)	17–18
Pectoral fin length	24	22–26	24–27
Pelvic fin length	22	20–23 (♀♀) 23–25 (♂♂)	21–24
In percent head length:			
Orbit	32	29–33	32–34
Bony interorbital	16	13–17	18–19
Preorbital distance	14	11–14	11–13

scales between pelvic fin and anal fin origins are reduced and embedded in the skin (detectable when skin is dried with an air stream) or absent. The second soft pelvic fin ray is usually slightly longer than the first and third soft rays. The proximal third of the inner pelvic fin ray is usually joined to the belly by a thin membrane. Caudal peduncle length divided by peduncle depth, 1.00–1.26.

Diet and trophic structures.—Stomachs of several *N. transvestitus* contained benthic Cladocera, midge larvae and mites among larger quantities of amorphous brown detritus (possibly originating from *Spongilla*). Length of gut slightly less than standard length; abdominal cavity unpigmented. The conical jaw teeth and subterminal mouth are consistent with a diet of benthic invertebrates.

TABLE 2. MERISTIC CHARACTERISTICS OF *Nanochromis transvestitus* AND OTHER SPECIES OF THE *N. nudiceps*-GROUP. Based on the holotype and 15 paratypes of *N. transvestitus* (FMNH 93584, 93583, 93585); comparative data for the other species is from Roberts and Stewart (1976: Table 18, materials listed in footnote) and is based on all or part of the type series for each species.

	Gill rakers on lower limb of first gill arch	Upper pored scales	Lower pored scales	Midlateral scales	Total dorsal fin elements	Vertebrae	Maximum standard length
nudiceps	8	14	4	26	26	27	48.8 mm
consortus	7–9	8–13	2–6	26–28	25	28	52.2 mm
parilus	7–9	11–16	3–7	25–27	25–27	27–29	44.1 mm
minor	6	6–10	2–5	23–24	22–24	25	26.3* mm
splendens	7–9	11–16	4–6	25–27	23–25	27–28	45.3 mm
transvestitus	6–7	8–11	3–5	23–25	23–24	25–26	33.8 mm

* A male specimen of *N. minor* larger than any in the original type series has been found at the California Academy of Sciences (CAS-SU 66431).

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Sexual differences, pigmentation.—Mature male *N. transvestitus* exhibit slight filamentous extensions of dorsal, anal and pelvic fins, as in other *Nanochromis* (Table 1). Males have a short, conical genital papilla, while females have the genital pore surrounded by two slender, conical papillae anterolaterally and a broad, sometimes trilobate papilla posteriorly (Fig. 3); both sexes have the genital structures recessed into a shallow depression just behind the anus. Two ripe females each have about 70 eggs evenly distributed in the two ovaries, the largest eggs 0.6 mm in longest dimension. The largest male is 33.8 mm SL, the largest female 32.5 mm SL, and females of 25 mm SL are mature.

Adults of both sexes have head, nape, spinous portion of dorsal fin and caudal peduncle olive brown; pectoral fins clear; pelvic fins clear with a dusky gray outer margin; a well-defined dark mark on dorsoposterior corner of gill cover, set off by a depigmented area nearly surrounding it; iris dark gray. A comparable opercular mark is present in other *Nanochromis* species, but usually less well defined (Roberts and Stewart, 1976: Pls. 9–11); some species of *Nanochromis* have a brightly colored iris (*Ibid.:* 287–292). Males have relatively drab olive brown coloration overall; light and dark areas of scales produce a network or reticulated effect similar to that in some other *Nanochromis* species; median fins relatively plain, same color as body and without distinct markings except for a dark edging on posterior portion of dorsal fin and upper edge of caudal fin. In females, abdomen and part of flanks deep reddish-maroon; caudal and anal fins and soft-rayed portion of dorsal fin dark-gray with three or four irregular, broad white bands; genital papillae unpigmented, appearing as a white spot on reddish-maroon abdomen. This sexual dichromatism is fully developed in the smallest specimens in our sample (16 mm SL).

Discussion

Species of the *N. nudiceps*-group exhibit an exceptionally broad spectrum of sexual dichromatism. *N. splendens* has gaudy-colored males and relatively drab females, *N. parilus* shows relatively little sexual dichromatism as the name implies, and in some instances, females of a particular species may become more intensely colored than males or acquire color features unique to their sex (Roberts and Stewart, 1976:284–292, Pls. 9–11), but none of the other *Nanochromis* species have reversed sexual dichromatism with strikingly colored females and drab males like those of *N. transvestitus*. *Nanochromis* species might form the basis for an interesting comparative study of reproductive behavior. So far as is known, all *Nanochromis* are territorial, substrate spawners, attaching their eggs to the underside of a hard surface like a log or rock (Zukal, 1981). Perhaps the varying degrees of sexual dichromatism reflect differential involvement of the two sexes in guarding the territory, eggs, and young. It should be noted that the most brightly colored *Nanochromis* species all live in rocky habitats in which light penetration is severely limited, and that where ever they occur, they tend to be relatively abundant, perhaps colonial and highly territorial.

Acknowledgments

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