

## A NEW *NOTHOBRANCHIUS* (PISCES, CYPRINODONTIDAE) FROM SOUTHEASTERN RHODESIA

R. A. Jubb, D.Sc.  
Research Associate, Albany Museum  
Grahamstown, Republic of South Africa

In the southeast of Rhodesia the boundary with Mozambique straddles a low-graded watershed between the Nuanetsi River, a tributary of the Limpopo, and the Lundi, a tributary of the Sabi or Save River. On the Rhodesian side of the boundary and wedged between these two large rivers is the Gona-re-Zhou Game Reserve with an area of some 2,000 sq. miles (Fig. 1). The altitude here is between 1,000 and 2,000 feet above sea level, the climate being uncomfortably hot from October to February. The rainfall, which occurs during these summer months, is in the order of 16 inches a year (Collins, 1965). Using Thornthwaite's classification of climate (Thornthwaite, 1948) this area would be described as semi-arid.

Most of Gona-re-Zhou, which in local dialect means "tusk of the elephant," falls within an area subject to periodic invasions by tsetse fly, a scourge which at the beginning of this century rendered most of southeastern Rhodesia uninhabitable. With the aid of fences and the clearing of wide corridors through wooded areas research veterinarians and game wardens have reclaimed much of this land, but Gona-re-Zhou remains isolated by tsetse fly and malaria. It is thus a natural sanctuary for numerous species of Africa's wild animals. As road communications are poor most people visiting this naturalist's paradise are either hardened naturalists or research personnel involved in game and tsetse fly control.

On the watershed there are numerous water pans which, during a good rainy season, drain southeastwards into headwater tributaries of the Guluene and Chefu rivers which empty into the Chingovo River in Mozambique. The Chingovo then becomes a series of swamps, pans and small inland lakes indicating a drainage system which, in earlier pluvial periods, must have drained into the Limpopo River. Although the mean rainfall is in the order of 16 inches, falls are extremely variable and erratic (Torrance, 1968). Heavy rains in the summer months are associated with occasional Indian Ocean cyclones which sweep down the Mozambique coast but in lean years barely 10 inches are recorded in this area. As little precipitation of consequence occurs during the months April to September, water in the Gona-re-Zhou pans is definitely seasonal, some of the pans being dry for four to five months of the year, and some remaining dry for a whole season.

The *Nothobranchius* to be described below was collected by Mr. R. E. Furzer (Furzer, 1969) and Dr. W. Warne in March 1968, together with mature specimens of *Nothobranchius orthonotus* Peters from one of the pans known as Sazale which, with many others, forms

part of the Guluene River drainage system. In January 1969, the middle of the rainy season, Sazale was the only pan with water in it, the others in the vicinity being dry (F. Junor, *in litt.*). In spite of such austere conditions three fish species are known from these pans: *Protopterus annectens brieni* Poll, *Nothobranchius orthonotus* Peters, and *Nothobranchius* sp. nov. It is significant that both genera are able to survive dry periods, *Protopterus* by aestivation, and *Nothobranchius* by depositing viable eggs on the bottom of the aquatic habitat before the water dries. The ability of *Nothobranchius* populations to survive both cyclically recurring periods of dryness, as well as to escape extinction due to erratic climatic conditions, has been found to be due to the ability of individual eggs to enter into and remain in a state of developmental arrest or diapause during their normal ontogeny (Peters, 1963; Wourms, 1964).

In December 1968 Mr. J. V. Ludbrook, Department of National Parks and Wild Life Management, Rhodesia, collected more specimens of *Nothobranchius* sp. nov. from a pan adjacent to Sazale. Preserved specimens, as well as photographs in color of a mature male, were sent to the Albany Museum for identification. As pointed out in a previous paper (Jubb, 1969) it was concluded from my investigations that breeding colors of mature males are important in the identification of *Nothobranchius* which show few, if any, morphological differences.

The type specimens of *Nothobranchius* in the British Museum have been examined in relation to their original descriptions but it was found, mainly due to lack of color, that no additional characteristics could be determined. From type localities and zoogeographical aspects, including illustrations in color of well-known species, it was possible to recognize five *Nothobranchius* of the inland waters of east Africa, and add a new species (Jubb, *loc. cit.*). The marked differences in mature male coloration between these closely related species suggested that in nature they would behave as biological species should they become sympatric. Ethological studies by Baerends and Baerends van Roon (1950), Wickler (1963) and numerous papers by Greenwood (1965) on *Haplochromis* and other cichlid fishes of Africa will stress the importance of mature male coloration in species discrimination amongst cichlids, and I have applied this to the *Nothobranchius*.

As from normal systematic investigations the one species of *Nothobranchius* from Sazale Pan proved to be undescribed in scientific literature, photographs in color of a mature male (Fig. 2) were sent to the British Killifish Association and to Dr. R. J. Goldstein, Department of Biology, Emory University, Atlanta, for examination and comment by *Nothobranchius* enthusiasts. Dr. Goldstein was able to show his slides to members attending the annual meeting of the American Killifish Association held in San Francisco early in September 1969. In both Britain and America, aquarists who had

studied and bred *Nothobranchius* agreed that the species from Sazale Pan was new to them. Subsequently a member of the American Killifish Association, Mr. Robert Parle of Granada Hills, California, managed to obtain live specimens of this *Nothobranchius* from Rhodesia (Fig. 3) through the efforts of Richard Furzer. In collaboration with Mr. Joe Ricco, Parle succeeded in obtaining viable eggs from some of these fishes and specimens were hatched and tank-reared in America. Some of Parle's material was preserved and forwarded by Dr. Goldstein to the Albany Museum, Grahamstown, for study purposes.

*Nothobranchius furzeri* sp. nov.

**HOLOTYPE:** An adult male, total length 53 mm, standard length 44 mm, collected on January 12, 1969, by Dr. W. Warne of the Rhodesia Department of Agriculture, from a pan known as Sazale Pan, approximately 21° 40' S, 31° 45' E, in the Gona-re-Zhou Game Reserve. Registered number PF 1239, Albany Museum, Grahamstown, South Africa.

The name *furzeri* is in honor of Mr. Richard Furzer of Rhodesia through whose efforts this beautiful fish was introduced to *Nothobranchius* enthusiasts.

**DESCRIPTION:** This species is described from the type specimen and nine paratypes, No. PF 1240, all males from the same locality. Values in parentheses are those of the type specimen. In percentage of standard length: Total length 120 - 126 (120); depth 28.2 - 31.0 (29.5); length of head 30.8 - 36.0 (32.9); snout to origin of dorsal 54.0 - 62.0 (56.6); snout to origin of pectoral 32.2 - 36.0 (34.2); snout to origin of pelvic 48.6 - 53.8 (50.0); snout to origin of anal 59.0 - 67.6 (59.0). In percentage of length of head: Length of snout 25.0 - 28.9 (27.4); eye 20.0 - 22.2 (20.6); interorbital width 41.7 - 44.5 (43.5). The standard length of the above specimens, all preserved in 5% formalin solution, ranged from 25 mm to 44 mm.

Scales markedly deciduous in preserved material, 28 - 30 in longitudinal series (not including small scales at the base of caudal fin); lateral line pores absent. Scales around body immediately in front of pelvic fins 22 - 24.

Snout short, flat and broad. Mouth directed upwards, lower jaw projecting. Teeth on premaxillary conical, sharply pointed, 3 - 4 rows, with 12 - 18 large teeth in anterior row, those in posterior rows smaller, numerous and scattered. Arrangement of teeth on dentary similar to that on premaxillary, but posterior rows consist of coarse teeth with flattened crowns.

Dorsal fin 14 - 15 (15); anal fin 14 - 16 (14). To confirm these values five additional specimens were stained and cleared. Origin of dorsal fin over or slightly in advance of anal fin. Mature males have tips of anal and caudal rays extending to beyond the membrane of these fins. In specimens of the same size there is no appreciable difference in the size of the anal fins of males and females, but males have a higher dorsal fin.

**COLOR:** The external characteristics listed above do not differ significantly from those of any other *Nothobranchius* of east Africa (Jubb, *loc. cit.*), but the color pattern of a mature male, as in all species of this genus, is constant but distinct from that of any known species. Using Figure 4 as a key, the scale centers (1) are iridescent turquoise edged with crimson (2) which forms a reticular pattern when full breeding colors have developed. Pupil of the eye (3) bordered with gold; iris golden but pigmented with small dots; a dark vertical stripe (4) passing through pupil and iris. Pectoral fins (5) pale orange edged with pale blue. Pelvic fins (6) with pale blue membrane and brick-red markings. Anal fin (7) membrane pale blue heavily mottled brick-red, the branched rays of the lower half being bright red and extending into the pale blue edging (8). The caudal fin base (9) has a pale blue or pale grey membrane with liver-colored markings between rays; the posterior portion of the caudal with a distinct pale yellow-orange band (10) followed by a black band (11), the whole of the caudal fin being edged with black. The dorsal fin has a pale blue-grey membrane heavily mottled with liver-colored markings (12), the rays being pigmented with black. The top edge of the dorsal fin (13) is pale blue. The ventral portion of the gill cover (14) is jet black. Specimens preserved in formalin lose their turquoise and red colors but the markings on the fins and fin rays show up either as heavily pigmented dark grey or black areas.

Females have the same overall turquoise sheen to the scales which are outlined with pale brick-red pigment, but the fins are unpigmented with very pale blue or olive membrane. The base of the gill cover is golden.

**HABITAT:** Much of the habitat has been discussed in the introduction. The pans in which these fishes occur are in an area where the maximum measured air temperatures from October to February range from 30° C to 35° C (Collins, *loc. cit.*) so water temperatures in shallow pans must be assumed to be correspondingly high. No data are available regarding the quality of the water but, as numerous wild animals, including elephants (Fig. 5), drink at these pans the water can be expected to be highly fertilized and well populated with zooplankton as well as mosquito and other aquatic insect larvae.

**AFFINITIES:** *N. furzeri* belongs to a group of small *Nothobranchius* including *N. rachovii* (Ahl, 1926) and *N. kirki* Jubb, 1969. From collections made by Mr. D. H. Plowes of Umtali, Rhodesia, and Mr. A. G. Plowes of Durban, South Africa from pools near Vila Machado in Mozambique it would appear that *Nothobranchius kuhntae* Ahl, originally described as coming from Beira (Ahl, 1926), can also be added to this list. Both in coloration of mature males, and in maximum size attained, *N. orthonotus* Peters, which is common in Mozambique and adjacent lowveld regions, is distinct from these species and is often found in the same waters (Furzer, *loc. cit.*; Plowes, *in litt.*).

#### ACKNOWLEDGMENTS

Mr. Frank Junor, Officer in Charge of the Lake Kariba Fisheries Research Institute, Rhodesia, supplied me with material and data relating to the pans where *Nothobranchius* specimens were collected in the Gona-re-Zhou Game Reserve.

The study of the taxonomy of the freshwater fishes of southern Africa is part of a program sponsored by the Council for Scientific and Industrial Research, Pretoria.

#### LITERATURE CITED

- AHL, E. 1926. Neue oder importierte Fische. *Bl. Aquarienkunde-Terrarienkunde*, Stuttgart, 37:222.
- BAERENDS, G. P. AND BAERENDS-VAN ROON, J. M. 1950. An introduction to the study of the ethology of cichlid fishes. *Behavior*, Supplement 1: 1-242. Leiden.
- COLLINS, M. O. 1965. Rhodesia - Its natural resources and economic development. M. O. Collins (Pvt.) Ltd., Salisbury, Rhodesia: 1-50.
- FURZER, R. E. 1969. A Rhodesian Hobbyist Reports. *Trop. Fish Hobbyist*, 17 (6):24-27.
- GREENWOOD, P. H. 1965. The cichlid fishes of Lake Nabugabo, Uganda. *Bull. Br. Mus. nat. Hist. Zool.*, 12 (9): 351-56.
- JUBB, R. A. 1969. The *Nothobranchius* (Pisces, Cyprinodontidae) of Southern Africa and a new species from Lake Chilwa, Malawi. *Ann. Cape Prov. Mus.*, 8 (1):1-11.
- PETERS, N., JR. 1963. Embryonale Anpassungen oviparer Zahnkarpfen aus periodisch Austrocknenden Gewässer. *Int. Rev. ges. Hydrobiol.* 48 (2):252-313.
- THORNTONWAITE, C. W. 1948. An approach towards a rational classification of climate. *Geological Review*, 38 (55).
- TORRENCE, J. D. 1968. The Nature of the Rainy Season in Central Africa. Symposium "Drought and Development," Association of Scientific Societies of Rhodesia, Salisbury: 13-43.
- WICKLER, W. 1963. Zur Klassifikation der Cichlidae, am Beispiel der Gattungen *Tropheus*, *Petrochromis*, *Haplochromis* und *Hemihaplochromis* n. gen. *Senck. biol.* 44:83-96.
- WOURMS, J. P. 1964. Comparative observations on the early embryology of *Nothobranchius taeniopygus* (Hilgendorf) and *Aplocheilichthys pumilus* (Boulenger) with special reference to the problem of naturally occurring embryonic diapause in teleost fishes. *Ann. Rep. E. Afr. Freshwater Fish Res. Org.*, Jinja: 68-73.

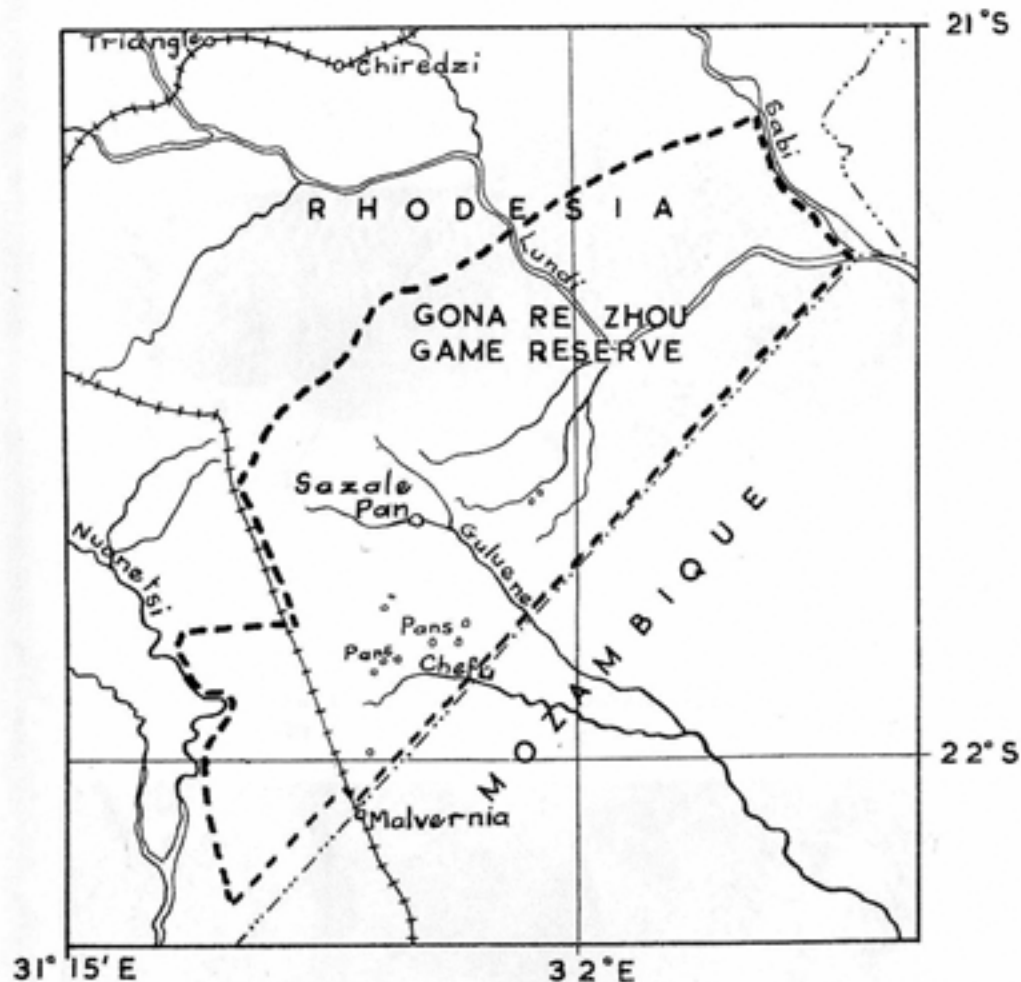


FIG. 1. Gona-re-Zhou Game Reserve, indicating Sazale Pan of the Guluene River.

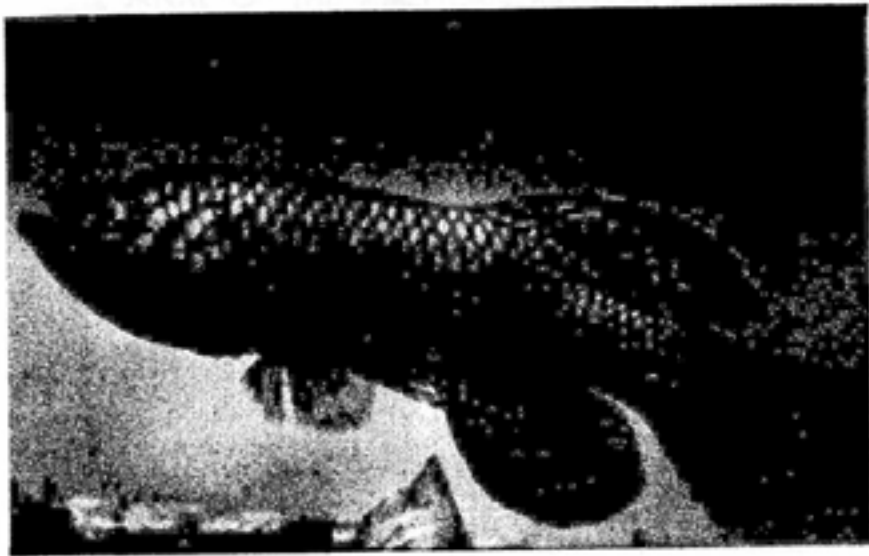


FIG. 2. Male of the new species. Photo by F. Junor.

FIG. 3. Male collected by R. Furzer. Photo by R. J. Parle.

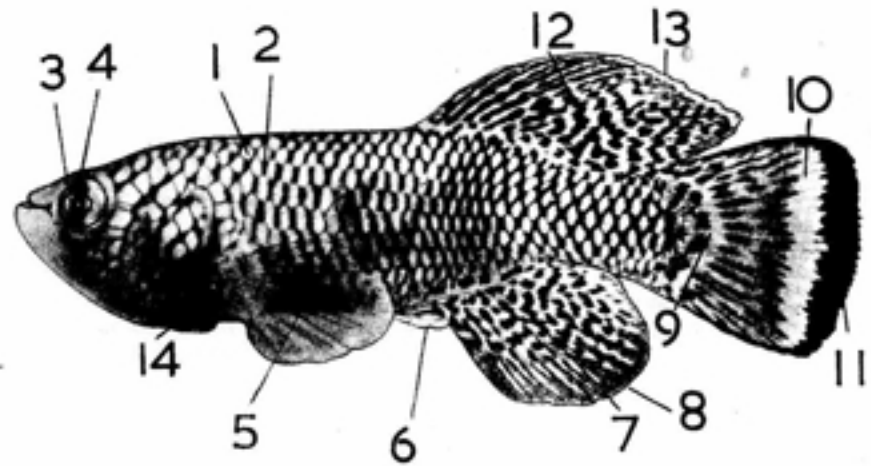
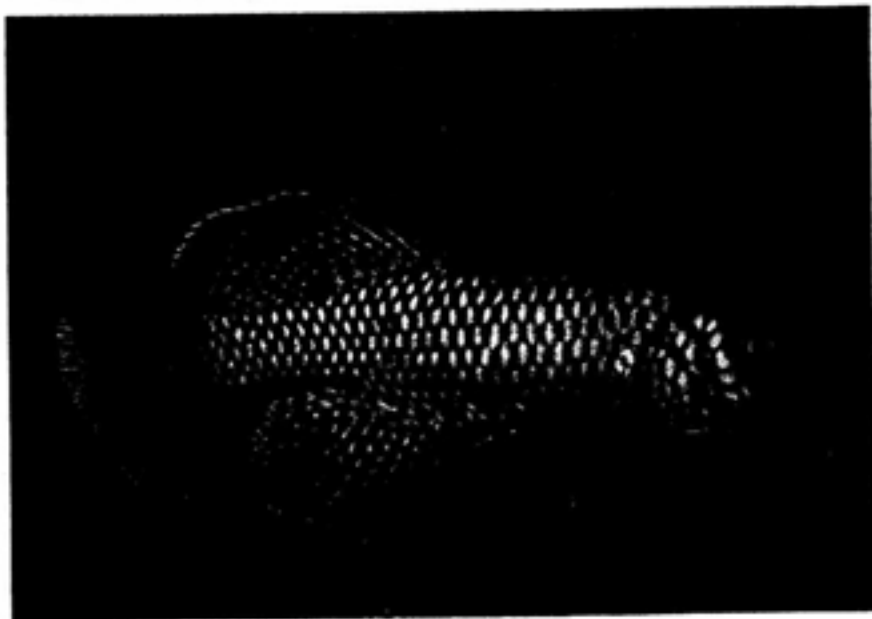


FIG. 4. Numbers refer to color description in text.

FIG. 5. Typical pan used by elephants.

