Annual Killifishes of the Orinoco Basin of Venezuela

Donald C. Taphorn*

Jamie E. Thomerson†

TECHNICAL PAPER #10

The Orinoco llanos of Venezuela and Colombia are one of the major annual killifish habitats of the world. They include most of the Orinoco River basin and cover an area of more than 450,000 square kilometers. Rainfall is seasonal with a dry period or "summer" from roughly December through May and a wet season or "winter" from May through November. The rain varies in timing and amount from place to place and year to year, but ranges from about 50 cm per year in the eastern llanos of Venezuela to over 200 cm per year in the southwestern llanos of Colombia.

Temperate biologists tend to think of tropical climates as very predictable, but we have not found this to be true in the Orinoco basin. Areas just a few kilometers apart may have very different situations. In early July, 1972 we visited areas near Calabozo that were dry and parched. A large pond which usually held permanent water was completely dry. About 40 kilometers north we found extensive temporary pools still muddy from runoff, and annual fishes which we estimated to be between two and three months old. Ninety kilometers northwest of Calabozo, near Caño Benito, we visited one pool that had the largest fishes we have seen. It probably had not gone dry from the 1971 rainy season. Then about 4 kilometers away we found another pool with small fish, not more than two months old.

Six species of annual killifishes are known from the Venezuelan llanos, but only one from the Colombian portion of the basin. Most of the information available on these fishes comes either directly or indirectly from the work of the well-known Venezuelan aquarist, Sr. E. (Leo) Hoigné, who has traveled and collected widely in the Venezuelan llanos since the early 1960's. All of the known species of the Orinoco basin have been identified or described and no new species have come to light in the past ten years. This paper provides a key for identification of the six species and a summary of what is known or suspected about their distribution and ecology.

* Department of Zoology, Florida State Museum, University of Florida, Gainsville, Florida 32611.

† Department of Biology, Southern Illinois University, Edwardsville, Illinois 62025.

KEY TO THE ORINOCO BASIN ANNUAL KILLIFISH SPECIES

The key is a dichotomous or two-branching key. To use it, examine the fish and start at number 1. You must decide which choice, a or b, best fits your fish. Disregard the statement that does not apply and follow the directions for the statement that does fit. This statement will either give you the name of the fish or send you to another part of the key, where you will have another choice to make. Only life colors are described in this key. Figure 1 illustrates some of the technical terms used.

1a. Dorsal fin base about as long as anal fin base; dorsal fin origin anterior to, above, or just slightly behind origin of anal fin . . . . . 2.

1b. Dorsal fin base less than ¾ length of anal fin base; dorsal fin origin behind anterior third of anal fin . . . . . 3.

2a. Dorsal and anal fins, as well as the upper and lower lobes of the caudal fin highly elongated (dorsal fin in males greater than 70% SL; in females greater than 35% SL); lateral scales 25-27; scales from the origin of the dorsal fin to the anal fin 9; no scales present on the caudal fin except at its base; dorsal fin rays 13-15, usually 15; a small fish rarely over 25 mm SL; body and fins with scattered dark blotches . . . . . *Austrofundulus dolichopterus.*

2b. Dorsal and anal fins not highly elongated (dorsal fin in both sexes less than 32% SL); lateral scales 30-33; scales from dorsal fin origin to anal fin 10 or more, usually 12; scales present on basal third of caudal fin; dorsal fin rays 12-15 usually 13; maximum size at least 60 mm SL; body without dark markings, unpaired fins pink in males . . . . . *Austrofundulus transilis.*

3a. Anal fin base into pre-anal length less than 2.3 times; 21-26 anal rays . . . . . 4.

3b. Anal fin base into pre-anal length more than 2.9 times; 14-17 anal rays . . . . . 5.

4a. Twelve to sixteen vertical bars on sides of body; 21-24 anal rays; 33-35 lateral scales, usually 33 or 34; males with 2 or 3 filaments from dorsal part of caudal fin . . . . . *Pterolebias zonatus.*

4b. No distinct vertical bars; 24-26 anal rays; 33-36 lateral scales, usually 35 or 36; males with elongated filaments from entire outer margin of caudal fin . . . . . *Pterolebias hoignei.*

5a. Distinct pearl blue spots scattered regularly over the maroon ground color of the sides of the body in both sexes; 32-37 lateral scales; male with elongated pelvic fins, black anal fin margin, pectoral fin tipped in orange, caudal fin without filaments; females with well-developed group of ocellated dark blotches at upper caudal fin base—a "Rivulus spot" . . . . . *Rivulus stellifer.*

5b. No blue spots; 29-31 lateral scales; males may have a blue sheen with faint vertical bars; posterior margin of male caudal fin with short filaments; dorsal fin often with dark blotch, no "Rivulus spot" in females . . . . . *Pterolebias maculipinnis.*

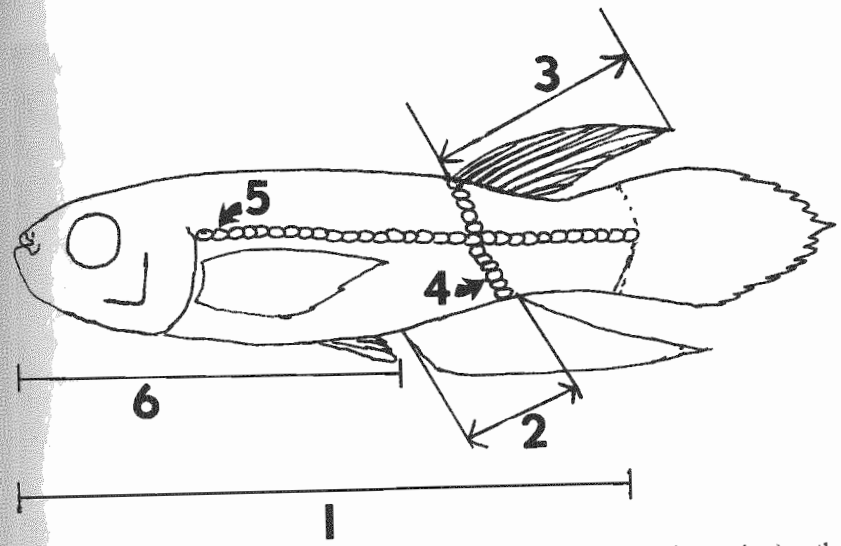

Fig. 1. [1] Standard length. Measured from the tip of the snout (upper jaw) to the base of the caudal fin (end of the vertebral column). [2] Anal Fin Base length. Length of the junction of the fin and body. The dorsal fin base length is measured similarly. [3] Dorsal Fin length. Measured from the origin of the fin on the body to the very tip of the longest ray. The length of the anal fin is measured similarly. [4] Transverse Scale Count. Number of scales from origin of the dorsal fin counted down diagonally to the anal fin. [5] Lateral Scale Count. From posterior edge of the opercle (gill cover), scales in the row back to the base of the caudal fin. [6] Preanal length. Measured from the tip of the snout to the origin of the anal fin.

Of all the species, *Pterolebias maculipinnis* Radda, 1964, (Fig. 2) seems to be the most generalized. It is widespread, both geographically and ecologically, inhabiting many types of pools. If only one species of annual is found, it is usually *P. maculipinnis.* When taken with other species it prefers the shallower grassy edges of the pools, and is generally the most abundant. Maximum size is about 5.5 cm standard length (SL). The nomenclatorial history of this species is one of several instances in which aquarists and taxonomists have interacted with unfortunate results. It was known for some time that Dr. Franz H. Weibezahn had planned to describe this species under the name *Pterolebias maculipinnis.* Unfortunately, Dr. A. Radda (1964), under the impression that the fish had already been described, figured and included *Pterolebias maculipinnis* Weibezahn in his review of the genus. This paper was published in **DATZ** after Weibezahn's description had been submitted to a scientific journal, but before it had been printed. On learning of Radda's paper, Weibezahn withdrew his manuscript and it was not published. Thus, even though he attributed the name to Weibezahn, Radda had in fact described the species. This is why taxonomists tend to be rather secretive about unpublished names. Use of code numbers such as U1, BIV, NSC-23 etc. or common names like "shady zonatus" and "saberfin" is preferable to accidentally describing a species by premature use of a scientific name.

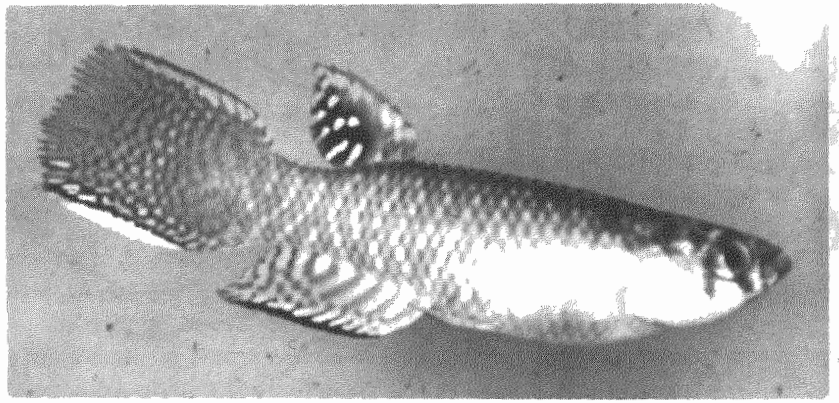

Fig. 2. Male *Pterolebias maculipinnis.* Photo by H. L. Arment.

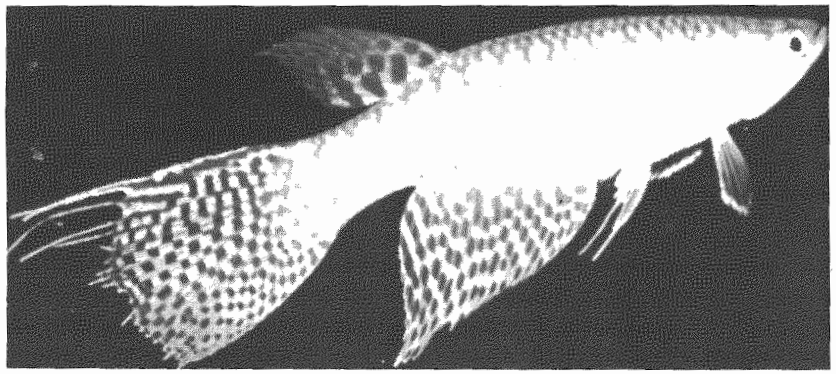

Fig. 3. Male *Pterolebias zonatus.* Photo by E. Hoigné.

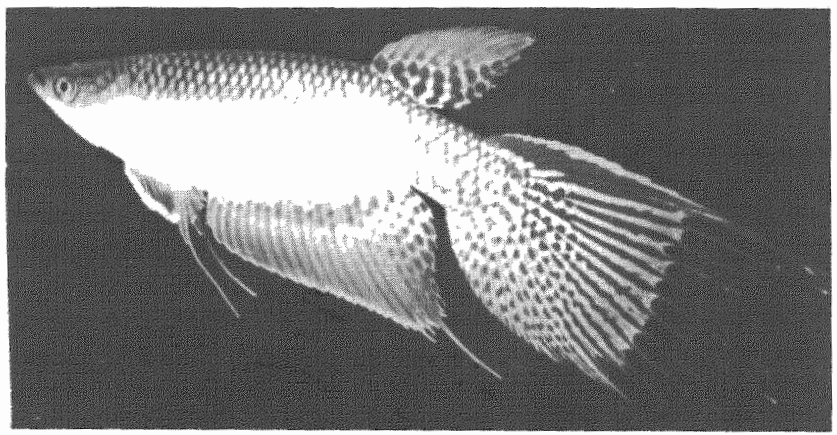

Fig. 4. Male *Pterolebias hoignei.* Photo by E. Hoigné.

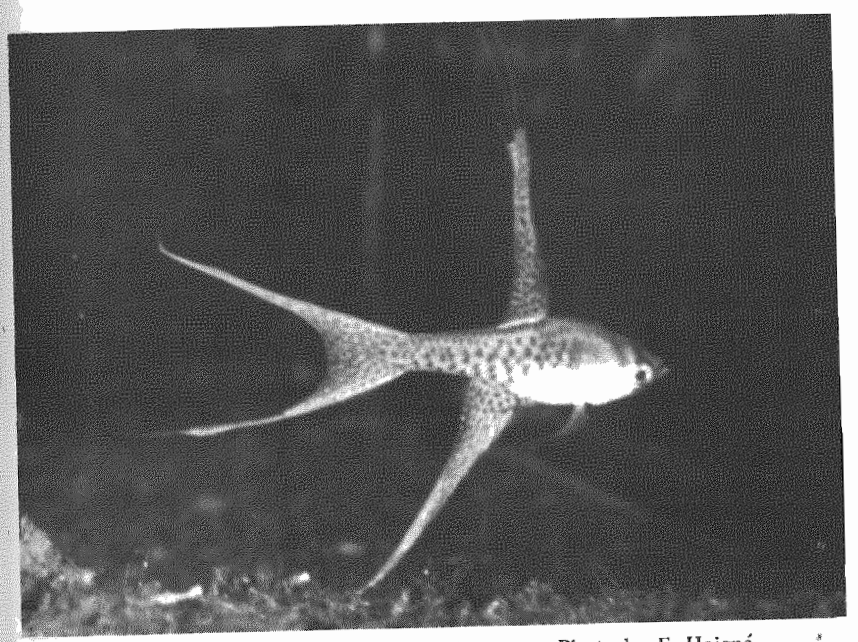

Fig. 5. Male *Austrofundulus dolichopterus.* Photo by E. Hoigné.

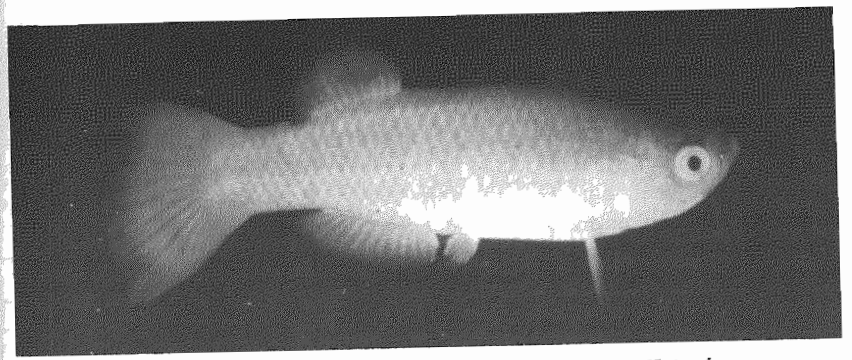

Fig. 6. Male *Austrofundulus transilis.* Photo by E. Hoigné.

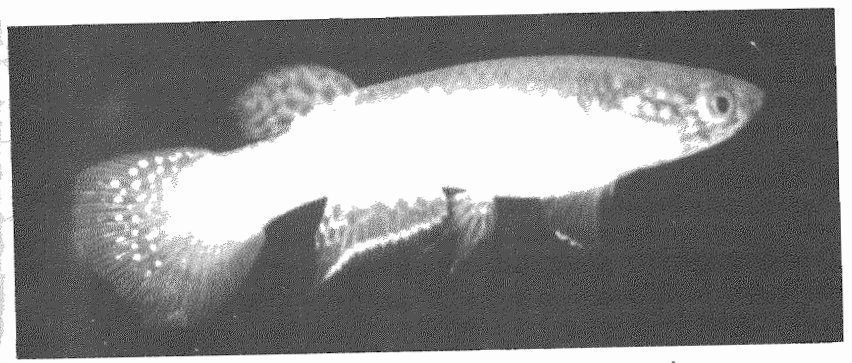

Fig. 7. Male *Rivulus stellifer.* Photo by E. Hoigné.

Pterolebias zonatus Myers, 1942, (Fig. 3) known as the "sunny zonatus" to aquarists, is also fairly widespread geographically. We have found it throughout the Venezuelan llanos, and it is known from near Puerto Lopez, Meta, Colombia. The "Colombian green zonatus" of aquarists is a color variety of this species. *P. zonatus* is a bit more choosy than *P. maculipinnis* about its habitat, preferring larger pools that are open and exposed to the sun. The water in these pools varies from clear to dark tea-colored, and there are large open expanses of water with scattered aquatic vegetation. *P. zonatus* is a surface fish that has been taken with all of the other Orinoco basin species except *P. hoignei*. Light intensity seems to have no relationship to its readiness to spawn under aquarium conditions.

Pterolebias hoignei Thomerson, 1974, (Fig. 4) the "shady zonatus" of aquarists, is closely related to *P. zonatus*. So far we have found it only in a small region around Caño Benito, Estado Cojedes, Venezuela. It is a creature of the forest swamps, preferring the surface waters of the cooler, deeper pools in shaded areas. Aquarists find this a relatively difficult species to propagate. Unlike *P. zonatus*, *P. hoignei* would not spawn in a brightly lit aquarium. It also seems to produce fewer eggs per female per day than *P. zonatus*.

Austrofundulus dolichopterus Weitzman and Wourms, 1967, (Fig. 5) is a midwater fish usually found with *P hoignei*. Weitzman and Wourms (1967) cited the following report on water conditions from Sr. Hoigné: temperature 23-27°C., pH 6.4-6.8, total hardness 30-70 ppm, color medium to dark amber, clear except after a rain. It is widely distributed and has been taken with all of the other species. The saberfin, as it is known to American aquarists, apparently entered the aquarium hobby from Colombia. It is likely that it occurs in the Colombian Orinoco llanos, but we have not yet been able to collect it there. Many fishes of Venezuelan origin have been exported to the USA and Europe through Colombia. The small size and flowing fins of *A. dolichopterus* are in marked contrast to the other members of the genus.

Austrofundulus transilis Myers, 1932, (Fig.6) was the first of the Orinoco basin annual species to be described. We have not collected this species nor seen it alive. Fortunately, Sr. Hoigné has supplied preserved specimens and color photographs. Myers (1932) in his original description remarked on the faded condition of the single type specimen. Examination of Sr. Hoigné's material shows that *A. transilis* is a very pale fish which lacks the scattered dark blotches, spots or bars of other *Austrofundulus species*. The type specimen came from pools in Estado Guarico and Sr. Hoigné has collected it in Estado Cojedes. This species has not yet entered the aquarium hobby. The fish presently known as *A. transilis* by aquarists in an undescribed coastal form that is not known from the Orinoco basin. We intend to describe it as new in a forthcoming review of the genus.

Rivulus stellifer Thomerson and Turner, 1974, (Fig. 7) is another species known only from the Caño Benito area. Unlike most other *Rivulus*, this species is an annual: in fact it is the most annual of all the species of the Orinoco basin, for it lives in very shallow pools, which are sometimes connected to deeper pools. Strangely enough it has never been taken from the deeper areas. *Pterolebias maculipinnis* is abundant in these shallow pools with the *Rivulus*, and the other species also occur there, but rarely. Both sexes have the scattered pearl blue spots. The females have a complex "Rivulus spot." The males have dark elongated pelvic fins, a dark marginal band on the anal fin, and orange tips on the pectoral fins. In the aquarium this species is highly belligerent, and males often kill one another.

As it now stands, *P maculipinnis*, *P. zonatus*, *A. dolichopterus* and *A. transilis* are known from several areas in the Orinoco basin. They are listed here roughly in decreasing order of numbers of known localities. The other two species, *P. hoignei* and *R. stellifer*, are known only from within a few kilometers of Caño Benito, Estado Cojedes, Venezuela. All six species occur in this area, as many as five in a single pool. Several distributional questions are still unanswered: are *P. hoignei* and *R. stellifer* actually that restricted in distribution or will other populations be discovered? Are there other restricted areas in the llanos which have unique species? Precise distribution for any species is as yet unknown.

ACKNOWLEDGMENTS

We wish to thank Sr. Francisco Mago-Leccia and Sr. E. Hoigné for their kind assistance, support and hospitality during our trips to Venezuela. Gerald Lofstead and Robert Yacano assisted us in the field. Dr. Plutarco Cala kindly allowed us to examine the Colombian specimen of *P. zonatus*. Roger Hoelter supplied specimens and information on the "Colombian green zonatus." Research for this paper was supported by grants to Thomerson by the Graduate School, Southern Illinois University at Edwardsville, and the National Geographic Society.

Literature Cited.

Myers, G. S. 1932. A new genus of funduline cyprinodont fishes from the Orinoco basin of Venezuela. Proc. Biol. Soc. Wash. 45: 159-162.

——— 1935. Four new fresh-water fishes from Brazil, Venezuela, and Paraguary. Proc. Biol. Soc. Wash. 48: 7-14.

Radda, A. 1964. Die gattung *Pterolebias* Garman 1895. DATZ 17: 39-41.

Thomerson, J. E. 1974. *Pterolebias hoignei*, a new annual cyprinodontid fish from Venezuela, with a redescription of *Pterolebias zonatus*. Copeia 1974 (1): 30-38.

Thomerson, J.E. & B. J. Turner 1973. *Rivulus stellifer*, a new species of annual killifish from the Orinoco basin of Venezuela. Copeia 1973 (4): 783-787.

Weitzman, S. H. & J. P. Wourms 1967. South American cyprinodont fishes allied to *Cynolebias* with the description of a new species of *Austrofundulus* from Venezuela. Copeia 1967 (1): 89-100.