

SYNTHETIC DESCRIPTION OF FOUR NEW ANNUAL RIVULIN CYPRINODONTS FROM PARAGUAY

Abstract:

Four collecting trips undertaken from 1992 to 1994 by two families of enthusiastic aquarists, one from North America (Fromm) and the other from Holland (Van den Berg), have considerably improved our knowledge of the South American Cyprinodonts of Paraguay, and especially from the Paraguayan Chaco: 39 new collecting localities of annual species are reported, and 4 new species, all annual, described: *Cynolebias patriciae* n.sp., *C. vandenbergi* n.sp., *C. monstrosus* n.sp., and *Trigonectes aplochiloides* n.sp.

I. Description of four new species of annual Cyprinodonts:

Cynolebias patriciae, new species (fig. 2, male; fig. 3, female; fig. 4, juvenile).

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Holotype. ANSP (1) 170424, male, 24.3 mm SL and 32 mm TL. Paraguay, Presidente Hayes department, ditch along the road to Clorinda, approximately 500m south of Rio Negro (Station DF 93-28). 25.25S, 57.67W (in this paper latitude and longitude are stated in degrees and hundredths, not in degrees and minutes). Dan and Pat Fromm, June 11, 1993.

Paratypes. ANSP 170424B, 1 male examined, 24.0 mm SL and 30.6 TL and 10 individuals, 9 males and 1 female, of which 4 were transferred to MNHNP (abbreviations of institutional



Fig. 1: Map of collecting sites. Type localities in the inset. Drawn by M. Chauche.



Fig. 2: Adult male *Cynolebias patriciae* n. sp., location DF 93-28. Photo: D. Fromm.



Fig. 3: Adult female *Cynolebias patriciae* n. sp., location DF 93-28. Photo: D. Fromm.



Fig. 4: Subadult male *Cynolebias patriciae* n. sp., location DF 93-28. Photo: D. Fromm.



Fig. 5: *Cynolebias vandenbergi* n. sp., male, location LV 93/2. Photo: J.W. Hoetmer.



Fig. 6: *Cynolebias vanderbergi* n. sp., female, location LV 94-34. Photo: J.W. Hoetmer.



Fig. 7: *Cynolebias vanderbergi* n. sp., male, aberrant population, location LV 94-30. Photo: J.W. Hoetmer.

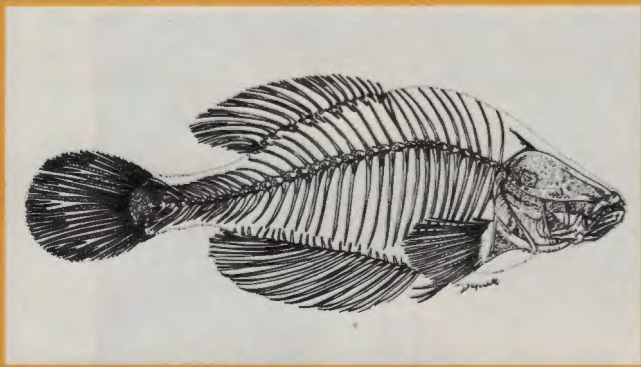


Fig. 8: *Cynolebias vanderbergi* n. sp., drawing of a radiograph of a male ANSP 169800, location DF 92-114. Drawing by P. Deynat in Huber (1994).



Fig. 9: *Cynolebias monstrosus* n. sp., male, location LV 94-33. Photo: R.H. Wildekamp.



Fig. 10: *Cynolebias monstrosus* n. sp., female, location LV 94-33. Photo: J.W. Hoetmer.



Fig. 11: *Cynolebias monstrosus* n. sp., male from the giant population, location LV 94-27. Photo: J.W. Hoetmer.

names explained at the end of this paper), number on request, and 2 to MACN, number on request. MHNH 1993-3620, 4 males and 1 female examined, all collected with the holotype.

Diagnosis:

Small relative to the average of the genus, resembling *C. alexandri* and *affinis* by its blue-green coloration, but distinguished when preserved by a rather less marked dichromatism, prominent anterior bars and by certain meristic data (males average A = 23-24 versus 21-23; LL = 23-25 versus 25-26, and especially D/A = +2 to +4 versus -1 to -3); in addition, *C. patriciae* has a

line of 8-12 neuromasts in place of a preopercular canal, and many others partially surround the eye, which is placed higher. The pectorals are long, reaching the fourth anal ray in the male (scarcely the first in *alexandri* and *affinis*) and the second in the female. Finally, a significant (?) element, the membrane between the rays of the vertical fins does not extend as far as their distal edge, the opposite of *affinis*, thus creating a ragged outline.

Life colors:

Male, female, and juveniles dissimilar (the inverse of the color in alcohol). Only juveniles have large dark gray bars on the flanks and dark

grey flames (= streaks) the length of the unpaired fins, more intense distally, almost forming a marginal band on the anal. The adult male is particularly handsome, especially when courting: the flanks are then an intense metallic green; normally only the lower flanks and the preopercular spot are bright emerald green, and the unpaired fins are densely spotted with the same color, all on a brownish beige base without stripes. A dark marginal band is present on the pectorals, the caudal, and the anal. The eye is, in contrast, circled with a brilliant orange and crossed by the black bar common among *Cynolebias*. The female is spotted vertically with maroon blotches on a lighter base, some, behind the opercle, are more intense and almost



Fig. 12: *Cynolebias monstrosus* n. sp., closeup of the head, location LV 94-27. Photo: J.W. Hoetmer.



Fig. 13: *Trigonectes aplochelloides* n. sp., male, location LV 94-35. Photo: J.W. Hoetmer.

black. In color, the female bears a strong resemblance to the other small *Cynolebias* of Argentina, Uruguay, and the extreme south of Brazil.

Comparison with males of *C. alexandri* and *C. affinis*:

- *patriciae* is easily separated from *alexandri* by the well marked striped pattern, in the latter made of regular brown bars; even though they are apparent only in the juvenile, broader and more distinct behind the opercule in the former.

- *patriciae* is distinguished from *affinis* (D. Fromm, pers. comm) by the disposition of spots on the flanks (vertically in the latter; posteriorly in a horizontal median line in the former), by the length of the lower part of the black eye bar (short in the latter; long, reaching the jaw, in the former).

Color in alcohol

The two sexes, with an intense vertical (not oblique as in *affinis*) bar from one side of the eye to the other, followed by a light zone, then a dark grey zone, on the preopercule; the flanks display 7 broad dark grey bars, sometimes divided in two, and between them six narrower light bars; often, and particularly in subadults and dominant individuals, the two to four first bars behind the opercule are very dark, contrariwise the following bars more grey, and they stand out strongly. The male is distinguished from the female by the presence of dark flames along all of the rays and of clear spots on the unpaired fins, as well as by the variably black trimmed end of the dorsal and anal. In the female, each bar on the flanks is interrupted at least once.

Size, proportions, and formulas

Males approximately 40 mm TL, females a little less, after rearing in the aquarium.

Morphological and meristic data of



Fig. 14: *Trigonectes aplochelloides* n. sp., pair, female above, location LV 94-35. Photo: J.W. Hoetmer.

the holotype, of a paratype 170424B and of paratypes in MNHN (holotype male first, in bold face, then 5 males and one female; abbreviations are explained in Huber, 1992) are, after radiophotographic confirmation: D= 22, 23, 22, 23, 23, 24, 18; A= 25, 24, 26, 25, 23, 24, 20; D/A= +2, +3, +2, +2, +3, +2, +4; LL= 25, 25, 24, 23, 25, 25, 24; TRAV.= 10, 9, 9, 9, 10, 10; CIR= 14, 15, 13, 14, 14, 14, 15; L.S. (in mm)= 24.3, 24.0, 23.2, 23.2, 22.9, 21.0, 17.0; L.T. (in % of L.S.)= 132%, 128%, 131%, 126%, 124%, 130%, 126%; P.D.= 54%, 57%, 58%, 57%, 51%, 50%, 66%; P.A.= 51%, 54%, 53%, 52%, 49%, 51%, 59%; P.V.= 45%, 46%, 46%, 46%, 45%, 46%, 53%; depth at the anal= 33%, 30%, 34%, 31%, 29%, 29%, 34%; head= 33%, 31%, 34%, 34%, 33%, 30%, 36%; interorbital width= 13%, 15%, 13%, 13%, 11%, 10%, 13%; diameter of the eye= 7%, 7%, 7%, 7%, 7%, 7%, 9%; vertebrae= 11+15, 11+14, 11+16, 11+15, 12+16, 12+15, no data.

One notes, as in many *Cynolebias*, an important sexual dimorphism. Fewer dorsal and anal rays, these fins inserted further to the rear, and form of the body more squat in the female. For example, here the female shows 4-6 fewer dorsal and anal rays, and a D/A

displacement, it seems, a little greater: this translates into a more rearwards position (8 to 10% of SL) of these fins.

Distribution

The Rio Negro crosses the road from Asuncion to Clorinda and discharges, not far from the type locality, directly into the Rio Paraguay. The other stream of the same name in that vicinity is an affluent of the Rio Pilcomayo. The species is known only from the type locality, across the Rio Paraguay from Asuncion, the capitol of Paraguay. As the site is near the border with Argentina, it is very probable that the fish also occurs in the north of that country.

Relationships

By its green color and general conformation, *C. patriciae* is close to *C. alexandri*, described from Gualeguaychu (33.07S; 58.57W) in Argentina, nearly 900 km to the south, and to *C. affinis*, described from Arroyo Tres Cruces (32.32S, 55.77W), in Uruguay, approximately the same distance to the southeast. More generally, *C. patriciae* belongs to a group of small *Cynolebias* species whose rounded unpaired fins do not have long filaments, whose males have

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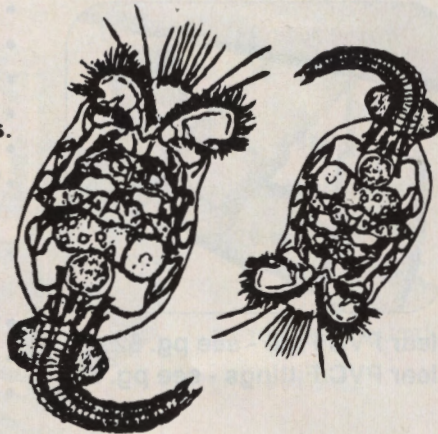
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the same average ray counts for dorsal and for anal fins, whose dorsal is inserted in front of or directly above the anal's insertion, and which have a southern distribution, viz., *affinis*, *alexandri*, *costai*, *cyaneus*, *gymnoventris*, *luteoflammulatus*, *nigripinnis* and *patriciae*. Together they form a group remarkably homogenous and distinct from other *Cynolebias* and would deserve the allocation of a subgeneric name. Costa, the specialist in these fishes, will probably do this.

Etymology:

The species is dedicated to Patricia Fromm, Cherry Hill, New Jersey, U.S.A., following the wishes of her husband, with whom she discovered it.

Cynolebias vanderbergi, new species (fig. 5, male; fig. 6, female; and fig. 7, aberrant phenotype; fig. 8, drawing of a radiophotograph of a male ANSP 169800).

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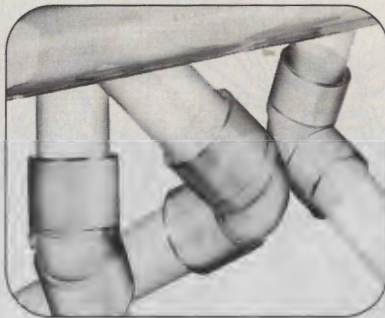
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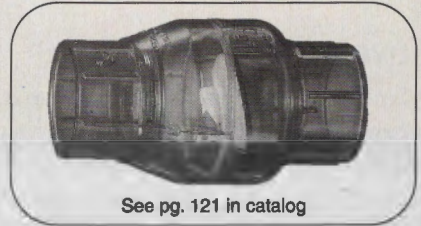


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Holotype. ZMA 121270, male, 61.0 mm SL and 74.3 mm TL
Paraguay, Boqueron Department, near Fortin Toledo, (Station LV 93-2 = LV 94-22). 22.27S., 60.54W. Leen and Arjen Van den Berg, July 23 1993, collected; Jan Willem Hoetmer, deposited.

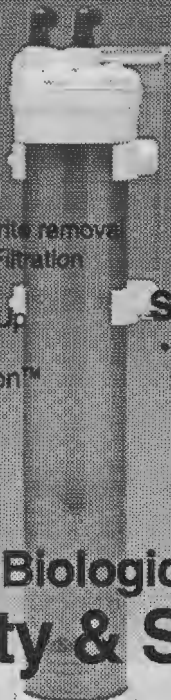
Paratypes. NRM 20231, UFRJ 3028, 1 pair each, NMW 92900, 1 pair; MNHN 1993-297, 3 individuals (Station LV 93-2), aquarium reared. Leen and Arjen Van den Berg, 1993 coll. and J. Huber dep. ANSP 169800, 4 males, of which 2 will be transferred to MNHNP (number on demand), from a roadside ditch 14.4 km from the Filadelfia airport on the road from Filadelfia to Teniente Montahia (Station DF 92-114); ANSP 169801, 5 males (Station DF 92-107B); ANSP 169802, 10 males (Station DF 92-107); ANSP 169803, 6 males (Station DF 92-110); ANSP 169804, 5 males (Station DF 92-122); ANSP 169805, 14 females (Station DF 92-122); ANSP 169806, 4 females (Station DF 92-108); ANSP 169807, 3 females (Station DF 92-114); ANSP 169808, 5 females (Station DF 92-110); ANSP 169809, 4 males (Station DF 92-108); ANSP 169810,

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bold face) are, after radiophotographic confirmation: D= 26, 25, 24, 23, 23, 28, 21, 18, 23, 21, 22, 22, 27, 24, 21, 21; A= 31, 30, 30, 26, 26, 31, 28, 26, 27, 24, 26, 26, 32, 26, 26, 26; D/A= +4, +4, +4, +3, +5, +4, +2, +5, +4, +2, +4, +4, +5, +4, +4, +5; LL= 30, 32, 31, 30, 32, 30, 30, 31, 31, 30, 30, 29, 30, 30, 31, 28; pDor= 24, 23, 19, 19, 19, 22, 21, 23, 22, 20, 22, 22, 17, 21, 19, 20; TRAV.= 16, 18, 17, 17, 16, 17, 16, 17, 17, 15, 16, 15, 16, 17, 17, 16; CIR= 20, 19, 21, 19, 18, 19, 20, 20, 19, 18, 18, 19, 19, 22, 21, 18; L.S. (in mm)= 61.0, 62.4, 61.5, 47.8, 50.4, 32.8, 53.0, 43.6, 43.1, 39.9, 36.1, 31.9, 37.8, 52.2, 45.8, 37.8; L.T. (in % of L.S.)= 122%, 121%, 120%, 121%, 121%, 127%, 122%, 124%, 123%, 130%, 129%, 121%, 122%, 125%, 124%, 125%; P.D.= 54%, 58%, 55%, 57%, 55%, 54%, 61%, 60%, 60%, 59%, 57%, 57%, 51%, 61%, 64%, 52%; P.A.= 46%, 46%, 47%, 49%, 45%, 55%, 58%, 55%, 53%, 56%, 53%, 49%, 49%, 56%, 56%, 48%; P.V.= 40%, 40%, 40%, 43%, 39%, 46%, 49%, 45%, 45%, 48%, 46%, 42%, 43%, 46%, 46%, 44%; depth at the anal= 41%, 42%, 41%, 41%, 38%, 37%, 42%, 41%, 38%, 39%, 39%, 36%, 35%, 38%, 41%, 36%; head= 30%, 29%, 28%, 28%, 28%, 36%, 30%, 28%, 28%, 28%, 29%, 29%, 29%, 30%, 28%, 31%; interorbital width= 16%, 15%, 13%, 12%, 12%, 11%, 14%, 13%, 12%, 13%, 11%, 11%, 10%, 12%, 13%, 13%; diameter of the eye= from 6% to 8%; vertebrae= 14+18, 13+17, 13+18, 12+18, 13+18, 13+18, 13+16, 13+18, 13+18, 13+18, 12+17, 13+17, 13+ 18, 12+18, 13+18, 13+17.

Sexual dimorphism is shown notably in the lower contour of the body behind the anal; it's much less deep in the female; in addition, females' frontal profile (sometimes as flattened as in some *Chaetodon*) is so variable that they might be taken for several different species. The classic *Cynolebias* sexual dimorphism (dorsal and anal rays; predorsal and preanal lengths; etc.) is very strong, but difficult to place in evidence given the great variability and the similarity of color patterns. *C. vanderbergi* is also characterized by the presence in the male of an exceptional number of ctenoid spines (almost on each scale in some specimens) on the flanks, the preopercle, and the tail. Finally, there are 17-22 neuromasts at the bottom of each of the sensory canals of the forehead, and the lateral line extends at

least 6 scales onto the caudal peduncle.

Distribution

The species is known from 16 collecting sites (see fig. 1) in the high Chaco, in the vicinity of Filadelfia in northwestern Paraguay. The limits of its distribution are unknown.

Relationships

C. vanderbergi belongs to a group of *Cynolebias* species with medium to large size; with deep and rhomboidal form; that do not prey on congeners; unpaired fins without long filaments, and, in addition, rounded; and with a southern distribution; viz., *adloffii*, *bellottii*, *carvalhoi*(?), *cinereus*, *melanoorus*, *vanderbergi*, and *viarius*.

Etymology

This species is dedicated to Leen Van den Berg and his son Arjen, of Maarn, the Netherlands, its codiscoverers with the Fromms.

Important note

The study and diagnosis of this species turned out to be formidably complex. Even after many tests, the possibility that it actually comprises two different species cannot be entirely

ruled out: extreme variability in the same sex in morphology, number of rays, presence or absence of particular neuromasts or of ctenoid spines; variability of certain osteological characters; reversal of characteristic features of male and female coloration, confirmed by aquarists; and selective courtship behavior that is difficult to understand. The conservative approach has prevailed here because of the impossibility of finding distinctive, stable, and objective criteria and because of the remarkable stability of the D/A displacement, of scale counts in the longitudinal series, and of numbers of vertebrae.

Cynolebias monstrosus, new species (fig. 9, male; fig. 10, female; fig. 11, male from the giant population; and fig. 12, male's head).

Holotype. MNHN 1994-1110, male, 105.5 mm SL and 128.9 mm TL Paraguay, Boqueron department, near La Serena (Station LV 94-27). 21.94S, 56.97W. Leen Van den Berg, 15 March 1994, coll. and Jan Willem Hoetmer, dep.

Paratypes. MNHN 1994-1111, female, with the same data as the holotype. ANSP 169974, 1 pair, of which the male will be transferred to MNHNP (number on demand), from a pool by the road from Filadelfia to Fortin Toledo, 32.3 km south of the Ruta TransChaco (Station DF 92-110); ANSP 169973, 1 pair (Station DF 92-107) and ANSP 169975, 2 males (?) (Station DF 92-107B), of which the largest has been transferred to MNHN, No 1993-3619; Dan Fromm, October 1992, coll. and dep. ZMA 121281, 3 individuals (Station LV 94-33); ZMA 121284, 4 males (Station LV 94-33); ZMA 121285, 1 pair (Station LV 94-28); NMW-92899, 1 individual (Station LV 94-23). Leen Van den Berg, 1994 coll. and Jan Willem Hoetmer, dep.

Diagnosis

Of very great size, probably, with *C. porosus*, the largest of the genus; similar to *C. elongatus* and *C. prognathus*, but easily distinguished by the color pattern, composed of 13 to 14 prominent bars on the flanks and by morphometric data (notably, the much higher number of scales in the longitudinal series, the strong reduction in the depth of the body behind the anal, with a form generally elongate, approximately from 28-30% to 14-18% in SL); additionally, *C. monstrosus* has approximately 104 neuromasts (a

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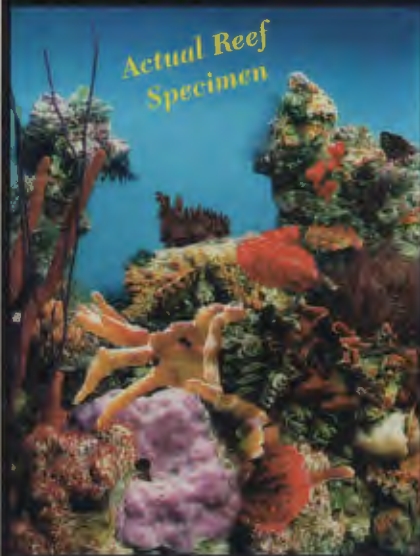


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previously unheard-of number) on the forehead in the canals characteristic of *Cynolebias*, as well as 6 neuromasts near the postorbital rim; the eye is relatively very small and not prominent, so much that the greatest width of the head is 30-40% greater than the interorbital distance.

Life colors

The male and female differ little, the female having paler coloration: both have the characteristic black bar across the eye, but at an angle of around 120 degrees, in contrast to the majority of *Cynolebias*, in which the angle is from 160-180 degrees, as well as 15 vertical to slightly oblique (/) dark grey bars on a lighter base, more intense in the male and varying with the fish's mood; the male displays weak coloration in the vertical fins: red in the dorsal, with grey blotches, and blue-green in the anal, also a black edging while the tail is uniformly dark grey. The female's color is generally less intense and all fins are transparent.

Colors in alcohol

Both sexes, with a very intense black vertical bar below and above the eye, making an angle, preceded and followed by a light area, then a grey zone, on the preopercule; the flanks display the narrow dark grey vertical bars of the live animal, but with more contrast, and between them six wider light bars; the area near the base of the anal is whitish, increasingly darker towards the distal edge of the fin, with a black border in the male; in the rear center part of the male's dorsal fin there are 6-10 intense small flames.

Size, proportions, and formulas

Males around 150 mm TL, females a little less, in aquarium specimens of the "giant" population; but this is a maximum, for the other populations collected remained relatively smaller.

Morphological and meristic data of the 8 first types mentioned (holotype first and in bold face, then alternatively female and male, the last individual being another male) are, after radiophotographic confirmation: D= 18, 16, 16, 17, 17, 16, 17, 17; A= 23, 22, 23, 22, 21, 21, 21, 22; D/A= +6, +7,



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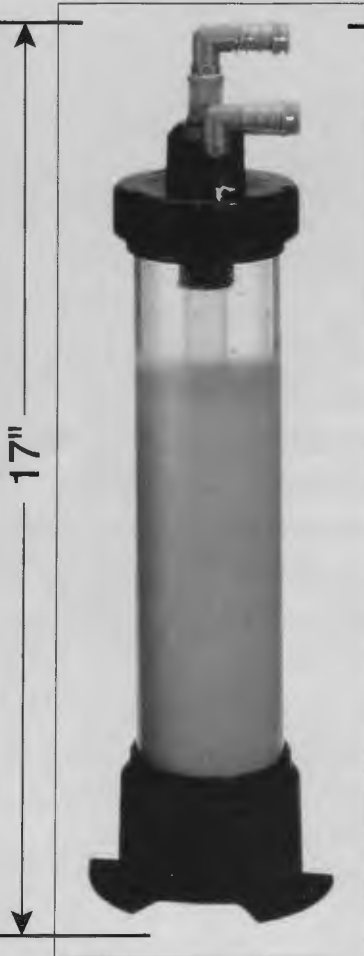
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+8, +7, +6, +7, +7, +8; LL= 66+9, 68+3, 77, 63, 64, 65, 74, 67; TRAV.= 21, 23, 26, 20, 20, 20, 22, 24; L.S. (in mm)= 105.5, 86.0, 76.9, 73.8, 65.1, 54.1, 65.2, 68.8; L.T. (in % of SL)= 122%, 122%, 127%, 118%, 122%, 124%, 123%, 117%; P.D.= 68%, 70%, 70%, 68%, 70%, 68%, 70%, 70%; P.A.= 60%, 60%, 58%, 57%, 57%, 60%, 56%, 57%; P.V.= 54%, 53%, 50%, 49%, 49%, 51%, 50%, 50%; depth at the anal= 27%, 28%, 33%, 28%, 28%, 27%, 31%, 27%; head= 37%, 40%, 37%, 36%, 38%, 38%, 38%, 38%; interorbital width= 17%, 14%, 15%, 15%, 14%, 13%, 16%, 14%; diameter the eye= 4%, 5%, 4%, 5%, 4%, 4%, 4%, 5%; snout= 11%, 11%, 8%, 8%, 9%, 9%, 9%, 10%; vertebrae= 15+22, 14+19, 12+21, 13+21, 13+21, 12+21, 12+21, 13+22.

For comparison, in the single type of *elongatus* (which we have examined and for which Dr. B. Herzig has kindly sent a radiophotograph), counts are: D= 19; A= 23; D/A= +3; LL= 48; L.T.= 122%; P.D.= 68%; P.A.= 67%; P.V.= 59%; depth at the anal= 30%; vertebrae= 14+21.

The general form is massive, notably the head, which is very long and wider than the rest of the body, making one think immediately of a predator (cf. fig. 12); the teeth in the outer row are numerous, unicuspid, and strongly recurved towards the inside. Sexual dimorphism is weak (morphology) to nonexistent (number of rays in and insertion of the vertical fins), as in *Cynopoeilus* and al., but contrary to the other *Cynolebias*.

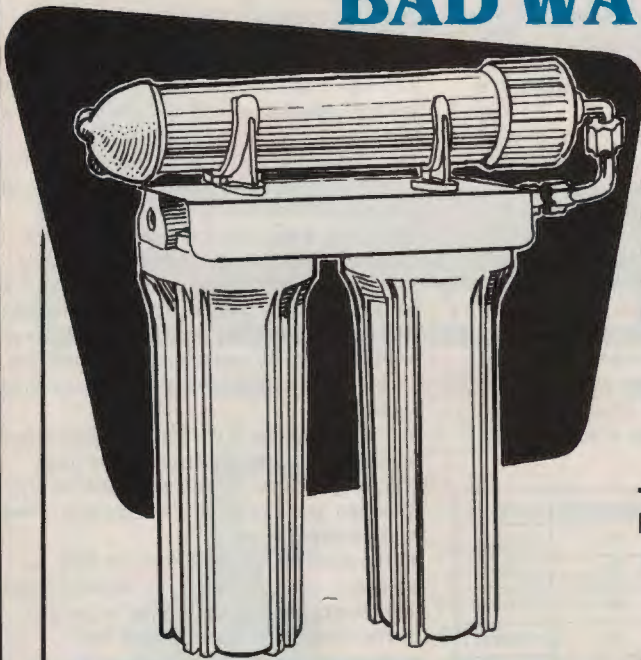
Distribution

The species is known from seven collecting sites in the high Chaco, in the vicinity of Filadelfia, in northwestern Paraguay; the limits of its distribution are unknown. The type locality of *C. elongatus* is "La Plata" (by assumption, near the town, 25.88S, 58.91W), around 1500 km from the *monstrosus* sites; its other known collecting sites are all near Buenos Aires. The type locality of *prognathus* is "Las Maravillas" in southeastern Uruguay (33.65S, 53.67W in Huber, 1994), roughly 1300 km from the *monstrosus* sites.

Relationships

C. monstrosus belongs to a group of very large species of *Cynolebias* having a cylindrical body and a massive appearance; with more than 45 scales in the longitudinal series; aggressive;

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female, 69.8 mm SL and 83.6 mm TL, with the same data as the holotype.

Paratypes. ANSP 169976, 3 individuals, the largest probably a female, respectively 69.1, 34.6, and 25.9 mm SL, Paraguay, KM 464.1 on the Ruta TransChaco (Station DF 92-103); ANSP 169977, 1 individual (Station DF 92-109); ANSP 169980, 1 juvenile (Station DF 92-122), Dan Fromm, 9 to 13 October 1992, coll. and dep. ANSP 170416, 2 individuals (Station DF 93-21); ANSP 170420, 1 individual (Station DF 93-25). Dan and Pat Fromm, 7 June 1993, coll. and dep.

Diagnosis

Of great size relative to the average of the genus, distinguished from all of the other *Trigonectes* by the color of the flanks (yellow-green spots, not red-brown), by the morphology which makes it appear like, to the point of being mistaken for, a fish of the Cyprinodont genus *Aplocheilus* from the Indo-Malaysian subcontinent (frontal profile greatly flattened, fusiform body, dorsal fin set far back, with, additionally, a generally ochre coloration).

Life colors

The male and female differ little, the female having paler coloration, as in *Rivulus*: both have two grey-black bars from top to bottom of the eye; a yellow band with orange speckles near the base of the anal; and (?) an oblong

bright yellow blotch on the forehead; additionally, in the male the distal part of the anal and the lower part of the caudal are bright orange. The flanks of both sexes are covered by 8-10 longitudinal series of bright yellow to green spots on an ochre to rose base,

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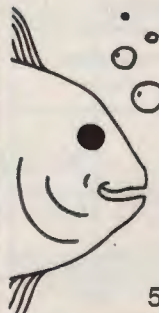
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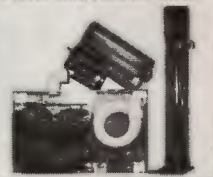
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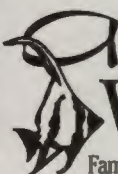
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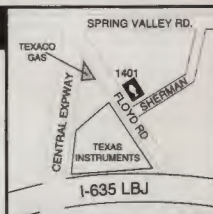


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eating large prey including their smaller congeners such as *C. chacoensis* and *C. bitteri*; having unpaired fins without long filaments; without gonopodium; and having a rather southern distribution. Viz., *C. elongatus*, *C. monstrosus*, and

C. prognathus. *C. porosus*, type species of the genus *Cynolebias* Steindachner 1978, and other forms described by Costa from Brazil (*albipunctatus*, *griseus*, *leptocephalus* and *perforatus*) could easily be included in the group, for they share certain of the traits listed

above (with, always, a somewhat lower LL), as well as, to a lesser degree, *cherodophilus*, *schreitmuelleri* and *wolterstorffi*. This group could make up the typical subgenus *Cynolebias*. s.s., containing several superspecies.

Etymology

From the Latin monstrum, referring to the species' shape and behavior; common name given by Dan Fromm "pike-like monster."

History:

The species was discovered 10 October, 1992 (ANSP 160073); however, Dan Fromm reports that specimens collected previously are cataloged in MHNHP as *C. elongatus*.

Trigonectes aplocheiloides, new species (fig. 13, male, and fig. 14, male and female)

Holotype. MNHN 1994-1104, male, 75.9 mm SL and 93.1 mm TL. Paraguay, Boqueron department, 74 km from Mariscal Estigarribia in the direction of Americo Picco, (Station LV 94-35). 21.30S, 60.51W. Leen Van den Berg, 16 March 1994, coll. and Jan Willem Hoetmer, dep.; maintained in aquarium for 4 months.

Paratype, MNHN 1994-1105,

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somewhat like *Rivulus bahianus*; a shining yellow preopercular blotch is likewise very distinct; the male's other fins are orange ventrals, the dorsal with chestnut reticulations and a vestigial basal band as in the anal, and finally the tail streaked with brown; the female's fins have similar but paler coloration; take note of an elegant little touch, that the ventrals are edged in white.

Color in alcohol (after 12 hours fixation)

Males, with unspotted flanks, dorsal and anal orange at the base, additionally with dark spots near the base and on all of the dorsal; the lower abdomen is orange; a grey vertical zone appears clearly on the tail to the rear of the peduncle; the female is similar, except for the flanks, which are spotted and the tail, dorsal, and anal, which are completely yellow; in both sexes the lower lip is dark, as is the preopercular region.

Size, proportions, and formulas

Males around 100 mm TL, females a little less, after rearing in the aquarium. Morphologic and meristic data of the 7 types mentioned (holotype, male, first and in bold face, then 6 probably females) are, after radiophotographic confirmation: D= 13, 14, 12, 12, 12, 13, 13; A= 17, 17, 16, 16, 17, 17, 16; D/A= +7, +6, +6, +7, +8, +7, +7; LL= 36+4, 37, 35, 33, 34, 35, 37; TRAV.= 11, 11, 9, 10, 10, 11, 11; L.S. (in mm)= 75.9, 69.8, 69.1, 34.6, 25.9, 28.4, 36.6; L.T. (in % of L.S.)= 123%, 120%, 124%, 126%, 127%, 125%, 125%; P.D.= 73%, 72%, 74%, 73%, 72%, 74%, 73%; P.A.= 64%, 67%, 67%, 64%, 62%, 66%, 66%; P.V.= 50%, 53%, 54%, 52%, 50%, 54%, 53%; depth of the anal= 23%, 20%, 20%, 20%, 19%, 21%, 20%; head= 28%, 29%, 27%, 32%, 32%, 31%, 30%; interorbital width= 14%, 15%, 13%, 13%, 12%, 11%, 12%; diameter of the eye= 6%, 7%, 7%, 7%, 8%, 8%, 6%; vertebrae= 15+18, 16+18, 15+17, 15+18, 16+18, 16+17, 15+18.

The pectorals are long for a *Trigonectes*: 21% of SL in the male and 18% in the female; the ventrals are long, but much less than in the other members of the genus: in males they reach only to the second or third anal ray.

There are around 22 circumpeduncular scales and 24-30 predorsal scales. There is no outstanding sexual dimorphism:



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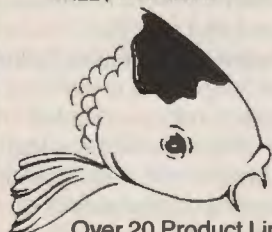
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ventrals a little longer in males, but vertical fins not pointed in either sex (respectively, very long and filamentous in *T. balzanii*).

Distribution

The species is known from five collecting sites in the high Chaco, in the vicinity of Filadelfia, in northwestern Paraguay; the limits of its distribution are unknown. *T. balzanii*, a species common to Brazil and Paraguay, is known to the northeast and to the south in the drainage of the Rio Paraguay. We doubt that the two species are sympatric.

Relationships

Although it is clearly distinguished from the other members of the genus, *T. aplocheiloides* belongs in *Trigonectes* s.s. The genus is very close to *Rivulus* and a more extensive study could even merge them if new characters are not used in the analysis. In fact, the criteria commonly believed to separate the two genera (filamentous ventrals, annual development, reproductive behavior) are no longer supportable because of the discovery of intermediate *Rivulus* species and because of the new diagnosis of *Rivulus* (Huber, 1992).

Costa (1990b), with the description of two new Brazilian *Trigonectes* species, tried to redefine the genus on the basis of osteological characters, but his data set was unfortunately too limited.

Etymology

Similar to *Aplocheilus*, a Cyprinodont genus of the Old World.

II. Conclusion

Thanks to teams of enthusiastic amateurs, the first significant approach to Paraguayan Cyprinodonts has been proposed for the annual forms.

Much field work remains to be done; in fact, collections have been made in only 10% of the country, life colors from the type localities of taxa as important as *Rivulus punctatus*, *Neofundulus paraguayensis*, and *N. ornatipinnis* are not yet known, and additional extremely limited, therefore not discussed here, collections allow us

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to expect the discovery of interesting forms.

The bases of the enormous morphological (including the sensory organs) meristic, and behavioral variability established above, and not only in *Cynolebias vanderbergi*, as well as habitat partitioning in the wild also remain to be understood.

This augurs well for the future and will provide the stimulus necessary for new expeditions by killie fanciers.

III. Acknowledgements

It is to the credit of the American amateurs Daniel and Patricia Fromm that they had the insight and courage to be the first aquarists to mount a systematic collecting trip to this country, which they believed rich in annual species allied to the genus *Cynolebias*. In fact, until the 1980's, it was firmly believed that the distribution of annual Rivulins in South America was restricted to coastal regions of Venezuela, Brazil, Uruguay, and Argentina. It was only at the end of the decade that numerous collections from the interior plateau of Brazil, thanks to LaCorte, Campello-Brasil, and Costa, proved the opposite.

With the Fromms' new collections, in October, 1992, and May and June, 1993, and those of the Dutch collector Leen Van den Berg and his son Arjen, in July, 1993 and March 1994, one region of Paraguay, the high Chaco, has been well worked over. Some sites have been visited twice at a one year interval. In addition, the Fromms made a single collection of annuals not far from Asuncion (cf. figure 1, a map of the high Chaco). Thanks to their initiatives, many of these fishes have been brought back alive and reared for the first time, and their ecology is better understood. Specimens have been deposited in museums in quantities sufficient to make study possible. We thank the collectors for having given specimens to museums. We thank them also for the valuable advice that they have given us and for having shared their aquaristic experiences with us. We note finally that all of the specimens donated by Jan Willem Hoetmer had been held for 2 to 4 months in the

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We are especially grateful to Prof. J. Daget (MNHN), Dr. M.L. Bauchot (MNHN), R.H. Wildekamp (Gemert), Dr. E. Maury and J. Braga (MACN, Buenos Aires), and to an anonymous reviewer for having reviewed the manuscript. Dr. W.J.E.M. Costa (UFRJ, Rio de Janeiro) also reviewed it, but his notes and new publications reached us only after it had been finalized. We thank as well Mme. de Soutter (MNHN) for having checked scale counts for the types of *C. monstrosus*.

Finally we thank Dan Fromm (Cherry Hill) for his translation of this text, an abstracted version of the French original. The full text includes history of collections; ecology of the Chaco; diagnoses of three other species (*Cynolebias chacoensis*, *Neofundulus paraguayensis*, *Pterolebias* sp. aff. *longipinnis*, and *Trigonectes balzanii*); and a preliminary discussion of the genus *Cynolebias* and its allies, which revalidates *Simpsonichthys* as a subgenus and places *Plesiolebias* as a subgenus of *Cynolebias*.

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Abbreviations of institutions' names: ANSP: Academy of Natural Sciences of Philadelphia (USA); MNHN: Museum national d'Histoire naturelle de Paris (France); ZMA: Zoologisch Museum Amsterdam (The Netherlands); MNHN: Museo Nacional de Historia Natural del Paraguay (Asuncion); NMW: Naturhistorisches Museum Wien (Austria); NRM: Naturhistoriska Rikjs Museum, Stockholm (Sweden); UFRJ: Universidad Federal do Rio de Janeiro (Brazil); MACN: Museo Argentino de Ciencias Naturales (Buenos Aires); MHNG: Musee d'Histoire Naturelle de Geneve (Switzerland).



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