

Article

Ariel

Mann Library QL624 .I35

TN:265234



Borrower: AUM

128.119.169.34

Reference#: 4584520

Shipping Address:

Patron: Godinho, Alexandre

University of Massachusetts

W.E.B. DuBois Library

Lending String: *COO,COO,UIU,ANS,IBT

154 Hicks Way

Amherst, MA 01003-9275

ISSN:

Fax: 413-577-3114

Max cost: @N/\$50IFM

Journal/Title: Ichthyological exploration of freshwaters.

Volume: 2

Issue: 1

Month/Year: 1991

Pages: 55

Article Author: Costa;

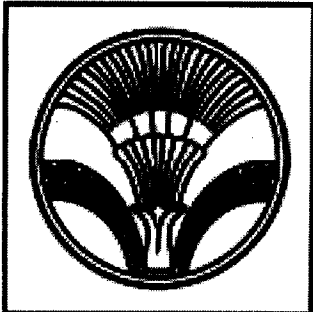
Article Title: Three new species of Cynolebias (Cyprinodontiformes);

Imprint: Mèunchen ; Verlag F. Pfeil, c1990-

Notes:

2nd Search: Sorting areas: _____ ILS tables/shelves: _____ Circ: _____ Ref: _____ Oversize: _____

Mann Library Interlibrary Services -- COO -- NYCY



Interlibrary Services
Mann Library Addition
Tower Rd.
Cornell University
Ithaca, NY 14853-4301

Phone: 607-255-7754
Fax: 607-255-0850
Ariel: 128.253.78.96
mill@cornell.edu

X8

\$15IFM

Three new species of *Cynolebias* (Cyprinodontiformes: Rivulidae) from the São Francisco basin, Brazil

Wilson J. E. M. Costa * and Gilberto C. Brasil **

Cynolebias perforatus, new species, and *C. albipunctatus*, new species, are closely related to *C. griseus* and *C. porosus*; *C. perforatus*, collected near Januária, Estado de Minas Gerais, differs by having more cephalic neuromasts (35-39) than *C. albipunctatus*, *C. griseus* and *C. porosus*; *C. albipunctatus* collected near Uauá, Estado da Bahia, is distinguished by the rounded profile of the head, longer anal fin base in old males and its colour pattern. *Cynolebias magnificus*, new species, is closely related to *C. flammeus*, but lacks dorsal fin filaments in males, and has more dorsal fin rays in males and less anal fin rays in females. It has been found near Manga, Estado de Minas Gerais.

Três novas espécies de *Cynolebias* da bacia do Rio São Francisco são descritas. *Cynolebias perforatus*, nova espécie, e *C. albipunctatus*, nova espécie, são estreitamente relacionadas a *C. griseus* e *C. porosus*; *C. perforatus*, coletada perto de Januária, Estado de Minas Gerais, difere por possuir mais neuromastos cefálicos (35-39) do que *C. albipunctatus*, *C. griseus* e *C. porosus*; *C. albipunctatus*, coletada perto de Uauá, Estado da Bahia, distingue-se pelo perfil de cabeça arredondado, maior base da nadadeira anal em machos idosos e padrão de colorido. *Cynolebias magnificus*, nova espécie, é estreitamente relacionada a *C. flammeus*, da qual se distingue pela ausência de filamentos na nadadeira dorsal de machos, mais raios na nadadeira dorsal de machos e menos raios na nadadeira anal de fêmeas. Foi encontrada pelor de Manga, Estado de Minas Gerais.

Introduction

The first author (Costa, 1990a-c) has recently dealt with relationships, delimitation and distribution of the genus *Cynolebias* Steindachner, 1876. He defined *Cynolebias* as having five autapomorphies: (1) males with more dorsal fin rays than females; (2) preanal length equals 45-55% of the standard length; (3) 16 or more neuromasts in supra-orbital series; (4) widened posterior portion of lower dentary bone process; (5) juveniles

with dark spot in center of flank. In this sense, *Cynolebias* comprises 35 species and is distributed in the coastal lowlands of northeastern and eastern South America, and the Paraná-Paraguay, upper Araguaia-Tocantins and São Francisco basins.

In addition to five recently described new species (Costa, 1990c; Costa & Brasil, 1990; Costa et al., 1990), three new species from the São Francisco basin are described below.

* Dep. de Biologia Marinha, Universidade Federal do Rio de Janeiro, CCS - Bloco A, Cidade Universitária, Ilha do Fundão, CEP 21941 - Rio de Janeiro, Brazil

** Rua Turiassú 1177, CEP 05005 - São Paulo, Brazil

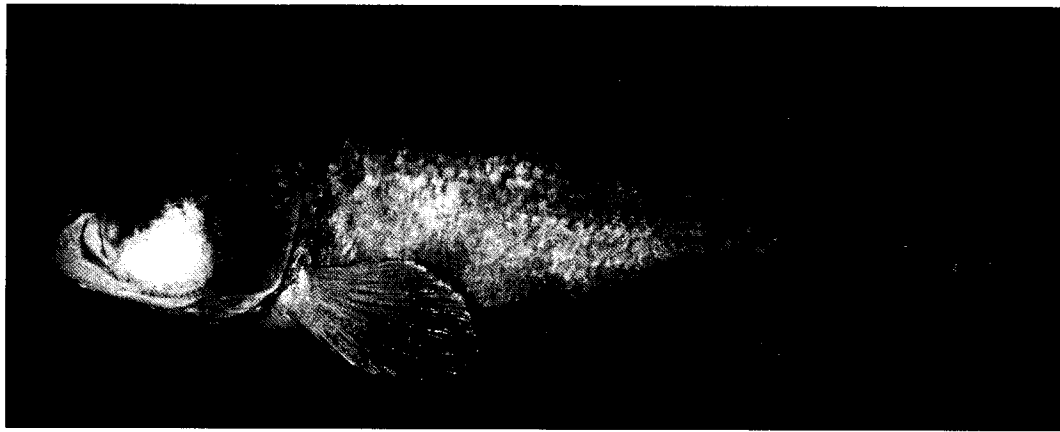


Fig. 1. *Cynolebias perforatus*, holotype, male, 90.7 mm SL, MZUSP 41376.

Material and methods

Methods for taking measurements and counts follow Costa (1988). Measurements are given as percents of standard length (SL) except for eye diameter, which is given as percent of head length. Throughout the text, vertical colour marks are called bars. The material is deposited in Museu de Zoologia da Universidade de São Paulo (MZUSP). Character polarities and comparative material are listed in Costa (1990a).

Table 1. Morphometric and meristic data of *Cynolebias perforatus* and *C. albipunctatus*. Measurements are expressed as % SL, except eye diameter as % of head length. m: male; f: female.

	<i>C. perforatus</i>				<i>C. albipunctatus</i>									
	Holotype		Paratypes		Holotype	Paratypes								
	m	m	f	f	m	m	m	m	m	m	f	f	f	f
SL (mm)	90.7	87.9	68.9	62.3	97.4	90.8	60.5	60.1	57.2	50.3	82.5	77.9	42.2	41.6
Body depth	31.5	32.2	29.2	30.4	35.1	31.7	30.5	32.3	32.0	31.2	30.0	28.8	33.3	33.1
Head length	30.1	31.1	31.7	32.2	31.0	29.1	27.9	31.5	31.5	31.6	28.7	31.1	31.8	33.0
Head depth	30.4	32.3	30.8	30.8	33.5	31.8	29.8	31.1	30.6	30.4	29.3	30.2	29.1	30.6
Head width	21.3	22.2	22.8	23.4	25.1	23.3	21.3	24.3	22.6	22.4	24.5	24.5	23.1	25.3
Eye diameter	20.5	19.7	22.9	22.7	19.4	20.8	26.0	23.0	23.9	24.2	20.1	21.2	28.0	28.5
Predorsal length	58.4	59.8	64.3	67.1	57.9	56.9	60.0	57.3	62.9	60.5	62.6	61.6	68.9	67.5
Prepelvic length	49.3	50.1	53.5	54.9	48.4	47.3	49.3	50.9	50.3	49.9	52.9	58.1	60.6	59.3
Depth of caudal peduncle	14.5	16.1	13.6	14.9	15.7	15.9	15.4	15.4	15.5	15.8	14.8	15.2	14.9	14.8
Length of dorsal fin base	27.5	27.1	24.5	22.9	28.0	28.3	28.1	29.7	28.6	28.8	24.1	25.2	21.5	22.9
Length of anal fin base	31.9	31.9	21.8	22.5	36.6	36.0	33.6	33.7	32.9	35.1	24.3	22.5	23.7	23.5
Dorsal rays	17	17	15	15	18	18	18	17	17	17	16	16	14	15
Anal rays	20	20	17	18	21	20	20	19	20	20	18	19	18	19
Scales in longitudinal series	40	38	39	41	41	43	41	42	39	36	42	39	39	36
Scales in transversal series	17	17	16	-	21	20	15	15	15	15	17	16	15	15
Horizontal scale rows around caudal peduncle	26	28	24	-	26	28	26	28	22	20	26	22	24	20



Fig. 2. Diagram

Diagnosis. *Cynolebias* *seus* and *C. albipunctatus* and other *Cynolebias* species. The following characters are present: about 20 scales (vs. 4 or 5 scales); dorsal fin reaching at least 20 scales; dorsal-lateral line with three similar branches; scales in sub-orbital (35-37) vs. 22-31) scales; by the point of origin of conspicuous dorsal fins; and shape of males (31.9 vs. 31.9) vs. *C. griseus* in males; 1 scale of origin behind dorsal fin; more scales in longitudinal series (31). It differs from *C. griseus* (19.7-20.5)

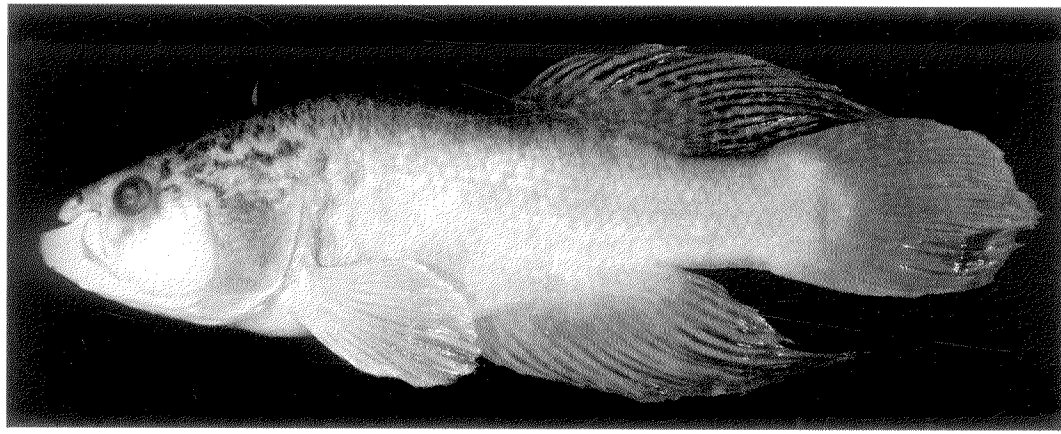


Fig. 1. *Cynolebias perforatus*, holotype, male, 90.7 mm SL, MZUSP 41376.

Material and methods

Methods for taking measurements and counts follow Costa (1988). Measurements are given as percents of standard length (SL) except for eye diameter, which is given as percent of head length. Throughout the text, vertical colour marks are called bars. The material is deposited in Museu de Zoologia da Universidade de São Paulo (MZUSP). Character polarities and comparative material are listed in Costa (1990a).

Table 1. Morphometric and meristic data of *Cynolebias perforatus* and *C. albipunctatus*. Measurements are expressed as % SL, except eye diameter as % of head length. m: male; f: female.

	<i>C. perforatus</i>				<i>C. albipunctatus</i>									
	Holotype		Paratypes		Holotype	Paratypes								
	m	m	f	f	m	m	m	m	m	f	f	f	f	
SL (mm)	90.7	87.9	68.9	62.3	97.4	90.8	60.5	60.1	57.2	50.3	82.5	77.9	42.2	41.6
Body depth	31.5	32.2	29.2	30.4	35.1	31.7	30.5	32.3	32.0	31.2	30.0	28.8	33.3	33.1
Head length	30.1	31.1	31.7	32.2	31.0	29.1	27.9	31.5	31.5	31.6	28.7	31.1	31.8	33.0
Head depth	30.4	32.3	30.8	30.8	33.5	31.8	29.8	31.1	30.6	30.4	29.3	30.2	29.1	30.6
Head width	21.3	22.2	22.8	23.4	25.1	23.3	21.3	24.3	22.6	22.4	24.5	24.5	23.1	25.3
Eye diameter	20.5	19.7	22.9	22.7	19.4	20.8	26.0	23.0	23.9	24.2	20.1	21.2	28.0	28.5
Predorsal length	58.4	59.8	64.3	67.1	57.9	56.9	60.0	57.3	62.9	60.5	62.6	61.6	68.9	67.5
Prepelvic length	49.3	50.1	53.5	54.9	48.4	47.3	49.3	50.9	50.3	49.9	52.9	58.1	60.6	59.3
Depth of caudal peduncle	14.5	16.1	13.6	14.9	15.7	15.9	15.4	15.4	15.5	15.8	14.8	15.2	14.9	14.8
Length of dorsal fin base	27.5	27.1	24.5	22.9	28.0	28.3	28.1	29.7	28.6	28.8	24.1	25.2	21.5	22.9
Length of anal fin base	31.9	31.9	21.8	22.5	36.6	36.0	33.6	33.7	32.9	35.1	24.3	22.5	23.7	23.5
Dorsal rays	17	17	15	15	18	18	18	17	17	17	16	16	14	15
Anal rays	20	20	17	18	21	20	20	19	20	20	18	19	18	19
Scales in longitudinal series	40	38	39	41	41	43	41	42	39	36	42	39	39	36
Scales in transversal series	17	17	16	—	21	20	15	15	15	15	17	16	15	15
Horizontal scale rows around caudal peduncle	26	28	24	—	26	28	26	28	22	20	26	22	24	20

Cynolebias perforatus, new species (Fig. 1)

Holotype. MZUSP 41376, male, 90.7 mm SL; Brazil, Minas Gerais, County of Januária, near the City of Januária; G. C. Brasil, 12 II 1990.

Paratypes. MZUSP 41377, 1 male, 87.9 mm SL and 2 females, 62.3 and 68.9 mm SL; collected with the holotype.

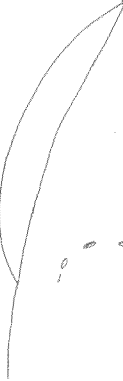


Fig. 2. Diagram

Diagnosis. *Cynolebias* *perforatus* and *C. albipunctatus* and other *Cynolebias* species. The following characters: about 20 scales (vs. 4 or 5 scales) reaching at least to the dorso-lateral line; three similar dorsal fin rays; masts in supra-orbital (35-36 vs. 22-31) scales; by the point of origin of conspicuous dorsal fins; and shape of males (31.9 vs. 31) in *C. griseus* in males; 1 scale at the origin behind the dorsal fin; more scales (31) in males; 31. It differs from *C. albipunctatus* in eyes (19.7-20.5 vs. 20.5-22.9).

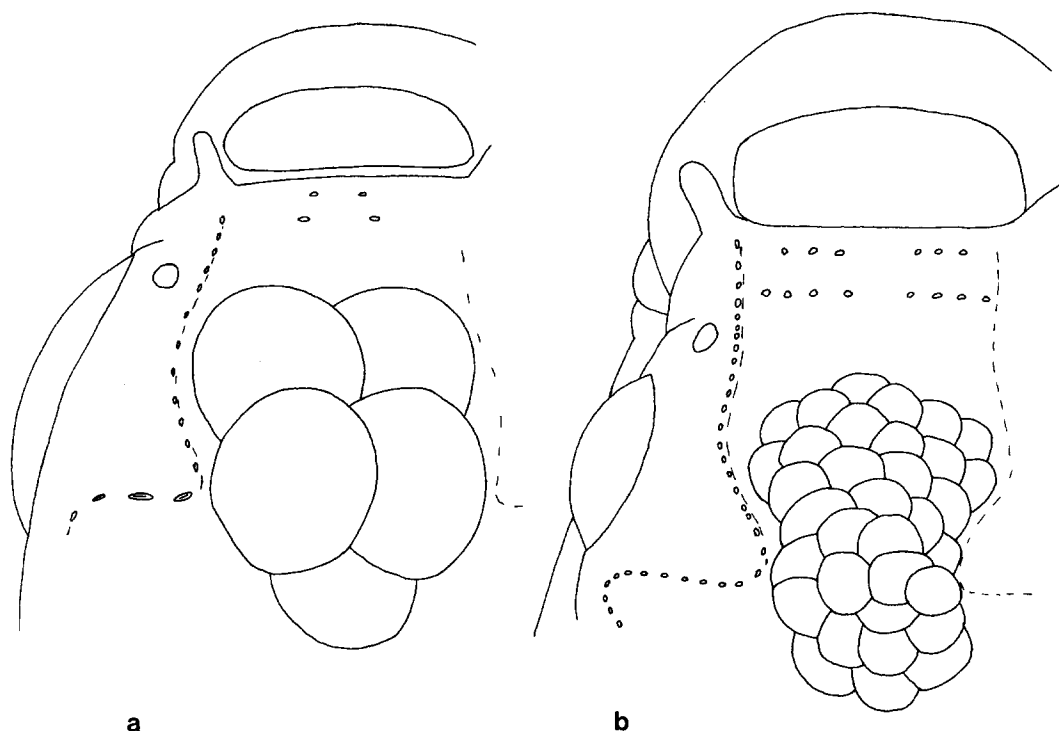


Fig. 2. Diagrammatic representation of dorsal view of head in *Cynolebias* species: a, *C. flavicaudatus*; b, *C. perforatus*.

Diagnosis. Similar to *C. albipunctatus*, *C. griseus* and *C. porosus*; they are distinguished from other *Cynolebias* species by the combination of the following characters: frontal squamation about 20 small irregularly distributed scales (vs. 4 or 5 regularly distributed) (Fig. 2b); males reaching at least 60 mm SL; scales irregularly arranged in longitudinal series; and blotches on dorso-lateral region of head. It differs from the three similar species by: males with more neuromasts in supraorbital (35-39, vs. 22-33), infraorbital (35-36, vs. 27-31) and preopercular (37-38, vs. 22-31) series. It differs from *C. albipunctatus* by the pointed (vs. rounded) profile of head; lack of conspicuous white dots on body and unpaired fins; and shorter length of anal fin base in old males (31.9% SL, vs. 36.0-36.6). It differs from *C. griseus* in having less dorsal fin rays (17, vs. 22 in males; 15, vs. 17-19 in females), dorsal fin origin behind (vs. in front) anal fin origin and more scales in longitudinal series (38-41, vs. 29-31). It differs from *C. porosus* in having smaller eyes (19.7-20.5% of head length, vs. 22.6-25.0% in

males; 22.7-22.9%, vs. 23.5-27.8% in females), not having flat dorsal surface of head, and longer pectoral fin in male reaching to the 5th anal fin ray (instead of only to the 2nd or 3rd).

Description. Dorsal and anal fins pointed in males, rounded in females. Caudal fin rounded. Distal margin of the pectoral fin reaches to the 5th anal fin ray in males and to urogenital papilla in females. Tip of pelvic fin reaches base of 3rd anal fin ray in males and to the base of 2nd anal fin ray in females. Dorsal fin origin opposite anal fin rays 5-6 in males and 3-4 in females. Head profile somewhat pointed. Males with 35-39 neuromasts in supraorbital series, 35-36 in infraorbital series and 37-38 in preopercular series. Frontal squamation consisting of about 20 small irregularly distributed scales. Longitudinal series of scales irregularly arranged. Meristic and morphometric data are given in Table 1.

Colouration. Males: sides of body dark brown, and belly light gray. Sides of head dark brown

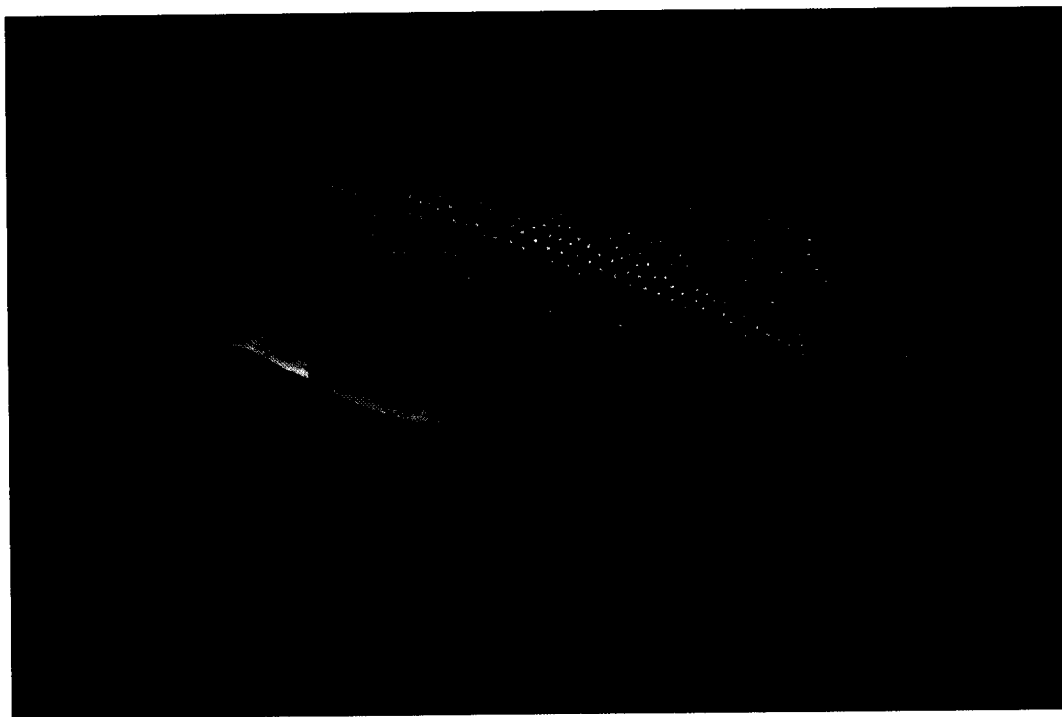


Fig. 3. *Cynolebias albipunctatus*, wild male, about 95 mm SL, not preserved.

with black dorso-lateral blotches. Iris brown; eye crossed by a black bar. Unpaired fins dark brown with pale gray dots; anal fin base brownish orange, and its tip black. Pelvic fin orange. Pectoral fin hyaline.

Females: sides of body and head light brown with dark brown bars and a black spot in the center of the flank. Iris brown; eye crossed by a brown bar. Fins hyaline with faint gray spots in dorsal and anal fins.

Ecological notes. The type-locality was a temporary pool, excavated in the past for the removal of clay. The water was turbid and no aquatic or marsh plants were found. The only other fish species found was *Cynolebias flavicaudatus* Costa & Brasil, 1990.

Etymology. From the Latin *perforatus* (perforated), in allusion to the elevated number of cephalic neuromasts. An adjective.

Cynolebias albipunctatus, new species
(Fig. 3)

Holotype. MZUSP 41378, male; 97.4 mm SL; Brazil, Bahia, County of Juazeiro, 70 km S from the City of Uauá; G. C. Brasil, 17 V 1989.

Paratypes. MZUSP 41379, 5 males; 50.3-90.8 mm SL and 4 females, 41.6-82.5 mm SL; collected with the holotype.

Diagnosis. Similar to *C. griseus*, *C. perforatus* and *C. porosus*; they are distinguished from other *Cynolebias* species by the combination of the following characters: frontal squamation about 20 small irregularly distributed scales (vs. 4 or 5 regularly distributed); males reaching at least 60 mm SL; scales irregularly arranged in longitudinal series; and blotches on dorso-lateral region of head. It differs from the three similar species by: rounded (vs. somewhat pointed) head profile; longer anal fin base in old males (36.0-36.6% SL, vs. 31.7-32.0); and body and unpaired fins with conspicuous white dots (vs. only pale gray dots



Fig. 3. *Cynolebias albipunctatus*, wild male, about 95 mm SL, not preserved.

with black dorso-lateral blotches. Iris brown; eye crossed by a black bar. Unpaired fins dark brown with pale gray dots; anal fin base brownish orange, and its tip black. Pelvic fin orange. Pectoral fin hyaline.

Females: sides of body and head light brown with dark brown bars and a black spot in the center of the flank. Iris brown; eye crossed by a brown bar. Fins hyaline with faint gray spots in dorsal and anal fins.

Ecological notes. The type-locality was a temporary pool, excavated in the past for the removal of clay. The water was turbid and no aquatic or marsh plants were found. The only other fish species found was *Cynolebias flavicaudatus* Costa & Brasil, 1990.

Etymology. From the Latin *perforatus* (perforated), in allusion to the elevated number of cephalic neuromasts. An adjective.

Cynolebias albipunctatus, new species
(Fig. 3)

Holotype. MZUSP 41378, male; 97.4 mm SL; Brazil, Bahia, County of Juazeiro, 70 km S from the City of Uauá; G. C. Brasil, 17 V 1989.

Paratypes. MZUSP 41379, 5 males; 50.3-90.8 mm SL and 4 females, 41.6-82.5 mm SL; collected with the holotype.

Diagnosis. Similar to *C. griseus*, *C. perforatus* and *C. porosus*; they are distinguished from other *Cynolebias* species by the combination of the following characters: frontal squamation about 20 small irregularly distributed scales (vs. 4 or 5 regularly distributed); males reaching at least 60 mm SL; scales irregularly arranged in longitudinal series; and blotches on dorso-lateral region of head. It differs from the three similar species by: rounded (vs. somewhat pointed) head profile; longer anal fin base in old males (36.0-36.6% SL, vs. 31.7-32.0); and body and unpaired fins with conspicuous white dots (vs. only pale gray dots

on bases of unpaired fins).

Description. Dorsal and anal fins pointed in males, rounded in females. Caudal fin rounded. Distal margin of the pectoral fin reaches to anal fin ray 1-4 in males and to pelvic fin base in females. Tip of pelvic fin reaches to the base of 2nd or 3rd anal fin ray in males and to urogenital papilla in females. Dorsal fin origin opposite anal fin ray 4-7 in males and 2-4 in females. Head profile rounded. Males with 22-33 neuromasts in supraorbital series, 27-31 in infraorbital series and 22-31 in preopercular series. Frontal squamation consisting in about 20 small, irregularly distributed scales. Scales irregularly arranged in longitudinal series. Meristic and morphometric data are given in Table 1.

Colouration. Males: sides of body dark brown with white dots; belly orange. Sides of head dark brown with black blotches in the dorsal region. Iris brown; eye crossed by a black bar. Unpaired fins dark brown, with white dots; tip of anal fin with crimson rays. Pelvic fin orange. Pectoral fin hyaline.

Females: sides of body and head light brown with dark brown bars and a black spot in the center of the flank. Iris brown; eye crossed by a brown bar. Fins hyaline with gray spots on unpaired fins.

Ecological notes. The type series was collected from a temporary pool in the semi-arid "Caatingas" ecosystem (Fig. 4). The water was turbid. Aquatic vegetation was mostly four-leaved water clover (not identified) rooted in the bottom and whose floating leaves adapt to the water depth. No other fishes were collected.

Etymology. From the Latin *albus* (white) and *punctatus* (with dots), an allusion to the colour pattern of the males. An adjective.

Cynolebias magnificus, new species
(Figs. 5-6)

Holotype. MZUSP 41374, male, 26.8 mm SL; Brazil, Minas Gerais, County of Manga, right bank plain of the Rio São Francisco, about 1 km from the river channel; G. C. Brasil, 10 II 1990.



Fig. 4. Flooded area near Uauá, type locality of *Cynolebias albipunctatus*.

Paratypes. MZUSP 41375, 4 males, 23.7-27.7 mm SL and 5 females, 19.5-22.0 mm SL; collected with the holotype.

Diagnosis. The new species is similar to *C. flammeus*; both are distinguished from the other *Cynolebias* species by adult males having a combination of the following characters: reduced predorsal length (at most 49% SL); pointed dorsal fin; red dorsal region of head; unpaired fins with transversal stripes or rows of spots. It differs from *C. flammeus* by the absence in males of both prolonged dorsal fin ray filaments extending beyond the upper margin of the fin and the absence of the dark stripes along the whole length of the body. It also has more dorsal fin rays in males (23-24, vs. 21-22) fewer anal fin rays in females (18-19, vs. 20-21), shorter prepelvic length in males (44.3-45.4% SL, vs. 49.0-50.0), longer dorsal fin base in males (39.6-41.0% SL, vs. 36.5-38.0), and longer anal fin base in males (38.9-40.4% SL, vs. 36.0-37.0).

Description. Dorsal and anal fins pointed in males, rounded in females. Caudal fin rounded. Distal margin of pectoral fin reaches to anal fin ray 6-7 in males and 1-2 in females. Tip of pelvic fin reaches base of 2nd or 3rd anal fin ray. Origin of dorsal fin opposite to 1st or 2nd anal fin ray in males, opposite to 3rd or 4th anal fin ray in females. Meristic and morphometric data are given in Table 2.

Colouration. Males: sides of body predominantly purple with green anterior part and red dorsal region; blue dots over body sides, except

on bases of unpaired fins).

Description. Dorsal and anal fins pointed in males, rounded in females. Caudal fin rounded. Distal margin of the pectoral fin reaches to anal fin ray 1-4 in males and to pelvic fin base in females. Tip of pelvic fin reaches to the base of 2nd or 3rd anal fin ray in males and to urogenital papilla in females. Dorsal fin origin opposite anal fin ray 4-7 in males and 2-4 in females. Head profile rounded. Males with 22-33 neuromasts in supraorbital series, 27-31 in infraorbital series and 22-31 in preopercular series. Frontal squamation consisting in about 20 small, irregularly distributed scales. Scales irregularly arranged in longitudinal series. Meristic and morphometric data are given in Table 1.

Colouration. Males: sides of body dark brown with white dots; belly orange. Sides of head dark brown with black blotches in the dorsal region. Iris brown; eye crossed by a black bar. Unpaired fins dark brown, with white dots; tip of anal fin with crimson rays. Pelvic fin orange. Pectoral fin hyaline.

Females: sides of body and head light brown with dark brown bars and a black spot in the center of the flank. Iris brown; eye crossed by a brown bar. Fins hyaline with gray spots on unpaired fins.

Ecological notes. The type series was collected from a temporary pool in the semi-arid "Caatingas" ecosystem (Fig. 4). The water was turbid. Aquatic vegetation was mostly four-leaved water clover (not identified) rooted in the bottom and whose floating leaves adapt to the water depth. No other fishes were collected.

Etymology. From the Latin *albus* (white) and *punctatus* (with dots), an allusion to the colour pattern of the males. An adjective.

Cynolebias magnificus, new species
(Figs. 5-6)

Holotype. MZUSP 41374, male, 26.8 mm SL; Brazil, Minas Gerais, County of Manga, right bank plain of the Rio São Francisco, about 1 km from the river channel; G. C. Brasil, 10 II 1990.



Fig. 4. Flooded area near Uaná, type locality of *Cynolebias albipunctatus*.

Paratypes. MZUSP 41375, 4 males, 23.7-27.7 mm SL and 5 females, 19.5-22.0 mm SL; collected with the holotype.

Diagnosis. The new species is similar to *C. flammeus*; both are distinguished from the other *Cynolebias* species by adult males having a combination of the following characters: reduced predorsal length (at most 49% SL); pointed dorsal fin; red dorsal region of head; unpaired fins with transversal stripes or rows of spots. It differs from *C. flammeus* by the absence in males of both prolonged dorsal fin ray filaments extending beyond the upper margin of the fin and the absence of the dark stripes along the whole length of the body. It also has more dorsal fin rays in males (23-24, vs. 21-22) fewer anal fin rays in females (18-19, vs. 20-21), shorter prepelvic length in males (44.3-45.4% SL, vs. 49.0-50.0), longer dorsal fin base in males (39.6-41.0% SL, vs. 36.5-38.0), and longer anal fin base in males (38.9-40.4% SL, vs. 36.0-37.0).

Description. Dorsal and anal fins pointed in males, rounded in females. Caudal fin rounded. Distal margin of pectoral fin reaches to anal fin ray 6-7 in males and 1-2 in females. Tip of pelvic fin reaches base of 2nd or 3rd anal fin ray. Origin of dorsal fin opposite to 1st or 2nd anal fin ray in males, opposite to 3rd or 4th anal fin ray in females. Meristic and morphometric data are given in Table 2.

Colouration. Males: sides of body predominantly purple with green anterior part and red dorsal region, blue dots over body sides, except

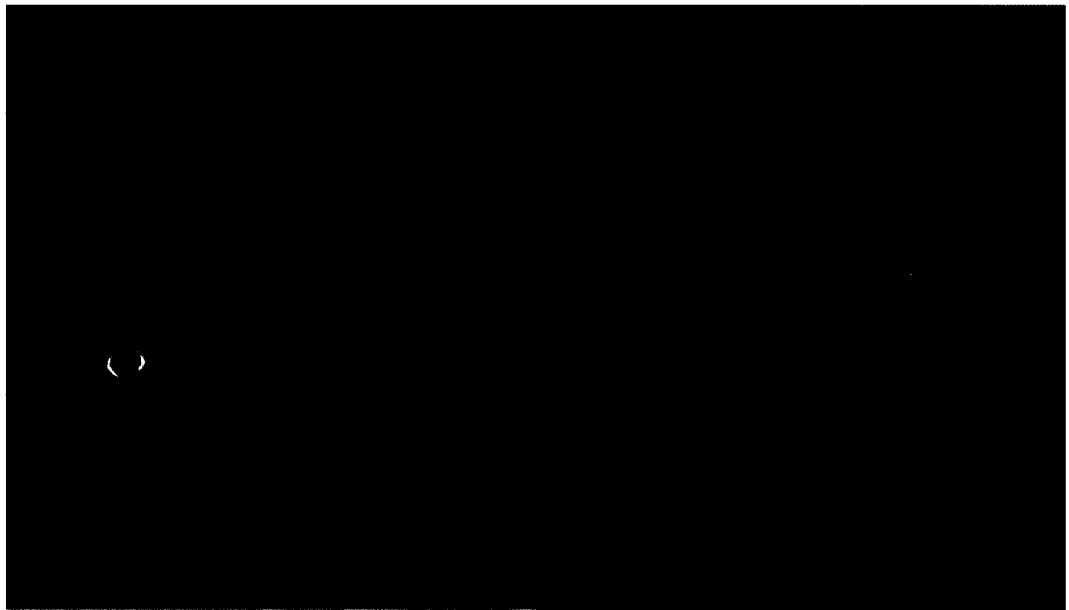


Fig. 5. *Cynolebias magnificus*, wild male, about 25 mm SL, not preserved.

in the antero-ventral region; two or three faint red bars in the anterior part of body. Sides of head greenish gold, except dorsal region which is red with blue dots. Iris orange; eye crossed by a black bar. Unpaired fins red with six or seven transverse rows of greenish blue dots and stripes. Pelvic and pectoral fins reddish with black margins.

Females: sides of body and head light brown with dark brown bars and with one or two spots in the center of the flank. Iris yellowish; eye crossed by a brown bar. Fins hyaline.

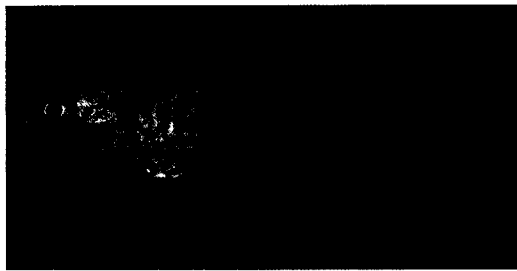


Fig. 6. *Cynolebias magnificus*, wild female, about 20 mm SL, not preserved.

Ecological notes. The type-locality was temporary puddle located in a native forest. Aquatic vegetation comprises *Echinodorus* sp., *Salvinia* sp., *Lemna* sp. and *Pistia* sp. The water was clear and slightly amber, due to a thin layer of organic sediment on the bottom. No other fishes were collected.

Etymology. From the Latin *magnificus* (magnificent), alluding to the exuberante colour pattern of the males. An adjective.

Discussion

None of the new species reported in this paper is closely related to the two species already known from Rio São Francisco basin: *C. flavicaudatus* Costa & Brasil, 1990 and *C. zonatus* Costa & Brasil, 1990 (collecting localities shown in Fig. 7).

Cynolebias perforatus and *C. albipunctatus* are clearly referred to a group of species which includes *C. cheradophilus* Vaz-Ferreira, Sierra & Scaglia, 1964, *C. elongatus* Steindachner, 1881, *C. griseus* Costa, Lacerda & Brasil, 1990, *C. porosus* Steindachner, 1876, *C. prognathus* Amato, 1986, and *C. wolterstorffi* Ahl, 1924. This group is

Costa & Brasil: Three new *Cynolebias*

Table 2
diamet

SL (mm)
Body d
Head l
Head d
Head v
Eye dia
Predor
Prepelv
Depth
Length
Length
Dorsal
Anal ra
Scales i
Scales i
Horizo
aro

charac
charac
ting o
scales
species
reaching
series o
ly arra
presen

Cyn
seem to
the Toc
coastal
other s
share t
on the

Cyn
of spec
length
compr
meus C
1990, a
1990. C
basin,
red do
dots a
gests a
two sp

The
the pr

Ichthyol.

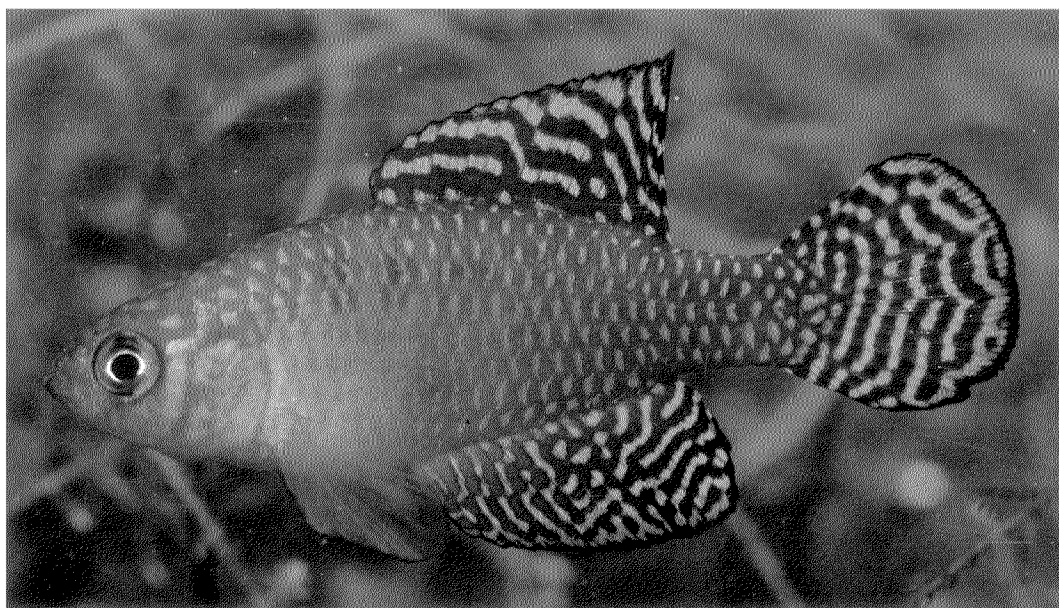


Fig. 5. *Cynolebias magnificus*, wild male, about 25 mm SL, not preserved.

in the antero-ventral region; two or three faint red bars in the anterior part of body. Sides of head greenish gold, except dorsal region which is red with blue dots. Iris orange; eye crossed by a black bar. Unpaired fins red with six or seven transverse rows of greenish blue dots and stripes. Pelvic and pectoral fins reddish with black margins.

Females: sides of body and head light brown with dark brown bars and with one or two spots in the center of the flank. Iris yellowish; eye crossed by a brown bar. Fins hyaline.

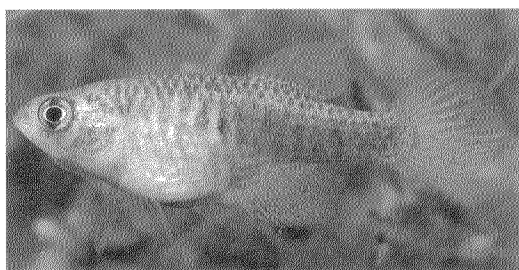


Fig. 6. *Cynolebias magnificus*, wild female, about 20 mm SL, not preserved.

Ecological notes. The type-locality was temporary puddle located in a native forest. Aquatic vegetation comprises *Echinodorus* sp., *Salvinia* sp., *Lemna* sp. and *Pistia* sp. The water was clear and slightly amber, due to a thin layer of organic sediment on the bottom. No other fishes were collected.

Etymology. From the Latin *magnificus* (magnificent), alluding to the exuberante colour pattern of the males. An adjective.

Discussion

None of the new species reported in this paper is closely related to the two species already known from Rio São Francisco basin: *C. flavicaudatus* Costa & Brasil, 1990 and *C. zonatus* Costa & Brasil, 1990 (collecting localities shown in Fig. 7).

Cynolebias perforatus and *C. albipunctatus* are clearly referred to a group of species which includes *C. cheradophilus* Vaz-Ferreira, Sierra & Scaglia, 1964, *C. elongatus* Steindachner, 1881, *C. griseus* Costa, Lacerda & Brasil, 1990, *C. porosus* Steindachner, 1876, *C. prognathus* Amato, 1986, and *C. wolterstorffi* Ahl, 1924. This group is

Costa & Brasil: Three new *Cynolebias*

Table 2
diamet

SL (mm)
Body d
Head l
Head d
Head v
Eye dia
Predor
Prepel
Depth
Length
Length
Dorsal
Anal ra
Scales i
Scales i
Horizo
aro

charac
charac
ting o
scales
species
reaching
series
ly arra
presen

Cyn
seem to
the Toc
coastal
other s
share t
on the

Cyn
of spec
length
compr
meus C
1990, a
1990. C
basin, a
red do
dots an
gests a
two sp

The
the pr

Ichthyol.

Table 2. Morphometric and meristic data of *Cynolebias magnificus*. Measurements are expressed as % SL, except eye diameter as % of head length. m: male; f: female.

	Holotype	Paratypes								
	m	m	m	m	m	f	f	f	f	f
SL (mm)	26.8	27.7	25.4	24.9	23.7	22.0	21.6	20.7	20.3	19.5
Body depth	35.3	35.8	35.7	35.3	35.1	33.9	33.1	33.3	32.5	33.3
Head length	28.4	27.3	29.4	29.1	29.2	30.3	29.9	31.2	31.0	31.3
Head depth	29.3	28.9	30.8	30.3	29.0	29.2	28.5	28.3	28.3	27.9
Head width	19.3	19.2	19.1	18.7	18.4	18.9	19.4	20.0	19.7	19.7
Eye diameter	34.9	33.8	34.2	32.4	34.8	34.6	36.4	35.7	34.1	35.2
Predorsal length	46.4	45.9	48.9	47.8	44.6	59.0	59.7	60.6	60.3	60.3
Prepelvic length	44.9	44.3	45.4	44.4	44.8	52.2	50.9	52.4	52.7	50.0
Depth of caudal peduncle	15.3	15.4	15.2	15.1	14.6	14.4	13.9	15.2	14.8	13.8
Length of dorsal fin base	40.4	40.5	39.6	40.8	41.0	22.3	23.1	22.2	21.4	23.1
Length of anal fin base	39.4	40.1	39.3	40.4	38.9	23.7	25.0	25.6	23.6	25.4
Dorsal rays	24	23	23	23	24	16	16	15	15	16
Anal rays	22	22	21	22	22	18	18	18	18	19
Scales in longitudinal series	27	28	26	26	27	27	27	26	27	26
Scales in transversal series	9	9	9	9	9	9	9	9	9	9
Horizontal scale rows around caudal peduncle	12	12	12	12	12	12	12	12	12	12

characterized by the following shared derived characters: frontal squamation pattern consisting of about 20 small irregularly distributed scales (vs. 4 or 5 regularly distributed as in other species; see Fig. 2 and Costa, 1990a); males reaching at least 60 mm SL; and, longitudinal series of scales irregularly arranged (vs. regularly arranged). No other *Cynolebiatinae* species present these character states (Costa, 1990a).

Cynolebias perforatus and *C. albipunctatus* seem to be more closely related to *C. griseus*, from the Tocantins basin and *C. porosus*, from isolated coastal basins of northeastern Brazil, than to other species, because males of these four species share the presence of black dorso-lateral blotches on the head.

Cynolebias magnificus belongs to a large group of species characterized by the reduced predorsal length in the adult males (Costa & Brasil, 1990) comprising *C. antenori* Tulipano, 1973, *C. flammeus* Costa, 1990, *C. flavicaudatus* Costa & Brasil, 1990, and *C. notatus* Costa, Lacerda & Brasil, 1990. *Cynolebias flammeus* from the Tocantins basin, and *C. magnificus* both have males with a red dorsum of the head and transverse rows of dots and stripes on the unpaired fins. This suggests a sister group relationships between these two species.

The range of *C. flavicaudatus* is extended by the present report. Originally described from

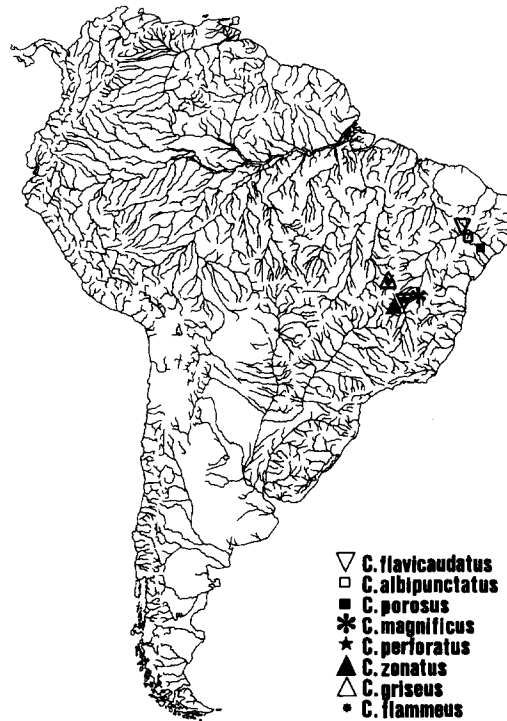


Fig. 7. Collecting localities of the *Cynolebias* species of the São Francisco basin and of some closely related species.



Fig. 8. *Cynolebias flavicaudatus*, wild male, about 40 mm SL, not preserved.

Pernambuco state, *C. flavicaudatus* is now reported from Minas Gerais state. The two populations may be distinguished by the number of body bars: 9-11 in Pernambuco population (see Costa & Brasil, 1990, Fig. 4) and 13-15 in Minas Gerais population (Fig. 8). Further field work in the Sao Francisco basin should allow to establish the variability of the number of body bar among *C. flavicaudatus* populations.

Acknowledgements

Thanks are due to Mrs. Tereza Padilha Charles (Centro de Pesquisas Agropecuárias do Trópico Semi-Árido, EMBRAPA) for the assistance in the field, to Mr. Suetone Coelho de Alencar for his help in collecting, to Mrs. Claudia Petean Bove for assistance in laboratory and to Ms. Marlene Raupp for typing the manuscript. The manuscript benefited greatly from the comments of anonymous reviewers.

Literature cited

- Costa, W. J. E. M. 1988. Sistemática e distribuição do complexo de espécies *Cynolebias minimus* (Cyprinodontiformes, Rivulidae) com a descrição de duas espécies novas. *Rev. Brasil. Zool.*, 5: 557-570.
- 1990a. Análise filogenética da família Rivulidae (Cyprinodontiformes, Aplocheiloidei). *Rev. Brasil. Zool.*, 50: 65-82.
- 1990b. Classificação e distribuição da família Rivulidae (Cyprinodontiformes, Aplocheiloidei). *Rev. Brasil. Biol.*, 50: 83-89.
- 1990c. Redescrição do gênero *Cynolebias* (Cyprinodontiformes, Rivulidae), com a descrição de uma nova espécie da bacia do rio Tocantins. *Com. Mus. Cienc. PUCRS*, 2: 181-190.
- Costa, W. J. E. M. & G. C. Brasil. 1990. Description of two new annual fishes of the genus *Cynolebias* (Cyprinodontiformes: Rivulidae) from the São Francisco basin, Brazil. *Ichthyol. Explor. Freshwaters*, 1: 15-22.
- Costa, W. J. E. M., M. T. C. Lacerda & G. C. Brasil. 1990. Description of two new species of the genus *Cynolebias* from the Rio Tocantins basin (Cyprinodontiformes, Rivulidae). *Rev. Fr. Aquariol.*, 17: 9-12.

Received 25 May 1990
Revised 10 September 1990
Accepted 29 September 1990

Costa & Brasil: Three new *Cynolebias*

This is a first record of *C. flavicaudatus* along the São Francisco basin. The water level fell at this time, and 10% cichlids were found in their steeper reaches in topographic positions, particularly species than in the migration of streams are

During the collection trip, the physical Society of Brazil organized a northward migration of the Amazon basin, studied in the field, still in the road, still in the

Most of the specimens made pers. coll. towards the headwaters were very small at low water chemistry

* Streaw

Ichthyol. Explor. Freshwaters



Fig. 8. *Cynolebias flavicaudatus*, wild male, about 40 mm SL, not preserved.

Pernambuco state, *C. flavicaudatus* is now reported from Minas Gerais state. The two populations may be distinguished by the number of body bars: 9-11 in Pernambuco population (see Costa & Brasil, 1990, Fig. 4) and 13-15 in Minas Gerais population (Fig. 8). Further field work in the Sao Francisco basin should allow to establish the variability of the number of body bar among *C. flavicaudatus* populations.

Acknowledgements

Thanks are due to Mrs. Tereza Padilha Charles (Centro de Pesquisas Agropecuárias do Trópico Semi-Árido, EMBRAPA) for the assistance in the field, to Mr. Suetone Coelho de Alencar for his help in collecting, to Mrs. Claudia Petean Bove for assistance in laboratory and to Ms. Marlene Raupp for typing the manuscript. The manuscript benefited greatly from the comments of anonymous reviewers.

Literature cited

- Costa, W. J. E. M. 1988. Sistemática e distribuição do complexo de espécies *Cynolebias minimus* (Cyprinodontiformes, Rivulidae) com a descrição de duas espécies novas. *Rev. Brasil. Zool.*, 5: 557-570.
- 1990a. Análise filogenética da família Rivulidae (Cyprinodontiformes, Aplocheiloidei). *Rev. Brasil. Zool.*, 50: 65-82.
- 1990b. Classificação e distribuição da família Rivulidae (Cyprinodontiformes, Aplocheiloidei). *Rev. Brasil. Biol.*, 50: 83-89.
- 1990c. Redescrição do gênero *Cynolebias* (Cyprinodontiformes, Rivulidae), com a descrição de uma nova espécie da bacia do rio Tocantins. *Com. Mus. Cienc. PUCRS*, 2: 181-190.
- Costa, W. J. E. M. & G. C. Brasil. 1990. Description of two new annual fishes of the genus *Cynolebias* (Cyprinodontiformes: Rivulidae) from the São Francisco basin, Brazil. *Ichthyol. Explor. Freshwaters*, 1: 15-22.
- Costa, W. J. E. M., M. T. C. Lacerda & G. C. Brasil. 1990. Description of two new species of the genus *Cynolebias* from the Rio Tocantins basin (Cyprinodontiformes, Rivulidae). *Rev. Fr. Aquariol.*, 17: 9-12.

Received 25 May 1990
Revised 10 September 1990
Accepted 29 September 1990

Costa & Brasil: Three new *Cynolebias*

This is a first
along the Se
level fell at t
10% cichlids
their steeper
ces in topog
particularly
species than
migration of
streams are

During the
phical Soc
to northea
organized
northward
of the Am
studied in
road, still r

Most o
made pers
towards th
were very
at low wat
chemistry

* Streatw

Ichthyol. Expl