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# REVIEW OF THE CICHLID GENUS *CRENICICHLA* HECKEL, 1840 FROM SURINAM, WITH DESCRIPTIONS OF THREE NEW SPECIES (PISCES, PERCIFORMES, CICHLIDAE)

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## ABSTRACT

The Surinam representatives of the cichlid genus *Crenicichla* Heckel, 1840 are reviewed. Seven species, among which three new to science, have been found, viz.: *C. albopunctata* Pellegrin, 1904, *C. coppenamensis* sp. n., *C. nickeriensis* sp. n., *C. saxatilis* (L., 1758), *C. sipaliwini* sp. n., *C. lugubris* Heckel, 1840, and *C. multispinosa* Pellegrin, 1903. The first five species are compared with each other, with *C. alta* Eigenmann, 1912, from Guyana, and with *C. labrina* (Spix & Agassiz, 1829) from the Tocantins River. *Crenicichla saxatilis* was recently redescribed and figured (Ploeg, 1986a); the other six species are described and figured in the present paper.

## INTRODUCTION

While identifying the many *Crenicichla* specimens assembled by Dr. M. Boeseman, Dr. G. F. Mees, and Dr. H. Nijssen during the Brokopondo Research Project (1963-1967), it appeared to be difficult to interpret the variability in *C. saxatilis sensu lato*. The intraspecific variability of *C. saxatilis* from the Surinam River system appeared to be greater than the interspecific variability of several closely related *Crenicichla* species (Ploeg, 1986a). From this study was concluded that several '*saxatilis*-like' species exist, which is the subject of this paper.

In the literature (Gronovius, 1754; Linnaeus, 1758; Bloch, 1792; Pellegrin, 1903, 1904; Regan, 1905, 1913; Steindachner, 1915; Boeseman, 1952; Wheeler, 1958; Nijssen, 1966, 1967a, 1967b; Richter & Nijssen, 1980; Ploeg, 1986a) four species are recorded from Surinam, viz.: *C. alta*, *C. saxatilis* (including *C. saxatilis albopunctata*), *C. lugubris*, and *C. multispinosa*.

## METHODS

All measurements were taken as shown in figure 1, and as in Ploeg 1986a, b and c. Abbreviations of characters are explained in table VIII. Vertebrae were counted from radiographs. Differences between the five *saxatilis*-like species are visualized with scatter diagrams. To avoid ontogenetic influences all measurements are expressed as percentages of

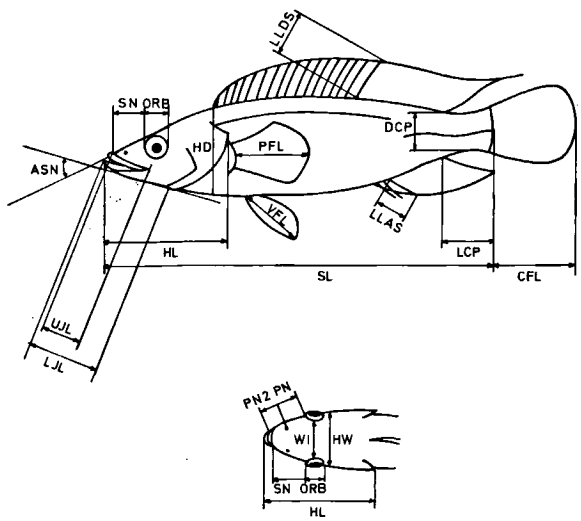


Fig. 1. Way of taking measurements. Abbreviations are listed in table VIII.

the standard length (SL). Comparisons with two closely related species, viz. *C. alta* (material listed in Ploeg, in press) and *C. labrina* (material listed in Ploeg, 1986b) are included. Local names of the species are from Heyde (1986) and from H. Nijssen (pers. comm.). Lists of material are arranged as follows: register number, number of specimens, locality, date of collecting, and collector.


## ACKNOWLEDGEMENTS

Rich material present in the Zoölogisch Mueum Amsterdam (ZMA), (Dr. H. Nijssen) was used as a basis for the present study. Additional material was made availably by the Institut Royal des Sciences Naturelles de Belgique (ISNB), Brussels (Dr. J. P. Gosse), the Muséum National d'Histoire Naturelle (MNHN), Paris (Dr. M. L. Bauchot), the Naturhistorisches Museum Wien (NMW), Vienna (Dr. B. Herzig), the Naturhistoriska Riksmuseet (NRM), Stockholm (Dr. S. O. Kullander), the Rijksmuseum van Natuurlijke Historie (RMNH), Leiden (Drs. M. J. P. van Oijen), and the National Museum of Natural History (USNM), Washington D.C. (Dr. R. P. Vari).

Thanks are due to the above-mentioned curators, to Mr. J. Zaagman (ZMA) for the drawings, to Mr. L. A. van der Laan (ZMA) for the photographs, to the University of Amsterdam for the facilities, and to Drs. H. Nijssen and I. J. H. Isbrücker for their criticism, their encouragement, and for editing the manuscript.

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## **Crenicichla** Heckel, 1840

*Crenicichla* Heckel, 1840: 416-417 (original diagnosis; type species, by subsequent designation of Eigenmann & Bray, 1894: 620: *C. macrophthalma* Heckel, 1840).

*Batrachops* Heckel, 1840: 432 (original diagnosis; type species, by subsequent designation of Eigenmann & Bray, 1894: 620: *B. reticulata* Heckel, 1840).

Local names in Surinam: Datra Fisi (all species), Adoenko (*C. albopunctata*, *C. coppenamensis*, *C. saxatilis*, and *C. sipaliwini*), Djonkodjo and Donfó (*C. nickeriensis*).

*Shared characters in the Surinam species*

Body elongate. Fleshy lips. Lower jaw prognathous. Orbit in upper half of head. Two well-developed lateral lines, continuing on caudal fin with one to three scales; dorsal part of head naked; scales on cheek, operculum, suboperculum, anterior part of back, and belly cycloid; scales on sides ctenoid; caudal fin with basal and interradial scales; pectoral, dorsal and anal fins without basal scales, although base sometimes covered with skin. Dorsal fin acute posteriorly. Anal fin origin just below first soft dorsay ray, fin posteriorly acute, three anal spines. Ventral fin acute; V 1.5; pectoral fin rounded. Caudal fin with 16 primary rays. Teeth conical and recurved, outer teeth series fixed, often considerably larger than inner teeth series. Gill rakers on first gill arch denticulated externally.

Key to the Surinam species

1a. Below lateral lines 100-130 scales ..... 2
1b. Below lateral lines 52-72 scales ..... 3
2a. 112-130 scales below lateral lines, dark spot just posterior to pectoral fin base, nostrils nearer to postlabial skinfold than to orbit ..... *Crenicichla lugubris* Heckel, 1840
2b. 100-115 scales below lateral lines, no dark spot posterior to pectoral fin; nostrils almost halfway between postlabial skinfold and orbit ..... ... *Crenicichla multispinosa* Pellegrin, 1903
3a. Series of dark blotches along lateral lines in males; humeral spot much longer than deep in females .. *Crenicichla nickeriensis* sp. n.
3b. No series of dark blotches along lateral lines in males; humeral spot in females not or only slightly longer than deep ..... 4
4a. Silvery dots present on operculum and cheek in both sexes ..... ... *Crenicichla albopunctata* Pellegrin, 1904
4b. Silvery dots absent ..... 5
5a. Maxilla not reaching orbit, or anterior margin of orbit; ground colour of body grey ..... *Crenicichla sipaliwini* sp. n.
5b. Maxilla reaching well below orbit; ground colour of body tan ..... 6
6a. Humeral spot round with a white ring; males with yellowish dots ..... ..... *Crenicichla coppenamensis* sp. n.
6b. Humeral spot with a dorsoanterior notch; males with silvery-white dots ..... ..... *Crenicichla saxatilis* (Linnaeus, 1758)

**Crenicichla albopunctata** Pellegrin, 1904
(Figs. 2 and 3; Pl. 1 upper; Tabs. I and VIII)

*Crenicichla saxatilis* var. *albopunctata* Pellegrin 1904: 374 (original description; in part:, French Guiana).

*Crenicichla albopunctata*; Ploeg, 1986c: 224 [restriction of type locality (Surinam, Marowijne River system, Lawa River, Maka Creek, 10 km S. of Stoelmanseiland); designation of the lectotype].

## MATERIAL EXAMINED

See Ploeg, 1986c: 224 (253 specimens, all from Marowijne river system).

## DESCRIPTION

Based on a 137 mm SL male topotype (morphometric and meristic data are presented in tables I and VIII).

Table I. Morphometric and meristic data for twelve specimens of *Crenicichla albopunctata* Pellegrin, 1904. Abbreviations are listed in table VIII.

CRENICICHLA ALBOPUNCTATA PELLEGRIN, 1904

| SL | CFL | HL | HD | HW | DCP | LCP | SN | UJL | LJL | LLDS | LLAS | VFL | PFL | PN | PN2 | ORB | WI | L1 | L2 | L1/L2 | L2C | LL | SCDL | DSP | DSR | GR | ASR | P | ASN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MILLIMETERS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 142 | 35 | 51 | 30 | 18 | 16 | 16 | 12 | 18 | 25 | 16 | 12 | 21 | 26 | 5,5 | 6,3 | 9,4 | 13 | 25 | 9 | 2 | 2 | 63 | 4 | 20 | 13 | 12 | 10 | 16 | 40 |
| 137 | 32 | 47 | 29 | 21 | 16 | 17 | 12 | 17 | 22 | 15 | 11 | 23 | 27 | 4,9 | 6,3 | 9,4 | 14 | 23 | 11 | 3 | 2 | 63 | 3 | 19 | 14 | 12 | 10 | 16 | 39 |
| 135 | 33 | 50 | 27 | 17 | 15 | 14 | 12 | 18 | 23 | 13 | 10 | 22 | 27 | 5,0 | 5,9 | 9,3 | 13 | 23 | 9 | 3 | 2 | 62 | 3 | 19 | 14 | 11 | 10 | 16 | 41 |
| 107 | 25 | 39 | 21 | 13 | 13 | 13 | 8,8 | 12 | 17 | 12 | 7,9 | 18 | 21 | 3,5 | 4,3 | 7,4 | 9,1 | 24 | 10 | 3 | 2 | 71 | 4 | 17 | 14 | 11 | 10 | 16 | 33 |
| 106 | 24 | 38 | 19 | 12 | 11 | 13 | 8,0 | 11 | 16 | 10 | 8,5 | 17 | 20 | 3,3 | 4,2 | 7,8 | 8,8 | 25 | 9 | 2 | 2 | 65 | 4 | 20 | 13 | 12 | 10 | 16 | 38 |
| 104 | 26 | 39 | 19 | 14 | 13 | 13 | 8,6 | 12 | 18 | 11 | 8,6 | 18 | 21 | 3,5 | 4,2 | 7,4 | 9,2 | 23 | 10 | 3 | 2 | 64 | 4 | 20 | 13 | 11 | 9 | 16 | 36 |
| 74 | 18 | 27 | 14 | 9,0 | 8,1 | 8,4 | 5,6 | 8,6 | 12 | 8,2 | 6,8 | 14 | 15 | 2,1 | 2,5 | 6,1 | 6,2 | 25 | 9 | 3 | 2 | 63 | 4 | 20 | 14 | 12 | 10 | 16 | 39 |
| 72 | 19 | 26 | 13 | 9,3 | 8,1 | 8,7 | 5,0 | 8,0 | 12 | 7,5 | 6,9 | 13 | 15 | 1,8 | 2,2 | 6,5 | 5,5 | 24 | 10 | 3 | 2 | 61 | 4 | 17 | 14 | 11 | 10 | 16 | 33 |
| 71 | 19 | 25 | 13 | 9,0 | 8,0 | 8,2 | 4,8 | 7,9 | 11 | 7,3 | 6,5 | 13 | 15 | 2,2 | 2,4 | 6,3 | 5,9 | 25 | 10 | 3 | 2 | 67 | 4 | 19 | 13 | 11 | 10 | 16 | 37 |
| 43 | 12 | 15 | 8,4 | 6,1 | 4,6 | 4,5 | 3,1 | 4,3 | 6,1 | 4,2 | 3,8 | 7,8 | 9,2 | 1,0 | 1,4 | 4,2 | 3,4 | 23 | 10 | 2 | 2 | 64 | 4 | 19 | 14 | 11 | 10 | 16 | 45 |
| 35 | 8,9 | 13 | 6,9 | 5,0 | 3,7 | 3,6 | 2,3 | 3,3 | 5,1 | 4,1 | 3,8 | 6,3 | 6,5 | 0,8 | 1,2 | 3,4 | 2,8 | 23 | 11 | 3 | 2 | 60 | 4 | 19 | 14 | 11 | 10 | 16 | 46 |
| 33 | 8,9 | 12 | 5,4 | 4,8 | 3,6 | 3,3 | 2,2 | 3,6 | 4,7 | 4,3 | 3,6 | 5,3 | 7,2 | 0,8 | 1,0 | 3,5 | 2,6 | 23 | 9 | 3 | 2 | 60 | 4 | 16 | 14 | 11 | 10 | 16 | 35 |
| PERCENTAGES | | | | | | | | | | | | | | | | | | MEAN | 23,8 | 9,8 | 2,8 | 2,0 | 63,6 | 3,8 | 18,8 | 13,7 | 11,3 | 9,9 | 16,0 | 38,5 |
| | 24,6 | 35,9 | 21,1 | 12,7 | 11,3 | 11,3 | 8,5 | 12,7 | 17,6 | 11,3 | 8,5 | 14,8 | 18,3 | 3,9 | 4,4 | 6,6 | 9,2 | SD | 0,94 | 0,75 | 0,45 | 0,00 | 3,09 | 0,39 | 1,36 | 0,49 | 0,49 | 0,29 | 0,00 | 4,15 |
| | 23,4 | 34,3 | 21,2 | 15,3 | 11,7 | 12,4 | 8,8 | 12,4 | 16,1 | 10,9 | 8,0 | 16,8 | 19,7 | 3,6 | 4,6 | 6,9 | 10,2 | | | | | | | | | | | | | |
| | 24,4 | 37,0 | 20,0 | 12,6 | 11,1 | 10,4 | 8,9 | 13,3 | 17,0 | 9,6 | 7,4 | 16,3 | 20,0 | 3,7 | 4,4 | 6,9 | 9,6 | | | | | | | | | | | | | |
| | 23,4 | 36,4 | 19,6 | 12,1 | 12,1 | 12,1 | 8,2 | 11,2 | 15,9 | 11,2 | 7,4 | 16,8 | 19,6 | 3,3 | 4,0 | 6,9 | 8,5 | | | | | | | | | | | | | |
| | 22,6 | 35,8 | 17,9 | 11,3 | 10,4 | 12,3 | 7,5 | 10,4 | 15,1 | 9,4 | 8,0 | 16,0 | 18,9 | 3,1 | 4,0 | 7,4 | 8,3 | | | | | | | | | | | | | |
| | 25,0 | 37,5 | 18,3 | 13,5 | 12,5 | 12,5 | 8,3 | 11,5 | 17,3 | 10,6 | 8,3 | 17,3 | 20,2 | 3,4 | 4,0 | 7,1 | 8,8 | | | | | | | | | | | | | |
| | 24,3 | 36,5 | 18,9 | 12,2 | 10,9 | 11,4 | 7,6 | 11,6 | 16,2 | 11,1 | 9,2 | 18,9 | 20,3 | 2,8 | 3,4 | 8,2 | 8,4 | | | | | | | | | | | | | |
| | 26,4 | 36,1 | 18,1 | 12,9 | 11,3 | 12,1 | 6,9 | 11,1 | 16,7 | 10,4 | 9,6 | 18,1 | 20,8 | 2,5 | 3,1 | 9,0 | 7,6 | | | | | | | | | | | | | |
| | 26,8 | 35,2 | 18,3 | 12,7 | 11,3 | 11,5 | 6,8 | 11,1 | 15,5 | 10,3 | 9,2 | 18,3 | 21,1 | 3,1 | 3,4 | 8,9 | 8,3 | | | | | | | | | | | | | |
| | 27,9 | 34,9 | 19,5 | 14,2 | 10,7 | 10,5 | 7,2 | 10,0 | 14,2 | 9,8 | 8,8 | 18,1 | 21,4 | 2,3 | 3,3 | 9,8 | 7,9 | | | | | | | | | | | | | |
| | 25,4 | 37,1 | 19,7 | 14,3 | 10,6 | 10,3 | 6,6 | 9,4 | 14,6 | 11,7 | 10,9 | 18,0 | 18,6 | 2,3 | 3,4 | 8,0 | 8,0 | | | | | | | | | | | | | |
| | 27,0 | 36,4 | 16,4 | 14,5 | 10,9 | 10,0 | 6,7 | 10,9 | 14,2 | 13,0 | 10,9 | 16,1 | 21,8 | 2,4 | 3,0 | 10,6 | 7,9 | | | | | | | | | | | | | |
| MEAN | 25,1 | 36,1 | 19,1 | 13,2 | 11,2 | 11,4 | 7,7 | 11,3 | 15,9 | 10,8 | 8,8 | 17,1 | 20,1 | 3,0 | 3,7 | 8,0 | 8,6 | | | | | | | | | | | | | |
| SD | 1,63 | 0,95 | 1,39 | 1,18 | 0,63 | 0,91 | 0,84 | 1,12 | 1,17 | 1,00 | 1,17 | 1,21 | 1,12 | 0,55 | 0,56 | 1,30 | 0,77 | | | | | | | | | | | | | |

1/12-ZMA 106.509, Surinam, Marowijne River system, Lawa River, 10 km South of Stoelmanseiland, 21-IV-1966, H. Nijssen.

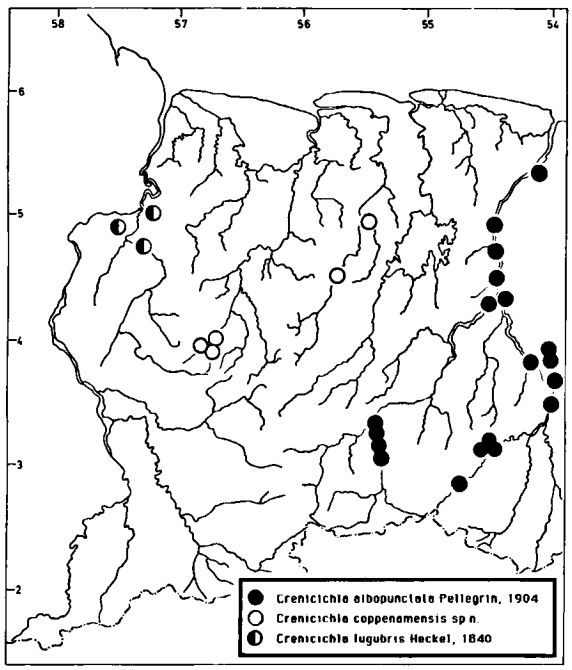


Fig. 2. Distribution of *Crenicichla albopunctata* Pellegrin, 1904, *C. coppenamensis* n. sp. and *C. lugubris* Heckel, 1840 in Surinam.

Predorsal contour straight; preventral contour straight. Snout somewhat rounded in lateral aspect, rounded from above. Maxilla extending to below orbit. Orbital diameter about half of head depth at orbit level. Nostrils slightly nearer to orbit than to postlabial skinfold.

Dorsal fin origin just dorsal to pectoral fin base; spines increasing in length to about eighth, from there equal in length; fifth from last ray the longest, reaching to 4/5 of caudal fin in adult males, to a fourth of caudal fin in adult females, to caudal fin base in juveniles. Anal fin tip reaching to caudal fin base; fourth from last ray the longest. Second ray of ventral fin the longest. Caudal fin rounded, with two to three basal scales at lateral line level, reduced to one dorsally and ventrally. Interradial scales to a fourth of caudal fin. Four, rarely three (one) scales between dorsal fin and most posterior scale of upper lateral line.

Upper jaw with maximum five teeth series in adults, in smaller specimens fewer, only two in the smallest specimens; lower jaw with maximum four teeth series, in smaller specimens fewer, only two in the smallest specimens; outer teeth series approximately the same size as inner teeth; teeth of upper jaw somewhat smaller than teeth of lower jaw.

Number of vertebrae in one specimen (ZMA 107.839): 19 + 16.

## COLOUR PATTERN IN ALCOHOL

*Male:* tan, dorsal half darker than caudal half. Mouth greyish; preventral area dirty white-yellow; cheek yellowish. Preoperculum greyish-brown.

Preorbital stripe present; suborbital stripe very faint, occasionally absent; postorbital stripe sharply delimited. Black lateral band, running from postorbital stripe to hind edge of caudal fin; this band becoming more vague on flanks, and very faint on caudal fin. Humeral spot on lateral band, just posteriorly to operculum. Silvery dots irregularly distributed on sides in dorsal two-third of body, on head, operculum and cheek; on the head these dots are present below and above the postorbital stripe, on the preoperculum these dots extend to ventral part; humeral spot with dots.

Dorsal fin grey with white dots, smaller than dots on sides of body; most dots in posterior part. Anal fin grey with dots only in posterior part of fin. Ventral and pectoral fins much lighter grey, without dots. Caudal fin grey with same dots as in dorsal fin, most dots in dorsal part of caudal fin; caudal spot on lateral band at base of caudal fin, just dorsal to lateral line scales, surrounded by eight dots; white caudal fin margin, except where lateral band ends.

*Female:* ground colour of body as in males. Dorsal fin with dark dorsal margin; some females show two ocelli (black, white ring) over 11th and 12th spine; in other females ocelli are absent, occasionally ocelli from first dorsal fin spine to last ray; ocelli exclusively in females. Caudal fin with dark margin, except in the middle. Anal fin with dark lower margin. Ventral with dark spine.

*Juvenile* (based on a 33 mm SL specimen, ZMA 106.509): conspicuous lateral band from tip of snout to end of caudal fin; above and below lateral band a tanish zone; humeral spot on lateral band; dark, ocellated caudal spot; small whitish ocelli in dorsal fin; yellow dots on both sides of lateral band, on lateral line scale series (these are present in females larger than about 100 mm SL, and are white in adult males); caudal fin dorsally with a dark submargin with white edges.

## DISTRIBUTION

In Surinam *Crenicichla albopunctata* occurs in the Marowijne river system only. The species is present almost everywhere in this river system (Ploeg, 1986c). Samples were examined from the following rivers: Marowijne, Tapanahony, Paloemeu, Oelemari and Lawa. Outside Surinam the species occurs in western French Guiana, where the species is present from Marowijne River eastwards to Approuague River. In the Oyapock River the species seems to be absent.

## REMARKS

Although the silvery-white dots on the operculum enables quick identification it seems useful to make comparisons with reminiscent species occurring in the region.

*Crenicichla albopunctata* is distinct from *C. alta* by the number of gillrakers (GR, fig. 3a); from *C. coppenamensis* by the number of scales in the upper lateral line (L1, fig. 3b), and by the number of scales between the lateral lines (L1/L2, fig. 3c); from *C. labrina* by the head length (HL, fig. 3d); from *C. nickeriensis* by the number of soft anal rays (ASR, fig. 3e); from *C. saxatilis* by the pectoral fin length (PFL, fig. 3f), and by the number of scales below the lateral lines (LL, fig. 3g), although the latter depends on the sample that is used for comparison. Specimens of *C. saxatilis* from the upper Suriname River and from French Guiana do not show this difference. *C. albopunctata* occurs sympatrically with *C. saxatilis* downstream of Tabbetje Hede in the Marowijne basin (approx. 04°45'N).

*Crenicichla albopunctata* can be distinguished from *C. sipaliwini* by its caudal fin length (CFL, fig. 3h).

### **Crenicichla coppenamensis** sp. n.

(Figs. 2, 3, 4, 5, 6; Pl. 1 second and middle; Tabs. II and VIII)

*Crenicichla alta*; (not Eigenmann, 1912) Boeseman, 1952 198 (Saramacca River).

## MATERIAL EXAMINED

*Holotype:* ZMA 107.841, 179 mm SL male, Surinam, left bank tributary to Linker Coppename River, 9-V-1967, H. Nijssen.

*Paratypes: Coppename River system:* ZMA 106.512 (42)/ZMA 107.842 (one), same data as holotype; ZMA 106.513 (12), right bank tributary to linker Coppename River (03°51'N, 56°45'W), 10-V-1967, H. Nijssen; ZMA 106.514 (11), left bank tributary to Coppename River (03°52'N, 56°55'W), 18-V-1967, H. Nijssen; ZMA 106.515 (10), right bank tributary to Coppename River (03°52'N, 56°53'W), 19-V-1967, H. Nijssen.

*Saramacca River system:* ZMA 105.630 (15), left bank tributary to Kleine Saramacca River, 13 km E.S.E. of confluence with Saramacca River, 28-II-1967, H. Nijssen; ZMA 105.616 (36), right bank tributary to Kleine Saramacca River, 11 km E.S.E. of confluence with Saramacca River, 27-II-1967, H. Nijssen; ZMA 109.848 (one), Toekoemoetoe Creek, S. of Poesoegroenoe Village, tributary to Saramacca River, III-1964, M. Boeseman.

## DESCRIPTION

Based on holotype (morphometric and meristic data are presented in tables II and VIII).

Predorsal contour straight; preventral contour straight. Snout somewhat rounded in

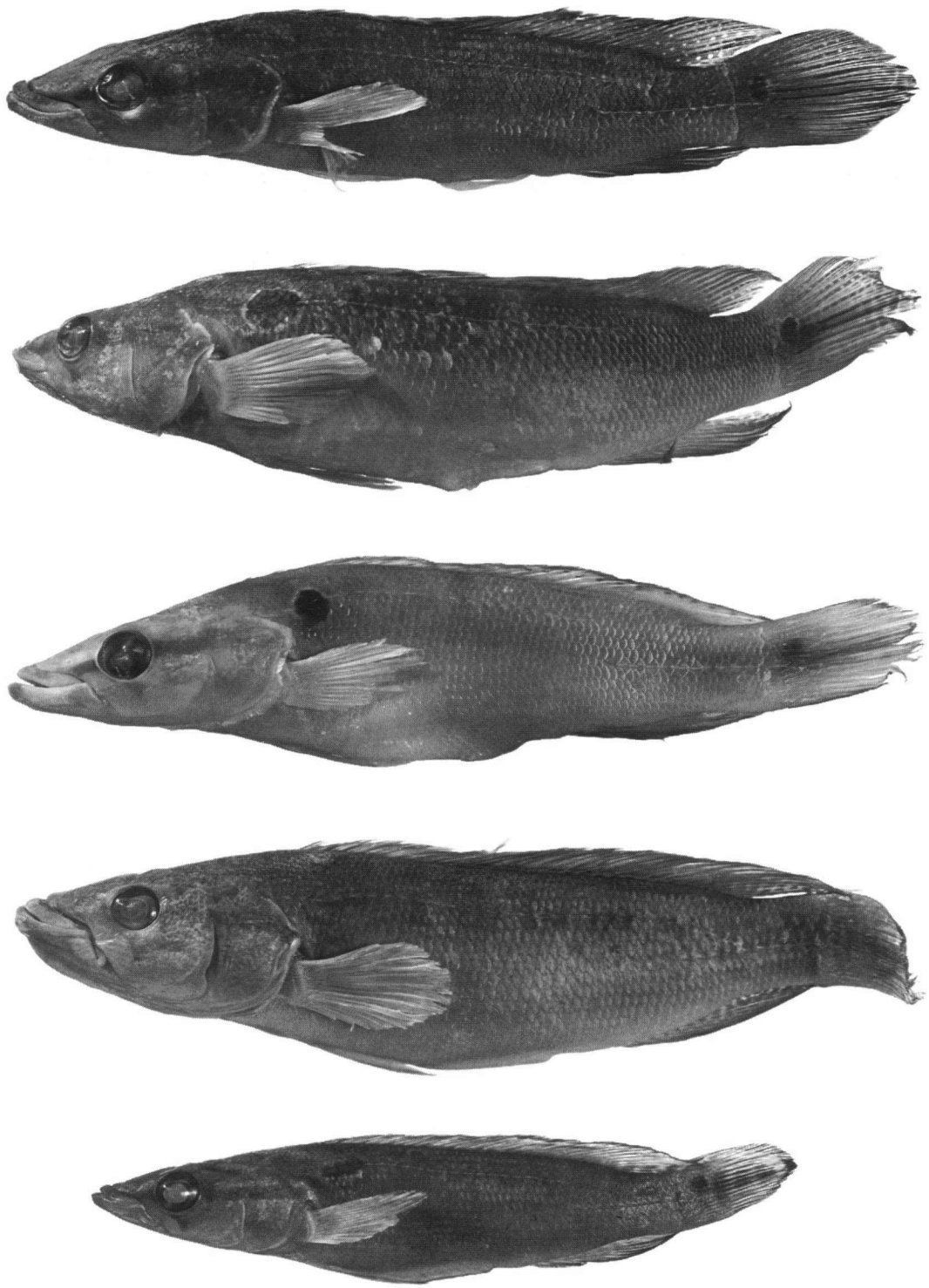

Plate I. Upper: Male of *Crenicichla albopunctata* Pellegrin, 1904. ZMA 107.839, 132 mm SL. Second: Holotype of *C. coppenamensis* sp. n., ZMA 107.841, 179 mm SL, male. Middle: Female of *C. coppenamensis* n. sp., ZMA 107.842, 121 mm SL. Fourth: Holotype of *C. nickeriensis* n. sp., ZMA 107.843, 191 mm SL, male. Lower: Female of *C. nickeriensis* n. sp., ZMA 107.844, 88 mm SL. Photographs L. A. van der Laan.

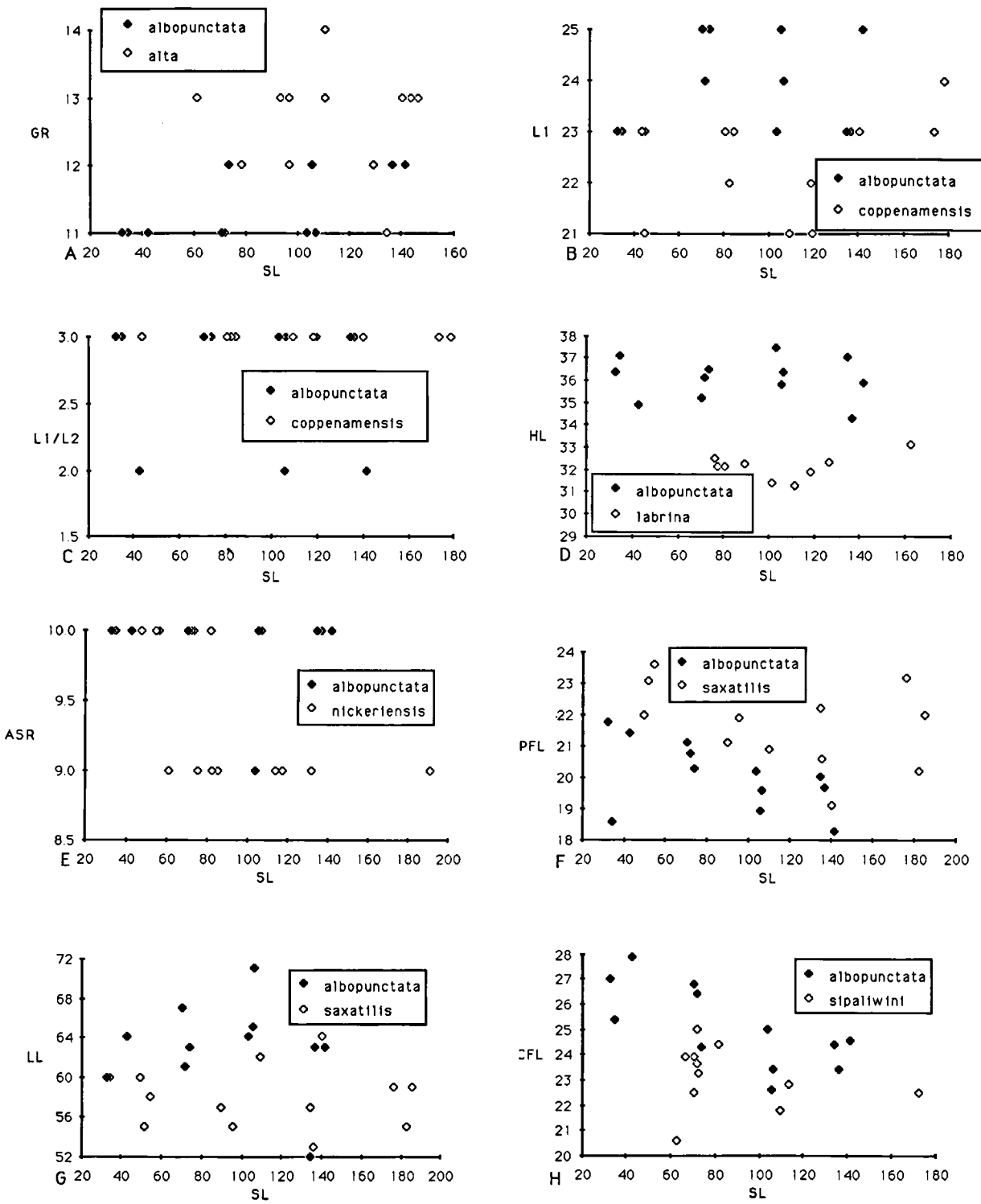


Fig. 3a-h. Relation between standard length (SL) and other characters for comparison of *C. albopunctata* with *C. alta*, *C. coppenamensis*, *C. labrina*, *C. nickeriensis*, *C. saxatilis*, and *C. sipaliwini*; see also 'methods'.

Table II. Morphometric and meristic data for twelve specimens of *Crenicichla coppenamensis* n. sp. Abbreviations are listed in table VIII.

CRENICICHLA COPPENAMENSIS SP.N.

| SL | CFL | HL | HD | HW | DCP | LCP | SN | UJL | LJL | LLDS | LLAS | VFL | PFL | PN | PN2 | ORB | WI | L1 | L2 | L1/L2 | L2C | LL | SCDL | DSP | DSR | GR | ASR | P | ASN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MILLIMETERS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 179 | 42 | 66 | 38 | 24 | 19 | 20 | 16 | 23 | 31 | 16 | 15 | 26 | 33 | 6,4 | 8,2 | 11 | 14 | 24 | 12 | 3 | 2 | 70 | 4 | 19 | 13 | 10 | 10 | 17 | 32 |
| 174 | 43 | 63 | 36 | 25 | 19 | 20 | 15 | 21 | 29 | 17 | 13 | 27 | 32 | 6,8 | 9,2 | 10 | 17 | 23 | 12 | 3 | 2 | 70 | 4 | 20 | 13 | 13 | 10 | 16 | 36 |
| 141 | 34 | 53 | 29 | 19 | 16 | 18 | 11 | 17 | 25 | 14 | 8,8 | 23 | 27 | 4,0 | 5,5 | 10 | 13 | 23 | 11 | 3 | 2 | 67 | 4 | 18 | 14 | 12 | 9 | 16 | 32 |
| 120 | 27 | 42 | 23 | 17 | 14 | 14 | 9,1 | 13 | 19 | 11 | 8,1 | 17 | 21 | 3,7 | 5,1 | 8,1 | 11 | 21 | 11 | 3 | 2 | 69 | 4 | 20 | 12 | 11 | 9 | 16 | 36 |
| 119 | 28 | 43 | 22 | 15 | 13 | 14 | 9,0 | 13 | 19 | 11 | 9,0 | 19 | 22 | 4,0 | 5,2 | 7,2 | 10 | 22 | 12 | 3 | 2 | 69 | 4 | 20 | 12 | 13 | 10 | 16 | 34 |
| 110 | 25 | 40 | 20 | 14 | 12 | 13 | 8,1 | 13 | 18 | 10 | 9,1 | 17 | 22 | 3,8 | 5,0 | 7,9 | 9,8 | 21 | 12 | 3 | 2 | 67 | 4 | 18 | 14 | 13 | 10 | 17 | 35 |
| 85 | 20 | 31 | 16 | 12 | 9,2 | 9,6 | 6,3 | 9,3 | 14 | 8,4 | 6,7 | 14 | 18 | 2,8 | 3,4 | 6,9 | 6,6 | 23 | 11 | 3 | 2 | 69 | 4 | 20 | 13 | 11 | 10 | 16 | 40 |
| 83 | 21 | 31 | 15 | 11 | 9,6 | 11 | 5,6 | 8,1 | 13 | 6,9 | 7,4 | 14 | 18 | 2,6 | 3,3 | 6,4 | 6,4 | 22 | 11 | 3 | 2 | 66 | 4 | 19 | 13 | 11 | 9 | 16 | 39 |
| 81 | 20 | 29 | 14 | 10 | 9,1 | 9,4 | 5,8 | 8,1 | 12 | 8,7 | 6,8 | 13 | 17 | 2,4 | 3,3 | 5,9 | 6,6 | 23 | 11 | 3 | 2 | 65 | 4 | 19 | 14 | 11 | 10 | 16 | 36 |
| 45 | 10 | 16 | 7,8 | 5,4 | 4,7 | 6,8 | 2,4 | 4,2 | 7,1 | 4,2 | 4,2 | 7,1 | 9,2 | 1,0 | 1,1 | 4,3 | 3,6 | 23 | 12 | 3 | 2 | 65 | 4 | 20 | 13 | 11 | 10 | 16 | 41 |
| 45 | 11 | 17 | 7,9 | 6,1 | 4,7 | 5,0 | 3,0 | 4,5 | 7,5 | 4,5 | 4,3 | 8,2 | 10 | 1,1 | 1,4 | 4,2 | 3,1 | 21 | 12 | 3 | 2 | 67 | 4 | 20 | 14 | 12 | 10 | 17 | 30 |
| 44 | 10 | 15 | 7,7 | 5,8 | 4,4 | 4,8 | 2,3 | 4,4 | 6,5 | 4,1 | 4,0 | 6,9 | 8,8 | 0,9 | 1,4 | 4,3 | 2,8 | 23 | 11 | 3 | 2 | 65 | 4 | 20 | 14 | 12 | 10 | 17 | 37 |
| MEAN | | | | | | | | | | | | | | | | | | 22,4 | 11,5 | 3,0 | 2,0 | 67,4 | 4,0 | 19,4 | 13,3 | 11,7 | 9,8 | 16,3 | 35,7 |
| SD | | | | | | | | | | | | | | | | | | 1,00 | 0,52 | 0,00 | 0,00 | 1,93 | 0,00 | 0,79 | 0,75 | 0,98 | 0,45 | 0,49 | 3,34 |
| PERCENTAGES | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 23,5 | 36,9 | 21,2 | 13,4 | 10,6 | 11,2 | 8,9 | 12,8 | 17,3 | 8,9 | 8,4 | 14,5 | 18,4 | 3,6 | 4,6 | 6,1 | 7,8 | | | | | | | | | | | | | |
| 24,7 | 36,2 | 20,7 | 14,4 | 10,9 | 11,5 | 8,6 | 12,1 | 16,7 | 9,8 | 7,5 | 15,5 | 18,4 | 3,9 | 5,3 | 5,7 | 9,8 | | | | | | | | | | | | | |
| 24,1 | 37,6 | 20,6 | 13,5 | 11,3 | 12,8 | 7,8 | 12,1 | 17,7 | 9,9 | 6,2 | 16,3 | 19,1 | 2,8 | 3,9 | 7,1 | 9,2 | | | | | | | | | | | | | |
| 22,5 | 35,0 | 19,2 | 14,2 | 11,7 | 11,7 | 7,6 | 10,8 | 15,8 | 9,2 | 6,8 | 14,2 | 17,5 | 3,1 | 4,3 | 6,8 | 9,2 | | | | | | | | | | | | | |
| 23,5 | 36,1 | 18,5 | 12,6 | 10,9 | 11,8 | 7,6 | 10,9 | 16,0 | 9,2 | 7,6 | 16,0 | 18,5 | 3,4 | 4,4 | 6,1 | 8,4 | | | | | | | | | | | | | |
| 22,7 | 36,4 | 18,2 | 12,7 | 10,9 | 11,8 | 7,4 | 11,8 | 16,4 | 9,1 | 8,3 | 15,5 | 20,0 | 3,5 | 4,5 | 7,2 | 8,9 | | | | | | | | | | | | | |
| 23,5 | 36,5 | 18,8 | 14,1 | 10,8 | 11,3 | 7,4 | 10,9 | 16,5 | 9,9 | 7,9 | 16,5 | 21,2 | 3,3 | 4,0 | 8,1 | 7,8 | | | | | | | | | | | | | |
| 25,3 | 37,3 | 18,1 | 13,3 | 11,6 | 13,3 | 6,7 | 9,8 | 15,7 | 8,3 | 8,9 | 16,9 | 21,7 | 3,1 | 4,0 | 7,7 | 7,7 | | | | | | | | | | | | | |
| 24,7 | 35,8 | 17,3 | 12,3 | 11,2 | 11,6 | 7,2 | 10,0 | 14,8 | 10,7 | 8,4 | 16,0 | 21,0 | 3,0 | 4,1 | 7,3 | 8,1 | | | | | | | | | | | | | |
| 22,2 | 35,6 | 17,3 | 12,0 | 10,4 | 15,1 | 5,3 | 9,3 | 15,8 | 9,3 | 9,3 | 15,8 | 20,4 | 2,2 | 2,4 | 9,6 | 8,0 | | | | | | | | | | | | | |
| 24,4 | 37,8 | 17,6 | 13,6 | 10,4 | 11,1 | 6,7 | 10,0 | 16,7 | 10,0 | 9,6 | 18,2 | 22,2 | 2,4 | 3,1 | 9,3 | 6,9 | | | | | | | | | | | | | |
| 22,7 | 34,1 | 17,5 | 13,2 | 10,0 | 10,9 | 5,2 | 10,0 | 14,8 | 9,3 | 9,1 | 15,7 | 20,0 | 2,0 | 3,2 | 9,8 | 6,4 | | | | | | | | | | | | | |
| MEAN | 23,7 | 36,3 | 18,7 | 13,3 | 10,9 | 12,0 | 7,2 | 10,9 | 16,2 | 9,5 | 8,2 | 15,9 | 19,9 | 3,0 | 4,0 | 7,6 | 8,2 | | | | | | | | | | | | |
| SD | 1,00 | 1,07 | 1,39 | 0,74 | 0,49 | 1,19 | 1,11 | 1,11 | 0,89 | 0,63 | 1,02 | 1,05 | 1,49 | 0,56 | 0,76 | 1,38 | 0,99 | | | | | | | | | | | | |

1-ZMA 107.841, HOLOTYPE, Surinam, Coppename River system, creek at left bank of Left Coppename River (03.54'N, 56.46'W), 9-V-1967, H. Nijssen.
2/12-ZMA 106.512, PARATYPES, Surinam, Coppename River system, creek at left bank of Left Coppename River (03.54'N, 56.46'W), 9-V-1967, H. Nijssen.

lateral aspect, rounded from above. Maxilla reaching to below orbit. Orbit in upper part of head, about half as deep as head at orbit level. Nostrils nearer to orbit than to postlabial skinfold.

Dorsal fin origin just posterior to hind edge of operculum; spines increasing in length to about ninth, from where equal in length; sixth ray from last the longest, reaching to a third of caudal fin, occasionally to end of fin in adult males, to caudal fin base in females and juveniles. Anal fin extending to caudal fin base with fifth ray from last the longest. Second ray of ventral fin the longest. Caudal fin rounded with three to four basal scales at lateral line level, diminishing to one dorsally and ventrally. Interradial scales to a fourth of caudal fin length. Pectoral rounded.

Upper jaw with maximum five teeth series, all teeth equal in length; lower jaw with maximum four teeth series, outer series with little larger teeth; in specimens smaller than 55 mm SL only two teeth series in both jaws.

Number of vertebrae in one specimen (ZMA 107.841): 20 + 14.

## COLOUR PATTERN IN ALCOHOL

*Male* (based on holotype): tan; dark on the back, lighter on the belly; head greyish; preventral area light, cheek yellowish.

Black preorbital, postorbital, and suborbital stripe. Lateral band on sides faint, prominent on caudal fin; running between lateral line scale series. Occasionally a second band present, running from below pectoral fin to halfway anal fin. Light-yellow dots which are smaller than flankscales; dots scattered on flanks, more numerous along lateral lines. Black humeral spot posterior to operculum, four scales long, ocellated by a silvery ring; spot in adults with center on lateral line, in juveniles below lateral line.

Dorsal fin grey and scattered with whitish dots, which are smaller than the dots on flanks; more dots on posterior part of fin. Anal fin grey scattered with hyaline dots. Caudal fin grey with series of small whitish dots, arranged in whitish lines. Black, ocellated caudal spot dorsally on caudal fin, just posterior to basal scales. Many specimens (absent in holotype) show a

small dark spot at end of caudal fin. Pectoral and ventral fins much lighter grey, almost white.

*Female* (based on 121 mm SL paratype, ZMA 107.842): somewhat lighter than males; lateral band on head and ring around humeral spot less conspicuous than in males. No ring around caudal spot; occasionally a horizontal band along abdominal side as in some males. Yellow dots absent. Dorsal fin much lighter than in males, dark margined; without dots. Anal fin without dots and much lighter than in males. Sexual dimorphism only in specimens larger than about 110 mm SL. Caudal fin without dots; often a small dark spot at end of lateral band; dark margin along dorsal edge, occasionally a white margin instead, together with a dark submargin.

*Juvenile* (based on a 25 mm SL paratype, ZMA 106.512): three horizontal zones: brown upper part, a darker band from tip of snout to caudal fin, and a tan ventral part; preventral area light. Humeral spot on lateral band, but well below the lateral line, ocellated by a light brown ring. Dorsal fin dark-margined. Dots absent.

## DISTRIBUTION

In Surinam *Crenicichla coppenamensis* is present in the Coppename and Saramacca River systems. No material is available from the lower Coppename River.

## REMARKS

*Crenicichla coppenamensis* is distinct from *C. alta* by the ventral fin length (VFL, fig. 4a), the number of scales below the lateral lines (LL, fig. 4b), the number of scales between the lateral lines (L1/L2, fig. 4c), and the number of gillrakers (GR, fig. 4d); from *C. labrina* by the head length (HL, fig. 4e), the depth of the caudal peduncle (DCP, fig. 4f), the snout length (SN, fig. 4g), the number of scales below the lateral lines (LL, fig. 4h), the number of scales between the lateral lines (L1/L2, fig. 5a), the number of spines in the dorsal fin (DSP, fig. 5b). *Crenicichla coppenamensis* can be distinguished from *C. nickeriensis* by the ventral fin length (VFL, fig. 5c), the number of scales between the lateral lines (L1/L2, fig. 5d), and the angle of the snout (ASN, fig. 5e); from *C. saxatilis* by the depth of the caudal peduncle (DCP, fig. 5f), the length of the last dorsal spine (LLDS, fig. 5g), the ventral fin length (VFL, fig. 5h), the number of scales below the lateral lines (LL, fig. 6a), and the number of dorsal spines (DSP, fig. 6b). *Crenicichla sipaliwini* can be distinguished by the ventral fin length (VFL, fig. 6c), by the more slender body shape and by the much larger humeral spot (the latter two not in a figure).

Females of *C. coppenamensis* do not show ocelli in their dorsal fin, as females of the related species *C. saxatilis* and *C. albopunctata.*

The position of the humeral spot shows ontogenetic variation: adults have the center of the spot on the lateral line (above the lateral band; in specimens smaller than about 100 mm SL the center of the spot is entirely below the lateral line (still above the lateral band when larger than 40 mm). This variation is shared with *C. coppenamensis*, *C. sipaliwini*, and *C. saxatilis.*

### **Crenicichla nickeriensis** sp. n.

(Figs. 3, 5, 6, 7, 8; Pl. I fourth and lower; Tabs. III and VIII)

Local names: Datra fisi, djonkodjo mantuari, donfò.

## MATERIAL EXAMINED

*Holotype:* ZMA 107.843, 191 mm SL male, Surinam, right bank tributary to Nickerie River, 12 km W.S.W. of Stondansie Fall, 5-IV-1967, H. Nijssen.

*Paratypes: Nickerie River system:* ZMA 105.764 (four), Stondansie Fall, 5-IV-1967, H. Nijssen; ZMA 106.506 (36), Fallawatra River, 5 km S.S.W. of Stondansie Fall, 6-IV-1967, H.

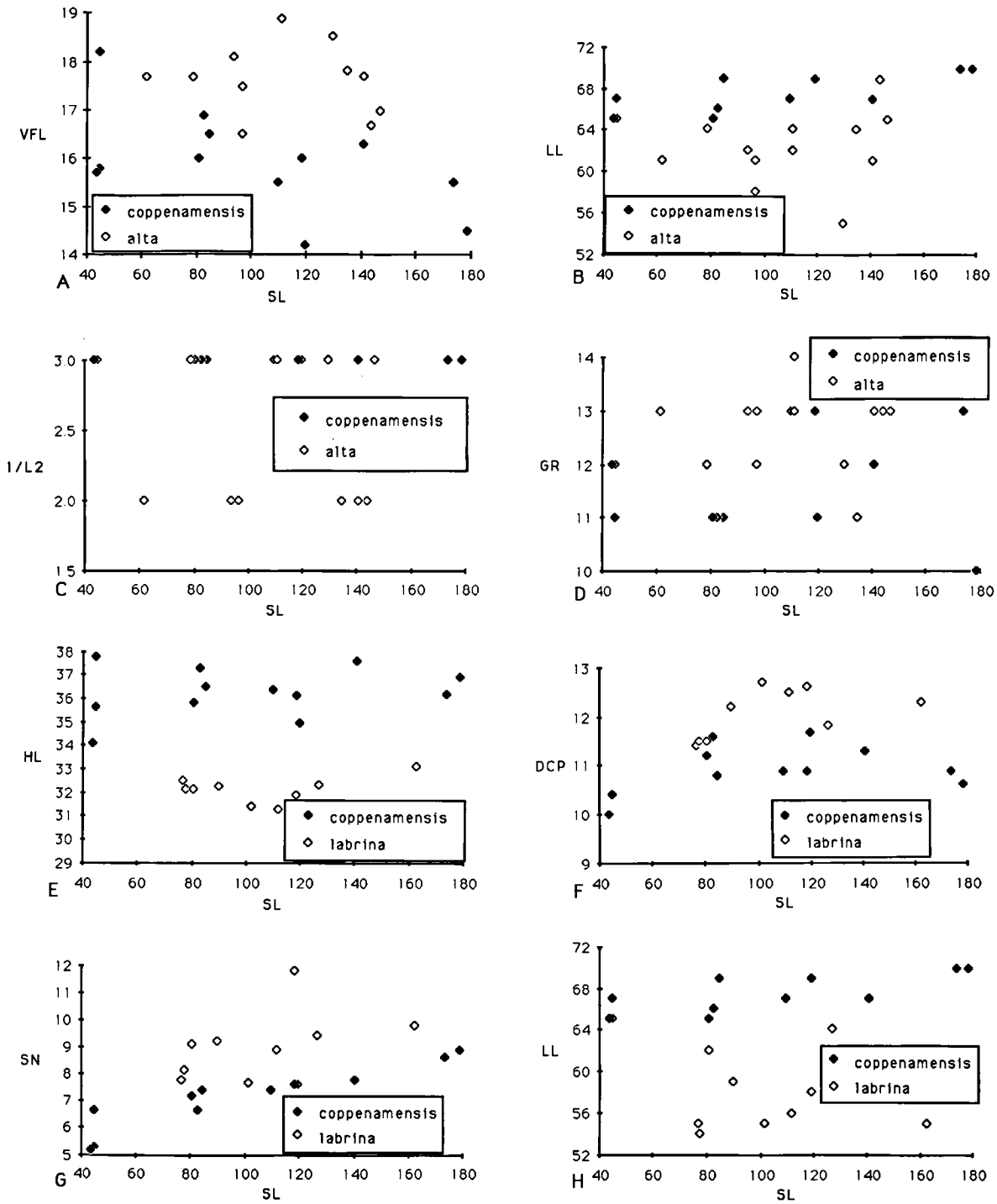


Fig. 4a-h. Relation between standard length (SL) and other characters for comparison of *C. coppenamensis* with *C. alta* and *C. labrina*; see also 'methods'.

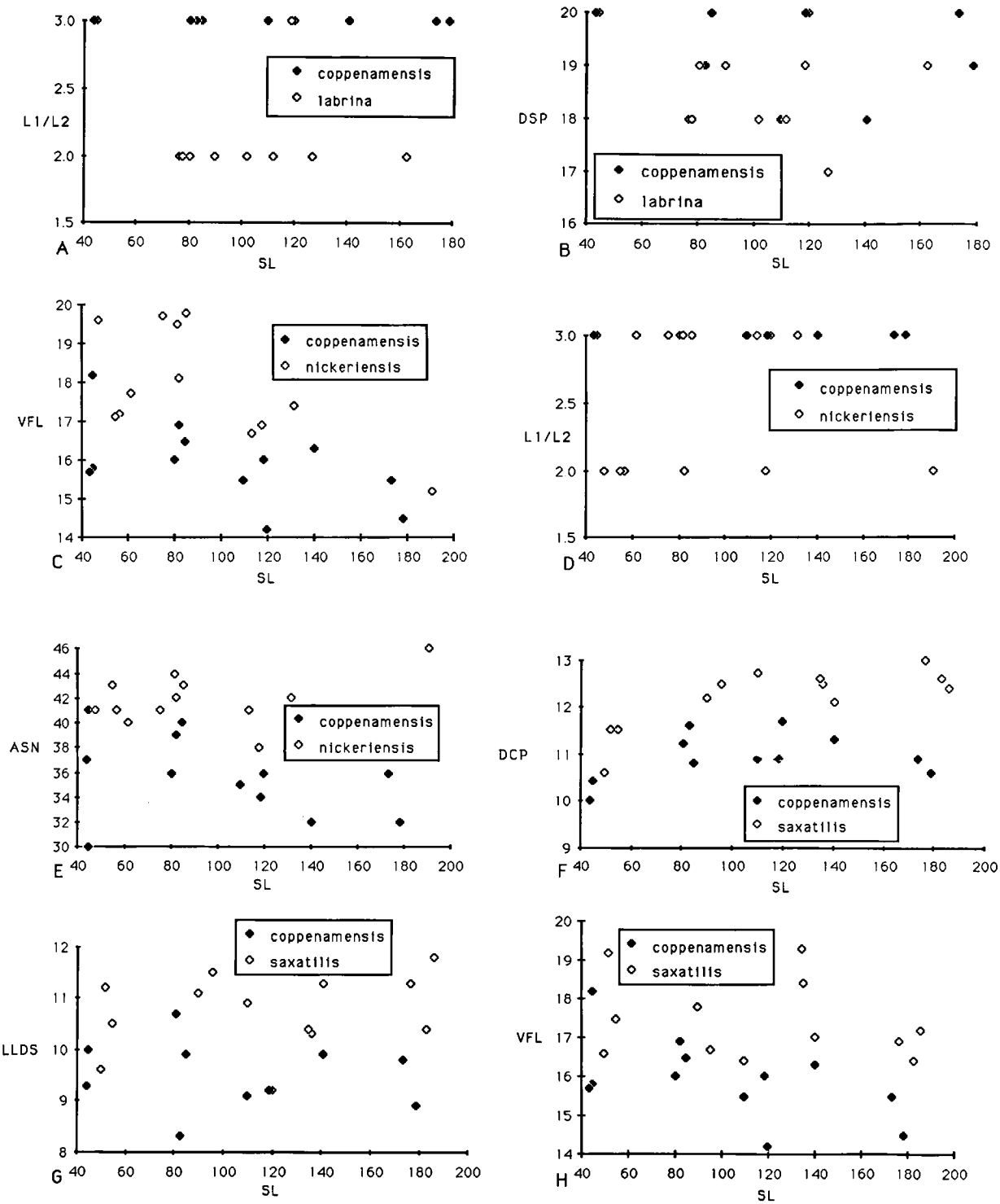


Fig. 5a-h. Relation between standard length (SL) and other characters for comparison of *C. coppenamensis* with *C. labrina*, *C. nickeriensis* and *C. saxatilis*; see also 'methods'.

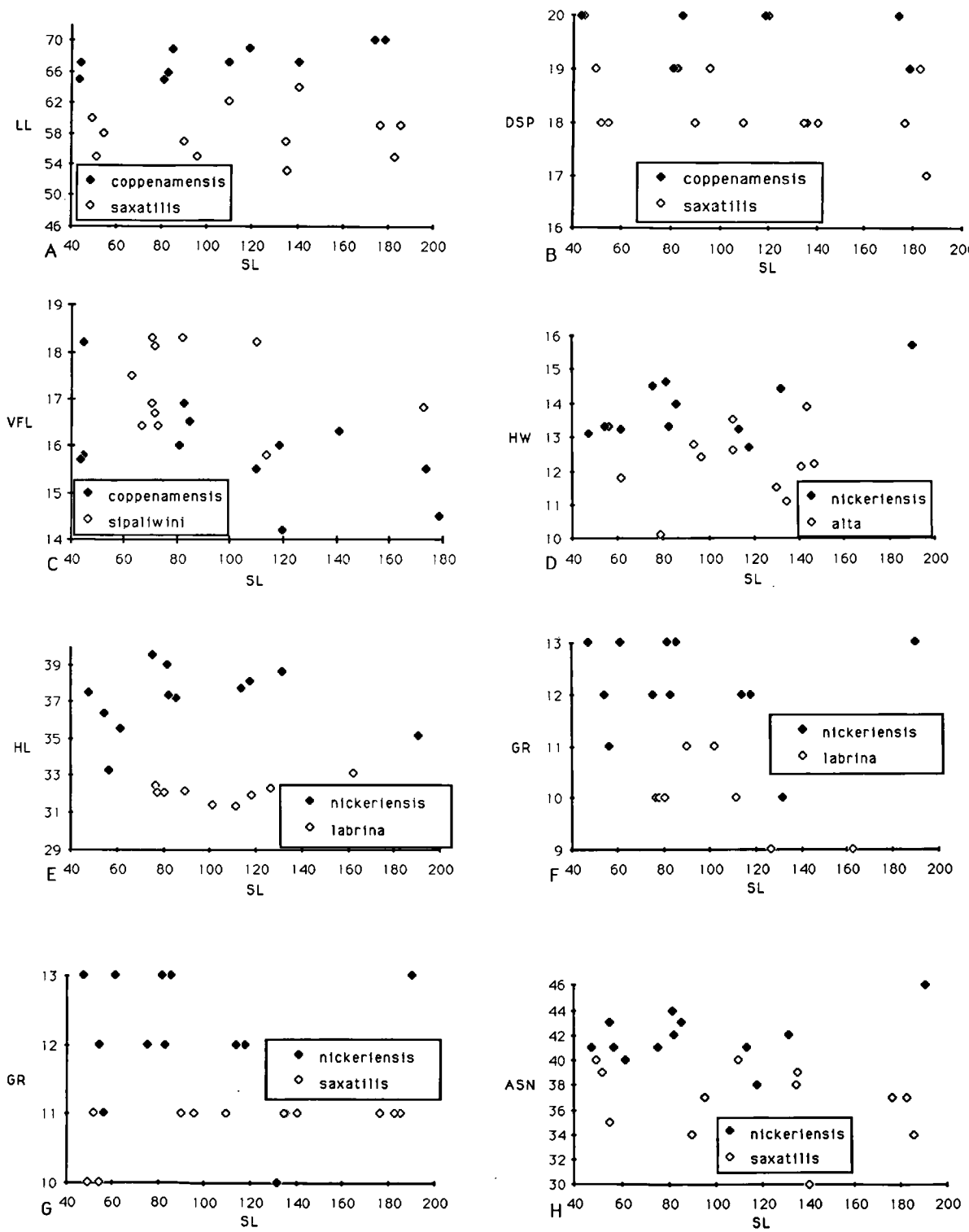


Fig. 6a-h. Relation between standard length (SL) and other characters for comparison of *C. coppenamensis* with *C. saxatilis* and *C. sipaliwini*, and of *C. nickeriensis* with *C. alta*, *C. labrina*, and *C. saxatilis*; see also 'methods'.

Table III. Morphometric and meristic data for twelve specimens of *Crenicichla nickeriensis* n. sp. Abbreviations are listed in table VIII.

CRENICICHLA NICKERIENSIS SP.N.

| SL | CFL | HL | HD | HW | DCP | LCP | SN | LJL | LJL | LLDS | LLAS | VFL | PFL | PN | PN2 | ORB | WI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MILLIMETERS | | | | | | | | | | | | | | | | | |
| 191 | 44 | 67 | 43 | 30 | 22 | 22 | 16 | 21 | 32 | 19 | 14 | 29 | 35 | 8,0 | 8,2 | 11 | 21 |
| 132 | 33 | 51 | 28 | 19 | 14 | 14 | 13 | 17 | 24 | 14 | | 23 | 27 | 5,3 | 6,9 | 8,2 | 14 |
| 118 | 28 | 45 | 22 | 15 | 13 | 13 | 9,7 | 15 | 21 | 12 | 10 | 20 | 24 | 4,4 | 5,3 | 8,0 | 11 |
| 114 | 29 | 43 | 21 | 15 | 12 | 12 | 10 | 14 | 19 | 12 | 9,3 | 19 | 24 | 4,1 | 5,3 | 8,4 | 10 |
| 86 | 21 | 32 | 16 | 12 | 9,6 | 10 | 6,5 | 10 | 15 | 9,3 | 7,3 | 17 | 18 | 2,9 | 3,7 | 6,3 | 7,3 |
| 83 | 21 | 31 | 16 | 11 | 9,0 | 9,2 | 6,1 | 8,9 | 15 | 9,2 | 7,7 | 15 | 16 | 2,6 | 3,8 | 6,7 | 6,2 |
| 82 | 21 | 32 | 15 | 12 | 8,9 | 8,9 | 6,4 | 9,1 | 14 | 8,9 | 7,5 | 16 | 17 | 2,8 | 3,5 | 6,6 | 6,9 |
| 76 | 19 | 30 | 15 | 11 | 8,5 | 9,1 | 6,1 | 9,0 | 14 | 8,3 | 6,7 | 15 | 17 | 2,6 | 3,7 | 6,3 | 6,7 |
| 62 | 17 | 22 | 11 | 8,2 | 6,5 | 7,3 | 4,3 | 6,2 | 9,5 | 6,7 | 5,9 | 11 | 13 | 1,7 | 2,1 | 5,3 | 4,8 |
| 57 | 14 | 19 | 10 | 7,6 | 6,1 | 6,3 | 4,1 | 5,3 | 9,0 | 6,1 | 5,5 | 9,8 | 12 | 1,6 | 2,1 | 5,2 | 4,5 |
| 55 | 14 | 20 | 9,5 | 7,3 | 6,0 | 6,3 | 3,7 | 4,7 | 8,8 | 6,5 | 5,1 | 9,4 | 11 | 1,8 | 2,2 | 4,8 | 4,3 |
| 48 | 12 | 18 | 8,9 | 6,3 | 5,3 | 5,2 | 3,2 | 4,5 | 7,0 | 4,5 | 4,4 | 9,4 | 11 | 1,5 | 2,3 | 4,5 | 3,5 |
| | PERCENTAGES | | | | | | | | | | | | | | | | |
| | 23,0 | 35,1 | 22,5 | 15,7 | 11,5 | 11,5 | 8,4 | 11,0 | 16,8 | 9,9 | 7,3 | 15,2 | 18,3 | 4,2 | 4,3 | 5,8 | 11,0 |
| | 25,0 | 38,6 | 21,2 | 14,4 | 10,6 | 10,6 | 9,8 | 12,9 | 18,2 | 10,6 | | 17,4 | 20,5 | 4,0 | 5,2 | 6,2 | 10,6 |
| | 23,7 | 38,1 | 18,6 | 12,7 | 11,0 | 11,0 | 8,2 | 12,7 | 17,8 | 10,2 | 8,5 | 16,9 | 20,3 | 3,7 | 4,5 | 6,8 | 9,3 |
| | 25,4 | 37,7 | 18,4 | 13,2 | 10,5 | 10,5 | 8,8 | 12,3 | 16,7 | 10,5 | 8,2 | 16,7 | 21,1 | 3,6 | 4,6 | 7,4 | 8,8 |
| | 24,4 | 37,2 | 18,6 | 14,0 | 11,2 | 11,6 | 7,6 | 11,6 | 17,4 | 10,8 | 8,5 | 19,8 | 20,9 | 3,4 | 4,3 | 7,3 | 8,5 |
| | 25,3 | 37,3 | 19,3 | 13,3 | 10,8 | 11,1 | 7,3 | 10,7 | 18,1 | 11,1 | 9,3 | 18,1 | 19,3 | 3,1 | 4,6 | 8,1 | 7,5 |
| | 25,6 | 39,0 | 18,3 | 14,6 | 10,9 | 10,9 | 7,8 | 11,1 | 17,1 | 10,9 | 9,1 | 19,5 | 20,7 | 3,4 | 4,3 | 8,0 | 8,4 |
| | 25,0 | 39,5 | 19,7 | 14,5 | 11,2 | 12,0 | 8,0 | 11,8 | 18,4 | 10,9 | 8,8 | 19,7 | 22,4 | 3,7 | 4,9 | 8,3 | 8,8 |
| | 27,4 | 35,5 | 17,7 | 13,2 | 10,5 | 11,8 | 6,9 | 10,0 | 15,3 | 10,8 | 9,5 | 17,7 | 21,0 | 2,7 | 3,4 | 8,5 | 7,7 |
| | 24,6 | 33,3 | 17,5 | 13,3 | 10,7 | 11,1 | 7,2 | 9,3 | 15,8 | 10,7 | 9,6 | 17,2 | 21,1 | 2,8 | 3,7 | 9,1 | 7,9 |
| | 25,5 | 36,4 | 17,3 | 13,3 | 10,9 | 11,5 | 6,7 | 8,5 | 16,0 | 11,8 | 9,3 | 17,1 | 20,0 | 3,3 | 4,0 | 8,7 | 7,8 |
| | 25,0 | 37,5 | 16,5 | 13,1 | 11,0 | 10,8 | 6,7 | 9,4 | 14,6 | 9,4 | 9,2 | 19,6 | 22,9 | 3,1 | 4,8 | 9,4 | 7,3 |
| MEAN | 25,0 | 37,1 | 19,0 | 13,8 | 10,9 | 11,2 | 7,8 | 10,9 | 16,8 | 10,6 | 8,8 | 17,9 | 20,7 | 3,4 | 4,4 | 7,8 | 8,6 |
| SD | 0,92 | 1,52 | 1,31 | 0,75 | 0,26 | 0,47 | 0,93 | 1,41 | 1,22 | 0,61 | 0,69 | 1,46 | 1,22 | 0,44 | 0,51 | 1,13 | 1,18 |

| | L1 | L2 | L1/L2 | L2C | LL | SCDL | DSP | DSR | GR | ASR | P | ASN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 24 | 9 | 2 | 2 | 61 | 4 | 18 | 14 | 13 | 9 | 16 | 46 |
| | 24 | 9 | 3 | 1 | 61 | 4 | 18 | 14 | 10 | 9 | 16 | 42 |
| | 23 | 10 | 2 | 2 | 63 | 4 | 19 | 13 | 12 | 9 | 16 | 38 |
| | 24 | 10 | 3 | 2 | 66 | 4 | 19 | 14 | 12 | 9 | 16 | 41 |
| | 22 | 10 | 3 | 2 | 61 | 4 | 18 | 13 | 13 | 9 | 16 | 43 |
| | 24 | 9 | 2 | 2 | 65 | 4 | 18 | 15 | 12 | 9 | 16 | 42 |
| | 23 | 9 | 3 | 2 | 65 | 3 | 19 | 14 | 13 | 10 | 16 | 44 |
| | 23 | 9 | 3 | 2 | 64 | 3 | 19 | 13 | 12 | 9 | 16 | 41 |
| | 23 | 10 | 3 | 2 | 65 | 4 | 20 | 13 | 13 | 9 | 16 | 40 |
| | 23 | 9 | 2 | 2 | 64 | 4 | 19 | 14 | 11 | 10 | 16 | 41 |
| | 23 | 10 | 2 | 2 | 66 | 4 | 19 | 14 | 12 | 10 | 17 | 43 |
| | 23 | 10 | 2 | 2 | 66 | 4 | 19 | 13 | 13 | 10 | 16 | 41 |
| MEAN | 23,3 | 9,5 | 2,5 | 1,9 | 63,9 | 3,8 | 18,8 | 13,7 | 12,2 | 9,3 | 16,1 | 41,8 |
| SD | 0,62 | 0,52 | 0,52 | 0,29 | 1,98 | 0,39 | 0,62 | 0,65 | 0,94 | 0,49 | 0,29 | 2,04 |

1-ZMA 107.843, HOLOTYPE, Surinam, Nickerie River, right tributary creek to Nickerie River, 12 km WSW of Stondansie Fall, 5-IV-1967, H. Nijssen.
2/12-ZMA 107.843, PARATYPES, Surinam, Nickerie River, right tributary creek to Nickerie River, 12 km WSW of Stondansie Fall, 5-IV-1967, H. Nijssen.

Nijssen; ZMA 106.505/107.844 (31), same data as holotype; RMNH 30553 (35), right tributary creek to Fallawatra River near confluence with Nickerie River, 2-II-1971, M. Boeseman; RMNH 30554/ZMA 116.681 (nine), right bank tributary to Nickerie River, 3 km below Stondansie Fall, 1-II-1971, M. Boeseman; RMNH 28955/30555 (five), right bank tributary to middle course of Maratakka River, 28-II-1971, M. Boeseman; RMNH 30556 (two), tributary to middle course of Maratakka River, 1-III-1971, M. Boeseman; RMNH 28951/28952 (13), right bank tributary to middle course of Maratakka River at second savanna, 6-III-1971, M. Boeseman; RMNH 28953/28954 (13), Bigi Birri Creek to Maratakka River, above Cupido, 8-III-1971, M. Boeseman; RMNH 30557 (one), ditches around Wageningen, 10-III-1971, M. Boeseman.

*Corantijn River system:* USNM 226023 (two), Steen Creek, (04°49'N, 45°27'W), 13-IX-1980, R. P. Vari; USNM 226039 (one), near Anjoemara (04°50'N, 57°26'W), 14-IX-1980, R. P. Vari; USNM 226044 (six), a small creek close to Mataway (04°58.5'N, 57°42'W), 18-V-1980, R. P. Vari; USNM 226028 (one), Matappi Creek (05°01'N, 57°17.5'W), 17-V-1980, R. P. Vari; USNM 226020 (one), Kapoeri Creek, ca. 4 km N from intersection with Corantijn River (05°16'N, 57°10'W),

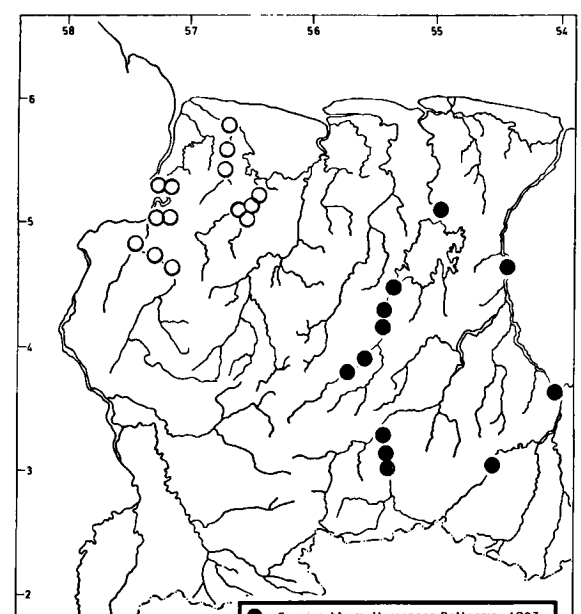


Fig. 7. Distribution of *C. multispinosa* Pellegrin, 1903 and *C. nickeriensis* n. sp. in Surinam.

18-IX-1980, R. P. Vari; USNM 225848 (six), Corantijn River along mud flats at Wakay, just below Amerindian camp boatlanding (05°18'N, 57°15'W), 7-IX-1980, R. P. Vari; RMNH 30558 (16), Sand Fall, near Avanavero Fall in Kabalebo River, 23-IX-1965, G. F. Mees; ZMA 116.682 (two), right bank tributary to Kabalebo River, just downstream of Avanavero Fall, 10-IV-1965, G. F. Mees.

## DESCRIPTION

Based on holotype (morphometric and meristic data are presented in tables III and VIII).

Predorsal contour straight; preventral contour somewhat convex. Snout rounded in lateral aspect and from above. Lower jaw a little prognathous, in other specimens more prognathous; maxilla reaching to anterior margin of orbit. Orbital diameter about a third of head depth at orbit level. Nostrils nearer to orbit than to postlabial skinfold.

Dorsal fin origin just posterior to vertical from posterior edge of operculum; spines increasing in length to about 10th, from where equal in length; fifth ray from last the longest, in males reaching to a third of caudal fin, occasionally to halfway, in females to caudal spot, in juveniles up to about 50 mm SL reaching to caudal fin base. Anal fin reaching to caudal fin base; fifth from last ray the longest. Caudal fin rounded, with 2-4 basal scales at lateral line level, diminishing to one dorsad and ventrad. Interradial scales to a fourth of caudal fin length. Pectoral fin rounded.

Upper jaw with maximum six teeth series, all teeth equal in length; lower jaw with maximum four teeth series, labial teeth series little larger; inner teeth equal in length; external teeth series fixed, internal series depressible.

Number of vertebrae in one specimen (ZMA 107.843): 19 + 16.

## COLOUR PATTERN IN ALCOHOL

*Male* (based on holotype): Brownish, dark on back, tan on belly, without conspicuous axial separating line; mouth and head grey; preventral area light, cheek tan, operculum grey.

Faint preorbital stripe; black postorbital stripe; chain of irregularly shaped black blotches along lateral lines, from operculum to caudal fin spot, from where a faint stripe runs to end of caudal fin. Short suborbital stripe, triangular. Pink dots, irregularly distributed on darker part of flanks, posteriorly more concentrated than just beyond operculum; dots smaller than flankscale-size.

Dorsal fin grey with pink dots, similar to those on flanks, in posterior part. Anal fin grey scattered with dots, becoming smaller caudad; dots ranked in lateral series showing horizontal lines. Ventral and pectoral fins lighter grey, immaculate. Caudal fin grey with dots like those on flanks; occasionally a small dark spot in end of faint horizontal band. Ocellated caudal spot dorsally on caudal fin base, encircled by about eight pink dots.

*Female* (based on 88 mm SL paratype, ZMA 107.844): Ground colouration of body and fins as in male; preorbital and postorbital stripe, the latter conspicuous, dorsally and ventrally margined by a white zone; humeral spot elongated horizontally, as long as eye, half as deep as long, situated on lateral line, ocellated by a light brown zone. Chain of blotches along lateral lines absent.

Dorsal fin somewhat lighter than in males; from edge of fin an alternating pattern of dark, white and dark spots between the rays. Black or white spot in dorsal fin (smaller than ocelli in *C. saxatilis*), from only one spot in the last spines up to occasionally on every interradial membrane along the dorsal margin of the fin. Occasionally no spots at all. Anal fin with dark margin; in last three rays six transversal lines, forming an alternating grey and white pattern. Ventral and pectoral fin pale white. Caudal fin dorsally with dark margin and white submargin, ventrally a dark margin only; three faint dark bars, dots absent. Round, black caudal spot, ocellated by a lighter ring, situated just above extending lateral line scales in caudal fin.

*Juvenile* (based on 48 mm SL paratype, ZMA 106.505). Dark lateral band running from tip of snout to caudal peduncle; lateral band becoming more vague with increasing age. Humeral spot round, smaller than eye; not ocellated, situated below lateral line, on lateral band. Dorsal fin greyish, with white margin and dark submargin; small white dots in posterior part of dorsal fin, arranged in series. Anal fin grey without dots. Ventral and pectoral fins much lighter than other fins. Caudal fin grey; dorsal part of caudal fin with margin and dark submargin; three white blotches in a series caudad. Ocellated dark caudal spot.

## DISTRIBUTION

In Surinam *C. nickeriensis* is known from Nickerie, Kabalebo, Maratakka, and Corantijn River. Available material from Essequibo River, described by Eigenmann, 1912, does not include this species, which suggests *C. nickeriensis* is restricted to the above four river systems.

## REMARKS

*Crenicichla nickeriensis* can be distinguished from *C. alta* by the head width (HW, fig. 6d); from *C. labrina* by the head length (HL, fig. 6e), and the number of gillrakers (GR, fig. 6f); from *C. saxatilis* by the number of gillrakers (GR, fig. 6g) and by the angle of the snout (ASN, fig. 6h); from *C. sipaliwini* by the caudal fin length (CFL, fig. 8a) and by the angle of the snout (ASN, fig. 8b). *Crenicichla nickeriensis* can be distinguished from all discussed species by the chain of blotches along the lateral lines in adult males.

The dots on the abdomen in adult males are not as conspicuous as in *C. saxatilis*. In *C. saxatilis* these dots are very bright silvery, in *C. nickeriensis* pale pink.

Although many specimens in the RMNH and ZMA collections exceed 180 mm SL, none of the females exceeds 100 mm SL, which suggests that the females remain smaller than the males. The females show a flattened humeral spot, which is remarkable; normally the spot is more or less round (e.g. in *C. alta* and *C. coppenamensis*). Small juveniles of *C. nickeriensis* are not distinguishable from juveniles of *C. saxatilis* and *C. coppenamensis*.

### **Crenicichla saxatilis** (Linnaeus, 1758)
### (Figs. 3, 5, 6, 8, 9, 10; Tabs. IV and VIII)

*Sparus saxatilis* Linnaeus, 1758: 278 (original description; Surinam).

*Perca saxatilis*; Bloch 1792: 79, fig. 309 (description; Surinam).

*Crenicichla saxatilis*; Heckel, 1840: 432 (Surinam); Regan 1905: 159 (Surinam); Steindachner, 1915: 571-573 (description; Marowijne River); Wheeler 1958: 226 (description; photograph of holotype of *Scarus pavoninus* Gronovius, 1854); Richter & Nijssen, 1980: 125 (Surinam, Brokopondo Reservoir); Nijssen, 1967: 246 (Surinam); Kullander, 1982: 655 (discussion on types); Ploeg, 1986a: 47 [description; designation of lectotype and restriction of the type locality (Suriname River, Carolina Creek)] and 1986c: 222 (Marowijne River system).

*Scarus pavoninus* Gronovius, 1854: 63 (Surinam).

*Crenicichla saxatilis albopunctata* Pellegrin, 1904: 374 (in part; Surinam).

*Crenicichla alta*; (not Eigenmann, 1912) Nijssen, 1966: 175 (Brokopondo Reservoir); Nijssen, 1967: 236 (Suriname River system).

## MATERIAL EXAMINED

*Lectotype:* NRM 5583; paralectotypes: NRM 5585 and BMNH 53.11.12: 23; 629 specimens from the Suriname, Commewijne, and Marowijne River systems (Ploeg, 1986a: 49 and 1986c: 222).

*Additional material:* BMNH 1981.6.9: 1211-1215, Nickerie River, Camp MacClemen, no date, R. P. Vari *et al.*; BMNH 1981.6.9: 1209-1210, Nickerie River, Koekwie Creek, no date, R. P. Vari *et al.*

## DISTRIBUTION

In Surinam *Crenicichla saxatilis* is present in the Nickerie, Suriname and Commewijne River

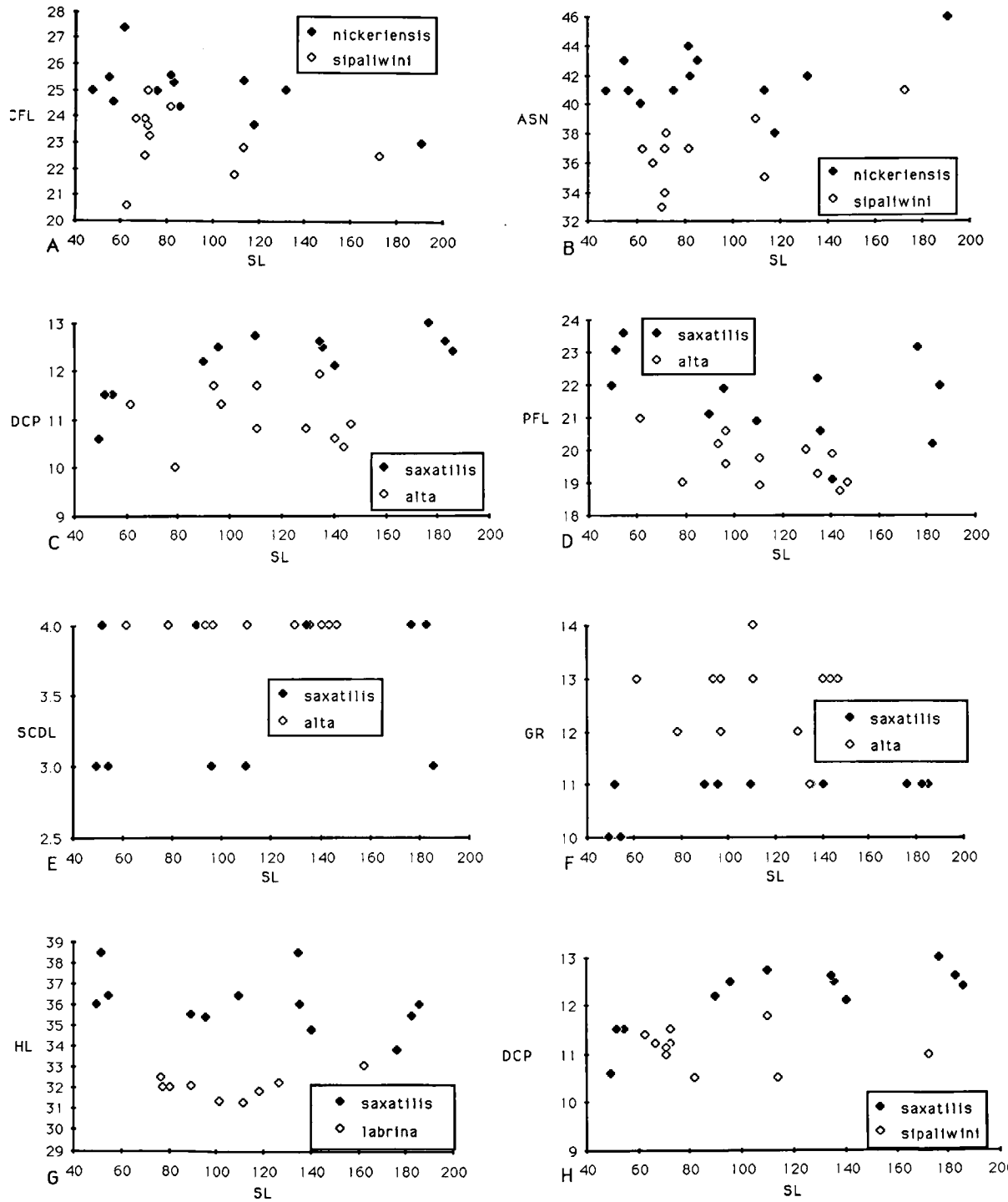


Fig. 8a-h. Relation between standard length (SL) and other characters for comparison of *C. nickeriensis* with *C. sipaliwini* and of *C. saxatilis* with *C. alta*, *C. labrina* and *C. sipaliwini*; see also 'methods'.

Table IV. Morphometric and meristic data for twelve specimens of *Crenicichla saxatilis* (Linnaeus, 1758). Abbreviations are listed in table VIII.

CRENICICHLA SAXATILIS (LINNAEUS, 1758)

| SL | CFL | HL | HD | HW | DCP | LCP | SN | UJL | LJL | LLDS | LLAS | VFL | PFL | PN | PN2 | ORB | WI | L1 | L2 | L1/L2 | L2C | LL | SCDL | DSP | DSR | GR | ASR | P | ASN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MILLIMETERS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 186 | 47 | 67 | 39 | 26 | 23 | 22 | 16 | 24 | 33 | 22 | 16 | 32 | 41 | 6,5 | 9,1 | 11 | 19 | 22 | 11 | 2 | 2 | 59 | 3 | 17 | 15 | 11 | 9 | 17 | 34 |
| 183 | 44 | 65 | 42 | 27 | 23 | 23 | 16 | 24 | 31 | 19 | 16 | 30 | 37 | 7,3 | 9,0 | 11 | 21 | 22 | 11 | 2 | 2 | 55 | 4 | 19 | 15 | 11 | 9 | 16 | 37 |
| 177 | 46 | 60 | 39 | 27 | 23 | 23 | 14 | 22 | 29 | 20 | 14 | 30 | 41 | 6,6 | 8,5 | 11 | 19 | 22 | 10 | 3 | 2 | 59 | 4 | 18 | 15 | 11 | 10 | 16 | 37 |
| 141 | 31 | 49 | 29 | 19 | 17 | 17 | 12 | 16 | 23 | 16 | 11 | 24 | 27 | 4,8 | 6,0 | 9,1 | 12 | 24 | 10 | 3 | 2 | 64 | 4 | 18 | 16 | 11 | 10 | 15 | 30 |
| 136 | 33 | 49 | 29 | 19 | 17 | 17 | 11 | 17 | 24 | 14 | 11 | 25 | 28 | 4,7 | 6,3 | 9,4 | 13 | 22 | 10 | 3 | 2 | 53 | 4 | 18 | 15 | 11 | 9 | 16 | 39 |
| 135 | 33 | 52 | 31 | 21 | 17 | 15 | 11 | 16 | 22 | 14 | 9,3 | 26 | 30 | 5,3 | 6,3 | 9,1 | 13 | 22 | 9 | 3 | 2 | 57 | 4 | 18 | 14 | 11 | 9 | 17 | 38 |
| 110 | 25 | 40 | 24 | 15 | 14 | 14 | 8,5 | 13 | 17 | 12 | 8,0 | 18 | 23 | 4,0 | 4,3 | 8,5 | 9,2 | 24 | 9 | 3 | 3 | 62 | 3 | 18 | 15 | 11 | 10 | 16 | 40 |
| 96 | 24 | 34 | 21 | 12 | 12 | 12 | 7,5 | 11 | 15 | 11 | 7,8 | 16 | 21 | 3,4 | 3,8 | 7,6 | 8,1 | 23 | 10 | 2 | 2 | 55 | 3 | 19 | 13 | 11 | 9 | 16 | 37 |
| 90 | 22 | 32 | 18 | 11 | 11 | 11 | 6,8 | 11 | 16 | 10 | 7,4 | 16 | 19 | 3,3 | 3,8 | 6,8 | 7,2 | 23 | 10 | 3 | 2 | 57 | 4 | 18 | 14 | 11 | 10 | 17 | 34 |
| 55 | 13 | 20 | 10 | 7,9 | 6,3 | 6,2 | 3,7 | 6,0 | 8,9 | 5,8 | 5,3 | 9,6 | 13 | 1,9 | 2,3 | 6,3 | 4,3 | 23 | 10 | 2 | 2 | 58 | 3 | 18 | 15 | 10 | 10 | 17 | 35 |
| 52 | 14 | 20 | 11 | 7,4 | 6 | 6,0 | 3,7 | 5,8 | 8,6 | 5,8 | 5,3 | 10 | 12 | 1,8 | 2,0 | 5,1 | 4,0 | 23 | 10 | 2 | 2 | 55 | 4 | 18 | 14 | 11 | 10 | 16 | 39 |
| 50 | 12 | 18 | 9,2 | 6,4 | 5,3 | 5,2 | 3,0 | 5,1 | 7,9 | 4,8 | 4,0 | 8,3 | 11 | 1,4 | 1,4 | 3,8 | 3,9 | 24 | 11 | 2 | 2 | 60 | 3 | 19 | 14 | 10 | 10 | 17 | 40 |
| PERCENTAGES | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 25,3 | 36,0 | 21,0 | 14,0 | 12,4 | 11,8 | 8,6 | 12,9 | 17,7 | 11,8 | 8,6 | 17,2 | 22,0 | 3,5 | 4,9 | 5,9 | 10,2 | MEAN | 22,8 | 10,1 | 2,3 | 2,1 | 57,8 | 3,6 | 18,2 | 14,6 | 10,8 | 9,6 | 16,3 | 36,7 |
| | 24,0 | 35,5 | 23,0 | 14,8 | 12,6 | 12,6 | 8,7 | 13,1 | 16,9 | 10,4 | 8,7 | 16,4 | 20,2 | 4,0 | 4,9 | 6,0 | 11,5 | SD | 0,83 | 0,67 | 0,52 | 0,29 | 3,19 | 0,51 | 0,58 | 0,79 | 0,39 | 0,51 | 0,65 | 2,96 |
| | 26,0 | 33,9 | 22,0 | 15,3 | 13,0 | 13,0 | 7,9 | 12,4 | 16,4 | 11,3 | 7,9 | 16,9 | 23,2 | 3,7 | 4,8 | 6,2 | 10,7 | | | | | | | | | | | | | |
| | 22,0 | 34,8 | 20,6 | 13,5 | 12,1 | 12,1 | 8,5 | 11,3 | 16,3 | 11,3 | 7,8 | 17,0 | 19,1 | 3,4 | 4,3 | 6,5 | 8,5 | | | | | | | | | | | | | |
| | 24,3 | 36,0 | 21,3 | 14,0 | 12,5 | 12,5 | 8,1 | 12,5 | 17,6 | 10,3 | 8,1 | 18,4 | 20,6 | 3,5 | 4,6 | 6,9 | 9,6 | | | | | | | | | | | | | |
| | 24,4 | 38,5 | 23,0 | 15,6 | 12,6 | 11,1 | 8,1 | 11,9 | 16,3 | 10,4 | 6,9 | 19,3 | 22,2 | 3,9 | 4,7 | 6,7 | 9,6 | | | | | | | | | | | | | |
| | 22,7 | 36,4 | 21,8 | 13,6 | 12,7 | 12,7 | 7,7 | 11,8 | 15,5 | 10,9 | 7,3 | 16,4 | 20,9 | 3,6 | 3,9 | 7,7 | 8,4 | | | | | | | | | | | | | |
| | 25,0 | 35,4 | 21,9 | 12,5 | 12,5 | 12,5 | 7,8 | 11,5 | 15,6 | 11,5 | 8,1 | 16,7 | 21,9 | 3,5 | 4,0 | 7,9 | 8,4 | | | | | | | | | | | | | |
| | 24,4 | 35,6 | 20,0 | 12,2 | 12,2 | 12,2 | 7,6 | 12,2 | 17,8 | 11,1 | 8,2 | 17,8 | 21,1 | 3,7 | 4,2 | 7,6 | 8,0 | | | | | | | | | | | | | |
| | 23,6 | 36,4 | 18,2 | 14,4 | 11,5 | 11,3 | 6,7 | 10,9 | 16,2 | 10,5 | 9,6 | 17,5 | 23,6 | 3,5 | 4,2 | 11,5 | 7,8 | | | | | | | | | | | | | |
| | 26,9 | 38,5 | 21,2 | 14,2 | 11,5 | 11,5 | 7,1 | 11,2 | 16,5 | 11,2 | 10,2 | 19,2 | 23,1 | 3,5 | 3,8 | 9,8 | 7,7 | | | | | | | | | | | | | |
| | 24,0 | 36,0 | 18,4 | 12,8 | 10,6 | 10,4 | 6,0 | 10,2 | 15,8 | 9,6 | 8,0 | 16,6 | 22,0 | 2,8 | 2,8 | 7,6 | 7,8 | | | | | | | | | | | | | |
| MEAN | 24,4 | 36,1 | 21,0 | 13,9 | 12,2 | 12,0 | 7,7 | 11,8 | 16,6 | 10,9 | 8,3 | 17,4 | 21,7 | 3,5 | 4,3 | 7,5 | 9,0 | | | | | | | | | | | | | |
| SD | 1,33 | 1,33 | 1,54 | 1,04 | 0,67 | 0,77 | 0,81 | 0,86 | 0,81 | 0,63 | 0,38 | 1,02 | 1,32 | 0,30 | 0,60 | 1,64 | 1,27 | | | | | | | | | | | | | |

1/12-ZMA 106.502, Surinam, Suriname River, Carolina Creek, to Para River, 14-XII-1966, Coll. H. Nijssen. of Pará, 30-XI-1964, Coll. S.M. Leopold III & J. -P. Gosse.

systems, and in the Marrowijne River system downstreams of Tabbetje Hede. Outside Surinam the species is present in French Guiana and possibly in Guyana.

## REMARKS

A detailed description of *Crenicichla saxatilis* is presented by Ploeg (1986a: 50). For comparison morphometric and meristic data are presented in tables IV and VIII).

*Crenicichla saxatilis* differs from *C. alta* by the depth of the caudal peduncle (DCP, fig. 8c), the pectoral fin length (PFL, fig. 8d), the number of scales between the upper lateral line and the dorsal fin (SCDL, fig. 8e), and by the number of gillrakers (GR, fig. 8f); from *C. labrina* by the head length (HL, fig. 8g); and from *C. sipaliwini* by the depth of the caudal peduncle (DCP, fig. 8h), the number of scales below the lateral lines (LL, fig. 10a), and by the number of scales between the upper lateral line and the dorsal fin (SCDL, fig. 10b), the number of dorsal spines (DSP, fig. 10c), and by the number of pectoral fin rays (P, fig. 10d).

Wheeler (1958: 226) redescribed and figured (pl. 30, fig. 2) the holotype of *Scarus pavoninus* Gronovius, 1854; the caption presents this specimen as the holotype of *Crenicichla saxatilis*. Because Linnaeus' description was based on this specimen and on two specimens present in

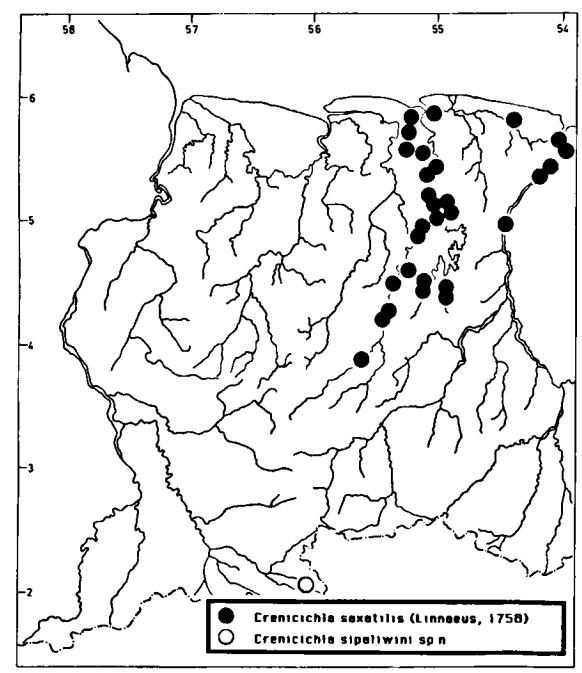


Fig. 9. Distribution of *C. saxatilis* (Linnaeus, 1758) and *C. sipaliwini* n. sp. in Surinam.

his own collection, the Gronovius-specimen is one of the three syntypes of *C. saxatilis*. Wheeler states that, according to Lönnberg, the Linnaean specimen was not among those still preserved in the University of Upsala, and therefore presumably no longer in existence. However, according to Fernholm & Wheeler (1983: 254-255), the Linnaean material is preserved in the collection of the NRM. The material consists of two specimens: NRM 5583 and 5585. A photograph of the first of these two is presented by Ploeg (1986a), who designated this specimen as lectotype of *Crenicichla saxatilis*. The second specimen may represent the specimen figured by Linnaeus (1754: 65, fig. 1).

Very conspicuous in *Crenicichla saxatilis* is the dorsoanterior notch in the humeral spot. Occasionally a second notch is present dorsally. *C. saxatilis* never shows a circular spot as present in *C. alta*. The position of the humeral spot is variable. In larger upstream specimens the spot is situated on the lateral line; in upstream juveniles and most downstream specimens it is situated below the lateral line; in very young specimens it is situated well below the lateral line and on the lateral band.

**Crenicichla sipaliwini** sp. n.
(Figs. 3, 6, 8, 9, and 10; Pl. II upper; Tabs. V and VIII)

## MATERIAL EXAMINED

All from Corantijn River system, Sipaliwini River near Sipaliwini airstrip.

*Holotype:* RMNH 30561, 110 mm SL, probably female, 6-II-1966, G. F. Mees.

*Paratypes:* All from same locality: RMNH 28956 (22), 6-II-1966, G. F. Mees; RMNH 28957/ZMA 116.683 (nine), 23-I-1966, G. F. Mees; RMNH 28958 (five), 9-II-1966, G. F. Mees; RMNH 28959 (one), 6-II-1966, G. F. Mees; ZMA 107.846 (eight), 23/26-I-1966, G. F. Mees.

## DESCRIPTION

Based on holotype (morphometric and meristic data are presented in tables V and VIII).

Predorsal contour straight; preventral contour straight. Snout pointed in lateral aspect, rounded from above. Maxilla not reaching to orbit, or to anterior margin of orbit. Orbit

Table V. Morphometric and meristic data for twelve specimens of *Crenicichla sipaliwini* n. sp. Abbreviations are listed in table VIII.

CRENICICHLA SIPALIWINI SP.N.

| SL | CFL | HL | HD | HW | DCP | LCP | SN | UJL | LJL | LLDS | LLAS | VFL | PFL | PN | PN2 | ORB | WI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MILLIMETERS | | | | | | | | | | | | | | | | | |
| 110 | 24 | 42 | 24 | 19 | 13 | 12 | 8,5 | 12 | 16 | 13 | 9,0 | 20 | 23 | 3,7 | 4,3 | 8,3 | 10 |
| 173 | 39 | 64 | 34 | 24 | 19 | 19 | 15 | 24 | 33 | 16 | 11 | 29 | 33 | 6,2 | 8,8 | 10 | 16 |
| 114 | 26 | 44 | 23 | 16 | 12 | 12 | 8,0 | 14 | 22 | 11 | 8,0 | 18 | 22 | 3,9 | 4,5 | 7,7 | 10 |
| 82 | 20 | 32 | 15 | 12 | 8,6 | 9,0 | 6,2 | 9,6 | 15 | 10 | | 15 | 18 | 2,5 | 3,5 | 6,9 | 6,0 |
| 73 | 17 | 26 | 12 | 9,6 | 8,2 | 8,1 | 4,5 | 6,7 | 10 | 8,6 | 6,5 | 12 | 14 | 2,3 | 2,5 | 6,2 | 5,4 |
| 73 | 17 | 27 | 13 | 10 | 8,4 | 8,8 | 5,3 | 7,6 | 12 | 7,6 | 6,3 | 12 | 15 | 2,1 | 2,6 | 6,0 | 5,3 |
| 72 | 17 | 25 | 12 | 9,8 | 7,9 | 8,1 | 4,9 | 6,4 | 11 | 8,4 | 7,4 | 13 | 15 | 2,1 | 2,4 | 5,9 | 5,2 |
| 72 | 18 | 26 | 12 | 10 | 8,0 | 8,3 | 5,0 | 7,0 | 12 | 7,0 | 7,0 | 12 | 14 | 2,3 | 2,9 | 6,8 | 5,9 |
| 71 | 17 | 25 | 12 | 9,7 | 7,9 | 8,0 | 5,1 | 6,5 | 11 | 8,7 | 7,1 | 12 | 14 | 2,1 | 2,4 | 5,5 | 5,2 |
| 71 | 16 | 24 | 12 | 8,9 | 7,8 | 7,7 | 5,0 | 6,3 | 11 | 8,6 | 6,6 | 13 | 15 | 2,1 | 2,3 | 5,5 | 5,0 |
| 67 | 16 | 25 | 11 | 8,6 | 7,5 | 7,5 | 4,6 | 5,8 | 10 | 7,4 | 6,8 | 11 | 14 | 2,1 | 2,3 | 5,6 | 5,0 |
| 63 | 13 | 22 | 11 | 8,6 | 7,2 | 7,7 | 3,8 | 5,9 | 9,4 | 7,4 | 6,7 | 11 | 13 | 1,8 | 2,0 | 5,1 | 4,8 |
| | PERCENTAGES | | | | | | | | | | | | | | | | |
| | 21,8 | 38,2 | 21,8 | 17,3 | 11,8 | 10,9 | 7,7 | 10,9 | 14,5 | 11,8 | 8,2 | 18,2 | 20,9 | 3,4 | 3,9 | 7,5 | 9,1 |
| | 22,5 | 37,0 | 19,7 | 13,9 | 11,0 | 11,0 | 8,7 | 13,9 | 19,1 | 9,2 | 6,4 | 16,8 | 19,1 | 3,6 | 5,1 | 5,8 | 9,2 |
| | 22,8 | 38,6 | 20,2 | 14,0 | 10,5 | 10,5 | 7,0 | 12,3 | 19,3 | 9,6 | 7,0 | 15,8 | 19,3 | 3,4 | 3,9 | 6,8 | 8,8 |
| | 24,4 | 39,0 | 18,3 | 14,6 | 10,5 | 11,0 | 7,6 | 11,7 | 18,3 | 12,2 | | 18,3 | 22,0 | 3,0 | 4,3 | 8,4 | 7,3 |
| | 23,3 | 35,6 | 16,4 | 13,2 | 11,2 | 11,1 | 6,2 | 9,2 | 13,7 | 11,8 | 8,9 | 16,4 | 19,2 | 3,2 | 3,4 | 8,5 | 7,4 |
| | 23,3 | 37,0 | 17,8 | 13,7 | 11,5 | 12,1 | 7,3 | 10,4 | 16,4 | 10,4 | 8,6 | 16,4 | 20,5 | 2,9 | 3,6 | 8,2 | 7,3 |
| | 23,6 | 34,7 | 16,7 | 13,6 | 11,0 | 11,3 | 6,8 | 8,9 | 15,3 | 11,7 | 10,3 | 18,1 | 20,8 | 2,9 | 3,3 | 8,2 | 7,2 |
| | 25,0 | 36,1 | 16,7 | 13,9 | 11,1 | 11,5 | 6,9 | 9,7 | 16,7 | 9,7 | 9,7 | 16,7 | 19,4 | 3,2 | 4,0 | 9,4 | 8,2 |
| | 23,9 | 35,2 | 16,9 | 13,7 | 11,1 | 11,3 | 7,2 | 9,2 | 15,5 | 12,3 | 10,0 | 16,9 | 19,7 | 3,0 | 3,4 | 7,7 | 7,3 |
| | 22,5 | 33,8 | 16,9 | 12,5 | 11,0 | 10,8 | 7,0 | 8,9 | 15,5 | 12,1 | 9,3 | 16,3 | 21,1 | 3,0 | 3,2 | 7,7 | 7,0 |
| | 23,9 | 37,3 | 16,4 | 12,8 | 11,2 | 11,2 | 6,9 | 8,7 | 14,9 | 11,0 | 10,1 | 16,4 | 20,9 | 3,1 | 3,4 | 8,4 | 7,5 |
| | 20,6 | 34,9 | 17,5 | 13,7 | 11,4 | 12,2 | 6,0 | 9,4 | 14,9 | 11,7 | 10,6 | 17,5 | 20,6 | 2,9 | 3,2 | 8,1 | 7,6 |
| MEAN | 23,1 | 36,5 | 17,9 | 13,9 | 11,1 | 11,2 | 7,1 | 10,3 | 16,2 | 11,1 | 9,0 | 17,1 | 20,3 | 3,1 | 3,7 | 7,9 | 7,8 |
| SD | 1,18 | 1,66 | 1,74 | 1,20 | 0,38 | 0,49 | 0,69 | 1,64 | 1,82 | 1,09 | 1,38 | 0,88 | 0,93 | 0,23 | 0,55 | 0,93 | 0,79 |

| L1 | L2 | L1/L2 | L2C | LL | SCDL | DSP | DSR | GR | ASR | P | ASN |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 25 | 10 | 3 | 2 | 66 | 5 | 18 | 15 | 12 | 10 | 16 | 39 |
| 25 | 10 | 2 | 2 | 68 | 5 | 20 | 15 | 12 | 9 | 16 | 41 |
| 23 | 11 | 3 | 2 | 67 | 5 | 19 | 14 | 12 | 10 | 15 | 35 |
| 24 | 11 | 3 | 3 | 67 | 5 | 19 | 14 | 11 | 10 | 16 | 37 |
| 23 | 11 | 3 | 2 | 65 | 4 | 20 | 12 | 11 | 9 | 16 | 38 |
| 21 | 11 | 3 | 3 | 68 | 4 | 20 | 13 | 11 | 10 | 16 | 34 |
| 22 | 12 | 3 | 2 | 66 | 4 | 20 | 14 | 11 | 9 | 16 | 34 |
| 23 | 11 | 3 | 3 | 65 | 4 | 19 | 13 | 11 | 10 | 16 | 37 |
| 21 | 11 | 3 | 2 | 65 | 4 | 19 | 13 | 11 | 9 | 16 | 33 |
| 22 | 11 | 3 | 2 | 67 | 4 | 19 | 13 | 10 | 9 | 16 | 33 |
| 21 | 12 | 3 | 2 | 65 | 4 | 19 | 12 | 11 | 9 | 16 | 36 |
| 23 | 10 | 3 | 2 | 68 | 4 | 19 | 13 | 11 | 10 | 16 | 37 |
| MEAN 22,8 | 10,9 | 2,9 | 2,3 | 66,4 | 4,3 | 19,3 | 13,4 | 11,2 | 9,5 | 15,9 | 36,2 |
| SD 1,42 | 0,67 | 0,29 | 0,45 | 1,24 | 0,49 | 0,62 | 1,00 | 0,58 | 0,52 | 0,29 | 2,48 |

1-RMNH 30561, HOLOTYPE, Surinam, Corantijne River system, Sipaliwini River near Sipaliwini airstrip, 6-II-1966, Mees.
2/12-ZMA 116.683/107.846, PARATYPES, Surinam, Corantijne River system, Sipaliwini River near Sipaliwini airstrip, 23/26-I-1966, Mees.

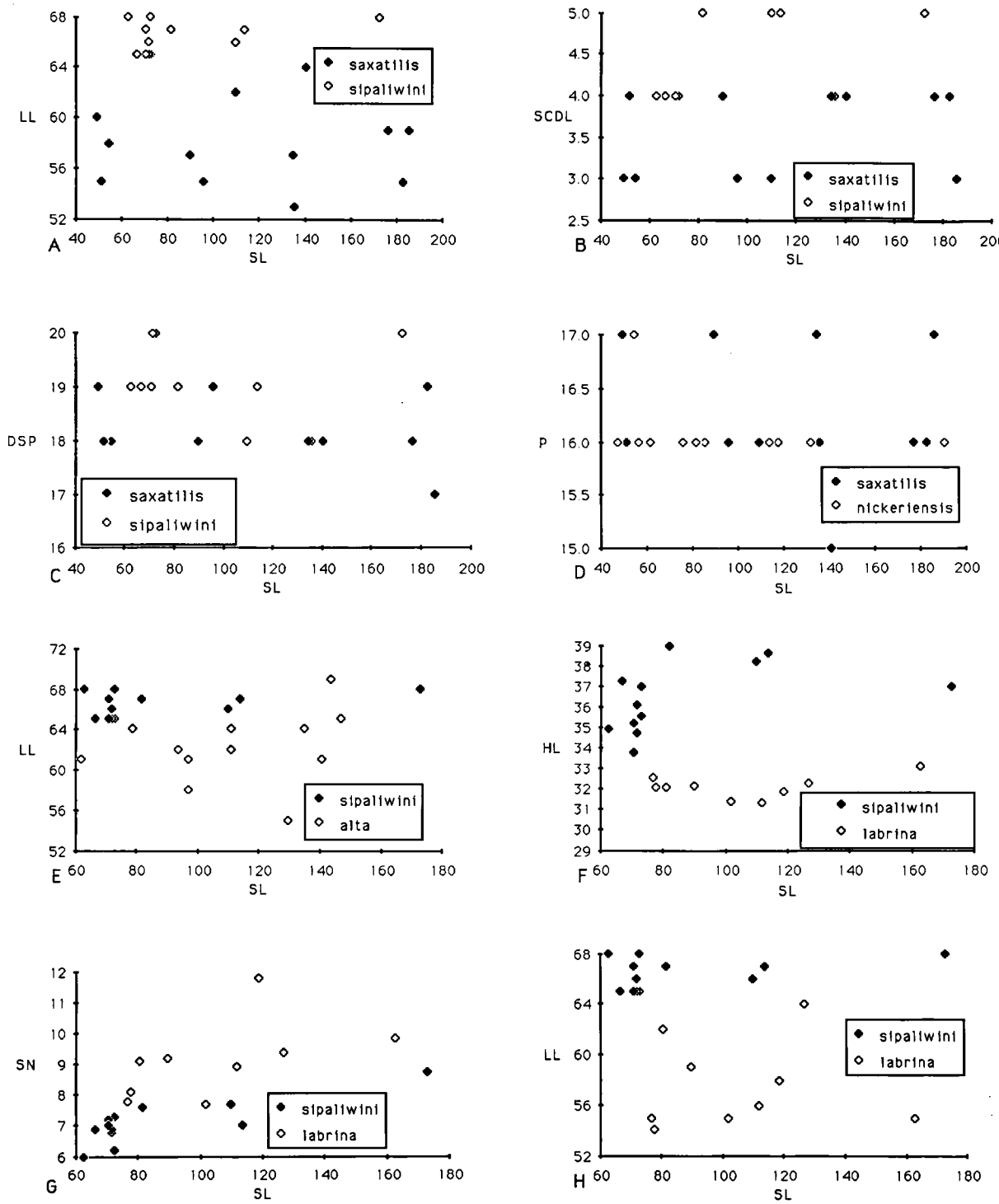


Fig. 10a-h. Relation between standard length (SL) and other characters for comparison of *C. saxatilis* with *C. sipaliwini* and of *C. sipaliwini* with *C. alta*, and *C. labrina*; see also 'methods'.

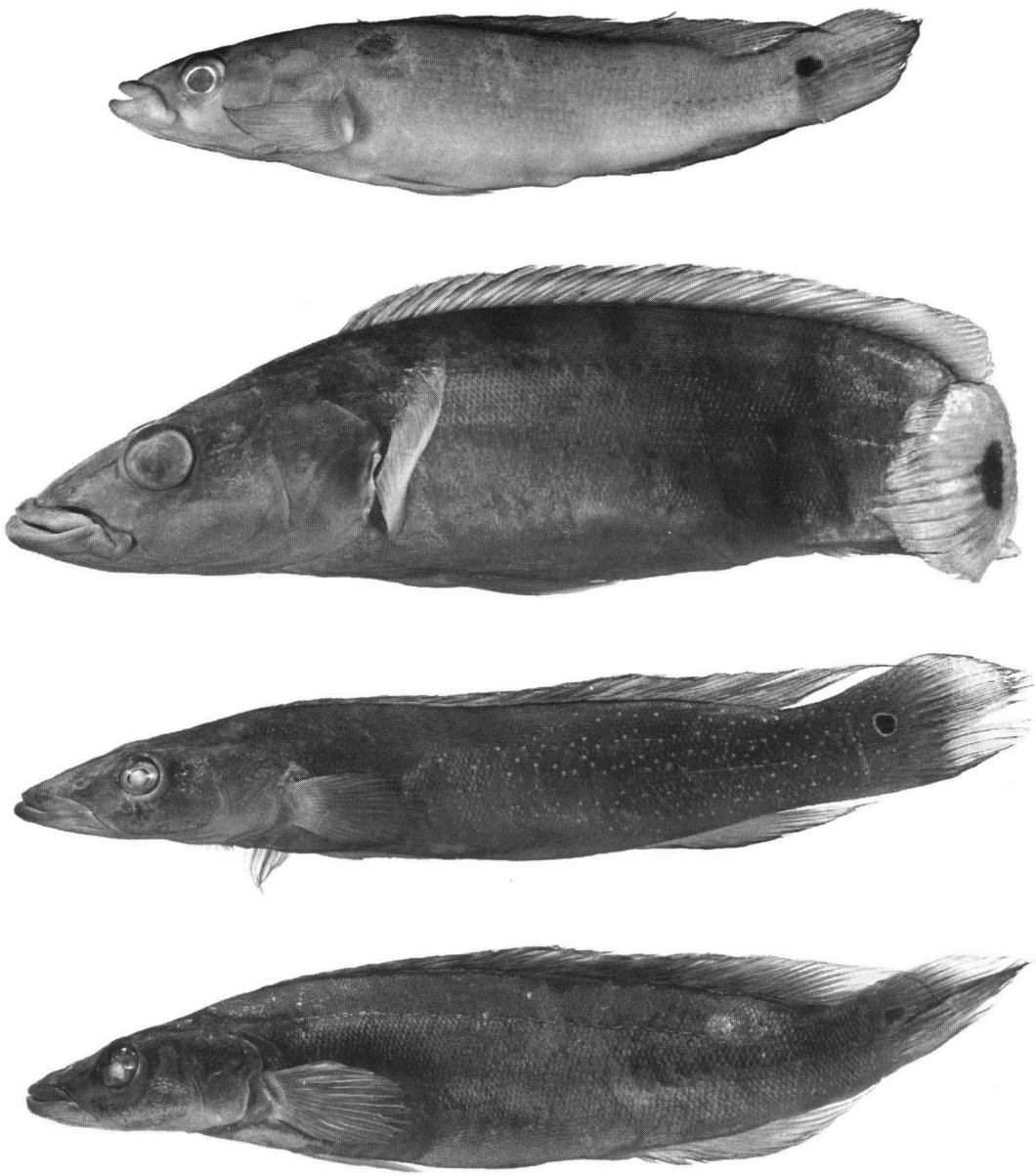

Plate II. Upper: Holotype of *Crenicichla sipaliwini* n. sp., RMNH 30561, 110 mm SL. Second: *C. lugubris* Heckel, 1840, ZMA 119.147, 204 mm SL. Third: Male of *C. multispinosa* Pellegrin, 1903, ZMA 119.148, 205 mm SL. Lower: Female of *C. multispinosa* Pellegrin, 1903, ZMA 119.148, 197 mm SL. Photographs L. A. van der Laan.

about one-third as deep as head at orbit level. Scales on cheek remarkably smaller than on operculum. Nostrils nearer to orbit than to postlabial skinfold.

Dorsal fin origin just anterior to hind edge of operculum; spines increasing in length to about ninth, from where equal in length; sixth ray from last the longest, reaching to a third of caudal fin, occasionally to end of fin in adults, to caudal fin base in juveniles. Anal fin extending to caudal fin base with fifth ray from last the longest. Ventral fin with first soft ray the

longest. Caudal fin rounded with three basal scales at lateral line level, diminishing to one dorsally and ventrally. Interradial scales to a fourth of caudal fin length. Pectoral fin rounded.

Upper jaw with maximum four teeth series, all teeth equal in length; lower jaw with maximum four teeth series, outer series with little larger teeth.

No radiographs available.

## COLOUR PATTERN IN ALCOHOL

Because of lack of conspicuous sexual dimorphism male and female are not described separately. Juveniles only differ in the position and size of the humeral spot and are therefore not treated separately.

Description based mainly on holotype. Yellow-grey on belly, dorsally more grey-yellow; dorsal part of head dark grey, sides of head greyish, ventral part yellowish-grey; preventral area and cheek yellowish.

In conspicuous black preorbital and postorbital stripes, suborbital stripe absent. Vague lateral band, running between lateral line scale series (in larger specimens such as holotype absent). Black humeral spot, occasionally with dorsoanterior notch. Humeral spot in adults with its center on lateral line, in juveniles below lateral line, in the latter relatively larger.

Dorsal fin grey. However, often without (as in holotype) a black margin. Holotype with one black ocellus between first two soft dorsal rays. Vague dots in posterior part of fin, arranged in rows from base of rays to more caudal distal margins. Anal fin grey with dots arranged as in dorsal fin. Caudal fin grey with series of same kind of dots as in dorsal fin, arranged in light bars. Black, ocellated caudal spot dorsally on caudal fin, just posterior to basal scales. Small dark spot at the centre of caudal fin end. Pectoral fin hyaline, ventral fin white.

## DISTRIBUTION

*Crenicichla sipaliwini* is known only from the Sipaliwini River, Corantijn River sytem.

## REMARKS

*Crenicichla sipaliwini* is distinct from *C. alta* by the number of scales below the lateral lines (LL, fig. 10e); from *C. labrina* by the head length (HL, fig. 10f), the snout length (SN, fig. 10g), and by the number of scales below the lateral lines (LL, fig. 10h).

The relative position of the humeral spot, as in *C. coppenamensis*, shows ontogenetic variation: adults have the centre of the spot on the lateral line (above the lateral band); in smaller specimens the centre of the spot is entirely below the lateral line.

No conspicuous sexual dimorphism was detected in *Crenicichla sipaliwini*. The holotype shows an ocellus in the dorsal fin as present in females of for instance *C. saxatilis* and *C. albopunctata*. However, it also shows white dots in the dorsal and anal fins as in males of *C. saxatilis* and *C. albopunctata*. The last dorsal and anal fin rays are not extremely elongated as in *C. saxatilis* and *C. albopunctata*. This may indicate that either only females are at hand, or that sexual dimorphism is lacking. Because of the ocellus in the dorsal fin, I suppose the holotype is a female.

*Crenicichla sipaliwini* is more elongated than other Surinam *saxatilis*-like species. This may be due to the habitat: fast running water.

## **Crenicichla lugubris** Heckel, 1840
## (Figs. 2; Pl. II second; Tabs. VI and VIII)

*Crenicichla lugubris* Heckel, 1840: 422 (original description: Rio Negro); Eigenmann, 1912: 518 (Essequibo); Pellegrin, 1904: 383 (Orinoco, Tonantins, Iça, Guyana); Ploeg, 1986b: 72 (Tocantins River); Regan, 1905: 165 (River Capin, River Cupai, Essequibo River); Lowe-McConnell, 1969: 296 (Essequibo River, Demerara River, Upper Cuyuni River).

*Crenicichla adspersa* Heckel, 1840: 421 (original description; Mato Grosso).

*Crenicichla funebris* Heckel, 1840: 424 (original description; Rio Guaporé); Günther, 1862: 307 (River Capin, Guyana).

*Crenicichla johanna* var. *B. strigata* Günther, 1862: 306 (original description; River Capin, River Cupai); Lowe-McConnell, 1969: 296 (River Capin, Manari, Rupununi).

## MATERIAL EXAMINED

*Syntype:* NMW 61.148, 231 mm SL from Brazil, Rio Negro.

SURINAM, *Corantijn River system:* USNM 226029 (one), Matapi creek, about 1 km from intersection with Corantijn River (05°00'N, 57°16'W), 9-IX-1980, R. P. Vari; USNM 226030 (one), Creek about 2 km N. of Matapi (05°03'N, 57°17'W), 9-IX-1980, R. P. Vari; USNM 226031 (one), stream entering Corantijn River at approximately km 385, slightly N. of Tiger Falls (04°00'N 58°02'W), 17-IX-1980, R. P. Vari *et al.*; USNM 226032 (one), Matappi creek (05°01'N, 57°17.5'W), 17-V-1980, H. M. Madari; USNM 226033 (three), small creek close to Mataway (04°58.5'N, 57°42'W), 18-III-1980, R. P. Vari *et al.*; ZMA 119.147 (one)/RMNH 31173 (one), Kabalebo River, Avanavero Fall, Zandvallen, 29-IX-1965, G. F. Mees.

## DESCRIPTION

Based principally on ZMA 119.147 (morphometric and meristic data are presented in tabs. VI and VIII).

Predorsal contour slightly convex; preventral contour anteriorly slightly convex, below orbit straight. Snout pointed in lateral aspect, rounded from above. Maxilla extending to anterior margin of orbit. Orbit large, diameter about half head depth at orbital level. Nostrils nearer to postlabial skinfold than to orbit.

Dorsal fin origin just dorsal to hind edge of operculum; spines increasing in length to fourth, from which equal in length; fifth from last ray longest and reaching to caudal fin base. Anal fin extending to caudal fin base; fourth ray from last longest. Ventral fin rounded; first soft ray the longest. Caudal fin straight, with up to six basal scale series.

Upper jaw with maximum eight teeth series, lower jaw with maximum five teeth series. In both jaws outer teeth the largest.

Number of vertebrae in one specimen (syntype: NMW 61.148): 22 + 18.

## COLOUR PATTERN IN ALCOHOL

Based on ZMA 119.147. No sexual dimorphism in colour pattern found. Ground colour of body brown, countershaded. No preorbital,

Table VI. Morphometric and meristic data for ten specimens of *Crenicichla lugubris* Heckel, 1840. Abbreviations are listed in table VIII.

CRENICICHLA LUGUBRIS HECKEL, 1840

| SL | CFL | HL | HD | HW | DCP | LCP | SN | UJL | LJL | LLDS | LLAS | VFL | PFL | PN | PN2 | ORB | WI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MILLIMETERS | | | | | | | | | | | | | | | | | |
| 193 | 37 | 64 | 38 | 28 | 22 | 24 | 17 | 19 | 27 | 19 | 16 | 31 | 35 | 9,7 | 6,5 | 10 | 19 |
| 202 | 36 | 66 | 43 | 29 | 23 | 27 | | 22 | 31 | 19 | | | | 9,8 | 7,5 | 11 | 20 |
| 189 | 37 | 59 | 42 | 27 | 21 | 24 | | 21 | 29 | 17 | | | | 9,1 | 6,3 | 10 | 17 |
| 161 | 33 | 50 | 30 | 23 | 17 | 19 | | 17 | 24 | 15 | | | | 7,1 | 6,1 | 9,5 | 14 |
| 143 | 27 | 44 | 29 | 19 | 15 | 19 | | 12 | 20 | 11 | | | | 5,8 | 4,1 | 8,4 | 12 |
| 194 | 36 | 64 | 40 | 27 | 23 | 22 | | 20 | 30 | | | | | | | 13 | 15 |
| 204 | 35 | 67 | 44 | 28 | 23 | 26 | 16 | 22 | 28 | 21 | 14 | 33 | 35 | 9,7 | 7,0 | 13 | 16 |
| 191 | 38 | 64 | 37 | 28 | 21 | 25 | 16 | 19 | 30 | 13 | | 31 | 34 | 8,9 | 6,7 | 11 | 17 |
| 217 | 35 | 75 | 41 | 32 | 23 | 30 | 18 | 24 | 31 | 19 | 16 | 36 | 38 | 11 | 7,4 | 13 | 20 |
| 231 | 40 | 74 | 49 | 32 | 27 | 28 | 20 | 26 | 35 | 23 | 18 | 38 | 41 | 12 | 7,4 | 12 | 21 |
| | PERCENTAGES | | | | | | | | | | | | | | | | |
| | 19,2 | 33,2 | 19,7 | 14,5 | 11,4 | 12,4 | 8,8 | 9,8 | 14,0 | 9,8 | 8,3 | 16,1 | 18,1 | 5,0 | 3,4 | 5,2 | 9,8 |
| | 17,8 | 32,7 | 21,3 | 14,4 | 11,4 | 13,4 | | 10,9 | 15,3 | 9,4 | | | | 4,9 | 3,7 | 5,4 | 9,9 |
| | 19,6 | 31,2 | 22,2 | 14,3 | 11,1 | 12,7 | | 11,1 | 15,3 | 9,0 | | | | 4,8 | 3,3 | 5,3 | 9,0 |
| | 20,5 | 31,1 | 18,6 | 14,3 | 10,6 | 11,8 | | 10,6 | 14,9 | 9,3 | | | | 4,4 | 3,8 | 5,9 | 8,7 |
| | 18,9 | 30,8 | 20,3 | 13,3 | 10,5 | 13,3 | | 8,4 | 14,0 | 7,7 | | | | 4,1 | 2,9 | 5,9 | 8,4 |
| | 18,6 | 33,0 | 20,6 | 13,9 | 11,9 | 11,3 | | 10,3 | 15,5 | | | | | | | 6,7 | 7,7 |
| | 17,2 | 32,8 | 21,6 | 13,7 | 11,3 | 12,7 | 7,8 | 10,8 | 13,7 | 10,3 | 6,9 | 16,2 | 17,2 | 4,8 | 3,4 | 6,4 | 7,8 |
| | 19,9 | 33,5 | 19,4 | 14,7 | 11,0 | 13,1 | 8,4 | 9,9 | 15,7 | 6,8 | | 16,2 | 17,8 | 4,7 | 3,5 | 5,8 | 8,9 |
| | 16,1 | 34,6 | 18,9 | 14,7 | 10,6 | 13,8 | 8,3 | 11,1 | 14,3 | 8,8 | 7,4 | 16,6 | 17,5 | 5,1 | 3,4 | 6,0 | 9,2 |
| | 17,3 | 32,0 | 21,2 | 13,9 | 11,7 | 12,1 | 8,7 | 11,3 | 15,2 | 10,0 | 7,8 | 16,5 | 17,7 | 5,2 | 3,2 | 5,2 | 9,1 |
| MEAN | 18,5 | 32,5 | 20,4 | 14,2 | 11,1 | 12,7 | 8,4 | 10,4 | 14,8 | 9,0 | 7,6 | 16,3 | 17,7 | 4,8 | 3,4 | 5,8 | 8,9 |
| SD | 1,37 | 1,20 | 1,21 | 0,46 | 0,48 | 0,76 | 0,37 | 0,89 | 0,72 | 1,13 | 0,61 | 0,21 | 0,24 | 0,35 | 0,27 | 0,51 | 0,73 |

| | L1 | L2 | L1/L2 | L2C | LL | SCDL | DSP | DSR | GR | ASR | P | ASN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 26 | 16 | 5 | 2 | 112 | 11 | 23 | 15 | 12 | 10 | 16 | 40 |
| | 26 | | 5 | 3 | 124 | | 22 | 15 | 13 | 11 | | |
| | 27 | 16 | 6 | 2 | 121 | | 23 | 15 | 13 | 11 | | |
| | 27 | 15 | 5 | 3 | 118 | | 23 | 15 | 13 | 11 | | |
| | 28 | 14 | 5 | 3 | 127 | | 24 | 14 | 13 | 10 | | |
| | 26 | 16 | 5 | 3 | 126 | | 23 | 14 | | 11 | | |
| | 25 | 17 | 6 | 2 | 123 | 11 | 22 | 15 | 14 | 10 | 17 | 36 |
| | 28 | 15 | 5 | 2 | 123 | 10 | 23 | 15 | 14 | 9 | 17 | 33 |
| | 30 | 15 | 5 | 2 | 130 | 8 | 24 | 14 | 14 | 10 | 17 | 39 |
| | 27 | 14 | 6 | 2 | 119 | 11 | 22 | 15 | 12 | 10 | 17 | 38 |
| MEAN | 27,0 | 15,3 | 5,3 | 2,4 | 122 | 10,2 | 22,9 | 14,7 | 13,1 | 10,3 | 16,8 | 37,2 |
| SD | 1,41 | 0,94 | 0,48 | 0,52 | 5,12 | 1,30 | 0,74 | 0,48 | 0,78 | 0,67 | 0,45 | 2,77 |

1-BMNH 1981.6.9:1208, Surinam, Nickerie River, 1980, Vari et al.
2-USNM 226030, Surinam, Corantijne River, Creek about 2 km North of Matapi (05.03'N, 57.17'W), 9-IX-1980, Vari et al.
3/6-USNM 226033, Surinam, Corantijne River, Small creek close to Mataway (05.01'N, 57.17'W), 18-III-1980, Vari et al.
7-RMNH Unreg., Surinam, Corantijne River, Kabalebo River, Avanavero Fall, Zandvallen, 29-IX-1965, Mees.
8-ZMA 119.147, Surinam, Corantijne River, Kabalebo River, Avanavero Fall, Zandvallen, 29-IX-1965, Mees.
9-USNM 226029, Surinam, Corantijne River, Matapi Creek, ca. 1 km from intersection with Corantijne River (05.00'N, 57.16'W), 9-IX-1980, Vari et al.
10-USNM 226031, Surinam, Corantijne River, Stream entering Corantijne River at approximately km 38, slightly North of Tiger Falls (04.00'N, 58.02'W), 17-IX-1980, Vari et al.

postorbital, or suborbital spot/stripe. Five bars between dorsal fin and upper lateral line. Dorsal, anal, ventral, and pectoral fins grey. Dorsal fin dark margined. Caudal fin with triangular black blotch just above middle of base. Humeral spot just posterior to pectoral fin.

## DISTRIBUTION

In Surinam *C. lugubris* is found in the Corantijn River system only. From Guyana it is recorded by Eigenmann (1912, Essequibo River system). The species is also present in the northern Amazonian branches in Brazil. Hitherto *C. lugubris* is not recorded from French Guiana.

## REMARKS

This is the first record of genuine *C. lugubris* from Surinam. Richter & Nijssen (1980: 125) erroneously recorded the species from the Suriname basin, based on a misidentification (now *C. multispinosa*).

### **Crenicichla multispinosa** Pellegrin, 1903 (Fig. 7; Pl. II third and lower; Tabs. VII and VIII)

*Crenicichla multispinosa* Pellegrin, 1903: 124 (original description; Guyane française); Pellegrin, 1904: 380 (in part, Surinam); Regan, 1905: 164 (description, bibliography; Surinam); Ploeg, 1986c: 230 [restriction of type locality (Marowijne River, S. of Gran Creek): Surinam, French Guiana].

*Crenicichla lugubris* (not Heckel, 1840), Richter & Nijssen, 1980: 124 (Suriname River).

## MATERIAL EXAMINED

*Lectotype*, designated by Ploeg (1986c: 230): MNHN 9542, 137 mm SL, French Guiana, Mélinon. *Paralectotypes:* MNHN 9542 (two), MNHN 9497 (three), French Guiana, Mélinon.

*Marowijne River system:* 124 specimens (see Ploeg, 1986c: 230).

*Suriname River system:* ZMA 106.504 (one), Awara Creek, right bank tributary to Suriname River, 1 km S. of Botopasi, 18-III-1967, H. Nijssen; RMNH 30560 (10), Awaradam, 17-VII-1965, G. F. Mees; ZMA 107.567 (five), Brokopondo Reservoir, 1 km E. of former Mamadam Rapid, 17/18-XII-1978, C. J. J. Richter; ZMA 105.529 (three), Gran MAu Creek, right bank tributary to Gran Rio, 1 km N.E. of Dombaai (= Bendi Watra), 13 km S.W. of Djoemoe, 30-I-1967, H. Nijssen; ZMA 105.705 (four), Jenjee Creek, right bank tributary to Suriname River, 7.5 km N. of

Table VII. Morphometric and meristic data for twelve specimens of *Crenicichla multispinosa* Pellegrin, 1903. Abbreviations are listed in table VIII.

CRENICICHLA MULTISPINOSA PELLEGRIN, 1903

| SL | CFL | HL | HD | HW | DCP | LCP | SN | UJL | LJL | LLDS | LLAS | VFL | PFL | PN | PN2 | ORB | WI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MILLIMETERS | | | | | | | | | | | | | | | | | |
| 216 | 47 | 70 | 36 | 29 | 27 | 30 | 20 | 23 | 31 | 22 | 15 | 29 | 33 | 9,9 | 11 | 12 | 22 |
| 212 | 41 | 70 | 33 | 31 | 24 | 28 | 19 | 23 | 32 | 19 | 15 | 31 | 32 | 8,8 | 9,6 | 11 | 20 |
| 201 | 45 | 61 | 31 | 25 | 23 | 25 | 16 | 19 | 28 | 17 | 13 | 28 | 31 | 7,9 | 8,0 | 11 | 18 |
| 180 | 41 | 60 | 31 | 23 | 21 | 23 | 15 | 18 | 26 | 17 | 13 | 27 | 29 | 6,7 | 7,8 | 10 | 17 |
| 161 | 34 | 53 | 23 | 20 | 16 | 22 | 13 | 16 | 23 | 15 | 11 | | 26 | 5,8 | 6,3 | 8,7 | 13 |
| 161 | 32 | 54 | 23 | 20 | 17 | 20 | 14 | 16 | 23 | 16 | 11 | 24 | 26 | 6,3 | 7,0 | 8,3 | 13 |
| 124 | 26 | 40 | 17 | 14 | 13 | 15 | 9,3 | 11 | 15 | 12 | 10 | 19 | 21 | 4,4 | 4,9 | 7,4 | 8,7 |
| 115 | 23 | 38 | 16 | 14 | 12 | 15 | 8,1 | 9,9 | 15 | 11 | 8,8 | 17 | 19 | 4,0 | 4,3 | 7,3 | 7,5 |
| 114 | 25 | 38 | 14 | 14 | 11 | 14 | 8,3 | 11 | 16 | 12 | 9,6 | 17 | 20 | 3,3 | 4,0 | 7,1 | 7,3 |
| 100 | 21 | 33 | 14 | 13 | 11 | 13 | 6,9 | 8,1 | 15 | 9,5 | 7,5 | 15 | 17 | 3,3 | 3,8 | 6,1 | 6,8 |
| 95 | 24 | 32 | 13 | 13 | 10 | 11 | 6,2 | 7,8 | 12 | 9,9 | 8,2 | 14 | 16 | 3,3 | 3,4 | 5,9 | 5,7 |
| 205 | 49 | 65 | 34 | 24 | 23 | 28 | 19 | 22 | 29 | 18 | | | 34 | 7,0 | 8,5 | 9,6 | 15 |
| | PERCENTAGES | | | | | | | | | | | | | | | | |
| | 21,8 | 32,4 | 16,7 | 13,4 | 12,5 | 13,9 | 9,3 | 10,6 | 14,4 | 10,2 | 6,9 | 13,4 | 15,3 | 4,6 | 5,1 | 5,6 | 10,2 |
| | 19,3 | 33,0 | 15,6 | 14,6 | 11,3 | 13,2 | 9,0 | 10,8 | 15,1 | 9,0 | 7,1 | 14,6 | 15,1 | 4,2 | 4,5 | 5,2 | 9,4 |
| | 22,4 | 30,3 | 15,4 | 12,4 | 11,4 | 12,4 | 8,0 | 9,5 | 13,9 | 8,5 | 6,5 | 13,9 | 15,4 | 3,9 | 4,0 | 5,5 | 9,0 |
| | 22,8 | 33,3 | 17,2 | 12,8 | 11,7 | 12,8 | 8,3 | 10,0 | 14,4 | 9,4 | 7,2 | 15,0 | 16,1 | 3,7 | 4,3 | 5,6 | 9,4 |
| | 21,1 | 32,9 | 14,3 | 12,4 | 9,9 | 13,7 | 8,1 | 9,9 | 14,3 | 9,3 | 6,8 | | 16,1 | 3,6 | 3,9 | 5,4 | 8,1 |
| | 19,9 | 33,5 | 14,3 | 12,4 | 10,6 | 12,4 | 8,7 | 9,9 | 14,3 | 9,9 | 6,8 | 14,9 | 16,1 | 3,9 | 4,3 | 5,2 | 8,1 |
| | 21,0 | 32,3 | 13,7 | 11,3 | 10,5 | 12,1 | 7,5 | 8,9 | 12,1 | 9,7 | 8,1 | 15,3 | 16,9 | 3,5 | 4,0 | 6,0 | 7,0 |
| | 20,0 | 33,0 | 13,9 | 12,2 | 10,4 | 13,0 | 7,0 | 8,6 | 13,0 | 9,6 | 7,7 | 14,8 | 16,5 | 3,5 | 3,7 | 6,3 | 6,5 |
| | 21,9 | 33,3 | 12,3 | 12,3 | 9,6 | 12,3 | 7,3 | 9,6 | 14,0 | 10,5 | 8,4 | 14,9 | 17,5 | 2,9 | 3,5 | 6,2 | 6,4 |
| | 21,0 | 33,0 | 14,0 | 13,0 | 11,0 | 13,0 | 6,9 | 8,1 | 15,0 | 9,5 | 7,5 | 15,0 | 17,0 | 3,3 | 3,8 | 6,1 | 6,8 |
| | 25,3 | 33,7 | 13,7 | 13,7 | 10,5 | 11,6 | 6,5 | 8,2 | 12,6 | 10,4 | 8,6 | 14,7 | 16,8 | 3,5 | 3,6 | 6,2 | 6,0 |
| | 23,9 | 31,7 | 16,6 | 11,7 | 11,2 | 13,7 | 9,3 | 10,7 | 14,1 | 8,8 | | | 16,6 | 3,4 | 4,1 | 4,7 | 7,3 |
| MEAN | 21,7 | 32,7 | 14,8 | 12,7 | 10,9 | 12,8 | 8,0 | 9,6 | 13,9 | 9,6 | 7,4 | 14,7 | 16,3 | 3,7 | 4,1 | 5,7 | 7,9 |
| SD | 1,47 | 0,80 | 1,27 | 0,77 | 0,68 | 0,70 | 0,94 | 0,96 | 0,91 | 0,64 | 0,70 | 0,56 | 0,75 | 0,44 | 0,45 | 0,52 | 1,39 |

| L1 | L2 | L1/L2 | L2C | LL | SCDL | DSP | DSR | GR | ASR | P | ASN |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 29 | 14 | 5 | 2 | 100 | 8 | 25 | 14 | 11 | 10 | 16 | 31 |
| 30 | 13 | 4 | 2 | 110 | 8 | 24 | 15 | 11 | 10 | 16 | 31 |
| 29 | 14 | 4 | 2 | 105 | 10 | 25 | 14 | 11 | 10 | 16 | 28 |
| 27 | 14 | 4 | 3 | 115 | 8 | 25 | 14 | 11 | 10 | 16 | 27 |
| 27 | 15 | 4 | 2 | 107 | 8 | 25 | 14 | 10 | 10 | 16 | 27 |
| 27 | 14 | 4 | 3 | 101 | 9 | 24 | 14 | 12 | 10 | 16 | 26 |
| 29 | 13 | 4 | 2 | 113 | 8 | 25 | 14 | 10 | 10 | 16 | 28 |
| 28 | 14 | 4 | 2 | 105 | 8 | 25 | 14 | 10 | 10 | 16 | 27 |
| 27 | 12 | 4 | 3 | 105 | 7 | 25 | 14 | 10 | 10 | 16 | |
| 29 | 13 | 4 | 3 | 103 | 8 | 24 | 15 | 11 | 9 | 16 | |
| 29 | 12 | 4 | 2 | 107 | 8 | 24 | 15 | 10 | 10 | 16 | 28 |
| 30 | 13 | 4 | 2 | 104 | 8 | 23 | 14 | 10 | 10 | 16 | 32 |
| MEAN | 28,4 | 13,4 | 4,1 | 2,3 | 106 | 8,2 | 24,5 | 14,3 | 10,6 | 9,9 | 16,0 | 28,5 |
| SD | 1,16 | 0,90 | 0,29 | 0,49 | 4,52 | 0,72 | 0,67 | 0,45 | 0,67 | 0,29 | 0,00 | 2,07 |

1/11-ZMA 119.148 Surinam, Suriname River, Sopo Fall (=Mamadam), 22-IX-1966, H. Nijssen.
12-RMNH 30562, Surinam, Suriname River in and between falls at Mamadam, 16/17-I-1964.

Botopasi, 21-III-1967, H. Nijssen; RMNH 30562 (27), Mamadam, in and between falls, 16/17-I-1964, M. Boeseman; RMNH 28974 (one), Mamadam, just under Grand Fall, 16/17-I-1964, M. Boeseman; RMNH 31174 (one), near Brokopondo, 30-XII-1963, M. Boeseman; RMNH 31175 (three), near Brokopondo, 4-I-1964, M. Boeseman; RMNH 31176 (nine), near Brokopondo, 28-I-1964, M. Boeseman; RMNH 31177 (five), near Brokopondo, 7-II-1964, M. Boeseman; RMNH 31178 (one), near Brokopondo, 2-II-1964, M. Boeseman; ZMA 105.752 (seven), Parwapa (= Paba) Creek, left bank tributary to Suriname River, 2.5 km N. of Botopasi near Foetoenakaba (= Voetoekaba), 20-III-1967, H. Nijssen; ZMA 105.527 (five), right bank tributary to Gran Rio, 4 km N.E. of Awadam (= Awaradam) rapids, 31-I-1967, H. Nijssen; ZMA 105.148 (three), Sopo Fall (= Mamadam) in Suriname River, 22-IX-1966, H. Nijssen; ZMA 105.129 (one), Sopo Fall (= Mamadam) in Suriname River, S.W. tributary of Brokopondo Reservoir, 21-IX-1966, H. Nijssen; ZMA 119.148 (two), Sopo (= Mamadam) Falls, 16/17-I-1964, M. Boeseman; ZMA 105.671 (three), Suriname River, 1 km S. of Botopasi, 22-III-1967, H. Nijssen; ZMA 105.674 (five), Suriname River, 7.5 km N. of Botopasi, 21-III-1967, H. Nijssen; MNHN A 9495 (one), no date, Mélinon.

## DESCRIPTION

Based on 205 mm SL male, ZMA 119.148 (morphometric and meristic data are presented in tables VII and VIII).

Head depressed; predorsal contour straight; preventral contour straight. Snout pointed in lateral aspect, rounded from above. Lower jaw slightly prognathous only; maxilla not reaching anterior margin of orbit. Orbital diameter about half as deep as head at orbit level. Nostrils nearer to orbit than to postlabial skinfold.

Origin of dorsal fin just posterior to hind edge of operculum; spines increasing in length to about ninth, from there equal in length;

Table VIII. Ranges in morphometric and meristic characters in *Crenicichla albopunctata* Pellegrin, 1904, *C. coppenamensis* n. sp., *C. nickeriensis* n. sp., *C. saxatilis* (Linnaeus, 1758), *C. sipaliwini* n. sp., *C. lugubris* Heckel, 1840, and *C. multispinosa* Pellegrin, 1903. Abbreviations in parentheses behind the characters.

| | ALBOPUNCTATA | COPPENAMENSIS | NICKERIENSIS | SAXATILIS | SIPALIWINI | LUGUBRIS | MULTISPINOSA |
|---|---|---|---|---|---|---|---|
| Standard Length (SL) | 33 - 142 | 44 - 179 | 48 - 191 | 50 - 186 | 63 - 173 | 143 - 231 | 95 - 216 |
| Caudal Fin Length (CFL) | 22.6 - 27.9 | 22.2 - 25.3 | 23.0 - 27.4 | 22.0 - 26.9 | 20.6 - 25.0 | 16.1 - 20.5 | 19.3 - 25.3 |
| Head Length (HL) | 34.3 - 37.5 | 34.1 - 37.8 | 33.3 - 39.5 | 33.9 - 38.5 | 33.8 - 39.0 | 30.8 - 34.6 | 30.3 - 33.7 |
| Head Depth (HD) | 16.4 - 21.2 | 17.3 - 21.2 | 17.3 - 22.5 | 18.2 - 23.0 | 16.4 - 21.8 | 18.6 - 22.2 | 12.3 - 17.2 |
| Head Width (HW) | 11.3 - 15.3 | 12.0 - 14.4 | 12.7 - 15.7 | 12.2 - 15.6 | 12.8 - 17.3 | 13.3 - 14.7 | 11.3 - 14.6 |
| Depth Caudal Peduncle (DCP) | 10.4 - 12.5 | 10.0 - 11.7 | 10.5 - 11.5 | 10.6 - 13.0 | 10.5 - 11.8 | 10.5 - 11.9 | 9.6 - 12.5 |
| Length Caudal Peduncle (LCP) | 10.0 - 12.5 | 10.9 - 15.1 | 10.5 - 12.0 | 10.4 - 13.0 | 10.5 - 12.2 | 11.3 - 13.8 | 11.6 - 13.9 |
| Snout Length (SN) | 6.6 - 8.9 | 5.2 - 8.9 | 6.7 - 9.8 | 6.0 - 8.7 | 6.0 - 8.7 | 7.8 - 8.8 | 6.5 - 9.3 |
| Upper Jaw length (UJL) | 9.4 - 13.3 | 9.3 - 12.8 | 8.5 - 12.9 | 10.2 - 13.1 | 8.7 - 13.9 | 8.4 - 11.3 | 8.1 - 10.8 |
| Lower Jaw Length (LJL) | 14.2 - 17.6 | 14.8 - 17.7 | 14.6 - 18.4 | 15.5 - 17.8 | 13.7 - 19.3 | 13.7 - 15.7 | 12.1 - 15.1 |
| Length Last Dorsal Spine (LLDS) | 9.4 - 13.0 | 8.3 - 10.7 | 9.4 - 11.8 | 9.6 - 11.8 | 9.2 - 12.3 | 6.8 - 10.3 | 8.5 - 10.5 |
| Length Last Anal Spine (LLAS) | 7.4 - 10.9 | 6.2 - 9.6 | 7.3 - 9.6 | 6.9 - 10.2 | 6.4 - 10.6 | 6.9 - 8.3 | 6.5 - 8.6 |
| Ventral Fin Length (VFL) | 14.8 - 18.9 | 14.2 - 18.2 | 15.2 - 19.8 | 16.4 - 19.2 | 15.8 - 18.3 | 16.1 - 16.6 | 13.4 - 15.3 |
| Pectoral Fin Length (PFL) | 18.3 - 21.8 | 17.5 - 22.2 | 18.3 - 22.9 | 19.1 - 23.6 | 19.1 - 22.0 | 17.2 - 17.8 | 15.1 - 17.5 |
| Distance Orbit-Nostril (PN) | 2.8 - 3.9 | 2.0 - 3.9 | 2.7 - 4.2 | 2.8 - 4.0 | 2.9- 3.6 | 4.1 - 5.2 | 2.9 - 4.6 |
| Distance Nostril-Snouttip (PN2) | 3.0 - 4.6 | 2.4 - 5.3 | 3.4 - 5.2 | 2.8 - 4.9 | 3.2 - 5.1 | 2.9 - 3.8 | 3.5 - 5.1 |
| Orbital Width (ORB) | 6.6 - 10.6 | 5.7 - 9.8 | 5.8 - 9.4 | 5.9 - 11.5 | 5.8 - 9.4 | 5.2 - 6.7 | 4.7 - 6.3 |
| Interorbital Width (WI) | 7.6 - 10.2 | 6.4 - 9.8 | 7.3 - 11.0 | 7.8 - 11.5 | 7.0 - 9.2 | 7.7 - 9.9 | 6.0 - 10.2 |
| Scales Anterior Lateral Line (L1) | 23 - 25 | 21 - 24 | 22 - 24 | 22 - 24 | 21 - 25 | 25 - 30 | 27 - 30 |
| Scales Posterior Lateral Line (L2) | 9 - 11 | 11 - 12 | 9 - 10 | 9 - 11 | 10 - 12 | 14 - 17 | 12 - 15 |
| Scales Between Lateral Lines (L1L2) | 2 - 3 | 3 | 2 - 3 | 2 - 3 | 2 - 3 | 5 - 6 | 4 - 5 |
| Lateral Line Scales on Caudal Fin (L2C) | 2 | 2 | 1 - 2 | 2 - 3 | 2 - 3 | 2 - 3 | 2 - 3 |
| Scale-series Below Lateral Lines (LL) | 60 - 71 | 65 - 70 | 61 - 66 | 53 - 64 | 65 - 68 | 118 - 130 | 100 - 115 |
| Scales Between Dorsal Fin and L1 (SCDL) | 3 - 4 | 4 | 3 - 4 | 3 - 4 | 4 - 5 | 8 - 11 | 7 - 10 |
| Dorsal Spines (DSP) | 17 - 20 | 18 - 20 | 18 - 20 | 17 - 19 | 18 - 20 | 22 - 24 | 23 - 25 |
| Dorsal Soft Rays (DSR) | 13 - 14 | 12 - 14 | 13 - 15 | 13 - 16 | 12 - 15 | 14 - 15 | 14 - 15 |
| Gill Rakers (GR) | 11 - 12 | 10 - 13 | 10 - 13 | 10 - 11 | 10 - 12 | 12 - 14 | 10 - 12 |
| Anal Spines (ASR) | 9 - 10 | 9 - 10 | 9 - 10 | 9 - 10 | 9 - 10 | 9 - 11 | 9 - 10 |
| Pectoral Fin Rays (P) | 16 | 16 - 17 | 16 - 17 | 15 - 17 | 15 - 16 | 16 - 17 | 16 |
| Angle Snout (ASN) | 33 - 46 | 30 - 40 | 38 - 46 | 34 - 40 | 33 - 41 | 33 - 40 | 26 - 32 |

reaching to 2/3 of caudal fin length in adults, to a fifth of caudal fin in juveniles; third from last soft ray the longest. Anal fin reaching to caudal fin base; third from last ray the longest. Ventral fin acute, first soft ray the longest. Caudal fin with free ray tips; five basal scales at lateral line level, to two ventrally and dorsally; interradial scales to a third of caudal fin. Pectoral fin rounded.

Scales on suboperculum, operculum, cheek, anterior part of back, and occasionally just posterior to base of pectoral fin cycloid, elsewhere ctenoid. Lateral line scales larger than adjacent scales.

Upper jaw with maximum seven teeth series, lower jaw with maximum four teeth series.

Number of vertebrae in three specimens (lectotype and two paralectotypes MNHN 9542): 22 + 19/22 + 18/22 + 18.

## COLOUR PATTERN IN ALCOHOL

*Male* (based on 205 mm SL specimen, ZMA 119.148): Brown; ventrally lighter and yellowish; cheek yellow; mouth blue-greyish; preventral area dirty white; a pattern of brown blotches on a bluish background below orbit (absent in some specimens, which then show a suborbital stripe). Posterior part of sides with many silvery dots, smaller than flankscale-size.

Dorsal fin whitish grey, dark margined; whitish dots scattered on dorsal fin. Anal fin whitish, dark margined; few white dots which are similar to those in dorsal fin. Ventral and pectoral fin hyaline. Caudal fin with many silvery dots; ground colour somewhat darker than dorsal fin; dark caudal spot, silvery ocellated.

*Female* (based on 201 mm SL specimen, RMNH 30562): Ground colour as in males. Dark lateral band, running between lateral line scale series. Neither suborbital stripe, nor a spot pattern below orbit; dots absent on flanks and on fins. Dorsal fin somewhat darker than in males, lacking the dark margins. Anal fin less whitish; dark margined. Ventral and pectoral fins as in males. Caudal fin with spot as in males, though less conspicuous ocellated. Dark band along middle; margins dark dorsally and ventrally.

*Juvenile* (based on 45 mm SL specimen, RMNH 28974): Body showing three zones: a brownish upper zone, a darker zone from orbit to caudal peduncle, and a lighter ventral zone; no bluish part on head; dots on flanks yellowish instead of silvery, as in adult males; caudal spot ocellated by a light brown ring; dark stripe from caudal spot to end of rays; dark margin in dorsal fin and in anal fin; larger juveniles look like adult males, except for the absence of a spot pattern below the orbit and the presence of yellowish coloured dots on the sides.

## DISTRIBUTION

*Crenicichla multispinosa* seems to be endemic in Suriname and Marowijne River systems. In these river systems the species is present in the middle and upper parts only.

## REMARKS

Ploeg (1986c) restricted the type locality of *C. multispinosa* to Marowijne River, S. of Gran Creek.

*Crenicichla multispinosa* is very similar to *C. ternetzi* Norman, 1926, which seems to be endemic in the Oyapock River system (French Guiana and Brazil). An easy character to separate the two species on first sight, apart from other characters (Ploeg, 1986c: 229), is the absence of the caudal fin spot in *C. ternetzi.*

Although *C. multispinosa* is named after its high number of dorsal spines, the species is certainly not unique in this character: *C. lugubris* and *C. ternetzi* also have up to 25 dorsal spines.

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