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Revision of the Surinam Catfishes of the genus *Corydoras* Lacépède, 1803 (Pisces, Siluriformes, Callichthyidae)

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CONTENTS

ABSTRACT

During recent expeditions to Surinam, large ichthyological collections have been made from nearly all river systems by several ichthyologists, one of which was the author. Because of new information provided by the especially rich collections of *Corydoras*, a revision of the Surinam species and subspecies of this genus was thought necessary. This revision is based on 5211 specimens belonging to seventeen species and subspecies of which seven are new to science, viz., *C. bondi coppenamensis, C. guianensis, C. heteromorphus, C. ociocirrus, C. oelemariensis, C. schwartzi surinamensis* and *C. saramaccensis*. A key to the Surinam species is provided and the taxonomic value of several characters is discussed. The distribution of the different groups within the genus *Corydoras* is discussed and remarks on ecology and ethology of Surinam species are given.

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INTRODUCTION

The Foundation for Scientific Research in Surinam and the Netherlands Antilles started the Brokopondo Research Project with the financial aid of the Netherlands Foundation for the Advancement of Tropical Research, the Hague.

A dam across the Suriname River (eight kilometers South of Brokopondo) was constructed by the Surinam Aluminium Company. This dam was completed and closed on February 1, 1964. From that moment on a reservoir, that ultimately would have a surface of about 1500 square kilometers, began to fill the valley of the Suriname River. The artificial lake (initially named Brokopondo Lake, because the dam was planned first near Brokopondo) was later officially named after Prof. Dr. Ir. W. J. van Blommestein, who instigated the "Combined plan for the Suriname River".

A team of Dutch scientists, consisting of hydrobiologists, a botanist, and ichthyologists, was sent to Surinam to study the consequences of the inundation. Most important was the investigation of biological changes caused by the transformation of the original river habitats into an artificial lake. In November 1963, Dr. M. Boeseman became the first ichthyologist of a team of three, to study the reservoir area. He was succeeded by Dr. G. F. Mees in March 1965. The author arrived in April 1966 and with his departure on June 30, 1967, the activities of the ichthyological research team near the lake came to an end.

The study of changes in fish composition in the lake area was the purpose of the ichthyological part of the Brokopondo Research Project. The knowledge of the ichthyofauna of Surinam is so poor that material from other river systems had to be collected for comparison. Dr. Mees and the author had the opportunity to make several collecting trips to other river systems besides their monthly inventory of the lake area and the Suriname River. Dr. Boeseman visited the Saramacca, Dr. Mees the Tapanahony, Paloemeu, Saramacca, Sipaliwini, and Kabalebo Rivers. The author collected in the Marowijne, Lawa, Tapanahony, Kleine Saramacca, Coppename, and Nickerie Rivers.

The resulting large fish collections, which were fixed in 5 to 10% formaldehyde and afterwards preserved in 70 to 80% aethylalcohol, were shipped to the Netherlands, where the material has been placed in the fish collections of the Rijksmuseum van Natuurlijke Historie, Leiden, and of the Institute of Taxonomic Zoology (Zoölogisch Museum) of the University of Amsterdam.

These collections contain numerous representatives of the genus *Corydoras*. Although taxonomic studies based on a part of this material have already been published (Nijssen & Isbrücker, 1967), a portion of Dr. Mees' collections and the material collected by the author were not available at that time. The present revision of the Surinam representatives of the genus *Corydoras*, together with notes on their distribution, adds new data to our knowledge, as it is based on recent collections made in nearly all river systems in Surinam. This revision, based on 5211 specimens belonging to seventeen

Surinam species and subspecies, of which seven new to science, can form a suitable starting point towards a revision of the entire neotropical genus.

Most of the material was collected with the financial support of the Netherlands Foundation for the Advancement of Tropical Research (WOTRO). For assistance in the field I am indebted to Mr. O. E. Pocorni, formerly Commissioner of the Brokopondo district, Ir. H. E. Lionarons, Director of the Fisheries Institute at Paramaribo, Ir. A. M. Bles, formerly head of the Department of Hydrolics of the Ministry of Public Works, to Drs. J. Verhofstad of the Mining Department, the heads of the Aucan, Paramaccan, Saramaccan and Matuarian Bushnegro tribes, and to my assistants Mr. Sekrepatoe and Mr. R. Ritveld.

There are more than one hundred nominal species in the genus *Corydoras*. Several of these nominal species were published without figures and with incomplete or erroneous descriptions. The study of *Corydoras* is impossible without comparison of the Surinam fishes with type material of related species, present in zoological institutions in Europe and America. Visits to some of these institutions were made: to London (BMNH), Frankfurt (SMF) and Vienna (NMW) financed by the University of Amsterdam; to Brussels (IRScNB) on a WOTRO grant, and to Paris (MNHN).

I am much obliged to my colleagues, who loaned material from their institutions: Dr. M. Blanc, Muséum National d'Histoire Naturelle (MNHN), Paris, Dr. M. Boeseman and Dr. G. F. Mees, Rijksmuseum van Natuurlijke Historie (RMNH), Leiden, Mr. W. I. Follet and Dr. W. N. Eschmeyer, California Academy of Sciences (CAS), San Francisco, Dr. J. P. Gosse, Institut Royal des Sciences Naturelles de Belgique (IRScNB), Brussels, Dr. P. H. Greenwood, British Museum (Natural History), (BMNH), London, Dr. P. Kähsbauer, Naturhistorisches Museum Wien (NMW), Vienna, Dr. W. Klausewitz, Natur-Museum und Forschungs-Institut Senckenberg (SMF), Frankfurt, Dr. G. S. Myers and Dr. W. C. Freihofer, Division of Systematic Biology Stanford University (SU), Palo Alto, and Dr. S. H. Weitzman, Smithsonian Institution, United States National Museum (USNM), Washington, who kindly read the manuscript.

I am thankful to my colleagues of the Zoölogisch Museum at Amsterdam (ZMA) and to Mr. I. J. H. Isbrücker of the Amsterdam Zoo "Natura Artis Magistra" (NAM) for their criticism and advice. Mr. L. R. Hafkamp made photographs of the fishes, which were helpful for the drawings made by Mr. J. Ruting.

SURINAM

Surinam (fig. 1), formerly Dutch Guiana, is roughly situated between 2° to 6° N and 54° to 56°W. It is bordered by the Atlantic Ocean in the North, French Guiana in the East, Brazil in the South, and Guyana, formerly British Guiana in the West.

Geologically, the interior of Surinam is formed by a basal complex of granitic, volcanic, and metamorphic rocks of the Precambrian Guiana Shield Occasionally this basal complex is covered with laterite caps and locally with substantial bauxite, ferrobauxite, or iron ore deposits. The Bakhuis, Brownsberg, Nassau, and Lely Mountains carry high quality bauxites. In the coastal region the basal complex is covered by sediments of Lower Tertiary to Quaternary age. In this northern part of Surinam, sedimentary bauxites are

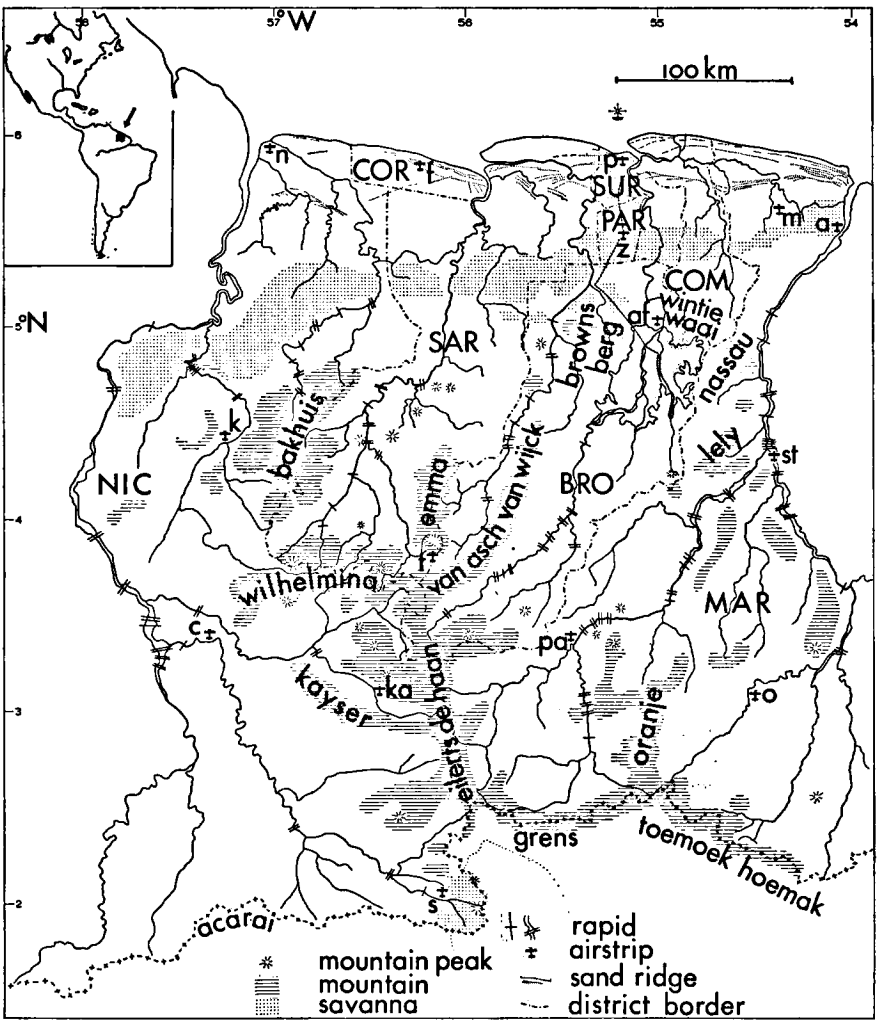

FIG. 1. Districts, mountains, and airstrips in Surinam (modified after a map of RMNH) (District names abbreviated in capitals, mountains in lower case, airstrips indicated by a plane symbol).
a Albina airstrip; af Afobaka airstrip; BRO Brokopondo district; c Coeroeni airstrip; COM Commewijne district; COR Coronie district; f Friendship airstrip; k Kabalebo airstrip; ka Kayser airstrip; m Moengo airstrip; MAR Marowijne district; n Nieuw Nickerie airstrip; NIC Nickerie district; o Oelemari airstrip; p Paramaribo airstrip; pa Paloemeu airstrip; PAR Para district; s Sipaliwini airstrip; SAR Saramacca district; st Stoelmanseiland airstrip; SUR Suriname district; t Tafelberg airstrip; z Zanderij airfield.

covered by unconsolidated sands and clays. An East-West zone of Upper Tertiary quartz sands, the Zanderij Formation, extends from 150 kilometers from the coast in the western part of the country to 40 kilometers from the coast in the East.

The river rapids ("soela's") form curious geomorphological phenomena. In many places in the basal complex, rock formations, slightly harder than their surroundings, may form rapids. Table Mountain (= Tafelberg) is an isolated remnant of a Precambrian flat-lying Roraima Sandstone, which once must have covered a much larger part of Surinam.

The continental shelf extends along the coast with the 100 meter depth line about 175 kilometers north of the coast. The shelf and the coast are muddy, the mud originating from the Amazon River and deposited by coastal currents. Along the coast an *Avicennia* belt is present developing into a *Rhizophora* vegetation along the river sides, where the influence of the tides is present. There are open swamps between old sand ridges with several types

FIG. 2. Main rivers in Surinam.

of primary or secondary swamp forests. The secondary forest grow where unremunerative plantations have become overgrown, following 1863 when the slaves were freed. A savanna belt exists on the zone of silica sands. South of the savannas the tropical rain forest extends to the southern border, traversed by several large river systems. There are, however, some small and isolated southern savannas: on the Tafelberg, at the foot of this mountain (Kappel Savanna), the Kayser and the Sipaliwini Savannas.
On these savannas several airstrips were made.

The river systems are from West to East (fig. 2):
Corantijn river system with Corantijn (border river with Guyana, named in English "Courantyn", whereas the upper Corantijn is named by the English "New River"), Kabalebo, Lucie, South, Coeroeni, Sipaliwini, and Oronoque Rivers.
Nickerie river system with the Nickerie and Marataka Rivers.
Coppename river system with the Coppename, Coesewijne, Tibiti, and Adampado Rivers.
Saramacca river system with the Saramacca and Pikien Saramacca Rivers.
Suriname river system with Suriname River, Van Blommestein Lake, Gran Rio, and Pikien Rio.
Commewijne river system with Commewijne and Cottica Rivers.
Marowijne river system with Marowijne (border with French Guiana, named in French Maroni), Tapanahony, Paloemeu, Lawa, Gonini, Oelemari, and Litanie Rivers.

Mountains are important watersheds. They determine the configuration of the different river systems as shown in fig. 1.

History of the genus *Corydoras* and its Surinam representatives

Corydoras Lacépède, 1803

Cordydoras Lacépède, 1803, type species *Corydoras geoffroyi* Lacépède, 1803 (= *Cataphractus punctatus* Bloch, 1794), by monotypy.
Cordorinus Rafinesque-Schmaltz, 1815, emendation of *Corydoras* Lacépède, 1803.
Hoplisoma Swainson, 1838, type species *Cataphractus punctatus* Bloch, 1794, by original designation.
Hoplosoma Agassiz, 1846, emendation of *Hoplisoma* Swainson, 1838.
Scleromystax Günther, 1864, as a subgenus of *Callichthys* Scopoli, 1777, type species *Callichthys barbatus* Quoy & Gaimard, 1824, by original designation.
Gastrodermus Cope, 1878, type species *Corydoras elegans* Steindachner, 1877, as designated by Gosline, 1940.
Gasterodermus Eigenmann & Eigenmann, 1888, emendation of *Gastrodermus* Cope, 1878.
Osteogaster Cope, 1894, type species *Corydoras eques* Steindachner, 1877, by original designation.
Microcorydoras Myers, 1953, as a subgenus of *Corydoras* Lacépède, 1803, type species *Corydoras hastatus* Eigenmann & Eigenmann, 1888, by original designation.

Bloch used the species name *punctatus* for a new species from Surinam published under the generic name *Cataphractus* (1794 : 90). The generic name *Corydoras* was proposed by Lacépède (1803 : 147) for his new species *C.*

geoffroy, afterwards emended to *geoffroyi*. This species, also coming from Surinam "provenu du Cabinet du Stadhouder", the Stadtholder of Holland, "donnée par la Hollande à la France" (Valenciennes, in d'Orbigny, 1847), was shown to be identical with *Cataphractus punctatus* Bloch, 1794, by Valenciennes (in Cuvier & Valenciennes, 1840). Afterwards Lacépède's material got lost and since his description of *C. geoffroyi* does not contradict Valenciennes' conclusion (Nijssen & Isbrücker, 1967 : 23), we accept this synonymy. Swainson (1838 : 336), not aware of Lacépède's congeneric *Corydoras geoffroyi*, proposed the generic name *Hoplisoma* (emended to *Hoplosoma* by Agassiz (1846 : 185, 186)), designating *Cataphractus punctatus* Bloch, 1794, as its type species, and retaining the name *Cataphractus* for his *C. depressus*, based on Bloch's pl. 377 fig. 1 (= *Callichthys callichthys* (Linnaeus, 1758)). In fact, the generic name *Cataphractus* Bloch was already preoccupied, viz., by Edwards (in Catesby, 1771) (Pisces). By the synonymy of *Corydoras geoffroyi* with *Cataphractus punctatus*, *Corydoras* proved to be the oldest valid generic name for Bloch's species *punctatus*. This is generally accepted since Bleeker (1862 : 4) decidedly designated *Corydoras* as the generic name for *Cataphractus punctatus* Bloch, regarding *Corydoras geoffroyi* as a junior synonym of *C. punctatus*.

Although the name of *Corydoras punctatus* was used several times in the literature, material indicated with this name always proved to be dissimilar to Bloch's description (1794 : 90, pl. 377 fig. 2). The *C. punctatus* material from (British) Guyana recorded by Eigenmann et al. (1888, 1890, 1903, 1912, and so on) and Ellis (1913) appeared to consist of both *C. melanistius* Regan, 1912, and *C. potaroensis* Myers, 1927. The material, mentioned by Van der Stigchel (1946 : 126) under the name *C. punctatus* also consisted of these two species. Hoedeman (1952 : 14, fig. 9) recorded a subspecies, which he named *C. punctatus punctatus*. He distinguished this nominate subspecies from other subspecies, but it was proved (Nijssen & Isbrücker, 1967 : 38) that this material was not identical with Bloch's *Corydoras punctatus*.

Boeseman (1954 : 20) recorded two specimens of *C. punctatus* from Surinam, identical with Bloch's description and figure. These are the first specimens really belonging to this species recorded since its original description. Thousands of specimens of *C. punctatus* were recently collected and a neotype (RMNH 25301) was designated (Nijssen & Isbrücker, 1967 : 28).

Van der Stigchel (1946 : 128) records *C. paleatus* (Jenyns, 1842) from the Lucie River, Surinam. His three specimens were re-examined and constitute a part of the paratype series of *Corydoras boesemani* Nijssen & Isbrücker, 1967.

Boeseman (1954 : 20) recorded a *Corydoras guianensis* specimen from the Tugumutu (= Toekoemoetoe) Creek under the name *Corydoras punctatus*. A fourth (aquarium) specimen listed by Boeseman, "possibly also from Surinam", is left out of discussion here.

Hoedeman (1965 : 87, 137) published in a Dutch aquarium booklet two names (nomina nuda) for Surinam representatives of the genus *Corydoras* without giving a description, viz., "*Corydoras punctatus sipaliwini* (n.n.)"

and "*Corydoras melanistius sipaliwini* (n.n.)". The first subspecies proved to belong to *C. bondi* Gosline, 1940 (in the present paper ascribed to *C. bondi bondi*), whereas the second invalid subspecific name was replaced by the specific name *C. bicolor* Nijssen & Isbrücker, 1967.

In 1967, Nijssen & Isbrücker recorded twelve species of *Corydoras* from Surinam: *C. punctatus, C. aeneus, C. melanistius, C. spilurus* (in the present paper described as *C. octocirrus*), *C. bondi, C. osteocarus,* and the new species *C. bicolor, C. boesemani, C. nanus, C. oxyrhynchus, C. sanchesi,* and *C. wotroi.*

Along with the descriptions of the species in the present paper, a list of synonyms is given for each species. These synonyms were checked by examination of material listed by the author, or with descriptions, figures, and geographical data. Aquarium literature is cited only when it contains original descriptions of new species. After each species doubtful records in literature, which could not be checked, are discussed. Only material identified by the author is listed and used for the maps showing the distribution in Surinam. Described as new species are *Corydoras guianensis, C. heteromorphus, C. octocirrus, C. oelemariensis,* and *C. saramaccensis,* as new subspecies *C. bondi coppenamensis,* and *C. schwartzi surinamensis.*

Morphology of the genus *Corydoras*

The Callichthyidae are distinguishable externally from all other catfishes by the presence of two longitudinal rows of lateral body plates which completely cover the sides, and by two or three barbels originating at each rictus, i.e., the junction of the lips at either side of the mouth (modified from Gosline, 1940 : 1).

With the genera *Brochis* Cope, 1872, and *Aspidoras* von Ihering, 1907, *Corydoras* is easily distinguished from other genera of the family Callichthyidae by possession of a laterally compressed head, short rictal barbels (not reaching much beyond the gill opening) and a single pair of short mental barbels at the lower lip. *Brochis* has 11 (10 to 12) soft dorsal fin rays; there are 7 (6 to 8) in *Corydoras* and *Aspidoras.* The genus *Aspidoras* differs from *Corydoras* by having a short supraoccipital crest, not separating the nuchal plates (first anterior dorsolateral scutes). These scutes meet along the midline between the supraoccipital and the azygous predorsal scute.

In *Corydoras* the supraoccipital forms a process posteriorly, which may or may not meet the azygous predorsal scute. The nuchal plates never meet along the middorsal line. The body and head are compressed and the sides have 22 to 26 dorsolateral and 19 to 24 ventrolateral body scutes. The number and position of the small scutes on the caudal peduncle are variable, as well as the number of the azygous preadipose scutes. The number of these preadipose scutes sometimes varies in one series of one species from a single locality from 2 to 5. The number of rays in the fins is less variable, being normally I,7 in the dorsal fin (D), i,6 in the anal (A), i,5 in the pelvic (P_1) and I,8 in the pectoral (P_2) fin. There are 7/7 principal caudal fin rays

(C). The count 7/7 in the caudal fin describes one long dorsal unbranched ray and six branched rays in the upper caudal fin lobe and six branched rays and one long unbranched ray in the lower caudal fine lobe. In the other fins, spines are indicated by capital Roman numerals, unbranched rays by lower case Roman numerals, and branched rays by Arabic numerals. The number of soft pectoral rays, as well as the number of lateral body scutes, are sometimes greater in the "long-snouted" species.

Fin rays and scutes were counted with the aid of a binocular dissecting microscope. Measurements were taken with vernier callipers and recorded to one-tenth of a millimeter. The measurements were taken directly (fig. 3). In the descriptions of species, figures are proportional in comparison with standard length (sl) or head length (hl), as explained in the list of abbreviations. Data for the holotypes of the species described as new in this paper are given first in millimeters, followed by proportions in parentheses.

In the literature a lot of measurements have been used in descriptions of new species within the genus *Corydoras*. However, many of these are so constant in the genus or so variable in the same species, that they cannot be used in discriminating between different species. Still it is advisable to give many data describing new species, as they may prove to be useful for comparison with yet undescribed forms. In this paper fifteen measurements and eight counts have been taken of each specimen. A drawing of the profile of the pectoral spines from ventral view is provided. Of the largest sample of each species meristic and morphometric data of twelve specimens are given. When the species was known from more than one river system, data of five specimens originating from each other system have additionally been included. The key and bar diagrams show the most useful measurements to distinguish the different species.

One of the most striking features in the genus *Corydoras* is the wide diversity of colour patterns. The ground colour is tan or greyish, less frequently pale brown. Black and brown pigments are often present on body, head, fins, and barbels. The area between the coracoid processes is mostly whitish, completely, partly, or not at all covered with a mosaic of plates. Small spots may occur on head, body, and fins, sometimes forming vertical bars on the caudal fin. Larger spots may be found on the dorsal fin, near the base of this fin and near the eyes, where it sometimes forms a mask. In some cases black or brown pigment causes a stripe near the junctions of the lateral body scutes and near the dorsal fin region.

When working with fishes with such remarkable colour patterns, one is tempted to assign taxonomic value to the colour pattern. I am inclined to do so and believe such action is systematically valid because the colour pattern and variation correlate with the geographical distribution of the species and subspecies in Surinam. This is further based on a consideration of the ecological distribution of 5211 specimens originating from the restricted area Surinam. Further support of this has been obtained from a comparative analysis of *Corydoras* specimens from through their distribution in South America. There is, of course, some variation within a given species, even in

one lot from a single locality. In spite of this, the colour pattern is remarkably constant in each of the seventeen Surinam species and subspecies listed here. Thus, the colour pattern has a definite diagnostic value. However, it is necessary to give more than just a description of the colour pattern in the characterization of the species. In addition, morphometric data are needed to further demonstrate differences and similarities between species and subspecies. Although at this time zoogeographical considerations, and especially genetics, and ethology cannot contribute very much if anything to taxonomic and evolutionary problems in the genus *Corydoras*, the genus offers a great deal of potential in this regard because of its wide distribution in South America, and the ease with which its members can be maintained in aquaria.

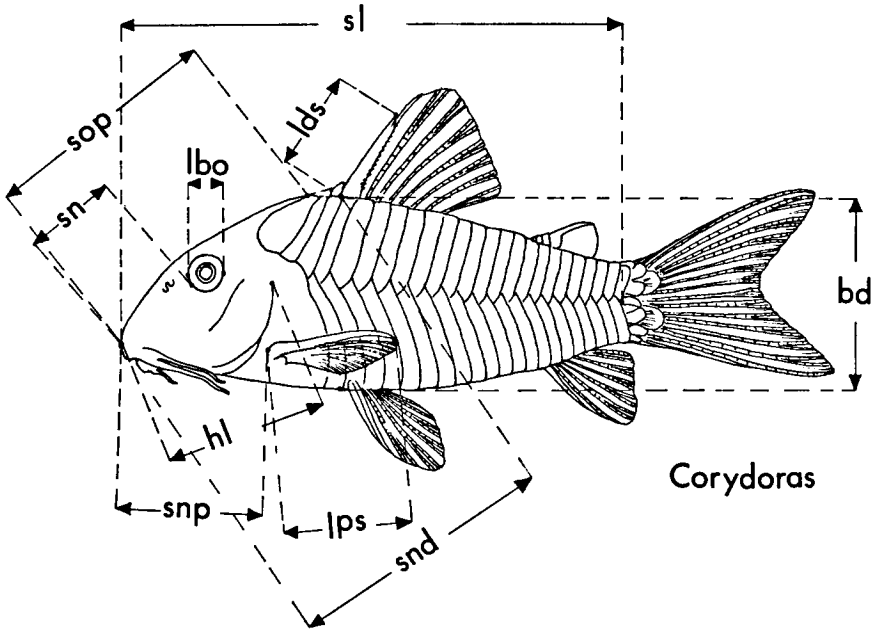

FIG. 3. Sketch of *Corydoras* showing methods of measurement (see text).

ABBREVIATIONS USED AND DEFINITIONS OF TERMS (fig. 3)

bd — the body depth, the height measured from the anterior edge of the azygous predorsal scute vertically to the lower edge of the coracoid (in adult females bearing ripe eggs the bulging belly is not included); expressed in sl.

bw — the body width, measured just before the pectoral spine insertions; expressed in sl.

ca — the width of the coracoid area between the lower edges of the first ventrolateral scutes; expressed in hl.

dbs — the number of the dorsolateral body scutes, except the small scutes at the end of the caudal peduncle.

dcp — the least depth of the caudal peduncle; expressed in hl.

hl — the head length, measured from the snout tip (ethmoid) to the highest point of the gill opening; expressed in sl.

lbo — the length of the bony orbit, horizontally measured; expressed in hl.
lds — the length of the dorsal spine in vertical position measured from the junction of the bases of the predorsal scute and the dorsal spine to the tip; expressed in sl.
lps — the length of the pectoral spine, pressed along the body, measured from the articulation point to the tip; expressed in sl.
pas — the number of the pre-adipose scutes; (the adipose spine, which is in fact a modified middorsal scute, is not included).
sl — the standard length, measured from the snout tip (ethmoid) to the junction of the posterior edges of the last counted body scutes.
sn — the snout length, measured from the snout tip (ethmoid) to the anterior edge of the bony orbit; expressed in hl.
sna — the distance between the snout tip (ethmoid) and the centre of the anus; expressed in sl.
snd — the distance between the snout tip (ethmoid) and the junction of the bases of the predorsal scute and the dorsal spine; expressed in sl.
snp — the distance between the snout tip (ethmoid) and the articulation point of the pectoral spine; expressed in sl.
sop — the distance between the snout tip (ethmoid) and the posterior edge or point of the occipital process; expressed in sl.
vbs — the number of the ventrolateral body scutes, except the small scutes at the end of the caudal peduncle.
wi — the least width of the interorbital; expressed in hl.

KEY TO THE SURINAM SPECIES AND SUBSPECIES OF THE GENUS *Corydoras*

Descriptions, figures, and diagrams give additional information for identification.

1	Pectoral spines strongly serrated at inner edge	2	
—	Pectoral spines not strongly serrated	5	
2	Snout 2.2 or more in head length	*nanus*	p. 24
—	Snout 1.8 or less in head length	3	
3	Three pairs of rictal barbels	*octocirrus*	p. 26
—	Two pairs of rictal barbels	4	
4	Pectoral spine length 4.3—4.9 in sl; depth caudal peduncle 2.1—2.3 in head length	*saramaccensis*	p. 38
—	Pectoral spine length 4.0—4.2 in sl; depth caudal peduncle 2.3—2.5 in head length	*oxyrhynchus*	p. 32
5	Black stripe along junctions of body scutes	6	
—	Black stripe absent	9	
6	Caudal fin without vertical bars; snout 1.8—2.0 in head length	*oelemariensis*	p. 29
—	Caudal fin with vertical bars; snout 2.0—2.3 in head length	7	
7	Caudal fin with 2 to 3 broad black vertical bars	*boesemani*	p. 16
—	Caudal fin with 4 to 6 narrow vertical bars	8	
8	Spots on head and dorsal part of body circular in outline	*bondi coppenamensis*	p. 19
—	Spots on head and dorsal part of body irregular	*bondi bondi*	p. 17
9	Mask across eyes and a dark blotch ventral to origin of dorsal fin	10	
—	Mask and blotch absent	12	
10	No spots on body	*bicolor*	p. 14
—	Spots on body	11	

11	Spots arranged in three longitudinal rows	*schwartzi surinamensis*	p. 39
–	Spots scattered all over the body	*wotroi*	p. 40
12	Large black blotch covering upper half of dorsal fin	*punctatus*	p. 33
—	Blotch absent	13	
13	Dorsal spine length 3.9 or more in sl	14	
—	Dorsal spine length 3.9 or less in sl	16	
14	Interorbital width 2.0—2.4 in head length	15	
—	Interorbital width 2.8—3.3 in head length	*heteromorphus*	p. 22
15	Dorsal spine length 4.2 or more in sl; dorsal part of body dark grey	*aeneus*	p. 12
—	Dorsal spine length 4.2 or less in sl; dorsal part of body brown	*guianensis*	p. 21
16	Interorbital width 2.1—2.4 in head length	*guianensis*	p. 21
—	Interorbital width 2.4—2.9 in head length	17	
17	Body depth 2.5—2.7 in sl; dorsal spine and first soft dorsal fin ray black	*sanchesi*	p. 37
—	Body depth 2.7—2.85 in sl; dorsal spine and first soft dorsal fin ray greyish	*osteocarus*	p. 31

Corydoras aeneus (Gill, 1858) (figs. 4, 26c, 38)

Type locality: "clear streams of the island of Trinidad" (original designation).

Hoplosoma aeneum Gill, 1858: 403 (original description; Trinidad).
Lütken, 1874: 214 (listed; in subgenus *Corydoras* of *Callichthys*).

Callichthys aeneus; Günther, 1864: 230 (after Gill; in subgeneric group *Corydoras* of *Callichthys*).

Corydoras aeneus; Cope, 1872: 282 (listed; after Gill).
Cope, 1878: 680 (listed).
Jordan, 1886: 560 (listed; after Günther).
Eigenmann & Eigenmann, 1888: 166 (listed).
Eigenmann & Eigenmann, 1890: 471 (reference after Gill).
Eigenmann & Eigenmann, 1891: 44 (reference after Gill).
Regan, 1906: 388—389 (description; Trinidad and Grenada).
Eigenmann, 1910: 403 (listed).
Regan, 1912: 218 (see discussion below).
Ellis, 1913: 404—405 (see discussion below).
Fowler, 1915: 530 (references after Gill and after Regan; *Hoplosternum aeneum* erroneously applied as a synonym).
Fowler, 1931: 395 (Trinidad: Moruga).
Gosline, 1940: 19 (see discussion below).
Gosline, 1945: 75 (see discussion below).
Fowler, 1946: 2 (Trinidad: Tumpuna River).
Price, 1955: 16 (Trinidad).
Boeseman, 1960: 108—109 (Trinidad: Aripo River).
Nijssen & Isbrücker, 1967: 30—32, fig. 3d, pl. 1 fig. 3 (Trinidad: Aripo River; Surinam: Suriname- and Saramacca river systems; French Guiana: Gaa Kaba and Degrad Cacao).

Corydoras spec., Guppy, 1934: 118 (Trinidad).

The following material is additional to that listed by Nijssen & Isbrücker (1967 : 28—29):

Surinam, district Brokopondo, Suriname river system, 540 specimens, 16.4—55.7 mm sl, collected by G. F. Mees (12-XII-1965/25-III-1966), and by H. Nijssen (28-IV-1966/20-III-1967), viz.:

Compagnie Creek	:	47 specimens (RMNH 25797, ZMA 106.098);
Van Blommestein Lake	:	3 specimens (ZMA 105.868);
Makambi Creek	:	5 specimens (RMNH 25801, 25810, ZMA 105.112);
Marchall Creek	:	167 specimens (RMNH 25800, ZMA 105.369, IRScNB 16786);
Mama Creek	:	8 specimens (RMNH 25804, ZMA 106.099);
Tapoeripa Creek	:	193 specimens (RMNH 25802, 25803, ZMA 105.092, 105.105, 105.869, USNM 203808, SSC, NMW);
Sara Creek	:	115 specimens (RMNH 25794, ZMA 106.097, 105.233, 105.241, 105.870, 106.097);
Parwapa Creek	:	1 specimen (ZMA 105.798);
Gran Rio	:	1 specimen (ZMA 105.486).

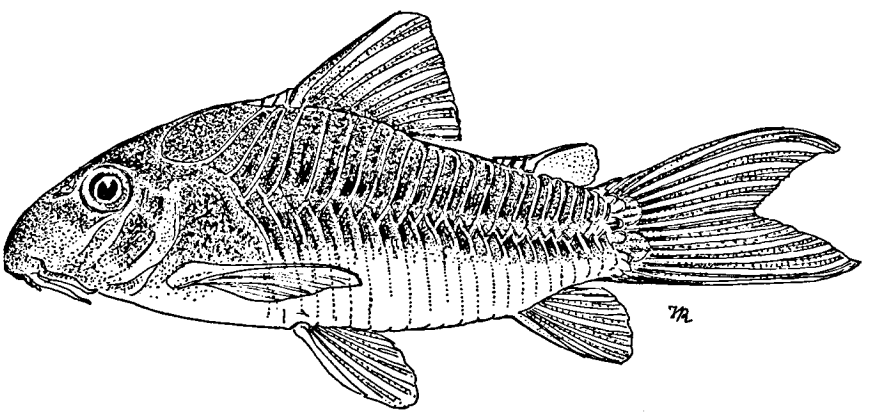

FIG. 4. *C. aeneus* (Gill, 1858), 48.6 mm sl. Marchall Creek (ZMA 105.369).

Description. —

Morphometric and meristic data based on 12 specimens (ZMA 105.369). sl 33.4—52.2 mm; bd 2.6—2.9; bw 3.6—3.9; lds 4.9—5.8; lps 3.5—4.2; sop 2.3—2.6; sna 1.8—2.0; snd 2.0—2.1; snp 3.2—3.8; hl 3.2—3.5; sn 1.9—2.1; lbo 3.4—4.1; wi 2.1—2.2; ca 2.0—2.6; dcp 2.0—2.2; pas 3—4; dbs/vbs 23—24/20—22; D I,7; A i—ii, 5—6; P_1 i,5; P_2 I,8—9; C 7/7.

Colour in alcohol: Ground colour pale yellowish brown (= tan in following descriptions). Head greyish, paler ventral to eye-level, except for dark blotch covering anterior part of opercle. Dorsal part of body dark bluish grey from head to base of caudal fin and extending to uppermost parts of ventrolateral body scutes. A blotch of the same colour covers dorsal part of cleithrum. In some specimens from Compagnie and Sara Creeks the pigmentation becomes paler posteriorly. Sometimes (apparently due to lack of pigment) a tan stripe occurs parallel to and just ventral to middorsal line. Dorsal, adipose, but especially caudal fin reddish-brown. Remaining fins tan, same as ventral body region. Dorsal rictal barbels and pectoral spines with greyish pigmentation. Intercoracoid area naked.

Discussion. — The populations from Trinidad, Guyana, Surinam, and French Guiana are here discussed without much further comments on additional distribution on continental South America about the geographical variation and subspeciation within *C. aeneus*. This is an extremely complicated problem not yet explored by previous authors.

Regan (1912) recorded material from Trinidad, Grenada, Matto Grosso (Urucum and Carandasinho), and Bolivia (Sara). He regarded *C. microps* Eigenmann & Kennedy, 1903 (Matto Grosso near Rio Branco) as a junior synonym and *C. venezuelanus* von Ihering, 1911 (Venezuela, Rio Cabriales) as a doubtful synonym of *C. aeneus*.

Ellis (1913) mentioned three specimens from Trinidad and also regarded *C. venezuelanus* as a doubtful synonym, without having studied Venezuelan material.

Gosline (1940 and 1945) considered *C. venezuelanus* and *C. macrosteus* Regan, 1912 (Sao Paulo, Rio Piracicaba) junior synonyms of *C. aeneus*. Apart from some aquarium specimens, he recorded material as *C. aeneus* from Venezuela: Rio Limon, Rio Urama, and Rio Carichapo. Unfortunately, he neither discussed this synonymy, nor mentioned type material of both species he placed in synonymy, so that his statement cannot be accepted without further study. Not having material from Venezuela at my disposal at the moment, I cannot give a solution. *C. aeneus* specimens from the three Guyana's are identical with those from Trinidad. The species has already been recorded from French Guiana and Surinam. A specimen from (British) Guyana, Kaituma River (SU 51298) has been examined by me.

Finally, Fowler (1946) states that in his three specimens of Tumpuna River, Trinidad, "the caudal shows at least traces of some darker brown spots scattered on its rays, apparently at least 4 or 5 on the median rays." Such spots are definitely absent in any Trinidad specimen seen by me, including four syntypes (USNM 1116).

During a visit to Vienna I saw seven specimens of *C. aeneus* (NMW 46725), collected by Heller in Surinam (without exact locality) in 1910 and identified by Steindachner as *C. eques* Steindachner, 1877.

Corydoras bicolor Nijssen & Isbrücker, 1967 (figs. 5, 26h, 37)

Type locality: Surinam, Sipaliwini River, station 7 (original designation); near the Brazilian border (Paru Savanna) (by present restriction).

Corydoras melanistius sipaliwini Hoedeman, 1965: 137, fig. 84a-c (nomen nudum).
Corydoras bicolor Nijssen & Isbrücker, 1967: 36—37, fig. 4b, pl. 3 fig. 3 (original description; Surinam: Sipaliwini River, and surroundings Paramaribo, pool with *Lotus* species at road to Kwatta).

The following material is additional to that listed by Nijssen & Isbrücker (1967 : 36):

Surinam, district Nickerie, Corantijn river system:

Lucie River at junction with Oost River (03° 32′ N, 56° 29′ W), one specimen 37.5 mm sl (RMNH 25814), coll. H. P. Pijpers, 26-VII-1963, ex Surinam Museum, Paramaribo.

Description. —

Morphometric and meristic data based on 12 paratypes (ZMA 104.628). sl 22.1—26.2 mm; bd 2.4—2.5; bw 3.4—3.6; lds 2.7—3.0; lps 2.8—3.0; sop 2.1—2.2; sna 1.7—1.8; snd 1.8—1.9; snp 3.1—3.3; hl 2.8—3.1; sn 2.0—2.3; lbo 2.8—3.1; wi 2.3—2.5; ca 2.3—3.2; dcp 1.9—2.1; pas 3—5; dbs/vbs 23/20—21; D I,7; A i,6; P_1 i,5; P_2 I,8; C 7/7.

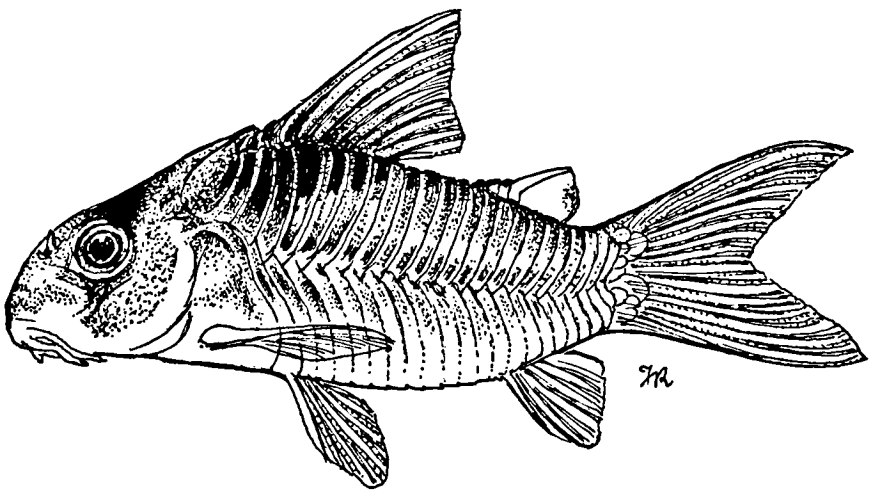

FIG. 5. *C. bicolor* Nijssen & Isbrücker, 1967. Holotype 25.9 mm sl. Sipaliwini River (ZMA 104.627).

Colour in alcohol: Ground colour tan. Dark brown blotch ventral to and on dorsal fin, extending from nuchal plate towards upper part of eighth dorsolateral body scute. On dorsal fin the blotch dorsally diminishes in intensity; upper parts of dorsal fin rays without pigment, except for spine and first soft ray in some paratypes. Dark brown mask present from supraoccipital ventrally across eyes. Scutes, especially dorsal ones, bordered with brown pigment posteriorly. Remaining fins, rictal barbels, and ventral body region dirty white. Intercoracoid area naked.

Discussion. — The type locality is here restricted to the Sipaliwini River near the Brazilian border (Paru Savanna), based on data found on maps sent by Mr. H. P. Pijpers (wireless operator during construction of the airstrip on the Sipaliwini Savanna).

I doubt whether the locality "surroundings Paramaribo, pool with *Lotus* species at road to Kwatta" (ZMA 104.627) (Nijssen & Isbrücker, 1967: 36) is correct. I visited this place but no representatives of the genus *Corydoras* could be collected. The type specimens of *C. bicolor* are no doubt juvenile specimens. The only adult specimen (RMNH 24814) shows a smaller head (3.2) and a broader intercoracoid area (2.3). *C. bicolor* is most closely related to *C. melanistius* Regan, 1912, from (British) Guyana, but differs from this species by the lack of pigment spots on the body and head.

Corydoras boesemani Nijssen & Isbrücker, 1967 (figs. 6, 26e, 39)*

Type locality: Surinam: district Brokopondo, Suriname river system, "little tributaries of Gran Rio between Ligolio and Awaradam Falls" (original designation).

Corydoras paleatus; (non Jenyns, 1842) Van der Stigchel, 1946: 127—128 (in part); Surinam: Lucie River (description).
Corydoras boesemani Nijssen & Isbrücker, 1967: 37—38, fig. 4c, pl. 4 fig. 1 (original description; Surinam: Gran Rio and Lucie River).

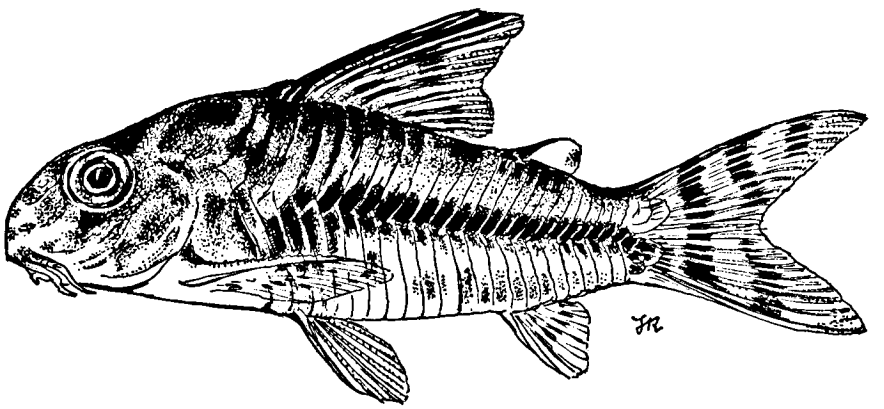

FIG. 6. *C. boesemani* Nijssen & Isbrücker, 1967. Paratype, 39.9 mm sl. Tributary of the Gran Rio (ZMA 104.638).

The following material is additional to that listed by Nijssen & Isbrücker (1967 : 37):

Surinam, district Brokopondo, Suriname river system:

96 specimens, 25.2—41.6 mm sl, from sidecreeks of the Gran Rio, collected by H. Nijssen (28-I/1-II-1967), viz., 91 topotypes from creeks 2.5—4.0 km northeast of the northeastern part of the Awaradam (= Awadam) (ZMA 105.415, 105.419, 105.427, USNM 203811, IRScNB 16583, NMW) and five specimens from the Granmau Creek, 13 km southwest of Djoemoe (ZMA 105.400).

district Nickerie, Corantijn river system:

4 specimens 29.6—38.9 mm sl; Lucie River at junction with Oost River 03° 32′ N; 56° 29′ W), coll. H. P. Pijpers, 26-VII-1963, ex Surinam Museum, Paramaribo (RMNH 25813).

Description. —

Morphometric and meristic data based on 12 topotypes (ZMA 105.419). sl 30.2—40.0 mm; bd 2.7—2.9; bw 3.7—4.0; lds 3.0—3.9; lps 2.9—3.7; sop 2.2—2.4; sna 1.8—2.0; snd 1.9—2.1; snp 3.2—3.6; hl 3.0—3.3; sn 2.0—2.2; Imo 2.8—3.3; wi 2.5—2.9; ca 2.2—2.7; dcp 1.9—2.2; pas 3—4; dbs/vbs 23—24/20—21; D I,6—7; A i,5—6; P_1 i,5; P_2 I,8—9; C 7/7.

* See also addendum.

Colour in alcohol: Ground colour tan. Scattered black pigmentation present on head and body, becoming paler towards ventral region. Oblique slender black mask present across eyes. Anterior part of nuchal plate dark brown. A broad black stripe extends across junctions of lateral body scutes from fifth dorsolateral scute to base of caudal fin. This stripe originates on second ventrolateral scute and becomes narrower as it extends across scute junctions. At base of caudal fin this stripe widens, covering small irregular scutes posterior to last ventrolateral body scute. On dorsal parts of dorsolateral body scutes pigmentation forms irregular blotches. Spine and first soft ray of dorsal fin black. First soft dorsal fin ray may be prolonged into a rather long filament, reaching beyond tip of adipose spine. Minute spots present on remaining dorsal fin rays, adipose, anal, and pectoral fins, and on dorsal rictal barbels. Caudal fin bears two broad black vertical bars, and a third vertical bar on each lobe. Intercoracoid area naked.

Discussion. — The RMNH material of the genus *Corydoras* was returned to Leiden in April 1966. However, two paratypes of *C. boesemani* (RMNH 17283) from the Lucie River could not be refound during the summer of 1967. The third specimen of that series, donated by Leiden to the Zoölogisch Museum, Amsterdam (ZMA 104.626) was returned to Leiden (RMNH 25789). *C. boesemani* seems related to *C. axelrodi* Rössel, 1962, said to be originated from the Rio Meta. I have examined the holotype (SMF 5700) and the two paratypes (SMF 5701-02) of *C. axelrodi*. *C. boesemani* has a lesser body depth, a narrower interorbital width, and a different organization of the stripe and spots on the body. Moreover, *C. boesemani* has two broad black bars on the caudal fin, lacking in *C. axelrodi*.

Corydoras bondi bondi Gosline, 1940 (figs. 7, 26i, 38)

Type locality: Venezuela, Rio Yuruari, 3 km east of El Callao (original designation).

Corydoras bondi Gosline, 1940: 20 (original description; Venezuela: Rio Yuruari and Rio Carichapo, a tributary to Rio Yuruari; no figure).
Myers, 1942: 99, fig. 7 (drawing of a paratype).
Schultz, 1944: 277 (key, after Gosline), 288 (references).
Gosline, 1945: 75 (listed).
Fraser-Brunner, 1947: 244 (British Guiana: Apaikwa).
Böhlke, 1953: 45 (type specimens listed).
Nijssen & Isbrücker, 1967: 34, fig. 3h, pl. 2 fig. 3 (Surinam: Sipaliwini River; British Guiana: Rupununi River).
Hoedeman, 1968: 85 (photograph of three specimens from Surinam: Sipaliwini River).

Corydoras punctatus sipaliwini Hoedeman, 1965: 87, fig. 46, 1—3 (nomen nudum).

The following material is additional to that listed by Nijssen & Isbrücker (1967 : 34):

Surinam, district Nickerie, Corantijn river system:

Sipaliwini River near airstrip, collected by G. F. Mees, 26-I/2-II-1966: 4 specimens, 42.9—45.9 mm sl (RMNH 25811, 25812, ZMA 105.892).

district Marowijne, Marowijne river system:

Creek along airstrip Paloemeu, near junction of Paloemeu River with Tapanahony River, 3 specimens, 22.6—32.9 mm sl, collected by L. Wolf, 29-XII-1966 (ZMA 105.848).

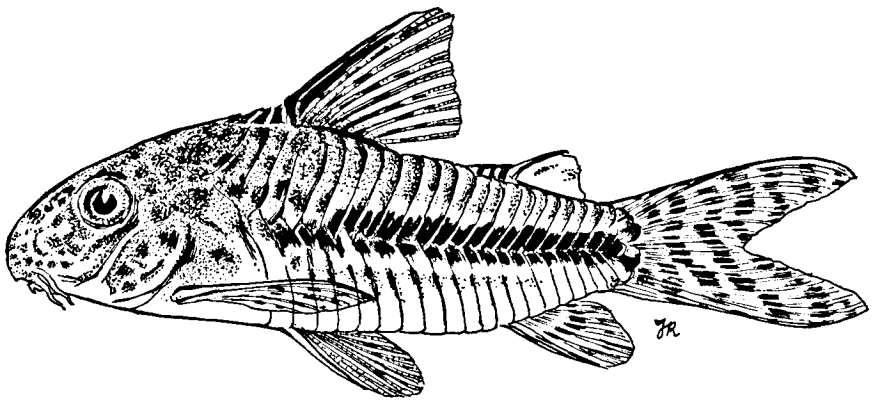

FIG. 7. *C. bondi bondi* Gosline, 1940, 44.0 mm sl. Sipaliwini River (ZMA 105.892).

Description. —

Morphometric and meristic data based on 12 specimens (ZMA 104.278, 105.892, RMNH 25811, 25812), and three specimens (ZMA 105.848). sl 22.5—45.9 mm; bd 2.6—3.0; bw 3.4—3.8; lds 2.7—3.6; lps 2.9—3.4; sop 2.1—2.4; sna 1.8—1.9; snd 1.9—2.1; snp 3.2—3.6; hl 3.1—3.4; sn 2.0—2.2; lbo 2.5—3.1; wi 2.3—2.6; ca 2.2—2.9; dcp 2.0—2.2; pas 2—4; dbs/vbs 23—24/20—21; D I,7; A i,6; P_1 i,5; P_2 I,8—9; C 7/7.

Colour in alcohol: Ground colour tan. Head covered with black spots. In some specimens an oblique black line covers preopercle ventral to eye. A broad black stripe extends across junctions of lateral body scutes, dorsally from fifth or sixth dorsolateral scute and ventrally from second ventrolateral scute, to base of caudal fin. A black blotch covers anterior part of nuchal plate, predorsal scutes, dorsal spine, and first soft dorsal fin ray. Irregular spots cover dorsolateral body scutes, decreasing in number posteriorly. These dorsal scutes bordered posteriorly with black pigment, in most specimens chiefly on dorsal parts of each scute, leaving an unpigmented area just dorsal to black stripe across scute junctions. Ventrolateral scutes bordered with pigment along the central parts of their posterior edges. Some irregular blotches present on anterior part of cleithrum and around otic region. Scattered small spots on remaining rays of dorsal fin, on adipose fin, and on rays of anal, pelvic, and pectoral fins. In some specimens pigmentation on pelvic fins is lacking. Spots present on caudal rays forming four to six irregular vertical bars. This pigmentation pattern differs from specimen to specimen. Dorsal rictal barbels greyish. Intercoracoid area naked.

Discussion. — The material from Surinam has been compared with nine paratypes (SU 35066), as shown in the bar diagrams. The holotype (SU 35065) was examined by the author in Washington. The material from the Corantijn river system and the three specimens from the Paloemeu River belong to the nominate subspecies. The two specimens of *C. bondi* mentioned by Fraser-Brunner (1947 : 244) from Apaikwa, (British) Guyana (BMNH 1936.4.4.34/35), and the specimen from the Rupununi River (SMF 6759), mentioned by Nijssen & Isbrücker (1967 : 34), also belong to the nominate subspecies.

Corydoras bondi coppenamensis new subspecies (figs. 8, 25i, 38)

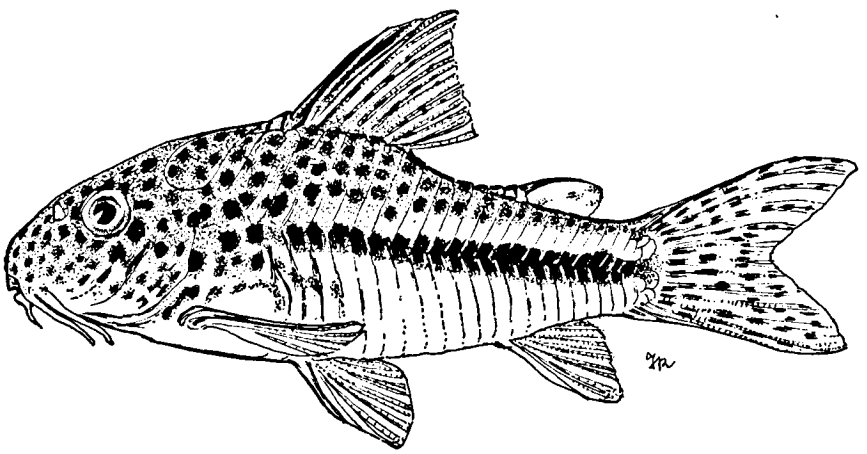

FIG. 8. *C. bondi coppenamensis* new subspecies. Paratype 36.5 mm sl. Coppename River (ZMA 105.872).

Surinam, district Saramacca, Coppename river system:

Holotype: ZMA 105.877, 35.0 mm sl; creek at left bank of Coppename River (03° 52′ N, 56° 55′ W), width 4 m, depth 0.3 to 1.0 m, bottom muddy sand, running water, coll. H. Nijssen, 18-V-1967.

Paratypes: ZMA 105.872, 239 specimens, 28.3—41.1 mm sl; same data as ZMA 105.877 (5 specimens deposited in USNM 202129, 8 in IRScNB 467, and 9 in NMW 61106).

ZMA 105.873, 192 specimens, 17.0—43.8 mm sl; creek at left bank of Left Coppename River (03° 54′ N, 56° 46′ W), width 4 m, depth 0.3 to 1.5 m, sand, rocks, mud, coll. H. Nijssen, 9-V-1967.

ZMA 105.874, 142 specimens, 28.6—45.0 mm sl; creek at right bank of Left Coppename River (03° 51′ N, 56° 45′ W), width 5 m, depth 0.2 to 1.0 m, running water, bottom with sand, gravel and rocks, coll. H. Nijssen, 10-V-1967.

ZMA 105.858, 1 specimen, 39.2 mm sl; Coppename River (03° 49′ N, 56° 57′ W), width 10 to 15 m, depth 1.5 to 4.0 m, bottom with sand, coll. H. Nijssen, 17-V-1967.

ZMA 105.875, 9 specimens, 34.8—42.5 mm sl; creek at right bank of Coppename River (03° 52′ 30″ N, 56° 53′ W), width 3.0 to 5.0 m, depth 0.5 to 2.0 m, bottom muddy sand, running water, coll. H. Nijssen, 19-V-1967.

Description. —

Morphometric and meristic data of holotype, bd 13.4 mm (2.6); bw 9.4 mm (3.7); lds 8.9 mm (3.9); lps 10.4 mm (3.4); sop 15.4 mm (2.3); sna 19.2 mm (1.8); snd 17.5 mm (2.0); snp 10.2 mm (3.4); hl 10.9 mm (3.2); sn 5.2 mm (2.1); lbo 3.4 mm (3.2); wi 4.5 mm (2.4); ca 4.2 mm (2.6); dcp 5.0 mm (2.2); pas 4; dbs/vbs 23/20; D I,7; A i,6; P_1 i,5; P_2 I,8; C 7/7.

Morphometric and meristic data based on 12 paratypes (ZMA 105.872), sl 28.3—40.5 mm; bd 2.5—2.8; bw 3.4—3.7; lds 3.5—4.0; lps 3.0—3.5; sop 2.1—2.3; sna 1.7—1.9; snd 1.9—2.0; snp 3.1—3.4; hl 3.1—3.2; sn 2.0—2.1; lbo 2.9—3.4; wi 2.4—2.7; ca 2.2—2.8; dcp 2.0—2.2; pas 3—4; dbs/vbs 23—24/20—21; D I,7; A i,5—6; P_1 i,5; P_2 I,7—8; C 7/7.

Colour in alcohol: Ground colour tan. Head with round black spots extending over body. In some paratypes these spots form short irregular lines. Broad black stripe extends across lateral body scute junctions, dorsally from fifth or sixth dorsolateral scute, ventrally from second ventrolateral scute to base of caudal fin. In paratypes this stripe sometimes interrupted on first scutes or transformed in zig-zag line across scute junctions. No pigment on area just dorsal and ventral to black stripe, except for some scattered dots on first five ventrolateral scutes, in paratypes often forming more or less regular spotted line parallel to black stripe. Predorsal scute and dorsal spine black, same as dorsal part of first soft dorsal fin ray and the membrane before this ray. The first soft dorsal fin ray may be prolonged in a rather long filament in some paratypes. Remaining dorsal fin rays with scattered pigmentation, same as on adipose membrane. Scattered spots on caudal fin rays forming about four irregular vertical bars. In the paratypes this pattern differs from specimen to specimen, in extreme cases pigment is scarcely present along edges of caudal fin ray segments or is clearly present on principal rays, forming short stripes. No pigment on anal and pelvic fins. Pectoral spine and rays with scattered dots. Dorsal rictal barbels greyish. However, in some paratypes all six barbels may be pigmented. Holotype with right dorsal rictal barbel bifurcated. Short prickles cover area in front of and ventral to eyes, same as on opercle and pectoral spine. In females and juveniles these prickles absent, this character apparently being secondary sexual character of male. Intercoracoid area naked. Pores of lateral line extend to third dorsolateral scute.

Discussion. — The subspecies *C. bondi coppenamensis* differs principally from the nominal subspecies by its colour pattern, viz. circular spots on head and dorsal part of body instead of irregularly formed spots on head and body for *C. bondi bondi*. *C. bondi coppenamensis* also has somewhat smaller eyes and a shorter dorsal spine. The new subspecies is named after the Coppename River, where it was found.

Corydoras guianensis new species (figs. 9, 25e, 37)

Corydoras punctatus; (non Bloch, 1794) Boeseman, 1954: 21 (in part: Surinam, Upper Saramacca River, near Tugumutu).

Corydoras species, Nijssen & Isbrücker, 1967: 45 (in part: Surinam, upper course of Saramacca River, Toegoemoetoe).

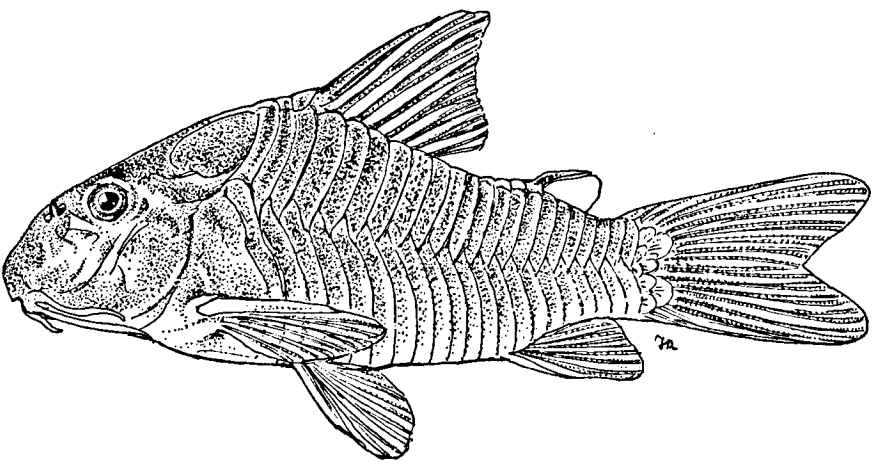

FIG. 9. *C. guianensis* new species. Holotype 39.0 mm sl. Nickerie River (ZMA 105.933).

Surinam, district Nickerie, Nickerie river system:

Holotype: ZMA 105.933, 39.0 mm sl; creek at right bank of Nickerie River, 12 km W.S.W. of Stondansie Fall, depth 0.5 to 1.0 m, width 5.0 m, running water, bottom sand, coll. H. Nijssen, 5-IV-1967.

Paratypes: ZMA 105.837, 130 specimens, 19.8—39.3 mm sl; same data as ZMA 105.933 (2 specimens deposited in USNM 204218, 31 in IRScNB 468, and 7 in NMW 61107).

ZMA 105.836, 4 specimens, 31.7—38.5 mm sl; rapid (= soela) in Fallawatra River, 5 km S.S.W. of Stondansie Fall, width 60 m, bottom sand and rocks, coll. H. Nijssen, 6-IV-1967.

district Saramacca, Coppename river system:

Paratypes: ZMA 105.887, 1 specimen, 24.1 mm sl; Coppename River (03° 49′ N, 56° 57′ W), depth 1.5 to 4.0 m, width 10 to 15 m, bottom sand, coll. H. Nijssen, 17-V-1967.

ZMA 106.101, 1 specimen, 27.0 mm sl; creek at left bank of Coppename River (03° 52′ N, 56° 55′ W), depth 0.3 to 1.0 m, width 4.0 m, running water, bottom muddy sand, coll. H. Nijssen, 18-V-1967.

district Brokopondo, Saramacca river system:

Paratypes: ZMA 105.888, 4 specimens, 24.1—27.7 mm sl; creek at right bank of Kleine Saramacca River, 11 km E.S.E. of the junction with the Saramacca River, depth 0.3 to 1.0 m, width 4.0 m, running water, bottom sand with rocks, coll. H. Nijssen, 27-II-1967.

RMNH 18499, 1 specimen, 28.0 mm sl; Toekoemoetoe (= Tugumutu = Toegoemoetoe) Creek at left bank of Saramacca River, 28 km S.S.W. of Poesoegroenoe, coll. P. J. de Kock, 23-II-1903. Recorded by Boeseman (1954), and by Nijssen & Isbrücker (1967).

Description. —

Morphometric and meristic data of holotype, bd 16.1 mm (2.4); bw 10.8 mm (3.6); lds 10.8 mm (3.6); lps 12.9 mm (3.0); sop 18.5 mm (2.1); sna 21.6 mm (1.8); snd 21.5 mm (1.8); snp 11.9 mm (3.3); hl 12.6 mm (3.1); sn 6.7 mm (1.9); lbo 3.7 mm (3.4); wi 5.7 mm (2.2); ca 4.8 mm (2.6); dcp 5.8 mm (2.2); pas 3; dbs/vbs 24/21; D I,7; A i,6; P_1 i,5; P_2 I,8; C 7/7.

Morphometric and meristic data based on 12 (ZMA 105.837) and 4 (ZMA 105.888) paratypes, sl 24.1—39.3 mm; bd 2.4—2.6; bw 3.5—3.9; lds 3.1—3.7; lps 2.9—3.4; sop 2.0—2.2; sna 1.8—1.9; snd 1.8—1.9; snp 3.0—3.3; hl 2.9—3.2; sn 1.9—2.2; lbo 2.7—3.4; wi 2.2—2.4; ca 2.3—2.9; dcp 2.0—2.2; pas 2—3; dbs/vbs 23—24/20—21; D I,7; A i,6; P_1 i,5; P_2 I,8; C 7/7.

Colour in alcohol: Ground colour tan. Dorsal part of head brown. Posterior edges of lateral body scutes with dark brown pigment, paler towards ventral body region. Dorsal, adipose, and pectoral fins with light brown pigment; anal and pelvic fins whitish, same as ventral body region. In four paratypes from the Kleine Saramacca River (ZMA 105.888) dorsal spine dark brown. The four paratypes from the Fallawatra River (ZMA 105.836) with denser pigment on body and head. Dorsal rictal barbels brownish. Intercoracoid area naked.

Discussion. — *C. guianensis* is possibly related to *C. polystictus* Regan, 1912, and to *C. virescens* Miranda Ribeiro, 1912, both species originating from the Mato Grosso, Brazil. The latter species was treated as a synonym of the former by Gosline (1940 : 24). I examined the two syntypes of *C. polystictus* (BMNH 1895.5.17.62-63), both of which differ from *C. guianensis* in having a shorter snout, a greater interorbital width, and a different colour pattern with longitudinal series of small dark spots on the sides of the body and on the dorsal fin rays. The holotype of *C. virescens*, probably preserved in Rio de Janeiro, was not available for examination. The colour pattern of *C. virescens* was described as being transparent uniform pale green in the living holotype. This colour never was found in freshly collected specimens of *C. guianensis*.

C. guianensis is found in three different river systems in Surinam and it may be expected to have a larger distribution area. It is named after the Guiana countries.

Corydoras heteromorphus new species (figs. 10, 25f, 39)

Surinam, district Saramacca, Coppename river system:

Holotype: ZMA 105.880, 48.1 mm sl; creek at right bank of Coppename River (03° 52′ 30″ N, 56° 53′ W), depth 0.5 to 2.0 m, width 3.0 to 5.0 m, bottom muddy sand, running water, coll. H. Nijssen, 19-V-1967.

Paratypes: ZMA 105.883, 55 specimens, 28.3—48.8 mm sl; same data as ZMA 105.880.

ZMA 105.881, 101 specimens, 29.0—53.0 mm sl; creek at left bank of Coppename River (03° 52′ N, 56° 55′ W), depth 0.3 to 1.0 m, width 4.0 m, running water, bottom muddy sand, coll. H. Nijssen, 18-V-1967 (2 specimens deposited in USNM 204224, and 6 in NMW 61108).

ZMA 105.884, 14 specimens, 35.6—48.4 mm sl; creek at left bank of Left Coppename River (03° 54′ N, 56° 46′ W), depth 0.3 to 1.5 m, width 4.0 m, sand, rocks, mud, coll. H. Nijssen, 9-V-1967.

ZMA 105.886, 1 specimen, 41.4 mm sl; Coppename River (03° 49′ N, 56° 57′ W), depth 1.5 to 4.0 m, width 10 to 15 m, bottom sand, coll. H. Nijssen, 17-V-1967.

district Nickerie, Nickerie river system:

Paratypes: ZMA 105.885, 11 specimens, 32.7—39.0 mm sl; creek at right bank of Nickerie River, 12 km W.S.W. of Stondansie Fall, depth 0.5 to 1.0 m, width 5.0 m, running water, bottom sand, coll. H. Nijssen, 5-IV-1967.

ZMA 105.835, 3 specimens, 35.6—47.7 mm sl; rapid (= soela) in Fallawatra River, 5 km S.S.W. of Stondansie Fall, width 60 m, bottom sand and rocks, coll. H. Nijssen, 6-IV-1967.

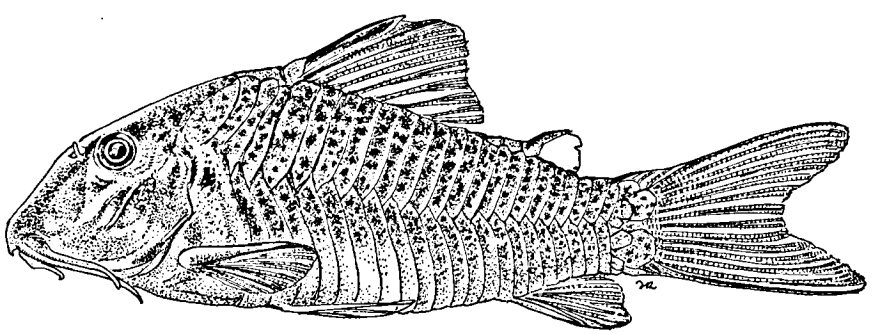

FIG. 10. *C. heteromorphus* new species. Holotype 48.1 mm sl. Coppename River (ZMA 105.880).

Description. —

Morphometric and meristic data of holotype, bd 17.8 mm (2.7); bw 12.3 mm (3.9); lds 10.6 mm (4.5); lps 11.3 mm (4.3); sop 21.9 mm (2.2); sna 25.2 mm (1.9); snd 24.9 mm (1.9); snp 13.9 mm (3.5); hl 16.0 mm (3.0); sn 9.1 mm (1.8); lbo 4.4 mm (3.6); wi 5.6 mm (2.9); ca 5.6 mm (2.9); dcp 6.8 mm (2.4); pas 3; dbs/vbs 25/22; D I,7; A i,6; P_1 i,5; P_2 I,8; C 7/7.

Morphometric and meristic data based on 12 (ZMA 105.883) and 5 (ZMA 105.885) paratypes, sl 28.3—47.6 mm; bd 2.7—3.0; bw 3.9—4.3; lds 4.0—4.6; lps 3.5—4.3; sop 2.1—2.3; sna 1.8—1.9; snd 1.9—2.0; snp 3.1—3.5; hl 2.8—3.1; sn 1.7—1.9; lbo 3.0—3.8; wi 2.8—3.3; ca 2.3—3.0; dcp 2.2—2.6; pas 3—6; dbs/vbs 24—25/21—22; D I,7; A i,5—6; P_1 i,5—6; P_2 I,8—10; C 7/7.

Colour in alcohol: Ground colour tan. Head and body with minute greyish brown spots, most densely placed on dorsal parts of head and dorsolateral body scutes. Pigmentation varies from widely scattered small spots to pattern where these spots are forming more or less vertical dotted lines, particularly on dorsolateral scutes. Spine and first soft dorsal fin ray greyish. Remaining rays scarcely pigmented. Adipose and pectoral spines greyish. Caudal fin with pigmentation on outermost principal rays only. Anal and pelvic fins tan, same as ventral body region. Some paratypes with irregular spots on central caudal fin rays. Dorsal rictal barbels greyish. Intercoracoid area naked.

Discussion. — *C. heteromorphus* seems to be related to *C. spilurus* Norman, 1926, from French Guiana, and to *C. griseus deweyeri* Meinken, 1957, from (British) Guyana (locality questionable). I was able to examine the types of both species. *C. spilurus* (lectotype BMNH 1926.3.2.738, and 7 paralectotypes BMNH 1926.3.2.739—744) is easily distinguishable from *C. heteromorphus* by having a serrate inner edge of the pectoral spine, lacking in *C. heteromorphus*. *C. griseus deweyeri* (lectotype ZMH 1186, and paralectotype ZMH 1187) differs from *C. heteromorphus* by having a black mask across the eyes and a different colour pattern on the body. The name *C. heteromorphus* is given because of several characters of this species being intermediate between the blunt-snouted and the long-snouted groups in the genus *Corydoras*.

Corydoras nanus Nijssen & Isbrücker, 1967 (figs. 11, 25d, 38)

Type locality: Surinam, district Brokopondo, Suriname river system, "little tributaries of Gran Rio between Ligolio and Awaradam Falls" (original designation).

Corydoras nanus Nijssen & Isbrücker, 1967: 41—42, fig. 4f, pl. 5 fig. 1 (original description; Surinam: Gran Rio).

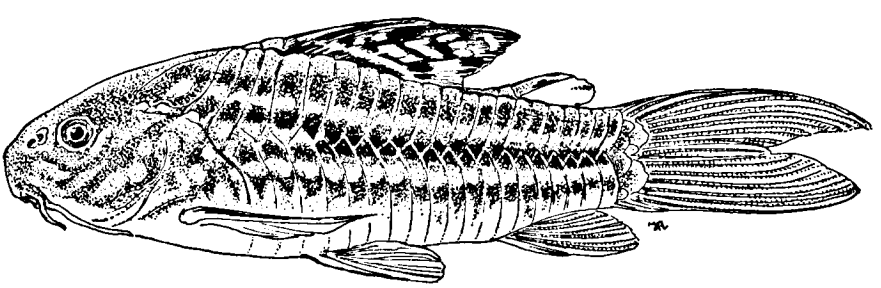

FIG. 11. *C. nanus* Nijssen & Isbrücker, 1967, 43.1 mm sl. Oelemari River (ZMA 108.417).

The following material is additional to that listed by Nijssen & Isbrücker (1967 : 41).

Surinam, district Marowijne, Marowijne river system:
2 specimens, 44.7 and 43.1 mm sl (IRScNB 16584, a ♀?, and ZMA 108.417, a ♂?, respectively), little creek at right bank of Oelemari River, in Wajarikoele region, collected by J. P. Gosse (14-XI-1966).

Description. —

Morphometric and meristic data based on the two specimens listed above, and, in parentheses, on seven juvenile type specimens (RMNH 25333, 25334, ZMA 104.642).
sl 43.1—44.7 (17.8—23.4) mm; bd 2.8—3.0 (2.7—3.1); bw 4.1—4.2 (3.8—4.7); lds 3.6—4.2 (4.3—4.8); lps 2.9—3.5 (3.4—4.2); sop 2.7 (2.4—2.6); sna 1.9 (1.8—1.9); snd 2.1—2.2 (2.0—2.1); snp 3.8—3.9 (3.2—3.8); hl 3.6—3.8 (3.3—3.5); sn 2.2—2.3 (2.3—2.5); lbo 3.3—3.5 (2.8—3.2); wi 2.0 (2.0—2.2); ca 3.1—3.6 (2.7—3.5); dcp 1.8—2.0 (1.5—1.7); pas 5 (3—5); dbs/vbs 23/20—21 (23—24/20—21); D I,7; A i—ii,5—6; P_1 i,5; P_2 I,8—9; C 7/7.

Colour in alcohol: Holotype and six paratypes from Gran Rio with tan ground colour. Two parallel brown stripes on body, viz. a broad dorsal stripe extending from nuchal plate to caudal fin base, and a slender stripe extending across scute junctions from dorsal part of cleithrum to caudal fin base. One or two rows of irregular small spots on ventrolateral scutes. Unpigmented areas between stripes. Most specimens with another unpigmented area dorsal to broader stripe, bordered dorsally by slender brown line extending between dorsal and adipose fin. Dorsal part of head and area around eyes dark brown, not forming a mask. Rictal barbels dark brown. Dorsal, adipose, and pelvic fins reddish brown. Caudal, anal, and pectoral fins greyish. Tan intercoracoid area naked. Lateral body scutes not completely developed, viz., dorsolateral scutes do not meet each other along middorsal line between dorsal fin and preadipose scutes: a juvenile character. The caudal fin of largest specimen with four indistinct vertical bars.

The two specimens from the Oelemari River seem to represent a male and a female. In these specimens the stripe across junctions of lateral body scutes is broadest. Parallel and dorsal to this stripe from scute junctions to middorsal line are present: a narrow tan zone from nuchal plate to caudal fin base, a brown stripe, and a greyish brown zone from ventral part of occipital to caudal fin base. Parallel and ventral to broad stripe across junctions are present: a narrow tan zone, and a row of irregular brown dots. In supposed female a dark brown blotch covers first five soft dorsal fin rays. Ventral parts of dorsal spine and all soft dorsal fin rays tan. Dorsal fin of the other specimen with irregular pattern shown in fig. 11. Head evenly brown. Some tan spots present on a dark cleithrum. Pectoral spine, and rays of pectoral, caudal, and anal fins greyish. Scattered brown pigment on rictal barbels and adipose fin. Pectoral spines covered with skin with numerous prickles.

Discussion. — After having seen many juvenile specimens of other species of the genus *Corydoras* I must admit that all type specimens of *C. nanus* are

juveniles, and that therefore the specific name is not well chosen. A good juvenile character seems to be a middorsal groove between the dorsal and adipose fins, caused by incompletely developed dorsolateral body scutes, which do not yet meet on the middorsal line. Neither Mees nor the author did succeed in collecting more specimens of *C. nanus* on the type locality. Ten days spent collecting with chemical fish poison in the little tributaries of the Gran Rio between Ligolio and the Awaradam Falls provided the sympatric species *C. aeneus, C. boesemani,* and *C. punctatus* only. The differences shown in bar diagrams between the types and the two adult specimens from the Oelemari River are caused by a difference in age. In other species the presence of juveniles in a sample together with adults causes the variation shown in some measurements, for instance a larger head in proportion to the standard length and a larger eye in proportion to the head length.

C. nanus is related to *C. elegans* Steindachner, 1877, from the Rio Amazonas near Cudajas, Brazil, of which I examined many syntypes (NMW 46729-30, MNHN 89-276-279, USNM 41531-32). *C. nanus* has, in comparison with *C. elegans,* a lesser body depth and a longer snout.

Corydoras octocirrus new species (figs. 12, 13, 25a, 25b, 39)

Corydoras spilurus; (non Norman, 1926) Nijssen & Isbrücker, 1967: 33 (in part: Surinam, Suriname river system).

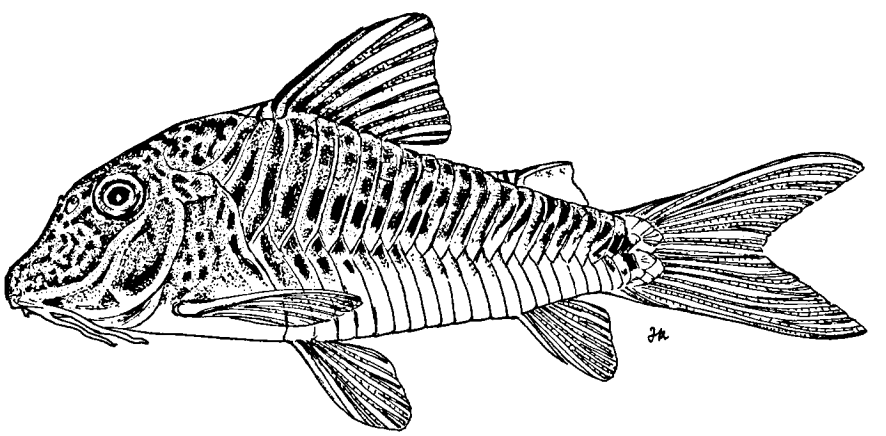

FIG. 12. *C. octocirrus* new species. Paratype ♀ 61.0 mm sl. Marchall Creek (ZMA 105.367).

Surinam, district Brokopondo, Suriname river system:

Holotype: ZMA 106.017, ♂, 65.7 mm sl; Marchall Creek, East of the road Paranam-Afobaka, 1.5 km North of Marchall Village, depth 1.2 m, running water, bottom with gravel and mud, coll. H. Nijssen, 8-XII-1966.

Paratypes: ZMA 105.367, 23 specimens, 38.2—65.2 mm sl; same data as ZMA 106.017 (2 specimens deposited in USNM 204222, and 3 in IRScNB 469).

RMNH 25799, 4 specimens, 50.6—59.2 mm sl; Marchall Creek, coll. G. F. Mees, 28-XII-1965.

RMNH 25806, 4 specimens, 28.7—53.9 mm sl; sidecreek of Mama Creek near Berg en Dal, coll. G. F. Mees, 12-III-1966.

15 specimens from the Compagnie Creek, collected by G. F. Mees, 20.6—64.6 mm sl; 19-XII-1965 (RMNH 25795: two specimens); 15-III-1966 (RMNH 25808: four specimens, ZMA 105.891: two specimens); 18-X-1965 (RMNH 25338: four specimens, ZMA 104.655: two specimens); 5-IX-1965 (RMNH 25339: one specimen).

RMNH 25337, 1 specimen, 46.8 mm sl; Suriname River and creeks near Brokopondo, coll. M. Boeseman, 5-I-1964.

ZMA 105.238, 5 specimens, 30.3—41.1 mm sl; Marowijne (= Gran) Creek, 63 km South of the dam at Afobaka, running water, bottom sand, coll. H. Nijssen, 20-X-1966.

ZMA 105.237, 3 specimens, 36.9—41.9 mm sl; Sara Creek, 27 km South of the village Dam, depth 1.5 m, running water, bottom with rocks, sand and mud, coll. H. Nijssen, 14-X-1966.

RMNH 25791, 2 specimens, 54.5—58.4 mm sl; Kwambaolo Creek at right bank of Sara Creek, South of Dam, coll. M. Boeseman, 28-XII-1963.

district Marowijne, Marowijne river system:

Paratypes: IRScNB 471, 1 specimen, 50.0 mm sl; creek at left bank of Oelemari River near airstrip, coll. J. P. Gosse, 10-XI-1966.

IRScNB 474, 6 specimens, 39.6—48.2 mm sl; fall in Oelemari River, one day travelling by boat upstream of Oelemari airstrip, coll. J. P. Gosse, 15-XI-1966 (3 specimens deposited in ZMA 109.066).

French Guiana, Marowijne river system:

Paratypes: ZMA 105.871, two specimens, 25.2—41.7 mm sl; Kamaloea or Saloea Creek, at right bank of Marowijne River, 9 km S.E. of outlet of Gran Creek (district Marowijne in Surinam), depth 0.3 to 2.0 m, width 4—8 m, coll. H. Nijssen, 24-IV-1967.

Surinam:

non-paratypes: RMNH 25817, 2 specimens, 44.1—50.3 mm sl; in bad state of preservation, said to be collected in the Saramacca River near Mamadam Fall, leg. Heyde, 12-II-1964, ex Surinam Museum (probably collected in the Suriname River, see discussion under *C. punctatus*).

Description. —

Morphometric and meristic data of holotype, bd 22.8 mm (2.9); bw 14.9 mm (4.4); lds 17.6 mm (3.7); lps 27.4 mm (2.4); sop 28.4 mm (2.3); sna 35.4 mm (1.9); snd 33.3 mm (2.0); snp 19.6 mm (3.5); hl 22.1 mm (3.0); sn 14.5 mm (1.5); lbo 4.9 mm (4.5); wi 5.4 mm (4.1); ca 5.5 mm (4.0); dcp 8.4 mm (2.6); pas 3; dbs/vbs 26/23; D I,7; A ii,5; P_1 i,6; P_2 I,10; C 7/7.

Morphometric and meristic data based on 17 (ZMA 105.367: 6 ♂♂, 6 ♀♀, 5 juv.) and 6 (IRScNB 474, ZMA 109.066) paratypes, sl 38.7—65.9 mm; bd 2.7—3.0; bw 4.1—4.8; lds 3.7—4.9; lps 2.1—4.9; sop 2.1—2.4; sna 1.8—1.9; snd 1.9—2.0; snp 3.2—3.7; hl 2.8—3.0; sn 1.5—1.7; lbo 3.9—4.6; wi 3.7—4.2; ca 2.8—4.2; dcp 2.5—2.8; pas 2—4; dbs/vbs 24—26/22—24; D I,7; A i—ii,5—6; P_1 i,5—6; P_2 I,9—10; C 7/7.

Colour in alcohol: Ground colour tan. Head, snout, nuchal plates, and cleithra marbled with light grey. On most dorsolateral body scutes grey pigment in more or less regular vertical bars. Sometimes this extends in grey pigmentation on anterior scutes of ventral row. Caudal peduncle with indistinct dark grey blotch. Dorsal fin, pectoral spines, and outer principal caudal fin rays with scattered grey pigment. Remaining fins tan. Rictal barbels tan except for dorsal barbels which are grey. Next to three pairs of barbels normally found in other species of *Corydoras*, a fourth pair is present. They can only be observed, when lifting the other rictal barbels

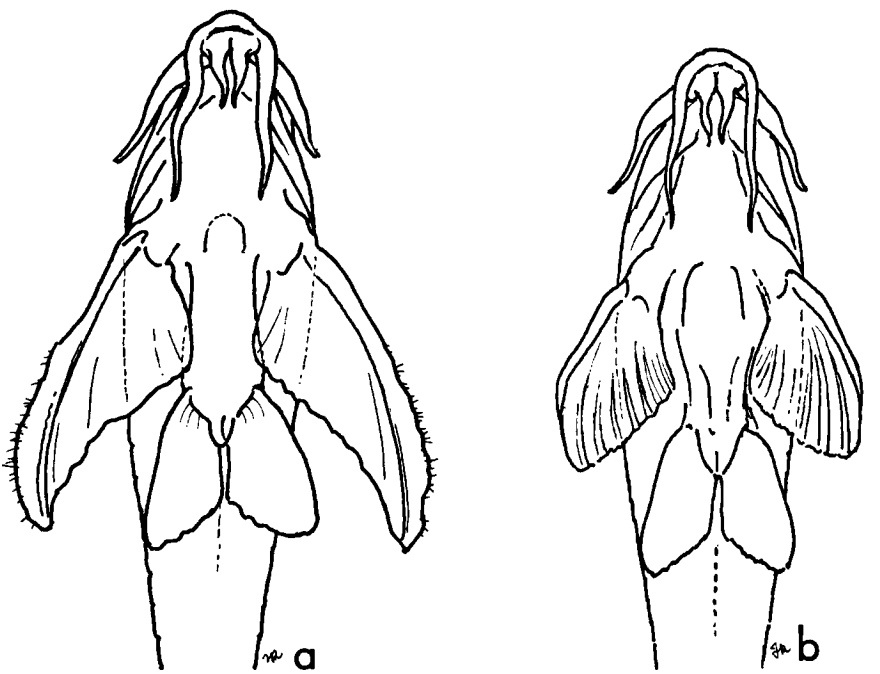

FIG. 13. *C. octocirrus* new species. Ventral view showing sexual dimorphism in pectoral spines. a, male (holotype) 65.7 mm sl (ZMA 106.017); b, female (paratype) 61.0 mm sl (ZMA 105.367), both from Marchall Creek.

in the direction of the snout. Pectoral spine very long in males and seems to become thicker to tip, due to thick skin with numerous prickles (fig. 13a). No prickles on cheeks. In many topotypical paratypes anterior part of opercle with even dark grey pigment. The marbled grey pattern on the snout is sometimes nearly visible, as is the blotch on caudal peduncle. Juveniles usually coloured evenly greyish with some traces only of the adult pattern. Largest specimen from Kamaloea (= Saloea) Creek differs from topotypical paratypes in having small and well defined dark grey spot on base of first two soft dorsal fin rays and slender grey stripe between dorsal fin and pre-adipose scutes. Smallest specimen from Kamaloea Creek with faint pigment on dorsal and caudal fin rays. Some specimens from Oelemari River differ from those described above in having small dark brown spot just posterior

to origin of dorsal spine and in having small brown stripe across lateral scute junctions extending from fifth dorsolateral scute to caudal fin base. Of these specimens the ventrolateral scutes lack pigment. Dorsal to this small brown stripe, pigment is also lacking on lower parts of dorsolateral scutes, resulting in a narrow tan zone from eleventh to last scute.

Discussion. — The name *C. octocirrus* is alluding to the presence of a third pair of rictal barbels. In other *Corydoras* species, except for *C. septentrionalis* Gosline, 1940, and *C. octocirrus*, only two pairs of rictal barbels are present, next to the single pair of mental barbels. Although this third pair of rictal barbels. In other *Corydoras* species, except for *C.* two longer pairs of rictal barbels in the direction of the snout. Even in juvenile specimens this third pair of rictal barbels can clearly be distinguished. In an earlier paper (1967 : 33) on *Corydoras* we identified some Surinam specimens (one adult female and seven juveniles) as belonging to the species *C. spilurus*, of which I examined the lectotype (BMNH 1926.3.2.738) and a paralectotype. I failed to examine the barbels of the Surinam specimens, since they did not seem to be of much importance at that moment. After having caught a large series of adult specimens in Surinam, both males and females, many differences with *C. spilurus* (of which I examined the type material again at London) were noted, including the presence of supernumerous barbels in *C. octocirrus*. This is the more striking as this character was present only in one (*C. septentrionalis*) of the eighty-odd different species of the genus *Corydoras* I studied hitherto. However, I should like to stress that some of the long-snouted species (*C. treitlii, C. spilurus, C. oxyrhynchus, C. saramaccensis*) have a triangular skin notch in the same place as where *C. octocirrus* has its third pair of rictal barbels. This notch could be considered an intermediate phase between the presence or absence of a third pair of rictal barbels, so that the presence of this third pair cannot be used as a character of generic importance. *C. octocirrus* is possibly related to *C. septentrionalis*, but differs from this species in having enlarged pectoral spines in the males, a larger head, a longer snout, a narrower interorbital width, and a different colour pattern on head and body. Of *C. septentrionalis* I examined the holotype (SU 35055) and 22 paratypes (SU 35056-59) from Venezuela.

Corydoras oelemariensis new species (figs. 14, 25g, 37)

Surinam, district Marowijne, Marowijne river system:

Holotype: IRScNB 472, 41.1 mm sl; creek at left bank of Oelemari River, near airstrip, coll. J. P. Gosse, 10-XI-1966.

Paratypes: IRScNB 473, 82 specimens, 24.7—42.5 mm sl; same data as IRScNB 472. ZMA 108.111, 82 specimens, 21.4—46.8 mm sl; same data as IRScNB 472 (two specimens deposited in USNM 204221).

Description. —

Morphometric and meristic data of holotype, bd 16.0 mm (2.6); bw 10.9

mm (3.8); lds 12.3 mm (3.3); lps 13.3 mm (3.1); sop 19.0 mm (2.2); sna 22.8 mm (1.8); snd 21.7 mm (1.9); snp 13.1 mm (3.1); hl 13.6 mm (3.0); sn 7.2 mm (1.9); lbo 4.0 mm (3.4); wi 5.4 mm (2.5); ca 4.6 mm (3.0); dcp 5.9 mm (2.3); pas 3; dbs/vbs 23/20; D I,7; A i,6; P_1 i,5; P_2 I,8; C 7/7.

Morphometric and meristic data based on 12 paratypes (ZMA 108.111), sl 30.5—46.8 mm; bd 2.4—2.7; bw 3.4—3.9; lds 3.1—3.8; lps 2.9—3.7; sop 2.1—2.2; sna 1.8; snd 1.9; snp 3.1—3.3; hl 3.0—3.1; sn 1.8—2.0; lbo 3.1—3.6; wi 2.4—2.8; ca 2.7—3.5; dcp 2.1—2.4; pas 3—4; dbs/vbs 23—24/20—21; D I,6—7; A i,6; P_1 i,5; P_2 I,8—9; C 7/7.

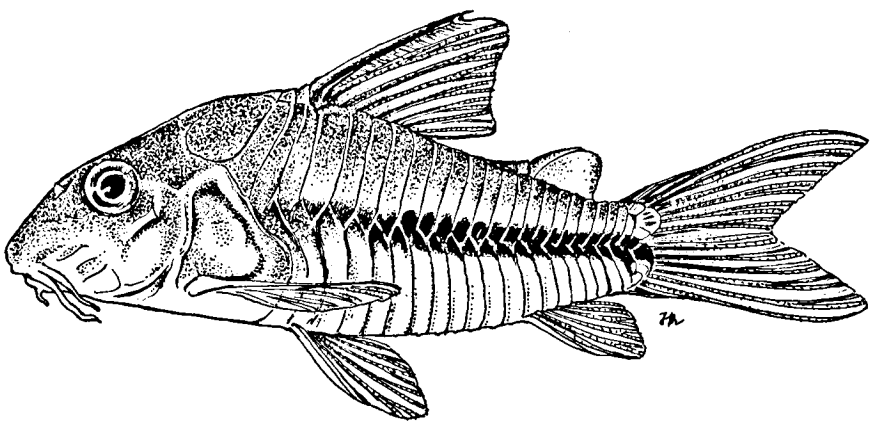

FIG. 14. *C. oelemariensis* new species. Paratype 40.7 mm sl. Oelemari River (ZMA 108.111).

Colour in alcohol: Ground colour tan. Scattered greyish brown pigmentation on snout, around and dorsal to eyes and on supraoccipital. This pigmentation also covers dorsolateral body scutes, but disappears on lower parts of posterior scutes. On ventrolateral body scutes pigment chiefly on anterior scutes. Broad black stripe extends across scute junctions from fourth or fifth dorsolateral scute to base of caudal fin. This stripe more densely pigmented and sharply bordered posteriorly, sometimes extending with some pigment on caudal fin rays. In a few paratypes one or two small black spots occur ventral to dorsal fin on dorsolateral body scutes. Fins evenly coloured without pigment, except for some caudal fin rays as mentioned above. Ventral region whitish and intercoracoid area naked. Dorsal rictal barbels with widely scattered greyish pigment.

Discussion. — *C. oelemariensis* is nearest to *C. bondi bondi* and *C. bondi coppenamensis* from which forms it differs by having a greater body depth, a larger head, a longer snout, and a lack of many black spots on body and head. The species is named after the Oelemari River, where it was found.

Corydoras osteocarus Böhlke, 1951 (figs. 15, 26d, 38)

Type locality: Venezuela, "San Fernando de Atabapo, where the Rio Atabapo empties into the Orinoco" (original designation).

Corydoras osteocarus Böhlke, 1951: 824—827 (original description; Venezuela: San Fernando de Atabapo, where the Rio Atabapo empties into the Orinoco; no figure).
Nijssen & Isbrücker, 1967: 34—35, fig. 3i, pl. 3 fig. 1 (Surinam: Kabalebo River).

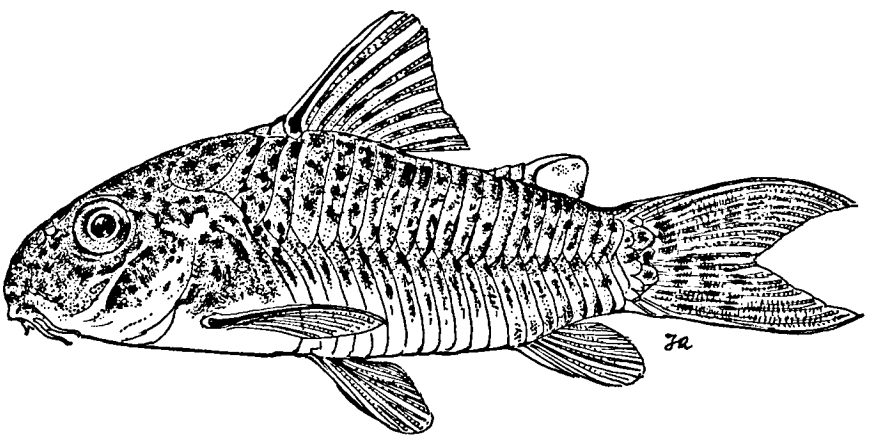

FIG. 15. *C. osteocarus* Böhlke, 1951, 33.3 mm sl. Kabalebo River (ZMA 104.654).

Description. —

Morphometric and meristic data based on four specimens (RMNH 25335, ZMA 104.654); sl 28.3—35.1 mm; bd 2.7—2.8; bw 3.7—4.0; lds 2.9—3.3; lps 2.7—3.3; sop 2.1—2.2; sna 1.8; snd 1.9—2.0; snp 3.3—3.5; hl 3.2; sn 2.0—2.4; lbo 2.5—3.0; wi 2.5—2.7; ca 2.4—2.7; dcp 2.1; pas 3; dbs/vbs 22—24/20—21; D I,7; A i—ii,5—6; P_1 i,5; P_2 I,7—8; C7/7.

Colour in alcohol: Ground colour tan. Scattered greyish brown pigmentation on head and body, paler towards ventral body area. Irregular brown spots on head, dorsolateral body scutes, and caudal fin rays. This pigmentation seems to form small irregular blotches, viz., on anterior part of nuchal plate, ventral to last dorsal fin ray, and ventral to base of adipose fin membrane. Grey pigmentation on all fins, except for pelvic fins. On caudal fin rays three indistinct vertical bars may occur. Intercoracoid area naked.

Discussion. — The Surinam material was compared with three paratypes from Venezuela, two from CAS 20563, and one from USNM 157367 (ex SU 16334). Moreover, I saw the holotype (SU 16333) and two other paratypes (CAS 20563) during a visit to Washington and San Francisco in summer 1967.

Corydoras oxyrhynchus Nijssen & Isbrücker, 1967 (figs. 16, 26a, 39)

Type locality: Surinam, Saramacca river system, Gojo Creek, 6 km South of Poesoegroenoe (original designation).

Corydoras oxyrhynchus Nijssen & Isbrücker, 1967 : 42—43, fig. 4e, pl. 4 fig. 3 (original description; Surinam: Gojo Creek, tributary of Saramacca River).

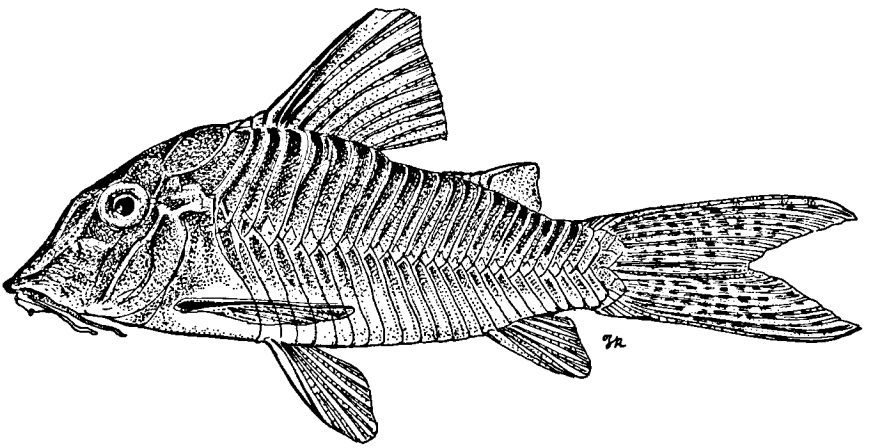

FIG. 16. *C. oxyrhynchus* Nijssen & Isbrücker, 1967. Paratype 47.6 mm sl. Gojo Creek (ZMA 104.640).

Description. —

Morphometric and meristic data based on holotype and 2 paratypes (RMNH 25329, 25330, ZMA 104.640).

sl 47.6—50.8 mm; bd 2.8—2.9; bw 4.1—4.5; lds 4.3—4.8; lps 4.0—4.2; sop 2.2—2.4; sna 1.9; snd 1.9—2.1; snp 3.7—3.8; hl 2.9—3.2; sn 1.6—1.7; lbo 3.8—4.1; wi 3.3—3.7; ca 3.2—4.1; dcp 2.3—2.5; pas 4; dbs/vbs 25/23; D I,7; A i—ii,5—6; P_1 i,6; P_2 I,9; C 7/7.

Colour in alcohol: Ground colour light grey. Pigmentation of minute dark grey spots all over head, body and fins, more intense on dorsal parts of head and body, on rictal barbels, and on pectoral spines, less intense towards ventral body region. On anterior parts of dorsolateral body scutes ventral to dorsal fin, this pigmentation is most intense. Caudal fin with about ten indistinct irregular vertical bars, formed by pigment on rays. Intercoracoid area with numerous minute prickles.

Discussion. — *C. oxyrhynchus* is probably related to *C. cervinus* Rössel, 1962, said to be originated from the upper Rio Guapore, Brazil. Of the latter species I examined the holotype (SMF 5460) and the single paratype (SMF 5461). *C. oxyrhynchus* has, in comparison with *C. cervinus*, a greater body depth, longer pectoral spines, and a larger head.

Corydoras punctatus (Bloch, 1794) (figs. 17, 18, 19, 26g, 37)

Type locality: "in den fischreichen Flüssen Surinams" (Bloch, 1794: 90). The original type material does not longer exist.

Restricted type locality: Surinam, district Brokopondo, Compagnie Creek, a tributary of the Suriname River (Nijssen & Isbrücker, 1967: 28).

Cataphractus punctatus Bloch, 1794: 90, pl. 377 fig. 2 (Surinam; original description).
Bloch & Schneider, 1801: 108 (after the original description).
Lacépède, 1803: 127 (after Bloch's description).
Swainson, 1838: 336 (designation as the type species of his new genus *Hoplisoma*), 337, fig. 81 (after Bloch).
Gill, 1858: 403 (in the genus *Hoplosoma*, emended spelling of Swainson's generic name).
Hoplisoma punctata; Swainson, 1838, l.c.
Swainson, 1839: 304 (diagnosis).
Callichthys punctatus; Valenciennes, in Cuvier & Valenciennes, 1840: 318—322 (in part: Surinam).
Bleeker, 1858: 53 (listed, with *Corydoras Géoffroy* Lacépède as a synonym).
Corydoras punctatus; Bleeker, 1862: 4 (diagnosis of the genus; *Corydoras Geoffroyi* Lacépède a synonym of *Cataphractus punctatus* Bloch).
Bleeker, 1863: 83 (as the preceding reference).
Bleeker, 1864: 4 (listed) and 27 (discussing synonymy *Cataphractus punctatus* Bloch/*Corydoras Geoffroyi* Lacépède).
Cope, 1872: 282 (listed).
Cope, 1878: 680 (listed).
Regan, 1912: 215 (listed, after Bloch).
Myers, 1927: 126 (statement of misidentifications by several authors).
Myers, 1940: 11 (discussion nomenclatorial status).
Gosline, 1940: 21 (listed, after Bloch).
Gosline, 1945: 75 (listed, after Bloch).
Boeseman, 1954: 20—22 (in part: see discussion below).
Nijssen & Isbrücker, 1967: 22—26 (discussion), 28—30 (designation of neo-

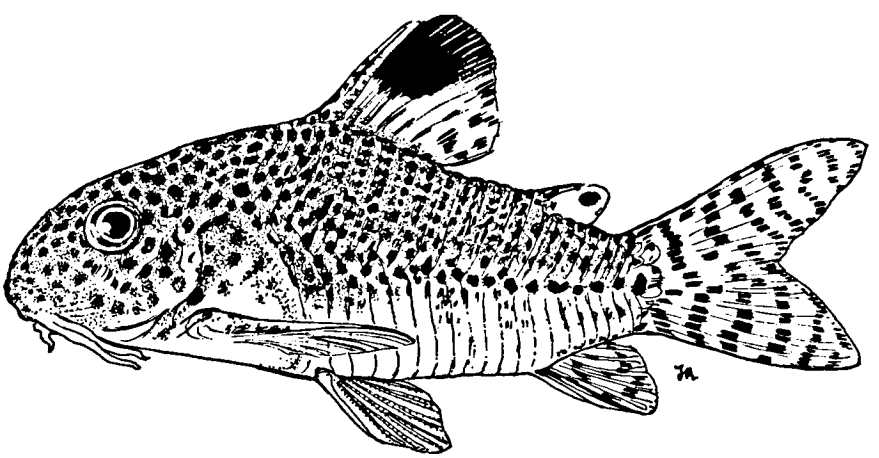

FIG. 17. *C. punctatus* (Bloch, 1794). Topotype 37.7 mm sl. Compagnie Creek (ZMA 105.890).

type); figs. 2, 3a-c, pl. 1 figs. 1 and 2 (Surinam: Suriname river system).
Corydoras geoffroy Lacépède, 1803: 147 (original description of genus and species; type locality; Surinam).

The following material is additional to that listed by Nijssen & Isbrücker (1967 : 28—29).
Surinam, district Brokopondo, Suriname river system: 1950 specimens, 18.1—48.3 mm sl, collected by M. Boeseman (28-XII-1963), G. F. Mees (20-III-1965/25-III-1966), and H. Nijssen (6-V-1966/20-III-1967), viz.:

Compagnie Creek:	:	126 topotypes (RMNH 25796, 25807, ZMA 105.889, 105.890);
Suriname River	:	2 specimens (RMNH 25792);
Van Blommestein Lake:		363 specimens (RMNH 25793, ZMA 105.866);
Makambi Creek	:	32 specimens (RMNH 25809, ZMA 105.111);
Witte Creek	:	88 specimens (ZMA 105.258);
Marchall Creek	:	213 specimens (RMNH 25798, ZMA 105.865, 105.368, USNM 203813, NMW);
Mama Creek	:	12 specimens (RMNH 25805, ZMA 105.096);
Tapoeripa Creek	:	1 specimen (ZMA 105.106);
Sara Creek	:	125 specimens (RMNH 25790, ZMA 105.232, 105.505, 105.242, 105.227, 105.296);
Marowijne Creek	:	960 specimens (ZMA 105.030, 105.032, 105.224, 105.236, 105.863, 105.864, 105.867, USNM 203809, SSC, IRScNB 16582, MNHN 1968-2, NMW);
Gran Rio	:	8 specimens (ZMA 105.412, 105.541);
Parwapa Creek	:	9 specimens (ZMA 105.797).

Description. —

Morphometric and meristic data based on 12 specimens (ZMA 105.889), 5 specimens (ZMA 105.541), and 5 specimens (ZMA 105.032); sl 29.8—46.6 mm; bd 2.4—2.8; bw 3.5—4.0; lds 3.5—4.3; lps 2.9—3.6; sop 2.1—2.4; sna 1.7—1.9; snd 1.8—2.0; snp 3.1—3.5; hl 2.9—3.3; sn 1.8—2.3; lbo 3.0—3.6; wi 1.9—2.3; ca 1.9—2.8; dcp 1.9—2.3; pas 3—4; dbs/vbs 22—24/19—21; D I,7; A i,5—6; P_1 i,5; P_2 I,7—8; C 7/7.

Colour in alcohol: Ground colour tan. Black spots all over body and head except for ventral half of ventrolateral body scutes. These spots mostly

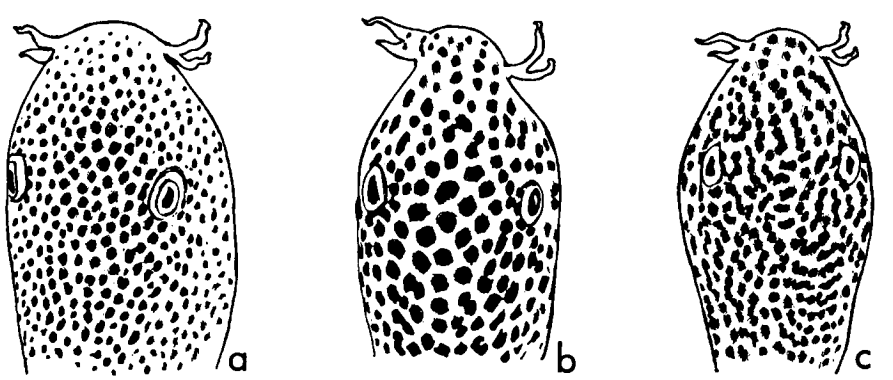

FIG. 18. *C.punctatus* (Bloch, 1794). Variation in pigmentation of the heads of some specimens, in dorsal view (see text).

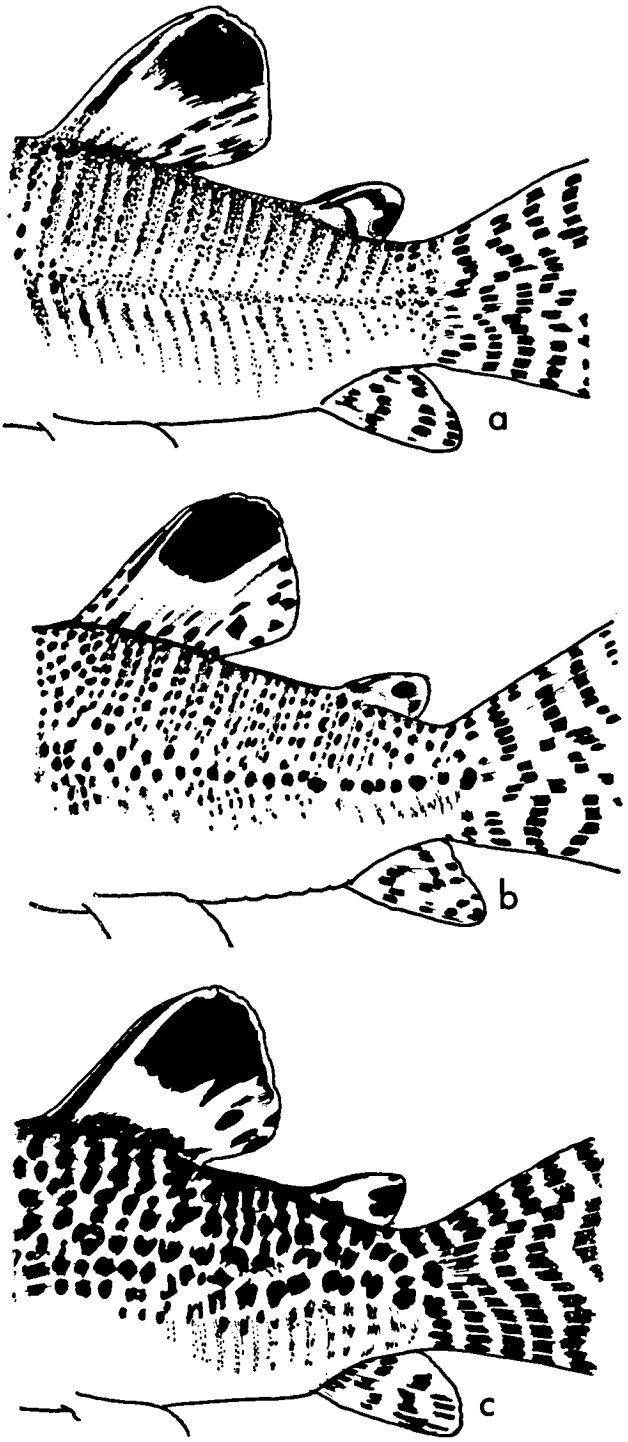

FIG. 19. *C. punctatus* (Bloch, 1794). Variation in pigmentation, in lateral view (see text).

circular but sometimes transformed into patches of indefinite shape, especially on head and near scute junctions. The latter may form a more or less regular dotted line across scute junctions. Dorsal part of dorsal fin black up to and including fourth soft dorsal fin ray. On remaining soft rays and on membranes between them, as well as on base of all dorsal rays, several spots are present. Markings on adipose fin are variable (fig. 19). Number of irregular vertical bars on caudal fin varies from six to eight. Anal fin with some small spots on rays. Pelvic and pectoral fins whitish, the last with a few scattered spots next to spine. Skin on intercoracoid area mostly with (in adults) a close-set mosaic of irregular plates. In juveniles this mosaic pattern is incomplete and sometimes absent.

Discussion. — After having examined more than 2000 specimens of *C. punctatus*, all from the Suriname river system, I found no greater variation than shown in figs. 18 and 19. Fig. 18 shows the head of three specimens in dorsal view, 18a & 18b being of the same sample (ZMA 105.368, Marchall Creek) with loam, sand, and gravel on the bottom, 18c (ZMA 105.863, Marowijne Creek) collected on inundated dark forest ground with decaying leaves (inundation caused by the artificial lake). Fig. 19 shows the variation in pigmentation on the lateral body scutes, 19c again from inundated forest ground, 19a (ZMA 105.368), and 19b (ZMA 105.890, Compagnie Creek) coming from a more brightly coloured bottom. Specimens of light colour have also been collected in the Marowijne Creek on inundated sandy places (ZMA 105.030). In fig. 19b an impression of a rather regular dotted midlateral line is given, which impression is strengthened by the paucity of pigment around and in particular just dorsal to these spots. This pigment pattern is present in a few specimens only and never resembles midlateral stripes present in other species.

In the collections of the Leiden Museum one specimen of *C. punctatus* is present (RMNH 25816), labelled Saramacca River, Mamadam Fall, donated by Mr. Heyde (12-II-1964). I doubt whether this locality is correct. Boeseman, Mees, as well as the author have collected in the Saramacca River near Mamadam Fall, but we never found *C. punctatus* in this river system. Moreover, there is another species, *C. octocirrus*, in the same sample, not collected in the Saramacca River either. I suppose that Mr. Heyde, busy as he was with aquarium fish export, did not well separate his living fishes. The bad state of preservation does suggest the fishes being preserved long after their death. They were deposited in the Surinam Museum and transported to Leiden later. The fact that *C. punctatus* is known from the Suriname River only, and that most of the specimens of *C. octocirrus* were equally caught in this river, gives ground for the idea that both RMNH 25816, as well as RMNH 25817 (*C. octocirrus*) were collected in the Suriname River, where also a fall named Mamadam Fall is found.

During a visit to Vienna I saw five specimens (NMW 46791, and NMW 46793), collected by Heller in Surinam in 1910 and 1915, which were correctly identified by Steindachner as *C. punctatus*.

Corydoras sanchesi Nijssen & Isbrücker, 1967 (figs. 20, 26b, 37)

Type locality: Surinam, Saramacca river system, Gojo Creek, 6 km South of Poesoegroenoe (original designation).

Corydoras sanchesi Nijssen & Isbrücker, 1967: 43—44, fig. 4g, pl. 5 fig. 2 (original description; Surinam: Gojo Creek above Poesoegroenoe, tributary of Saramacca River).

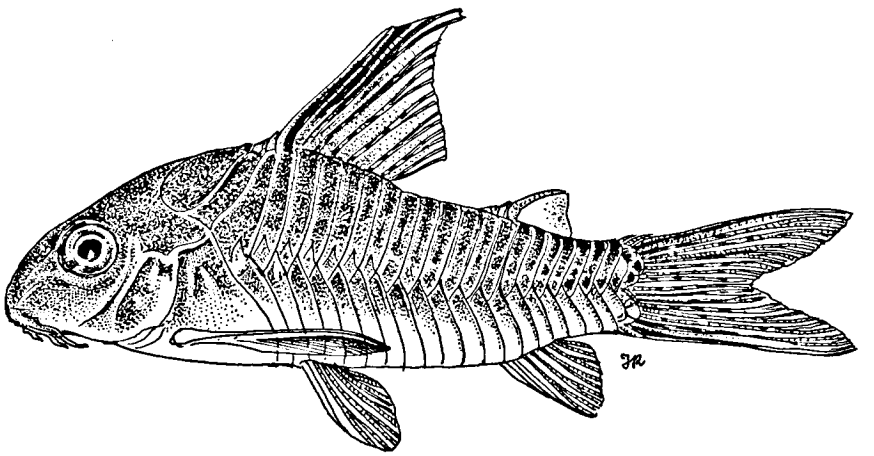

FIG. 20. *C. sanchesi* Nijssen & Isbrücker, 1967. Holotype 34.6 mm sl. Gojo Creek (RMNH 25319).

The following material is additional to that listed by Nijssen & Isbrücker (1967 : 43):

Surinam, district Brokopondo, Saramacca river system:

406 specimens, 21.5—38.9 mm sl, from sidecreeks of the Kleine Saramacca River, 11—13 km E.S.E. from the junction with the Saramacca River, collected by H. Nijssen, 27/28-II-1967 (ZMA 105.561, 105.649, USNM 203810, IRScNB 16787, NMW); 109 specimens, 21.4—35.0 mm sl, Kleine Saramacca River, 9 km E.S.E. from confluence with the Saramacca River, collected by H. Nijssen, 1-III-1967 (ZMA 105.573).

Description. —

Morphometric and meristic data based on 12 specimens (ZMA 105.561) sl 26.8—38.0 mm; bd 2.5—2.7; bw 3.5—3.8; lds 3.2—3.7; lps 3.1—3.5; sop 2.1—2.2; sna 1.8—1.9; snd 1.9—2.0; snp 3.2—3.5; hl 3.1—3.3; sn 1.9—2.1; lbo 2.7—3.0; wi 2.4—2.9; ca 2.1—2.8; dcp 2.0—2.3; pas 3—4; dbs/vbs 23—24/20—21; D I,7; A i,6; P_1 i,5; P_2 I, 8; C 7/7.

Colour in alcohol: Ground colour brownish grey. Pigmentation consisting of minute grey spots on head, body, and fins, most intense on dorsal part of body and head, paler ventrally. On dorsolateral body scutes minute spots may form faint vertical lines. Interorbital region, dorsal spine, and first soft dorsal fin ray — which is often prolonged — are dark grey. Small brown spots on remaining dorsal and on caudal fin rays. In many specimens these spots are absent. Dorsal rictal barbels greyish. Intercoracoid area naked.

Discussion. — The silver colour on opercles and humeral shields, mentioned in the original description, is greyish in most specimens collected by the author, who preserved the fishes first in formaldehyde. When the fishes remain too long in formaldehyde, the silver colour disappears.

There is not much difference between *C. sanchesi* and *C. osteocarus* except for the colour pattern. Perhaps *C. sanchesi* represents an eastern subspecies of *C. osteocarus*. Material from (British) Guyana and more specimens from the Corantijn river system are needed for a solution of this problem.

Corydoras saramaccensis new species (figs. 21, 25c, 38)

Surinam, district Brokopondo, Saramacca river system:

Holotype: ZMA 106.018, 51.3 mm sl; creek at right bank of the Kleine Saramacca River, 11 km E.S.E. from junction with the Saramacca River, running water, bottom sand with rocks, depth 0.3 to 1.0 m, width 4.0 m, coll. H. Nijssen, 27-II-1967.

Paratypes: ZMA 105.563, 8 specimens, 36.0—44.8 mm sl; same data as ZMA 106.018.
ZMA 105.650, 1 specimen, 40.2 mm sl; creek at left bank of the Kleine Saramacca River, 13 km E.S.E. from junction with the Saramacca River, stagnant water, bottom sand with rocks, depth 0.5 to 1.0 m, width 3.0 m, coll. H. Nijssen, 28-II-1967.

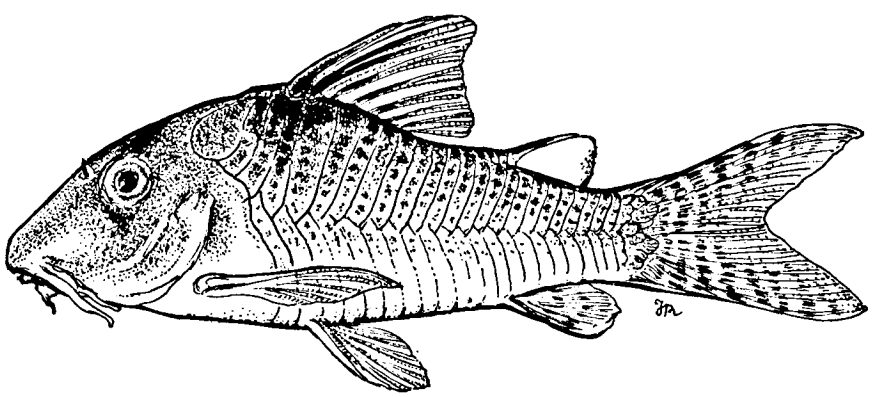

FIG. 21. *C. saramaccensis* new species. Holotype 51.3 mm sl. Kleine Saramacca River (ZMA 106.018).

Description. —

Morphometric and meristic data of holotype, bd 19.0 mm (2.7); bw 12.4 mm (4.1); lds 11.2 mm (4.6); lps 11.7 mm (4.4); sop 21.6 mm (2.4); sna 27.3 mm (1.9); snd 25.1 mm (2.0); snp 14.1 mm (3.6); hl 15.9 mm (3.2); sn 10.5 mm (1.5); lbo 4.2 mm (3.8); wi 4.7 mm (3.4); ca 7.0 mm (2.3); dcp 7.1 mm (2.2); pas 4; dbs/vbs 25/22; D I,7; A i,6; P_1 i,5; P_2 I,10; C 7/7.

Morphometric and meristic data based on holotype and 9 paratypes (ZMA 106.018, 105.563, 105.650),

sl 36.0—51.3 mm; bd 2.7—3.0; bw 4.1—4.6; lds 4.6—5.1; lps 4.3—4.9; sop 2.3—2.5; sna 1.9; snd 1.9—2.1; snp 3.4—3.7; hl 3.0—3.4; sn 1.5—1.8; lbo 3.5—3.9; wi 3.2—3.7; ca 2.3—3.0; dcp 2.1—2.3; pas 1—5; dbs/vbs 25—26/22—23; D I,7; A i,6; P_1 i,5; P_2 I,9—10; C 7/7.

Colour in alcohol: Ground colour tan. Dorsal part of head and body more intense pigmented with minute grey spots than ventral part, especially between eyes and on dorsolateral body scutes. Dots on these scutes arranged in rows parallel to edges. Dark grey blotch ventral to dorsal fin, extending from second to fifth dorsolateral body scute, well defined in holotype, less distinct in some paratypes. 8 or 9 indistinct grey vertical bars on caudal fin. Intercoracoid area naked.

Discussion. — *C. saramaccensis* is closely related to *C. oxyrhynchus*. The differences are given in their descriptions and bar diagrams. *C. saramaccensis* and *C. oxyrhynchus* look very similar except for the head structure. Even when a paratype of *C. saramaccensis* was dried out, differences between the two species remained, viz., a more bony head and a concave dorsal side of the snout in *C. oxyrhynchus*. The species is named after the Saramacca River, where it was found.

Corydoras schwartzi surinamensis new subspecies (figs. 22, 25h, 37)

Surinam, district Saramacca, Coppename river system:

Holotype: ZMA 105.876, ♂?, 36.6 mm sl; creek at right bank of Coppename River (03° 52′ 30″ N, 56° 53′ W), width 3.0 to 5.0 m, depth 0.5 to 2.0 m, bottom muddy sand, running water, coll. H. Nijssen, 19-V-1967.

Paratypes: ZMA 105.878, 63 specimens, 24.1—42.3 mm sl; same data as ZMA 105.876 (2 specimens deposited in USNM 204223, 1 in IRScNB 470, and 2 in NMW 61109).

ZMA 105.879, 28 specimens, 26.8—31.6 mm sl; creek at left bank of Coppename River (03° 52′ N, 56° 55′ W), width 4.0 m, depth 0.3 to 1.0 m, bottom muddy sand, coll. H. Nijssen, 18-V-1967.

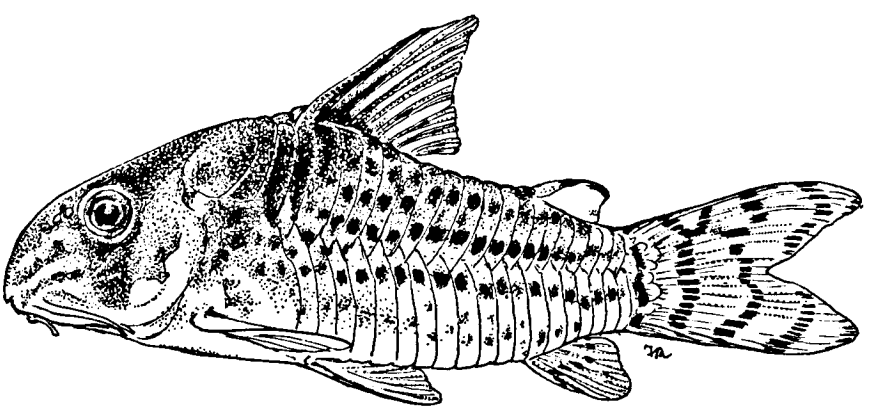

FIG. 22. *C. schwartzi surinamensis* new subspecies. Paratype 33.4 mm sl. Coppename River (ZMA 105.878).

Description. —

Morphometric and meristic data of holotype, bd 13.6 mm (2.7); bw 9.7 mm

(3.8); lds 10.2 mm (3.6); lps 11.5 mm (3.2); sop 15.8 mm (2.3); sna 20.0 mm (1.8); snd 17.8 mm (2.1); snp 10.6 mm (3.4); hl 11.5 mm (3.2); sn 5.5 mm (2.1); lbo 3.6 mm (3.2); wi 5.4 mm (2.1); ca 4.2 mm (2.7); dcp 5.3 mm (2.2); pas 3; dbs/vbs 22/20; D I,7; A i,6; P_1 i,5; P_2 I,8; C 7/7.

Morphometric and meristic data based on 12 paratypes (ZMA 105.878), sl 31.4—40.5 mm; bd 2.5—2.8; bw 3.4—4.1; lds 3.1—3.6; lps 3.1—3.6; sop 2.1—2.4; sna 1.7—1.9; snd 2.0—2.1; snp 3.2—3.5; hl 3.0—3.3; sn 1.9—2.2; lbo 3.1—3.6; wi 2.1—2.5; ca 1.9—2.7; dcp 2.1—2.3; pas 3—4; dbs/vbs 22—24/19—21; D I,7—8; A i,6; P_1 i,5—6; P_2 I,8; C 7/7.

Colour in alcohol: Ground colour tan. Black pigment on head, supra-occipital, and across eyes, forming a mask. This mask reaches to ventral part of opercle. Snout evenly grey in most paratypes. However, in holotype and in some paratypes small dots are present on snout, forming an irregular pattern of short horizontal lines. Large black blotch ventral to dorsal fin from nuchal plate to seventh dorsolateral body scute, extending to anterio-dorsal part of cleithrum. This blotch also covers spine and part of four or five rays of dorsal fin. Remaining rays of this fin with small dots in most specimens. Colour pattern on body scutes variable. Mostly there are two horizontal rows of small dots, forming more or less regular lines, one on dorsolateral and the other on ventrolateral body scutes. In many specimens one more irregular row of dots is present on upper parts of dorsolateral body scutes, extending from beyond dorsal blotch to adipose fin. This last mentioned row is duplicated in some paratypes. Ventral to dotted line on ventrolateral body scutes, sometimes another dotted line occurs, so that in extreme cases five dotted lines may occur. Caudal fin with four to five vertical black bars, the first across base of the fin, the last on the lobes. Some small dots on anal fin. Pectoral and pelvic fins whitish, except for pectoral spines, which have widely scattered grey pigment, same as dorsal rictal barbels. In most specimens the skin covering the intercoracoid area, bears a close-set mosaic of irregular plates.

Discussion. — The Surinam material was compared with the holotype (SMF 6425) and nine paratypes (SMF 6426/34) of *C. schwartzi* Rössel, 1963, said to be from the mouth of the Rio Purus, Brazil. The Surinam material differs in many characteristics from this type material as shown in the bar diagrams. So, *C. schwartzi surinamensis* has a less deep body, shorter dorsal and pectoral spines, and a smaller eye. The colour pattern is similar to that of the types of *C. schwartzi schwartzi*, though in *C. schwartzi surinamensis* the black blotch ventral to the dorsal fin is covering a larger area of the body. The subspecies is named after the country Surinam.

Corydoras wotroi Nijssen & Isbrücker, 1967 (figs. 23, 26f. 39)*

Type locality: Surinam, outlet Kleine Saramacca River, along and between sand banks (original designation).

* See also addendum.

Corydoras wotroi Nijssen & Isbrücker, 1967: 44—45, fig. 4h, pl. 5 fig. 3 (original description; Surinam, outlet Kleine Saramacca river, along and between sand banks).

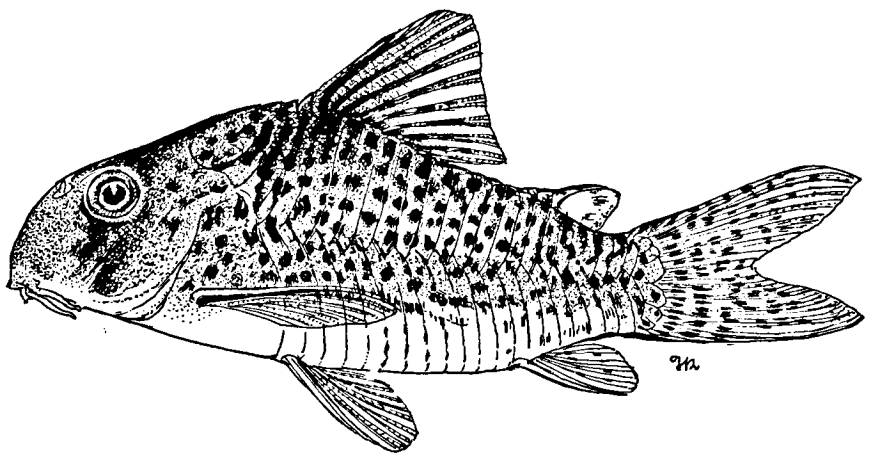

FIG. 23. *C. wotroi* Nijssen & Isbrücker, 1967, 35.5 mm sl. Kleine Saramacca River (ZMA 105.562).

The following material is additional to that listed by Nijssen & Isbrücker (1967: 44).

Surinam, district Brokopondo, Saramacca river system:

In total 204 specimens, 19.5—40.6 mm sl, collected by H. Nijssen (27-II/2-III-1967). Kleine Saramacca River, 9—11 km E.S.E. of the junction with the Saramacca River, 200 specimens (ZMA 105.562, 105.574, 105.648, USNM 203812, IRScNB 16788, NMW). Toeboeka Creek, 5 km N. of the mouth of the Kleine Saramacca River: 4 specimens (ZMA 105.603).

Description. —

Morphometric and meristic data based on 12 specimens (ZMA 105.648). sl 25.8—36.2 mm; bd 2.4—2.6; bw 3.5—3.9; lds 3.1—3.8; lps 3.1—3.5; sop 2.2—2.3; sna 1.7—1.9; snd 1.9—2.0; snp 3.1—3.4; hl 3.1—3.4; sn 1.8—2.1; lbo 2.7—3.0; wi 2.1—2.4; ca 2.0—2.4; dcp 1.9—2.0; pas 3—4; dbs/vbs 23—24/20—21; D I,7; A i,6; P_1 i,5; P_2 I,8; C 7/7.

Colour in alcohol: Ground colour tan. Brownish-black blotch ventral to dorsal fin extending from nuchal plate to dorsal part of fifth dorsolateral body scute. It continues on spine and first two soft rays of dorsal fin. Black blotch from occipital across eyes, forming a mask. Both blotches are indistinct in many specimens. Small irregular spots all over body, decreasing in size and number towards ventral body region. Snout and dorsal rictal

barbels with widely scattered grey pigment. Irregular brown spots on remaining dorsal fin rays, and on adipose and anal fin. Four to six irregular vertical bars on caudal fin. Scattered pigment on pectoral and pelvic fins; however, in most specimens absent. Intercoracoid area naked.

Discussion. — The specimens caught by the author near the type locality add more information about the variation within the species of which the original description was based on four specimens only. However, the position of *C. wotroi* in the "*melanistius*" group is not yet clear.

C. melanistius Regan, 1912, was known only from the lectotype and a paralectotype found in the Essequibo River (British) Guyana, by Mr. Ehrhardt, and already mentioned by Günther (1864 : 229—230) under the paragraph *Callichthys punctatus* (Bloch) as being different from this species: "nearly the entire dorsal fin is black, and this colour also extends over some of the shields below the dorsal fin; anal and caudal colourless. A blackish vertical bar below the eye; body minutely punctulated with black." I had the opportunity to examine both specimens (BMNH 1864.1.21.86/87) which are not young, contrary to Günther's opinion.

C. wotroi differs from *C. melanistius* in certain characters by having a different colour pattern on the caudal fin, shorter pectoral spines and larger eyes in the former. These differences may be considered by some of subspecific rank. The situation is in addition complicated by nomenclature, because there were already two subspecies of *C. melanistius* described, viz., *C. m. brevirostris* Fraser-Brunner, 1947, and *C. m. longirostris* Hoedeman, 1952. As their names indicate, these subspecies were principally distinguished from the nominal subspecies by their snout length. Fraser-Brunner (1947 : 244) had only one (aquarium) specimen available (33.4 mm sl) for his description of *C. m. brevirostris*, which was said to be collected in the Orinoco River. Fraser-Brunner, comparing his specimen with the smallest type specimen (now the lectotype) of *C. melanistius*, gives as differences: "The snout is much shorter, being contained 2⅓ times in length of head (twice in *C. melanistius*). The spots on the sides are larger and fewer, and do not extend on to the head. The caudal fin has intense black transverse bars." I have seen the holotype of *C. m. brevirostris* (BMNH 1946.10.10.1), which is poorly preserved. I also measured the snout length of the two specimens compared by Fraser-Brunner with each other, and found 2.2 in *C. m. brevirostris* and 2.0 in the lectotype of *C. melanistius*. However, the paralectotype gives 2.1. Moreover, in the bar diagrams is shown that in eight different Surinam species the snout/head ratio varies from 2.0—2.2. Thus within species of *Corydoras* there is variation in snout length. Indeed, smaller specimens tend to have shorter snouts in relation to head length than adults. However, even in adults there is variation in the snout/head ratio.

C. m. longirostris was described by Hoedeman (1952 : 17) in a Dutch aquarium encyclopedia and was based on a single specimen, said to originate from the "Amazon area". He gives a picture of his aquarium specimen, records seven vertical bars on the caudal fin, small spots in vertical rows on

the edges of the lateral body scutes, and a longer snout as compared with *C. m. brevirostris*, but he gives no measurements. He notes an extension of the mask across the eyes towards the snout, this not being present in *C. m. melanistius* and in *C. m. brevirostris* (Hoedeman did not examine the London type material of these two forms). Unfortunately, the specimen of *C. m. longirostris* is not preserved in any collection, and the snout/head ratio cannot be measured. In one character both *C. m. brevirostris* and *C. m. longirostris* differ from the nominal subspecies. This is the presence of black vertical bars on the caudal fin, which is also present in *C. wotroi*, but lacking in *C. m. melanistius*. Günther (1864) already noted the lack of caudal bars in this species, later described as *C. melanistius* by Regan in 1912. Because of this character we listed three specimens from Surinam (1967 : 32), labeled by Hoedeman as originating from the "surroundings of Paramaribo" under the name *C. melanistius*. However, Boeseman, Mees, and the author did not succeed in collecting any specimens of the genus *Corydoras* within a circle of 60 km around Paramaribo, hence this locality record should be regarded as questionable. It seems advisable to postpone a revision of the "*melanistius*" species/subspecies complex until large series of adult specimens of "*melanistius*" forms are available from large numbers of localities, especially from the Essequibo river system and the Orinoco.

HYBRID (fig. 24)

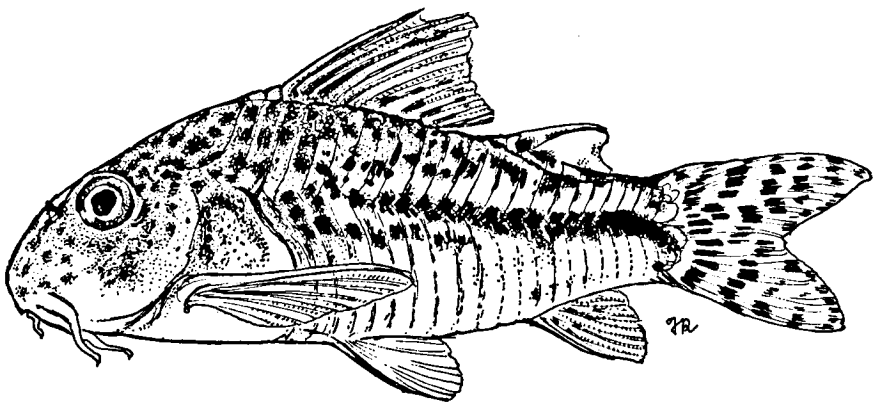

FIG. 24. Hybrid, 35.5 mm sl. (ZMA 105.944) between *C. bondi coppenamensis* (ZMA 105.872) and *C. schwartzi surinamensis* (ZMA 105.879).

The close relationship between certain subspecies belonging to two different species is particularly emphasized by the record of a hybrid caught in nature. It was found in a tributary at the left bank of the Coppename River in a sample along with 240 specimens of *C. bondi coppenamensis* (ZMA 105.872) and 28 specimens of *C. schwartzi surinamensis* (ZMA 105.879). The measurements as well as the colour pattern of this hybrid (ZMA 105.944) are intermediate between the above mentioned subspecies.

Description. —

Morphometric and meristic data: sl 35.5 mm; bd 2.5; bw 3.7; lds 3.7; lps 3.3; sop 2.2; snp 3.2; hl 3.1; sn 1.9; lbo 3.2; wi 2.3; ca 3.0; dcp 2.1; pas 2; dbs/vbs 24/22; D I,7; A i,6; P_1 i,5; P_2 I,8; C 7/7.

Colour in alcohol: Ground colour tan. Small irregular black spots on head and dorsal part of body. Small black stripe extends across the scute junctions from sixth dorsolateral scute to base of caudal fin. Just dorsal to this stripe an unpigmented zone is present except for the first seven dorsolateral scutes, of which the ventral parts are covered with irregular black spots. A light grey blotch covers occipital extending across eyes, forming an indistinct mask. Indistinct grey blotch ventral to dorsal fin from third to sixth dorsolateral

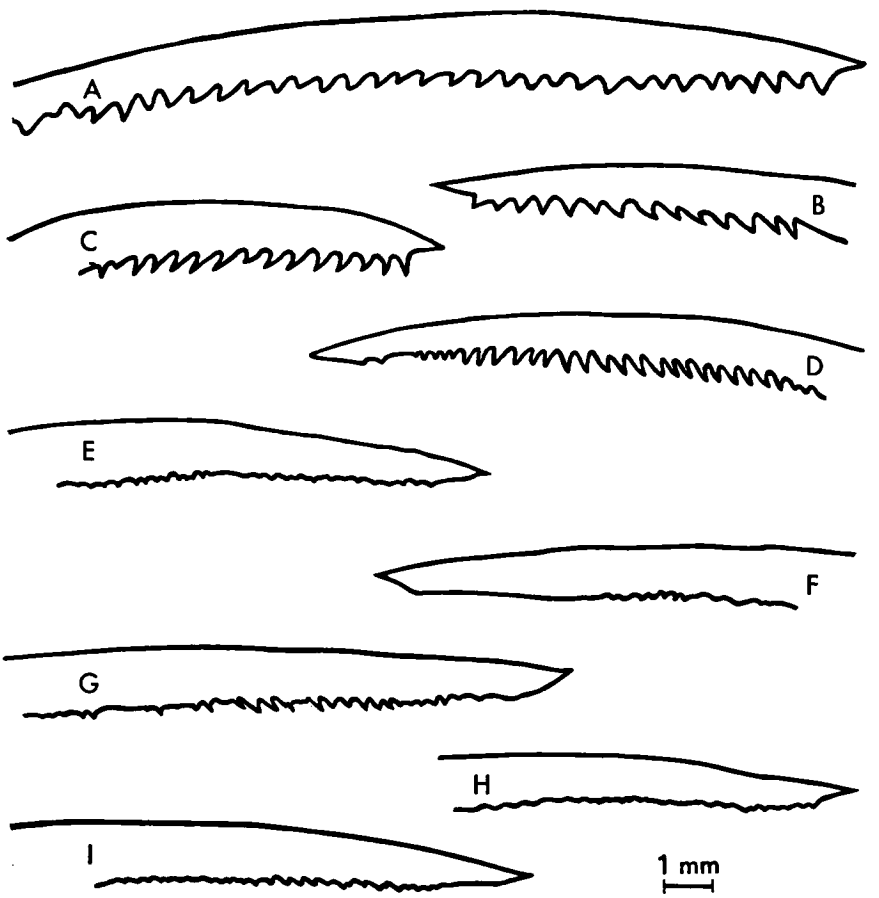

FIG. 25. Profile of pectoral spines from ventral view in A, *Corydoras octocirrus* ♂, 56.3 mm standard length; B, *C. octocirrus* ♀, 56.2 mm sl; C, *C. saramaccensis* 44.8 mm sl; D, *C. nanus* 43.1 mm sl; E, *C. guianensis* 39.3 mm sl; F, *C. heteromorphus* 47.6 mm sl; G, *C. oelemariensis* 46.8 mm sl; H, *C. schwartzi surinamensis* 39.9 mm sl; I, *C. bondi coppenamensis* 40.5 mm sl.

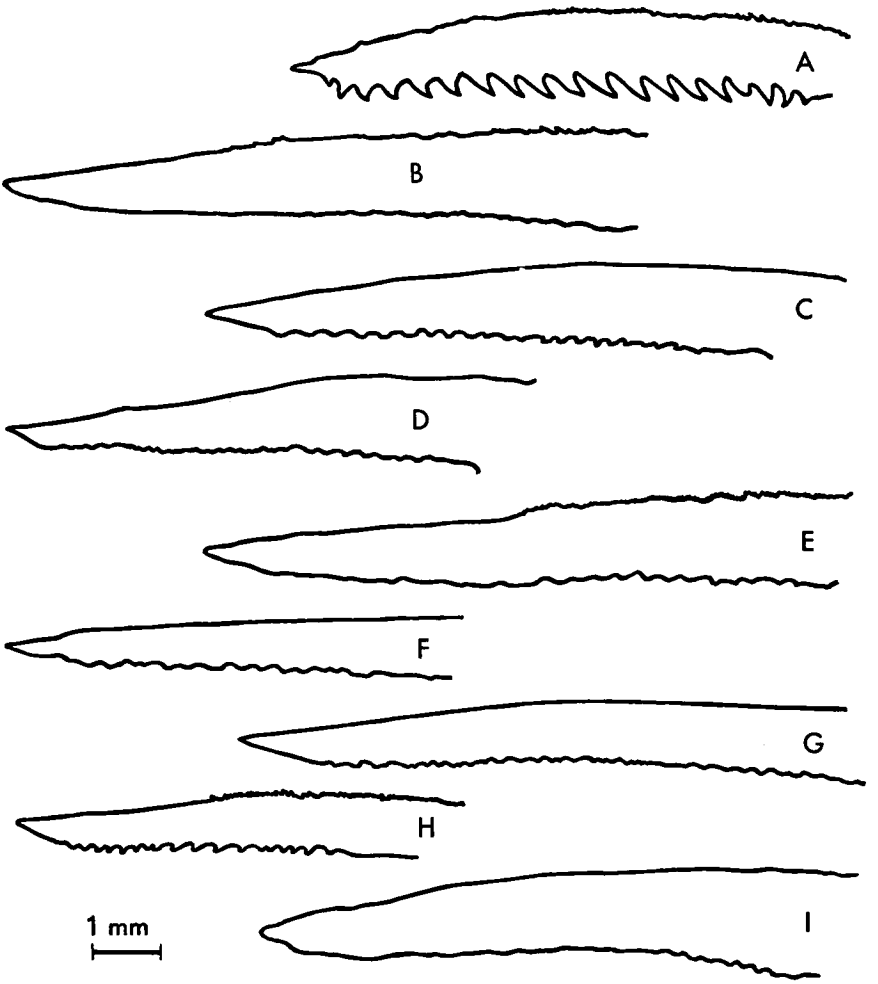

FIG. 26. Profile of the right pectoral spines from ventral view in A, *Corydoras oxyrhynchus* 47.6 mm standard length; B, *C. sanchesi* 41.0 mm sl; C, *C. aeneus* 44.5 mm sl; D, *C. osteocarus* 35.7 mm sl; E, *C. boesemani* 38.0 mm sl; F, *C. wotroi* 27.2 mm sl; G, *C. punctatus* 42.5 mm sl; H, *C. bicolor* 23.7 mm sl; I, *C. bondi bondi* 39.6 mm sl.

body scute. Ventral and parallel to black stripe an irregular row of black dots covers first nine ventrolateral body scutes. Spine and first soft ray of the dorsal fin greyish. Few spots on remaining dorsal fin rays and on anal fin. Adipose spine, pectoral fin and dorsal rictal barbels with widely scattered pigment. Caudal fin with five irregular vertical bars on its rays. Intercoracoid area naked.

Table I. Material used for the bar diagrams

species name	number of specimens	locality	standard length in mm	reg. nr.
1a *aeneus*	12	Tapoeripa Creek, Surinam	33.4—52.2	ZMA 105.369
1b *aeneus*	12 topotypes	Trinidad, W.I.	27.5—56.8	RMNH 21541, 25818, USNM 203858
2 *bicolor*	12 paratypes	Sipaliwini River, Surinam	22.1—26.2	ZMA 104.628
3 *boesemani*	12 topotypes	Gran Rio, Surinam	30.2—40.0	ZMA 105.419
4a *bondi bondi*	12	Sipaliwini River, Surinam	26.2—45.9	RMNH 25811/12, ZMA 104.278, 105.892
4b *bondi bondi*	9 paratypes	Rio Yuruari, Venezuela	25.6—31.9	SU 35066
4c *bondi bondi*	3	Paloemeu River, Surinam	22.5—32.8	ZMA 105.848
5 *bondi coppenamensis*	12 paratypes	Coppename River, Surinam	28.3—40.5	ZMA 105.872
6a *guianensis*	12 paratypes	Nickerie River, Surinam	24.9—39.3	ZMA 105.837
6b *guianensis*	4 paratypes	Kl. Saramacca River, Surinam	24.1—27.7	ZMA 105.888
6c *guianensis*	2 paratypes	Coppename River, Surinam	24.1—27.0	ZMA 105.887, 106.101
7a *heteromorphus*	12 paratypes	Coppename River, Surinam	28.3—47.6	ZMA 105.883
7b *heteromorphus*	5 paratypes	Nickerie River, Surinam	36.1—39.0	ZMA 105.885
8a *nanus*	7 holo- & paratypes	Gran Rio, Surinam	17.8—23.4	RMNH 25333/34 ZMA 104.642
8b *nanus*	2	Oelemari River, Surinam	43.1—44.7	IRScNB 16584 ZMA 108.417

species name	number of specimens	locality	standard length in mm	reg. nr.
9a *octocirrus*	6 ♂♂ holo- & paratypes	Marchall Creek, Surinam	55.4—65.9	ZMA 106.017, 105.367
9b *octocirrus*	6 ♀♀ paratypes	Marchall Creek, Surinam	56.2—61.0	ZMA 105.367
9c *octocirrus*	6 paratypes	Oelemari River, Surinam	39.6—48.2	IRScNB 474 ZMA 109.066
10 *oelemariensis*	12 paratypes	Oelemari River, Surinam	30.5—46.8	ZMA 108.111
11a *osteocarus*	4	Kabalebo River, Surinam	28.3—35.1	RMNH 25335 ZMA 104.654
11b *osteocarus*	3 paratypes	Rio Atabapo, Venezuela	23.3—26.1	CAS 20563 USNM 157367
12 *oxyrhynchus*	3 holo- & paratypes	Saramacca River, Surinam	47.6—50.8	RMNH 25329/30 ZMA 104.640
13 *punctatus*	12 topotypes	Compagnie Creek, Surinam	31.5—46.6	ZMA 105.889
14 *sanchesi*	12	Kl. Saramacca River, Surinam	26.8—38.0	ZMA 105.561
15 *saramaccensis*	10 holo- & paratypes	Kl. Saramacca River, Surinam	36.0—51.3	ZMA 105.563, 105.650 ZMA 106.018
16 *schwartzi schwartzi*	10 holo- & paratypes	Rio Purus, Brazil	22.6—34.5	SMF 6425/34
17 *schwartzi surinamensis*	12 paratypes	Coppename River, Surinam	31.4—40.5	ZMA 105.878
18 *wotroi*	12 topotypes	Kl. Saramacca River, Surinam	25.8—36.2	ZMA 105.648

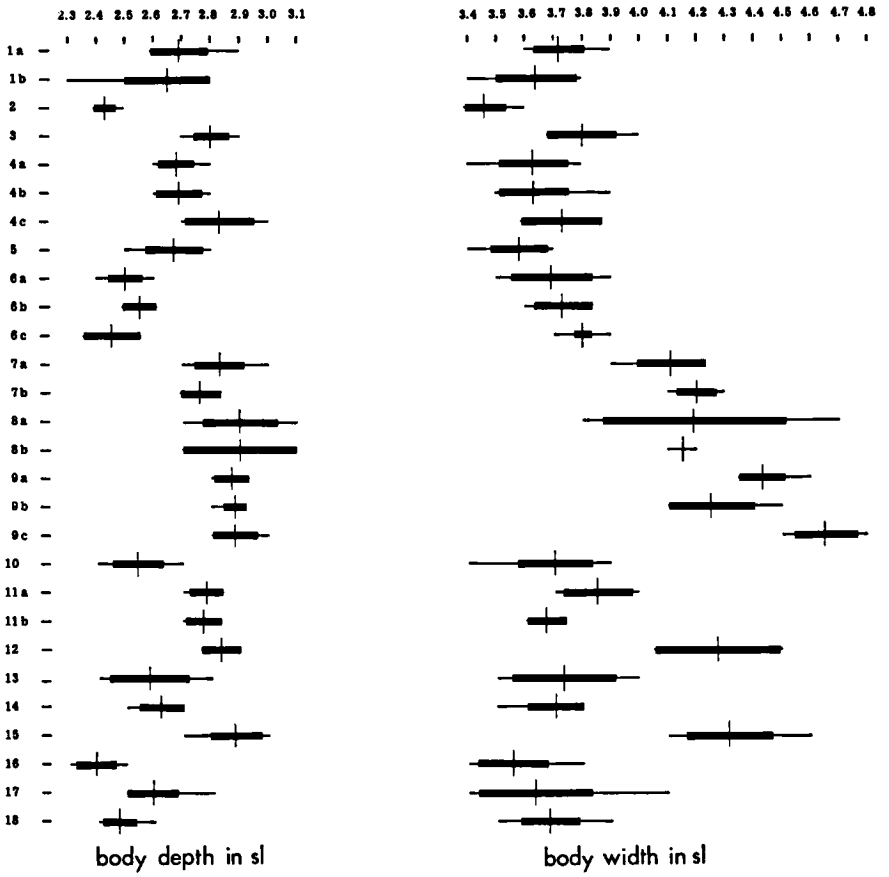

FIG. 27. Variation in ratios of body depth/standard length and body width/standard length in 18 species and subspecies of *Corydoras*. Horizontal lines, solid bars, and vertical lines indicate ranges, standard deviations on either side of the mean, and means, respectively.

VALIDITY OF CERTAIN DATA AS TAXONOMIC CHARACTERS

The most useful and apparently less variable measurements are used in the key to distinguish the different species and subspecies of the genus *Corydoras*. Some other characters show a wide variation range and have not been thought useful by some authors for identification purposes. This wide variation range is mostly due to sexual dimorphism as shown for *C. octocirrus* in figs. 27, 28, and 33 (9a and 9b) in body width, length of dorsal spine, and width of coracoid area, respectively. A wide range is also caused by juvenile specimens as shown for *C. nanus* in figs. 28, 30, 31, and 33 (8a and 8b) in length of the dorsal and pectoral spines, head length, length of the bony orbit, and depth of the caudal peduncle, respectively. If the range of

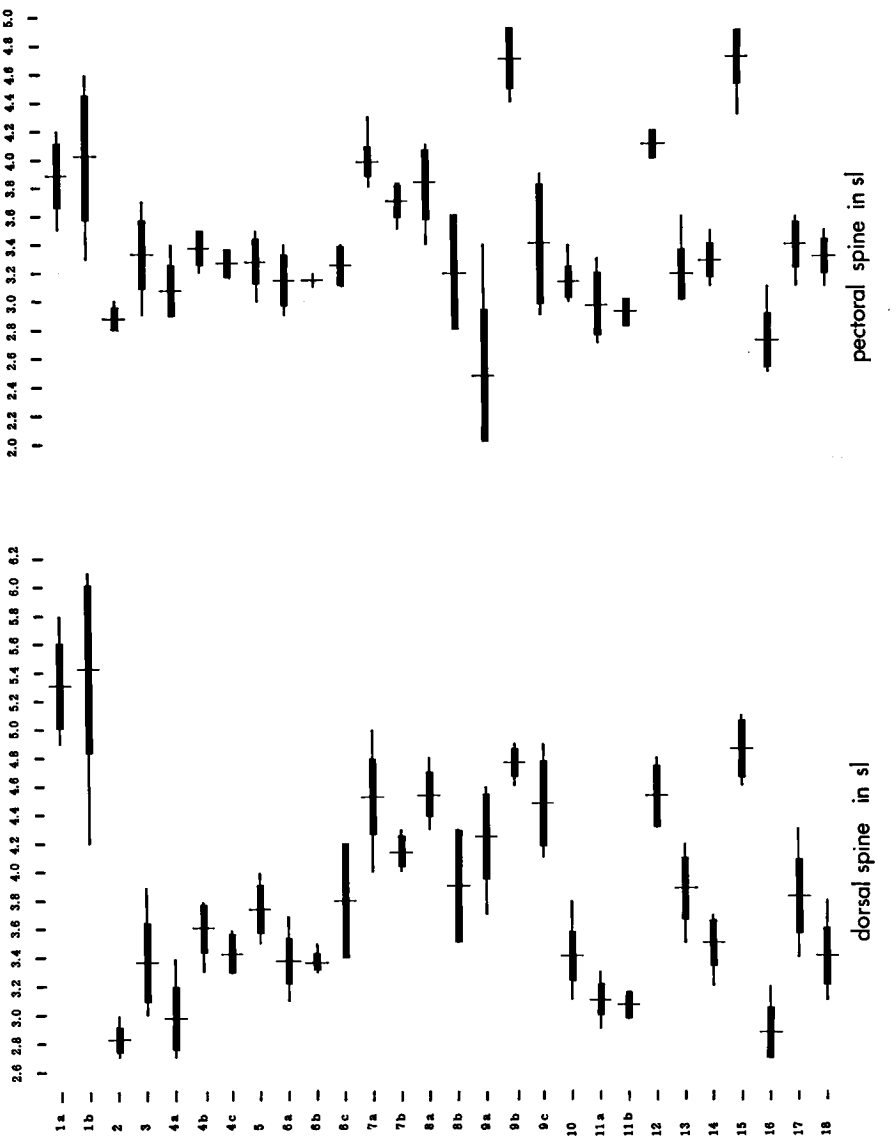

FIG. 28. Variation in ratios of length dorsal spine/standard length and length pectoral spine/standard length in 18 species and subspecies of *Corydoras*. Horizontal lines, solid bars and vertical lines indicate ranges, standard deviations on either side of the mean, and means, respectively.

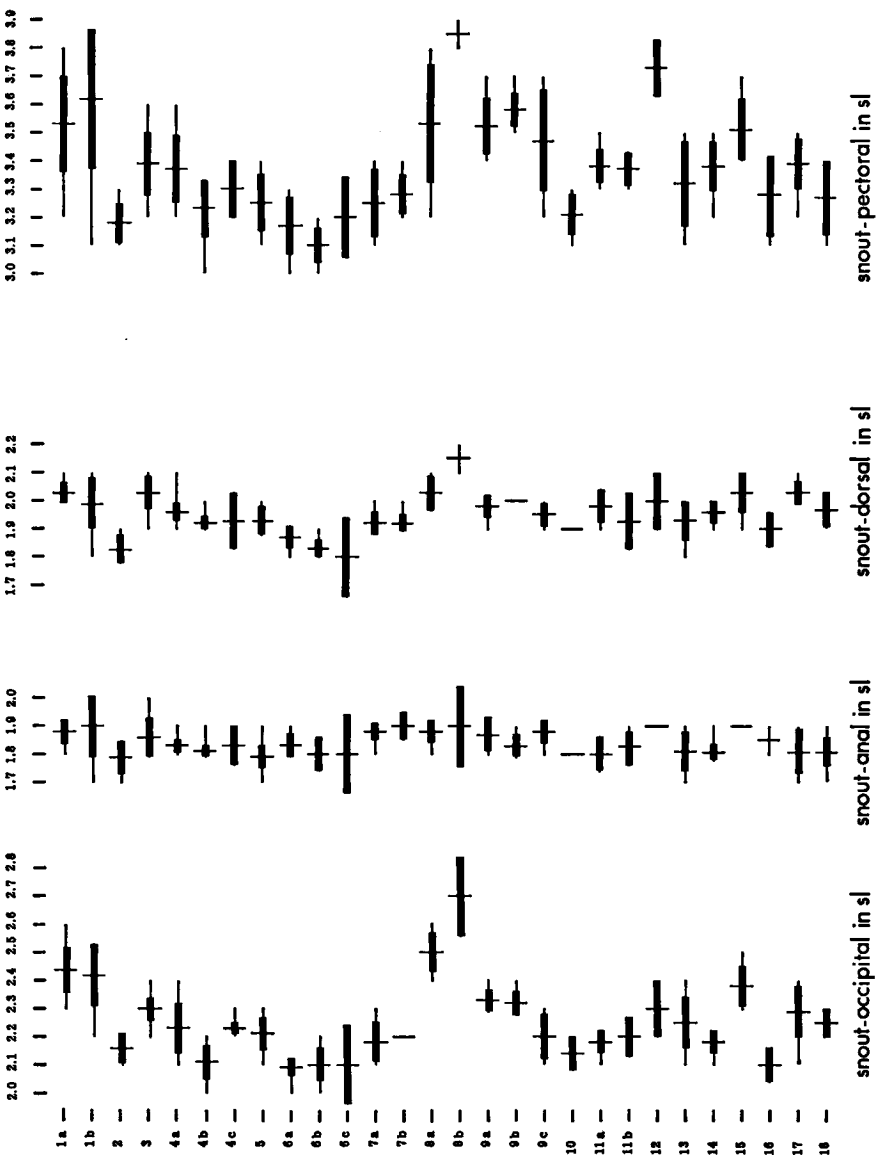

FIG. 29. Variation in ratios of snout-occipital/standard length, snout-anal/standard length, snout-dorsal/standard length and snout-pectoral/standard length in 18 species and subspecies of *Corydoras*. Horizontal lines, solid bars and vertical lines indicate ranges, standard deviations on either side of the mean, and means, respectively.

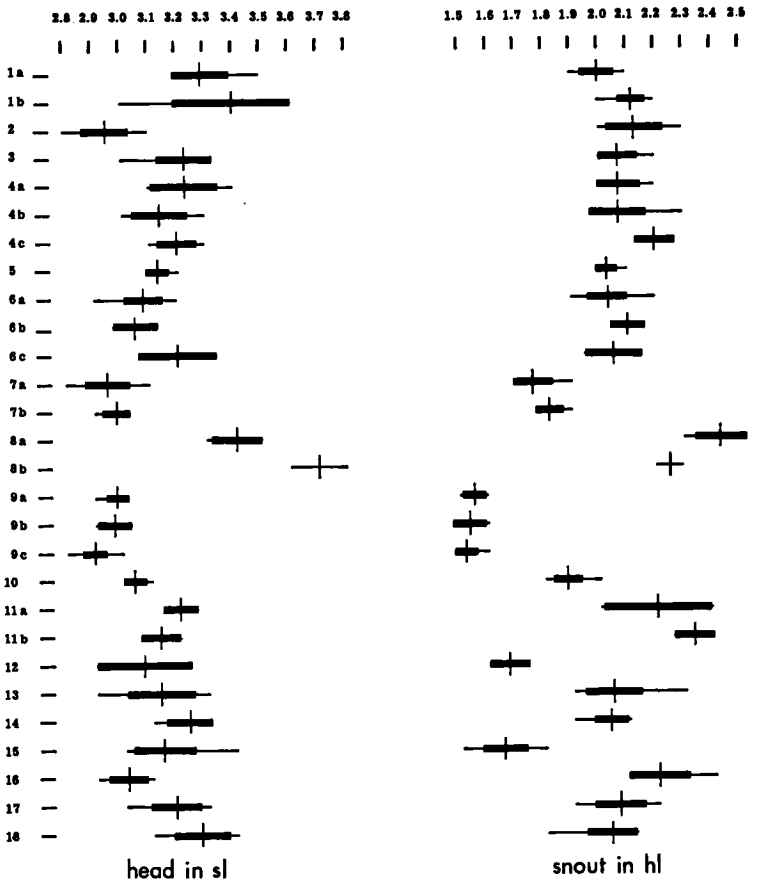

FIG. 30. Variation in ratios of head length/standard length and snout length/head length in 18 species and subspecies of *Corydoras*. Horizontal lines, solid bars and vertical lines indicate ranges, standard deviations on either side of the mean, and means, respectively.

variation is sexually dimorphic, it can still be very important in comparing species. Males and females should be treated separately and the ranges of their characters defined and compared with other species. This also can be done for juvenile against adult characters. Here regression analysis is useful.

It is advisable not to judge at this early stage on the usefulness of various meristic and morphometric data until most of the species in the genus are redescribed. Some of the characters mentioned above are used in the key given here. These characters consist of combined data from juveniles and adults of both sexes. In spite of the resulting increased variation in data, the characters are still useful for separating species. For example, the length of the dorsal spine (in spite of its wide variation range in *C. aeneus*) is a good

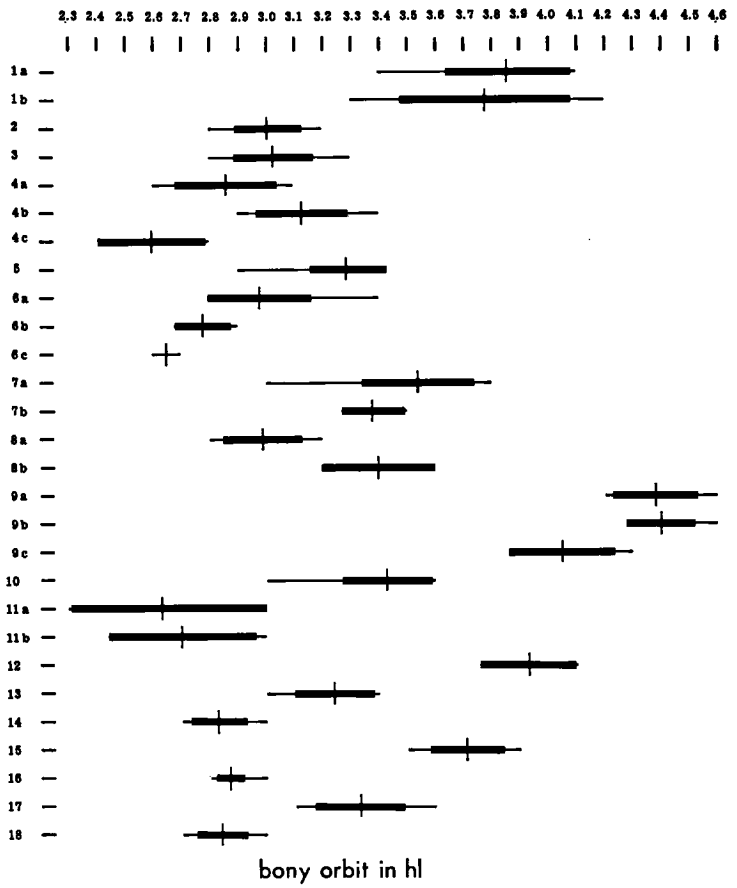

FIG. 31. Variation in ratios of length bony orbit/head length in 18 species and subspecies of *Corydoras*. Horizontal lines, solid bars and vertical lines indicate ranges, standard deviations on either side of the mean, and means, respectively.

character to distinguish *C. aeneus* from most of the other species occurring in Surinam (see fig. 28). The same can be said for the length of the pectoral spine in *C. saramaccensis* (fig 28). The long-snouted species, *C. octocirrus*, *C. oxyrhynchus*, and *C. saramaccensis*, are easily separable from most other Surinam species by their less wide bodies and their smaller eyes (figs. 27 and 31). The head length, in spite of its wide variation between juvenile and adult specimens, is still useful in distinguishing *C. nanus* from other Surinam species (fig. 30). Juvenile specimens usually have longer heads in proportion to their standard length than adults.

Of the measurements taken, the distance between the snout and the anus,

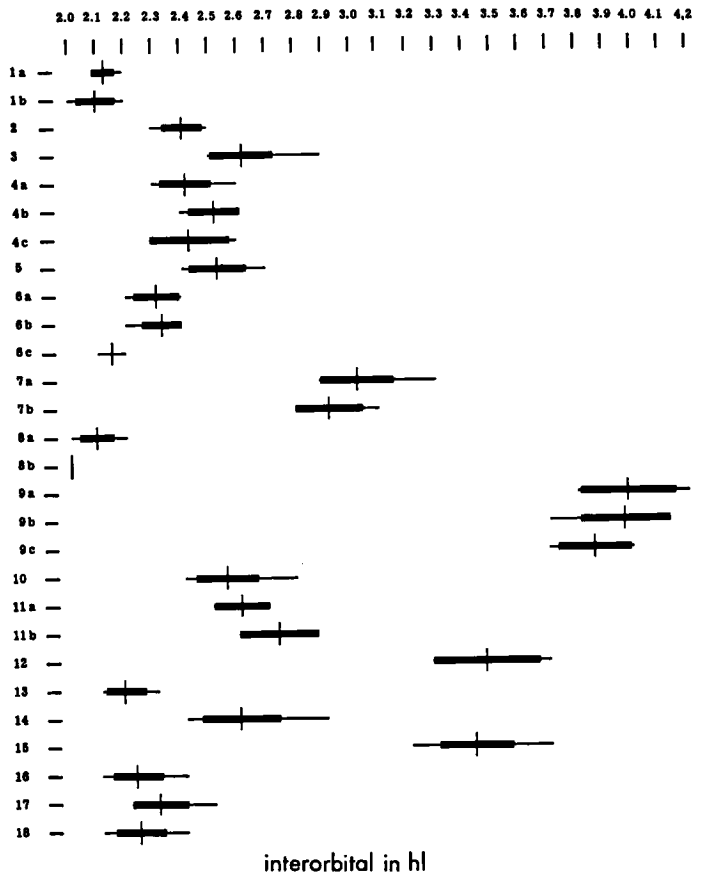

FIG. 32. Variation in ratios of interorbital width/head length in 18 species and subspecies of *Corydoras*. Horizontal lines, solid bars and vertical lines indicate ranges, standard deviations on either side of the mean, and means, respectively.

and between the snout and origin of the dorsal fin, show so little variation and such a large overlap in almost all species of the genus, that it does not seem useful to use them in the descriptions of new species. The width of the coracoid area (fig. 33) is not used here to distinguish any Surinam species and it might not seem an appropriate character to mention in the future. However, this character is useful to separate species such as *C. eques* Steindachner, 1877, in which the intercoracoid area is very narrow. Of all meristic and morphometric characters, the most useful to separate species seem to be the serration of the inner edge of the pectoral spines, the least width of the interorbital space, and the snout length. This has been determined by examination of almost all species within the genus. Of the other meristic data only the number of the lateral body scutes and the number of soft pectoral

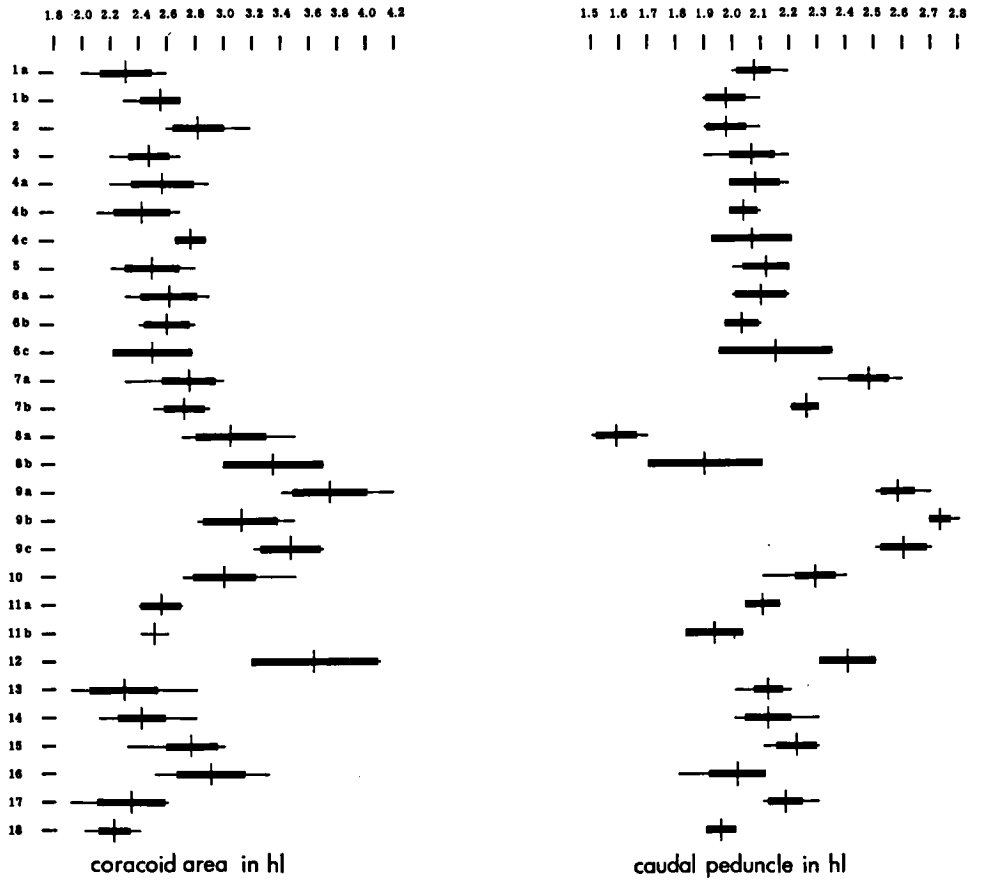

FIG. 33. Variation in ratios of width coracoid area/head length and depth caudal peduncle/head length in 18 species and subspecies of *Corydoras*. Horizontal lines, solid bars and vertical lines indicate ranges, standard deviations on either side of the mean, and means, respectively.

rays can be used to separate the species of the long-snouted group from those of the blunt-snouted group. The Surinam species *C. octocirrus*, *C. oxyrhynchus*, and *C. saramaccensis* of the long-snouted group, have at least 24 dorsolateral body scutes (usually 25 or 26) and at least 22 ventrolateral body scutes (usually 23). They have at least nine soft pectoral fin rays. The blunt-snouted species from Surinam have at most 24 dorsolateral body scutes (usually 23) and at most 22 ventrolateral body scutes (usually 20 or 21). They usually have eight soft pectoral fin rays.

Zoogeography

In Gosline's systematic revision (1940) 50 species names were mentioned and ascribed to *Corydoras* sensu Lacépède. The majority of the type specimens was not examined by Gosline and his paper thus mainly consists of a literature survey, in particular where it concerns species described by European ichthyologists — as Steindachner and Regan — who described 10 and 8 species respectively, of *Corydoras*. Gosline considered 33 taxa as valid species and provided a key to these species. He illustrated no species. Although Gosline's paper certainly was of value in 1940, it is (since it was unsupported by study of much type material) too subjective to be used for zoogeographical studies.

At least 50 new species of *Corydoras* have been described since 1940. Most of these descriptions were accompanied by figures. However, several of these species were described from commercial aquarium fishes, often without positive locality information and sometimes with no locality information at all. So, 15 species have been described without exact type localities: *C. paleatus* (Jenyns, 1842); *C. nattereri* Steindachner, 1877; *C. leopardus* Myers, 1935; *C. arcuatus* Elwin, 1939; *C. griseus* Holly, 1940; *C. pestai* Holly, 1940; *C. grafi* Holly, 1940; *C. schultzei* Holly, 1940; *C. funnelli* Fraser-Brunner, 1947; *C. melanistius longirostris* Hoedeman, 1952; *C. griseus deweyeri* Meinken, 1957; *C. sychri* Weitzman, 1960; *C. haraldschultzi* Knaack, 1962; *C. sterbai* Knaack, 1962; and *C. dubius* Nijssen & Isbrücker, 1967. Even from species such as *C. caudimaculatus* Rössel, 1961; *C. cervinus* Rössel, 1962; *C. axelrodi* Rössel, 1962; *C. evelynae* Rössel, 1963; and *C. semiaquilus* Weitzman, 1964, exact type localities are unknown. They are described from rivers which in most cases have a length of hundreds of kilometers (Rio Meta, Rio Guaporé, Rio Solimoes).

Because there is much confusion about the identity of many species and often specimens have been referred to the wrong species, one cannot rely on locality data for the different species mentioned in literature, unless they are accompanied by an adequate description and figure. This confusion is increased by several descriptions of new species based on a single specimen, so that no data on the variability of these species are available, as for example in *C. amphibelus* Cope, 1872; *C. ambiacus* Cope, 1872; *C. nattereri* Steindachner, 1877; *C. aurofrenatus* Eigenmann & Kennedy, 1903; *C. virescens* Miranda Ribeiro, 1912; *C. metae* Eigenmann, 1914; *C. latus* Pearson, 1924; *C. arcuatus* Elwin, 1939; *C. griseus* Holly, 1940; *C. pestai* Holly, 1940; *C. grafi* Holly, 1940; *C. leucomelas* Eigenmann & Allen, 1942; *C. stenocephalus* Eigenmann & Allen, 1942; *C. bertonii* Eigenmann, 1942; *C. caquetae* Fowler, 1943; *C. melanistius brevirostris* Fraser-Brunner, 1947; *C. fowleri* Böhlke, 1950; *C. melanistius longirostris* Hoedeman, 1952; *C. sychri* Weitzman, 1960; and *C. evelynae* Rössel, 1963. Fortunately, some of these species have been rediscovered and now adequate material is available. However, in many cases, especially with some descriptions published before 1940, the original descriptions are so brief that the name cannot be correlated with recently collected

specimens. Also in some cases, type specimens have become lost, damaged, or their colour pattern so faded as to make them unrecognizable. All type material has been lost of the following species: *C. punctatus* (Bloch, 1794); *C. geoffroyi* Lacépède, 1803; *C. barbatus* Quoy & Gaimard, 1824; *C. acutus* Cope, 1872; *C. nattereri* Steindachner, 1877; *C. reticulatus* Fraser-Brunner, 1938; *C. griseus* Holly, 1940; *C. pestai* Holly, 1940; *C. grafi* Holly, 1940; *C. schultzei* Holly, 1940; *C. bertonii* Eigenmann, 1942; and *C. melanistius longirostris* Hoedeman, 1952.

It is evident that under such circumstances one can give a detailed zoogeographical review only with great caution. First of all a systematic revision of the entire genus is needed. Holotypes (if available) must be reexamined, their type localities established and their colour pattern, morphometric, and meristic parameters determined. These then must be compared with other specimens of the same species from the same locality (if available) to determine the limits of variation associated with sexual dimorphism (if any) and growth. Once a name can be "attached" with certainty to a given population sample, then we are ready to study geographic variation within a species by comparing the variation already studied in topotypic material with other population samples of the same species from other localities. A study of this sort, comparing as many population samples of a species as possible, taken from its entire geographical range, would give us a relatively complete picture of its variation. We would then be ready to compare that species with other species that have also been treated in the same manner. In this way, by comparing all species of *Corydoras*, we would arrive at a reasonable understanding of the geographical variation and distribution, and perhaps evolution, within the large genus of possibly 70 to 80 species. Unfortunately, we are far from this ideal, there being too few collections.

Corydoras does seem to be divided into species groups based on colour pattern, morphometric, and meristic characters. These are still somewhat ill defined; however, one must make a beginning and I will here discuss some of these groups.

The "*punctatus*-group", as typological group, occurs in an area indicated in fig. 34 A. They have spots on body and head. About 35% of the described species belongs to this group, which can be subdivided in smaller groups, viz.,

(a) With a dark spot on the upper part of the dorsal fin. This group consists of: *C. punctatus* (Bloch, 1794); *C. geoffroyi* Lacépède, 1803; *C. trilineatus* Cope, 1872; *C. julii* Steindachner, 1906; *C. multimaculatus* Steindachner, 1907; *C. reticulatus* Fraser-Brunner, 1938; *C. episcopi* Eigenmann & Allen, 1942; and *C. dubius* Nijssen & Isbrücker, 1967.

(b) With a mask across the eyes, mostly accompanied by a dark blotch beneath the dorsal fin. This group consists of: *C. ambiacus* Cope, 1872; *C. melanistius* Regan, 1912; *C. potaroensis* Myers, 1927; *C. grafi* Holly, 1940; *C. leucomelas* Eigenmann & Allen, 1942; *C. caquetae* Fowler, 1943; *C. melanistius brevirostris* Fraser-Brunner, 1947; *C. melanistius longi-*

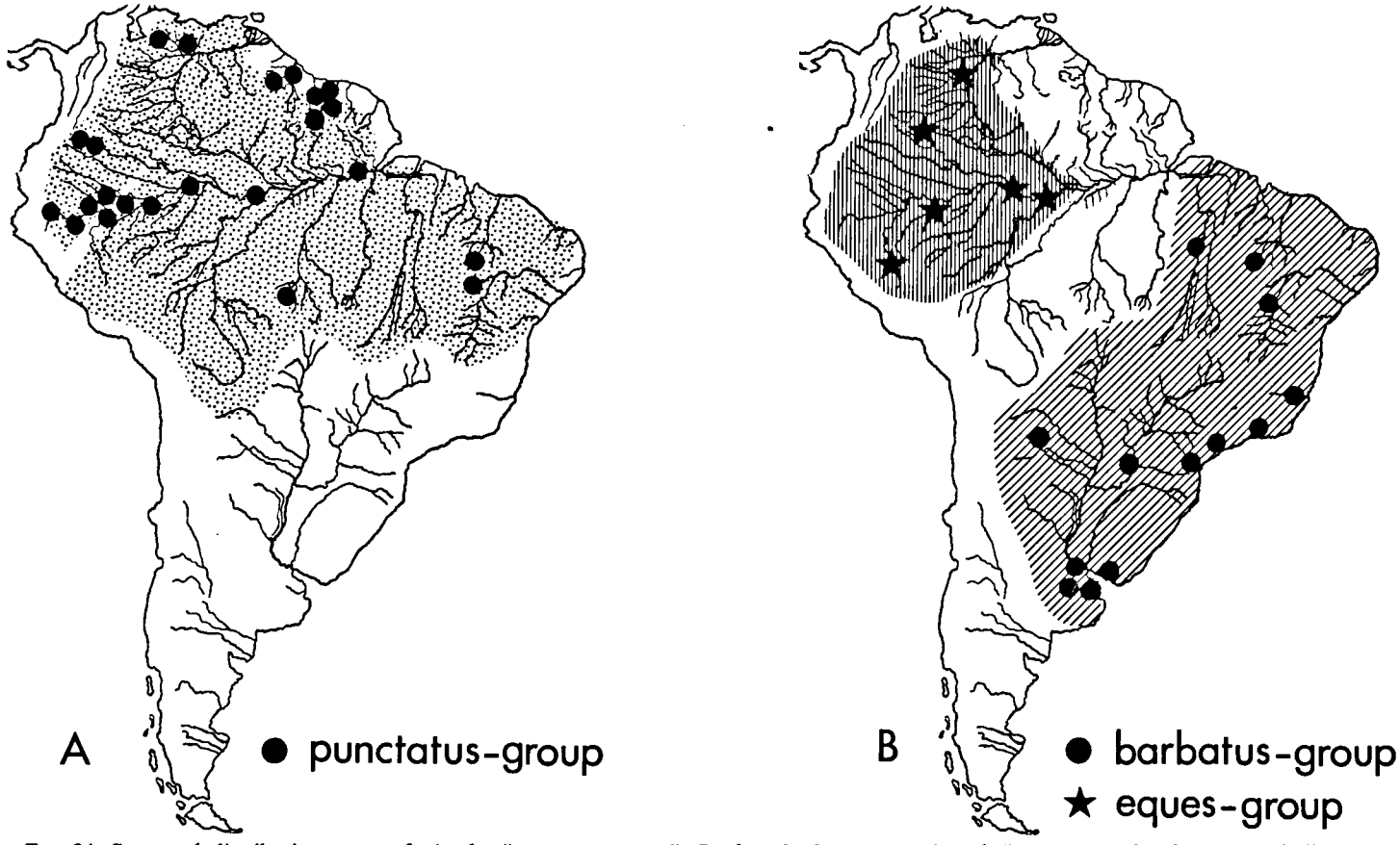

FIG. 34. Supposed distribution areas of: A, the "*punctatus* group"; B, the "*barbatus*-group" and "*eques*-group". The marks indicate the type localities of the species, belonging to these groups.

rostris Hoedeman, 1952; *C. sychri* Weitzman, 1960; *C. schwartzi schwartzi* Rössel, 1963; *C. evelynae* Rössel, 1963; *C. bicolor* Nijssen & Isbrücker, 1967; *C. wotroi* Nijssen & Isbrücker, 1967; and *C. schwartzi surinamensis* Nijssen, 1970.

(c) With long snouts:
C. agassizi Steindachner, 1877; *C. leopardus* Myers, 1935; and *C. funnelli* Fraser-Brunner, 1947.

(d) With relatively elongate bodies:
C. osteocarus Böhlke, 1951; *C. reynoldsi* Myers & Weitzman, 1960; *C. habrosus* Weitzman, 1960; and *C. sanchesi* Nijssen & Isbrücker, 1967.

(e) With relatively deep bodies:
C. polystictus Regan, 1912; *C. virescens* Miranda Ribeiro, 1912; and *C. guianensis* Nijssen, 1970.

(f) With relatively long dorsal spines:
C. armatus (Günther, 1868); and *C. amphibelus* Cope, 1872.

The "*barbatus*-group" with a colour pattern of brownish blotches on the dorsolateral body scutes, more or less alternating with others on the ventrolateral scutes, shows a distribution as indicated in fig. 34 B. To this group belong *C. barbatus* (Quoy & Gaimard, 1824); *C. paleatus* (Jenyns, 1842); *C. marmoratus* Steindachner, 1879; *C. raimundi* Steindachner, 1907; *C. kronei* Miranda Ribeiro, 1907; *C. eigenmanni* von Ihering, 1907; *C. ehrhardti* Steindachner, 1910; *C. meridionalis* von Ihering, 1911; *C. flaveolus* von Ihering, 1911; *C. garbei* von Ihering, 1911; *C. micracanthus* Regan, 1912; *C. microcephalus* Regan, 1912; *C. undulatus* Regan, 1912; *C. macropterus* Regan, 1913; *C. bertonii* Eigenmann, 1942; and *C. cochui* Myers & Weitman, 1954.

The widely distributed "*aeneus*-group" (fig. 35 A) consists of *C. aeneus* (Gill, 1858); *C. microps* Eigenmann & Kennedy, 1903; *C. venezuelanus* von Ihering, 1911; *C. melanotaenia* Regan, 1912; *C. macrosteus* Regan, 1912; and *C. schultzei* Holly, 1940. They have a plain blue-greyish colouration on the superior part of the body.

The "*nattereri*-group" can be characterized by a dark stripe across the junctions of the lateral body scutes. Its distribution is indicated in fig. 35 A. To this group belong *C. nattereri* Steindachner, 1877; *C. juquiaae* von Ihering, 1907; *C. triseriatus* von Ihering, 1911; *C. bondi bondi* Gosline, 1940; *C. axelrodi* Rössel, 1962; *C. boesemani* Nijssen & Isbrücker, 1967; *C. bondi coppenamensis* Nijssen, 1970; and *C. oelemariensis* Nijssen, 1970.

The "*eques*-group", with a black band on the upper part of the body, occurs in the upper reaches of the Amazon and Orinoco river (fig. 34 B). Similar to *C. eques* Steindachner, 1877, with nearly no naked intercoracoid area, are *C. rabauti* LaMonte, 1941; *C. myersi* Miranda Ribeiro, 1942; and *C. zygatus* Eigenmann & Allen, 1942. *C. metae* Eigenmann, 1914; *C. melini* Lönnberg & Rendahl, 1930; and *C. arcuatus* Elwin, 1939, with a broader naked area between the coracoids, are also considered to belong to this group.

The long-snouted species, assembled in the "*acutus*-group", have a serrate pectoral spine and a greyish colour. They are widely distributed as in shown in fig. 35 B. This group comprises *C. acutus* Cope, 1872; *C. aurofrenatus*

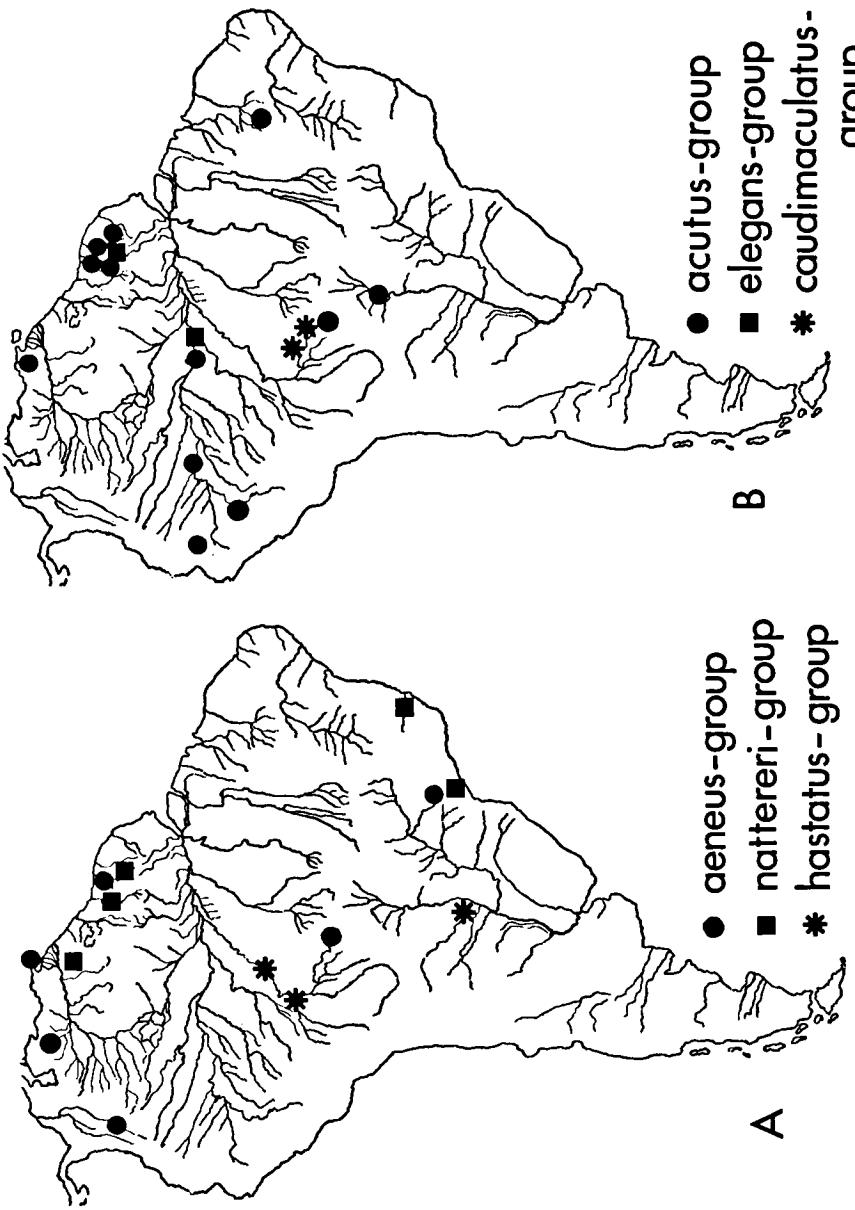

FIG. 35. Type localities of species belonging to: A, the "*aeneus*-group", "*nattereri*-group", and "*hastatus*-group"; B, the "*acutus*-group", "*elegans*-group", and "*caudimaculatus*-group".

Eigenmann & Kennedy, 1903; *C. treitlii* Steindachner, 1906; *C. spilurus* Norman, 1926; *C. septentrionalis* Gosline, 1940; *C. ellisae* Gosline, 1940; *C. stenocephalus* Eigenmann & Allen, 1942; *C. cervinus* Rössel, 1962; *C. pastazensis* Weitzman, 1963; *C. semiaquilus* Weitzman, 1964; *C. oxyrhynchus* Nijssen & Isbrücker, 1967; *C. octocirrus* Nijssen, 1970; and *C. saramaccensis*

Nijssen, 1970. *C. griseus griseus* Holly, 1940; *C. fowleri* Böhlke, 1950; *C. griseus deweyeri* Meinken, 1957; and *C. heteromorphus* Nijssen, 1970, do not have a serrate pectoral spine, but they are considered related to this group.

The "*elegans*-group" (for distribution see fig. 35 B) with several brown horizontal stripes along the lateral body scutes, consists of *C. elegans* Steindachner, 1877; *C. pestai* Holly, 1940; and *C. nanus* Nijssen & Isbrücker, 1967.

The "*caudimaculatus*-group" (fig. 35 B) consists of *C. caudimaculatus* Rössel, 1961, and *C. guapore* Knaack, 1961, only. They have a large black spot on the caudal peduncle.

The dwarf species, *C. hastatus* Eigenmann & Eigenmann, 1888; *C. australe* Eigenmann & Ward, 1907; and *C. pygmaeus* Knaack, 1966, could be assembled in the "*hastatus*-group" (fig. 35 A). They might be transferred to the (sub)genus *Microcorydoras* established by Myers in 1953.

Of the one hundred taxa described in the genus *Corydoras* sensu Lacépède, only four species, *C. latus* Pearson, 1924; *C. haraldschultzi* Knaack, 1962; *C. sterbai* Knaack, 1962; and *C. concolor* Weitzman, 1961, cannot be attributed to any particular group at the moment.

The distribution of the seventeen representatives of *Corydoras* in Surinam is given in figs. 37, 38, and 39. Sympatric occurrence of species is found in several instances, viz.,

in the Sipaliwini River:	*C. bicolor*, and *C. bondi bondi*;
in the Lucie River :	*C. bicolor*, *C. boesemani*, and *C. wotroi*;
in the Nickerie River :	*C. guianensis*, and *C. heteromorphus*;
in the Coppename River:	*C. guianensis*, *C. heteromorphus*, *C. schwartzi surinamensis*, and *C. bondi coppenamensis*;
in the Saramacca River:	*C. guianensis*, *C. sanchesi*, *C. aeneus*, *C. saramaccensis*, *C. oxyrhynchus*, and *C. wotroi*;
in the Suriname River: and the Gran Rio	*C. punctatus*, *C. aeneus*, *C. octocirrus*, *C. boesemani*, and *C. nanus*;
in the Oelemari River:	*C. oelemariensis*, *C. octocirrus*, and *C. nanus*.

When looking at the distribution maps one observes that no *Corydoras* species are recorded from some rivers: Corantijn, Coeroeni, Marataka, Adampado, Coesewijne, Commewijne, Cottica, Gonini, and Litanie Rivers (see also fig. 2). This is probably due to the fact that these rivers are not frequently investigated. It seems reasonable that *Corydoras* also occurs in these rivers. Furthermore, the geographical situation of the upper reaches of all rivers is insufficiently known.

Most creeks, originating from the watersheds, are never visited and are indicated on official maps by dotted lines. Their location is only deducted from aerocarting. Therefore, it seems too early to discuss the active and passive dispersal of *Corydoras* in Surinam, the more so, since distribution records from surrounding areas are far less known at the moment. However, some remarks are possible.

The rivers in the Guiana countries are very interesting for zoogeographical

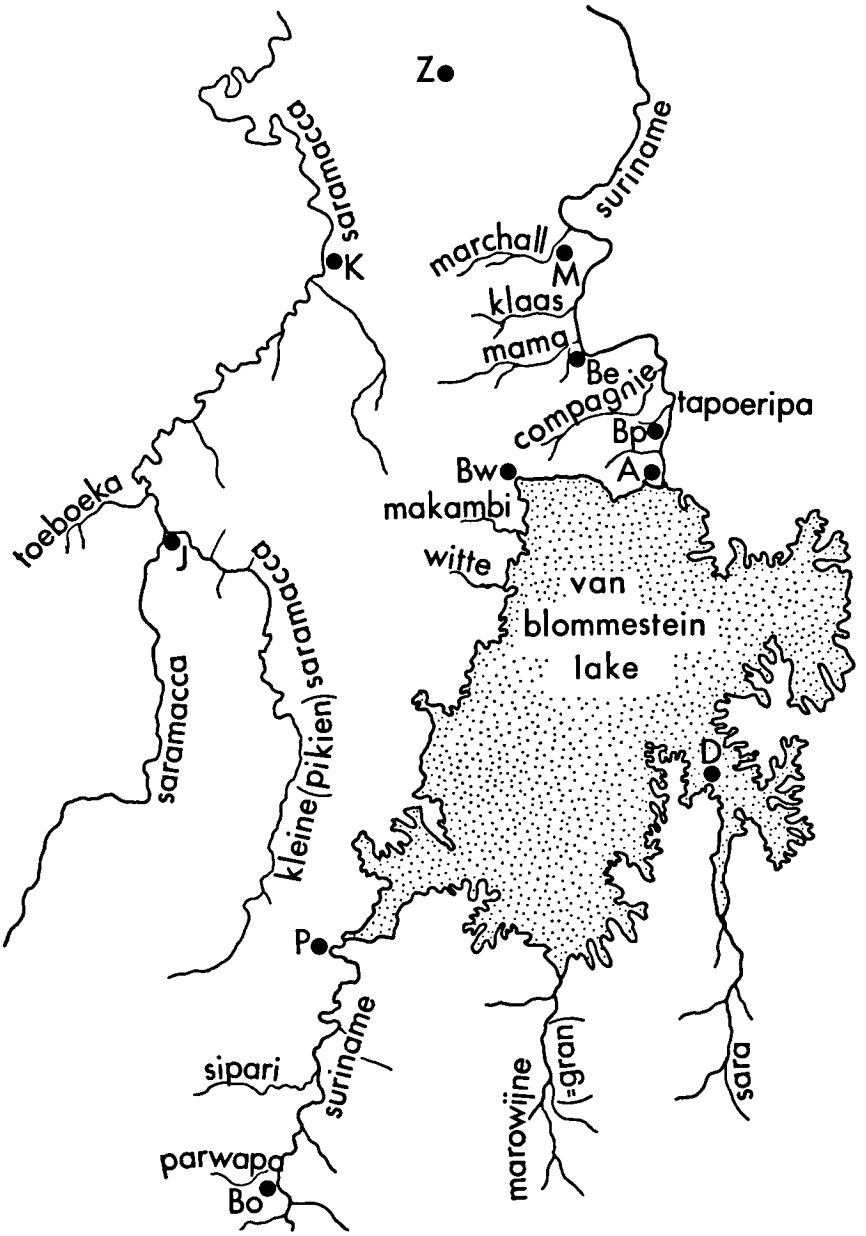

FIG. 36. Map of surroundings of the artificial lake (District Brokopondo), showing smaller tributaries of the Suriname and Saramacca-Rivers.
A Afobaka; Be Berg en Dal; Bo Botopasi; Bp Brokopondo; Bw Brownsweg; D Dam; J Jacobskondre; K Kwakoegron; M Marchall dorp; P Pokiegron; Z Zanderij.

studies, since most of the rivers run parallel, and from South to North. The watersheds are formed and separated by mountains. Also in the South the Guiana rivers are separated from the Amazon basin by mountains.

Although the Precambrian Guiana Shield is very old, the Guiana mountains must have been subjected to recent tectonic movements since, in general, the fresh water fauna of the Guiana countries shows a strong relation to that of the Amazon basin. Most genera which occur in the Guiana rivers are also found in the Amazon River. The isolation of the Guiana rivers from the Amazon basin and the isolation between the different Guiana rivers themselves, seem to have existed long enough to allow speciation. Each Guiana river system has endemic species. The rivers in Surinam and in French Guiana have probably been isolated from the Amazon basin for a longer period than the rivers in (British) Guyana. Also in Guyana, the Essequibo river system does not appear to be well isolated from the upper reaches of the Rio Branco.

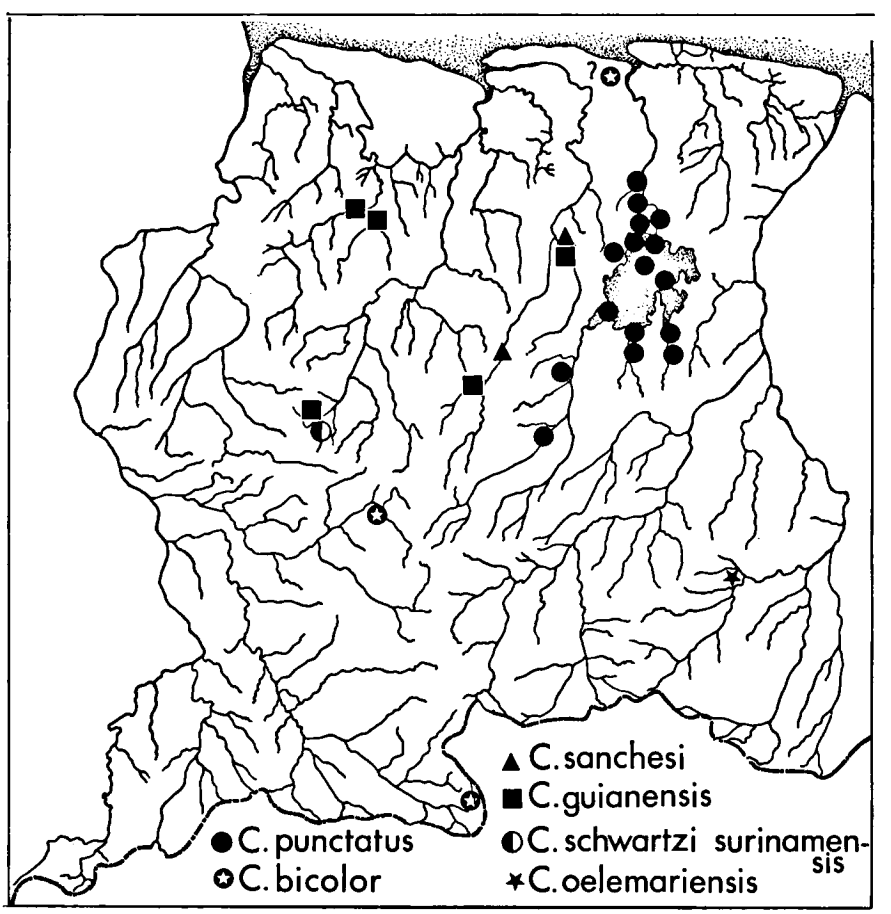

FIG. 37. Map of Surinam showing localities where six species and subspecies of *Corydoras* were collected.

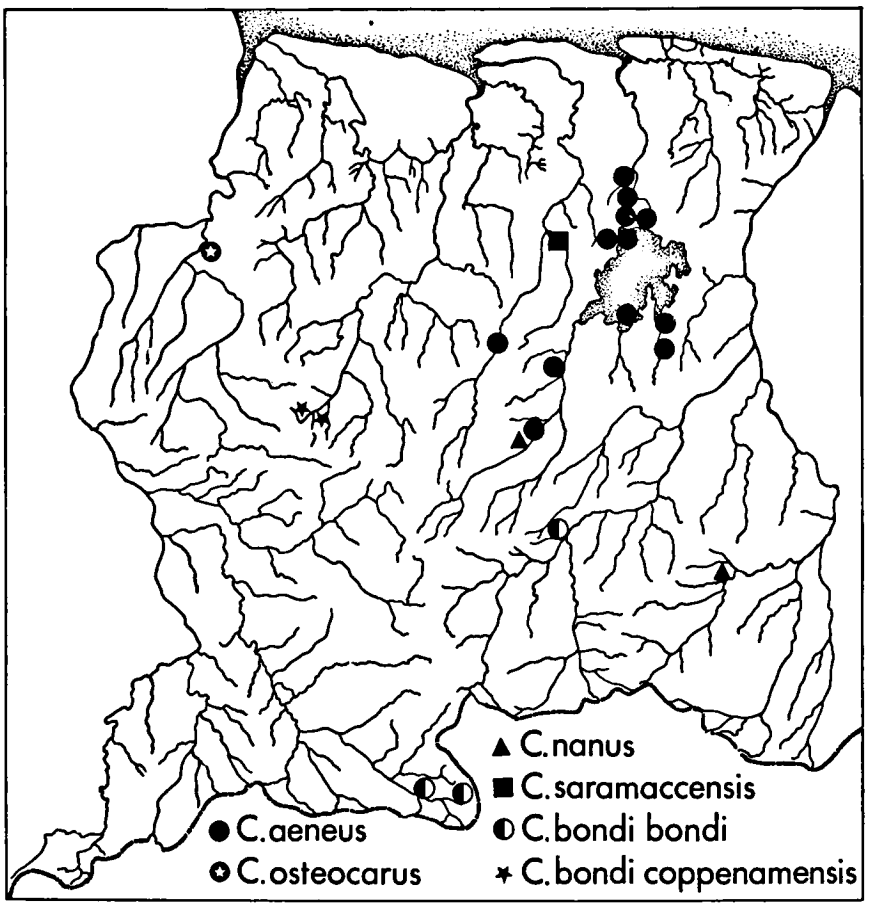

FIG. 38. Map of Surinam showing localities where six species and subspecies of *Corydoras* were collected.

For example, in the Rupununi River (Essequibo river system) two well-known Amazon species occur (see Eigenmann, 1912), viz., *Arapaima gigas* (Cuvier, 1817) and *Osteoglossum bicirrhosum* Vandelli, 1829, which never have been recorded for Surinam or French Guiana.

When considering Surinam only, the Corantijn river system seems to have the least perfect isolation; it probably has connections through the upper courses of the Sipaliwini River with the upper reaches of the Rio Paru de Oeste of the Amazon basin. One can imagine that during heavy rainfall both river systems can be connected across the Sipaliwini-Paru Savanna by shallow inundated areas. It is therefore not surprising to find two species in the Corantijn river system *(C. bondi bondi* and *C. osteocarus)* which are also known from rivers in (British) Guyana and Venezuela. The Orinoco river

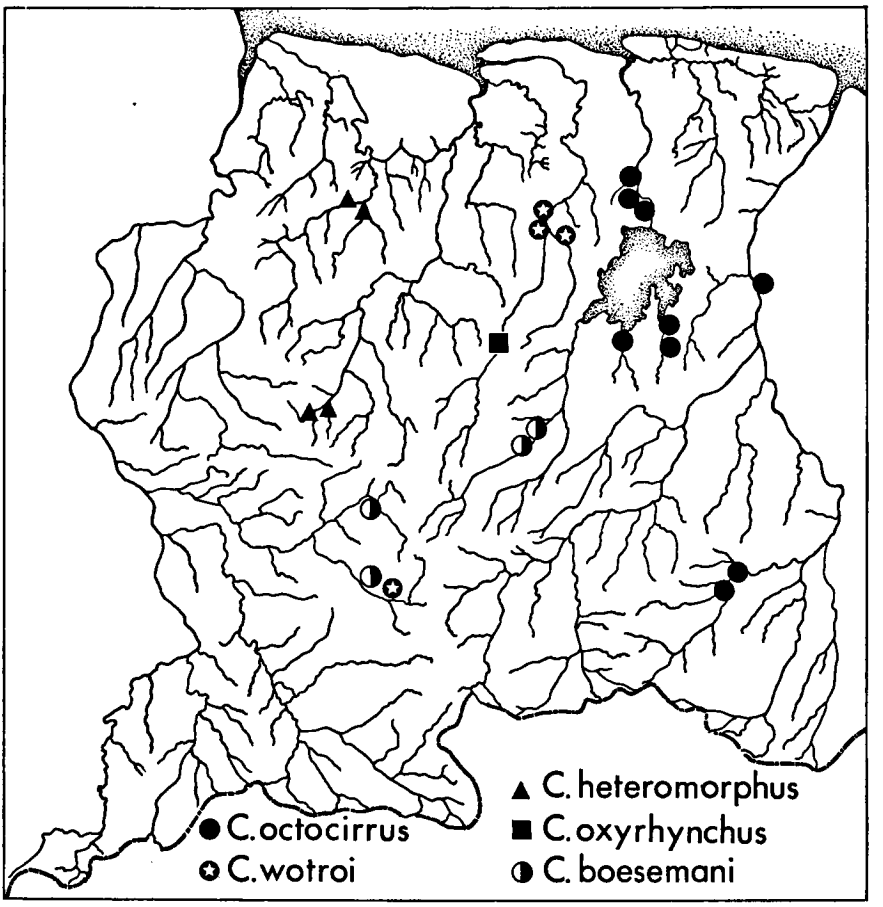

FIG. 39. Map of Surinam showing localities where five species of *Corydoras* were collected.

system also has a connection with the Amazon basin through the upper reaches of the Rio Negro via the Casiquiare Canal.

The fact that *C. bondi bondi* was found at the junction of the Tapanahony and Paloemeu Rivers leads one to suppose that in the upper reaches of one of these rivers connections have existed (perhaps also across the Paru Savanna) with the Corantijn system (Sipaliwini River), in which *C. bondi bondi* occurs. The occurrence of *C. boesemani* in the Gran Rio as well as in the upper course of the Lucie River suggests that formerly a connection has existed between these two river systems. The distribution of *C. heteromorphus* and *C. guianensis* can easily be explained by temporary connections between the Nickerie, Coppename and Saramacca Rivers, just South of the savanna belt. During the investigations made for several artificial lakes in Surinam (Stondansie and Saramacca Projects) it was found that some of

these connections exist during long periods with heavy rainfall. Moreover, the Nickerie and Coppename Rivers are connected by the Arawara-Wayambo River just North of the Zanderij Formation.

The occurrence of both *C. octocirrus* and *C. nanus* in the Suriname as well as in the Marowijne river system may point to connections along their watersheds. These may occur between the upper reaches of the Sara Creek and the northern tributaries of the Lower Tapanahony River.

It is surprising that in Surinam *C. aeneus* is only found in the Suriname and Saramacca river systems. This species seems to be widely distributed. It certainly occurs in all three Guiana countries and therefore can also be expected to occur in other Surinam rivers, except perhaps in the Coppename River. This river seems to be the most perfectly isolated river system (at least in its upper course) in Surinam, enclosed by the Wilhelmina Mountains in the South (with the Juliana Top of 1280 meters as highest peak of Surinam), the Bakhuis Mountains in the West and the Emma Mountains in the East (with highest peaks of 1070 and 1080 meters, respectively). It is not surprising, therefore, that two subspecies described in this paper (*C. bondi coppenamensis* and *C. schwartzi surinamensis*) are restricted to the Coppename River. *C. bondi bondi* occurs in the vicinity of the Coppename River, viz., in the Corantijn system, while *C. schwartzi schwartzi* is known only from the Amazon River near Manaus.

The other species occurring in Surinam (*C. bicolor, C. sanchesi, C. saramaccensis, C. oxyrhynchus, C. punctatus,* and *C. oelemariensis*) are recorded from one river system only and thus seem to be endemic. If these Surinam species really do not occur elsewhere, they could be subspecies but, considering the difficulty of pursuing a problem of speciation on the basis of so few samples from a restricted region in relation to the total distribution area of the genus, one is inclined to treat aberrant populations as full species for the moment, until additional data prove that they represent lower ranks (see also discussion under *C. sanchesi* and *C. wotroi*).

Ecology and ethology

Our knowledge concerning ecology and ethology of the species of *Corydoras* is limited. Field data are scarce. Because most species of *Corydoras* are highly appreciated as exotic aquarium fishes, a few data are known from observations by aquarists.

Of the species from Surinam, *C. aeneus, C. bondi bondi, C. osteocarus,* and *C. wotroi* only have been imported alive in the United States of America and in Europe. Of these species, only *C. aeneus* and *C. wotroi* have been bred.

At present it is impossible to describe the ecology and ethology of each species separately. The genus is here considered as a whole and only phenomena typical for some particular species are mentioned.

Corydoras species are bottom dwellers. They hover across the bottom in search for food. In aquaria they consume dead leaves and dead snails, acting

as "scavengers". They also dig tubificid worms and other mud and sand dwelling organisms out of the bottom. They burrow their snouts into the sand up to their eyes, thus keeping the surface of the sand and mud loose. They even consume living *Daphnia* at the surface, sometimes swimming upside down (in a manner suggesting, but not really like, some species of the African catfish genus *Synodontis*). They seemingly rake in *Daphnia* by means of a small current, effected by moving their barbels. However, most of the time they rest on the bottom, principally supporting themselves with the pelvic fins but also with the pectorals and anal fin. When observing representatives of *Corydoras* after presentation of tubificid worms as food, one is inclined to believe the worms are found rather through chemical than through optical means. The fishes swim around in circles before finding the worms, which have been placed just in front of their snouts. They also become very active when worm extract is put into the water. Also they appear very sensitive to vibrations.

Most *Corydoras* species have been observed to endure successfully a temperature range from 17 to 28° Centigrade and thrive in slightly alkaline as well as in slightly acid waters. Undoubtedly, in a widely distributed genus such as *Corydoras*, each species has its own optimum ecological conditions. In Surinam the water temperature varies from a about 22° C in the shaded forest creeks to 32° in open water. The rivers and creeks in Surinam are slightly acid, pH ranging from about 5.3 to 6.7, except for some savanna creeks which can have a pH as low as 4.6. In the latter creeks with tea-coloured water (Carolina Creek, Coropina Creek) I did not find *Corydoras*. In fact, they are not found on and North of the Zanderij Formation, a savanna belt, extending from 150 km from the coast in the western part of Surinam, to 40 km from the coast in the eastern part. Marchall Creek, with *C. punctatus*, *C. aeneus*, and *C. octocirrus* (see fig. 36), is the northernmost locality where *Corydoras* was found in Surinam. The distribution in Surinam indicates that *Corydoras* has a very limited tolerance for salt and it is not found in lowland areas subject to tidal influence.

In Surinam, *Corydoras* is found in shallow waters to a depth of only about 2.0 meters. The fishes occasionally dash to the surface to gasp air. This was especially observed under abnormal conditions when fish poison was used. This poison, rotenone, acts as a vasoconstrictor. When it is added to the water most fishes come to the surface to gasp constantly for air and stay at the surface. However, *Corydoras* comes less frequently and with a quick movement to the surface, takes a bubble of air, and returns immediately to the bottom, where it remains for several minutes. Many catfishes, including *Corydoras*, can use atmosferic air for respiration. In aquaria that are low in oxygen, *Corydoras* also quickly goes to the surface for air. However, no records of the (presumably low) oxygen concentrations that bring about this behaviour have been published.

Corydoras seems to frequent small tributary streams. At least the fishes are most easily caught there. During the rainy season when it is hard to find small streams to work with poison, it is very difficult to catch *Corydoras*. The

high level of the water in the main streams backs up water in the tributaries. These become deep and filled with turbid water. One must penetrate deep into the rain forest to find the upper course of the creeks where water is still running. One then should place a seine across the lower course of the creek to prevent escape of fishes. Many *Corydoras* specimens apparently never swim downstream towards the seine when influenced by poison. Instead, they try to escape upstream from the fish poison. However, most of them dive to the bottom and stay there under submerged tree trunks and stones. As said before, they sometimes dash to the surface for air. Others try to escape the rotenone by swimming to the embankments of the creek or to tree trunks, which lay half submerged. In such a position they can easily be removed by hand, whereas also some Loricariidae, such as species of the genera *Hypostomus, Ancistrus,* and *Farlowella,* could be caught. Most *Corydoras* specimens die by suffocation and remain on the bottom of the creek. One can catch the surfacing fishes with dip-nets, while one slowly descends the stream towards the seine near the outlet of the creek. The seine can be then removed, after having picked out the desired species. The larger species which are no longer needed can escape into the main current. It takes several hours before the creek becomes clear and free of suspended mud. Most *Corydoras* specimens can then be collected by walking upstream. One can pick up the dead fishes from the bottom, from under submerged trees, and from the banks. During this second search about 80% of the total number of *Corydoras* specimens were found in my collecting attempts, along with the greater number of species belonging to the genera *Trichomycterus, Centromochlus* sensu Eigenmann, *Microglanis,* and *Loricariichthys.*

Most *Corydoras* specimens have been found in small and mean-sized tributary creeks of larger creeks and rivers. The depth of these tributaries varies from about 20 cm upstream to about 200 cm near their outlet. They are always overgrown with land vegetation and usually running. During dry periods, *C. sanchesi, C. saramaccensis,* and *C. wotroi* have also been found in stagnant waters. *C. punctatus* and *C. aeneus* have been found in the artificial lake along the shores, where they had survived the influence of the increasing depth of the lake, which was still filling up during my investigations in 1966 and 1967.

Corydoras is mostly found on sandy bottoms partly covered by mud, dead leaves, and with submerged trees. Near small rapids the bottom consists of stones and gravel, while in deeper pools and near the outlet mud is found. During dry periods *Corydoras* is also caught in shallow water situated between the rocks of the rapids in the main current.

In Surinam *Corydoras* probably spawns in April or May during the beginning of the long rainy season. Suitable breeding places are then available between the submerged plants found along the embankments of creeks. During this period the rainwater washes extra food into the creeks for the fry.

The colour pattern in the different species may have a behavioral significance which is of value to the population behaviour. Most, if not all, *Corydoras* species live in schools; males, females, and juveniles together. In

Surinam I observed schools of *C. aeneus* in the Tapoeripa Creek, *C. boesemani* in a tributary of the Gran Rio, *C. bondi coppenamensis* in a tributary of the Coppename River, *C. punctatus* in the Marowijne Creek, *C. sanchesi* in the Kleine Saramacca River, and *C. wotroi* in a tributary of the Kleine Saramacca River. The number of specimens found in one sample of each of the species *C. guianensis, C. heteromorphus, C. oelemariensis,* and *C. schwartzi surinamensis* leads one to suppose that these also live in schools.

Although the general pattern of pigmentation in each species is constant, it becomes clear that intensity of pigmentation depends on the local nature of the bottom. These differences in intensity are still visible in freshly preserved specimens as shown in figs. 18 and 19. The specimens shown in figs. 18a and 19a were collected on a sandy bottom, whereas the specimens shown in figs. 18c and 19c came from inundated dark rain forests with decaying leaves (see discussion *C. punctatus).* In *C. aeneus* and *C. heteromorphus,* which do not have a striking colour pattern, it was also found that specimens caught on a darker bottom showed a more intense pigmentation.

It is noteworthy that in each river system different species or subspecies have about the same colour design. Species with a broad dark stripe across the junctions of the lateral body scutes are present in the Corantijn system (*C. bondi bondi* and *C. boesemani*), Coppename system (*C. bondi coppenamensis),* Suriname system *(C. boesemani),* and in the Marowijne system *(C. oelemariensis).* Species with a mask across their eyes are present in the Corantijn system (*C. bicolor* and *C. wotroi*), Coppename system (*C. schwartzi surinamensis),* and in the Saramacca system *(C. wotroi).* Species with many dots on body and head are present in the Corantijn system *(C. osteocarus* and *C. wotroi),* Coppename system *(C. bondi coppenamensis),* Saramacca system (*C. wotroi*), and in the Suriname system (*C. punctatus*). All river systems also have a species of the long-snouted group, viz., *C.* species(*) in the Corantijn system, *C. heteromorphus* in the Nickerie and Coppename systems, *C. oxyrhynchus* and *C. saramaccensis* in the Saramacca system, and *C. octocirrus* in the Suriname and Marowijne systems.

The long-snouted species appear to have a different adaptation than the blunt-snouted group (which comprises about 85% of the known *Corydoras* species). The first group, with their long and thin snouts, are better equipped for digging food out of the bottom. Their prey may be different from that of the second group.

Only once did I observe a case of predation on *Corydoras.* In the Tapoeripa Creek I caught a specimen of *Hoplias malabaricus* (Bloch, 1794) with a specimen of *C. aeneus* in the mouth. *Corydoras* species can only defend themselves by their pungent dorsal and pectoral spines which can be locked in the most widely spread position by a friction lock.

The first *Corydoras* species to become well established among aquarists were *C. paleatus* (Jenyns, 1842) and *C. aeneus* (Gill, 1858). Since the latter occurs in Surinam it seems advisable to describe the spawning of *C. aeneus* in the aquarium. Recent additional data are available from Knaack (1964).

* See addendum.

The first sign indicating that spawning is soon to follow is when several males persistently swim over the back of the female, bringing their barbels in occasional contact with the supraoccipital of the femāle and butting against the sides of her body and head with their snouts. This display is often interrupted by cleaning leaves of plants and side glass of the tank with their mouths. At this phase commonly more than one male is involved. The males do not chase each other, nor defend a territory. At last, just below the surface of the water, one of the males pinches the head of the female between one or both pectoral spines. The female has already pursed her ventral fins together, in which then the eggs are caught and fertilized. During this phase both male and female sink to the bottom, where the female commonly rests some minutes holding her eggs in her pursed ventral fins. She then searches a suitable place to attach them on leaves or side glasses where they adhere tenaciously. This process is repeated at intervals over a period of several hours. At the end of this time the female can have deposited over two hundred eggs. The male does not follow the female when the eggs are deposited, neither does he pay any attention to them. The eggs hatch in three to five days according to temperature. Parental care for the offspring is never observed.

It seems reasonable to suppose that the spawning process of the different species follows about the same pattern throughout the genus since external morphological differences in the genital regions are absent. In *Corydoras* sex differences are hardly visible. The males of *C. barbatus* (Quoy & Gaimard, 1824), *C. macropterus* Regan, 1912, and *C. octocirrus* Nijssen, 1970. have prolonged pectoral spines. This might be correlated with the breeding behaviour. In *C. paleatus, C. barbatus,* and *C. macropterus* the first and second soft fin rays of the dorsal fin are more elongate in the males than in the females.

Of the ten species bred by aquarists, most have nearly the same breeding behaviour. However, *C. elegans* Steindachner, 1877, externally quite similar to *C. nanus* Nijssen & Isbrücker, 1967, shows a somewhat different behaviour with intraterritorial chasing. *C. hastatus* Eigenmann & Eigenmann, 1888, and *C. pygmaeus* (Knaack, 1966) show a different behaviour, unlike that of other members of the genus, even in their daily movements. They do not always hover around and rest on the bottom, but balance themselves well above the bottom by a rapid motion of the pectoral and caudal fins.

Addendum

After the manuscript was completed I received in November 1969 from Dr. M. Boeseman seven specimens of *Corydoras.* The specimens were collected by Drs. M. S. Hoogmoed in August 1968 in a forest creek, northeast of the Kayser airstrip (see fig. 1), a tributary of the South River, Corantijn river system.

Because it was impossible to add these data to the lists of material in this paper, the specimens are listed here. However, the data could still be in-

corporated in the distribution maps (see fig. 39) and in the chapters zoogeography, ecology, and ethology.

C. boesemani: 1 juvenile specimen, 20.4 mm sl, RMNH 25823.

C. boesemani was already known from the confluence of East and South River with Lucie River.

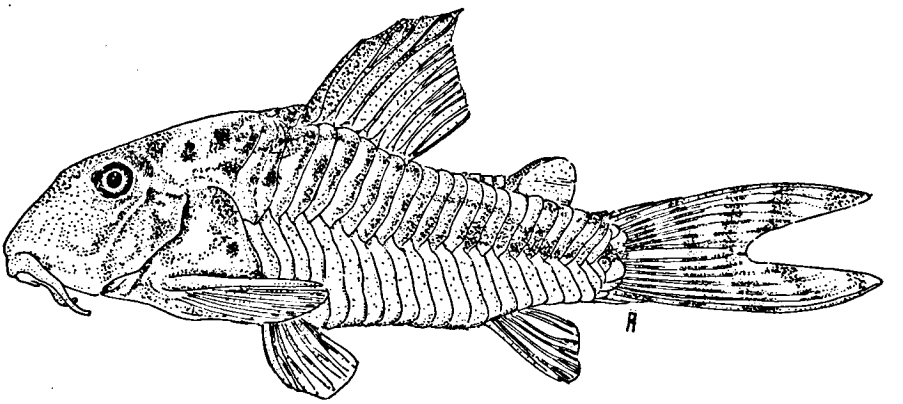

FIG. 40. *Corydoras* species, juvenile specimen, 33.0 mm sl., creek northeast of Kayser airstrip, tributary of South River (RMNH 26174) (P.P.O.H. Höhner del.).

C. wotroi: 3 juvenile specimens, 23.7—23.9 mm sl, RMNH 26173.

C. wotroi was only known from the Saramacca River. The occurrence of this species in the Corantijn river system is a new record and suggests that some connection might have existed between these two river systems.

C. species (fig. 40): 3 juvenile specimens, 26.1—33.0 mm sl, RMNH 26174.

I am unable to identify these specimens at the moment, because of their juvenile state. They belong to the long-snouted group of *Corydoras*, which has not yet been recorded from the Corantijn river system. Characteristic for the juvenile state of the specimens is the middorsal groove between dorsal fin and adipose spine, where the dorsolateral body scutes do not yet meet each other. They have a moderately serrated inner edge of the pectoral spine, different from *C. oxyrhynchus*, *C. saramaccensis*, and *C. octocirrus*. From the latter species they also differ by having only two pairs of rictal barbels. The next to largest specimen (32.6 mm sl) does not show the distinct vertical bars on the caudal fin as shown in fig. 40.

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