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## **SURINAM CAECILIANS, WITH NOTES ON *RHINATREMA BIVITTATUM* AND THE DESCRIPTION OF A NEW SPECIES OF *MICROCAECILIA* (AMPHIBIA, GYMNOPTIONA)**

by

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With 1 text-figure, 2 plates and 4 tables

### SUMMARY

In this paper we list seven species of caecilians known to occur in Surinam. An eighth species, the aquatic *Typhlonectes compressicaudus*, is likely to be found in Surinam, but there are no voucher specimens. We report the rediscovery of the rare *Rhinatrema bivittatum*, now known from four specimens, one each from Brazil, French Guiana, Guyana, and Surinam. *Microcaecilia taylori*, described as a new species from Sipaliwini, is characterized mainly by a complete lack of secondary annuli, a feature which necessitated rediagnosis of the genus *Microcaecilia*. A *Microcaecilia* from the Lely Mountains differs from all known specimens of the genus by its larger size. The specimen is either a geographic variant of *Microcaecilia unicolor*, or it is an undescribed species. Additional material is needed to solve the problem. The known ranges of *Rhinatrema bivittatum* and *Microcaecilia rabei* are significantly extended. A key to Surinam caecilians is provided. A discussion on zoogeography leads to the tentative conclusion that part of the 13 species of caecilians known from Guiana are widespread, but others apparently have limited distributions and might represent indicator species of former forest-refuges.

### INTRODUCTION

Van Lidth de Jeude (1914-1917) reported only three species of caecilians from Surinam, viz., *Caecilia gracilis* Shaw, *Caecilia tentaculata* Linnaeus, and *Typhlonectes compressicaudus* (Duméril & Bibron). Dunn (1942) also listed three species for Surinam, but his list differed slightly from that of

Van Lidth de Jeude (1914-1917): 1. *Caecilia gracilis*, 11 specimens; 2. *Caecilia tentaculata*, three specimens including the Linnaean type which is lost; and 3. *Siphonops annulatus* (Mikan), one specimen. Taylor's (1968)

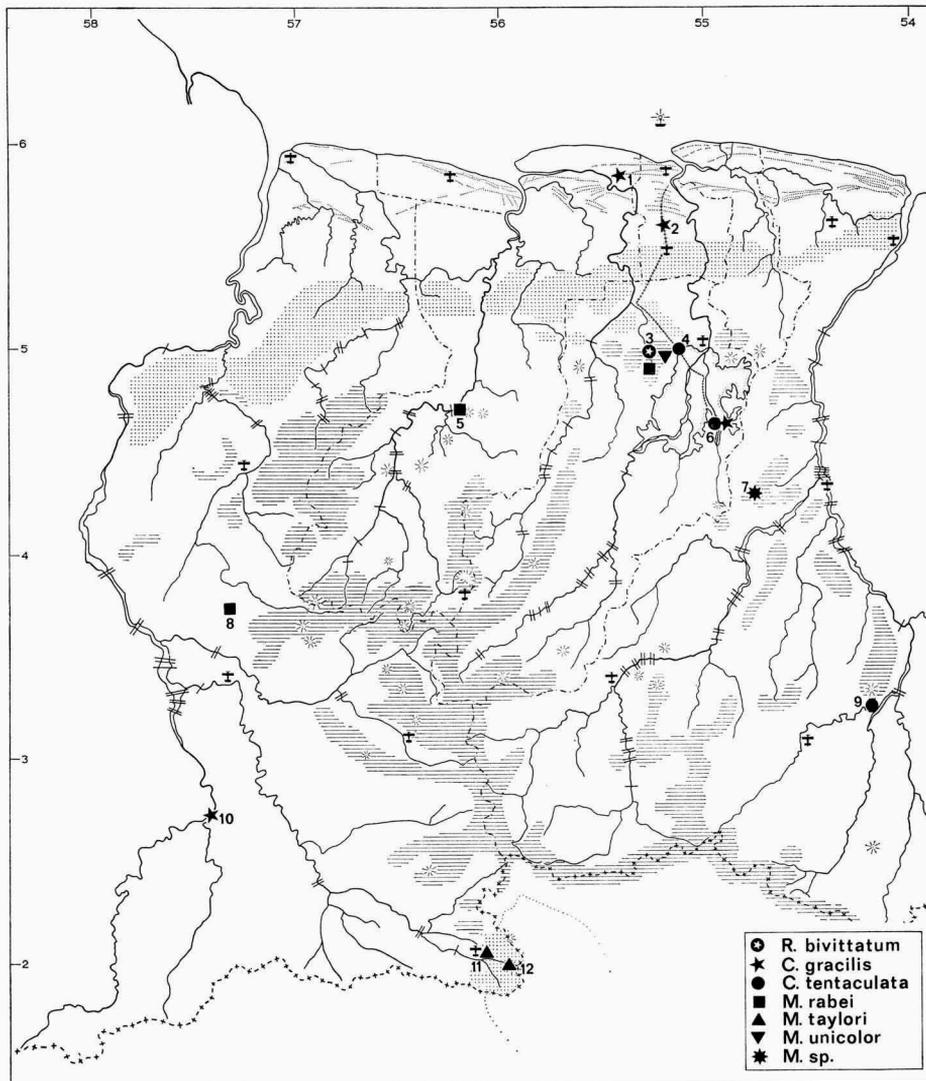


Fig. 1. Map of Surinam showing collecting sites for caecilians. 1. 30 km W. of Paramaribo, 2. Onverwacht, 3. Brownsberg Nature Reserve (including Irene Falls), 4. Railway km 121, 5. Raleighvallen, 6. Sara Creek, Placer van Hemert, 7. Lely Mountains, 8. Rechter Kabalebo River, 10 km S. of K.vallen, 9. Camp Koemaroe, 10. Orenoque Creek, 11. Sipaliwini rainforest, 12. Sipaliwini, forest-island, Vier Gebroeders Mountain.

review of caecilians did not expand or modify Dunn's (1942) list, but his distributional data indicated that several other species might as well occur in Surinam. For example, *Microcaecilia unicolor* (A. Duméril) and *Typhlonectes compressicaudus* are both known from French Guiana and Guyana, on either side of Surinam, and thus could be expected to occur in the latter country as well. This proved to be true for *Microcaecilia unicolor*, but not for *Typhlonectes compressicaudus*.

One of us (Hoogmoed) has recently spent several months collecting in Surinam, resulting in significant new information on the caecilians of that country. In this paper we report the rediscovery of *Rhinatrema bivittatum* (Guérin-Méneville) in Surinam and Guyana, extend the ranges of *Microcaecilia rabei* (Roze & Solano) and *M. unicolor* to Surinam, describe a new *Microcaecilia* currently known only from Surinam, and summarize distributional, ecological and taxonomic data on Surinam caecilians.

#### Family Rhinatrematidae

#### ***Rhinatrema bivittatum*** Guérin-Méneville)

*Caecilia bivittatum* Guérin-Méneville, 1829-1844: pl. 25 fig. 2.

Material. — See Distribution.

Variation. — Comparative morphometric data for the four known specimens of *R. bivittatum* are given in table 1. The Surinam specimen differs from those from Brazil, French Guiana and Guyana only in that the tail is longer and has a higher number of complete annuli behind the vent. This difference may reflect sexual dimorphism since the Surinam specimen is an immature male, whereas the others are mature females. Tooth counts for the Surinam and Guyana specimens are not given here because we prefer not to cut the jaws. However, the mouths were forced open far enough to determine that the number of teeth and the variation in size of teeth along the maxillary bones are nearly the same as was illustrated by Taylor (1968: 163, fig. 73) for the holotype.

Colour. — The colour, in life, of RMNH 17667, was as follows: dorsum brown with many irregularly dispersed yellow spots; a large yellow spot, bisected by a narrow brown longitudinal line, on top of the head; upper lips yellow, with a yellow band extending obliquely anteriorly and dorsally, starting from the corner of the mouth; tip of snout yellow, with a yellow line extending posteriorly to the eye, separated from the yellow upper lip by a dark-brown stripe from eye to nostril; lower lips dark-brown, bordered ventrally by a wide yellow band, posteriorly merging into a very wide yellow band on the flanks, starting at the corner of the mouth and continuing to the

TABLE I. Morphometric data for *Rhinatrema bivittatum*

	MNHN 585	MNHN 99101	BMNH 1976.102	RMNH 17667
Sex	♀	♀	♀	♂
Maturity	mature	mature	mature	immature
Total Length (mm)	213	(192)	175	163
Tail Length (mm)	2.0	2.5	2.4	3.5
Body Width (mm)	7.0	7.0	6.0	8.0
Head Length (mm)	9.5	9.9	8.7	8.9
Head Width (mm)	6.1	6.4	4.8	5.1
Distance Between Eyes (mm)	3.9	3.9	3.0	2.8
Distance Between Nares (mm)	1.4	1.4	0.9	1.2
Distance From Eye To Naris (mm)	3.0	2.9	2.4	3.2
Total Body Annuli	371	(326)	345	384
Annuli Interrupted By Vent	3	4	3	3
Tail Annuli (Behind Vent)	4	5	7	11
Premaxillary-Maxillary Teeth	(25) <sup>1</sup>	33	---	---
Prevomeropalatine Teeth	(25)	37	---	---
Dentary Teeth	(24)	28	---	---
Splential Teeth	(22)	31	---	---
Vertebrae	90	(86)	99	85
Total Annuli/Vertebrae	4.12	(3.79)	3.48	4.52
Total Length/Tail Length (mm)	106.5	(76.8)	72.9	46.6

<sup>1</sup> Data in parentheses approximate only, specimens damaged so that precise measurements and counts are impossible.

level of the vent; dorsal and ventral border of band not well defined, wavy with yellow offshoots into the brown of back and belly or with brown offshoots into the yellow of the band; a white, circular area around the vent; venter dark-brown with narrow, transverse brownish yellow stripes at the margins of the segments and some scattered yellow spots. The specimen agrees perfectly with the figure in Guérin-Méneville (1829-1844). The figure in the atlas of Duméril, Bibron & Duméril (1854) is much poorer.

Habitat. — The Surinam specimen was collected on October 20, at the height of the dry season, in daytime under a stone at the edge of a clear-water creek in very wet surroundings. The stone was partly in the water, partly on land, thus presenting a truly amphibious habitat. The locality was at the foot of Irene Fall, at an altitude of about 300 m, where a clearwater creek tumbles over a ledge 25 m high. At the foot of the fall there is a shallow pool with numerous rocks of variable size. A small creek flows from the pool opposite from the fall. The area is on the flank of Brownsberg, a laterite-capped mountain in relatively flat surroundings. The flanks of this mountain

are covered with well developed rainforest. The waterfall and its immediate surroundings are in a small clearing, thus enabling the sun to reach the water of the pool and the ground immediately adjacent. The ground around the pool is covered by herbaceous vegetation, whereas the rocky ledge, outside of the actual streambed, was grown over with algae, mosses, liverworts and ferns. At this same locality fishes of the genus *Rivulus* were found. The Winiperu specimen (BMNH<sup>1</sup>) 1976.102 according to the collector (D. Healy in litt.) "was found under a rotting log."

Distribution. — *R. bivittatum* is rarely collected. Previous to this report, the species was known only from the holotype (MNHN<sup>2</sup>) 585 collected sometime prior to 1829 at "Cayenne, French Guiana" and a second specimen (MNHN 99101) collected in 1899 in the Tumuc-Humac Mountains on the Upper Lunier River, Brazil (Amapá). Another specimen, reported by Dunn (1942) from São Paulo, may have belonged to this species but the specimen (Hamburg 5268) is lost. The third known specimen (RMNH<sup>3</sup>) 17667 was collected 20 October 1975 by A. H. P. Stumpel at Irene Falls, Brownsberg, Surinam (Fig. 1). A fourth specimen was collected at Winiperu, (58°34' W 6°10' N) Guyana in 1976 by D. Healey (BMNH 1976.102).

Remarks. — Taylor (1968) presented a complete synonymy for this species, which needs not be repeated here. However, Taylor (1968) perpetuated a mistake, regarding the original author, which we want to correct. The name was first used by Cuvier (1829) in a footnote in which he stated only that *Caecilia bivitata* (sic) occurs in America. No further description was included, so this name must be disposed of as a nomen nudum. The next authority to use the name was Guérin-Méneville (1829-1844), who depicted a caecilian under the name previously used by Cuvier, but spelled differently. No description accompanied the excellent figure, but the name is valid; the specimen MNHN 585 served as the model for the figure. Consequently, Guérin-Méneville, and not Cuvier, is the author of the name *Caecilia bivittatum*. It is not possible to determine the exact publication date, but fortunately we can restrict it to a certain period. According to Cowan (1971) the reptile plates were published between 1829 and December 1837. Plates 1-5 were published between 1829 and May 1830. Plate 25, on which *Caecilia bivittatum* is depicted, thus was published between May 1830 and December 1837.

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1) BMNH = British Museum (Natural History), London.

2) MNHN = Museum National d'Histoire Naturelle, Paris.

3) RMNH = Rijksmuseum van Natuurlijke Historie, Leiden.

## Family Caeciliidae

**Caecilia gracilis** Shaw

*Caecilia gracilis* Shaw, 1802: 597; Van Lidth de Jeude, 1914-1917: 49; Hoogmoed, 1977: 680.

*Caecilia lombricoidea* Daudin, 1803: 420; Duméril & Bibron, 1841: 275.

A complete synonymy is provided by Taylor (1968). Only Surinam references are cited here, as is the case with all other synonymies presented in this paper.

Material. — Surinam: 1 ex., RMNH 2406; 1 ex., RMNH 2411; 1 ex., RMNH 2412; 1 ♂, RMNH 18695, 1867; 2 ex., SMNS<sup>4)</sup> 164.922, 1845/1863, leg. A. Kappler; 1 ex., ZMB<sup>5)</sup> 5826, leg. A. Kappler.

Para District, Onverwacht: 1 ♀, RMNH 18696, I-XII-1939, leg. D. C. Geijskes.

Brokopondo District, Sara Creek: 1 ♀, RMNH 18703, September-November 1941, leg. A. M. H. Hermans.

Variation. — Morphometric variation for three Surinam specimens is summarized in table 2. In preservative these specimens are generally uniform gray-brown with the ventral surfaces somewhat lighter in colour. The area immediately surrounding the vent is lighter, and is markedly white in RMNH 18703. This specimen also has a distinct pattern of lighter lines on the dorsal surface of the collars which does not occur in the other two specimens.

TABLE 2. Morphometric data for *Caecilia gracilis* and *Caecilia tentaculata*

	<i>Caecilia gracilis</i>			<i>Caecilia tentaculata</i>						
	RMNH 18695	RMNH 18696	RMNH 18703	RMNH 17739	RMNH 18697	RMNH 18698	RMNH 18699	RMNH 18700	RMNH 18701	RMNH 18702
Sex	♂	♀	♀	♀	♂	♂	♂	♂	♂	♂
Maturity	mature(?)	mature	mature(?)	mature	mature	mature	mature	mature	mature	immature
Total Length (mm)	420	645	640	606	545	570	590	530	590	165
Body Width (mm)	5	9	11	22	14	19	16	17	16	5
Head Length (mm)	6.4	10.4	10.7	18.3	15.8	18.3	17.6	17.0	18.0	7.0
Head Width (mm)	4.0	6.6	6.7	13.9	11.0	11.6	11.9	11.0	14.0	5.4
Distance Between Eyes (mm)	2.7	4.7	4.4	8.8	7.3	7.9	7.4	7.7	8.5	3.5
Distance Between Nares (mm)	1.6	2.8	2.6	5.7	4.9	5.1	5.1	5.1	4.8	2.1
Distance From Eye to Naris (mm)	2.0	3.9	3.9	5.9	5.7	5.8	5.6	5.6	5.7	2.6
Primary Annuli	207	205	196	122	119	119	118	114	120	121
Secondary Annuli	18	27	23	30	30	28	32	28	30	32
Annuli Interrupted By Vent	1	1	1	4	2	2	2	3	2	3
Premaxillary-Maxillary Teeth	18	15	17	20	21	22	18	21	20	18
Prevomeropalatine Teeth	18	19	18	22	19	22	19	22	20	16
Dentary Teeth	18	15	17	17	20	19	19	20	18	20
Splential Teeth	2	3	2	1	2	2	2	2	4	3
Vertebrae	208	205	201	125	124	123	122	118	124	126

<sup>4)</sup> SMNS = Staatliches Museum für Naturkunde in Stuttgart, Ludwigsburg.

<sup>5)</sup> ZMB = Zoologisches Museum, Berlin.

Colour in life. — RMNH 18696 was said to be “dark purplish blue” in life.

Ecology and habitat. — Some detailed notes are available for only one specimen (RMNH 18696). It was found in a pit made during the excavation of a nest of *Atta sexdens* L. (leaf cutter ants) in forest. The specimen is covered with numerous cuts and on several places ants, which apparently are responsible for the cuts, are still clinging to the body. This seems to indicate that this specimen was not an habitual inhabitant of the ant nest, but accidentally fell into the pit and subsequently was attacked by the ants.

The localities from where this species has been collected all are situated in forest, ranging from rainforest to ridge forest.

*C. gracilis* is preyed upon by the hawk *Leucopternis albicollis* (Latham) and by the pipe snake *Anilius s. scytale* (L.) (Taylor, 1968). Taylor (1968) found one specimen from Surinam (NMNH (= ? BMNH) 66.8.14.34.1) in the stomach of *Anilius*, whereas another specimen was found protruding from the mouth of another pipe snake (RMNH 8a, from Surinam).

Distribution. — According to Taylor (1968) this species is distributed in the Guianas, Brazilian Guiana, and also is known from Iquitos. These localities suggest an Amazonian distribution for the species. The specimen mentioned by Taylor (1968) from Arenoque, British Guiana (CMNH 6) 35116) actually comes from Orenoque Creek in Surinam (Fig. 1). In the Leiden, Berlin and Stuttgart collections there are several old specimens of this species with no other locality data than “Suriname”. The only known specimens from Surinam with more detailed locality data are ZMA 7) 5240 from 30 km W. of Paramaribo (Taylor, 1968) and the new material (RMNH 18696, 18703) reported here.

### **Caecilia tentaculata** Linnaeus

*Caecilia rugis* CXXXV Sundius, 1749: 498; Gronovius, 1756: 52.

*Caecilia tentaculata* Linnaeus, 1758: 229; Van Lidth de Jeude, 1914-1917: 49; d'Audretsch, 1967: 82; Hoogmoed, 1977: 680.

Material. — Brokopondo District, railway km 121 (foot of Brownsberg): 3 ♂♂, RMNH 18697-99, 21-IV-1949, leg. Surinam Expedition 1948-49 (D. C. Geijskes); 2 ♂♂, RMNH 18700-01, May 1949, leg. C. Bleys. Sara Creek, Placer van Hemert: 1 ♂, RMNH 18702, May 1941, leg. A. M. H. Hermans.

Marowijne District, Camp Koemaroe, junction of the Oelemari and Litani Rivers: 1 ♀, RMNH 17739, 1-VIII-1975, leg. M. S. Hoogmoed & C. W. Myers.

Variation. — Morphometric data for the Surinam specimens are listed in table 2. The eyes are distinct in all specimens. Narial plugs are present on

6) CMNH = Field Museum of Natural History, Chicago.

7) ZMA = Zoölogisch Museum, Amsterdam.

the tongues of all specimens, but they are variously developed, and they are indistinct in RMNH 18700. Scales are present posteriorly in all specimens, beginning on the 25th to 29th primary annulus of larger specimens and on the 80th primary annulus of the single available juvenile (RMNH 18702). None of the secondary annuli completely encircles the body in the Koemaroe specimen (RMNH 17739), although those just anterior to the vent are nearly complete. In contrast, the secondary annuli of the specimens from Brown's Mountain completely encircle the body, beginning with the fifth to eighth secondary annulus anterior of the vent. The Koemaroe specimen is uniform gray with pinkish infusion around the lips. The five adults from Brown's Mountain are uniform gray dorsally, but their ventral surfaces have irregular, large, cream-yellow spots and bars. The juvenile from Brown's Mountain (RMNH 18702) is gray-brown above and cream-yellow ventrally, except for the posterior-most 8 mm which are gray above and below. The throat and chin are also gray. Apparently young *C. tentaculata* are light-ventered, with an ontogenetic increase in dark, ventral pigment. The venter of adults may become totally darkened, as in the Koemaroe specimen, or only partially darkened, as in those from Brown's Mountain.

Colour in life. — The only specimen (RMNH 17739) collected by the junior author was dark bluish. According to d'Audretsch (1967) the back and flanks are immaculately dark violet, the belly is slightly lighter and has purplish-dirty white spots ("effen donker violet op de rug, zowel als aan de zijkanten, welke kleur op de buik iets lichter wordt. Op de onderzijde bevinden zich ook uitvloeiende paarsig-vuilwitte vlekken").

Ecology and habitat. — The single specimen collected by the junior author was caught during a very heavy downpour. The specimen apparently became activated (or was washed out of its retreat) by the rain and crawled into our camp at 19.30 h. The camp was situated on a steep riverbank at the junction of two rivers. Immediately bordering on the river was a narrow, level stretch of cleared land and immediately behind it a hill covered with rainforest. The other specimens mentioned in the list of material were found in prospection pits in rainforest at the foot of Brownsberg. So far it has not been recorded from over 100 m in Surinam.

Distribution. — The lost holotype and the two specimens listed by Dunn (1942) from Surinam are without specific locality data. The material reported here has detailed locality data. Probably the species occurs throughout Surinam, with the possible exception of the area north of the coastal savanna belt. However, there are too few specimens known to allow categorical statements. This species ranges from eastern Panama over the greater part of South America east of the Andes, south to Central Brazil.

**Microcaecilia rabei** (Roze & Solano)

*Gymnopsis rabei* Roze & Solano, 1963: 290.

Material. — Saramacca District, Raleighvallen: 1 ex., MCZ <sup>8)</sup> A89473, 5-V-1975, across river from reserve, leg. R. A. Mittermeier; 1 ♀, 3 ex., RMNH 17731, 17734, 17735, 5/7-XI-1968, leg. M. S. Hoogmoed.

Nickerie District, Rechter Kabalebo River: 1 ♀, 1 ♂, RMNH 17737, 4-VI-1975, 10 km S. of K.vallen, leg. M. S. Hoogmoed.

Brokopondo District, Brownsberg Nature Park: 1 ex., MCZ A89639, 2-X-1976, leg. R. A. Mittermeier.

Variation. — Morphometric data for *M. rabei* from Surinam are summarized in table 3. These data are remarkably similar to data presented by Roze and Solano (1963: 292, table 1) and by Taylor (1968) for Venezuelan specimens. Within Surinam, some geographic variation is evident. Two specimens from west-central Surinam (RMNH 17737a, b) have fewer vertebrae and primary annuli than specimens from north-western Surinam.

In preservative, the Surinam specimens are blue-gray to slate above and below, somewhat lighter anteriorly. The tip and sides of the snout are cream. The chin and throat region is tan. The area immediately surrounding the vent is white. Apparently the Surinam and Venezuelan specimens are nearly identical in colour pattern (cf. Taylor, 1968: 541).

Colour in life. — Colour notes were made for RMNH 17737 a and b: snout pinkish, anterior part of the body purple-blue, darkening towards the posterior part of the body.

Ecology and habitat. — All RMNH specimens, except RMNH 17737a, b, were collected in the daytime by digging in the upper soil layer in rainforest, between the buttresses of trees. RMNH 17737a, b (two specimens) were collected at 08.30 h, when they were seen swimming in an inundated area along a creek. The previous night the creek had risen about 3 m in a few hours after a heavy rain. This flooding probably chased the animals from their burrows. When captured they were trying to climb the vertical stem of a tree protruding from the water.

Distribution. — This species was previously known only from Bolívar State, Venezuela (Taylor, 1969). It is here reported for the first time from Surinam.

**Microcaecilia taylori** nov. spec.

Holotype. — 1 ♂, RMNH 15165a, Sipaliwini; forest-island on western slope Vier Gebroeders Mountain, 2° N 55° 58' W, 250 m, Surinam, 16 September 1968, leg. M. S. Hoogmoed.

<sup>8)</sup> MCZ = Museum of Comparative Zoology, Cambridge.

TABLE 3. Morphometric data for Surinam *Microcaecilia*

	<i>M. rabiei</i>						<i>M. unicolor</i>			<i>M. kaylori</i> nov. spec.				<i>M. spec.</i>	
	MCZ A89473	MCZ A89639	RMNH 17731	RMNH 17734a	RMNH 17734b	RMNH 17735	RMNH 17737a	RMNH 17737b	RMNH 17732	RMNH 17733	RMNH 15165a (holotype)	RMNH 15165b	RMNH 17832	RMNH 17738	
Sex	?	?	?	?	?	?	?	?	?	?	?	?	?	?	
Maturity	immature	?	immature	immature	immature	immature	immature	immature	immature	immature	mature	maturating	mature	mature	d
Total Length (mm)	153	---	161	94	132	(66)1	153	187	102	240	172	128	151	324	
Body Width (mm)	4	---	---	3	3	2	4	5	3	6	5	4	4	8	
Head Length (mm)	5.0	---	6.6	4.0	4.7	4.0	5.0	6.8	4.0	7.7	6.3	5.0	6.0	10.8	
Head Width (mm)	3.3	---	3.0	2.4	2.9	2.5	3.1	4.7	3.1	5.4	4.5	3.3	3.5	7.5	
Distance between Nares (mm)	1.0	---	1.3	0.7	1.0	0.9	1.0	1.5	0.8	1.5	1.7	1.1	1.2	2.5	
Distance from Tentacle to Naris (mm)	2.0	---	2.0	1.6	1.6	1.4	1.8	2.4	1.4	3.1	2.5	1.8	1.7	4.4	
Primary Annulli	114	---	113	111	114	---	105	106	116	113	118	115	117	123	
Secondary Annulli	22	---	27	23	25	26	25	26	63	64	---	---	---	41	
Complete Secondary Annulli anterior of Vent	5	7	9	7	6	6	6	5	12	6 <sup>1</sup>	---	---	---	6	
Annuli interrupted by Vent	2	---	2	3	2	3	2	2	6	2	3	3	2	3	
Premaxillary-Maxillary Teeth	19	---	22	17	19	18	18	---	23	27	30	25	27	29	
Prevomeropalatine Teeth	25	---	26	26	28	22	23	---	28	37	30	23	28	42	
Dentary Teeth	16	---	26	14	16	17	13	---	18	19	20	17	18	21	
Vertebrae	119	---	116	113	117	---	109	110	121	117	122	119	120	128	

1) Approximate value, specimen damaged.

Paratypes. — 1 ♂, RMNH 15165b, same data as holotype; 1 ♀, RMNH 17832, Sipaliwini, rainforest surrounding savanna (2°01' N 56°5' W), 250 m, Surinam, 16 January 1970, leg. M. S. Hoogmoed and J. J. P. Paats.

Diagnosis. — A *Microcaecilia* which matures at relatively small size (128 mm total length), no other *Microcaecilia* are mature at this size; differs from all other *Microcaecilia* by lacking secondary annuli and having as many or more premaxillary-maxillary teeth than prevomeropalatine teeth (Table 4). In all other species the prevomeropalatine teeth are more numerous than the premaxillary-maxillary teeth.

TABLE 4. Comparison of species of *Microcaecilia*<sup>1)</sup>

	<i>M. albiceps</i>	<i>M. rabei</i>	<i>M. unicolor</i>	<i>M. supernumeraria</i>	<i>M. taylori</i> nov. spec.
Maximum Total Length (mm)	227	187	240	258	172
Primary Annuli	115-123	105-116	97-118	143	115-118
Secondary Annuli	48-62	21-34	46-74	93	0
Premaxillary- Maxillary Teeth	15-19	17-27	15-35	15	25-30
Prevomeropalatine Teeth	25-35	22-31	22-37	28	23-30
Dentary Teeth	16-26	14-26	18-26	22	17-21
Vertebrae	---	109-119	117-121	---	119-121

<sup>1)</sup>Includes data from Taylor (1968, 1969)

(Erratum: last column: second line from below, for 21 read 20; bottom line, for 121 read 122).

Description of holotype. — Measurements and counts are given in table 3, illustrated on plate 1. A mature male, testes white, elongate, lobed (5 left lobes, 6 right), lobes 2.5-3.5 mm long; eyes not visible externally; tentacle apertures in position of eyes; collars complete, each with a short groove confined to dorsal surface, groove on second collar longer and more distinct than groove on first collar; primary annuli complete; no secondary annuli; scales present posteriorly, beginning on 12th annulus anterior of tail tip, scales small and few; vent transverse; tongue smooth, no narial plugs, attached in front; premaxillary-maxillary and dentary teeth larger than prevomeropalatine teeth; gray above and below; area around vent cream; chin and gular region cream; lateral portion of collars cream, sides and tip of snout cream; (colour from preserved specimen).

Colour in life. — Body purple above and below, with small, lighter spots, especially in the posterior part. Head and first annulus distinctly lighter, pinkish. Posterior part of body slightly darker than rest, bluish-purple. Ventral parts transparent.

Variation. — Morphometric data for the two paratypes are listed in table 3. Variation in both colour and morphometrics is slight. RMNH 17832 has five short rows of skin glands on the dorsal surface of the posteriormost five primary annuli. These rows of glands are similar in appearance to gland rows associated with primary and secondary grooves in caecilians, and may represent vestigial secondary grooves in this specimen.

Relationships. — *M. taylori* seems to be most closely related to *M. rabei*. Both are relatively small and have fewer secondary annuli (none in the case of *M. taylori*) than all other species of *Microcaecilia*.

Ecology and habitat. — All three specimens were collected in daytime, but this merely reflects the collector's activity pattern, as they were all found when opening decayed logs, lying on the forest-floor. The holotype and one paratype (RMNH 15165a, b) were collected in one log, which still had a hard core and in which wide tunnels were present. One end of the log was occupied by a termite-nest. The other paratype was collected in a well-decayed log, with a soft consistency, together with an amphisbaenid, *Amphisbaena vanzolinii* Gans. The habitat in which RMNH 15165a, b were found is extensively described in Hoogmoed 1969a, b.

Distribution. — So far only known from extreme southern Surinam where the species is found both in the forest west of the Sipaliwini savanna and in isolated forest-islands on this savanna. This distribution pattern again represents evidence for a former connection between the forest-islands and the large area of forest surrounding the savanna (Hoogmoed, 1973).

Remarks. — One of Taylor's (1968: 532) diagnostic characteristics for the genus *Microcaecilia* is the presence of secondary annuli. Since *M. taylori* lacks secondary annuli, either the generic diagnosis must be modified or a new genus must be constructed for *M. taylori*. We prefer to modify the generic diagnosis to accommodate *M. taylori* because the species is closely related to other *Microcaecilia* and because *Microcaecilia* is sufficiently established on other diagnostic features. *Microcaecilia* may then be diagnosed as follows: caeciliids with eyes covered by bone; tentacular apertures near position of eyes; collars and primary annuli distinct; secondary annuli present or absent; scales present posteriorly; no splenial teeth; tongue smooth, no narial plugs, attached anteriorly to gums or not.

Etymology. — *M. taylori* is named in honour of the late Edward H. Taylor, the leading student of caecilians who taught us that caecilians are far more diverse than anyone had realized.

**Microcaecilia unicolor** (A. Duméril)

*Rhinatrema unicolor* A. Duméril, 1864: 321.

Material. — Brokopondo District, Brownsberg: 1 ex., RMNH 17732, 16-X-1968, leg. SURALCO; 1 ♂, RMNH 17733, 12-XI-1968, leg. Mrs. R. Hoogmoed-Verschoor; 1 ex., DGR<sup>9)</sup>, 15-X-1970, leg. D. G. Reeder.

Variation. — Differences between Surinam *M. unicolor* and those from French Guiana are slight. However, the single specimen reported by Taylor (1968) from Guyana has fewer primary and secondary annuli (97, 46) and more premaxillary-maxillary and dentary teeth (35, 26) as compared with the Surinam specimens (see Table 3). The significance of these differences cannot be assessed until larger samples are available.

The colour of preserved *M. unicolor* from Surinam is as follows: dorsal and ventral surfaces gray, tip of tail cream, chin and throat cream-tan, dorsal surface of head light-gray to tan. This colour description is similar to that given by Taylor (1968: 546) for the Guyana specimen and to Duméril's (1864) description of the type-series from French Guiana. Dunn's (1942) statement that the species is "uniform dark" is misleading.

Colour in life. — No colour notes on these specimens are available.

Ecology and habitat. — One specimen (RMNH 17732) was found crawling on the forest-floor in daytime at 13.30 h. The weather at that moment was dry and sunny. Another (DGR) was found at a depth of 50 cm in soil. The specimens were collected in rainforest at altitudes between 300 and 500 m.

Distribution. — Taylor (1968) listed seven specimens of *M. unicolor* from French Guiana and one from Guyana. The three specimens reported here from Surinam bridge the gap between French Guiana and Guyana.

**Microcaecilia** spec.

A single specimen (RMNH 17738) from the Lely Mountains, Marowijne District, Surinam, is not readily assignable to any known species. The specimen is much larger (324 mm total length) than any other reported specimen of the genus. Compared to other *Microcaecilia* from Surinam (Table 3) the specimen has more primary annuli and vertebrae, and more prevomeropalatine teeth. There are 41 secondary annuli, a value which falls between the ranges for *M. rabei* and *M. unicolor*.

This specimen (in preservative) is gray above and below, with a cream tail tip. The chin and throat region is light tan, with a central, gray, gular spot. In life, the snout was pinkish, and the anterior part of the body was

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<sup>9)</sup> Private collection of D. G. Reeder, Leiden. Specimen not included in Table 3.

purple-blue. Posteriorly, the body was darker, being nearly black at the end of the body.

RMNH 17738 is closest to *M. unicolor* and may actually belong to that species. The two Surinam *M. unicolor* listed in Table 3 are smaller than RMNH 17738, but they are also immature. Although RMNH 17738 has far fewer secondary annuli than the two *M. unicolor* from Surinam, it has only 5 fewer secondary annuli than one specimen of *M. unicolor* from Guyana (cf. Taylor, 1968: 544). Since RMNH 17738 was collected 85 km SE. of the locality where the three Surinam *M. unicolor* (RMNH 17732, 17733, DGR) were collected, its unique phenotype could be attributed to geographic variation. The problem cannot be solved until additional specimens become available. The specimen was collected in daytime, when turning over a large, rotting log lying at the edge of an exploration road through rainforest at an altitude of 680-690 m. The specimen was partly embedded in the relatively damp earth under the log.

#### **Siphonops annulatus** (Mikan)

*Caecilia annulata* Mikan, 1820: pl. 11.

*Siphonops annulatus*: Dunn, 1942: 480.

Distribution. — This species has an extensive distribution east of the Andes, ranging from Colombia along the eastern foot of the Andes, south to northern Argentina and southern Brazil.

Remarks. — The inclusion of this species in the Surinam herpetofauna is based on the single specimen (MNHN 156) reported by Dunn (1942). Its occurrence in Surinam could not be confirmed by recent collections.

#### Family Typhlonectidae

#### **Typhlonectes compressicaudus** (Duméril & Bibron)

*Caecilia compressicauda* Duméril & Bibron, 1841: 278.

*Typhlonectes compressicauda*: Van Lidth de Jeude, 1914-1917: 49.

Distribution. — Specimens of this species have been reported from Guyana and French Guiana and possibly also from the Amazon basin (Taylor, 1968), although others state without reservation that it is a species of the "Amazonian drainage of northeastern South America" (Murphy, Quinn & Campbell, 1977). Lüling (1973, 1974) reported it from Pucallpa in eastern Peru, Moodie (1978) from the Rio Solimoes near Manaus and Toews & Macintyre (1978) from the Amazon river near Manaus. These recent data seem to be in accordance with the opinion that this is a species with an Amazonian distribution (Hoogmoed, 1979).

Remarks. — Van Lidth de Jeude (1914-1917) mentioned this species from Surinam, but we could not find specimens on which this report might have been based. Therefore, we assume Van Lidth de Jeude relied on literature records, which indeed strongly suggest that the species could occur in Surinam. However, there are several other cases in which aquatic Amazonian species occur in Guyana and French Guiana because of the connections in the rainy season of certain rivers in those countries with the Amazonian system. This apparently is true for *Melanosuchus niger* (Spix) and *Chelus fimbriatus* (Schneider) (Hoogmoed, 1979), which both have been reported from Guyana and French Guiana but apparently are absent from Surinam. The reason may be that no connection existed at any time between Surinam and Amazonian rivers. Therefore we refrain from including this species in our list of caecilians of Surinam, although we include it in our key.

SYNOPSIS OF SURINAM CAECILIANS

Rhinatreumatidae Nussbaum

*Rhinatrema* Duméril & Bibron

*R. bivittatum* (Guérin-Méneville)

Caeciliidae Gray

*Caecilia* Linnaeus

*C. gracilis* Shaw

*C. tentaculata* Linnaeus

*Microcaecilia* Taylor

*M. rabei* (Roze & Solano)

*M. taylori* Nussbaum & Hoogmoed

*M. unicolor* (Duméril)

*Siphonops* Wagler

*S. annulatus* (Mikan)

KEY TO SURINAM CAECILIANS

1. Tail present; total number of annuli (primaries and secondaries indistinguishable) more than 300; mouth terminal; tentacle adjacent to well-developed eye; paired yellow lateral stripes . . . . . *Rhinatrema bivittatum*
- No tail; fewer than 300 primary annuli; no lateral stripes . . . . . 2
2. Primary annuli indistinct, posterior part of body triangular in cross-section (aquatic) . . . . . *Typhlonectes compressicaudus*
- Primary annuli distinct, posterior part of body round in cross-section . . . . . 3
3. Fewer than 100 primary annuli (white edged); no secondary annuli; no scales; an unsegmented terminal shield; tentacle between eye and nostril (closer to eye); no splenial teeth . . . . . *Siphonops annulatus*
- More than 100 primary annuli; secondaries present (except in *Microcaecilia taylori*); scales present; no terminal shield; splenial teeth present or absent . . . . . 4

4. Tentacular aperture below nostril, not visible from above; splenial teeth present; tongue free, often with narial plugs; eye usually visible externally (*Caecilia*) . . . 5  
Tentacular aperture in position of eyes; no splenial teeth; tongue attached anteriorly to gums, no narial plugs; eye under bone, not visible externally (*Microcaecilia*) 6
5. Primary annuli 114-150; 28 or more secondary annuli . . . . . *Caecilia tentaculata*  
Primary annuli 183-207; secondary annuli 11-28 . . . . . *Caecilia gracilis*
6. No secondary annuli; prevomeropalatine teeth as many or fewer than the number of premaxillary-maxillary teeth . . . . . *Microcaecilia taylori*  
Secondary annuli present posteriorly; more prevomeropalatine teeth than premaxillary-maxillary teeth . . . . . 7
7. Secondary annuli 21-34 . . . . . *Microcaecilia rabei*  
Secondary annuli 46-74 . . . . . *Microcaecilia unicolor*

## DISCUSSION

Currently, 13 species of caecilians are known to occur in the Guiana area. Nine of these belong to the family Caeciliidae, two to the Rhinatrematidae, and two to the Typhlonectidae (Hoogmoed, 1979). Only a few of these species are wide-ranging, and in all cases these are large and conspicuous and/or aquatic species (*Caecilia gracilis*, *C. tentaculata*, *Siphonops annulatus*, *Potomotyphlus kaupii* (Berthold), *Typhlonectes compressicaudus*). The other species are all terrestrial and small to medium in size and have small areas of distribution. In this paper we have considerably extended the known ranges of *Rhinatrema bivittatum* and *Microcaecilia rabei*. Even so, the known distribution areas of these two species are still within the limits of the Guiana region as defined by Hoogmoed (1979).

In our opinion, some of the apparent endemism of eight of the 13 species of caecilians known from Guiana results from undercollecting. Surinam and French Guiana have been explored by herpetologists to a greater extent than the surrounding regions, but, nevertheless, the entire Guiana region needs further field work. Because of their secretive, burrowing habits, caecilians are difficult to collect, and this factor, along with undercollecting, may contribute to a false impression of high caecilian endemism in the Guiana region. However, some of the endemism is likely to be real.

During 24 months of fieldwork in Surinam, the junior author did not find a single case of caecilian microsympatry. However, topographical sympatry does seem to exist, for example, at Brownsberg where *Caecilia tentaculata* was found at the foot of the plateau, and *Microcaecilia unicolor* from 300 m to the top. *Rhinatrema bivittatum* was also found at Brownsberg, but in very special habitat at the margin of land and water. Also *Microcaecilia rabei* was found at "Brownsberg", but no further data on this specimen are available. Another case of topographical sympatry (Placer van Hemert, Sara Creek) concerns *Caecilia tentaculata* and *C. gracilis*. No ecological data accompany the specimens, but there is a separation in time,

*C. tentaculata* having been collected in the rainy season, *C. gracilis* in the dry season. However, from these scant data it is not clear whether microsympatry did occur or not. These data suggest strict ecological separation of caecilian species.

Terrestrial species of caecilians seem to have limited means of dispersal as reflected by the high degree of endemism in all regions inhabited by this group. This may be due to their great dependence on moisture which severely restricts their dispersal. This is generally true for amphibians as compared to reptiles, and Hoogmoed (1979) suggested this factor is responsible for the higher endemism of amphibians than reptiles in the Guiana region.

The distributions of *Rhinatrema bivittatum*, *Microcaecilia rabei*, *M. taylori*, and *M. unicolor* seem to provide further evidence for the presence of a forest refuge (Guiana refuge) on the northern slopes of the Tumuc Humac Mountains, which was present there during dry climatic periods in the Pleistocene. The distributions of other caecilians (*Epicrionops nigrus* (Dunn), *Caecilia pressula* Taylor, *Osaecilia zweifeli* Taylor), endemic to northern Guiana, may provide evidence for the presence of an Imataca refuge as postulated by Prance (1973) and substantiated by Brown et al. (1974) for butterflies. *Brasilotyphlus braziliensis* (Dunn), which is known only from the type-series of four specimens collected at Manaus, might be regarded as a member of the fauna of the Manaus centre postulated by Prance (1973).

Very few specimens and localities are known for most species of caecilians, and, therefore, zoogeographical conclusions based on caecilian distributions are highly speculative. However, caecilian distributions in Guiana seem to fit the pattern of forest-refuges which has emerged in recent years from the work of Brown et al. (1974), Haffer (1969, 1974), Prance (1973), and Vanzolini (1970).

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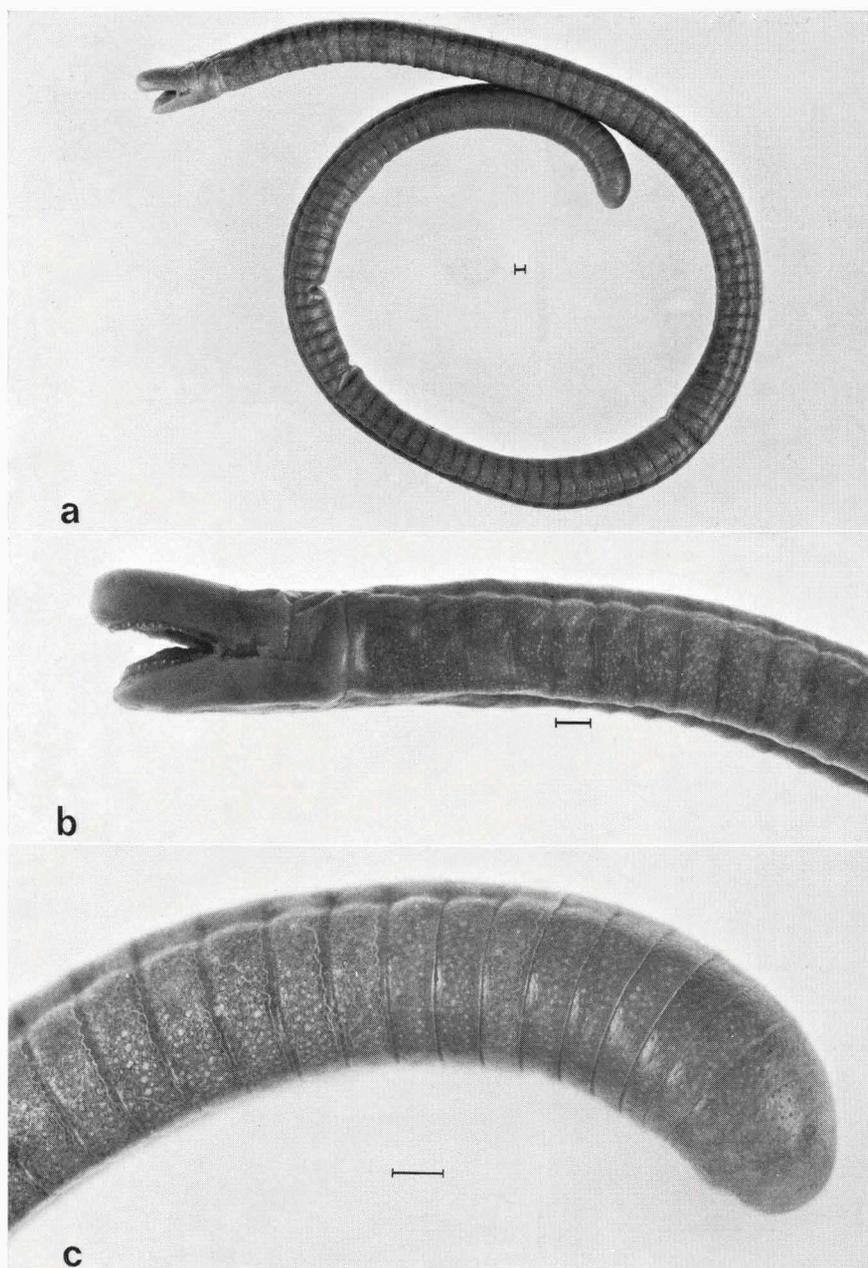
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*Microcaecilia taylori* nov. spec., holotype, RMNH 15165a, fig. a, total view, fig. b, lateral view of head, fig. c, lateral view of posterior part of body. Bar = 1.0 mm.



Habitat of *Microcaecilia taylori* nov. spec., forest-island on west flank of Vier Gebroeders Mountain, Sipaliwini, Surinam.