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The geophilomorph centipedes (Chilopoda) of Brazilian Amazonia

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Resumen. Se presenta un catálogo de los Chilopoda Geophilomorpha conocidos para el territorio brasileño correspondiente a la Región Amazónica. Se conocen treinta y una especies para esta región; excepto seis, todas las demás son endémicas como lo es un género (*Hyphydrophilus*) entre los once conocidos de Amazonia hasta el presente.

Palabras clave: Chilopoda-Geophilomorpha, Amazonia brasileña, composición faunística.

Abstract. A catalogue of the Chilopoda Geophilomorpha known from Brazilian Amazonia is here presented. Thirty-one species are known from this region; all but six of these species are endemic to it, as is one (*Hyphydrophilus*) of the eleven genera hitherto known from Amazonia.

Key words: Chilopoda - Geophilomorpha, Brazilian Amazonia, faunal composition.

Introduction

Geophilomorph centipedes are currently classified into 14 families, of which 11 occur in the Neotropical Region, the remaining families, not further mentioned in

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this paper, being the Eucratonychidae, Gonibregmatidae and Dignathodontidae. Some 1100 species in 180 genera are known worldwide and ca. 310 have been hitherto described from the Neotropical Region including the whole of México (Foddai & Minelli 2000; Foddai, Minelli & Pereira 2002; Foddai, Pereira & Minelli 2000, 2002).

Morphology and biology

The main traits of geophilomorph morphology and biology, with particular reference to the Amazonian fauna, have been recently summarized by Foddai, Minelli & Pereira (2002); therefore we will limit this account to very few details.

The number of leg-bearing segments in the Neotropical representatives of this group range between 27, hitherto recorded from a single specimen of *Schendylops oligopus* (Pereira, Minelli & Barbieri 1995) from Amazonia (Minelli *et al.* 2000) and 151 in *Notiphilides grandis* Brölemann 1904, also from Amazonia; the size ranges between the 5 mm of *Dinogeophilus oligopodus* Pereira 1984 from Argentina and the 14 cm of *Notiphilides grandis*.

In the Neotropics, geophilomorphs occur both in forest and in open habitats, especially in the litter and soil, with peculiar adaptations to periodically inundated forest. All species are blind and primarily adapted for life in dark environments and preying on small invertebrates.

The females lay a group of eggs, less than ten to about eighty, in a cavity in the soil, and remain coiled around them until the hatchlings are able to feed for themselves.

The hatching juveniles are already provided with the full number of legs.

Amazonian geophilomorphs

As for Amazonia, some biotopes in the vicinity of Manaus have been intensively investigated during the last two decades. Some species are well-adapted to survive in periodically inundated forests (Adis *et al.* 1996; Morais *et al.* 1997) and morpho-anatomical modifications for surviving submersion have been recorded in the respiratory system of a couple of species (Adis *et al.* in prep.).

Most Amazonian species belong to the large families Geophilidae and Schendylidae. The genera with the highest number of Amazonian species are *Ribautia* and *Schendylops*, each with six Amazonian species.

At the species level, Amazonian geophilomorphs show a high level of endemicity, but there is only one endemic genus, the geophilid *Hyphydrophilus* Pereira, Minelli & Barbieri 1994.

Pereira, Foddai & Minelli (1997) attempted to reconstruct the recent history of this centipede group in Amazonia on basis of the hypothesis of Pleistocene refugia (*sensu* Haffer 1982). As far as we know, half of the Neotropical species belonging to

the genera *Schendylops*, *Pectiniunguis* and *Ribautia* are endemic to areas that have been identified as Pleistocene refugia, based on evidence from woody Angiosperms (Nelson *et al*. 1990, Prance 1982). The main routes of subsequent distribution did probably follow the valleys of the major rivers (Amazon, Orinoco, Paraná, Paraguay).

Unfortunately, the current level of knowledge of the Amazonian geophilomorphs, and those of the Neotropical Region at large, is still very limited and future research may modify the current picture to a significant extent.

A list of the Neotropical genera of Geophilomorpha, with the number of species hitherto known from Brazilian Amazonia is given in Table 1.

Table 1. Neotropical genera of Chilopoda - Geophilomorpha: total number of species, number of species in the Neotropical Region and in Brazilian Amazonia

Family	*Genus*	*Total number of species*	*Number of species in the Neotropical Region*	*Number of species in the Brazilian Amazonia*
Aphilodontidae				
	Aphilodon	14	4	-
	Mecistauchenus	1	1	-
	Mecophilus	1	1	-
Ballophilidae				
	Ballophilus	41	3	-
	Caritohallex	1	1	-
	Cerethmus	1	1	-
	Clavophilus	1	1	-
	Diplethmus	6	6	-
	Ityphilus	22	17	6
	Koinethmus	1	1	-
	Leucolinum	1	1	-
	Taeniolinum	6	6	1
	Tanophilus	1	1	-
	Zygethmus	1	1	-
Eriphantidae				
	Eriphantes	1	1	-
Geophilidae				
	Apogeophilus	2	2	-
	Aztekophilus (Aztekophilus)	1	1	-
	Aztekophilus (Thylakiophilus)	1	1	-
	Barrophilus	1	1	-
	Chilenophilus	4	4	-
	Chomatophilus	3	3	-

Table 1. *Continues*

Family	*Genus*	*Total number of species*	*Number of species in the Neotropical Region*	*Number of species in the Brazilian Amazonia*
	Dinogeophilus	2	2	-
	Ecuadoron	1	1	-
	Erithophilus	1	1	-
	Eurytion	29	8	-
	Filipponus	1	1	-
	Garrina	13	11	-
	Geoperingueyia	11	1	-
	Gosipina	2	1	-
	Hyphydrophilus	2	2	2
	Ketampa	1	1	-
	Nabocodes	1	1	-
	Nesidiphilus	7	7	-
	Nicopus	1	1	-
	Oligna	1	1	-
	Orinomerium	1	1	-
	Pachymerinus	9	6	-
	Pachymerium	38	6	-
	Pandineum	10	10	-
	Peruphilus	1	1	-
	Piestophilus	2	2	-
	Polycricus	16	16	-
	Portoricona	2	2	-
	Ribautia	Ca. 45	23	6
	Schendyloides	2	2	-
	Schizonampa	3	1	1
	Schizonium	6	6	-
	Sogona	5	3	-
	Suturodes	4	4	-
	Synerium	1	1	-
	Taiyuna	5	1	-
	Telocricus	5	5	-
	Tuoba	10	3	-
Himantariidae				
	Arcophilus	2	2	-
	Californiphilus	2?	1	-
	Causerium	1	1	-
	Chomatobius	9	4	-
	Geoballus	2	2	-
	Straberax	1	1	-
Linotaeniidae				
	Araucania	1	1	-

Table 1. *Continues*

Family	*Genus*	*Total number of species*	*Number of species in the Neotropical Region*	*Number of species in the Brazilian Amazonia*
	Pagotaenia	1	1	-
	Tomotaenia	10	1	-
Macronicophilidae				
	Macronicophilus	4	4	2
Mecistocephalidae				
	Mecistocephalus	Ca. 130	5	1
	Tygarrup	15	1	-
Neogeophilidae				
	Evallogeophilus	1	1	-
	Neogeophilus	3	3	-
Oryidae				
	Heniorya	1	1	-
	Metaxythus	1	1	-
	Notiphilides	3	3	1
	Orphnaeus	20	6	2
	Pentorya	4	1	-
	Titanophilus	4	4	-
	Trematorya	1	1	-
Schendylidae				
	Algunguis	1	1	-
	Bimindyla	1	1	-
	Ctenophilus	12	1	-
	Cymochilus	1	1	-
	Marsikomerus	5	1	-
	Mexiconyx	1	1	-
	Morunguis	1	1	-
	Nannopodellus	1	1	-
	Nyctunguis	18	3	-
	Orygmadyla	1	1	-
	Parunguis	4	3	-
	Pectiniunguis	23	20	3
	Portoricellus	1	1	-
	Schendylellus	1	1	-
	Schendylops	63	51	6
	Sogodes	1	1	-
	Sogolabis	1	1	-
	Thindyla	1	1	-

Catalogue of the Chilopoda Geophilomorpha from Brazilian Amazonia

Family BALLOPHILIDAE
Genus ***Ityphilus*** Cook

Ityphilus Cook 1899: 306. Type-species, *lilacinus* Cook (orig. des.).
Thalthybius Attems 1901: 139-140. Type-species, *melanostigma* Attems (mon.).
Thalthybius, subg. *Prionothalthybius* Brölemann 1909a: 334. Type-species, *perrieri* Brölemann 1909 (mon.).

calinus Chamberlin 1957: 25, fig. 7. Type-locality: "Columbia: 13 mi. W. of Cali, Valle". Distr. - Colombia (Cali), Brazil (AM [Reserva Ducke]).
crabilli Pereira, Minelli & Barbieri 1994: 163, 164-166, figs. 1-28. Type-locality: Brazil, AM, Rio Tarumã Mirím. Distr. - Brazil (AM [Rio Tarumã Mirím, Reserva Ducke]).
demoraisi Pereira, Minelli & Barbieri 1995: 325, 327-328, figs. 3-42. Type-locality: Brazil, AM, Manaus [Reserva Ducke].
guianensis Chamberlin 1921: 23-25, pl. v, figs. 20, 23-24. Type-locality: "British Guiana: Dunoon". Distr. - Trinidad, Guyana, Brazil (AM).
saucius Pereira, Foddai & Minelli 2000: 8-9, figs. 69-89. Type-locality: Brazil, AM, 02° 34' S, 60° 06' W.
sensibilis Pereira, Foddai & Minelli 2000: 9-11, figs. 90-112. Type-locality: Brazil, AM, 02° 34' S, 60° 06' W.

Genus ***Taeniolinum*** Pocock

Taeniolinum Pocock 1893: 469, 471. Type-species, *setosum* Pocock (mon.).

arborum Pereira, Minelli & Barbieri 1994: 163, 167-169, figs. 30-59. Type-locality: Brazil, AM, Rio Tarumã Mirím.

Family GEOPHILIDAE
Genus ***Hyphydrophilus*** Pereira, Minelli & Barbieri

Hyphydrophilus Pereira, Minelli & Barbieri 1994: 169. Type-species, *adisi* Pereira, Minelli & Barbieri (orig. des.).

adisi Pereira, Minelli & Barbieri 1994: 163, 169-171, figs. 60-91. Type-locality: Brazil, AM, Rio Tarumã Mirim.
projectus Pereira, Foddai & Minelli 2000: 11-13, figs. 113-140. Type-locality: Brazil, AM, 2° 30' S, 60° 10' W.

Genus ***Ribautia*** Brölemann

Ribautia Brölemann 1909a: 335-336. Type-species, *bouvieri* Brölemann (mon.).

bouvieri Brölemann 1909c: 421-425, figs. 19-26. Type-locality: "Brésil: Haut Carsevène".
centralis (Silvestri) 1907: 256-257, figs. 81-86 (*Eurytion*). Type-locality: "Columbia: Inirida?". Distr. - Colombia, Brazil (AM [Rio Tarumã Mirím]).
difficilis Pereira, Minelli & Barbieri 1995: 325, 333-334, figs. 123-152. Type-locality: Brazil, AM, Lago Janauarí.
ducalis Pereira, Minelli & Barbieri 1995: 325, 329, 331, figs. 46-87. Type-locality: Brazil, AM, Manaus [Reserva Ducke].
onycophaena Pereira, Foddai & Minelli 2000: 13-15, figs. 141-167. Type-locality: Brazil, AM, 02° 34' S, 60° 06' W.
proxima Pereira, Minelli & Barbieri 1995: 325, 331-333, figs. 88-122. Type-locality: Brazil, AM, Manaus [Reserva Ducke].

Genus ***Schizonampa*** Chamberlin

Schizonampa Chamberlin 1914: 214-215. Type-species, *manni* Chamberlin (orig. des.).

manni Chamberlin 1914: 215-217, pl. 6, figs. 1-7. Type-locality: "Brazil, State of Pará: Pará" [i. e., PA, Belém].

Family MACRONICOPHILIDAE
Genus ***Macronicophilus*** Silvestri

Macronicophilus Silvestri 1909: 267. Type-species, *ortonedae* Silvestri (orig. des.).

abbreviatus Pereira, Foddai & Minelli 2000: 16-18, figs. 168-197. Type-locality: Brazil, AM, Manaus, 03° 08' S, 60° 01' W.
unguiseta Pereira, Foddai & Minelli 2000: 18-19, figs. 205-237. Type-locality; Brazil, AM, Rio Tarumã Mirim.

Family MECISTOCEPHALIDAE
Genus ***Mecistocephalus*** Newport

Mecistocephalus Newport 1843: 178. Type-species, *punctifrons* Newport (subs. des., Chamberlin 1914).

guildingii Newport 1845: 429, 430, pl. xxiii, figs. 18-19. Type-locality: "In insula

Caribaea S.ti Vincentii". Distr. – United States (Florida), Panamá (Canal Zone), Cuba, Haiti, Guadeloupe, Jamaica, Martinique, St. Vincent, Brazil (AM [Manaus], RJ).
janeirensis Verhoeff 1937: 230. Type-locality: Brazil, Rio de Janeiro.

Family ORYIDAE
Genus ***Notiphilides*** Latzel

Notiphilides Latzel 1880: 20. Type-species, *Notiphilus maximiliani* Humbert & Saussure (orig. des.).

grandis Brölemann [1905]: 71-73, pl. 1, figs. 8-11. Type-locality: Brazil, AM, Manaus.

Genus ***Orphnaeus*** Meinert

Orphnaeus Meinert 1870: 17-19. Type-species, *lividus* Meinert (subs. des., Crabill, 1968) = *brevilabiatus* (Newport).
Azygethus Chamberlin 1920: 32. Type-species, *atopus* Chamberlin (orig. des.) = *brevilabiatus* (Newport).
Andenophilus Verhoeff 1941: 62-64. Type-species, *striatus* Verhoeff (mon.) = *brasilianus* (Humbert & Saussure).

brasilianus (Humbert & Saussure) 1870: 205 (*Chomatobius*). Type-locality: "Brasilia". Distr. - Honduras, Nicaragua, Panama, Ecuador, Peru, Brazil (PA, RN, PE, RJ); South Africa, Madagascar.
brasilianus var. *nigropictus* Attems 1903: 201. Type-locality not fixed; described from Venezuela and Madagascar.
branneri Chamberlin 1914: 152. Type-locality: Brazil, RN, Natal.
striatus Verhoeff 1941: 64-65, figs. 91-96. Type-locality: "Südperu bei Sivia".
brevilabiatus (Newport), 1845: 436 (*Geophilus*). Type-locality: "In Orâ Tenasserim Peninsulae Indiae Ulteriori". Distr. - Guatemala, Nicaragua, Panama, Cuba, Bahama Is., Jamaica, Venezuela, Guyana, Brazil (AM [Manaus], PA, PE, RJ), Galapagos Is.; Borneo, Java, Sumatra, Celebes, Australia, Hawaii, Solomon Is., Samoa Is., Society Is., Japan, Formosa, Cameroon, Madagascar, Yemen, United States (Florida), New Caledonia.
bilineatus Peters 1855: 83. Type-locality: "Inhanbane, 23 1/5 lat. Austr.".
brasiliensis Meinert 1870: 20-21, pl. iii, fig. 12. Type-locality: Brazil, RJ, Rio de Janeiro.
lividus Meinert 1870: 19-20, pl. ii, figs. 6-11. Type-locality not fixed; described from Hawaii (Oahu) and Nicobares.
xanti Tömösvary 1885: 64. Type-locality: "Borneo".
phosphoreus, *auct.*

Family SCHENDYLIDAE
Genus ***Pectiniunguis*** Bollman

Pectiniunguis Bollman 1889: 212. Type-species, *americanus* Bollman (orig. des.).
Adenoschendyla Brölemann & Ribaut 1911a: 192. Type-species, *geayi* Brölemann & Ribaut (mon.).
Litoschedyla Chamberlin 1923: 391. Type-species, *Pectinunguis insulanus* Brölemann & Ribaut (orig. des.).

ascendens Pereira, Minelli & Barbieri 1994: 174-176, figs. 120-149. Type-locality: Brazil, AM, Rio Tarumã Mirim.
ducalis Pereira, Minelli & Barbieri 1995: 325, 338-340, figs. 188-225. Type-locality: Brazil, AM, Manaus [Reserva Ducke].
geayi (Brölemann & Ribaut) 1911b: 219-220 (*Adenoschendyla*). Type-locality: "Bas Carsévène". Distr. - Brazil (AM [Rio Tarumã Mirim; Lago Janauarí]), State of Parà, Bas Carsévène.

Genus ***Schendylops*** Cook

Schendylops Cook 1899: 305. Type-species, *Schendyla grandidieri* Saussure & Zehnter (orig. des.).
Schendylurus Silvestri 1907: 245-246. Type-species, *australis* Silvestri (mon.).
Schendylurus, subgen. *Ploutoschendylurus* Brölemann & Ribaut 1912: 115. Type-species, *tropicus* Brölemann & Ribaut (subs. des., Hoffman & Pereira 1997).
Nesondyla Chamberlin 1950*:* 135. Type-species, *nealota* Chamberlin (orig. des.).
Koepckeiella Kraus 1954: 311-312. Type-species, *titicacaensis* Kraus (orig. des.).

amazonicus (Pereira, Minelli & Barbieri) 1994: 163, 176-178, figs. 150-177 (*Schendylurus*). Type-locality: Brazil, AM, Rio Tarumã Mirim.
bakeri (Chamberlin) 1914: 152, 196-198, pl. 4, figs. 5-8 (*Schendylurus*). Type-locality: Brazil, AM, Manaus.
continuus (Pereira, Minelli & Barbieri) 1995: 325, 340-342, figs. 229-265 (*Schendylurus*). Type-locality: Brazil, AM, Manaus [Reserva Ducke].
janauarius (Pereira, Minelli & Barbieri) 1995: 325, 342-343, figs. 266-293 (*Schendylurus*). Type-locality: Brazil, AM, Lago Janauarí.
marchantariae (Pereira, Minelli & Barbieri) 1995: 325, 344-345, figs. 300-336 (*Schendylurus*). Type-locality: Brazil, AM, Rio Solimões, Ilha da Marchantaria, 03° 15' S, 59° 58' W. Distr. - Peru (Loreto [Iquitos]), Brazil (AM [Ilha da Marchantaria, Ilha de Curarí]).
oligopus (Pereira, Minelli & Barbieri) 1995: 325, 345-347, figs. 337-371 (*Schendylurus*). Type-locality: Brazil, AM, Manaus [Reserva Ducke].

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