Mem. Inst. Oswaldo Cruz, Rio de Janeiro, Vol. 75(3-4) :105-11, jul./dez. 1980

SIMULIUM ARGENTISCUTUM SP. NOV. (DIPTERA: SIMULIIDAE), A MEMBER OF THE *S. AMAZONICUM*-GROUP OF SPECIES: DESCRIPTION OF ADULTS, PUPA ANDA LARVA

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The adult, pupal and larval morphology of S. argentiscutum *sp. nov., a member of the* S. amazonicum*-group, is compared with* S. amazonicum *Goeldi and its distribution, biology and medical importance are discussed.* S. argentiscutum *is one the most important anthropophilic species in the* S. amazonicum*-group as it is responsible, together with* S. amazonicum, *for the transmission of* Mansonella ozzardi *in Brazil.*

Recent investigations into the transmission of onchocerciasis (Shelley et al, 1979) and mansonelliasis (Shelley et al, 1980) in the Brazilian Amazon have highlighted the problems of black-fly species identification in this area and emphasized the need for basic morphotaxonomic studies of this group before epidemiological studies can begin. Present taxonomic efforts are being concentrated on one species group, the *S. amazonicum*-group. This contains several species that are widespread in the Neotropical Region and is represented in Brazil by at least three anthropophilic species, all of which are proven vectors of either *Onchocerca volvulus* or *Mansonella ozzardi.* One of the vectors of *M. ozzardi*, an undescribed species referred to by Shelley at al (1980) as *Simulium* n. sp. and by Shelley et al (in press) as *Simulium* sp. (Madeira), is the subject of this paper.

SIMULIUM ARGENTISCUTUM sp. nov.

Holotype ♀ with associated pupal pelt. BRAZIL: Rondônia Territory, Cachoeira Teotônio, R. Madeira. In Instituto Oswaldo Cruz, Rio de Janeiro, Brazil.

In the following description frequent reference is made to the morphology of *S. amazonicum.* A full redescription of this species may be found in Shelley et al. (in press).

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Received for publication on September 19th, 1980.

Female. General body colour black. Length of body: dry specimens 2.0-2.2mm, alcohol specimens 2.1-2.8mm. Length of wing 1.8-2.2mm, width of wing 0.8-1.0mm.

Coloration and morphology of head as in *S. amazonicum* except antenna paler at base.

Scutum black with silver-grey pruinosity. With light anterior to specimen (Fig. 1) three velvet black vittae present: median arising at anterior scutal border and running three fourths length of scutum, narrow, often in form of thin line, widening posteriorly; lateral vittae wider, in central third of scutum, divergent anteriorly and level with extremity of median vitta posteriorly. Intervittal marks cuneiform, black, arising on anterior scutal border between median and lateral vittae and extending for half scutal length. With light posterior to specimen (Fig. 2) scutal pattern similar except intervittal marks less distinct and brilliant silver, and median vitta slightly narrower anteriorly. Rest of thorax including appendages as *S. amazonicum* but legs paler, hind leg femur cream with distal half to third brown and hind leg tibia with basal half cream.

Abdomen as *S. amazonicum* except pruinose area on second tergite interrupted centrally by velvet black mark.

Male. General body colour black. Length of body: dry specimens 1.9-2.4mm, alcohol specimens 3.0-3.2mm. Length of wing 1.9-2.0mm, width of wing 0.8-0.9mm.

Morphology and coloration of male as *S. amazonicum.* Although both *S. argentiscutum* and *S. amazonicum* have fused vittae forming an anchor-shaped pattern on the scutum, the extent of fusion differs in each species. In *S. argentiscutum* (Fig. 3) the fusion of the vittae is less complete, the lateral vittae being separate from the median vitta for about three fourths of their lengths, whereas in *S. amazonicum* the separation is only for about half their lengths.

Pupa. Length of cocoon: dorsally 1.9-2.2mm, ventrally 2.8-3.4mm. Length of pupa 1.7-24mm. Length of gill 0.8-0.9mm.

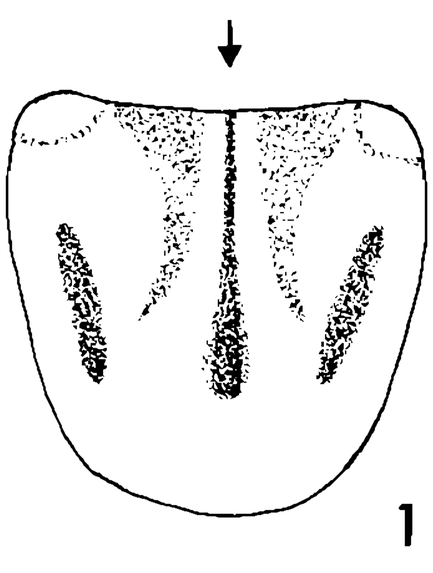
Cocoon shoe-shaped, dark brown and of a thick gelatinous consistency with no reinforced rim to aperture (Fig. 4). Gill light brown with six forwardly directed filaments arranged in a vertical plane and slightly protruding through aperture of cocoon. Main gill trunk with three primary branches, each with a single bifurcation: bifurcations on dorsal and median primary branches arising basally, ventral primary branch with bifurcation about one third its length from base (Fig. 5). Filaments thick basally, tapering apically with highly crenated margins.

Head and thorax as *S. amazonicum* except for the following: absence of spine combs on tergite seven; presence of spiny cuticular processes on tergites five and six; strongly developed spinelike setae on tergite two.

Larva. Length of body 4.4-5.3mm. Width of head capsule 0.48-0.55mm.

General body colour and form as *S. amazonicum.* The larva of *S argentiscutum* differs from that of *S. amazonicum* in the following ways.

Faint positive pattern on cephalic apotome consisting of an antero-median group of four spots, an antero-lateral group of three spots and a postero-median group of about ten spots (Fig. 6). Postgenal cleft large, slightly longer than wide and extending anteriorly to hypostomial groove thereby interrupting postgenal bridge centrally (Fig. 7). Mandible as *S. amazonicum* except serrations posterior to mandibular serrations are irregularly distributed along the edge of the mandible and not linear and sawlike. Antenna similar to *S. amazonicum* except antennal ratio of 4:5:6. Cephalic fan with 25-26 rays.



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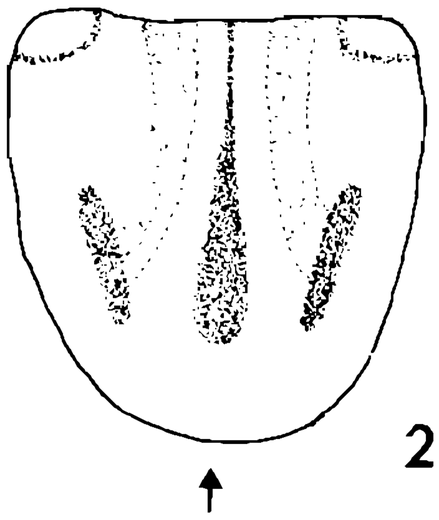

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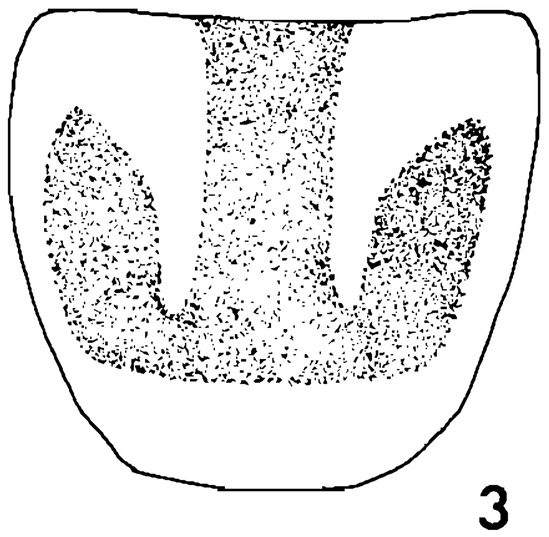

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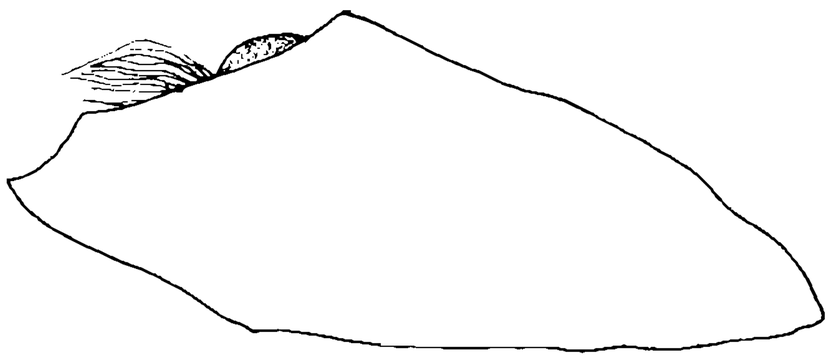

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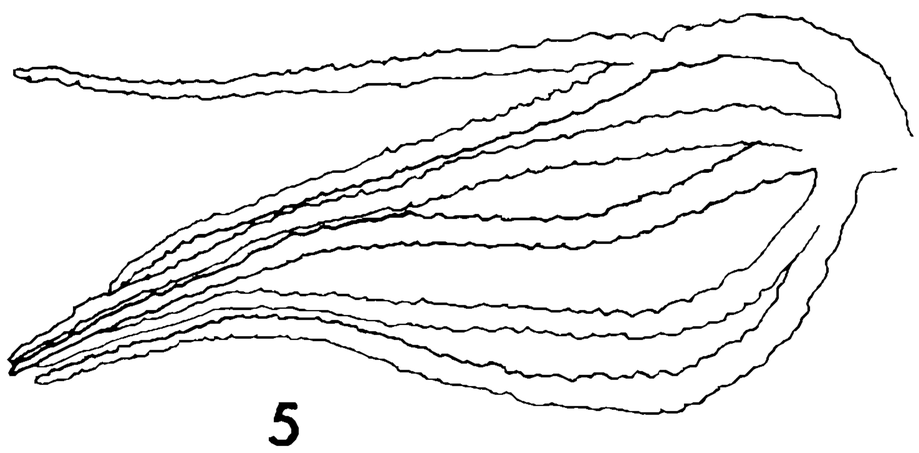

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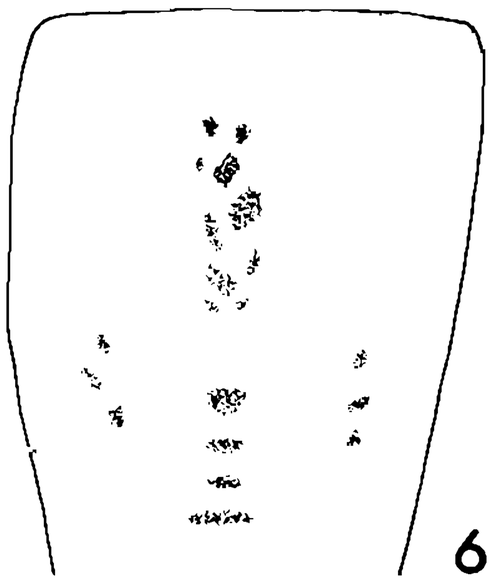

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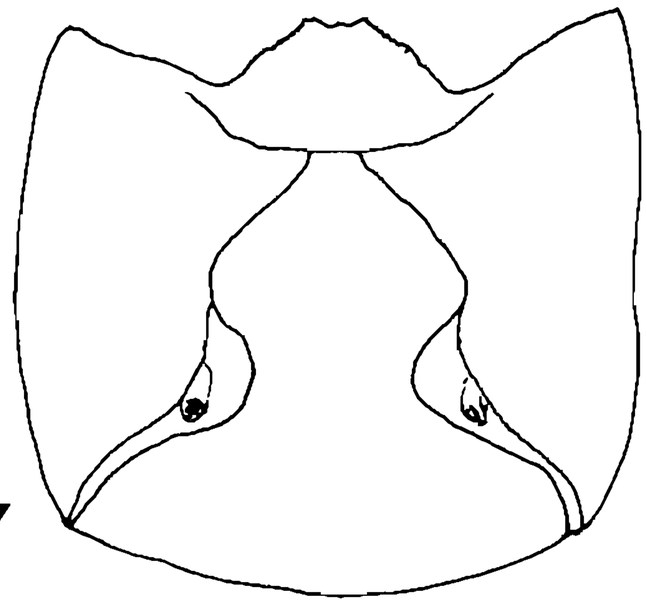

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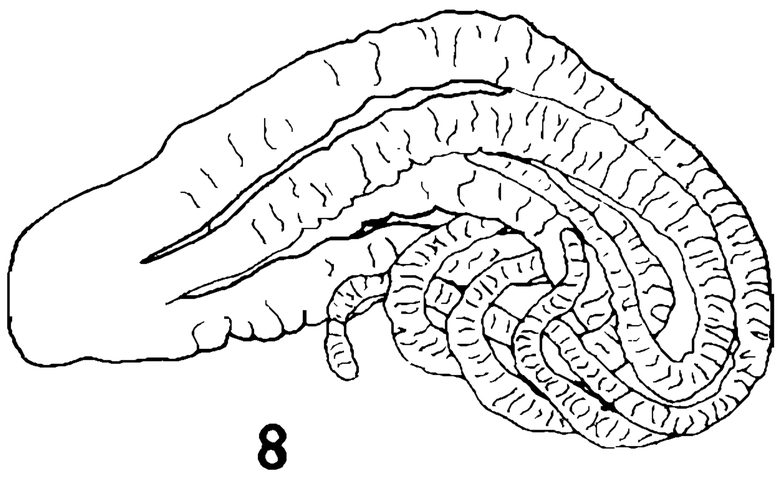

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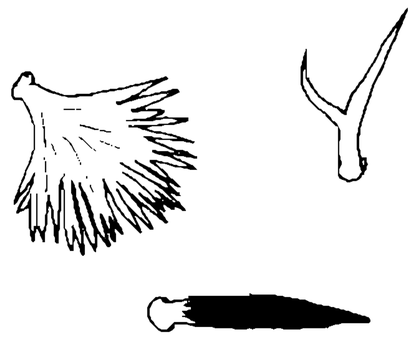

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Figs. 1-9. *S. argentiscutum* sp. nov. 1. Female scutum, light source anterior. 2. Female scutum, light source posterior. 3. Male scutum. 4. Pupa, lateral view. 5. Pupal gill. 6. Cephalic apotome of larva showing pigment pattern. 7. Ventral view of larval head capsule showing postgenal cleft. 8. Pupal respiratory histoblast of mature larva. 9. Setae and scales of abdominal cuticle. (In Figs. 1 and 2 arrows indicate direction of light source).

Thorax as in *S. amazonicum* but spinules, only present dorsally, are more sparsely distributed and dark. Pupal respiratory histoblast dark brown and claviform (Fig. 8) with six coiled filaments arising from three primary branches basally. Number of rows of hooks in proleg circlet not obtained but lateral sclerite of same form and colour as *S. amazonicum*.

Abdomen as *S. amazonicum* except distribution of spinules: these are arranged annularly on dorsal surface of first five abdominal segments and cover dorsal and lateral surfaces of rest of abdomen. Because of their dark colour the spinules of *S. argentiscutum* are easily discernible at low magnifications whereas in *S. amazonicum* though the spinules are larger their transparency renders them invisible except at high magnifications in slide preparations. Interspersed between the spinules, particularly on the posterior abdominal segments are brown fan-like scales and the occasional bifid transparent spinule. The three types of setae found on the abdominal integument are shown in fig. 9. Ventral papillae absent. Posterior circlet with about 75 rows of 8-16 hooks. No rectal gills were everted in any of the specimens and hence their form is not known.

MATERIAL EXAMINED

Holotype ♀ ex pupa. BRAZIL : Rondônia, Cachoeira Teotônio, R. Madeira. 8°50'S 64°05'W. Approximate elevation 60m. 10.x.1978. *(A.J. Shelley & A.P.A. Luna Dias).* In Instituto Oswaldo Cruz, Rio de Janeiro, Brazil. (Specimem number 398-5). Paratypes. Collection data as for holotype. 3♀, 6♀ ex pupae, 7♂ ex pupae, 7 pupae, 11 larvae. In British Museum (Natural History), London, United kingdom; Instituto Oswaldo Cruz, Rio de Janeiro, Brazil and Museu de Zoologia, Universidade de São Paulo, São Paulo, Brazil (Specimen numbers 398-1 to 398-4, 396-6 to 396-16 for reared material and 398 for the remainder).

AFFINITIES

S. argentiscutum, which is named for the silver scutum of the female, is a member of the *S. amazonicum*-group of species which is defined in Shelley et al. (in press). Its closest relatives in Brazil are *S. amazonicum* and *S. minusculum*. It is easily distinguishable from other species of the group by the female scutal pattern, pupal gill and vestiture of the larval integument. Although *S. argentiscutum* may be separated from *S. amazonicum* and *S. minusculum* by the degree of fusion of the male scutal vittae, the validity of this character can only be confirmed once more material has been examined.

DISTRIBUTION

S. argentiscutum is essentially associated with certain large rivers in the Amazon basin, not being found in the smaller forest rivers and streams where other zoophilic species typically occur. Specimens of this species deposited in the British Museum (Natural History) and Oswaldo Cruz Institute's collections have been collected from the following localities in Brazil:

Rondônia Territory: Cachoeira Teotônio, R. Madeira. (Nr. Porto Velho). 8°50'S 64°05'W.

Amazonas State:
- Jacy Parana, R. Jacy Parana. 9°15'S 64°24'W
- Guajará Mirim, R. Guaporé. 10°50'S 65°21'W
- Bom Lugar & Valparaiso, R. Purus. 8°42'S 67°22'W
- Confluence of R. Ituxi with R. Purus. 7°18'S 64°52'W
- Benjamin Constant, R. Solimões. 4°23'S 69°59'W
- Codajás, R. Solimões. 3°55'S 62°00'W (Identified by Cerqueira as *S. amazonicum)*

Bahia State { Feijoal, R. Solimões. 4°10'S 69°25'W
Tefé, R. Solimões. 3°22'S 64°43'W
Sant'Anna do Sobradinho, R. São Francisco. 9°23'S 40°50'W
(Identified by Lutz as *S. amazonicum*)

S. argentiscutum has also been found in Colombia at Arara and Santa Sofia about 80km upstream from Leticia (4°09'S 69°57'W).

Fig. 10 shows the distribution of *S. argentiscutum* in Brazil and Colombia.

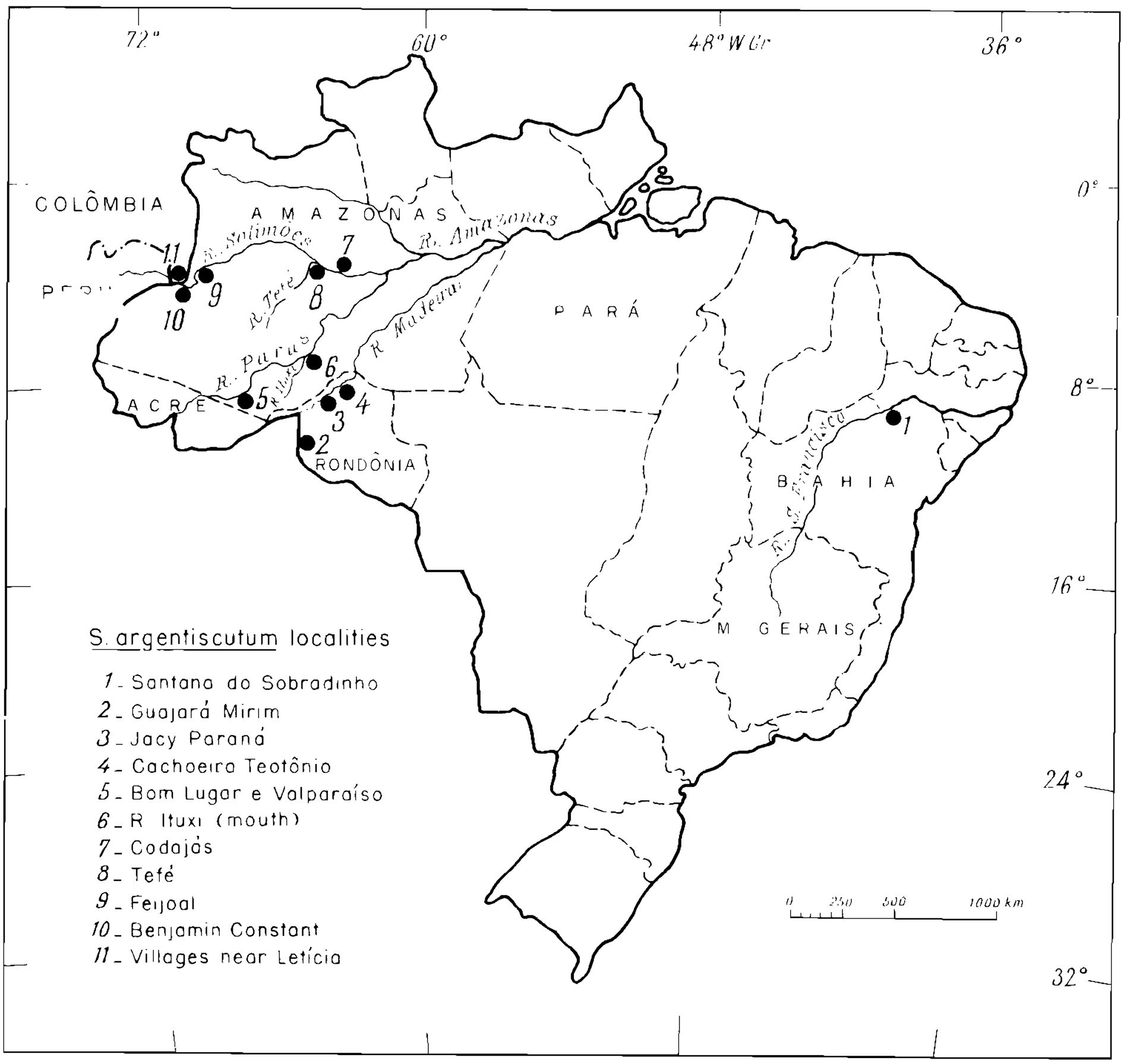

Fig. 10. Distribution of *S. argentiscutum* sp. nov. in Brazil and Colombia.

BIOLOGY

S. argentiscutum is the more common man-biting species along the river Solimões where it is found with *S. amazonicum*. It has also been recorded from the R. Madeira in association with *S. minusculum* and from the R. Purus where it is occasionally found in collections from human bait at localities where *S. amazonicum* is common. The only record of immature stages is from its type locality at Cachoeira Teotônio on the R. Ma-

deira, where larvae and pupae were collected from the dry season inflorescences of a species of Podostemaceae that had recently been inundated by the rising river. Larvae and pupae were only found on Podostemaceae that were growing on rocks in fast flowing parts of the river.

MEDICAL IMPORTANCE

This species (as *Simulium* n. sp.) has been shown to be a vector of *M. ozzardi* at Feijoal on the R. Solimões by Shelley et al.,(1980) and is probably responsible, together with *S. amazonicum*, for the transmission at other localities along this river where the filarial species occurs. Similarly, its presence at localities on the R. Purus and R. Madeira where mansonelliasis is present would suggest that it is involved in transmission in these areas also. Cerqueira (1959) was probably confusing *S. argentiscutum* with *S. amazonicum* in his transmission studies on mansonelliasis at Codajás on the R. Solimões.

S. argentiscutum at Leticia in Colombia has also been shown to be capable of allowing the development of *M. ozzardi* to the infective larva stage (World Health Organization, 1979).

RESUMO

Simulium argentiscutum sp. nov. (Diptera: Simuliidae), um membro do grupo de espécies *S. amazonicum:* descrição dos adultos, pupa e larva.

A morfologia dos adultos e da pupa e larva do *S. argentiscutum* sp. nov., um membro do grupo de espécies *S. amazonicum*, é comparada com a do *S. amazonicum* Goeldi e são discutidos aspectos da sua distribuição, biologia e importância médica. *S. argentiscutum* é uma das espécies antropofílicas mais importantes do grupo *amazonicum* porque é responsável, junto com o *S. amazonicum*, pela transmissão da mansonelose no Brasil.

ACKNOWLEDGMENTS

We wish to thank Dr. M.A. Tidwell for loaning material from Colombia. The Brazilian 'Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq)' and 'Ministério da Saúde, SUCAM' as well as the UNDP/World Bank/ World Health Organization under their Special Programme for Research and Training in Tropical Diseases are gratefully acknowledged for their financial assistance.

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