NEW SPECIFIC SYNONMY IN NEOTROPICAL SIMULIUM S.L. 
(Diptera: Simuliidae) 
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In an attempt to clarify the taxonomy of Neotropical Simuliidae prior to the production of keys to species, various nomenclatural problems are resolved. Information is given on the status of types, their depositories, the condition of type-material where relevant, and on already established synonyms. Fifteen new synonyms are established and six lectotypes designated based on an examination of type-material and long series of reared specimens from many localities to take account of intraspecific variation.

The discovery of new foci of onchocerciasis in Brazil, Ecuador and Venezuela in the last two decades, together with the recently proven role of blackflies in the transmission of mansonelliasis in South America, has stimulated interest in Neotropical Simuliidae. The resultant proliferation of descriptions of species, especially from the lowland tropical forests of the Amazon and Orinoco basins, has in many cases stemmed from the widely-held view that these hitherto unprospected regions of South America must contain a plethora of new species awaiting discovery. Our contention is, however, that these regions largely contain the same species as adjacent regions offering similar habitats for which the fauna is already known. In addition, recognition of these "new species" is often based on comparisons with named specimens in small national or even institutional collections or solely on descriptions in the literature, rather than on comparisons with long series of specimens in the larger regional collections of international centres. This is largely due to the lack of a recognised international centre for Simuliidae in the Neotropical region (World Health Organization, 1979). However, collaborative work involving such major international centre as the Biosystematics Research Institute, Canada, the British Museum (Natural History), United Kingdom, and the National Museum of Natural History, U.S.A., where there are substantial holdings of species from all zoogeographical regions, has now started in an attempt to clarify the currently confused taxonomy of Neotropical Simuliidae.

Another factor that will undoubtedly influence future taxonomic work in this region is the discovery of species complexes in Simuliidae, particularly of the Afrotropical and Holarctic regions. It is highly probable that similar species complexes occur in the Neotropical region but their supposed occurrence can only be investigated once the Neotropical simulids have been well defined morphotaxonomically. One of the objectives of the present work is to provide a morphotaxonomic framework that will be the basis for future cytological studies, especially in species groups that contain vectors of human filariae. In this paper we contribute towards a simplification of the taxonomy of Neotropical Simuliidae by clarifying the nomenclature of several species based on an examination of type-material and long series of reared specimens essential for an understanding of intraspecific variation, previously overlooked by many workers in this region. Unfortunately, the primary types of species held in Venezuela could not be sent for examination. However Mr. J. Ramírez-Pérez kindly made available for study paratypes of some of these species. The species order in this paper is alphabetical.

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The following abbreviations are used for depositories:

BMNH — British Museum (Natural History), London, United Kingdom.

DER — Division de Endemias Rurales, Ministerio de Sanidad y Asistencia Social, Maracay, Venezuela.

IND — Instituto Nacional de Dermatología, Villa de Cura, Venezuela.

INPA — Instituto Nacional de Pesquisas da Amazônia, Manaus, Brazil.

IOC — Instituto Oswaldo Cruz, Rio de Janeiro, Brazil.

IP — Institut Pasteur, Paris, France.

MLP — Museo de La Plata, La Plata, Argentina.


_Simulium cauchense_ Floch & Abonnenc

_Simulium cauchense_ Floch & Abonnenc, 1946c: 1. Lectotype ♀ and associated pupal pelt [present designation], FRENCH GUIANA: Patawa Creek, K. Kaw [as ‘Caux’]. In IP. [Examined].


_Simulium cauchense_ is a zoophilic species belonging to the _S. amazonicum_ group as defined by Shelley, Pinger & Moraes (1982) and is closely related to _S. quadrifidum_ Lutz. Floch & Abonnenc (1946c) described the male morphology and leg coloration [of limited value since the specimen had not eclosed] and the morphology of the female and pupa. As adults were removed from pupae no details of their general coloration were given.

Type-material consists of a male and its associated pupal pelt, as well as the abdomen of a female, mounted on slide 742, and a female and pupal pelt on slide 743. Both slides bear labels in Abonnenc’s hand as well as “type” labels added later. We designate the male and pupal pelt on slide 742 as lectotype because, unlike the female on slide 743, which is immature and still partially enclosed in the pupa, it is in good condition. The form of the genital forks, paraprocts and cerci of the female abdomen on slide 742 and the supernumerary female abdomens on slide 743 are similar and hence the specimens are judged as conspecific. It is probable that other paratype types exist, possibly in the Pasteur Institute in French Guiana, since Floch & Abonnenc (1946c) state that they collected specimens from a river system other than the Patawa, which is the provenance of the material that we examined.

We compared type-material of _S. cauchense_ with paratypes and reared topotypes of _S. sextobecium_ Nunes de Mello (1974) and type-series and reared topotypes of _S. quadrifidum_ and found them to be morphologically very similar. _S. quadrifidum_ can be distinguished from _S. sextobecium_ by the female scutal pattern but neither could be compared in coloration to _S. cauchense_ as this character was lacking in the original description (Floch & Abonnenc, 1946c) and is indiscernible in the type-material. However, the pupal gill configuration of _S. sextobecium_ and _S. cauchense_ are the same, but differ from _S. quadrifidum_ in that the secondary branch bifurcations are more distal, and the inner of these bifurcations is more distal than the outer in _S. cauchense_ and _S. sextobecium_ whereas in _S. quadrifidum_ they are equidistant from the base of the gill. We therefore synonymise _S. sextobecium_ with _S. cauchense_.

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*S. cauchense* has been recorded from French Guiana and is found sympatrically with *S. quadrifidum* in western Roraima, Brazil as well as the savannahs of eastern Brazil and western Guiana.

Although types were not available for study, the descriptions of *S. rangeli* Ramírez-Pérez, Rassi & Ramírez (1977) by Ramírez-Pérez, Yarzábal & Peterson (1982) are sufficiently detailed for us to synonymise this name with *S. cauchense*. The type-locality of *S. rangeli* is in eastern Venezuela continuous with the Brazilian onchocerciasis zone where *S. cauchense* is known to occur. For a full description of the adults and pupa of *S. cauchense* see Ramírez-Pérez, Yarzábal & Peterson (1982, as *S. rangeli*).

*Simulium distinctum* Lutz


*Simulium distinctum*, a zoophilic species from south-east Brazil, is often confused with *S. pertinax*. Lutz (1910) described *S. distinctum* from female syntypes collected in several localities. Since then only a superficial description of the female has been provided by d’Andretta (1954) who also lists some of the references to and misidentifications of this species. The only nomenclatural change affecting *S. distinctum* was its synonymy with *S. pertinax* by Lane & Porto (1939) which Smart (1944, 1945) and Vargas (1945) follow. d’Andretta & d’Andretta (1950) revalidate *S. distinctum* and d’Andretta (1954) and Vulcano (1967) follow this action.

Following a comparison (by M.M.H) of *S. distinctum* syntypes with female holotype and male allotype of *S. prumirimense* from which the figures were drawn for Coscarón’s description (1981), we synonymise this species with *S. distinctum*.

A description of the adults, pupa and larva of *S. distinctum* is given by Coscarón (1981, as *S. prumirimense*).

*Simulium goeldii* Cerqueira & Nunes de Mello


*Simulium goeldii* is a common distinctive, zoophilic species from northern Brazil whose adults, pupa and larva were first described by Cerqueira & Nunes de Mello (1967).

Ramírez-Pérez (1980) described what he believed to be a related species, *S. scorzai*, from Venezuela which he separated from *S. goeldii* on a single character, the configuration of the pupal gill filaments. We have examined reared topotypes of *S. goeldii* and a reared female paratype of *S. scorzai* and judge them to be conspecific.

For a full description of the adults, pupa and larva see Cerqueira & Nunes de Mello (1967) and for the adults and pupa see Ramírez-Pérez, Yarzábal & Peterson (1982, as *S. scorzai*).
Simulium limbatum Knab


Simulium machadoi Ramírez-Pérez, 1971: 341. Holotype [sex unspecified presumed female since only a full description of this stage is given], VENEZUELA: Aragua, Choroní. In DER. [Junior primary homonym of S. machadoi Luna de Carvalho 1962] [Not Examined]. Syn.n.


Simulium limbatum was described by Knab (1915) from a series of females collected from human baits in Guiana (formerly British Guiana). Knab placed S. limbatum, which is one of the most common anthropophilic species in the savannahs of northern Brazil and western Guyana, in the same group as S. amazonicum. The pinned female holotype and a female paratype, both in good condition, are in the BMNH, and other paratypes are probably in the USNM collection.

We have examined the BMNH material and compared it with reared specimens collected in Brazil and Guiana, as well as paratypes and topotypes of S. meroacea Nunes de Mello, Almeida & Dellome Filho (1973). We conclude that S. meroacea is conspecific with S. limbatum.

A similar comparison was made with reared male and female paratypes of S. machadoi Ramírez-Pérez which we also synonymise with S. limbatum. S. machadoi Ramírez-Pérez is a junior primary homonym of S. machadoi Luna de Carvalho (1962) of the Atrotropical region. Vulcano (1981) published a new name, S. machadoallisoni, in a check list of Simuliiidae from tropical South America, indicating that it applied to a Venezuelan species which she omitted to name. She confirmed this to be S. machadoi Ramírez-Pérez in a letter to Dr. R.W. Crosskey of the BMNH (Crosskey, pers. comm.). Under the International Code of Zoological Nomenclature, S. machadoallisoni has to be treated as a nomen nudum.

Simulium nigrimanum Macquart

Simulium nigrimanum Macquart, 1838: 88. Lectotype ♀ [present designation], BRAZIL: São Paulo State. In MNHN. [Publication date incorrectly cited as 1837 by Vargas (1945) and d'Andretta & d'Andretta (1945)]. [Examined].


Simulium nigrimanum is a zoophilic species described by Macquart (1938) from specimens collected from the north of Sào Paulo, Brazil [the collection site is referred to as "nord de la Capitainerie de Saint-Paul" and would probably be within present day city limits]. As usual with Macquart's descriptions, no reference is made to the number of original specimens but the sex "♀" is given. The short description, which only refers to body length and colour, and leg and wing colour, is as follows: "SIMULIUM NIGRI-MANA, Nob. Nigrum; fémoribus fulvis. Long 11/21. Pieds: cuisses fauves; jambes et tarses noirâtres, premier article des tarses intermédiaires et postérieures blanc, à extrémité noire; deuxième noir, à base blanche. Ailes blanches. Du Brésil, au nord de la Capitainerie de Saint-Paul". Since the original description, only one attempt has been made at giving a more precise definition of this species, but this was later found to refer to a species
other than S. nigrimanum. Thus in 1909 Lutz redescribed S. nigrimanum based on his own specimens from Brazil and without reference to type-material. However, in 1910 Lutz believed that his specimens were not true S. nigrimanum but a new species, S. orbitale, which he then described in the adult, larval and pupal stages. *Simulium nigrimanum* has been cited as a Brazilian species in all relevant catalogues (Kertész, 1902; Surcouf & González-Rincónes, 1911; Pinto, 1932; Vargas, 1945; and Vulcano, 1967). In 1939, Lane & Porto synonymised S. orbitale with S. nigrimanum without giving their reasons, and this was accepted by Vargas (1945) and Smart (1945). However, d’Andretta & d’Andretta (1945) revalidated *S. orbitale* after an examination of Lutz’s type-material and regarded S. nigrimanum as a species inquirenda because of the difficulty in recognising it from its original description.

Two female specimens of S. nigrimanum collected at São Paulo, Brazil, and identified by Macquart, have been located in the MNHN. One bears a label in Macquart’s handwriting which reads “*Simulium nigrimanum*” and a label “*S. nigrimanum* Macquart” in what is thought to be Séguyl’s hand. From the labels there is little doubt that these specimens, which are conspecific, are syntypes, and the reference to males in Macquart’s description (1838) is probably a typographical error. Both are in poor condition being covered in a whitish deposit and mould. The better specimen, with Macquart’s label, has been cleaned as far as possible with “Cellosolve” and a slide mount made of the head, abdomen, wing and foreleg. It is here designated as lectotype and has been labelled accordingly. Our examination of the lectotype of *S. nigrimanum* has shown that it is closely related to *S. orbitale*, S. guianense and S. pintoi and conspecific with S. pruinum (Lutz, 1910) which falls as its synonym.

Some clarification in nomenclature needs to be made with reference to S. nigrimanum and S. orbitale. In 1909, Lutz erroneously referred to S. nigrimanum sensu Lutz as S. albimanum but as he later (Lutz, 1910) realised that his material was not true S. nigrimanum but a new species *S. orbitale*, the name *S. albimanum* became a synonym of *S. orbitale*. A complete description of the adults, pupa and larva of S. nigrimanum is given by Vulcano (1959, as S. pruinum).

*Simulium oyapockense* Floch & Abonnenc


*Simulium oyapockense* was described by Floch & Abonnenc (1946c) in the adult and pupal stages. As adults were dissected from pupae, their coloration was not reliably known and hence the only subsequent reference made to *S. oyapockense* is in papers dealing with nomenclature and in catalogues.

Type-material consists of two specimens with syntype status; a male and associated pupal pelt mounted on slide 731 and a female and pupal pelt on slide 732. Both specimens bear the label “type”. The latter specimen has been incorrectly quoted as 729 in the original description (Floch & Abonnenc, 1946c). There is no doubt that the error lies in the publication and not in the numbering of the adults since; specimen 732 bears a type label and agrees entirely with the data given in the paper for this type, albeit under the number 729; it is consecutive in number sequence to the other syntype of this
species, a practice observed by the authors in all their descriptions of new species from French Guiana (Floch & Abonnenc, 1946 a,b,c); it is deposited in the Pasteur Institute, France, where Abonnenc sent the types on which his descriptions were based (Abonnenc, pers. comm. to AJ S). The female and associated pupal pelt (732) is here designated as lectotype. Its condition is poor; the morphology of the undissected head is unrecognizable as it is still within the pupal integument; legs and wings are badly macerated but the claw is visible; the abdomen clearly shows the genital fork, paraaproct and cercus, spermatheca and gonopophysis; the pupal thorax and gills are complete but the abdomen is missing. The other specimen (731) consists of a male dissected from its pupal pelt. Its condition is also poor: the head and thorax are badly macerated but the abdomen is intact and clearly shows the genitalia; the pupal thorax and gills are in good condition but the rest of the pupa is missing.

Before dealing with the new synonyms of *S. oyapockense*, we would like to clarify the status of a related species, which is now possible from our examination of Floch & Abonnenc's types. In 1982 Shelley, Pinger & Moraes dealt with *S. minisculum* Lutz and concluded from their examination of syntypes that either *S. minisculum* is a polymorphic species with regard to female scutal pattern, or that the syntype series contains two distinct species. They also suggested the possible synonymy of *S. roraimense* Nunes de Mello (1974) with *S. minisculum*. Since the pupal gill of *S. oyapockense* figured by Floch & Abonnenc (1946c) greatly resembled that of a species from Amazonia accepted as *S. minisculum* s. 1 by Shelley, Pinger & Moraes (1982) collections were made at the type-localities of *S. oyapockense* and of *S. minisculum*. The following conclusions have now been reached after an examination of these collections: the syntype series of *S. minisculum* contains two species, *S. minisculum* sensu stricto and *S. oyapockense*, which can be distinguished on both female scutal pattern and pupal gill configuration; *S. roraimense* is a valid species that can be distinguished from *S. minisculum* on male and female scutal patterns and on pupal gill configuration, and from *S. oyapockense*, its nearest relative, on male scutal pattern.

We synonymise *S. pseudosanguineum* Ramirez-Perez & Peterson (1981) with *S. oyapockense* on the basis of the description given by these authors and on an examination of paratypes and other specimens identified by Ramirez-Perez in the BMNH collection. *Simulium pseudosanguineum* was previously regarded as *Simulium* form C of the "*S. amazonicum* and *S. sanguineum* groups" (= *S. amazonicum* group of Shelley, Pinger & Moraes, 1982), by Tidwell et al. (1981). These authors also refer to form A which they distinguish from form C by the width of the vittae on the female scutum. We believe the two forms to be conspecific, the variation in vittal width being an intraspecific character and hence *Simulium* form A also falls within our interpretation of *S. oyapockense*. In their 1981 paper Ramirez-Perez & Peterson describe differences between *S. pseudosanguineum* and the closely related *S. pseudoamazonicum* on which we would like to comment. Reference is to *S. pseudosanguineum* unless stated otherwise. The ventral ommatidia of male eyes are stated as being black, whereas they are dark red; the female cibarium is said to have a single row of teeth, whereas their figure shows at least two uneven rows, which agrees with BMNH material; female leg coloration is stated to differ from that of *S. pseudoamazonicum* — intensity of leg coloration is variable within species and this is often complicated by the use for descriptions of tenar specimens which do not show final coloration — this character is regarded by us as of limited value within the *S. amazonicum* group of species; the form of the cerci and paraaprocts is used for distinguishing *S. pseudosanguineum* from related species — in this case specimen orientation is causing an artefact as the character is relatively uniform throughout the *S. amazonicum* group; *S. pseudosanguineum* is stated to have a reinforced collar to the cocoon [at least this is presumably what is meant by "con refuerzo en el borde anterior y lateral"], a character separating it from *S. pseudoamazonicum* — in BMNH specimens from Venezuela identified by Ramirez-Perez *S. pseudoamazonicum* also shows this thick collar but it is less discernible as the cocoon is more transparent than that of *S. pseudosanguineum*, the ventral plate of male *S. pseudoamazonicum* and *S. pseudosanguineum* is described as "sin proceso mediano" [presumably meaning not pointed] — specimens of both these
taxa in the BMNH collection have been examined and seen to have a pointed ventral plate, which can be more easily seen when this structure is moved into different positions in glycerine — this character is consistent for all *S. amazonicum* group members. Lastly, in both the Spanish and English summaries *S. pseudomazonicum* and *S. pseudosanguineum* are stated as having pupae with three gill filaments and not six as is the case.

We also regard *S. sanchezi* Ramírez-Pérez, Yarzábal & Peterson (1982) as a synonym of *S. oyapockense* based on the authors' description and key, on paratypes, and on specimens in the BMNH identified by Ramírez-Pérez. These authors distinguish *S. sanchezi* from *S. sanguineum* and other allied species of the *S. amazonicum* group on leg coloration, size of submedian silver cunae on the male scutum and the form of the granulations on the pupal integument. We are unable to confirm any of these differences as being of consistent value. As previously indicated, variation in leg coloration is a poor discriminant within the *S. amazonicum* group and the variations seen in male scutal pattern and pupal integument granulations between *S. sanchezi* and *S. oyapockense* are regarded as intraspecific.

Another species of the *S. amazonicum* group, *S. cuasisanguineum* described by Ramírez-Pérez, Yarzábal & Peterson (1982) is claimed by these authors to be most closely related to *S. roraimense* from which it may be distinguished by leg coloration in the female, scutal pattern in the male and a lack of granulations in the pupal integument (cephalothorax) of *S. cuasisanguineum*. Our comparison of reared *S. cuasisanguineum*, determined by Ramírez-Pérez, with topotypes of other *S. amazonicum* group species, produced the following conclusions. *Simulium cuasisanguineum* is closer to *S. oyapockense* than to either *S. roraimense* or *S. sanguineum*. It only differs from *S. oyapockense* in having no granulations on the frontoclypeus of the pupa and in having a reduced number of granulations on the thorax. The other differences cited by these authors were not observed. Although we have seen intraspecific variation in this character in all members of the *S. amazonicum* group, we have never encountered a complete lack of granulations on the frontoclypeus. Until such a time as the full extent of variation in this character is known, we maintain *S. cuasisanguineum* as a valid species.

For a description of the adults and pupa of *S. oyapockense* the reader is referred to Ramírez-Pérez, Yarzábal & Peterson (1982, as *S. pseudosanguineum* and *S. sanchezi*).

**Simulium pertinax** Kollar


*Simulium inexorable* Schrottky, 1909: 63. Syntypes ♀, ARGENTINA, BRAZIL, PARAGUAY: R. Paraná. [Type depository unknown; types probably destroyed.] [Synonymised with *Simulium pertinax* Kollar by Lutz (1922), revalidated by d'Andretta & d'Andretta (1950); synonymised with *Simulium pertinax* Kollar by Wygodzinsky (1953)].

*Simulium* (as *Chirostilbia*) *flavifemur* Enderlein, 1921a: 199. Lectotype ♀ [designated by Stone (1962)]. BRAZIL: [no locality specified]. In Museum fur Naturkunde der Humboldt-Universität, Berlin, East Germany. [Synonymised with *Simulium pertinax* Kollar by Lane & Porto (1939); revalidated by d'Andretta & d'Andretta (1950); synonymised with *Simulium pertinax* Kollar by Coscarón (1981).] [Not examined].

*Simulium* (as *Trichodagma*) *lutzianum* Enderlein (1934a): 291. Syntypes ♀, BRAZIL: [Rio de Janeiro and São Paulo regions]; PARAGUAY: San Bernardino and Hohenau. In IOC; Museum fur Naturkunde der Humboldt-Universität, Berlin, East Germany, Staatliches Museum für Tierkunde, Dresden, East Germany, [Synonymised with *Simulium pertinax* Kollar by Lane & Porto (1939).] [Not located in IOC].


Simulium cerqueirai Vulcano, 1981: 276. [Incorrect subsequent spelling of S. cerqueirai Nunes de Mello & Almeida.].

Simulium pertinax, the most common anthropophilic simulid in south-east Brazil, was described briefly in Latin and more extensively in German by Kollar in Pohl’s book (1832) “Reise im Innern von Brasilien [Journey in the Interior of Brazil]” in the section entitled “Die vorzüglich lästigen Insecten Brasilien’s” [The highly annoying insects of Brazil]. This Section was reprinted with basically the same title, but with Pohl and Kollar as authors and with different pagination, in 1832. No details of type-locality or type-material are given, but reference is made to the biting habits of this species and to the appearance of the bite, and it is compared to the Golubatz fly (S. columbuschense) of Yugoslavia. The description obviously refers to the female as reference is made to its biting habits and fig. 14b of the plate clearly shows the sex.

We have examined a unique specimen from the Naturhistorisches Museum, Wien (Vienna Natural History Museum) that was collected on the Austrian expedition to Brazil during the second decade of the last century. The specimen is a female bearing the printed italic label: “Natt. Brasil” to which has been added in handwriting the collecting locality “Ypanema”. The second printed label reads “Alte Sammlung” meaning “old collection”. The specimen also has an Enderlein determination label dated 1935 reading “Trichodagmia pertinax (Kollar, 1832)”. From these data it is concluded that the specimen is the holotype of S. pertinax. It was collected by Natterer and sent in his general insect collection to the then Imperial Cabinet of Natural History (now the Natural History Museum) in Vienna, which was housed in the Imperial Palace. Since the Natterer insect collection was large and important, it was housed separately to the main collection and hence escaped fire damage in the 1848 revolution. The collection locality Ypanema could either refer to the present-day Ipanema suburb of Rio de Janeiro or the locality near Sorocaba in São Paulo State. d’Andretta & d’Andretta (1950) believed the former, presumably since the description of S. pertinax by Kollar (in Pohl, 1832) occurs in an appendix to the chapter dealing with collections made by the main Austrian expedition in Rio de Janeiro. We, however, believe the collecting locality to be in São Paulo State since the preface (p.ix) to Pohl’s work (1832) indicates that Natterer (the collector) and Sochor left Rio de Janeiro soon after arrival and went to Ypanema, São Paulo State, near the iron foundry, where they spent three years making extensive insect collections. This obviously refers to the iron foundry near Sorocaba and the appending of the section, “The highly annoying insects of Brazil” in which the description of S. pertinax is made, to the chapter concerning Rio de Janeiro was possibly for editorial reasons. The holotype was collected in the period 1819-1822 [for full details of Natterer’s itinerary in Brazil see Papavero (1971)]. The specimen which is pinned, is in fair condition. A fore-leg, mid-leg and the abdomen have been removed and mounted on a slide by the senior author, and both slide mount and pinned specimen labelled as holotype. The modern concept of S. pertinax based on d’Andretta & d’Andretta’s description (1950) conforms with this specimen.

The preceding list of synonyms is based mainly on d’Andretta & d’Andretta’s comprehensive revision (1950) of S. pertinax in which full details of the reasons behind the synonymies as well as a list of misidentifications may be found. Where discord occurs between authors or where the nomenclatural problems are particularly confusing, a clarification of the relevant synonyms is given below.
Lutz (1909) suggested that *S. inexorabile* Schrottky may be a synonym of *S. pertinax* and later (Lutz, 1922), confirmed this synonymy. This action was followed by Lane & Porto (1939), Smart (1945) and Vargas (1945). d’Andretta & d’Andretta (1950) did not accept this synonymy but Wygodzinsky (1953) again synonymised *S. inexorabile* with *S. pertinax* based on his extensive collections made in the type-locality region of *S. inexorabile*. Vucano (1967) lists *S. inexorabile* as a distinct species. We are supporting Wygodzinsky’s action (1953) as it is unlikely that he would have missed *S. inexorabile* in his collections, if it were distinct from the well known *S. pertinax*. Schrottky’s description (1909) of *S. inexorabile* is superficial and does not indicate any distinctive character of the species. No type-material has been found of Schrottky’s three simulid species from Paraguay and it is assumed that it was destroyed, together with the rest of his collection, “by soldiers during one of Paraguay’s peasant riots around 1922” (Horn & Kahle, 1936).

The first description of *Simulium flavifemur* (with the generic name *Chirostilibia*) is attributed by some authors to Enderlein (1921c, published on 20/12/1921) in which the female is described as a new species. However, Enderlein had mentioned this species in two previous publications (1921a and 1921b published on 16/4/1921 and 3/6/1921 respectively). A key to simulid genera is given in the 1921a paper in which Enderlein includes the genus *Chirostilibia* (regarded as a subgenus of *Simulium* by us) and names *Chirostilibia flavifemur* as type-species. As Enderlein’s genus *Chirostilibia* was monotypic, sufficient detail of the “genus” is given for the name *Chirostilibia flavifemur* to be available under Article 12 of the International Code of Zoological Nomenclature by indication as defined in Article 16 (a) (v). d’Andretta & d’Andretta (1950) and Vucano (1967) are the only authors not accepting Lane and Porto’s synonymy (1939) of *S. flavifemur* with *S. pertinax*, the other two catalogues relevant to Neotropical simulids (Smart, 1945; Vargas, 1945) being in accord. We support Coscaron’s latest synonymy (1981) of *S. flavifemur* with *S. pertinax* based on his examination of the lectotype of the former species.

The synonymy of *Simulium lutzianum* Enderlein (as *Trichodagmia lutziana*) with *S. pertinax* by Lane & Porto (1939) without explanation is accepted by all authors and d’Andretta & d’Andretta (1950) support this action. We also agree with this synonymy and give the following clarification in its support. In 1909 Lutz gave a description of *S. venustum* Say based on specimens collected by him in Brazil (presumably in the regions around Rio de Janeiro and Sao Paulo) and identified by Coquillett. Lutz was obviously not in full acceptance of Coquillett’s determination since he entitled the description “*S. venustum* Say (S. pertinax Kollar)” and stated that he had not fully decided on the name to use. In 1910 Lutz positively identified his material as *S. pertinax* Kollar after comparing it with specimens of the North American species *S. venustum* sent by Coquillett. His references, however, to the six-filamented pupae of *S. pertinax* (Lutz, 1909, 1910) are misidentifications which he later corrected (Lutz, 1922). From his examination of simulids in the Staatliches Museum für Tierkunde, Dresden, and Museum für Naturkunde der Humboldt-Universität, Berlin (Natural History Museums of Dresden and Berlin), Enderlein (1934a) described the new species *Trichodagmia lutziana* based on females collected in Paraguay at San Bernardino by Fiebrig and at Hohenau, and regarded them as conspecific with the specimens from Brazil that Lutz (1909) had originally described as *S. venustum*. As Enderlein had examined specimens of true *S. venustum* he correctly noted that the Brazilian specimens were of another species, but was apparently not aware of Lutz’s subsequent identification (1910) of this material as *S. pertinax*. Enderlein’s new species was thus a synonym of *S. pertinax*. In the same year (1934b) Enderlein produced a paper on simulids in the Vienna Natural History Museum. In it he referred to 19 females, collected by Fiebrig from San Bernardino, Paraguay, some of which were also deposited in the Natural History Museum, Berlin, as well as a single female from Ypanema, Brazil. He identified all those specimens as *T. lutziana*. However, in 1936 Enderlein regarded *S. lutzianum* (as *T. lutziana*) and *S. pertinax* (as *T. pertinax*) as distinct species and stated that all the Paraguayan material referred to in his 1934b paper as *T. lutziana* was now considered as *T. pertinax*. This therefore infers that Enderlein still considered the single specimen from Ypanema, Brazil, mentioned in his 1934b
paper, the Paraguayan material from Hohenau in his 1934a paper and Lutz’s “S. venus-
tum” specimens (Lutz, 1909) as T. lutziana. We have examined the specimen from Ypa-
nema, Brazil, which bears an Enderlein determination label dated 1935 with the script
Trichodagmía pertinax (Kollar, 1832), and regard it as the S. pertinax holotype (see abo-
ve). It is apparent therefore that Enderlein was unable to distinguish between “T. perti-
nax” and “T. lutziana”. We are also unable to distinguish these two species from the
characters cited by Enderlein (Enderlein, 1936) and accept that all his references to
Trichodagmía lutziana and T. pertinax (Enderlein 1934a,b; 1936) refer to S. pertinax.
This synonymy also avoids the necessity for proposing a new name for T. lutziana Ender-
lein which became preoccupied by S. lutzianum Pinto (1932) after the genus Tricho-
dagmía was regarded by Edwards as a synonym of Simum (Smart, 1944). Later, Stone
(1963) proposed a classification of the Simulidae involving subgenera which is accepted
by most workers today. In this, Trichodagmía is treated as a synonym of the subgenus
Chirostilbia within the genus Simum.

Confusion has also arisen over the reference by Lutz (1909) to S. venustum
variety infuscatum and later (Lutz, 1910) to a different species S. infuscatum Lutz
which he synonymised with S. auristriatum Lutz (Lutz, 1917). We follow d’Andretta
& d’Andretta (1949) and Vulcano (1967) in accepting this synonymy and in regarding
S. venustum var. infuscatum as a varietas inquisitoria. Pinto (1932) and Vargas (1945)
incorrectly list this variety as a synonym of S. infuscatum Lutz; S. infuscatum is regard-
ed by Pinto (1932) as distinct from S. auristriatum but as the latter’s synonym by Lane
& Porto (1939) followed by Smart (1945) and Vargas (1945). S. venustum var. infusca-
tum could not be located in IOC, its original depository, and is presumed lost.

S. distinctum Lutz was also synonymised by Lane & Porto (1939) with S. perti-
nax, an action followed by both Smart (1945) and Vargas (1945). d’Andretta & d’An-
dretta (1950) however, revalidated S. distinctum. We agree with the latter authors based
on our comparison of reared material of both species from Brazil with the holotype of
S. pertinax. The two species may be most readily distinguished in the pupa; S. pertinax
has an eight-filamented gill whereas that of S. distinctum bears ten filaments.

A full description of the adults, pupa and larva of S. pertinax, is given by d’An-
dretta & d’Andretta (1950).

Simulium quadrifidum Lutz

Simulium quadrifidum Lutz, 1917: 66. Lectotype pupa [here designated], BRAZIL: Ron-
dônia Territory, Madeira-Mamoré region. In IOC [Synonymised with Simulium amazoneum
goeldi] Cercqueira & Nunes de Mello (1964); revalidated by Shelley, Pinger & Moraes (1982). ] [Examined].
[Simulium amazonicum Goeldi sensu Cercqueira & Nunes de Mello, 1964. Male, pupa and
larva. Misidentification].

Simulium rassii Ramírez-Pérez, 1980: 60. Holotype ♀ and associated pupal pelt, VENE-
ZUELA: Amazonas State, Alto Ventuari, Caquiri. In IND. [Not examined].
Syn.n.

Simulium torrealbai Ramírez-Pérez, 1980: 64. Holotype ♀ and associated pupal pelt, VENE-
ZUELA: Amazonas State, Department of Atabapo, Parima Mountains.
In IND. [Not examined]. Syn.n.

Simulium quadrifidum is a zoophilic member of the S. amazonicum group, closely
related to S. cauchenese Floch & Abonnenc; it was described from the pupa by Lutz in
1917. The confused nomenclatural background to S. quadrifidum is discussed by Shelley,
Pinger & Moraes (1982). S. quadrifidum was collected by Oswaldo Cruz at some point
along the Madeira-Mamoré railroad in Rondônia, Brazil.
Type-material consists of five syntypes on four slides numbered 12.307 to 12.310 and also with the respective number sequence 321 to 324. The former numbers are those used by the Oswaldo Cruz Institute for the main insect collection and the latter were presumably given by Lutz. The pupa on slide 12.308 (322) is here designated as lectotype: it is in good condition, showing clearly the gill filaments, as well as the thorax and abdomen which are still within the cocoon. Slides 12.307 (321) and 12.309 (323) contain two pupae and one pupa respectively and slide 12.310 (324) contains a dissected male as well as a pupal abdomen from which it had possibly emerged. We have collected extensively in the Madeira-Mamoré region and base the following synonyms on this material which we have judged to be conspecific with the type-series.

*Simulium quadrifidum* can only be distinguished from *S. cauchense* by the female scutal pattern and pupal gill configuration. The two species are found sympatrically in the forested onchoceriosis zone of Brazil and in the adjacent area of Venezuela (recorded as *S. rassii* and *S. torrealbait* for *S. quadrifidum* — see Ramírez-Pérez, 1980 and as *S. rangeli* for *S. cauchense* — see Ramírez-Pérez, Rassi & Ramírez, 1977). We regard *S. rassii* and *S. torrealbait* as synonyms of *S. quadrifidum* since we consider the differences shown by Ramírez-Pérez (1980) in the female scutal pattern and pupal gill to be intraspecific and not interspecific.

A description of the adults and pupa of *S. quadrifidum* is given by Ramírez-Pérez, Yarzábal & Peterson (1982, as *S. rassii* and *S. torrealbait*) and the male, pupa and larva by Cerqueira & Nunes de Mello (1964, as *S. amazonicum*).

*Simulium rorotaense* Floch & Abonnenc


*Simulium maroniense* Ortiz, 1957: 166. [Incorrect subsequent spelling of *S. maroniense* Floch & Abonnenc.]


*Simulium wuyaraka* Vulcano, 1967: 44. [Incorrect subsequent spelling of *S. wuyaraka* Ortiz].

*Simulium wuyaraca* Ramírez-Pérez, Yarzábal & Peterson, 1982: 96. [Incorrect subsequent spelling of *S. wuyaraka* Ortiz].


*Simulium rorotaense* is a widespread anthropophilic species from the Amazon and Orinoco basins and the Guianas. It is described in both adult and pupal stages by Floch & Abonnenc (1946b). The authors refer to two "types" which they number 751 and 752, being respectively, a female and pupal pelt and a male and pupal pelt mounted on slides. These have the status of syntypes, as do the six pupae numbered in the paper as 698, 699, 704, 705a, 705b and 716. No subsequent descriptions of *S. rorotaense* have been made but Floch & Abonnenc described a closely related species, *S. maroniense*, in the same
paper. Again they refer to two “types”, a male and pupal pelt and a female and pupal pelt, mounted on slides and numbered 708 and 709 respectively. These are syntypes, as are the other nine pupae numbered 680B, 681, 682, 706, 706bis, 707, 707A, 707B, 710. They distinguished S. maroniense from S. rootaense on the form of the pigmentation of the female paraprocts and gonapophysis, cibarium and gill, platelet density and trichome branching of the pupa.

We have examined two syntypes of S. rootaense (751 and 752) and two of S. maroniense (708 and 709) from the Pasteur Institute, Paris; we presume that the other syntypes are in the Pasteur Institute, French Guiana. We designate the female and its pupal pelt on slide 751 as the lectotype of S. rootaense since slide 752 of the male lacks the pupal pelt referred to in Floch & Abonnenc’s paper (1946b). We designate the female on slide 709 as the lectotype of S. maroniense despite the lack of the pupal pelt referred to in Floch & Abonnenc’s description (1946b). Similarly the material on slide 708 does not entirely correspond with that stated in this paper; a male parallectotype is present but with only the abdomen of its pupal pelt. Based on the examination of these types and the descriptions by Floch & Abonnenc (1946b) we regard S. maroniense as a synonym of S. rootaense for the following reasons: the differences in the form of the paraprocts and gonapophyses noted by these authors are artefactual and caused by the abdomen of S. rootaense being tilted slightly on the slide; no differences in pigmentation were observed. The cibariums of the two species are identical and the differences in pigmentation, platelet size and density, trichome branching and gill branch heights of the pupae are small and considered as intraspecific variations.

We also regard S. wuayaraka as a synonym of S. rootaense. The female from Venezuela was described by Ortiz (1957), who cited the yellow colour of the first two abdominal tergites as the distinguishing character between this species and S. rootaense and S. maroniense (in which these segments are dark brown according to Floch & Abonnenc (1946b)). In reared specimens of S. rootaense from Brazil we found that these tergites ranged from dirty yellow to light brown.

Simulium fulvinotum from Brazil, described by Cerqueira & Nunes de Mello in Cerqueira (1967) and later, more fully with type designations in Cerqueira & Nunes de Mello (1968), is synonymised with S. rootaense by Py-Daniel (1982). The designation of a “holotype” in the third paper in their series the “Simulidæ da Amazônia” (Cerqueira & Nunes de Mello, 1968) is incorrect and should have been of a lectotype since the earlier, second paper in the series (Cerqueira, 1967) conferred the status of syntypes to the type-material as no type designation had been made. Cerqueira & Nunes de Mello (1968) distinguish S. rootaense from S. fulvinotum by the smaller size of the former (2.55 mm compared to 3 mm), the colour of the first three abdominal segments of the female, the form of the tooth on the female claw and on pupal gill form. Py-Daniel (1982) gives no reasons for his synonymy of S. fulvinotum with S. rootaense. We cannot support their new taxon as no account has been taken of artefacts caused by orientation of the specimen, nor of intraspecific variation.

Simulium ignacioli, here synonymised with S. rootaense, was described by Ramírez-Pérez & Vulcano (1973) from syntypes incorrectly referred to as “Una hembra y un macho holotipos . . . . y ocho pupas . . . .” [a female and a male holotypes and eight pupae]. These authors distinguished S. ignacioli from S. wuayaraka solely on the character that S. ignacioli has 17-20 gill filaments in the pupa; this is a puzzling statement since at that time the pupa of S. wuayaraka was unknown. Simulium wuayaraka was, however, later described by Ramírez-Pérez, Yarzábal & Peterson (1982) as having a pupal gill with 20 filaments, just as in S. ignacioli. Despite giving descriptions of both S. ignacioli and S. wuayaraka in the text, these authors make no comparison of these species; they place S. ignacioli in the subgenus Psilopelma but do not refer to the subgeneric position of S. wuayaraka. Some confusion exists in their paper over the differences between these two species. The descriptions of both S. ignacioli and S. wuayaraka show no differences in the male scutum, whereas a figure of the male scutum of S. ignacioli clearly shows the
presence of submedian light bands on the anterior and posterior scutal margins; the male scutum of *S. waayara* is not figured. Though not referred to in the description, this supposed distinction is contradicted by the key which refers to the absence of scutal bands in both species. Specimens of *S. rotata* and *S. ignaci* and *S. waayara* (the last two species determined by Ramírez-Pérez) in the BMNH collection all show to a varying degree the submedian banding figured in the male *ignaci*; the ease with which this character is seen depends on the degree of translucency and/or greasing of the specimen. Other differences between *S. ignaci* and *S. waayara* shown in the keys are in the coloration of the legs of adults (except that descriptions in the keys do not always coincide with those in the text) and the coloration of the pupa and length of pupal filaments. In adults of these two species determined by Ramírez-Pérez we were unable to see differences in leg coloration and the pupal pelt associated with these specimens were concolorous. We presume that these authors were comparing teneral adults with mature adults and young pupae with older, more mature pupae. The differences in gill filament length cited by Ramírez-Pérez, Yarzabal & Peterson (1982) were not seen in the BMNH specimens but fall within the range of intraspecific variation.

*Simulium rotata* is closely related to *S. panamense* Fairchild which can only be distinguished by the presence of 1+1 submedian white vittae on the female scutum, and *S. suarezi* Ramírez-Pérez, Russi & Ramírez, which may be separated on pupal gill form. Ramírez-Pérez, Yarzabal & Peterson (1982) distinguish *S. suarezi* from *S. rotata* (as *S. waayara* and *S. ignaci*) in their keys by the presence of *S. suarezi* of an orange area in the postero-superior pleural region in adults and on leg coloration. We did not observe these differences in our specimens.

Full descriptions of adults, pupae and larvae of *S. rotata* are given by Cercy & Nunes de Mello (1968, as *S. fulvimentum*) and of adults and pupa by Ramírez-Pérez, Yarzabal & Peterson (1982, as *S. ignaci* and *S. waayara*).

*Simulium samboni* Jennings


This is a widespread zoophilic species common from Central America southwards to the Amazon basin of northern Brazil. The female and male were described by Jennings from Panama in 1915.

In 1952 Dalmat described the new species *S. colvini* from Guatemala and likened it to *S. downs* and *S. samboni*. According to this author, characters for distinguishing the three species could be found in the female and male genitalia and in the pupal gill. *S. colvini* was synonymised with *S. samboni* by Vargas & Diaz Najera in 1954. Although we have not examined the type-series of *S. colvini*, we agree with the reasons given by Vargas & Diaz Najera for their synonymy.

The new species *S. santaelena* described by Ramírez-Pérez & Peterson (1981) is also likened by its authors to *S. samboni*. They claim that the two species may be distinguished because the submedian vittae in the female scutum of *S. samboni* do not reach the silver-white posterior scutal margin whereas they do in *S. santaelena* and that only simple trichomes are present in *S. santaelena* pupae whereas they are bifid in *S. samboni*. We have compared the holotype of *S. samboni* with reared material collected
in Brazil 20 km south of Santa Elena, Venezuela which is judged by us as conspecific with S. samboni of Ramírez-Pérez & Peterson. We regard the latter species as a synonym because the submedian white vittae on the scutum of the female holotype of S. samboni do reach the silvery white pruinosity of the posterior scutal margin, and trichome branching varies intraspecifically.

A full description of the adults, pupa and larva of S. samboni are given by Dalmat (1955, as S. colvini, not S. samboni) and of the adults and pupa by Ramírez-Pérez & Peterson (1981, as S. samboni).

A summary of the fifteen new specific synonyms created in this paper is as follows:

1. S. cauchense Floch & Abonnenc, 1946  

2. S. distinctum Lutz, 1910  

3. S. goeldii Cerqueira & Nunes de Mello, 1967  

4. S. limbatum Knab, 1915  

5. S. nigrimanum Macquart, 1838  

6. S. oyapockense Floch & Abonnenc, 1946  

7. S. quadrifidum Lutz, 1917  

8. S. rorotense Floch & Abonnenc, 1946  

9. S. samboni Jennings, 1915  

The six lectotypes designated are for the following species: S. cauchense, S. nigrimanum, S. oyapockense, S. quadrifidum, S. rorotense, S. marionense (= S. rorotense).

**RESUMO**

Procurando esclarecer a taxonomia dos Simuliidae Neotropicais, o que antecede a confecção de chaves para as espécies, vários problemas nomenclaturais são resolvidos. São dadas informações sobre os tipos, onde estão depositados, suas condições, quando importante, e sinonímias. Quinze novos sinônimos são criados e seis lectotipos designados com base no exame de material tipo e de uma grande série de espécimes criados de muitas localidades, para se verificar as variações intraespecíficas.
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Addendum

While this manuscript was in press two papers concerning nomenclature of Neotropical simuliiids have been published which affect the priority of the new synonymy given above.

Initially we presented our synonymies in an informal workshop on the taxonomy of neotropical simuliiids in 1982 with the intention of formally ratifying them in this paper. However, according to the Code of Zoological Nomenclature the following two papers should be cited as the original source for these synonymies:


*Simulium cauchense* Floc & Abonnenc, 1946


*Simulium limbatum* Knab, 1915


*Simulium rotoaense* Floc & Abonnenc, 1946


*Simulium oya Packense* Floc & Abonnenc, 1946


*Simulium goeldii* Cerqueira & Nunes de Mello, 1967

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ENDERLEIN, G. [1934a]. Weiterer Ausbau des Systems der Simuliiden (Dipt.). Deutsch. Ent. Zeitschr., 273-292. [This paper is often quoted as 1933; it was issued in February 1934 as indicated on the journal's front cover.]


POHL, J.E., 1832. Reise im Innem von Brasilien. Erster Theil [= Part I.] xxx+448pp. Anton Strauss, Wien [= Vienna]. [pp. 101-119 of this work form a section entitled ‘Die vorzüglich lästigen Insecten Brasilien’s’ in which the description of Simulium pertinax by Kollar is on p.117. Kollar is not named as co-author of this section, but is named so on the version issued as a separate (see Pohl & Kollar, 1832). The legend to the plate occupies pp.118 and 119.]
POHL, I. [= J.] E. & KOLLAR, V., 1832. Brasilien vorzüglich lästigen Insecten. 20 pp. Wien. [This work contains the description of Simulium pertinax by Kollar on p. 19. It is extracted and repaginated from pp. 101-119 in Pohl, 1832. It differs from the original in attributing co-authorship to Kollar on the title page and in the differently set legend (p. 20) to the plate.]


