

THE NAIDIDAE (OLIGOCHAETA) OF SURINAM

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[With 7 text-figures]

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INTRODUCTION

Neotropical oligochaetes have been the object of study of several investigators over the last century, but these have resulted, for the most part, in reports of small collections or of limited geography. More exhaustive studies such as the one on Brazil by Marcus (1943) have been few. It is hoped that the knowledge of the fauna of another South American country, Surinam, will add materially to an overview of neotropical Naididae and will stimulate additional studies in other areas of the continent.

Through the courtesy of the Rijksmuseum van Natuurlijke Historie, Leiden, and Dr. J. van der Land, the opportunity to study the aquatic oligochaetes of the family Naididae in Surinam was presented. All specimens were collected by Dr. van der Land ¹⁾ and loaned to me in 1967. The collection sites, detailed in fig. 2, included a variety of habitats. In all, several thousand specimens were available.

1) Aided by a grant from the Stichting voor Wetenschappelijk Onderzoek van de Tropen WOTRO (No. W954-53).

Several students in the Louisiana State University have assisted me in preparing the specimens on individual slides and in the task of keeping the records. Notable among these have been Dennis Towers, Martha Hiegel, Shelly Carter, and Michael McMahan. Mr. John O'Neil has skillfully prepared the illustrations of the new species. Each has made my task easier by his willing assistance, and I express my appreciation to them.

Identified specimens have been returned to the Leiden museum. Where duplicates permit, a synoptic series will be deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C. I have also retained a series of duplicates in my collection at the Louisiana State University.

LIST OF LOCALITIES

- 287: Corapinakreek near Republiek, among grass and green algae.
- 288: Kwattaweg near Paramaribo, in *Typha*-swamp, pH 7.8.
- 289: Kwattaweg near Paramaribo, ditch in *Typha*-swamp, pH 8.5.
- 290: Weg-naar-Zee near Paramaribo, pond near coast, pH 7.5.
- 291: Weg-naar Zee near Paramaribo, grass-swamp, pH 7.5.
- 292: Weg-naar-Zee near Paramaribo, *Cyperus gigantea*-swamp, pH 7.5.
- 293: Leiding 19 near Uitkijk, ditch with *Eichhornia*, pH 7.2.
- 294: Leiding 19 near Uitkijk, ditch, among *Eichhornia*-roots, pH 7.2.
- 295: Leiding 19 near Uitkijk, small ditch with sedges, pH 7.8.
- 297: Livorno near Paramaribo, rush-swamp, pH 5.9.
- 298: Tout-lui-faut canal near Paramaribo, brackish water, pH 6.5.
- 299: Houttuin near Paramaribo, small pool in clearing, pH 6.3.
- 300: Same locality, among rotting palm leaves.
- 301: Same locality, among green algae.
- 302: Lelydorp, small marsh with shrubs and herbs, pH 5.9.
- 303: Lelydorp, swamp with floating grass.
- 304: Bernhardsdorp near Onverwacht, trench along road, pH 6.0.
- 305: Bernhardsdorp near Onverwacht, swamp forest, pH 6.7.
- 306: Onverwacht, dense swamp forest, pH 6.0.
- 307: Hannover near Zanderij, wet clay savanna, pH 5.7.
- 308: Same locality, small savanna creek, pH 5.7.
- 309: Hannover near Zanderij, forest creek, pH 5.0.
- 310: Lelydorp, trench along road, strongly polluted.
- 311: Hannover near Zanderij, bank of Para river, pH 5.6.
- 312: Paramaribo, experimental pond.
- 313: Latour near Paramaribo, ditch, among *Eichhornia*-roots.
- 314: Same locality, among grass roots and plant debris.

- 315: Latour near Paramaribo, ditch, pH 7.1.
316: Vierkinderen near Paramaribo, trench along rice fields.
317: Noordbergerweg near Paramaribo, small pond with *Eichhornia*.
318: Welgedacht A near Paramaribo, ditch along road.
319: Sabakoekreek near Zanderij, forest creek, pH 4.8.
320: Troelindekreek near Zanderij, savanna creek, pH 6.0.
321: Zanderij, pool in white-sand savanna, pH 6.4.
322: Zanderij, small pool in clearing, pH 6.4.
323: Onverwacht, bauxite lake.
324: Onverwacht, rush swamp.
325: Onverwacht, creek in rush swamp.
326: Onverwacht to Zanderij, large pond in forest.

The animals were extracted from rotting vegetable debris, unless stated otherwise. More detailed information is given by Van der Land (1970). Figs 1 and 2 give maps of the country with detailed position of the collecting sites and associated landmarks. In the text, only the number of the collecting site will be given for each species.

SYSTEMATICS

Chaetogaster langi Bretscher, 1896

Diagnosis. — Prostomium inconspicuous. Dorsal setae absent. Setae in II, 3-9 per segment, 63-100 μ long. In the remainder of the segments, 3-6 per bundle, 35-68 μ .

Distribution. — Previously known from Europe, Africa, North America, and South America. Collection site in Surinam: 288. (Single specimens of a *Chaetogaster*-species were observed by the collector in three samples: 294, 313, 315).

Discussion. — These worms are small, a chain of zooids being 650 μ in length in preserved material. The setae of II are 80-90 μ with 3-4 per bundle. This is surprisingly conservative in a genus where the number of setae per bundle may be much larger. In the posterior segments, the number of setae is 2-4 and their lengths 50-68 μ . Aside from the conservative number of setae, the lengths fit well within the established ranges for the species.

It is surprising that only a single collection of this genus was made in the entire survey of Surinam. However, *Chaetogaster* is not abundantly represented in the neotropical literature, and it must be assumed that it is neither common in its distribution nor locally abundant. In North America this genus seems to be more abundant in the colder waters of the north temperate zone than in the warmer waters of the south. It is possible that *Chaetogaster* may

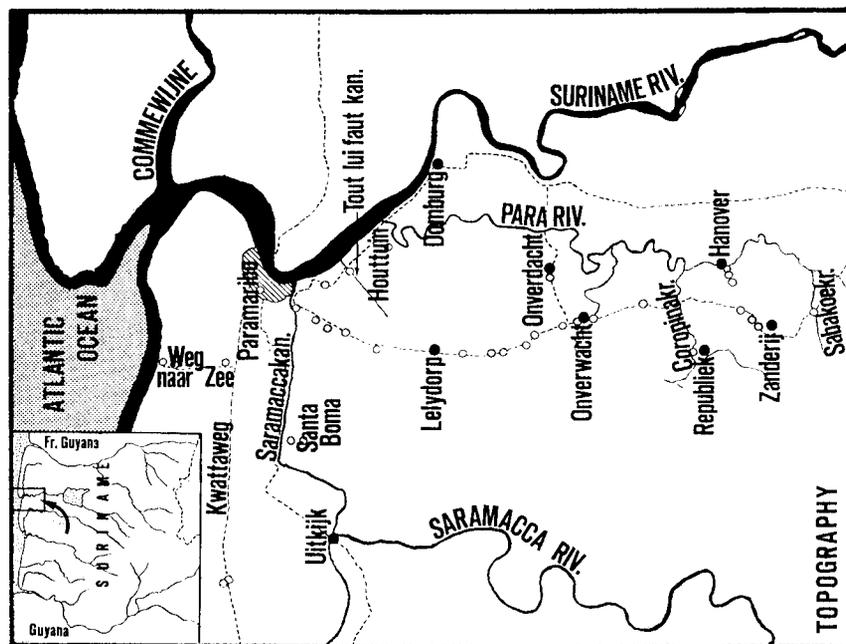
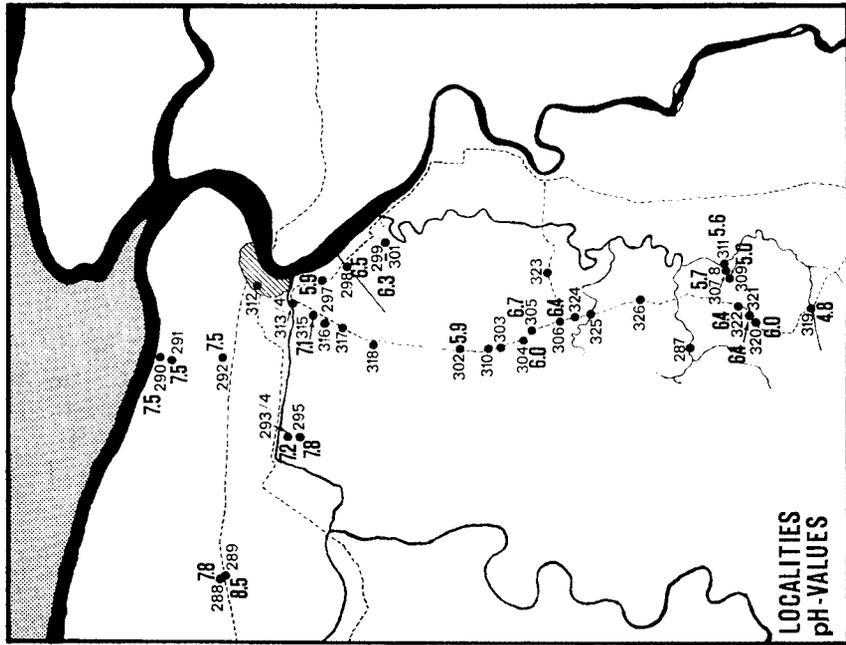


Fig. 1. Landmarks in the collecting area. Fig. 2. Position of collecting sites and results of pH-measurements.

also be more abundant in the colder climates of South America and that this information awaits a thorough investigation of the less tropical regions of the continent.

Allonais paraguayensis (Michaelsen, 1905)

Diagnosis. — Dorsal setae beginning in V, VI, or VII, 1-2 hairs per bundle, and 1-2 needles either simple pointed, or bifid with long teeth, the proximal being about twice as long as the distal. Ventral setae 2-8 per bundle, all about equally long, or slightly shorter and thinner in the anterior segments with the distal tooth slightly longer than the proximal. In the posterior ventral setae, nodulus is distal and the teeth equally long. In the anterior segments the nodulus may be either median or slightly distal.

Distribution. — Previously known from Asia, Africa, North America, and South America. Collection sites in Surinam: 288, 291, 297, 299, 300, 301, 302, 303, 315, 317, 318, 323, 324, 325, and 326. Although several subspecies have been recognized in the past, Brinkhurst & Jamieson (1971) do not now recognize subspecies because "...variation within specimens seen by me from Africa make it impossible to maintain... subspecies as distinct". Their material was said to show intermediates between what had been recognized as distinct subspecies. The distribution just cited takes into account the unification of the subspecies formerly recognized. *Allonais paraguayensis* is abundant in Surinam, having been taken in 15 different collecting sites, and in each of these, the species is abundant.

Discussion. — *Allonais paraguayensis* is an extremely variable species, not only in its setal characteristics, but also in body size. Occasionally a specimen may exceed 2 centimeters in length, which is much greater than most Naididae. The anterior ventral setae are, in this Surinamese material, fewer and shorter than those beginning in VI. These anterior ventrals number 1-4, occasionally 5; they range in length from 43 μ to 123 μ , but do not usually exceed 110 μ . The minimal end of this range is shorter than the 55 μ stated by Sperber (1948), but it does serve to illustrate the extreme variation of the species. Beginning in VI, the minimal length rises to 71 μ and the maximal length ranges up to 142 μ . The more usual posterior ventral range is 85-120 μ .

Needle setae are large and distally straight. The proximal tooth is always twice as long and thicker than the distal, which may occasionally be absent. The literature records an occasional bifid distal tooth which was not observed in any specimen from Surinam. Needles are typically 1 per bundle, although 2 may occasionally be present. Needles range from 33 μ to 129 μ , with the usual being 80-120 μ . Those setae accounting for the minimal end of

the range are in the very anterior end of the body, or near the periproct. Such a wide range for needle setae also illustrates the extreme variability of the species.

Hair setae, usually 1 per bundle, are up to 460 μ , but the typical measurement is about 275 μ . An occasional hair as short as 150 μ is also recorded, but these are near the periproct and may represent an incompletely formed seta.

***Slavina evelinae* (Marcus, 1942)**

Diagnosis. — No eyes. Dorsal setae begin in VI, 1 hair and 1 needle. Ventral setae 1-4 per bundle; in II-V shorter and thinner than the rest in immature specimens, but longer in mature ones. Teeth of anterior ventrals equally long, the proximal being thicker. In the posterior ventral setae, the proximal tooth is longer and much thicker than the distal.

Distribution. — Previously known only from Brazil. Collection sites in Surinam: 288, 292, 293, 315, and 317. These sites are all standing water with much vegetation; they are alkaline.

Discussion. — Marcus (1942) made a great distinction between the immature and the mature specimens. This is a phenomenon not of such great concern among other Naididae. I have examined many specimens from this collection in which the anterior ventrals had not reached their full length, or specimens in which there was a zone of rapid proliferation at the caudal end, and I have seen nothing that could clearly be separated as immature or mature specimens. It is extremely unlikely that my entire series was either all immature or all mature.

Marcus (1942) stated that the hair setae were up to 200 μ in a mature specimen. The longest that I observed was 165 μ , with some as short as 120 μ . Hairs are consistently smooth (non-serrated), but do tend to collect debris along their shaft.

Needles are stated to be 35-40 μ in immature specimens or as much as 47 μ in mature ones. The range I measured was 38-57 μ . The needles are small and thin, not observable in all segments. But I think this is a function of their small size and the accumulation of debris.

Ventral setae of II-V in immature specimens were stated by Marcus to be 108 μ , and those of posterior segments to be 120 μ . His measurements for mature specimens are 170 μ and 130-165 μ respectively. The Surinamese specimens, in segments II-V range from 81 to 123 μ . Posteriorly, the range is 81-105 μ . Teeth of the ventral setae are unusual. The proximal tooth is always thicker. Anteriorly, the distal tooth may be longer, or more rarely, of equal length. In VI the teeth are usually of equal length, while posterior to that segment, the distal tooth is shorter and weaker. In newly formed setae

in the posterior zone of rapid segment formation, the distal tooth is weaker than the proximal, but of equal length.

While Marcus makes great distinction between immature and mature specimens, we are ordinarily unaccustomed to thinking of setal characteristics as a function of age. Once the seta is formed, no change in proportion is possible because of the chitinous structure, except possibly in wear or breakage of teeth.

Specimens available to me range in total number of segments up to 72, the average being 22 or 23. The longer specimens all had budding zones. These were collected in February and March, and all specimens had zones of rapid segmental proliferation at the caudal end. It is unlikely that a specimen of 72 segments and possessing a budding zone is an immature specimen, except in the sense of developing gonads, which none of this material showed. I do not think, therefore, that setal variation is so much a function of age as it is likely to be a function of individual or clonal variation.

Since all specimens had a zone of proliferation at the caudal end, and many of them were budding, February and March must be a season of rapid growth and asexual reproduction. In some specimens, a caudal length of 300 μ (preserved) had so recently been added that neither setae nor segmentation was evident.

These specimens had a tendency to attract and hold foreign matter. Even the setae held more debris than in other species in the same collection. In general, the anterior and posterior segments were more nearly devoid of this foreign matter.

Numerous papillae were observed. In I-V the papillae are lateral, but beginning in VI, some are dorsal. As many as 10 papillae are distributed in the setal circumference with a few near the intersegmental groove. One papilla seems to be associated with each dorsal bundle of setae. These are large and conspicuous with an equatorial constriction giving them the form of the figure 8. They may extend as much as 20 μ from the body wall and have a center that is optically distinct from the wall of the papilla.

***Haemonais waldvogeli* Bretscher, 1900 (fig. 3)**

Diagnosis. — Dorsal setae originally beginning in an anterior segment (II or VI ?), then shed from a variable number of these anterior segments (usually those anterior to XVIII). Dorsal bundles consisting of 1 short hair and 1 curved, bifid needle with distal nodule and long teeth. Ventral setae 2-4 per bundle, slightly longer and thinner anteriorly, with the distal tooth longer than the proximal. The nodule of the anterior ventrals is proximal, changing to distal posteriorly. Teeth of the ventrals show the distal tooth to

be longer in the anterior segments. In posterior segments, the teeth are nearly equal in length, or the proximal is slightly shorter than the distal. Length of worm up to 20 mm.

Distribution. — Previously known from Europe, North America, South America, and possibly Africa. Collection sites in Surinam: 288, 291, 292, 293, 295, 299, 302, 303, 305, 306, 315, 318, and 321.

By synonymy, this monotypic genus is known from three, and possibly four continents. In 1947, du Bois-Reymond Marcus reported *H. laurentii* from Brazil and Argentina. This name is now regarded as a junior synonym of *H. waldvogeli* (see Sperber, 1948; Brinkhurst & Jamieson, 1971). Brinkhurst (1966) studied some specimens from Africa which he referred to this species, but with reservations.

Discussion. — *Haemonais waldvogeli* is distinct. In no other taxon is the shedding of dorsal setae so well established as a taxonomic characteristic. Variation does occur between specimens reported in Russia, China, and Surinam, but not having specimens to examine from other localities, it is not possible to assess these differences from the literature alone.

In this Surinamese material, it appears that the ventral setae of II-V are formed anew at the zone of fission. These segments remain smaller (setal bundles closer together) than segments to the posterior. This relationship holds even after the zooids have separated and are again budding. Anterior ventral setae are slightly longer, straighter, and thinner than those of posterior segments although a range of setal lengths will obscure this phenomenon. Stephenson (1915) mentioned an anterior type of ventral setae as opposed to a posterior type. Such a dichotomy is evident in my material. It is best exemplified in diameter of the setae and in tooth length. Diameter of ventral II is 2 μ ; in VII it is also 2 μ ; but in XI the diameter increases to 3.5 μ . Anteriorly, the teeth of the ventrals shows the distal tooth to be 6 μ , the proximal to be 4 μ . In X the distal tooth is 5 μ , the proximal is 5 to 6 μ .

When more than 2 setae are present ventrally, the third seta is only partially (distally) formed. These setae appear to arise from cells separated as widely as 10 μ , rather than having their cells of origin tightly compact.

It has long been stated that the dorsal setae begin anteriorly and are shed later. I can confirm that these setae do begin in II, one specimen having been taken in this collection showing that setal placement. Other specimens showing variability in the position of this first dorsal setal bundle are listed in the following table.

The shedding of dorsal setae is early in the maturation process. In one specimen, the dorsals were absent in a posterior zooid back to XIII even though the zooid had not separated. Asexual reproduction is common in this

Most anterior segment with dorsal setae	number of specimens
VII	1
IX	2
XI	4
XIII	2
XIV	1
XV	2
XVI	6
XVII	6
XVIII	3
XIX	4
XX	3
XXI	3
XXV	1
XXVII	1

species. A budding zone approximately at segment XXX was most typical.

Hair setae, according to Stephenson (1915) are up to 150 μ ; Malevitch (1929) recorded up to 160 μ . In my material, the range is 81-123 μ , with the usual measurements being 90-120 μ .

Needle setae are larger than in most other Naididae. The length in the literature is up to 115 μ . My material ranges from 60 μ to 104 μ , typically 80-90 μ .

Anterior ventral setae range, in previous reports, up to 117 μ ; my specimens are 72 to 110 μ , with the usual range being 80 to 100 μ . Posterior ventrals are usually shorter than those in anterior segments. The range, taken from the literature, is up to 108 μ ; this Surinamese material shows 104 μ to be the maximum, with 85-95 μ being the usual range. All of these ranges fall well within the parameters as previously established for the species.

Stephensoniana trivandran (Aiyer, 1926)

Diagnosis. — No eyes. Body wall with cutaneous glands, foreign matter adhering. Dorsal setae beginning in II, 3-4 hairs anteriorly, 1-2 hairs posteriorly, and 3-4 simple pointed needles. Ventral setae 4 per bundle anteriorly, decreasing to 1 posteriorly, all with a proximal nodulus and the distal tooth longer than the proximal.

Distribution. — Previously known from India, Palestine, and Africa. Collection site in Surinam: 315. This monotypic genus was described from mud in tanks in India and was later reported from Lake Huleh in Palestine by Černosvitov (1938). Brinkhurst (1966) reported it from Africa in the Ingane, Umgababa, and the Umvoti rivers, near Durban. A single collection of this species was made in Surinam, in a ditch at Latour near Paramaribo. The pH of the water was 7.1.

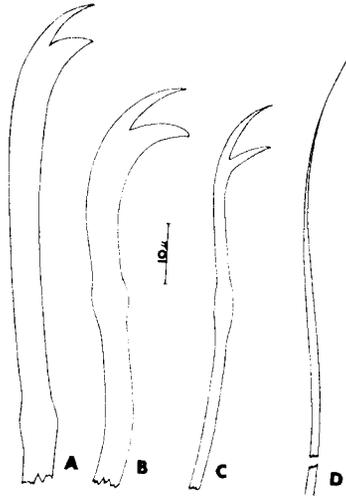


Fig. 3. *Haemonais waldvogeli*, setae. A, anterior ventral seta; B, posterior ventral seta; C, needle seta; D, hair seta.

Discussion. — With dorsal setae beginning in II, the body covered with adhering debris, simple pointed needles, lack of differentiation of the ventral setae into anterior and posterior kinds, and the angle and proportional length of the teeth of the ventral bundles, all characteristics of this species are met. The adhesion of foreign particles obscured the proximal ends of most of the setae so that an accurate measurement of total length could not be made. However, considering the diameter of the body and the length of visible setal shaft, an extrapolation of setal length could be made. In no case does the calculated length of a seta vary from the limits of the ranges as stated by Sperber (1948). These are: hair setae, 120-145 μ ; needles, 38-50 μ ; and ventral setae, 67-90 μ .

***Nais raviensis* Stephenson, 1914**

Diagnosis. — No eyes. Dorsal setae from VI on, consisting of 1 short hair per bundle and 1-2 bifid needles with short diverging teeth and a distal nodulus. Ventral setae 3-4 per bundle; those of II-V much longer and slightly thinner than the rest, with proximal nodulus and the distal tooth longer than the proximal. Posterior ventral setae have a distal nodulus, and the proximal tooth is thicker and longer than the distal.

Distribution. — Previously known from India, Sumatra and Africa. Collection sites in Surinam: 292, 294, 317, 323, and 326. This species is perhaps

from Asia, from which it has been known a long time. It was originally recorded from Africa by Stephenson (1931) under the name *N. communis*, which Sperber (1948) referred to *N. raviensis*. Brinkhurst (1966) reported it from a stream, the Nunwahuku, in Rhodesia. The genus *Nais* is widely distributed, having several cosmopolitan species, but only one endemic to the neotropical zone. This account is the first report of *N. raviensis* from the Western Hemisphere.

Discussion. — The hair setae are smooth (unserrated) and 1 per bundle. The majority measure 70-82 μ , with an occasional one shorter (broken?). The bifid needles are consistently 1 per bundle, 21-35 μ . The teeth are short and diverging.

Ventral setae of II-V, 3-5 per bundle, 70-80 μ , with distinctly proximal nodulus; the distal tooth is considerably longer than the proximal. Ventrals beginning in VI are 35-42 μ , about half the length of those in II-V; the nodulus posteriorly is distal and the proximal tooth is longer and thicker than the distal.

Ranges, as taken from the literature, seem to be slightly longer than comparable measurements on Surinamese specimens. These, however, are so close as to show no evolutionary differentiation of this South American population.

Ranges established in the literature are: hairs, up to 83 μ ; needles, 40 μ ; anterior ventrals up to 90 μ ; posterior ventrals up to 48 μ .

***Pristina menoni* (Aiyer, 1930)**

Diagnosis. — No proboscis. Hairs beginning in II, 1-2 per bundle, non-serrated. Needles 1-2 per bundle, stout, simple pointed, or occasionally with a small distal tooth; bayonet-shaped in the distal half of the setae. Ventral setae 2-5 per bundle, increasing in length posteriorly within the anterior segments; nodulus median in II, distal in the rest. Distal tooth of ventrals longer than the proximal in the anterior segments, changing to equal length in posterior segments.

Distribution. — Previously known from Europe, Asia, and Africa. Collection site in Surinam: 318. This is the first report of this species from the Western Hemisphere. It is a rare species in the other parts of its distribution. Sperber (1948) "...identified with this species two specimens from Lake Trehorningen" in Sweden. Brinkhurst (1966) had one immature specimen from Cameroons in his report of it from Africa. That it occurs in only one collecting site in Surinam seems to follow a trend. It is likely that it is more widely distributed in Surinam, and in South America, but that its distribution is not continuous nor are its numbers large at any site.

Discussion. — The hair setae, 1-2 bundle, range from 124 μ to 222 μ . This is only slightly longer than the 114-195 μ reported by Sperber (1948). Needles range from 44 μ to 71 μ . Sperber's range was 42-63 μ .

Ventral setae range from 44 μ to 59 μ , a slightly more conservative figure than the 39-61 μ stated by Aiyer (1930), and differing only slightly from the 43-53 μ in Sweden. Since the species is probably clonal in much of its distribution, it is not surprising that setal lengths vary so little.

***Pristina americana* Černosvitov, 1937**

Diagnosis. — Prothorax forming a proboscis. Dorsal setae commencing in II, consisting of 1-2 serrated hairs per bundle, and 1-2 stout, slightly curved needles, with a distal nodulus and long teeth; the distal tooth is shorter than the proximal or occasionally absent. Ventral setae in the anterior segments, 3-6 per bundle, diminishing posteriorly to 1-2 per bundle. Within the anterior segments, the setal length increases progressively, but slightly. In II, the distal tooth is longer than the proximal, and the nodulus is proximal. In III, the teeth are equally long, and there is a median nodulus. In the rest of the segments, the distal tooth is shorter than the proximal, and the nodulus is distal.

Distribution. — Previously known only from South America. Collection site in Surinam: 318. Černosvitov (1937) described two subspecies from Argentina. Marcus (1943) reported it in Brazil. His specimens were identified as belonging to one of Černosvitov's varieties (*typica*). The single collection of this species in Surinam indicates that the species is not common. Since the other reports also indicate few specimens and no wide distribution, one may assume that the species has a sporadic distribution over a considerable portion of South America, but that it is nowhere abundant.

Discussion. — The hair setae range from 184 μ to 281 μ in this Surinamese material. This fits more closely the range of the variety *loretana* of Černosvitov which has an upper limit of 320 μ . The needles range from 60 μ to 95 μ , also fitting the range of the variety of Černosvitov.

Ventral setae number 2-4 per bundle, the smaller number being in a posterior bud, and range from 60 μ to 86 μ . Černosvitov's variety *loretana* ranged 70-90 μ .

Clearly, these Surinamese specimens fit the description of the variety *loretana*, but since both subspecies were taken in the same locality the names can hardly stand as valid subspecies. Marcus' Brazilian specimens had measurements even longer than the typical subspecies, with hair setae as long as 550 μ . It is clear, then, that *Pristina americana* is an endemic South American species with widely varying characteristics. Since the species seems not to

have a continuous distribution, but is rather locally isolated, clonal variation will be great.

Pristina proboscidea Beddard, 1896

Diagnosis. — Prostomium forming a proboscis. Dorsal setae beginning in II, consisting of 1-4 serrated hairs per bundle and 1-4 simple pointed needles, straight and fine, without a nodulus. Ventral setae in anterior segments, 2-4 per bundle, up to 9 posteriorly, all of one type, with the distal tooth longer than the proximal.

Distribution. — Previously known from Asia, Zanzibar, Australia, and widely distributed in South America in Argentina, Chile, Paraguay, and Brazil. Collection sites in Surinam: 303, 324, and 325.

Discussion. — Surinamese specimens consistently have only one or two serrated hair setae, 150-358 μ long. The needles, 1-3 per bundle, measure 33-52 μ . Ventral setae are 50-95 μ anteriorly, and 50-68 μ posteriorly. All these measurements are within the range previously published for the species, but are on the short end of the range.

P. proboscidea was collected in all cases in association with its congener, *P. aequisetata*, from which it can easily be recognized even when the giant setae of the latter are not developed. *P. proboscidea* has simple pointed needle setae and little or no differentiation of ventral setae from anterior to posterior.

Subspecies have been proposed for *P. proboscidea*, but the range of variability between the two forms so nearly overlap that it probably is not wise to retain subspecific names.

P. proboscidea was collected three times in March from running as well as standing water, and from matted vegetation in a swamp.

Pristina macrochaeta Stephenson, 1931

Diagnosis. — Prostomium forming a proboscis. Dorsal setae beginning in III or IV; hair setae stout, serrated, 1-4 per bundle; needles simple pointed, 1-3 bundle; ventral setae 5-10 per bundle, in II longer than the rest, all of similar type, with distal tooth longer than proximal.

Distribution. — Previously known from South America and from Afghanistan. Collection sites in Surinam: 295, 301, 302, 303, 306, and 314.

Stephenson (1931) described the species from Makthlawaiya in the Chaco, the swampy region of N. W. Paraguay. Marcus (1943) reported it from two localities in Brazil. Brinkhurst & Jamieson (1971) added Afghanistan, but I have not seen the paper. Six localities in Surinam represent the most extensive collection of this species yet reported.

Discussion. — Dorsal setae typically begin in IV, consisting of 1-2 hairs

and 1-2 needles. Hairs are coarsely serrate, 200-460 μ long; occasionally a posterior hair is shorter. Needles, not observed by Stephenson, are 40-60 μ . Marcus (1943) also recorded the presence of needles and gave 60 μ as their length.

Ventral setae commonly 5-8 per bundle, fewer in posterior segments. Ventrals of II, 102-103 μ ; in III, 84-94 μ ; posterior to III, 61-77 μ . The teeth of all ventrals are alike, the distal being longer.

One is immediately impressed with the length of the proboscis, being like that of *Stylaria* — extremely long. Both Stephenson (1931) and Marcus (1944) called attention to the accumulation of foreign particles on the cuticle. My specimens have little of this. It is possible that the shipment from South America to Europe, and then to North America, plus the rigors of dehydration and mounting divested the specimens of much of this debris.

While segment IV is clearly the segment on which the first dorsals begin, 3 of 26 specimens examined for this characteristic have a needle, but no hair, in III. One specimen has no hair anterior to VI, but shows needles in IV and V. It seems, therefore, that dorsal setae are shed in the anterior segments since there is variability in the anterior position of two kinds of dorsal setae.

***Pristina longidentata* Harman, 1965**

Diagnosis. — Prostomium not elongated into a proboscis. Dorsal setae beginning in II, consisting of 1 finely serrated hair and 1 needle, curved distally, with long teeth. Ventral setae up to 4 per bundle, with proximal nodulus, in II; distal nodulus in the posterior segments; distal tooth longer than the proximal in anterior segments, becoming equal in length to the proximal in posterior segments.

Distribution. — Previously known only from North America. Collection sites in Surinam: 291, 292, 303, 318, and 325. This species was described from a lake in Louisiana in 1965 and later reported from Oklahoma in a stream (Harman, 1973). The species is also well established in the fauna of Surinam, having been collected in 5 localities.

Discussion. — Hair setae 1, occasionally 2 per bundle, range up to 460 μ , slightly longer than the 423 μ stated in the description. Needle setae range from 50 μ to 100 μ , only slightly longer than the maximum of 91 μ as stated for North American specimens (Harman, 1965).

Ventral setae number 5 anteriorly, but 2 posteriorly. In length they range from 63 μ to 91 μ , an extension of the range by only 2-3 μ . It seems, therefore, that the North American and the South American populations of this species show little variation in their setal characteristics, but the South American forms possess slightly longer setae.

This species was thought by Brinkhurst & Jamieson (1971) to be synonymous with *P. idrensis* Sperber. I do not think this is the case, because *P. longidentata* has finely serrated hair setae while *P. idrensis* is stated to have smooth hair setae. The setal length of *P. longidentata* is more than 100% longer than that given for *P. idrensis* for each kind of seta. The differences in setal length and the difference in setal serrations seem adequate to separate the two. In all other species the presence or absence of serrations is a very stable characteristic. I do not think, therefore, that a legitimate claim can be made for the synonymy of these two species.

***Pristina unidentata* Harman, 1973**

Diagnosis. — Prosthomium not forming a proboscis. Eyeless. Dorsal setae beginning in II, consisting of 1 hair, unserrated, very thin, and 1 simple pointed needle per bundle, with a conspicuous nodulus. Ventral setae 3-4 per bundle, anteriorly with a proximal nodulus and distal tooth nearly twice as long as proximal. Posteriorly the nodulus becomes distal and the teeth nearly equal with the proximal being stronger and slightly longer.

Distribution. — Previously known only from North America. Collection sites in Surinam: 302, 303, 317, 318, 320, and 324. This species was described from a stream in Oklahoma in the United States. Six collections in Surinam from a wide variety of habitats including a marsh, a swamp, a pond, a roadside ditch, and an acid stream, may indicate that the species is primarily neotropical.

Discussion. — In the Surinamese specimens the hairs are unserrated, 1 per bundle, and 95-152 μ in length. The needles, also 1 per bundle, with a nodulus, are 32-60 μ long, 3-4 μ thick, with a single tooth.

Ventral setae, 3-4 per bundle, have a proximal nodulus anteriorly, distal posteriorly. These setae are longer anteriorly and the distal tooth is twice as long as the proximal, changing to nearly equal in the posterior segments and the proximal tooth is stouter and very slightly longer. In II-V, the ventrals range 75-100 μ in length. Posteriorly, 60-76 μ . All these measurements are within the ranges as established for the species in North America.

P. unidentata shares a simple toothed needle with *P. menoni*, *P. longiseta* (in part), *P. proboscidea*, and *P. macrochaeta*. It is easily distinguished from *P. menoni* in having thicker needles and longer ventrals; from the other species in the thicker needles and not forming a proboscis.

***Pristina aquiseta* Bourne, 1891**

Diagnosis. — Prosthomium forming a proboscis. Dorsal setae 1-2 finely serrated hairs and 1-2 finely bifid needles, slightly curved distally, but

without a nodulus. Ventral setae 5-8 per bundle, those of II longer and thinner than the rest with slightly proximal nodulus and with distal tooth twice as long as proximal; in III-VII shorter and thicker with a distal nodulus and the distal tooth slightly longer than proximal, or usually, in IV or V, or both, greatly enlarged setae much thicker than the rest and with the distal tooth more than twice as long as the proximal, or the proximal may be absent; behind VII the setae are thicker than II, more curved, with teeth equally long.

Distribution. — The previously known distribution is so great that it is said to be cosmopolitan. Collection sites in Surinam: 288, 291, 292, 293, 295, 297, 299, 300, 301, 303, 305, 306, 308, 313, 314, 315, 317, 318, 320, 322, 324, 325, and 326. *Pristina aequisetata* is a cosmopolitan species abundantly represented on most major land masses of the world, and even in oligohaline waters of the West Indies (Brinkhurst & Jamieson, 1971). It is the most common species of the genus *Pristina* in Surinam, having been collected in 23 localities in all kinds of habitats and in both acid and alkaline waters.

Discussion. — Hair setae mostly 1 per bundle, finely serrated, but not consistently visible in all setae (probably a mounting artifact), from 80 μ to 190 μ long; needles finely bifid, without a nodulus, 21-40 μ long.

Ventral setae of II, 2-5 per bundle, 33-52 μ ; in III, 29-43 μ ; posterior segments, 33-42 μ long. In segments IV and/or V there are usually giant setae, up to 85 μ long. It is interesting that these giant setae do not develop initially, but are replacement setae after ordinary setal bundles have been formed. It may be possible that some specimens, or even whole clones, never develop the giant seta. Harman (1973) reported on this species from Texas in which no specimen in a very large series showed giant setae. In this Surinamese material it was conventional for the normal setal bundle to develop first, consisting of setae about 40 μ in length. In several specimens it was evident that in addition to the normal bundle, the distal portion of a giant seta was beginning to form. As the giant seta grew larger, the number of ordinary setae diminished until the smaller setae were absent and usually only one giant seta remained. The giant setae do not begin development simultaneously in both bundles of the same segment. In some specimens the giant seta would be formed to the extent of the tooth structure being visible on one side, but the corresponding bundle of the same segment would show no evidence of a giant seta. In no case was the giant seta commenced in a posterior zooid before it had separated from the anterior zooid.

With over 1,000 specimens to study, it soon became evident that I could not maintain a distinction between *P. aequisetata* and *P. evelinae* Marcus, 1943. The ranges of setal measurements are either inclusive or overlap. The very slight distinction between the giant setae of IV or V of the two nominal

species also merge in their degree of variability. With measurements of over 1,000 specimens at hand, the data on individual variation are such that distinction cannot be discerned. I am, therefore, classifying all specimens in this group as *P. aequisetata* and declaring *P. evelinae* to be a junior synonym.

***Pristina longiseta bidentata* Černosvitov, 1942**

Diagnosis. — Elongate proboscis. Dorsal setae beginning in II, consisting of hair setae 1-3 per bundle, closely serrated, the hairs in III unserrated and extremely elongate; needles 1-5 per bundle, extremely finely bifid. Ventral setae 3-5 per bundle in anterior segments, up to 13 per bundle in posterior segments; in II longer and thicker than the rest, with distal prong twice as long as the proximal; in III longer and thicker than the rest, with the distal tooth $1\frac{1}{2}$ times as long as the proximal; in other segments the teeth about equally long.

Distribution. — Previously known distribution is only in South America. Surinam collection sites: 287, 288, 291, 297, 299, 301, 302, 303, 305, 306, 312, 313, 314, 315, 318, 323, 324, 325, and 326. This subspecies is endemic to the neotropical region and abundantly distributed therein.

Discussion. — While this subspecies is apparently widely distributed in South America, the availability of comparative measurements is meager. The data presented here are from the Surinamese collection.

Hair setae 1-4 per bundle (usually 1 or 2), finely serrated, 142-294 μ long except in III, where the range is 375-750 μ , and this seta is unserrated. These data fit the range as given by Černosvitov (1942). Serrations on the hairs are not uniformly distributed, nor are they uniformly close. The basal portion of the hair may be devoid of visible serrations. Commencing at 5 μ intervals near the base of the seta, the serrations become 3 μ apart in the middle, changing to 2 μ as the distal tip is approached. Černosvitov also noted the variation in serration placement.

Needle setae, extremely finely bifid, are 1-3 per bundle, 20-50 μ near the anterior and posterior ends of the specimens, but 40-75 μ in midbody. The bifurcation of the needle is so fine that not all needles will show this phenomenon. But a good profile view leaves no doubt that the needles are in fact bifid.

Ventral setae are fewer, longer, thicker, and have longer teeth in segments II and III than in posterior segments. In II the bundle consists of 3-5 setae, 75-114 μ long, with teeth measuring 7 μ and 3 μ for the distal and proximal teeth respectively. In III the number of setae is also 3-5, but the length is 63-90 μ . Beginning in IV the number of setae may range up to 8 (Sperber, 1948, says 13), 52-71 μ long, with teeth that are nearly equal in length. There

is a proximal nodulus in II, median in III, changing to distal in the more posterior segments.

Pristina longiseta bidentata is very common in Surinam, having been collected in 19 localities and represented by hundreds of specimens. All collections were made in March, a time of rapid asexual reproduction, but of no sexual development.

Dero (Dero) digitata (Müller, 1773)

Diagnosis. — Dorsal setae from VI on, 1 hair and 1 bifid needle with the distal tooth slightly longer than the proximal. Ventral setae of II-V, 3-6 per bundle, longer than the rest, with a proximal nodulus, and the distal tooth $1\frac{1}{2}$ -2 times as long as the proximal; those following, 2-5 per bundle, thicker and more curved, with a distal nodulus, and the distal tooth hardly longer than the proximal. Branchial fossa normally with 4 pairs of gills. Entire branchial fossa very large.

Distribution. — *Dero (D.) digitata* is considered to be cosmopolitan. Collection sites in Surinam: 287, 288, 292, 295, 303, 313, 314, 315, 324, 325, and 326. Eleven collections of this species in Surinam establish it as one of the common species. It is known from all of the major land masses of the world and has undergone intensive local modifications. Because of genetic drift and clonal populations, it is frequently difficult to determine synonymy, and therefore exact distributional limits. It is nonetheless widely distributed in the world, and abundant in Surinam.

Discussion. — Hair setae are consistently 1 per bundle, 186-332 μ long. Needles, 1 per bundle, 60-95 μ long, with teeth slightly shorter than stated by Sperber (1948). The distal tooth of the needle is, nonetheless, longer than the proximal.

Ventral setae, 3-5 in all bundles, 112-150 μ in II-V; 70-112 μ beginning in VI. In all other respects the specimens agree so closely with the published data as to make comment on variability unnecessary.

Dero (Dero) nivea Aiyer, 1930

Diagnosis. — Dorsal setae from VI on, 1 hair and 1 bifid needle with equal teeth. Ventral setae about 4 per bundle, in II-V longer and thinner than the rest and with the distal tooth almost twice as long as proximal, and with a proximal nodulus. In the remaining segments, teeth of the ventral setae are equally long; the nodulus is distal. Branchial fossa with 3 pairs of stumpy gills and the fossa extended caudad to the gills.

Distribution. — Previously known from Europe, Asia, North America, Africa, and Australia. Collection sites in Surinam: 287, 290, 291, 295, 304,

305, 314, and 315. *Dero nivea* enjoys a near cosmopolitan distribution, but has only recently been reported from the Western Hemisphere. Brinkhurst (1964) reported it from the United States and Canada, but this is the first report of its presence in the neotropical zone.

Discussion. — The hair setae are consistently 1 per bundle, 82-122 μ long. Needles, 1 per bundle, 30-42 μ , slightly shorter than the range given for other areas in the distribution of the species.

Ventral setae, 2-5 per bundle, 65-90 μ in II-V, and 35-60 μ beginning in VI. The nodular position and tooth relationships do not appreciably vary from the previously published accounts and are detailed in the section on the diagnosis.

The conspicuous characteristic in the identification of this species is the caudal extension of the branchial fossa posterior to the gills.

***Dero (Dero) obtusa* d'Udekem, 1855**

Diagnosis. — Dorsal setae beginning on VI, usually 1 hair and 1 finely bifid needle with equal teeth and with a nodulus. Ventral setae of II-V longer and thinner than the rest, with the distal tooth twice as long as the proximal, and with a proximal nodulus; ventrals from VI on with the teeth about equally long, but with the stoutness and thickness of the proximal tooth gradually increasing, and the length of the distal tooth gradually decreasing backward. Branchial fossa normally with 3 pairs of gills, and no posterior extension of the fossa.

Distribution. — Previously known distribution is in Europe, Palestine, North America, South America, China, and Africa. Collection sites in Surinam: 288, 290, 295, 303, 305, 313, 314, 315, 324, and 326. Marcus (1943) reported this species from near São Paulo in Brazil. It was collected in 10 different localities in Surinam where it was less than abundant at any site.

Discussion. — Hair setae in the Surinamese material consist of 1 hair per bundle and range from 130 μ to 180 μ , slightly longer than the 140 μ reported for Brazilian specimens by Marcus (1943). The needles range 40-65 μ , slightly shorter than the 70 μ reported by Marcus.

Ventral setae of II-V range 75-118 μ , usually near 100 μ . In the posterior segments the range is 71-92 μ . These vary only slightly from the 107 μ (anteriorly) and 70 μ (posteriorly) as previously reported for neotropical specimens.

***Dero (Dero) sawyai* Marcus, 1943**

Diagnosis. — Dorsal setae beginning in VI, 2 hairs and 2 bifid needles with proximal tooth longer and thicker than the distal. Ventral setae of II-V

longer than the rest with a proximal nodulus and the distal tooth longer than the proximal; in the posterior segments, the proximal tooth is longer and thicker than the distal and there is a distal nodulus. Branchial fossa small with 2 pairs of gills.

Distribution. — Previously known only from South America and India. Collection sites in Surinam: 310, 324, and 325. This species was described by Marcus (1943) from Brazil, and reported again from other localities in 1944. Naidu (1962) recorded the species from "...the Ulsoor tank, Bangalore..." as being present, but uncommon. The species was collected in Surinam in only 3 localities, and was not abundant at any locality. It was present, however, even in strongly polluted waters.

Discussion. — Hair setae 1 or 2 per bundle, have a range of 77-89 μ , Needle setae, 1 or 2 per bundle, 26-33 μ , have short and diverging teeth, the proximal prong a little longer and stouter than the distal.

Ventral setae of II-V, 3 to 4 per bundle, 65-72 μ , with a longer distal tooth and a proximal nodulus. Posterior ventrals, up to 4 per bundle, are 35-52 μ , with teeth equally long, but with the proximal tooth stouter; the nodulus is near median or slightly distal.

The gills are 2 pairs, strongly contracted in preserved material. In some specimens the branchial fossa may be slightly pointed posteriorly, but it is never elongated behind the gills. All measurements agree closely with those measurements of Marcus for his Brazilian material.

Naidu (1962) called attention to the fact that Indian specimens had only 1 rather than 2 hairs and needles. Such reduction was noted in my material, but it was not an absolute, there being some variability. Since setal lengths for Naidu's Indian material so closely agree with the ranges stated for Surinamese specimens, it seems to indicate that the species has so recently been transported from one continent to another that there has not yet been time for geographic, or even clonal differentiation to have taken place.

***Dero (Dero) pectinata* Aiyer, 1930**

Diagnosis. — Dorsal setae from VI on, 1 plumose hair and 1 needle with 3 equally long teeth and a weak nodulus. Ventral setae of II-V about twice as long as, and straighter and thinner than, the rest, with long distal tooth and a proximal nodulus; in the following segments, the nodulus is distal and the proximal tooth is longer and thicker than the distal. Branchial fossa with 2 pairs of small gills.

Distribution. — Previously known from India, West Indies, and Australia. Collection sites in Surinam: 288, 290, 297, 299, 301, 302, 303, 305, 306, 312, 313, 314, 317, 318, 322, 324, 325, and 326. This species was described

from India and has been subsequently reported from the West Indies and from Australia. Since it is present in the neotropical islands, it is not surprising to find it on the mainland. But its abundance is perhaps surprising, having been collected in 18 localities in Surinam with numbers up to 100 specimens at each location. This makes it the most common species of the subgenus in the Surinamese fauna.

Discussion. — Hair setae of this Surinamese material range from 65 μ to 90 μ , usually 75-80 μ . The plumose serration of the hairs is very evident. Needle setae, 25-38 μ , are trifid and bayonette shaped with short, widely diverging teeth of which the proximal seems to be stouter. Because of the short length of the needle teeth, the trifid condition may not be immediately evident on lower magnifications.

Ventral setae of II-V are 68-80 μ long with the distal tooth nearly twice as long as the proximal. The distal portion of the seta is nearly straight, not curved through much of an angle. The nodulus is proximal. Beginning in VI, the distal tooth becomes shorter than the proximal, and the proximal is stouter. The length ranges 37-47 μ , only slightly longer than the Asian material.

The branchial fossa contains 2 pairs of short, knoblike gills. There is a very slight postbranchial extension of the fossa as in the case of *D. nivea*, although the two species are readily distinguished. Another peculiarity of *D. pectinata* is that in preserved material, the branchial fossa may contract to the point of enclosing the gills, with only a dorsal aperture visible. In no other species of this genus, with which I am familiar, does the branchial fossa ever enclose the gill structure in preserved material.

All setal measurements agree closely with the measurements reported from other parts of the range, with the possible exception of longer posterior ventrals. Sperber (1948) gave 39 μ as the length of posterior ventrals; Surinamese specimens have a range of 37-47 μ , usually 40-44 μ .

Dero (Dero) magna ¹) n. sp. (fig. 4)

Diagnosis. — Dorsal setae beginning in VI, consisting of 1 unserrated hair and 1 bifid needle with 1-3 intermediate teeth and a nodulus. Ventral setae of II-V, 2-3 per bundle with distal tooth slightly longer than proximal, but the proximal is stouter, and there is a near median nodulus. Posterior ventrals 3-4 per bundle, strongly sigmoid, with equal teeth and a distal nodulus. Posterior ventrals are approximately 6 μ in diameter. Branchial fossa with about 2 pairs of stumpy gills and no postbranchial extension. The gills may actually be oriented caudad rather than dorsally.

¹) This species is so named because of the very large setae.

Distribution. — Collection site in Surinam: 303, a swamp with floating grass near Lelydorp. Holotype: RMNH 14405 (anterior zooid) and RMNH 14406 (posterior zooid).

Discussion. — Hair setae are consistently 1 per bundle, 270-340 μ , with 275-310 μ being the usual range. The hairs are stout and unserrated.

Needle setae are consistently 1 per bundle, ranging in length from 65 μ to 95 μ , with 80-90 μ being the usual range. These large needles have a distal nodulus about 1/3 from the distal end. The needle is nearly straight up to the nodular position, distal to which it is bayonette shaped. The primary teeth, about 3 μ in length, are widely diverging and are separated by 1-3 intermediate teeth. The proximal tooth is thicker than the distal.

Anterior ventral setae (II-V) are shorter than in the more posterior segments, but it must be pointed out that each of the specimens was undergoing asexual reproduction, and it may be possible that setal lengths had not reached their maximum. In II-V, the ventrals range 98-107 μ and are straighter and thinner than the rest. The distal tooth is only slightly longer than the proximal, and the proximal is thicker. The nodulus is slightly proximal or near median.

Ventral setae posterior to V have equally long teeth, a distal nodulus, and the distal tooth is thinner than the proximal. These setae are strongly sigmoid, about 6 μ in diameter, and range 115-130 μ in length, with 3-4 setae per bundle.

Gills are short and stumpy, and consist of 2 (or 3?) pairs. The fossa is oriented dorsally with no postbranchial extension. Some specimens showed the gills to be oriented more posteriorly than dorsally, but the rapid asexual reproduction may not have given sufficient time for the more typical dorsal orientation of the fossa to have been assumed.

This species shares pectinate needle setae with its congeners, *D. (D.) asiatica* and *D. (D.) pectinata*. It is distinguishable from them, however, in its much larger setal measurements. Needles measure 25-38 μ in *pectinata*, 42-44 μ in *asiatica*, and 65-95 μ in *magna*. The posterior ventrals in *D. magna* at 115-130 μ are three times as long as the 39 μ in *pectinata* and twice as long as the 53-60 μ in *asiatica*.

The serrated or plumose hairs of *D. pectinata* contrast sharply with the unserrated hairs of *D. magna*, and the maximum length of hairs (up to 200 μ) in *asiatica* fall short of the 270-340 μ range of *D. magna*. Other characteristics such as nodular position and tooth proportion are also different, but these characteristics are not necessary for differentiation among the species presently known as having pectinate needles.

D. magna is known only from the type locality in Surinam. It is hoped

that further collecting in the coastal swampy habitat of northeastern South America will yield more material and that exact limits of setal variation and gill structure can be illucidated at that time. All specimens in the type series were collected in March, a time of rapid asexual reproduction, but no sexual development.

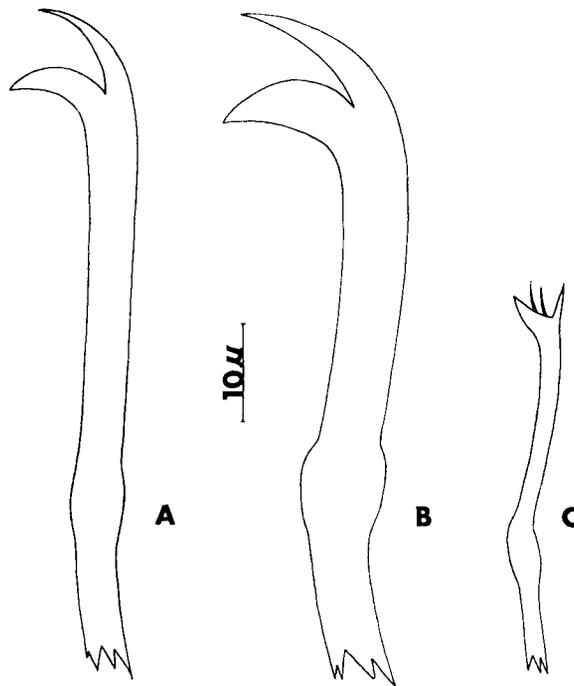


Fig. 4. *Dero (Dero) magna* n. sp., setae. A, anterior ventral seta; B, posterior ventral seta; C, needle seta.

***Dero (Aulophorus) costatus* Marcus, 1944 new rank**

Diagnosis. — Dorsal setae begin in VI, 1 hair and 1 palmate needle with ribs in the web. Ventral setae of II-V, 4-5 per bundle, nearly twice as long as the remainder; the distal tooth is longer and thinner than the proximal, and there is a proximal nodulus. Posterior ventral setae, 3-5 per bundle, with the proximal tooth longer and thicker; the nodulus is distal. Gills 2 pairs; palps thin, long, and diverging.

Distribution. — Previously known only from South America. Collection site in Surinam: 314.

Discussion. — *Dero (Aulophorus) costatus* was proposed by Marcus

(1944) as a subspecies of *D. (A.) schmardai*. After examining the material from Surinam, there seem to be specific differences rather than subspecific. *D. (A.) costatus* not only has ribs in the web of the needle (not possessed by *D. (A.) schmardai*) but the lengths of the ventral setae have ranges that are separable, and the ranges for the hair meet, but do not overlap.

Hair setae of *D. (A.) costatus* are short, 66-100 μ , without serrations. Needle setae are 40-60 μ in length, have a web 5-7 μ in width, and possess about 16 ribs which are visible in only the distal part of the web.

Ventral setae of II-V, 4-6 per bundle, 78-89 μ long; the distal tooth is longer and thinner, and there is a proximal nodulus. Ventrals posterior to V are 3-5 per bundle, 39-47 μ long; the proximal tooth is stronger and longer, and there is a distal nodulus. All these measurements fit closely with those of Marcus (1944) when she described the taxon as a subspecies.

D. (A.) costatus can, therefore, be distinguished from *D. (A.) schmardai* in the shorter hairs, shorter needles with ribbed web, and in the shorter ventrals possessed by the former.

D. (A.) costatus differs from *D. (A.) carteri* in the possession of ribbed needles and markedly shorter hairs and ventral setae. It differs from *D. (A.) flabelliger* in having shorter setae of all kinds and in having the palm of the needle only 5-7 μ wide instead of the 18-19 μ reported for the latter. *D. (A.) costatus* has needles only about one half as long as those of its cogener, *D. (A.) huaronensis*, and the latter has longer hairs and ventrals.

The distinction of *D. (A.) costatus* and *D. (A.) tonkinensis* is less clear because of a confused synonymy. However, the latter does have distinguishably longer and more numerous setae, and the ranges for the setal types of the two are nonoverlapping. For example, the posterior ventrals of *D. (A.) costatus* are 39-47 μ long, and those of *D. (A.) tonkinensis* are 52-80 μ .

D. (A.) costatus is distinguishable from its cogener, *D. (A.) caraibicus*, most easily in the ventral setae. The latter has fewer anterior ventrals which are only slightly longer than the remainder, whereas *D. (A.) costatus* has up to 6 anterior ventrals which are nearly twice as long as the remainder.

D. (A.) vagus lacks ribbing in the web of the needle, and its minimal number of ventrals in II is 7, while in *D. (A.) costatus* the maximum number is 6, usually 4 or 5, and there are ribs in the web of the *D. (A.) costatus* needle.

The Surinamese specimens of *D. (A.) costatus* showed no visible gills in the branchial fossa due to the state of contraction in preservation. However, one may infer that the gills are present, but small. The two lateral palps extend 110 μ beyond the posterior limit of the fossa in preserved material.

Brinkhurst & Jamieson (1971) placed "*Aulophorus schmardai* Mich. forma *costatus* Marcus, E., 1944" in species inquirenda. Having now seen specimens

that are referable to this taxon, I am recommending that it be restored to the status of valid species and that it be raised from subspecies to species.

***Dero (Aulophorus) pectinatus* Stephenson, 1931**

Diagnosis. — Dorsal setae begin in V, 1 hair and 1 bifid needle with 2-4 intermediate teeth. Ventral setae of anterior segments, 3-4 per bundle; posteriorly, 2-3 bundle; nodulus more or less distal; teeth about equally long, the proximal being thicker. Gills 4 pairs; palps diverging.

Distribution. — Previously known from South America, and Brinkhurst (1966) recorded specimens from Kariba and Volta Lake in Africa which are referable to this taxon, with uncertainty. Collection sites in Surinam: 291 and 299.

Discussion. — The hair setae of the Surinamese specimens are consistently 1 per bundle; unserrated, and 230-336 μ long. In his description (1931) Stephenson said the hairs are 280 μ long. This is near the mean value for my material. The questionable report of this species from Africa (Brinkhurst, 1966) is because his specimens showed "...lateral hairs in at least some instances" on the hair setae. This would characterize the hair setae of the African material as serrated or plumose, a characteristic not possessed by the taxon in Surinam and not mentioned by Stephenson in his material from Paraguay.

Needle setae are consistently 1 per bundle, bifid, with 1, 2 or 3 intermediate teeth. Stephenson (1931) said there may be 2-4 intermediate teeth. A distal nodulus is present. Needles range from 75 μ to 109 μ ; Stephenson gave 102 μ .

Ventral setae in II-V are 3-4 per bundle, changing to 2-4 in the posterior segments. Setae in II-V range 104-137 μ ; posteriorly, they range 95-128 μ . Teeth of all ventrals are nearly equal in length with the distal thinner than the proximal. The nodular position is nearly median in II, changing progressively to a slightly distal position in succeeding segments. The total shift, however, is not dramatic, and the uncertainty expressed by Stephenson about there being a clearcut distinction between anterior and posterior setae is warranted.

D. (A.) pectinatus is not a common species in Surinam. It was collected in only 2 localities, an acid swamp and an alkaline pool, but was represented by several specimens at each locality.

***Dero (Aulophorus) tonkinensis* (Vejdovsky, 1894)**

Diagnosis. — Dorsal setae begin in VI, 1 hair and 1-2 palmate needles with

long prongs. Ventral setae of II-V, 3-9 per bundle, longer than the rest, with distal tooth longer than the proximal, and with a proximal nodulus. Posterior ventral setae, 3-7 per bundle, with distal tooth shorter and thinner than the proximal, and nodulus distal. Branchial fossa funnel-like with 2 pairs of long gills.

Distribution. — Previously known from Asia and Africa. Collection site in Surinam: 312. Although *D. (A.) tonkinensis* probably has a wide distribution in both Asia and Africa, this is the first report from South America. It was collected only once in Surinam and is not abundant even in that locality. It was collected in an experimental pond in Paramaribo where it was probably recently introduced.

Discussion. — The length of the hair setae as taken from the literature is 96-160 μ ; needles 60-80 μ ; anterior ventrals 90-120 μ ; posterior ventrals 52-80 μ .

In the Surinamese material, the hair setae range 107-160 μ . The needles are 68-100 μ ; anterior ventrals, 5-7 per bundle, 103-105 μ ; and the posterior ventrals, 4-6 per bundle, are 65-75 μ . These measurements fit well within the stated ranges except for the needles, which are longer. The needle is palmate, 6-7 μ at the broadest part, not ribbed, but slightly serrated at the free border.

The gills in preserved material were strongly contracted, but obviously 2 pairs.

***Dero (Aulophorus) carteri* Stephenson, 1931**

Diagnosis. — Dorsal setae begin in VI, 1-2 hairs and 1-2 palmate needles with long teeth and web without ribs. Ventral setae of II-V, 5-7 per bundle, about twice as long as the rest, with distal tooth longer, and with a proximal nodulus. Posterior ventrals, 3-6 per bundle, with the distal tooth shorter and thinner. Branchial fossa with 3 pairs of short gills, and diverging palps.

Distribution. — Previously known only from South America. Collection site in Surinam: 291. This endemic South American form is not widely distributed in Surinam, having been collected at only one locality, an alkaline swamp. However, it was abundant at that site.

Discussion. — *D. (A.) carteri* has hairs stated to be 160-200 μ long although I found them to be 121-165 μ . Needles are stated to be 80-120 μ ; my range is 71-120 μ , and there is a nodulus on the needle. Anterior ventrals are said to be up to 120 μ long, but my range is 100-126 μ with 6-9 per bundle. Posteriorly, the range as taken from the literature is 60-72 μ ; my range is 60-74 μ , usually 63-70 μ .

There is clearly a median nodulus in the needle. The web does not appear

to be ribbed. One tooth of the needle is straight, and the other slightly curved. The web goes to the distal end of the teeth and the maximum diameter is $7\ \mu$. The maximum diameter of the seta proximal to the web is $3\ \mu$.

The branchial fossa and gills are not well developed and were strongly contracted in preserved material. Only 2 pairs of gills were visible in some specimens, but the state of contraction was severe.

Dero (Aulophorus) bimagnasetus ¹⁾ n. sp. (fig. 5)

Diagnosis. — Dorsal setae begin in V, 1 hair and 1 bifid needle. Ventral setae in II, 4 per bundle, with the distal tooth longer than the proximal, and with a poorly developed proximal nodulus. In III and IV, 1 or 2 giant setae, twice as large and long as the rest. The distal tooth of these giant setae in III about 5 times as long as the proximal; in IV, the teeth are equally developed and diverging; in V, the nodulus remains slightly proximal, and the distal tooth remains longer than the proximal. Beginning in VI, the teeth are nearly equal in length, the proximal being more strongly developed, and the nodulus appears median. In the more posterior segments, the distal tooth becomes shorter and the nodulus becomes progressively distal. Prostomium greatly enlarged, but not elongated into a proboscis. Gills, 4 pairs, plus 2 nonretractile palps. About 39 setigerous segments in a nonbudding specimen.

Distribution. — Type locality: Surinam; Lelydorp, small marsh with shrubs and herbs, pH 5.9 (collection site 302). Holotype: RMNH 8389 (whole mount); paratype: LSU 939 (whole mount of posterior zooid). Additional locality: collection site 315.

Discussion. — Hair setae consistently 1 per bundle, $133\text{--}163\ \mu$, without serrations. Needles, 1 per bundle, bifid, with the proximal tooth longer and more strongly developed than the distal. There is a distal nodulus. The length of the needles is $47\text{--}59\ \mu$, slightly shorter at the ends of the body than in midbody. Not consistently, but occasionally present is an intermediate tooth associated with the proximal tooth.

Ventral setae of II, 4 per bundle, are $95\text{--}105\ \mu$. The distal tooth is longer than the proximal, but the two teeth are equally developed. In the ventral bundles of III there is present a single giant seta $157\text{--}184\ \mu$ long and $15\ \mu$ in diameter measured proximal to the nodulus. This giant seta is approximately twice as long as the setae of V or VI; for example, in one specimen in which the giant seta measured $184\ \mu$, the length of a seta in V was $96\ \mu$. In another

1) This species is so named because of the very large ventral setae in segments III and IV.

specimen in which the giant seta measured 157μ , the setae in VI were 74μ .

In the ventral bundle of IV, there may be 1 or 2 giant setae, $163-184 \mu$, with two strongly developed teeth, widely diverging. The nodulus of this seta is not distinct.

In V the ventral bundles consist of 3-5 setae, usually 3-4, and are $80-96 \mu$ long. The nodulus is proximal and the distal tooth is still longer than the proximal. Beginning in VI, the posterior setae show the distal tooth to be progressively shorter and thinner, and the nodulus is distal. The length of these posterior setae is $65-85 \mu$.

The distinctiveness of *Dero (Aulophorus) bimagnisetus* is striking. In no other species of the subgenus does one find giant setae, although the phenomenon is known in other genera, i.e. *Pristina aquiseta*. There seems, therefore, to be no other species in *Aulophorus* with which this one could be confused. *D. (A.) bimagnisetus* ranks with its congeners *D. (A.) furcatus*,

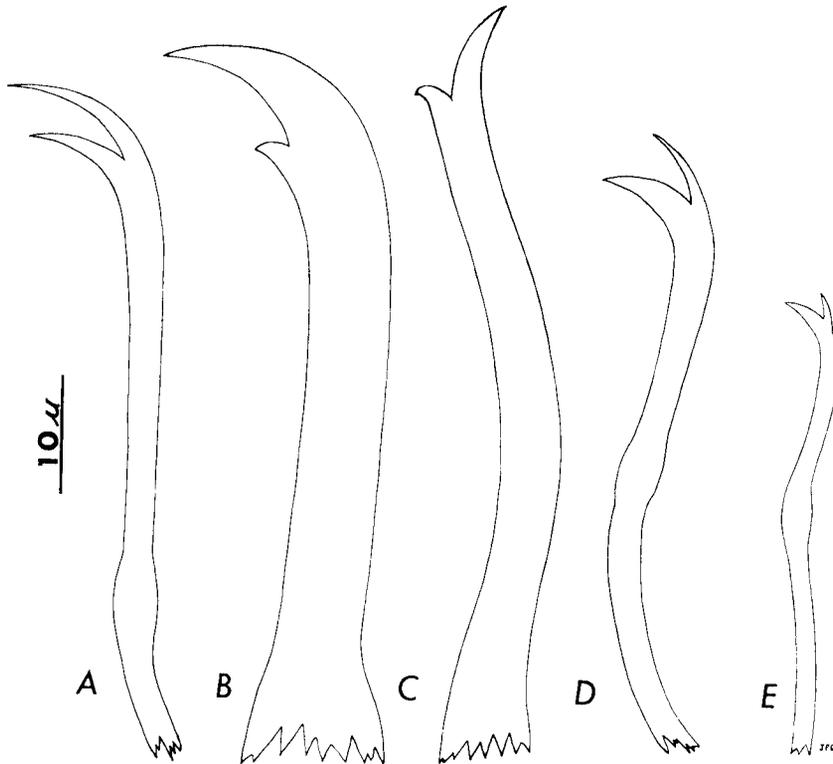


Fig. 5. *Dero (Aulophorus) bimagnisetus* n. sp., setae. A, ventral seta of II; B, ventral seta of III; C, ventral seta of IV; D, posterior ventral seta; E, needle seta.

D. (A.) borellii, *D. (A.) pectinatus*, *D. (A.) hymanae*, and *D. (A.) indicus* in having the bifid or pectinate needle begin in V. However, this new species introduces a heterozygosity not previously anticipated, in its possession of giant setae in the ventral bundles.

***Dero (Aulophorus) furcatus* (Müller, 1773)**

Diagnosis. — Dorsal setae begin in V, 1 hair and 1 bifid needle with unequal teeth and a distal nodulus. Ventral setae of II-V, 2-5 per bundle, with long teeth, the distal longer than the proximal. Ventral setae from V on with teeth nearly equal. Branchial fossa with 3 or 4 pairs of gills and lateral palps.

Distribution. — Previously known distribution is so wide as to be cosmopolitan. Collection sites in Surinam: 287, 288, 290, 291, 292, 294, 295, 297, 299, 300, 301, 302, 303, 304, 305, 306, 310, 318, 322, 324, and 325. This species has been extensively and frequently collected in South America by Marcus (1943) in Brazil, Cordero (1931) in Uruguay, and Černosvitov (1937) in Argentina to mention a few. In Surinam it was collected in 21 localities and could be considered abundant at all of them.

Discussion. — Hair setae consistently 1 per bundle, 98-131 μ , slightly shorter than the range to be found in the literature. Needles 1 per bundle, 35-53 μ , slightly shorter than the stated range of 45-62 μ (Sperber, 1948). The needles have a distal nodulus and short diverging teeth of unequal length, the proximal stouter and slightly longer than the distal.

Ventral setae of II-IV show the distal tooth to be longer and of equal thickness. In V and VI the teeth are more nearly equal in length, but the proximal is stouter. Beginning in VII, the distal tooth is very slightly shorter and the proximal is stouter.

In the anterior ventrals the nodulus is slightly proximal and changes to nearly median or only slightly proximal in the posterior segments. The lengths in the anterior segments are 48-65 μ and posteriorly 42-60 μ ; both ranges are slightly shorter than the ranges stated in the literature.

Three pairs of gills are most frequently found.

One is immediately impressed with the fact that all setal measurements for this species are shorter than the ranges found for the same species elsewhere in the world. Surinamese specimens even have shorter setal measurements than those in Brazil (Marcus, 1944).

CONCLUSIONS

Twenty six species of Naididae are discussed and established in the fauna of Surinam. Six of these species are the only representatives of their respective genera. These are *Chaetogaster langi*, *Allonais paraguayensis*, *Slavina*

evelinae, *Haemonais waldvogeli*, *Stephensoniana trivandrana*, and *Nais raviensis*.

Of the six genera known in Surinam by only a single species, *Slavina* is a small taxon. It has only four generally recognized species, three of which are endemic to South America. *Slavina evelinae* has previously been known only from Brazil, but its occurrence in Surinam is not surprising. It seems to be well established, having been collected six times in considerable abundance.

Chaetogaster langi, *Allonais paraguayensis*, and *Haemonais waldvogeli* are already known in the neotropical fauna, but are established in the fauna of Surinam for the first time. *C. langi* is rare, having been collected only once, but individuals are very small, almost crystal clear, and could be easily overlooked under all but ideal collecting circumstances¹⁾. It apparently is rather well and widely established in other parts of South America. *A. paraguayensis* and *H. waldvogeli* are far more common, having been collected in 15 and 13 localities respectively and in more than one sample at each locality.

Stephensoniana trivandrana and *Nais raviensis* are established as uncommon components of the neotropical fauna, having been collected in one and five localities respectively. However, each species was represented by several specimens at each locality.

With the exception of *S. evelinae*, which is endemic, each of the other species seems to have been recently introduced to South America. Their morphometric characteristics are so similar to those of specimens on other continents that time and genetics have not allowed the evolutionary divergence of even a race, in spite of the geographic isolation.

The genus *Pristina* has about 24 species recognized; of this number 14 are known in the neotropical fauna with 5 endemic species. This is indicative of a long, and well established position for the genus. In Surinam, there are 8 species of *Pristina*, constituting about 30% of the species of Naididae.

In *Dero* (*Dero*) there are 6 species represented in the fauna of Surinam. One of these is described as a new species, and the remainder are either cosmopolitan or widely distributed.

In *Dero* (*Aulophorus*), only one species, *D. (A.) furcatus*, has anything like a cosmopolitan distribution; and another, *D. (A.) tonkinensis*, may be said to be widely distributed. The four remaining species are endemic. When taking an overview of the subgenus *Aulophorus*, the data do not change. Of the approximately 15 recognized species, 10 are components of the neotro-

¹⁾ The collector has seen single specimens of a *Chaetogaster*-species in three other samples.

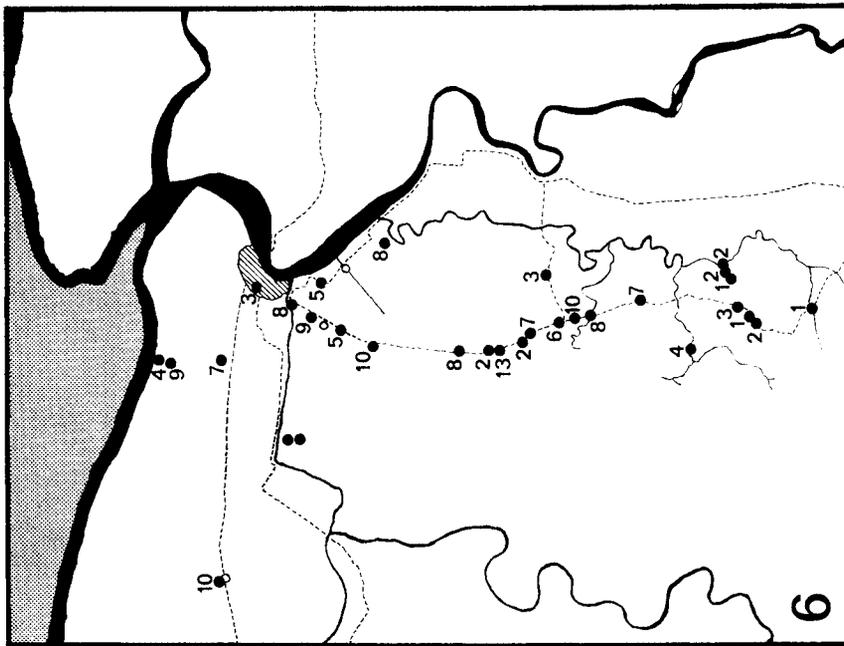
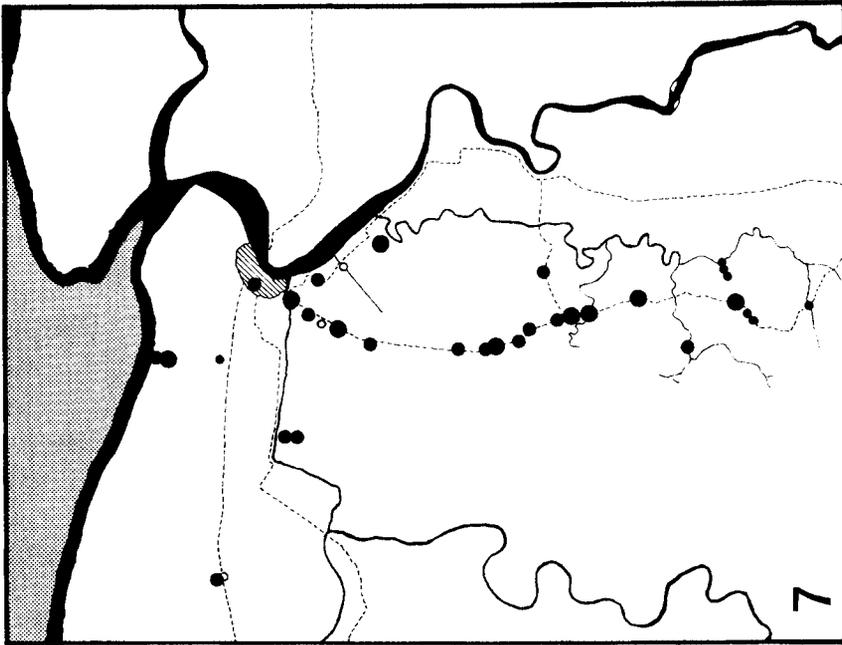


Fig. 6. The number of species of Naididae found in each of the localities.
 Fig. 7. The number of specimens of Naididae found in each of the localities. The black dots of three different sizes stand for 1 to 50, 50 to 500 and 500 to 5000 specimens per sample.

pical fauna, with as many as 6 endemic species. *Aulophorus*, then, is one of the oldest taxa in the neotropical fauna. It finds here a center of dispersal, and, perhaps a center of origin.

Naididae were predominant in the meiofauna of most collecting sites. Hundreds or even thousands of specimens were present in most of the samples (see fig. 7). Some species of *Pristina* and *Dero* were particularly abundant. It is remarkable that none of the species shows a definite distribution pattern within the area. There is no evidence that any of the species is restricted to a certain habitat. Van der Land (1970) observed the same phenomenon in other meiobenthic animals, viz., several species of micro-turbellarians, several species of the oligochaete genus *Aeolosoma*, and the tardigrade *Hypsibius augusti*. Many species occur in eutrophic, alkaline water as well as in oligotrophic, acid water, in the open field as well as in the forest.

The 26 species are rather equally distributed over the collecting area (see fig. 6), with the notable exception of the savanna-region in the south, where the number of species per sample is very low. Usually there were five to ten species present in each sample, and even 13 in one case. No naidids were found in a trench without free water (316) and in a canal with brackish water (298). Low numbers of species were found in a coastal pond, which is probably somewhat brackish (290), in polluted trenches with little water along the main road (304 and 310), in artificial ponds (312 and 323), and in temporary pools in the savanna-region (307, 321, and 322). In most of these localities the number of specimens was rather high, but in the acid streams of the savanna-region (287, 308, 309, 311, 319, and 320) the number of specimens per sample was also generally low. In the brown, acid water (pH 4.8 to 6.0) of these creeks there is hardly any plankton and the densities of the benthos in general are also extremely low. The obvious reason is that the water is nearly devoid of food-salts. The numerous fishes must take their food from the surface of the water (falling fruits and insects) or they must feed on other fishes. Of course the number of naidid species in these streams may be just as high as in the localities with high population densities. Not all specimens of Naididae from the six collecting sites were identified, but in total there were at least six different species.

KEY TO THE NAIDIDAE OF SURINAM

- | | | |
|--|----------------------------|----|
| 1. With gills at the caudal end (of intact specimens!) | genus <i>Dero</i> | 2 |
| Without gills at the caudal end | | 13 |
| 2. With gills and nonretractile palps at caudal end | subgenus <i>Aulophorus</i> | 3 |
| With gills and no palps | subgenus <i>Dero</i> | 8 |
| 3. Dorsal bundles of setae begin in V | | 4 |
| Dorsal bundles of setae begin in VI, needles palmate | | 6 |

4. Needle setae bifid only, no intermediate teeth . . . *Dero (Aulophorus) furcatus*
 Needle setae bifid, but containing intermediate teeth 5
5. Enlarged ventral setae in III and IV . . . *Dero (Aulophorus) bimagnasetus* n. sp.
 No enlarged ventral setae *Dero (Aulophorus) pectinatus*
6. Web of needle strongly ribbed *Dero (Aulophorus) costatus*
 Web of needle smooth (i.e., not ribbed) 7
7. Web of needle slightly serrated at free edge . . . *Dero (Aulophorus) tonkinensis*
 Web of needle smooth, neither serrated nor ribbed . . . *Dero (Aulophorus) carteri*
8. Needle setae bifid, with intermediate teeth 9
 Needle setae bifid, no intermediate teeth 10
9. Hair setae serrated or plumose *Dero (Dero) pectinata*
 Hair setae smooth, i.e., not serrated or plumose . . . *Dero (Dero) magna* n. sp.
10. Needle teeth equally long 11
 Needle teeth of unequal length 12
11. Branchial fossa prolonged posterior to gills *Dero (Dero) nivea*
 Branchial fossa not prolonged posterior to gills *Dero (Dero) obtusa*
12. Branchial fossa small, 2 pairs of gills: hair setae less than 100 μ *Dero (Dero) sawayai*
 Branchial fossa large, 4 pairs of gills; hair setae 186-332 μ *Dero (Dero) digitata*
13. Dorsal setae absent *Chaetogaster langi*
 Dorsal setae present 14
14. Dorsal setae beginning in II 15
 Dorsal setae beginning in any segment posterior to II 22
15. Body encrusted with foreign matter *Stephensoniana trivandrana*
 Body not so encrusted genus *Pristina* . . . 16
16. Needles simple pointed 17
 Needles bifid, with at least a minute distal tooth 18
17. Hair setae serrated, proboscis present *Pristina proboscidea*
 Hair setae not serrated, no proboscis present *Pristina unidentata*
18. Proboscis absent 19
 Proboscis present 20
19. Needle teeth long (i.e., about 10 μ) *Pristina longidentata*
 Needle teeth short (i.e., less than 4 μ) *Pristina menoni*
20. Needle teeth long *Pristina americana*
 Needle teeth short and fine 21
21. Hair setae of III very elongate *Pristina longiseta bidentata*
 No hair seta elongate, giant setae usually present in IV or V . . . *Pristina aequiseta*
22. Dorsal setae shed in anterior segments back to XVIII . . . *Haemonais waldvogeli*
 Dorsal setae begin in III to VII 23
23. Dorsal setae beginning in III or IV *Pristina macrochaeta*
 Dorsal setae beginning in V, VI, or VII 24
24. Body encrusted with foreign matter *Slavina evelinae*
 Body not so encrusted 25
25. Hair setae short (i.e., less than 100 μ) *Nais raviensis*
 Hair setae long (i.e., up to 400 μ) *Allonais paraguayensis*

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