# A review of the genus *Tanytarsus* van der Wulp, 1874 (Insecta, Diptera, Chironomidae) from the Neotropical Region

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# A review of the genus *Tanytarsus* van der Wulp, 1874 (Insecta, Diptera, Chironomidae) from the Neotropical Region

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**Hinweis**

Hiermit erkläre ich, dass die nomenklatorisch relevanten Handlungen in dieser Arbeit im Sinne von Artikel 8 des Internationales Kodes für Zoologische Nomenklatur als unpubliziert zu gelten haben (ICZN 1999). Sie werden ausschließlich durch die entsprechenden Publikationen verfügbar gemacht.

**Disclaimer**

I herewith declare that the nomenclaturally relevant acts in this thesis have to be regarded as unpublished according to article 8 of the International Code of Zoological Nomenclature (ICZN 1999), and will only become availabe by the referring publications.

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# 1. INTRODUCTION

## 1.1. The family Chironomidae

The Chironomidae are a family of insects which belong to the order Diptera (non-biting midges), suborder Nematocera. Together with the families Ceratopogonidae (biting midges), Simuliidae (black flies) and Thaumaleidae (solitary midges), the Chironomidae form the superfamily Chironomoidea. The oldest geological record of the Chironomidae dates from the Lower Jurassic (Upper Liassic, ca. 185 Mio years), and the family probably evolved in the Triassic (Ansorge 1999).

Eleven extant subfamilies are currently recognized within the Chironomidae: Aphroteniinae, Buchonomyiinae, Chilenomyiinae, Chironominae, Diamesinae, Orthocladiinae, Podonominae, Prodiamesinae, Tanypodinae, Telmatogetoninae and Usambaromyiinae. All subfamilies, except the Afrotropical Usambaromyiinae, have been documented in the Neotropics (Spies & Reiss 1996).

Chironomids are holometabolous insects which present four distinct stages during their life cycle: egg, larva, pupa and imago (adult). The largest part of their life cycle is spent in the larval stage (Oliver 1971), which ranges from less than two weeks to several years, depending on species and environmental conditions (Coffman & Ferrington 1996). In regard to larval feeding modes, chironomids can be grouped into six general categories: collector-gatheres, collector-filteres, scrapers, shredders, engulfers and piercers; most chironomids are not restricted to a single feeding mode (Berg 1995). The pupal stage is short, and most chironomid pupae are active for the greater part of their existence (Langton 1995). For most chironomids, pupal movements are limited to perform three main functions: ecdysis from the larval cuticle, providing sufficient respiratory oxygen, and moving to the water surface for adult eclosion (Langton 1995). The adults usually live for a few days, but some species survive up to two weeks, and this stage serves the purposes of reproduction and dispersal (Coffman & Ferrington 1996). The adult mouthparts are reduced, and functional mandibles have been observed in females of a Podonominae genus (Cranston *et al.* 1987; Cranston & Edward 1992). Chironomid adults do not need to feed, but many species take liquid and semiliquid carbohydrate sources such as aphid honeydew and flower nectars (Coffman & Ferrington 1996).

The family is known by its abundance, species diversity and ecological importance, and occurs in all zoogeographical regions including Antarctica (Ashe *et al*. 1987). The extensive

geographical distribution of the Chironomidae may be partly due to the great age of the family (Brundin 1966, Cranston & Edward 1992, Cranston *et al.* 1987 *apud* Coffman 1995). The immature forms inhabit freshwater, brackish, marine and terrestrial environments, colonizing several substratum types. The family global richness estimates vary from 8000 to 20000 species, and indications suggest that a fauna of at least 2000-3000 species per biogeographical region is a realistic calculation (Coffman 1995).

The Chironomidae exhibit a great ecological diversity, living under a wide range of environmental conditions, with species that tolerate low oxygen concentrations and extremes of temperature, pH, salinity and nutrients. They are frequently used in management programs and water quality evaluation, by acting as bioindicators. They are utilized in toxicity tests, and investigations of morphological deformities (especially in larval head structures) enable this group to be used in evaluations of polluted environments (Rosenberg 1993). The family is also used in the water body classification, especially in the Lake Typology and in the application of the River Continuum Concept (Lindegaard 1995). Chironomids play an important role in palaeoecological studies (Walker 1995), as well as in the knowledge of ancient biotopes and past environmental conditions. In regard to the economic importance, chironomids larvae are utilized as fish food. Some species are plagues in rice fields, feeding on recently-germinated seeds, seedlings, stem and leaves, causing damages to the agriculture (Ferrarese 1993). There are reports and studies about allergic diseases induced by mass emergencies of Chironomidae adults (Cranston 1995a).

The research on the family Chironomidae started with Meigen, who established the genera *Chironomus* and *Tanypus* in 1803. Fabricius (1805) described the first South American chironomids, *Chironomus maculatus* and *Tanypus pubicornis*. In the 19th century, studies regarding chironomids in the Neotropical Region were performed by many authors, such as Wiedemann (1828), Macquart (1838), Blanchard (1852), Loew (1861 / 1866), Philippi (1865), Schiner (1868), Weyenbergh (1886), Bigot (1891), Lynch-Arribálzaga (1893), Coquillett (1895) and Williston (1896). Further investigations and descriptions were performed by Jacobs (1900), Brèthes (1909), Enderlein (1912), Picado (1913), Cockerell (1915) and Kieffer (1925). Most of these recorded chironomid species were from the south part of South America, collected mainly from Argentina, Bolivia, Chile, Paraguay and Uruguay.

According to Fittkau (*in press*), the first Neotropical Chironomidae contribution to the modern research patterns was made by Edwards (1931) in his work "Diptera of Patagonia and South Chile". During a collection trip in the years of 1926 / 1927, Edwards found 80 species, most of them new to science. Due to his knowledge of the Chironomidae fauna of New Zealand

and to his studies on genera and species from Patagonia and Chile, Edwards was the first to manifest the idea that an exchange of Chironomidae fauna could happen through Antarctica as a result of adults' dispersion by the wind (Fittkau *in press*). This idea of fauna exchange was proved by Brundin (1966) in his work about the transantarctic relationships of austral chironomids, a pioneer work on applying and understanding the theory of vicariance biogeography using the principles of Hennigian phylogenetic systematic.

Other important works on Neotropical Chironomidae were done by Fittkau (1965, 1968, 1971, 1974), Fittkau & Reiss (1973), Messias & Fittkau (1997), Messias *et al.* (2000), Oliveira (1949, 1953, 2000), Paggi (1977, 1984, 1986), Reiss (1972, 1974, 1985, 1990), Roback (1960, 1970, 1982), Roback & Coffman (1983), Säwedal (1981), Spies *et al.* (1994), Sublette & Sasa (1994), Trivinho-Strixino & Strixino (1995, 2000a, 2003), Sæther and Andersen (2003), Mendes *et al.* (2004), Sæther & Roque (2004), among others.

In 1996, Spies & Reiss's catalog of Neotropical Chironomidae supplied the lack of information on genera, species and references in this region. As pointed out by Fittkau (*in press*), this catalog can be considered the most important work for the chironomid research in the Neotropics after the work of Brundin.

In spite of all those studies, the number of Neotropical described genera and species is still small in comparison with other regions. The Neotropical Region possesses 155 genera and 709 described species of chironomids, which represents less than 50% of the total estimated for the group in this area (Spies & Reiss 1996).

## 1.2. The genus *Tanytarsus* van der Wulp, 1874

The genus *Tanytarsus* belongs to the subfamily Chironominae - among Chironomidae, the largest one in number of described species (Ashe *et al*. 1987) -, tribe Tanytarsini. The genus is speciose, with more than 300 species world-wide (Ekrem 2003), and the immature forms occur in all types of freshwater, in marine (Cranston *et al*. 1989) and terrestrial environments (Ashe *et al*. 1987).

*Tanytarsus* larvae are considered to be collectors (filterers and gatherers) and a few are scrapers (Coffman & Ferrington 1996); some are agricultural pests, feeding on rice fields. Some *Tanytarsus* species can be used as good indicators of water quality (Kawai *et al*. 1989; Lindegaard 1995). There are reports on allergic disease induced by mass emergences of *Tanytarsus* (Cranston 1995a).

The genus *Tanytarsus* was created by van der Wulp in 1874 and is considered to be the type-genus of the tribe Tanytarsini. *Tanytarsus signatus*, described by van der Wulp in 1858 as *Chironomus signatus*, is the valid type-species of the genus (Reiss & Fittkau 1971). In 1945, Townes proposed the name Calopsectrini, based on the genus *Calopsectra* Kieffer, 1909, to replace the tribe Tanytarsini as well as the genus *Tanytarsus*, respectively. Townes used to recognize Coquillett's (1910) designation of *Chironomus punctipes* Wiedemann, 1817, as the type-species of the genus *Tanytarsus.* In 1961, The International Commission on Zoological Nomenclature invalidated Townes's proposition by suppressing previous type designations, considering *T. signatus* to be the type-species of the genus *Tanytarsus* and by validating the tribe name Tanytarsini (Ashe 1983).

Most of the publications updating *Tanytarsus* species have been assigned to the Holarctic region. In 1971, Reiss and Fittkau reviewed all described species of European *Tanytarsus*, dividing the genus into 13 groups. They pointed out that some of those groups, after a detailed analysis of the immature stages, will probably represent separate genera. This was the case of the *triangularis* group of Reiss and Fittkau, 1971, which was erected to the genus *Virgatanytarsus* by Pinder (1982). Recent studies and world-wide revisions on *Tanytarsus* have been performed by Cranston (2000), Ekrem (2001, 2002) and Ekrem *et al.* (2003).

The first Neotropical species of *Tanytarsus* van der Wulp, *Tanytarsus tupungatensis* from Argentina, was described by Brèthes (1909). In 1917, Kieffer described *Tanytarsus virgo* from Bolivia and, some years later, Rempel (1939) published the first Brazilian species of the genus, namely *Tanytarsus oligotrichus* from Paraíba State in the Northeast. After Spies & Reiss (1996), all these three taxa are considered nomina dubia. Roback (1960) described *Calopsectra breda* from Peru, but as Ashe (1983) treated *Calopsectra* as a junior synonym of *Tanytarsus*, Spies & Reiss (1996) made a new combination for the species (*Tanytarsus breda*). Reiss (1972) described *Tanytarsus clivosus*, *T. fastigatus*, *T. hamatus* and *T. tuberculatus* from Argentina and Chile, *T. paraligulatus* and *T. rinihuensis* from Chile and *T. ligulatus* from Brazil. Fittkau & Reiss (1973) presented the *riopreto* group of the genus and described four new species also from Brazil: *Tanytarsus branquini, T. cuieirensis, T. cururui* and *T. riopreto.* New descriptions for Neotropical *Tanytarsus* were made later on by Contreras-Lichtenberg (1988), *Tanytarsus curvicristatus* from Colombia, by Paggi (1992), *Tanytarsus alatus* and *T. reissi* from Argentina, Sublette & Sasa (1994), *T. capitatus*, *T. guatemalensis*, *T. hastatus* and *T. pandus* from Guatemala, Ekrem & Reiss (1999), *T. monospinosus* and *T. tumultuarius* from Brazil, Sanseverino *et al*. (2002), *T. marauia*, *T. revolta*, *T. waika* and *T. xingu* from Brazil, and Trivinho-Strixino & Strixino (2004), *T. impar* and *T. magnus* from Brazil. Trivinho-Strixino &

Sanseverino (2003) made a new combination for *Nimbocera rhabdomantis* Trivinho-Strixino & Strixino, 1991, transferring the species to the genus *Tanytarsus*. Thus, there are 28 valid *Tanytarsus* species in the Neotropical Region.

Faunal works including descriptions of *Tanytarsus* morphotypes have been done by some authors. Roback & Coffman (1983) recorded a widespread *Tanytarsus* species from Bolivia and Peru, including descriptions of pharate male genitalia, pupa and larva, and a possible new subgenus from Peru also with descriptions of pupa and larva. Based on pupal exuviae, Ospina-Torres (1992) distinguished a number of six groups and 55 morphotypes of *Tanytarsus* in Central Amazonian forest streams, Stumpp (1993) recorded 10 morphotypes from rivers in Rio de Janeiro State, and Wiedenbrug (2000) recorded 17 morphotypes of *Tanytarsus* from mountain streams in Rio Grande do Sul. Stur (2000) investigated a lowland river at Pantanal area in Mato Grosso State and found three groups of *Tanytarsus* larvae.

## 2. PURPOSE

The main purpose of this study was to review all described *Tanytarsus* species from the Neotropical Region, in order to contribute to the knowledge of the chironomid fauna in the Neotropics. It was in the scope of this study the recognition of useful characters in imaginal and immature stages in order to improve the systematic of the genus, to discuss the existence of groups of species, to construct diagnostic keys and to allow systematic predictions.

The present dissertation is the first review of the genus *Tanytarsus* in the Neotropical Region. The revision includes more complete diagnoses, morphological descriptions and diagnostic keys to adult males and pupae, as well as new drawings, more detailed measurements and descriptions, discussions, notes on distribution and, as far as possible, ecological remarks.

Most measurements and morphological descriptions are also given in tables I-V (adult males) and VI-VIII (pupae).

An amount of 36 species were studied, diagnosed, described, figured and discussed.

Among the 28 Neotropical species of *Tanytarsus*, only one species, namely *Tanytarsus breda* (Roback), was not reviewed because the material was not available.

One paratype and some identified specimens of *Tanytarsus ligulatus* Reiss, 1972, are slightly different from the holotype, and thus were described separately as *Tanytarsus* cf. *ligulatus*. The pupa of *Tanytarsus ligulatus* is described here for the first time.

Two species of *Tanytarsus* are transferred to the genus *Caladomyia*, namely *T. alatus* Paggi, 1992 and *T. tuberculatus* Reiss, 1972. The two species are redescribed, diagnosed and figured, and the placement of both species in the genus *Caladomyia* is discussed.

In the past, the immature stages of the Nearctic *Tanytarsus limneticus*, Sublette, 1964 as well as those of the Neotropical *Tanytarsus rhabdomantis* (Trivinho-Strixino & Strixino) were erroneous placed in the monotypic genus *Nimbocera* Reiss, 1972. Thus, *T. limneticus* and the genus *Nimbocera*, i.e. *Nimbocera patagonica*, were also redescribed in this review. The larva of *T. rhabdomantis* is diagnosed. A detailed discussion about *Nimbocera patagonica*, *Tanytarsus limneticus* and *Tanytarsus rhabdomantis* is given, including comparisons of immatures and adults and considerations about the validity of the genus *Nimbocera*.

The *Tanytarsus riopreto* and *Tanytarsus marauia* species groups are discussed in the light of imaginal and pupal morphology. Diagnostic characters for the *riopreto* and *marauia* groups are commented and compared among their members.

Some Neotropical species seem to share diagnostic characters with Holarctic *Tanytarsus* species groups. Thus, some Holarctic groups are also discussed and, as far as possible, figured.

Six species of *Tanytarsus* are presented, diagnosed and described as new to science.

Keys to adult males and pupae of the studied species were constructed based on diagnostic characters and are presented here for the first time.

Potential characters and their states were tentatively selected, commented and presented in the final discussion of the current dissertation.

# 3. MATERIAL AND METHODS

In general, the identification of chironomids requires a stereo microscope for sorting adults, pupae and larvae, and for mounting them on microscope slides. A compound microscope is necessary for identification. In the present study, a ZEISS microscope equipped with phase-contrast optics and high power oil-immersion lens was used for the species identification, descriptions, measurements and drawings. The measurements were taken with a LEITZ micrometer. Prior to measurements, the measuring reticule was calibrated with a ZEISS micrometer (engraved glass slide) at all magnifications. The drawings were made with a LEITZ drawing mirror.

The type material (slides) of the revised species was provided by different institutions (listed below). Some additional material was dissected and mounted on microscope slides. The species prepared for light microscope were dissected in alcohol 70%, transferred to 80%, 90% and 100% ethanol, then transferred to a drop of Euparal on a slide and covered by a cover slip. Head, antennae, wings, legs, thorax and abdomen of each species were mounted under separate cover slips on a slide. If necessary, thorax and abdomen were cleared in hot 10% KOH before mounting. A ZEISS stereomicroscope was used for the slides mounting.

The material location is designated under each species description. The sampling methods and the mounting medium (e.g. Canada Balsam, Euparal) for the species are also mentioned in the descriptions.

The male morphological terminology follows Sæther (1980) except for vannal fold (here called postcubitus), “lamellate setae” of median volsella (here called “lamellae”) and “sensillae basiconicae” on the anal point (here called “group of spines”). The measurements of the angles between longitudinal axes of superior volsella and body were made according to Fittkau & Reiss (1973). Measurements of antennal (AR), leg (LR, BV, SV), wing (L/WR) and hypopygium (Gc/Gs) ratios, and lengths or widths of all other characters were made according to Sæther (1968), Schlee (1966) and Soponis (1977).

Pupal terminology follows Sæther (1980) with modifications suggested by Langton (1991) and Langton (1994). The terms “taenia” and “taeniae” are, respectively, singular and plural, while the term “exuviae” is used in both cases (Langton 1994).

As previously mentioned, it was in the scope of this study the recognition and selection of useful characters in imaginal and immature stages. The selected morphological features,

measurements and terminology used in the present dissertation are described, commented and figured in the following section.

**Institutions:**

Collection of J. E. Sublette: Private collection of Prof. James E. Sublette, Tucson, Arizona, USA.

DZRJ: Coleção entomológica do Departamento de Zoologia (Entomological Collection, Department of Zoology), Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil.

ICN: Instituto de Ciencias Naturales, Universidad Nacional Bogotá, Bogotá, Colômbia.

INPA: Instituto Nacional de Pesquisas da Amazônia, Manaus, Amazonas, Brazil.

Instituto de Limnologia "Dr. Raúl A. Ringuelet": Universidade Nacional de La Plata, La Plata, Argentina.

IOC/FIOCRUZ: Instituto Oswaldo Cruz/ Fundação Oswaldo Cruz, Rio de Janeiro, Brazil.

MCNLP: Museo de Ciencias Naturales de La Plata, La Plata, Argentina.

MZUSP: Zoological Museum of São Paulo, São Paulo, Brazil.

NHRS: Swedish Museum of Natural History, Stockholm, Sweden.

NMW: Museum of Natural History, Vienna, Austria.

UFSCar: Coleção do laboratório de Entomologia Aquática (Collection of the laboratory for Aquatic Entomology), Universidade Federal de São Carlos, São Carlos, São Paulo, Brazil.

ZMBN: Museum of Zoology, University of Bergen, Bergen, Norway.

ZSM: Zoologische Staatssammlung München, Munich, Germany.

# 4. RESULTS AND DISCUSSIONS

## 4.1. Imaginal and pupal morphology of Neotropical *Tanytarsus*: considerations on diagnostic characters, descriptions and measurements

The following descriptions of morphological features refer not only to the studied Neotropical *Tanytarsus*, but also to the Nearctic *Tanytarsus limneticus*, the Neotropical *Nimbocera patagonica* and two *Tanytarsus* species which are transferred here to the genus *Caladomyia*.

### - Male Imago-

**Head (Fig. 1)**

**Antenna.** Composed by scape, pedicel and usually 13 plumose flagellomeres. The total length of flagellomeres 1-12 and the length of 13$^{th}$ flagellomere were measured.

**AR.** Antennal Ratio (Edwards 1929): length of last flagellomere / total length of flagellomeres 1-12.

**Eyes dorsomedian extension.** The eyes are rounded and in many species have a dorsomedian extension.

**Frontal tubercles.** Pair of small lobes above antenna, probably representing remains of reduced ocelli (Sæther 1980). The frontal tubercle total length was measured from base to apex.

**Temporals.** Setae behind, dorsal, mesal and between eyes, composed of frontals, orbitals, postorbitals, inner and outer verticals (Sæther 1980). In *Tanytarsus*, postorbitals, inner and outer verticals can be present. Since the vertical and postorbital setae may have a slightly different location even within the same species, the total number of temporal setae is given instead of the number in each group, as suggested by Sæther (1971).

**Clypeal setae.** The number of setae on clypeus was counted.

**Palp.** 5-segmented, the length of each palpal segment and total length were measured.

**Thorax (Figs 2-4)**

As in all Diptera, the chironomid thorax is dominated by the mesonotum, the second thoracic segment that contains the flight muscles (Cranston 1995b) and includes the scutum, the scutellum and the postnotum (Sæther 1971). Dorsally the scutum is the major component, with a rounded lobe called scutellum, which is situated posteriorly (Cranston 1995b). Cranston also stated that the thorax is dorsally convex in winged species, but more flattened in brachypterous and apterous taxa, which do not require the space for bulky flight muscles.

**Thorax length (Fig. 2).** Measured from the beginning of scutum to the end of postnotum.

**Scutal tubercle.** A median tubercle on scutum can be found in some chironomid species. In the diagnosis of *Tanytarsus* (Cranston *et al.* 1989) this structure is absent, but Stur & Ekrem (2000) examined material of *T. luctuosus* Freeman, 1958 and revealed that the species possesses a well developed scutal tubercle. Stur & Ekrem (2000) emended the genus diagnosis to also include species with a scutal tubercle.

**Acrostichals.** Row of setae placed median longitudinal on scutum.

**Dorsocentrals.** Row of setae placed median lateral on scutum.

**Scutellars.** Setae on scutellum.

**Prealars.** Setae on the prealar area of scutum.

**Setae on halteres.** The setae on halteres are sometimes difficult to count.

**Wing (Fig. 3).** The setosity of veins and membrane, among other features of the chironomid wing, can give taxonomic and phylogenetic information (Cranston 1995b). In the present study, the number of setae on wing veins and cells was recorded.

**Wing length.** Distance from arculus to tip. Width: widest distance between margins.

**L/WR.** Wing length to wing width ratio: length of wing/ width of wing.

**Alula.** Membranous basal portion on posterior wing margin (Sæther 1980).

**Squama.** Basalmost lobe of wing, with setae or without (Sæther 1980). The squama is bare in all *Tanytarsus*.

**Arculus.** Small, strong, L-shaped sclerite found at tip of brachiolum (Sæther 1980).

**Brachiolum.** Enlarged and strongly sclerotized base of radius and base of subcosta (Sæther 1971), associated with wing articulation.

**Wing venation.** The nomenclature of wing venation follows Sæther (1969, 1980) and some suggestions of Lindeberg (1964, 1966), and is based on the Tillyard modification of the

Comstock-Needham system. Between the M and the Cu there is an unnamed vein-like structure; Lindeberg (1964, 1983) hypothesized that after a more or less complete basalization of the posterior basal cell, the bases of $M_4$ and $Cu_1$ have fused and, consequently, the unnamed vein between M and the posterior fork would be $M_3$. Sæther (1969) pointed out that the rudimentary vein $M_3$ suggested by Lindeberg may be merely a fold. In the present study, this “unnamed vein” is called "false vein", as also termed by Ekrem (2001, 2002). The number of setae on this false vein was recorded and treated separately under the setae counting of cells m and $m_{1+2}$.

**Wing veins:**

C - Costa

Sc - Subcosta. Bare in most of Neotropical *Tanytarsus* and in *Nimbocera*, with setae only in *T. rinihuensis* Reiss and *T. rhabdomantis* (Trivinho-Strixino & Strixino). The Nearctic *T. limneticus* Sublette has also setae on Sc.

R - Radius

$R_1$ - First branch of the Radius

$R_{2+3}$ - Fusion of Radius branches $R_2$ and $R_3$

$R_{4+5}$ - Fusion of Radius branches $R_4$ and $R_5$

M - Media

$M_{1+2}$ - Fusion of Media branches $M_1$ and $M_2$

Cu - Cubitus

$M_{3+4}$ - Anterior branch of the cubital fork

$Cu_1$ - Posterior branch of the cubital fork

Postcubitus - Vein that lies under Cu and $Cu_1$

An - Anal vein

**Wing cells:** The wing membrane is divided into cells, which are named after the anterior vein that delimits them (Cranston 1995b). The following cells are recognized: m, $r_{4+5}$, $m_{1+2}$, $m_{3+4}$, cu and an.

**Legs (Fig. 4).** The lengths of femur, tibia and five tarsal segments (tarsomeres) of fore, mid and hind legs were measured.

**Armament of tibiae: tibial spur and tibial combs.** The fore tibia usually has a single, apical spur, while the mid and hind tibiae have one pair of separated combs, each comb presenting a spur. The spur lengths and comb widths were measured.

**BV.** "Beinverhältnis" (Pagast 1947): total length of femur, tibia and first tarsal segment/ total length of tarsal segments 2-5. Pagast (1947) defined the BV to express the proportions of the fore leg segments not touching the ground versus those on the ground in the resting adult; high BV values mean that the leg parts off the ground are relatively longer.

**LR.** Leg ratio (Edwards 1929): length of first tarsal segment/ length of tibia. The leg ratio was recognized as allowing subfamily segregation; ratios such as this may be functionally associated with the chironomid habit of holding its forelegs aloft as sensory organs (Cranston 1995b).

**SV.** "Schenkel-Schieneverhältnis" (Pagast 1947): total length of femur and tibia/ length of first tarsal segment. The SV primarily indicates whether the metatarsus is elongated with no concurrent extension of the tibia of the femur (Pagast 1947).

**Observation.** In the present work, BV, LR and SV are calculated for the fore, mid and hind legs.

## Abdomen

**Length of abdomen.** The abdomen of adult males consists of eight segments plus the genitalia, which is termed hypopygium. The maximum length was measured from the anterior margin of the first abdominal segment to the posterior margin of the gonocoxite (on segment IX).

### Hypopygium (Figs 5-8)

**Tergite IX.** Maximum length, measured from its anterior insertion on tergite VIII to its posterior margin.

**Lateral tooth.** A single or double tooth can be present lateral on tergite IX.

**Setae of the anal tergite.** In the present descriptions, the setae on tergite IX were divided into median setae and apical setae. Although this division is sometimes difficult to distinguish, all setae placed median on tergite and prior to the anterior beginning of anal point were considered median setae, while setae placed lateral to anal point and apical on tergite were termed apical setae. The number of median and apical setae and the placement of median setae were described.

**Microtrichia-free area.** The anal tergite is in general covered with microtrichia, but in some species the anal tergite shows areas without microtrichia.

**Orolateral spine of laterosternite IX.** Placed lateral to anal tergite, sometimes difficult to see or absent. The length of the orolateral spine was measured from base to apex.

**Anal tergal bands (Fig. 6).** Basal and sublateral to median darkened bands on tergite IX. The bands may be of V, Y, T or H-type (Sæther 1980), and of different lengths. The design of the anal tergal bands can be helpful to discriminate species groups or even generic ranks.

**Anal point.** There are different opinions concerning the origin of anal point. Frommer (1967) stated that the anal point is the median portion of the terminal tergum of the male when developed. Frommer mentioned that in the past the "point" in question was considered part of the ninth tergum, but Wensler & Rempel (1962) gave evidence that this would be in fact the tenth tergum. According to Cranston (1995b), the tergite IX has a frequent posteromedian extension, forming specifically a distinctive anal point. In his glossary of chironomid terminology, Sæther (1980) described the anal point (processus analis) as the point-like to rounded, posterior extending, median portion of terminal tergum when developed, which is part of tergum IX or consisting of tergum X.

**Anal point length.** Most of the studied species present anal crests (see below) on the anal point. As the beginning of the anal point on the anal tergite was sometimes difficult to recognize, the anal point length was measured here as suggested Ekrem (1999) - "the length from the anterior begin of the anal crests to the apex of the anal point". In species without anal crests, the anal point length was measured when its beginning was recognized on the anal tergite.

**Anal point form.** The anal point can be short or more elongate, rounded, circular, oval, quadrate, spoon-like, triangular or pointed at tip.

**Anal point armament (Fig. 7).** In *Tanytarsus*, several structures as crests, spines, setae, microtrichia, bars among others are found on the anal point. These structures, which can give important taxonomic and phylogenetic information, are commented on as follow.

**Anal crests.** The anal crests are raised, in general paired, lamellae placed on the anal point of many *Tanytarsus*. The maximum length was measured, i.e. the anal crests extension on the anal point.

**Spines on the anal point.** Sæther (1980) applied the term "sensilla basiconicae" for the spines or spinulae on the anal point. However, "sensillae" and "spines" are structures of different origins. Sensilla basiconicae are short, thick walled pegs of variable length, blunt-tipped with terminal pore or papilla, arising from cup-shaped alveoli, and are probable contact chemoreceptors, while spines are acellular immovable projection of body wall of multicellular origin (Sæther 1980). According to these postulations, I decided not use the Sæther's term since "true" spines were observed on the anal point of most Neotropical *Tanytarsus*.

**Spiniform/ shorter setae on the anal point.** Some species showed short, arising from a basis, spine-like setae on the anal point. Such setae could be the sensilla basiconicae of Sæther's terminology, but here again I decided not to use this term since it could be misinterpreted.

**Microtrichia on the anal point.** The presence of field of microtrichia was only considered when it extends beyond the anterior beginning of the anal point. If the field of microtrichia reaches only the beginning of the anterior half of the anal point, this feature was considered absent ("without microtrichia between anal crests").

**"Normal" setae on the anal point.** These setae are called "normal" to differentiate them from the short, spine-like setae.

**Bars on the anal point.** Bar-like (or rod-like) processes are found on the anal point of some Tanytarsini genera, and can differ in position and orientation.

The following structures, i.e. volsellae and digitus, are appendages of the gonocoxite and are named according to their positions (superior, median and inferior volsella) and form (digitus).

**Superior volsella.** The shape of superior volsella, number and distribution of setae vary among the *Tanytarsus* species and seem to be good characters for species and groups delimitation. In the present work, three "groups" of setae are distinguished: setae on dorsal surface, on median margin and on ventral surface. The setae on dorsal surface vary in number and distribution, while on median margin they do not vary much (in general 1-3 setae placed more anterior); on ventral surface it was observed only one single seta, which in some species is placed on a well-developed tubercle. In addition to these setae, a field of microtrichia can be present.

**Angle of superior volsella.** Angle between longitudinal axes of superior volsella and body (Fittkau & Reiss 1973). The angle of superior volsella gives an idea of the direction of the superior volsella in relation to the body.

**Digitus.** The digitus varies in form (e.g. pointed, rounded, finger-like, thumb-like) and length (short, reaching median margin of superior volsella, extending beyond margin of superior volsella), and this variation can be useful to delimit species and groups.

**Median volsella (Fig. 8).** The length was measured from basis to apex, not including setae. In general, the median volsella presents apical setae, which can be simple, lamellate, cochleariform or ramose Sæther (1980). Sæther classified the lamellate setae into 7 general types: angulate, falciform, foliate, furcate, pectinate, spatulate and subulate. In the present study the term "lamellae" is used instead of Sæther's suggestion of "lamellate setae", but the types of "lamellae" follow Sæther's classification, including also the types "cochleariform" and "ramose".

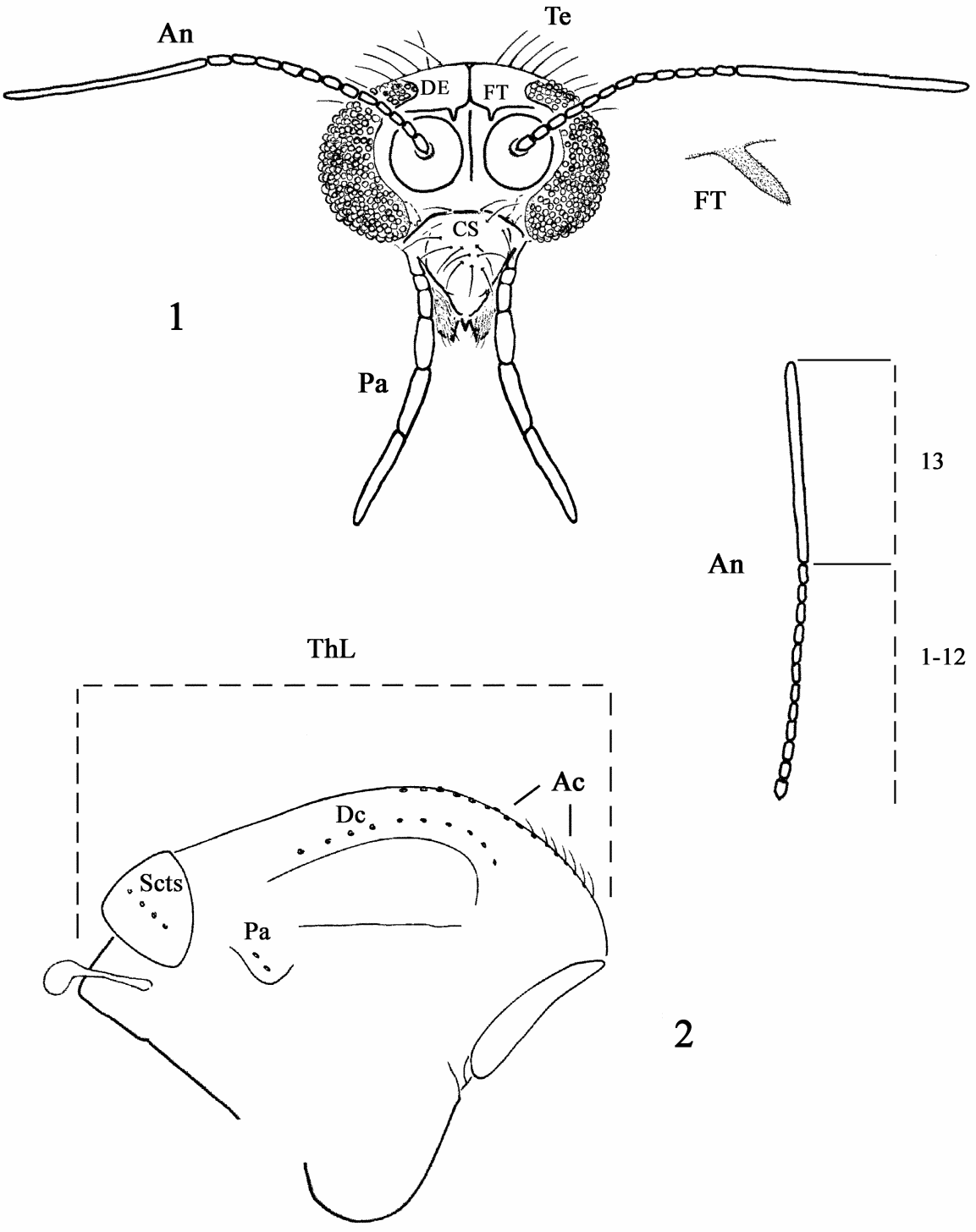
**Length of simple setae and lamellae of median volsella.** Measured from insertion on median volsella to apex.

**Inferior volsella.** This appendage can be curved or straight, thin or thick. The distal part of inferior volsella has long setae and in many species shows an apical or subapical swelling. The length was measured from basis to apex, not including setae.

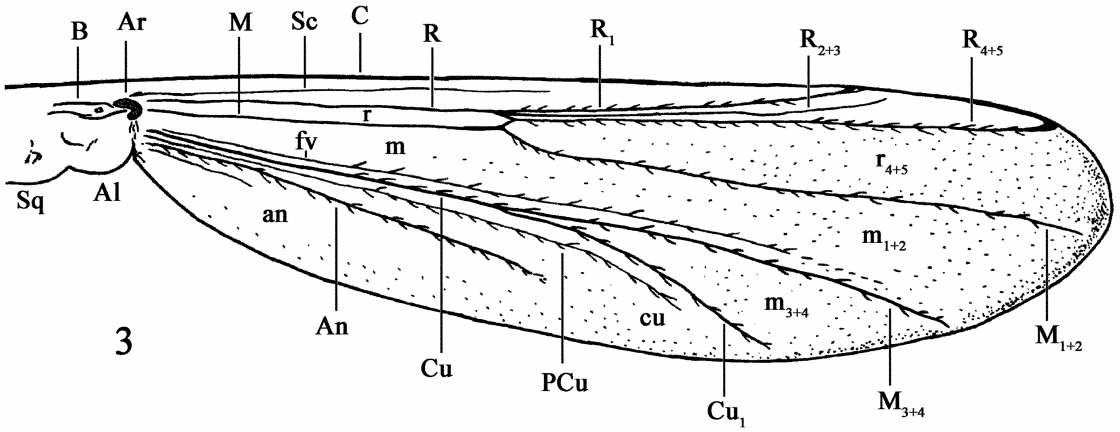
**Gonocoxite and Gonostylus.** Paired claspers of the male genitalia. The gonocoxite was measured from its anterior margin to posterior one, and the gonostylus from basis to apex. According to Sæther (1971), the terms gonocoxite and gonostylus have been used more commonly in the chironomids instead of Snodgrass' terms basimere and telomere, and instead of coxite and stylus (adopted by Wensler & Rempel 1962). Sæther (1971) argued that coxite refers to the coxopodite or the second segment of limb-basis of arthropod legs in general, and the term gonocoxite thus would be more precise. In the subfamily Chironominae, the gonostylus is inserted at the apex of the gonocoxite and appears fused to the last, but a variable amount of movement is possible (Cranston 1995b). The superior, median and inferior volsella and the digitus are appendages of the gonocoxite, as mentioned above.

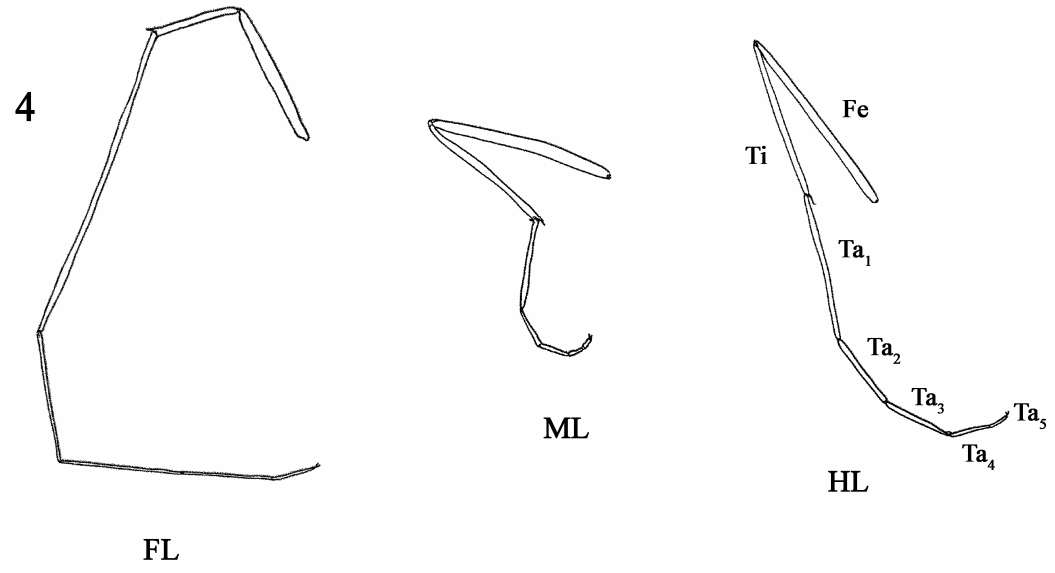
**HR.** Hypopygium ratio (Sæther 1969): length of gonocoxite / length of gonostylus.

**Apodemes.** Internal supporting and connecting structures of genitalia.




**Figs 1-2. Adult male morphology. 1. Head: An- Antenna; 1-12, 13- Antennal flagellomeres; CS- Clypeal setae; DE- Eyes dorsomedian extension; FT- Frontal tubercles; Pa- Palp; Te- Temporals. 2. Thorax: Ac- Acrostichals; Dc- Dorsocentrals; Pa- Prealars; Scts- Scutellars; ThL- Thorax length.**




**Figs 3-4. Adult male morphology. 3. Wing: Al- Alula; Ar- Arculus; B- Brachiolum; Sq- Squama; Veins: C- Costa; Sc- Subcosta; R- Radius; $R_1$- First branch of the Radius; $R_{2+3}$- Fusion of Radius branches $R_2$ and $R_3$; $R_{4+5}$- Fusion of Radius branches $R_4$ and $R_5$; M- Media; $M_{1+2}$- Fusion of Media branches $M_1$ and $M_2$; Cu- Cubitus; $M_{3+4}$- Anterior branch of the cubital fork; $Cu_1$- Posterior branch of the cubital fork; PCu- Postcubitus; An- Anal vein; fv- false vein; Cells: m, $r_{4+5}$, $m_{1+2}$, $m_{3+4}$, cu and an. 4. Legs: FL, ML, HL- fore, mid and hind legs; Fe- Femur; Ti- Tibia; $Ta_{1-5}$- Tarsal segments.**

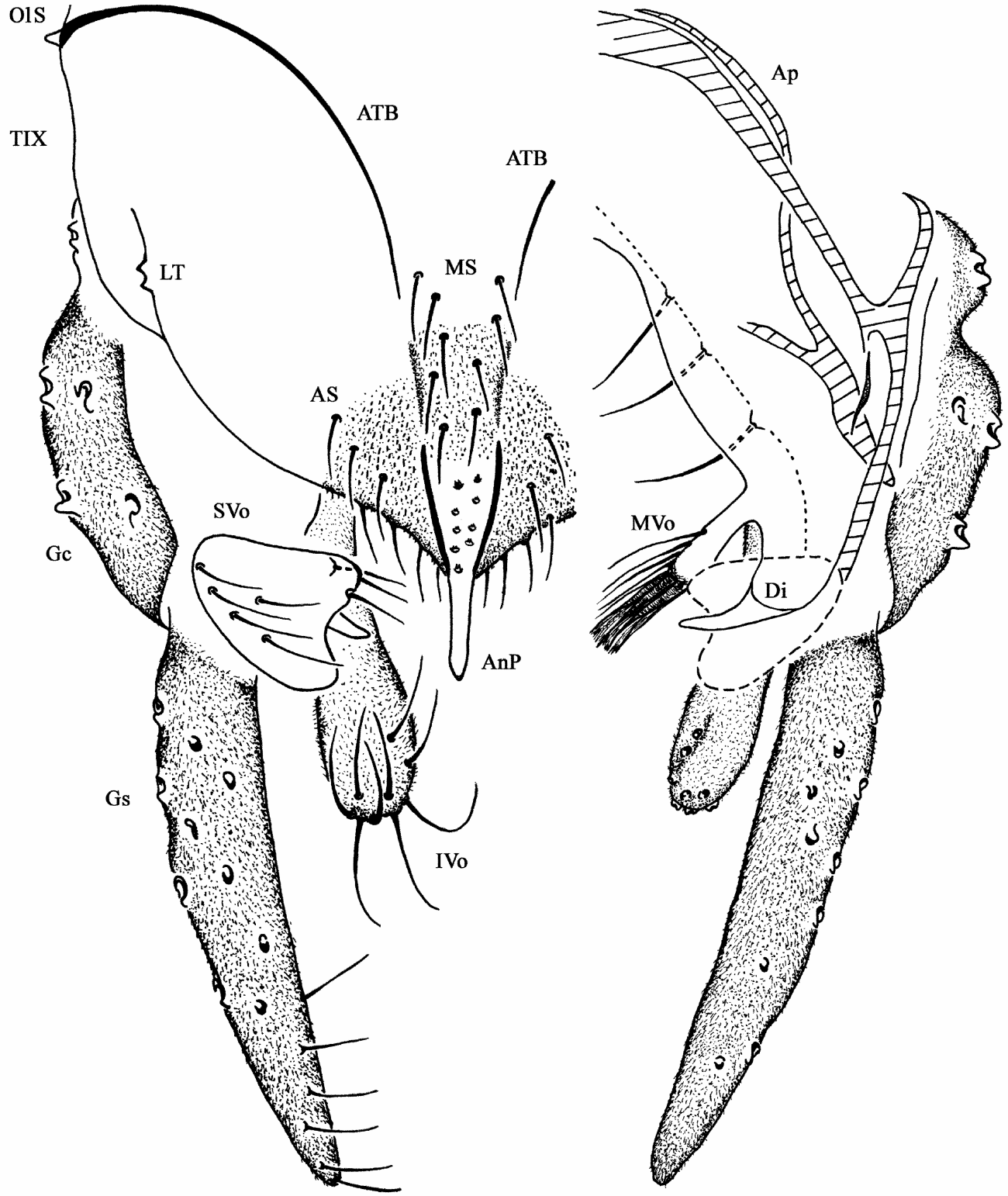
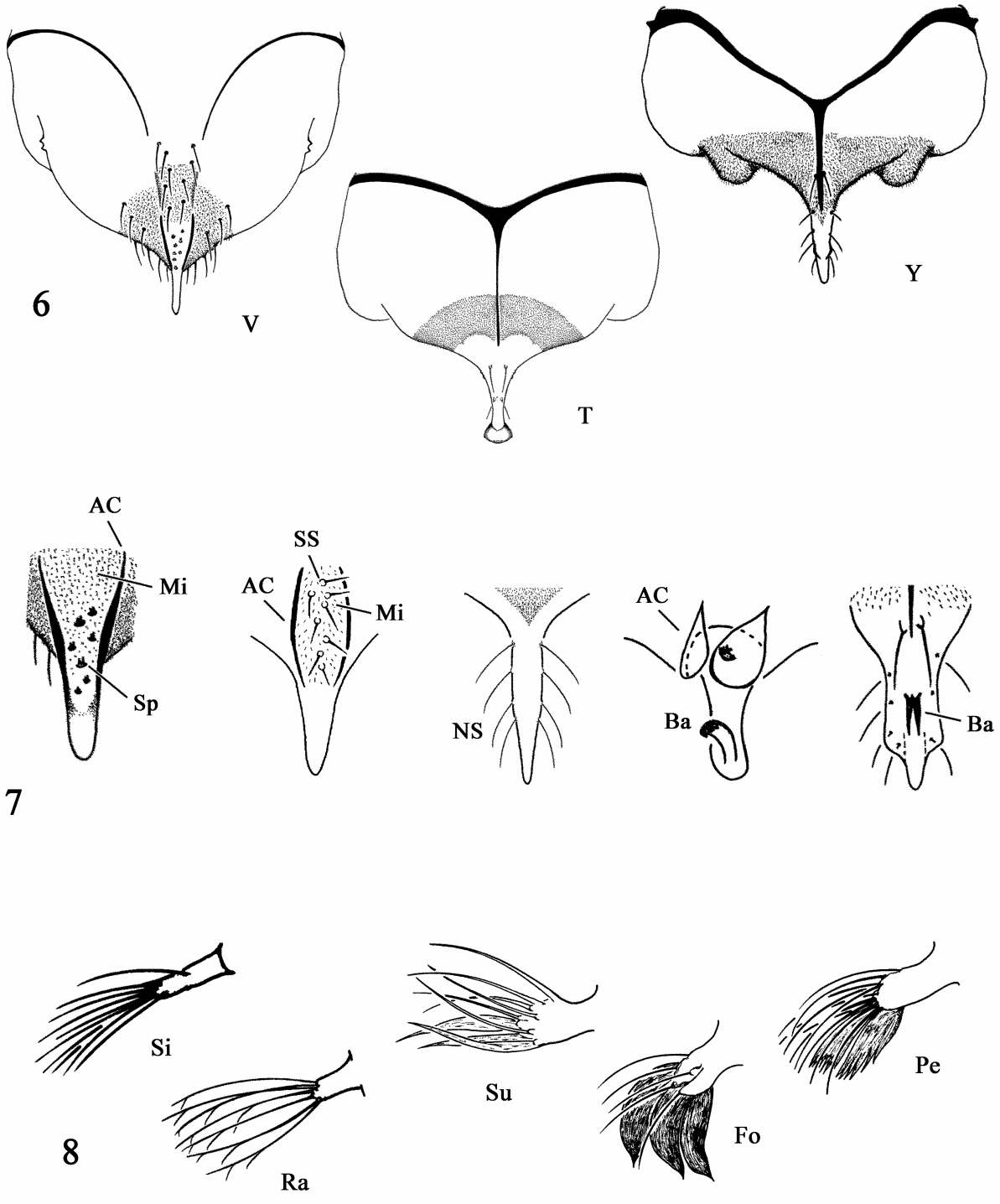



**Fig. 5. Adult male morphology, hypopygium. AnP- Anal point; Ap- Apodemes; AS- Apical setae; ATB- Anal tergal bands; Di- Digitus; Gc- Gonocoxite; Gs- Gonostylus; IVo- Inferior volsella; LT- Lateral tooth; MS- Median setae; MVo- Median volsella; OlS- Orolateral spine of laterosternite IX; SVo- Superior volsella; TIX- Tergite IX.**




**Figs 6-8. Adult male morphology, details of hypopygium. 6. Types of anal tergal bands: V-type, T-type, Y-type. 7. Anal point armament: AC- Anal crests; Ba- Bars; Mi- Microtrichia; NS- "Normal" setae; Sp- Spines; SS- Spiniform setae. 8. Types of median volsella lamellae: Fo- Foliate; Pe- Pectinate; Ra- Ramose; Si- Simple; Su- Subulate.**

## - Pupa -

### Cephalothorax

### Cephalic area (Fig. 9)

Features of taxonomic significance on the cephalic area include location, number and strength of setae and occurrence of tubercles and warts (Cranston 1995b).

**Frontal apotome.** Plate in front of and between covering case of pedicel, usually carrying frontal setae and often cephalic tubercles (Sæther 1980); the frontal apotome varies from smooth to strong granulose.

**Cephalic tubercles.** Pair of weak- to well-developed conical tubercles on frontal apotome, in general carrying frontal setae. The length was measured from basis to apex, not including setae.

**Frontal warts.** Wart-like tubercles on frontal apotome in addition to cephalic tubercles (Sæther 1980). As postulated by Langton (1991, 2001), the term frontal wart is used in the strict sense of Sæther, i.e. if there is only a single pair of swellings on the frontal apotome they are, regardless of position, cephalic tubercles; if two pairs are present, then the more dorsal pair are frontal warts.

**Frontal setae.** Pair of setae, can be situated dorsally, anteriorly or antero-ventrally to the chironomid pupal head (Langton 1991); in *Tanytarsus* usually mounted apically on weakly- to well-developed cephalic tubercles. The length of frontal seta was measured.

**Pedicel sheath tubercle.** At the pedicel, the pupal antennal sheath is larger and in many species shows a tubercle which could be of taxonomic importance (Hirvernoja 1973). Hirvernoja pointed out that when the tubercle is well developed, it is also seen at the pedicel of the imaginal antenna.

### Thorax (Fig. 10)

The thorax presents setae whose number and position have taxonomic value and phylogenetic importance (Coffman 1983). The thoracic horn, the prealar tubercle and the presence of points, teeth and other ornaments are also of taxonomic significance.

**Thorax length.** Maximum length from its anterior margin to posterior end.

**Wing sheath.** The wing sheath of most *Tanytarsus* has a small, distal-lateral projection called "nose".

**Prealar tubercle.** Weakly- to well-developed tubercle in front of wing sheath.

**Thoracic horn.** Situated on anterior portion of cephalothorax, in *Tanytarsus* the thoracic horn is a simple organ, which can be smooth or with spinulae, spines or setae. According to Sæther (1980), the thoracic horn is originally connected to pharate adult spiracle, as still seen in some chironomid subfamilies, but this connection was lost in some others including Chironominae. Sæther (1980) mentioned that in Chironominae a new indirect connection was established in the tribes Pseudochironomini and Chironomini, while in Tanytarsini there would be some evidence that a secondary indirect connection has again been lost. The length of thoracic horn was measured from basis to apex.

**Precorneals.** In number of three and classified from the most anterior ($Pc_1$) to the most posterior ($Pc_3$), the precorneal setae are situated in front of thoracic horn, sometimes on a tubercle, and arranged or not in a triangular pattern.

**Antepronotals.** Setae on each side of antepronotum, classified into median and lateral antepronotals. The tribe Tanytarsini (and Chironomini) has one median antepronotal seta, which apparently represents a reduction from the presumed ancestral condition of at least two median antepronotals (Coffman 1983). The number of lateral antepronotals varied from one to two in the studied *Tanytarsus*.

**Dorsocentrals.** In number of four, the dorsocentral setae are arranged into anterior and posterior pairs, a pattern found in the subfamily Chironominae, Prodiamesinae and in many Orthocladiinae (Coffman 1983).

**Observation.** The lengths of antepronotals, precorneals and dorsocentrals were measured, but in many specimens these setae are broken or lay in a position that does not allow a correct measure.

**Abdomen (Fig. 11)**

The pupal abdomen shows nine segments, each bearing a dorsal tergite and all but the last, a ventral sternite (Langton 1991). These are armed with tubercles, points, teeth, spines, spinules and shagreen (Langton 1991): tubercles are rounded, teeth and points are conical, spines and spinules are elongate. Teeth are larger than points; spines are larger than spinules. Shagreen is composed of minute points or spinules.

**Total length.** Maximum length, measured from the anterior margin of first abdominal segment to posterior margin of anal lobe.

**Pedes spurii A.** Whorl of spinules in caudolateral corners of sternite IV-VIII, may be reduced to a row of spinules, few spinules or lacking (Sæther 1980). Absent in *Tanytarsus* and in the closely related taxa studied here.

**Pedes spurii B.** Weakly to well-developed swelling on lateral posterior part of segment II.

**Hook row.** Row of hook-like spines placed posterior on tergite II. The hook row width was measured.

**Shagreen.** The term shagreen was used according to the definition of Sæther (1980) and Langton (1991), i.e. pattern of spinules or points on abdominal segments.

**Paired patches of spines.** Many *Tanytarsus* and related taxa show paired patches of spines on abdominal tergites. The spines patches may be rounded, oval, elongate or in form of bands with longer spines.

**Posterolateral comb of segment VIII.** The postero-lateral margins of segment VIII are armed with a comb of teeth or with a stout tooth and additional smaller ones. They are used to push the pupa along its tube (Langton 1991). The shape and arrangement of the comb spines (here called "teeth") give a useful indicator to species (Cranston 2000). The comb width was measured from the outermost to the innermost tooth.

**Abdominal setation.** The setae on abdominal segments are classified into O-setae, dorsal, lateral and ventral setae, plus setae of anal lobe. Langton (1994) suggested the term "taenia/ taeniae" for the broad flattened seta of pupal abdomen. This term is easily applied to the broad, filamentous lateral setae. However, some dorsal setae are stronger and more flattened than the others, and the exactly distinction between seta and taenia is in some cases difficult to define. In the present work, the term taenia is used for any abdominal seta which is large and flattened, while the term "taeniate" refers to a seta which is stronger but not as broad and flattened as a taenia.

**O-setae.** Very small setae on anterior margins of sternites and tergites.

**D setae.** Dorsal setae on tergites, generally five pairs on tergites II-VII, varying in number and strength on tergites I and VIII.

**L setae.** Setae placed lateral on segments (in *Tanytarsus* usually on II-VIII), in many species large and flattened in the most posterior segments. Such filamentous and flattened setae are here termed **L taeniae** (**lateral taeniae**), following the suggestion of Langton (1994).

**V setae.** Ventral setae on sternites, usually four-five pairs on sternites II-VII and absent on I, varying in number and strength on sternite VIII.

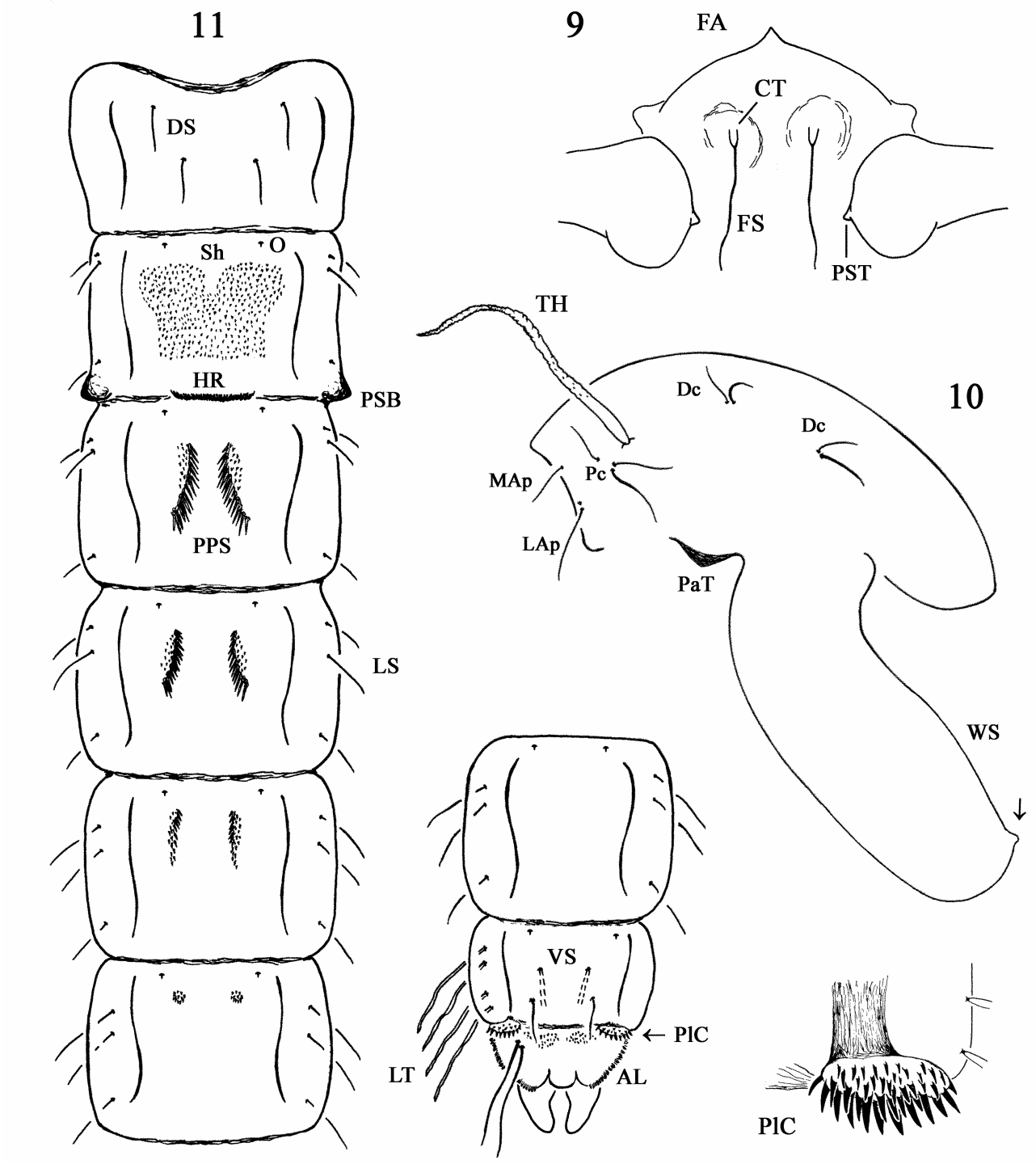
**Observation.** Among the studied pupae of *Tanytarsus*, the tergite I of some species shows strong and taenia-like dorsal setae. Considering the segment VIII, the dorsal seta/setae on tergite is/are somewhat taeniate and usually the ventral seta/setae on sternite can be considered

taenia/taeniae. The number and strength of lateral setae are known to be of taxonomic importance. In my opinion, the presence of strong and taenia-like setae on tergite I and the number and strength of setae on sternite and tergite VIII could be of diagnostic importance.

**Anal lobe.** Lateral paratergites of anal segment (a complex of segments IX, X and XI) (Sæther 1980).

**Dorsal setae of anal lobe.** Two pairs of long taeniae are placed dorsal on each side of anal lobe.

**Anal lobe fringe.** Row of long taeniae on outermost margin of anal lobe. Langton (1991) pointed out that anal lobe fringe together with the lateral taeniae of the preceding segments enable the pupa to drive the respiratory stream of water through its tube.




**Figs 9-11. Pupal morphology. 9. Cephalic area: CT- Cephalic tubercles; FA- Frontal apotome; FS- Frontal setae; PST- Pedicel sheath tubercle. 10. Thorax: Dc- Dorsocentrals; LAp- Lateral antepronotal; MAp- Median antepronotal; PaT- Prealar tubercle; Pc- Precorneals; TH- Thoracic horn; WS- Wing sheath, nose marked by arrow. 11. Abdomen, dorsal view: AL- Anal lobe; DS- Dorsal setae; HR- Hook row; LS- Lateral setae; LT- Lateral taeniae; O- "O"-setae; PlC- Posterolateral comb of segment VIII; PPS- Paired patches of spines; PSB- Pedes spurii B; Sh- Shagreen; VS- Ventral setae.**

## 4.2. List of species

The species studied in the present review are listed below in alphabetical order. To facilitate comparisons and systematic discussions, the descriptions are given in a more or less "systematic order", i.e. similar or apparently closely related species are presented as follows.

*Caladomyia alata* (Paggi, 1992) comb. nov. – Adult male
*Caladomyia tuberculata* (Reiss, 1972) comb. nov. – Pupa and adult male
*Nimbocera patagonica* Reiss, 1972 – Pupa and adult male
*Tanytarsus amazonicus* spec. nov. – Pupa and adult male
*Tanytarsus branquini* Fittkau & Reiss, 1973 – Adult male
*Tanytarsus capitatus* Sublette & Sasa, 1994 – Adult male
*Tanytarsus clivosus* Reiss, 1972 – Pupa and adult male
*Tanytarsus cuieirensis* Fittkau & Reiss, 1973 – Pupa and adult male
*Tanytarsus cururui* Fittkau & Reiss, 1973 – Adult male
*Tanytarsus curvicristatus* Contreras-Lichtenberg, 1988 – Adult male
*Tanytarsus digitatus* spec. nov. – Adult male
*Tanytarsus fastigatus* Reiss, 1972 – Pupa and adult male
*Tanytarsus friburgensis* spec. nov. – Adult male
*Tanytarsus guatemalensis* Sublette & Sasa, 1994 – Adult male
*Tanytarsus hamatus* Reiss, 1972 – Pupa and adult male
*Tanytarsus hastatus* Sublette & Sasa, 1994 – Pupa and adult male
*Tanytarsus impar* Trivinho-Strixino & Strixino, 2004 – Pupa and adult male
*Tanytarsus jacaretingensis* spec. nov. – Adult male
*Tanytarsus ligulatus* Reiss, 1972 – Pupa and adult male
*Tanytarsus* cf. *ligulatus* – Adult male
*Tanytarsus limneticus* Sublette, 1964 – Pupa and adult male
*Tanytarsus magnus* Trivinho-Strixino & Strixino, 2004 – Pupa and adult male
*Tanytarsus marauia* Sanseverino, Wiedenbrug & Fittkau, 2002 – Pupa and adult male
*Tanytarsus monospinosus* Ekrem & Reiss, 1999 – Adult male
*Tanytarsus pandus* Sublette & Sasa, 1994 – Pupa and adult male
*Tanytarsus paraligulatus* Reiss, 1972 – Adult male
*Tanytarsus pararinihuensis* spec. nov. – Adult male

*Tanytarsus pseudorinihuensis* spec. nov. – Adult male

*Tanytarsus reissi* Paggi, 1992 – Adult male

*Tanytarsus revolta* Sanseverino, Wiedenbrug & Fittkau, 2002 – Pupa and adult male

*Tanytarsus rhabdomantis* (Trivinho-Strixino & Strixino, 1991) – Larva, pupa and adult male

*Tanytarsus rinihuensis* Reiss, 1972 – Pupa and adult male

*Tanytarsus riopreto* Fittkau & Reiss, 1973 – Adult male

*Tanytarsus tumultuarius* Ekrem & Reiss, 1999 – Adult male

*Tanytarsus waika* Sanseverino, Wiedenbrug & Fittkau, 2002 – Pupa and adult male

*Tanytarsus xingu* Sanseverino, Wiedenbrug & Fittkau, 2002 – Pupa and adult male

## 4.3. Descriptions and discussions

### *Tanytarsus branquini* Fittkau & Reiss, 1973

(Fig. 12)

Type material. Holotype [examined]: 1 adult male, Brazil, Amazonas State, Rio Branquinho, confluence Rio Cuieiras, at light (sample A307), 20.XII.1961, slide mounted in Euparal, leg. E. J. Fittkau (INPA).

**Diagnostic characters.** The male imago of *Tanytarsus branquini* can be separated from other *Tanytarsus* species by the following combination of characters. Antennal ratio about 0.77; eyes with dorsomedian extension; small frontal tubercles; wing veins Sc and M bare; tergite IX without microtrichia-free areas; anal tergal bands separate, curved, running parallel on middle of tergite and ending close to anal point base; anal point elongate and rounded at tip, with pair of well-developed anal crests, microtrichia absent; spines placed irregularly between the crests; superior volsella more or less heart-shaped, without microtrichia, posteromedian corner slightly projecting; longitudinal axes of superior volsella and body at angle of about 58°; digitus long and pointed, extending beyond margin of superior volsella; median volsella with pectinate lamellae, not reaching apex of inferior volsella; inferior volsella thin and somewhat straight, distal part slightly wider, with weakly developed dorsoapical swelling; gonostylus somewhat short, straight and thin; hypopygium ratio about 0.94.

**Description**

**Male Imago (n=1)**

**Head.** AR 0.77. Antennal flagellomeres one to twelve 446 µm long, thirteen 343, total length 789 µm. Eyes with dorsomedian extension; small frontal tubercles (length 10 µm), about two times as long as wide; 7 temporal setae; clypeus with 12 setae; lengths of palpal segments (in µm): 27, 29, 76, 86, 157, total length 375 µm.

**Thorax.** Length 540 µm. Scutal tubercle absent; 12 acrostichals, 6 dorsocentrals, 4 scutellars, 2 prealars. Halteres missing.

**Wing.** Wing length 1040 µm, width 300 µm; L/WR 3.4. Brachiolum with 1 seta, Sc bare, R with 20 setae, $R_1$ with 23 setae, $R_{4+5}$ with 44 setae, M bare, $M_{1+2}$ with 32 setae, $M_{3+4}$ with 20 setae, Cu with 16 setae, $Cu_1$ with 13 setae, Postcubitus and An with setae, difficult to count. Cell m with 3 setae (+ 6 setae on false vein), $r_{4+5}$ with ca. 120 setae, $m_{1+2}$ with ca. 100 setae (+ 28 setae on false vein), $m_{3+4}$ with ca. 70 setae, cu with ca. 25 setae and an with setae.

**Legs.** Foreleg bearing single tibial spur (24 µm). Lengths of combs of mid tibia 15 µm (with 24 µm long spur) and 14 µm (with 36 µm long spur); widths of combs of hind tibia 13 µm (with 47 µm spur) and 12 µm (with 51 µm long spur).

Lengths of segments (in µm):

| | fe | ti | $ta_1$ | $ta_2$ | $ta_3$ | $ta_4$ | $ta_5$ | Total length |
|---|---|---|---|---|---|---|---|---|
| $P_1$ | 631 | 232 | - | - | - | - | - | - |
| $P_2$ | 579 | 410 | 242 | 104 | 76 | 41 | 32 | 1484 |
| $P_3$ | 598 | 443 | 375 | 199 | 182 | 108 | 59 | 1964 |

Leg ratios:

| | LR | BV | SV |
|---|---|---|---|
| $P_1$ | - | - | - |
| $P_2$ | 0.59 | 4.86 | 4.08 |
| $P_3$ | 0.84 | 2.58 | 2.77 |

**Abdomen.** Length about 1270 µm.

**Hypopygium (Fig. 12 A-C).** Tergite IX 84 µm long with 7 median (not separated into groups, placed from well anterior to anal point base, between anal tergal bands, to close to anal point base), and 10 apical setae; lateral tooth difficult to see (probably absent). T IX without microtrichia-free areas. Orolateral spine of laterosternite IX difficult to see (probably absent). Anal tergal bands separate, curved, running parallel on middle of tergite and ending close to anal point base. Anal point 40 µm long, elongate and rounded at tip, with pair of well-developed anal crests (23 µm long) not extending posterior to tergite IX, microtrichia absent; spines placed irregularly between the crests. Superior volsella more or less heart-shaped, without microtrichia; anterior margin slightly curved to straight, lateral and posterior margins curved, median margin concave, posteromedian corner curved and more developed than anteromedian one; 6 setae on dorsal surface, 2 setae on median margin (both ventral) and 1 seta arising from a ventral tubercle

close to anteromedian margin. Longitudinal axes of superior volsella and body at angle of 58-59°. Digitus long and pointed, extending beyond margin of superior volsella. Median volsella 13 µm long with 13-14 µm simple setae, the more apical setae stronger (14-16 µm) and 13-14 µm pectinate lamellae, not reaching apex of inferior volsella. Inferior volsella 44 µm long, thin and somewhat straight, distal part (area carrying setae) slightly wider, with weakly developed dorsoapical swelling. Gonocoxite length 64 µm; gonostylus 68 µm, somewhat short, straight and thin; hypopygium ratio (HR) 0.94.

**Discussion, distribution and ecological notes**

*Tanytarsus branquini* is a member of the Neotropical *Tanytarsus riopreto* species group. More detailed comments are given in the discussion about *Tanytarsus branquini*, *Tanytarsus cuieirensis*, *Tanytarsus cururui* and *Tanytarsus riopreto.*

*Tanytarsus branquini* is recorded from Amazonas State, Brazil. The immature stages are unknown, but probably inhabit black-water streams of the Amazon lowlands. Black waters concept (Sioli 1950, 1965) refers to rivers and streams with drainage systems in the nutrient-poor Central Amazon, characterized by strongly acidic black water, poor in electrolytes and with a high content of humic substances.

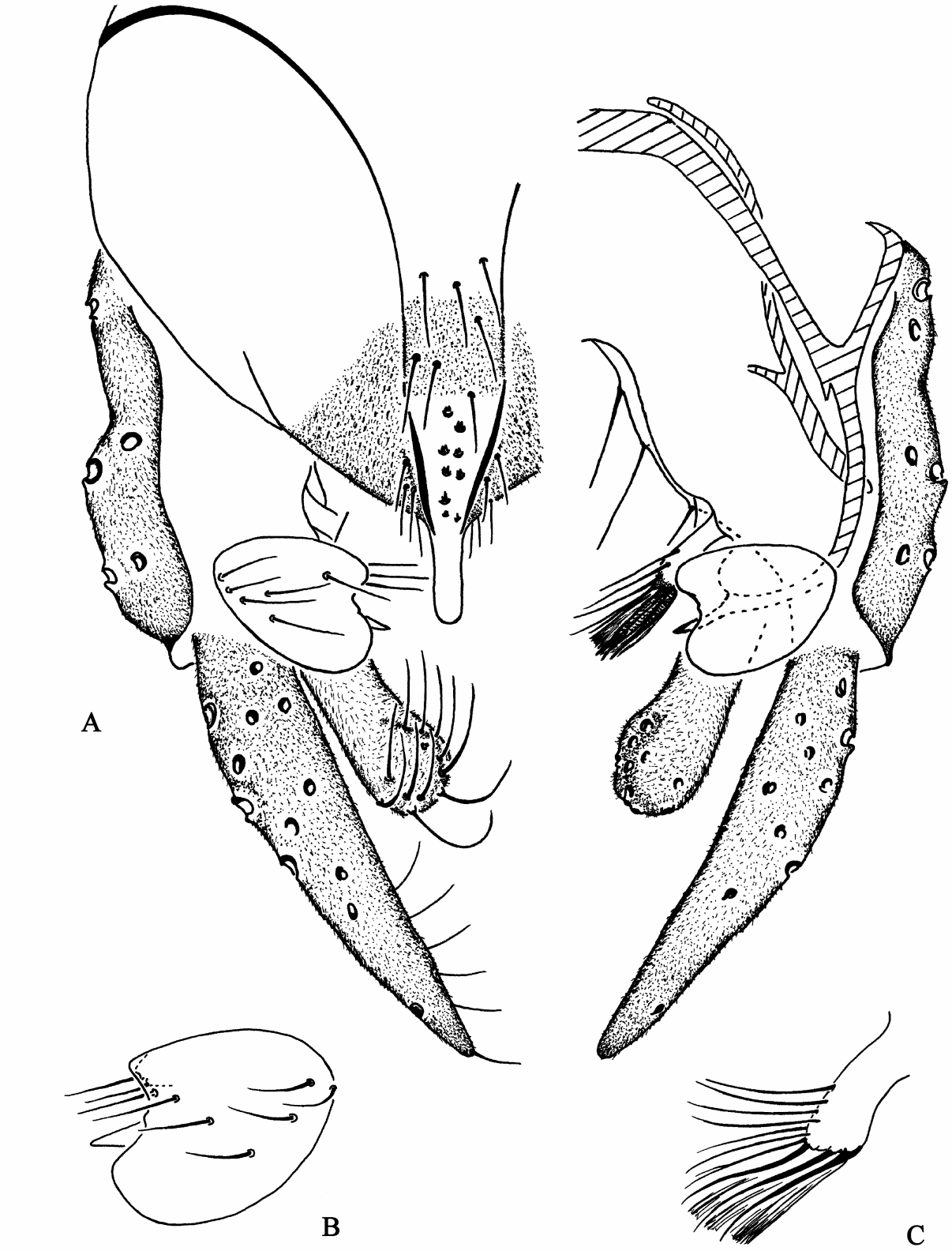



**Fig. 12.** ***Tanytarsus branquini*** **Fittkau & Reiss, adult male. A: Hypopygium, dorsal view. B: Superior volsella and digitus. C: Median volsella.**

### *Tanytarsus cuieirensis* Fittkau & Reiss, 1973

(Figs 13-14)

Type material (Brazil, leg. E. J. Fittkau). Holotype [examined]: 1 adult male, Amazonas State, Rio Cuieiras, ca. 50 km above mouth, at light (sample A62), 15.XII.1960, slide mounted in Canada balsam (INPA). Paratypes [examined]: 2 adult males as holotype; 3 adult males, Amazonas State, Igarapé do Cachoeira (tributary of Rio Cuieiras) near Cachoeira da Traíra, at light (sample A431), 26.XI.1962, slides mounted in Canada Balsam (all paratypes deposited at ZSM).
Further material examined. 3 pharate males, 2 pupal exuviae, Brazil, Amazonas State, Rio Cuieiras, confluence Rio Branquinho, drift net (sample A308), 21.XII.1961, leg. E. J. Fittkau (all ZSM).

The pupa of *Tanytarsus cuieirensis* was described by Sanseverino & Wiedenbrug (2000). Drawings of the pupa are presented here (Fig. 14) as well as a more complete pupal diagnosis. A full description of the pupa including measurements is given in Tables VI-VIII.

**Diagnostic characters.** *Tanytarsus cuieirensis* can be separated from other *Tanytarsus* species by the following combination of characters.
**Male Imago:** Antennal ratio about 0.72; eyes with dorsomedian extension; small frontal tubercles; wing veins Sc and M bare, wing cells m, cu and an bare; tergite IX with small microtrichia-free areas on each side of anal point; anal tergal bands separate, curved, running parallel on middle of tergite and ending well anterior to anal point base; anal point somewhat elongate and rounded at tip, with pair of well-developed anal crests; with field of microtrichia reaching the posterior half of the surface between the crests; spines placed irregularly between the crests; superior volsella somewhat T-shaped, without microtrichia, posterior and lateral margins elongate, sack-like; longitudinal axes of superior volsella and body at angle of about 31°; digitus long and finger-like, extending well beyond margin of superior volsella; median volsella with pectinate lamellae**,** not reaching apex of inferior volsella; inferior volsella thin and straight, distal part (area carrying setae) with very slight sub-apical swelling; gonostylus somewhat short, straight and thin; hypopygium ratio about 0.92.
**Pupa (Fig. 14 A-D):** Frontal apotome rugose; frontal setae thick, mounted on weakly developed cephalic tubercles; frontal warts absent; pedicel sheath tubercle well developed, cone-shaped; thorax smooth, over median suture rugose with small spinules and brown coloured; wing sheath with nose; prealar tubercle well developed, rectangular and inwardly folded; thoracic horn elongate and thin, sparsely covered with spinules; 3 precorneals in triangular pattern, $Pc_2$ and $Pc_3$

closer to each other, $Pc_2$ thicker and longer; 1 median and 2 lateral antepronotals, median and one lateral antepronotal thick and long; 2 pairs of dorsocentrals, each pair with one seta thin and one thick, $Dc_4$ stronger than other three Dcs; hook row about 1/3 width of segment II; Pedes Spurii B present on abdominal segment II, well developed; tergites I and VII without armament; T II with homogeneous shagreen, sparse medially; T III with pair of long bands of longer spines and pair of lateral fields of fine shagreen, bands anteriorly straight, posteriorly curving outward; T IV with bracket-shaped pair of long bands of spines and pigment, anterior band section with thin, elongate spines directed to caudal, mid section with short spines directed to median, occasionally sparse or absent, posterior band section with short spines directed to median, lateral and caudal, short spines of mid and posterior section cone-shaped; T V with pair of elongate patches of spines, sometimes slightly curved anteriorly; T VI with pair of rounded to elongate patches of spines; T VIII-IX with oral-lateral shagreen; conjunctives unarmed, pleuron of segment II with anterior field of sparse spinules; posterolateral comb of segment VIII unusually broad, with 10-12 stronger marginal teeth and 12-16 smaller one; abdominal segment I with 2 dorsal long taeniae, 1 dorsal taeniate seta and without lateral setae; segment II-VI with 3 lateral setae; segment VII with 3 lateral setae, seta L3 taeniate; segment VIII with 1 dorsal seta, 3 lateral taeniae and 2 ventral taeniae; anal fringe with about 20 taeniae in single row.

**Description**

**Male Imago (n=4)**

**Head.** AR 0.71-0.75. Antennal flagellomeres one to twelve 405-420 µm long, thirteen 290-300 µm long, total length 681-720 µm. Eyes with dorsomedian extension; frontal tubercles small (length 9-10 µm), about two times as long as wide; 7 temporal setae; clypeus with 9-11 setae; lengths of palpal segments (in µm): 26-27, 30-34, 79-83, 85-88, 153-159, total length 373-391 µm.

**Thorax.** Length 565-598 µm. Scutal tubercle absent; 5-7 dorsocentrals, 9-10 acrostichals, 1 prealar, 4 scutellars. Halteres with 4 setae.

**Wing.** Wing length 1030-1093 µm, width 305-315; L/WR 3.37-3.46. Brachiolum with 1 seta, Sc bare, R with 13-15 setae, $R_1$ with 15-16 setae, $R_{4+5}$ with 11-13 setae, M bare, $M_{1+2}$ with 18-19 setae, $M_{3+4}$ with 6-9 setae, Cu bare, $Cu_1$ with 8-9 setae, Postcubitus bare and An with 11-15 setae. Cell m bare (false vein bare), $r_{4+5}$ with 59-64 setae, $m_{1+2}$ with 40-50 setae (+ 13-15 setae on false vein), $m_{3+4}$ with 1-5 setae, cu and an bare.

**Legs.** Foreleg bearing single tibial spur (24 µm). Lengths of combs of mid tibia 14 µm (with 21 µm long spur) and 12 µm (with 31 µm long spur); lengths of combs of hind tibia 14 µm (with 23 µm spur) and 16 µm (with 36 µm long spur).

Lengths of segments (in µm):

| | fe | ti | $ta_1$ | $ta_2$ | $ta_3$ | $ta_4$ | $ta_5$ | Total length |
|---|---|---|---|---|---|---|---|---|
| $P_1$ | 540-562 | 219-223 | 729-796 | 328-357 | 296-312 | 240-254 | 108-110 | 2491-2583 |
| $P_2$ | 500-521 | 388-403 | 228-230 | 98-108 | 67-72 | 42-44 | 30-38 | 1353-1416 |
| $P_3$ | 553-570 | 471-491 | 349-370 | 190-200 | 175-192 | 110-120 | 60-67 | 1908-2010 |

Leg ratios:

| | LR | BV | SV |
|---|---|---|---|
| $P_1$ | 3.32-3.56 | 1.48-1.57 | 0.98-1.04 |
| $P_2$ | 0.57-0.58 | 4.40-4.70 | 3.89-4.01 |
| $P_3$ | 0.74-0.75 | 2.47-2.56 | 2.86-2.93 |

**Abdomen.** Length 1260 µm.

**Hypopygium (Fig. 13 A-C).** Tergite IX 85-96 µm long with 3 median setae (not separated into groups, not placed between anal tergal bands, placed more or less close to anal point base), 8-10 apical setae and small microtrichia-free areas on each side of anal point; lateral tooth difficult to see (probably absent). Orolateral spine of laterosternite IX difficult to see (probably absent). Anal tergal bands separate, curved, running parallel on middle of tergite and ending well anterior to anal point base. Anal point 36-37 µm long, somewhat elongate and rounded at tip, with pair of well-developed anal crests (26-28 µm long) extending posterior to tergite IX; with field of microtrichia reaching the posterior half of the surface between the crests; spines placed irregularly between the crests. Superior volsella somewhat T-shaped, without microtrichia; anterior margin curved, median, posterior and lateral margins elongate, sack-like; 5(6)-7 setae on dorsal surface, 2 setae on median margin (1 placed on dorsal surface and 1 with a ventral insertion) close to anterior margin and 1 seta arising from a ventral tubercle (also close to anterior margin). Longitudinal axes of superior volsella and body at angle of 30-31°. Digitus long and finger-like, extending well beyond margin of superior volsella. Median volsella 17-19 µm long with 12-14 µm simple setae, the more apical setae stronger (13-15 µm) and 12-15 µm pectinate lamellae, not reaching apex of inferior volsella. Inferior volsella 53-55 µm long, thin

and straight, distal part (area carrying setae) with very slight sub-apical swelling. Gonocoxite length 68-70 µm; gonostylus 74-76 µm, somewhat short, straight and thin; hypopygium ratio (HR) 0.91-0.92.

**Discussion**

According to the description of the pupa of *Tanytarsus cuieirensis* (Sanseverino & Wiedenbrug 2000), the thorax has 1 median and 1 lateral antepronotal, both thick and long. However, after reviewing the material, it was noticed that there is in fact one more very short lateral antepronotal, placed close to the described lateral antepronotal. In the present work, the term "taeniae" is used instead of "taeniate setae" of Sanseverino & Wiedenbrug.

The pupal morphotypes (exuviae) described as *Tanytarsus* sp. 9 by Stumpp (1993) and *Tanytarsus* spec. 13 by Wiedenbrug (2000) show diagnostic characters identical to *Tanytarsus cuieirensis*. The males and pupae of *T. cuieirensis* are recorded from the Amazon basin in North Brazil, while the exuviae of *T.* sp. 9 Stumpp is registered in Rio de Janeiro (Southeast Brazil) and *T.* spec. 13 Wiedenbrug in Rio Grande do Sul (South Brazil). Since there is no adult material associated, the identification of *T.* sp. 9 and *T.* spec. 13 as *T. cuieirensis* should only be considered "tentatively associated". Ospina-Torres (1992) also described an exuviae, named *Tanytarsus* ET 137, which resembles *T. cuieirensis*.

*Tanytarsus cuieirensis* is a member of the Neotropical *Tanytarsus riopreto* species group. More detailed comments are given in the discussion about *Tanytarsus branquini*, *Tanytarsus cuieirensis*, *Tanytarsus cururui* and *Tanytarsus riopreto.*

**Distribution and ecological notes**

*Tanytarsus cuieirensis* is recorded from Amazonas State, Brazil. The immature stages were found inhabiting small and medium-sized black-waters streams in the Amazon lowlands.

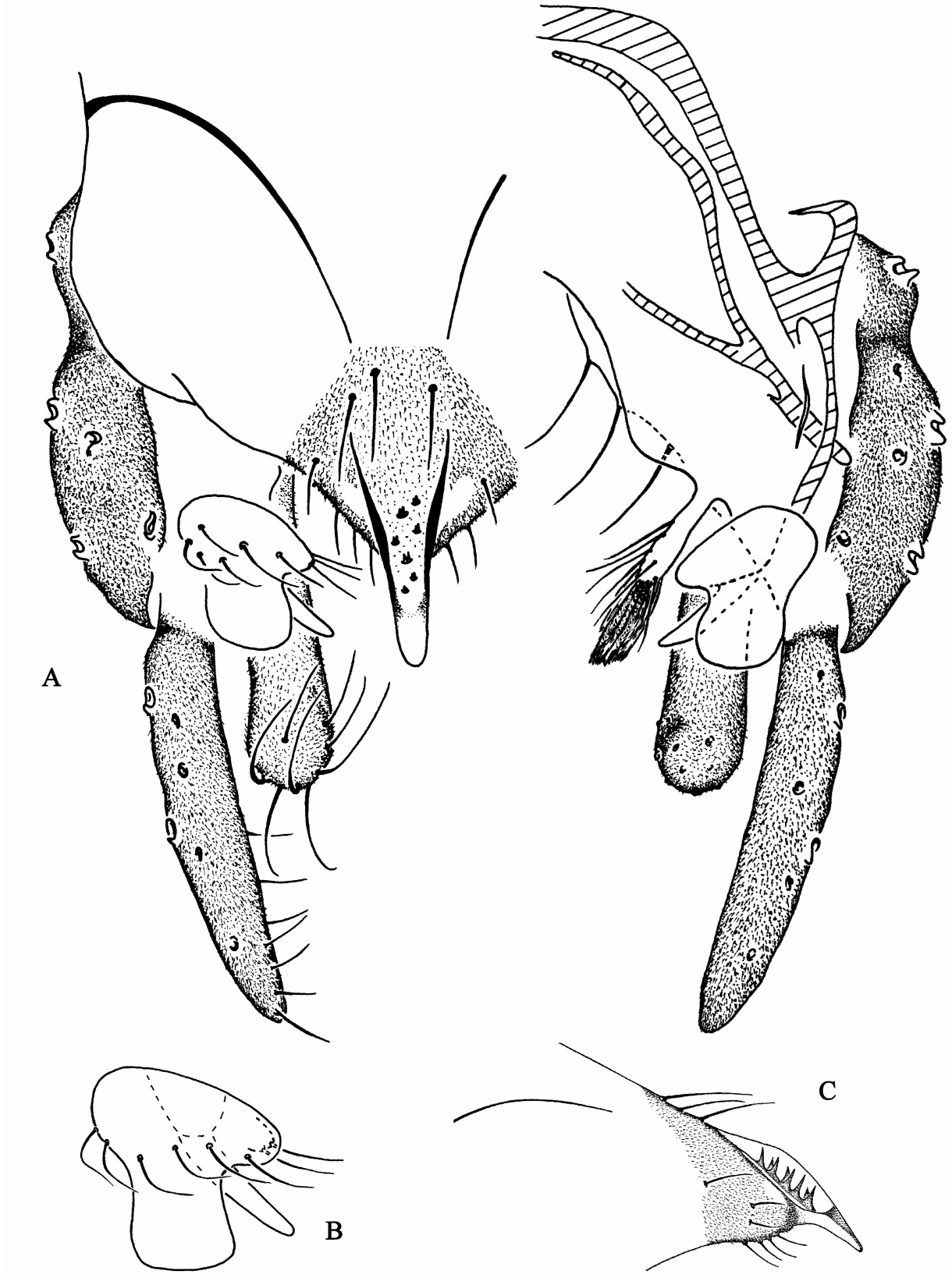



**Fig. 13.** ***Tanytarsus cuieirensis*** **Fittkau & Reiss, adult male. A: Hypopygium, dorsal view. B: Superior volsella and digitus. C: Anal point, lateral view.**

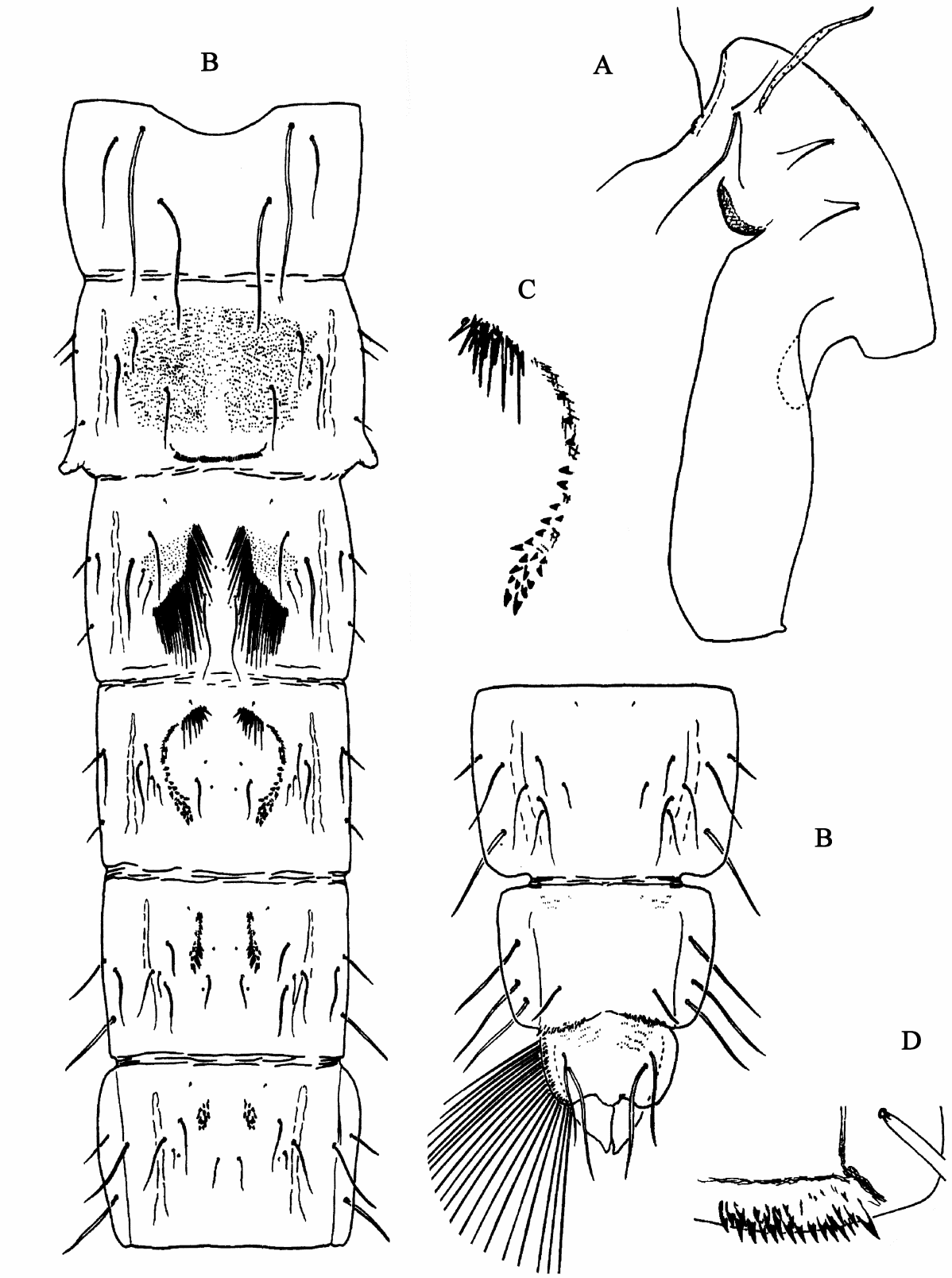



**Fig. 14.** ***Tanytarsus cuieirensis*** **Fittkau & Reiss, pupa (after Sanseverino & Wiedenbrug 2000). A: Thorax. B: Abdomen, dorsal view. C: Band of spines on abdominal tergite IV. D: Posterolateral comb of abdominal segment VIII.**

### *Tanytarsus cururui* Fittkau & Reiss, 1973

(Fig. 15)

Type material (Brazil, leg. E. J. Fittkau). Holotype [examined]: 1 adult male, Pará State, Rio Cururú, at light close to Missão Cururú house (sample A88-11), 6.II.1961, slide mounted in Canada Balsam (INPA). Paratypes [examined]: 1 adult male as holotype; 1 adult male as holotype except 16.I.1961 (sample A88-3) (both paratypes deposited at ZSM).

**Diagnostic characters.** The male imago of *Tanytarsus cururui* can be separated from other *Tanytarsus* species by the following combination of characters. Antennal ratio about 0.91; eyes with dorsomedian extension; medium-sized frontal tubercles; wing vein Sc bare, M vein with setae; tergite IX with double lateral tooth and large microtrichia-free areas on each side of anal point; anal tergal bands separate, curved, running parallel on middle of tergite and ending well anterior to anal point base; anal point elongate and rounded at tip, with pair of well-developed anal crests; with field of microtrichia on the anterior half of the surface between the crests; spines placed irregularly between the crests; superior volsella more or less heart-shaped, with small field of microtrichia on lateral margin, posteromedian corner not projecting; longitudinal axes of superior volsella and body at angle of about 44°; digitus long and finger-like, extending well beyond margin of superior volsella; median volsella with pectinate lamellae, not reaching apex of inferior volsella; inferior volsella thin and somewhat straight, distal part (area carrying setae) with rounded dorsoapical swelling; gonostylus somewhat elongate, straight and thin; hypopygium ratio about 0.80.

**Description**

**Male Imago (n=3)**

**Head.** AR 0.91-0.92. Antennal flagellomeres one to twelve 498-509 µm long, thirteen 460-466 µm long, total length 958-975 µm. Eyes with dorsomedian extension; medium-sized frontal tubercles (length 11-13 µm), about two-three times as long as wide; 8 temporal setae; clypeus with 15 setae; lengths of palpal segments (in µm): 27-29, 34-36, 101-107, 102-112, 198-212, total length 462-496 µm.

**Thorax.** Length 636-648 µm. Scutal tubercle absent; 10 dorsocentrals, 16-17 acrostichals, 3-4 prealars, 6 scutellars. Halteres with 5 setae.

**Wing.** Wing length 1293-1296 µm, width 361-375 µm; L/WR 3.45-3.58. Brachiolum with 1 seta setae, Sc bare, R with 26-29 setae, $R_1$ with 44-45 setae, $R_{4+5}$ with 66-72 setae, M with 9-10 setae, $M_{1+2}$ with 48-54 setae, $M_{3+4}$ with 37-38 setae, Cu with 23-28 setae, $Cu_1$ with 19-22 setae, Postcubitus with 50-55 setae and An with 26-32 setae. Cell m with 16 setae (+ 19-23 setae on false vein), $r_{4+5}$ with more than 150 setae, $m_{1+2}$ with more than 150 setae (+ 50-60 setae on false vein), $m_{3+4}$ with more than 100 setae, cu with ca. 80 setae and an with ca. 100 setae.

**Legs.** Foreleg bearing single tibial spur (33-36 µm). Lengths of combs of mid tibia 16-19 µm (with 27-30 µm long spur) and 16-18 µm (with 50-52 µm long spur); lengths of combs of hind tibia 20-21 µm (with 56-62 µm spur) and 20-22 µm (with 68-72 µm long spur).

Lengths of segments (in µm):

| | fe | ti | $ta_1$ | $ta_2$ | $ta_3$ | $ta_4$ | $ta_5$ | Total length |
|---|---|---|---|---|---|---|---|---|
| $P_1$ | 851-887 | 318-330 | 1220-1280 | 540-549 | 468-470 | 391 | 148 | 4055 |
| $P_2$ | 763-775 | 558-574 | 350-372 | 168-170 | 110-111 | 62-64 | 42-45 | 2054-2100 |
| $P_3$ | 780-803 | 598-602 | 541-557 | 287-291 | 260-263 | 151-154 | 74-76 | 2691-2746 |

Leg ratios:

| | LR | BV | SV |
|---|---|---|---|
| $P_1$ | 3.83-3.87 | 1.60 | 0.95 |
| $P_2$ | 0.62-0.64 | 4.36-4.42 | 3.62-3.77 |
| $P_3$ | 0.90-0.92 | 2.48-2.50 | 2.52-2.54 |

**Abdomen.** Length about 1750 µm.

**Hypopygium (Fig. 15 A-C).** Tergite IX 109-120 µm long with 9 median setae (not separated into groups, placed from well anterior to anal point base, between anal tergal bands, to close to anal point base), 11 apical setae, double lateral tooth and large microtrichia-free areas on each side of anal point. Orolateral spine of laterosternite IX difficult to see (probably absent). Anal tergal bands separate, curved, running parallel on middle of tergite and ending well anterior to anal point base. Anal point 42-48 µm long, elongate and rounded at tip, with pair of well-developed anal crests (27-29 µm long) not extending posterior to tergite IX; with field of microtrichia on the anterior half of the surface between the crests; spines placed irregularly

between the crests. Superior volsella more or less heart-shaped, with small field of microtrichia on lateral margin; anterior margin curved to slightly straight, lateral and posterior margins curved, median margin slightly concave, posteromedian corner not projecting; 9-10 setae on dorsal surface, 2 setae on median margin (both ventral) and 1 seta arising from a ventral tubercle close to anteromedian margin. Longitudinal axes of superior volsella and body at angle of 43-45°. Digitus long and finger-like, extending well beyond margin of superior volsella. Median volsella 17-20 µm long with 16-17 µm simple setae, the more apical setae stronger (16-18 µm) and 15-17 µm pectinate lamellae, not reaching apex of inferior volsella. Inferior volsella 60-64 µm long, thin and somewhat straight, distal part (area carrying setae) with rounded dorsoapical swelling. Gonocoxite length 74-76 µm; gonostylus 90-96 µm, somewhat elongate, straight and thin; hypopygium ratio (HR) 0.79-0.82.

**Discussion, distribution and ecological notes**

*Tanytarsus cururui* is a member of the Neotropical *Tanytarsus riopreto* species group. More detailed comments are given in the discussion about *Tanytarsus branquini*, *Tanytarsus cuieirensis*, *Tanytarsus cururui* and *Tanytarsus riopreto.*

*Tanytarsus cururui* is recorded from the Amazon Basin in Pará State, Brazil. The immature stages are unknown, but probably inhabit black-water streams of the Amazon lowlands.

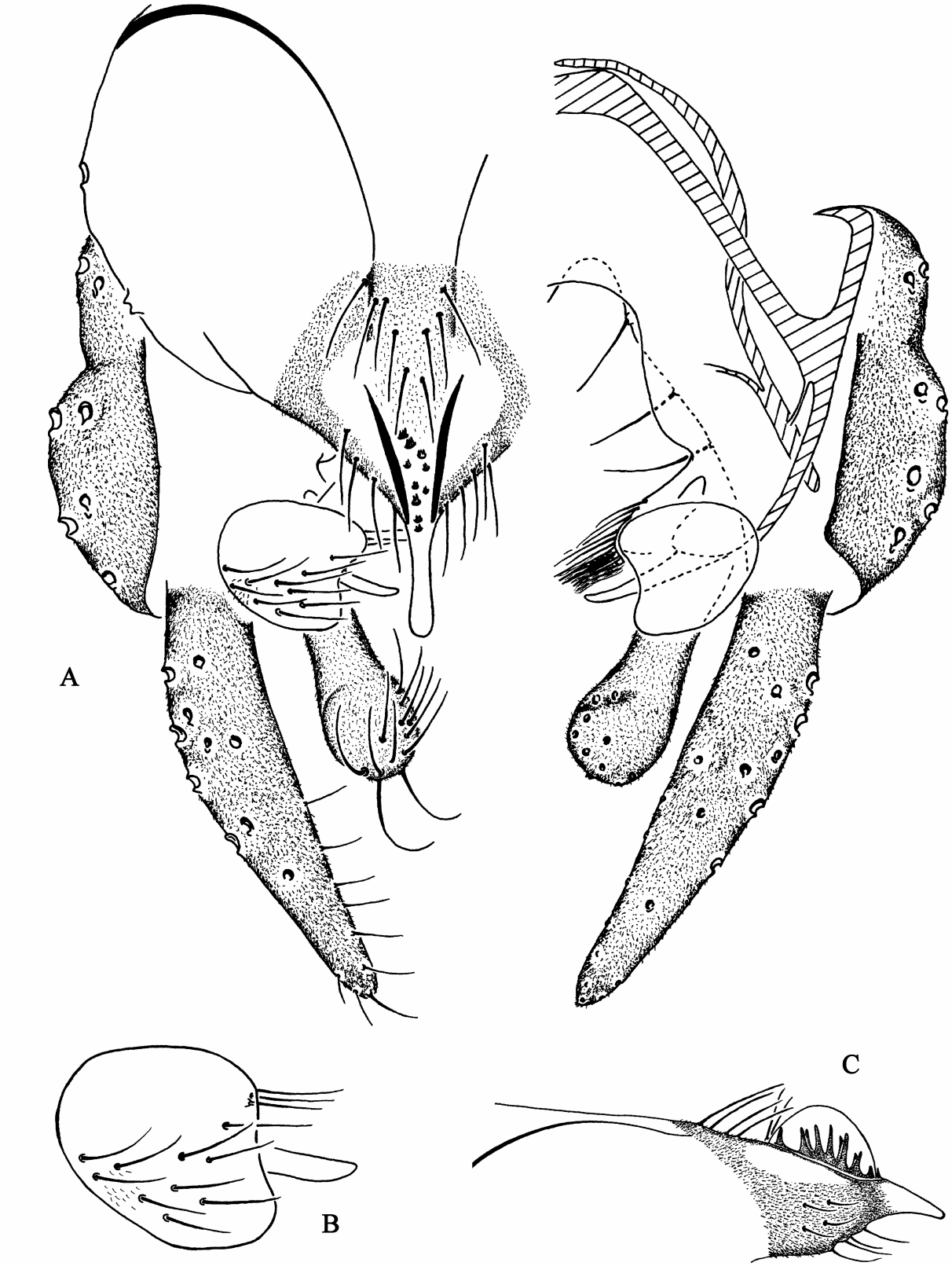



**Fig. 15.** ***Tanytarsus cururui*** **Fittkau & Reiss, adult male. A: Hypopygium, dorsal view. B: Superior volsella and digitus. C: Anal point, lateral view.**

### *Tanytarsus riopreto* Fittkau & Reiss, 1973

(Fig. 16)

Type material (Brazil, leg. E. J. Fittkau). Holotype [examined]: 1 adult male, Pará State, Rio Cururú, at light close to Missão Cururú house (sample A88-1), 12.I.1961, slide mounted in Canada Balsam (INPA). Paratypes [examined]: 5 adult males as holotype; 3 adult males, Amazonas State, Rio Branquinho (principal tributary of Rio Cuieiras), at light (sample A164), 20.IV.1961, slides mounted in Canada Balsam (all ZSM).

**Diagnostic characters.** The male imago of *Tanytarsus riopreto* can be separated from other *Tanytarsus* species by the following combination of characters. Antennal ratio about 0.96; eyes with dorsomedian extension; large frontal tubercles; wing veins Sc and M bare; tergite IX with double lateral tooth and without microtrichia-free areas; anal tergal bands separate, curved, running parallel on middle of tergite IX and ending well anterior to anal point base; anal point elongate and pointed at tip, with pair of well-developed anal crests, microtrichia absent; spines placed irregularly between the crests; superior volsella somewhat triangular, heart-shaped, without microtrichia, posteromedian corner slightly projecting; longitudinal axes of superior volsella and body at angle of about 42°; digitus long and finger-like, extending well beyond margin of superior volsella; median volsella with pectinate lamellae, not reaching apex of inferior volsella; inferior volsella rather thin and straight, distal part (area carrying setae) with very slight sub-apical swelling; gonostylus somewhat elongate, straight and thin; hypopygium ratio about 0.81.

**Description**

**Male Imago (n=6)**

**Head.** AR 0.90-1.00. Antennal flagellomeres one to twelve 450-472 µm long, thirteen 406-475 µm long, total length 856-947 µm. Eyes with dorsomedian extension; frontal tubercles present (length 17-18 µm), about four times as long as wide; 8 temporal setae; clypeus with 14-16 setae; lengths of palpal segments (in µm): 31-33, 33-36, 84-104, 91-116, 165-200, total length 404-489 µm.

**Thorax.** Length 730-788 µm. Scutal tubercle absent; 7 dorsocentrals, 12-15 acrostichals, 2-3 prealars, 5-6 scutellars. Halteres with 4 setae.

**Wing.** Wing length 1170-1370 µm, width 355-410 µm; L/WR 3.29-3.34. Brachiolum with 1 seta, Sc bare, R with 25-30 setae, $R_1$ with 27-34 setae, $R_{4+5}$ with 47-58 setae, M bare, $M_{1+2}$ with 35-46 setae, $M_{3+4}$ with 24-33 setae, Cu with 12-19 setae, $Cu_1$ with 12-19 setae, Postcubitus with 7-9 setae, An with 20-24 setae. Cell m with 8-14 setae (+ 6-7 setae on false vein), $r_{4+5}$ with more than 150 setae, $m_{1+2}$ with more than 150 setae (+ 28-35 setae on false vein), $m_{3+4}$ with 63-98 setae, cu with 34-58 setae, an with 28-57 setae.

**Legs.** Foreleg bearing single tibial spur (31-36 µm). Lengths of combs of mid tibia 16-19 µm (with 22-29 µm long spur) and 15-16 µm (with 34-42 µm long spur); lengths of combs of hind tibia 16-19 µm (with 50-60 µm spur) and 15-18 µm (with 56-62 µm long spur).

Lengths of segments (in µm):

| | fe | ti | $ta_1$ | $ta_2$ | $ta_3$ | $ta_4$ | $ta_5$ | Total length |
|---|---|---|---|---|---|---|---|---|
| $P_1$ | 697-800 | 275-332 | 1030-1199 | 500-512 | 440-457 | 310-370 | 138-176 | 3390-3841 |
| $P_2$ | 658-720 | 461-531 | 288-330 | 124-156 | 91-108 | 52-64 | 39-44 | 1713-1953 |
| $P_3$ | 660-751 | 510-592 | 463-538 | 240-290 | 220-260 | 120-150 | 75-84 | 2288-2661 |

Leg ratios:

| | LR | BV | SV |
|---|---|---|---|
| $P_1$ | 3.6-3.7 | 1.44-1.55 | 0.94 |
| $P_2$ | 0.59-0.62 | 4.25-4.59 | 3.79-3.94 |
| $P_3$ | 0.90 | 2.39-2.49 | 2.49-2.52 |

**Abdomen.** Length about 1700 µm.

**Hypopygium (Fig. 16 A-C).** Tergite IX 106-112 µm long with 6-9 median setae (not separated into groups, placed from well anterior to anal point base, between anal tergal bands, to close to anal point base), 12-15 apical setae and double lateral tooth. T IX without microtrichia-free areas. Orolateral spine of laterosternite IX difficult to see (probably absent). Anal tergal bands separate, curved, running parallel on middle of tergite and ending well anterior to anal point base. Anal point 42-58 µm long, elongate and pointed at tip, with pair of well-developed anal crests (22-36 µm long) not extending posterior to tergite IX, microtrichia absent; spines placed irregularly between the crests. Superior volsella somewhat triangular, heart-shaped, without microtrichia; anterior margin slightly curved to straight, lateral and posterior margins curved, median margin concave; posteromedian corner slightly projecting; 5-6 setae on dorsal surface, 2

setae on median margin (1 placed on dorsal surface and 1 on ventral surface) close to anterior margin and 1 seta arising from a ventral tubercle (also close to anterior margin). Longitudinal axes of superior volsella and body at angle of 41-43°. Digitus long and finger-like, extending well beyond margin of superior volsella. Median volsella 15-19 µm long with 15-17 µm simple setae, the more apical setae stronger (16-18 µm), and 14-17 µm pectinate lamellae, not reaching apex of inferior volsella. Inferior volsella 61-64 µm long, rather thin and straight, distal part (area carrying setae) with very slight sub-apical swelling. Gonocoxite length 72-84 µm; gonostylus 86-103 µm, somewhat elongate, straight and thin; hypopygium ratio (HR) 0.78-0.83.

**Discussion, distribution and ecological notes**

*Tanytarsus riopreto* is a member of the Neotropical *Tanytarsus riopreto* species group. A more detailed discussion is given in the following section.

*Tanytarsus riopreto* is recorded from Amazon Basin in Amazonas and Pará States, Brazil. The immature stages are unknown, but they probably live in black-water rivers and streams of the Amazon lowlands.

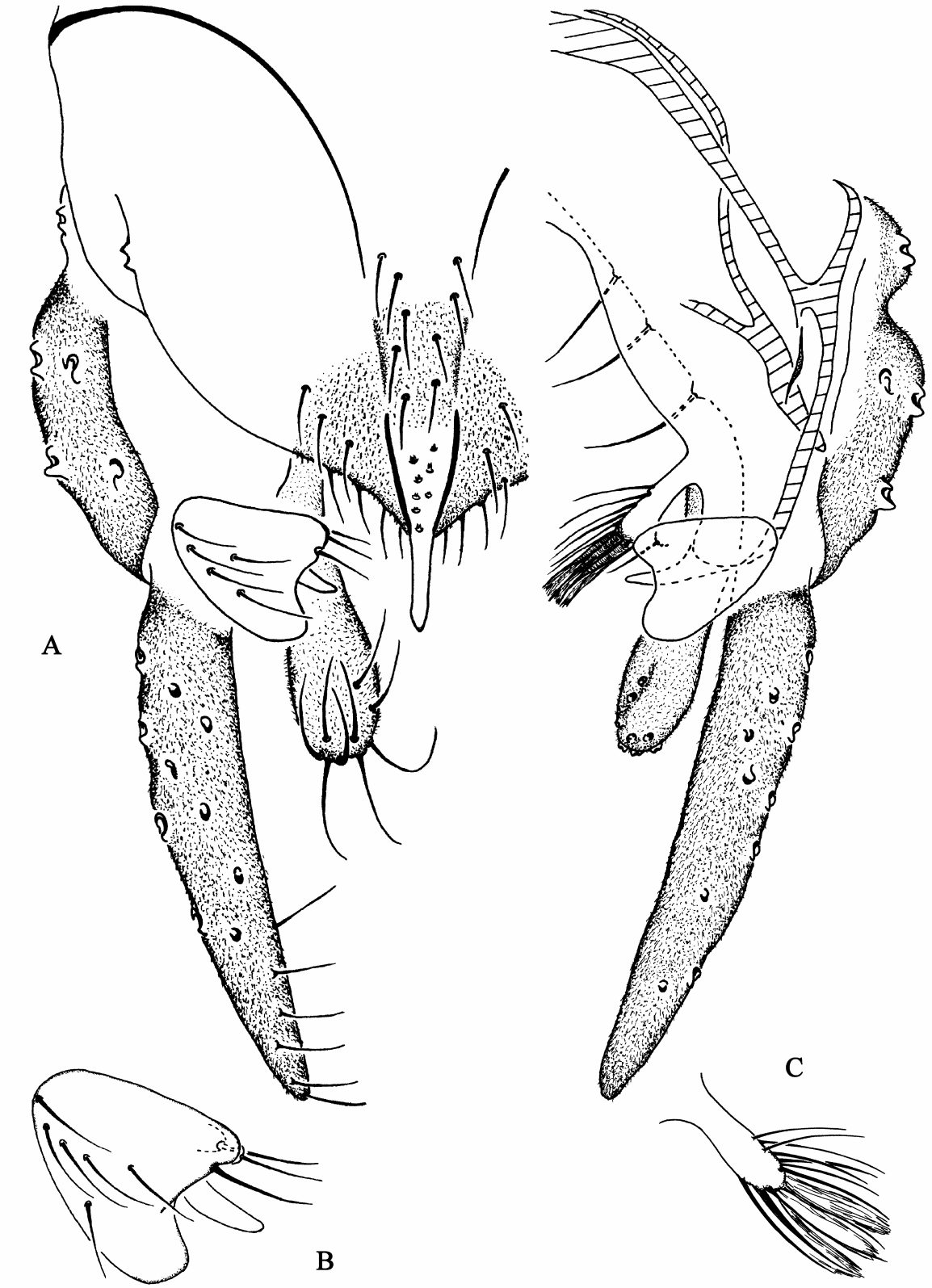



**Fig. 16.** ***Tanytarsus riopreto*** **Fittkau & Reiss, adult male. A: Hypopygium, dorsal view. B: Superior volsella and digitus. C: Median volsella.**

**Discussion about *Tanytarsus branquini, Tanytarsus cuieirensis, Tanytarsus cururui* and *Tanytarsus riopreto,* with comments on the Neotropical *Tanytarsus riopreto* species group**

The *riopreto* species group of the genus *Tanytarsus* was described by Fittkau & Reiss (1973) based on four Amazonian species, *Tanytarsus branquini, T. cuieirensis, T. cururui* and *T. riopreto.* All species were described from adult males collected from light traps in the Amazon basin. Some considerations of the diagnostic characters proposed by Fittkau & Reiss for the *riopreto* group are discussed as follows.

Fittkau & Reiss (1973) considered that the lateral tooth of the abdominal tergite IX is absent, but in fact this feature is mistaken since *T. cururui* and *T. riopreto* show a double lateral tooth on T IX. Another character in question is the field of microtrichia on the anal point, between the anal crests. According to the group diagnosis, these species do not present microtrichia on the anal point; however, *T. cururui* and *T. cuieirensis* show microtrichia on the anal point between the anal crests.

Fittkau & Reiss described a dorsomedian lobe and a ventromedian lobe on the superior volsella, both carrying setae. I prefer not to use these terms since they could be interpreted as characters always present in the superior volsella (see more comments under "superior volsella"). The "setae of the dorsomedian lobe" of Fittkau & Reiss are described here as "setae on median margin of superior volsella", and the ventromedian lobe is in fact a tubercle on ventral surface carrying a seta. All four species present 2 setae on median margin and 1 seta on ventral tubercle, as stated in the group diagnosis.

It is also assumed in the diagnosis, that the superior volsella shows a heart-like form and its longitudinal axis is directed at an angle of more than 45° in relation to the longitudinal body axis. After re-measuring the species, the longitudinal axes of superior volsella and body are at an angle of more than 40° in *T. branquini*, *T. cururui* and *T. riopreto,* while in *T. cuieirensis* the angle is about 30°. The superior volsella of *T. branquini* (Fig. 12 B), *T. cururui* (Fig. 15 B) and *T. riopreto* (Fig. 16 B) is more or less heart-shaped while in *T. cuieirensis* it is somewhat T-like (Fig. 13 B).

According to the descriptions of Fittkau & Reiss, the median volsella has a short base with simple setae and enlarged lamellae. The hypopygium drawings of Fittkau & Reiss show foliate lamellae, but in fact *T. branquini, T. cuieirensis, T. cururui* and *T. riopreto* have pectinate lamellae on the median volsella.

Among the four species, *T. cururui* is the only to present setae on the wing vein M and a field of microtrichia on the superior volsella. The occurrence of microtrichia on the superior volsella is not mentioned either in the original description of *T. cururui* or in the group diagnosis.

Some diagnostic characters for the adult males proposed by Fittkau & Reiss are shared by the four species (Figs 12, 13, 15 and 16), namely anal tergal bands running parallel on middle of tergite and ending more or less close to anal point base, up to 10 median setae in the area close to the anal tergal bands, anal point elongate, with a pair of anal crests, spines placed irregularly between the crests, superior volsella with 2 setae on median margin and 1 seta on ventral tubercle, digitus finger-like, extending beyond margin of superior volsella and inferior volsella club-shaped.

Sublette & Sasa (1994) argued the placement of the Guatemalan species *Tanytarsus capitatus* (Fig. 24), *T. guatemalensis* (Fig. 25), *T. hastatus* (Figs 28 and 29), *T. pandus* (Fig. 26 and 27), the Patagonian *T. clivosus* Reiss (Figs 17 and 18) and *T. hamatus* Reiss (Figs 19 and 20) and the Nearctic *T. limneticus* Sublette, 1964 (Figs 30 and 31) in the *riopreto* group. None of these species fit well the group diagnosis of Fittkau & Reiss. The anal tergal bands of these species are shorter and run parallel (but do not end close to anal point base) only in *T. capitatus*, *T. clivosus* and *T. hastatus*. In regard to the anal point, *T. capitatus* and *T. hastatus* show a different armament. The spines of *T. capitatus* are placed regularly in one row (whereas they are placed irregularly in the *riopreto*), while *T. hastatus* presents small, minute spines (whereas spines are larger in the *riopreto*). A more or less heart-shaped superior volsella is found only in *T. clivosus*, *T. guatemalensis*, *T. limneticus*, *T. pandus*. Furthermore, none of these species present pectinate lamellae on the median volsella (all species except *T. guatemalensis* have foliate lamellae).

Sanseverino & Wiedenbrug (2000) described the pupa of *Tanytarsus cuieirensis* (Fig. 14) and proposed some diagnostic characters for the pupae of the *riopreto* group. The authors suggested that the combination of the presence of 1 median and 1 lateral antepronotal, both thick and long, at least 1 thick and long dorsocentral, at least 2 long dorsal taeniae on tergite I, 3 taeniate L-setae on segment VIII and the shape of the posterolateral comb of segment VIII (Fig. 14 D), which is unusually broad, could be characteristic for the group. After comparing material, I noticed that the length and thickness of the antepronotals and dorsocentrals are sometimes difficult to determine, and the presence of at least 1 thicker and longer dorsocentral is reported for many *Tanytarsus* species. In fact, the combination of at least 2 dorsal taeniae on segment I, 3 taeniae on segment VIII and the broad anal comb could be diagnostic.

Among the species with pupae proposed by Sublette & Sasa (1994) as *riopreto* group members (*T. clivosus*, *T. hamatus*, *T. hastatus*, *T. limneticus*, *T. pandus*), only *T. limneticus* (see description in the present study, Fig. 31) fits this diagnosis; the species has 2 dorsal taeniae on segment I, a broad posterolateral comb and 3 lateral taeniae on segment VIII. *Tanytarsus clivosus* and *T. hamatus* show two taeniate D-setae on tergite I and the comb of *T. hamatus* is somewhat broad, but the comb of *T. clivosus* and the number of lateral taeniae of both species are different.

The pupa of the Neotropical *Tanytarsus rhabdomantis* (Trivinho-Strixino & Strixino) presents these diagnostic features, and seems to be closely related to *T. limneticus* and to *T. cuieirensis*. The three species also show a similar spine pattern on pupal tergites, especially the bracket-shaped spine bands on tergite IV, in which the spines are both caudally and orally directed (Trivinho-Strixino & Sanseverino 2003). This spine pattern on pupal tergite IV is also found in *Nimbocera* Reiss, 1972, and is typical for the North American species in the *T. confusus* aggregate (Ekrem 2003; Ekrem *et al.* 2003).

Pupae with these diagnostic characters were also encountered by Ospina-Torres (1992), Stumpp (1993) and Wiedenbrug (2000): six pupal morphotypes from Amazonas, one from Rio de Janeiro and one from Rio Grande do Sul, respectively.

As discussed here, the presence of an unusually broad anal comb could be considered diagnostic for the *riopreto* group. However, such a comb is neither exclusive to this group nor even to the genus *Tanytarsus*. A peculiar, broad anal comb can be found in pupae of the Palaearctic-Afrotropical *Virgatanytarsus* Pinder. Cranston (2000) reported the presence of broad combs in the Australian species *Tanytarsus bispinosus* Freeman and *T. hardwicki* Cranston, in *T. dostinei* Cranston and *T. reidi* Cranston (the latter two showing a somewhat different comb design), and in *T. edwardi* Glover. Prior to the discovery of these pupae, it was supposed that a broad anal comb would be unique and exclusive to the genus *Virgatanytarsus*, as pointed out by Pinder (1982) and Pinder & Reiss (1986).

A phylogenetic analysis is necessary to elucidate the systematic positions of *T. branquini*, *T. cuieirensis*, *T. cururui*, *T. riopreto*, *T. capitatus*, *T. guatemalensis*, *T. hastatus*, *T. pandus*, *T. clivosus*, *T. hamatus*, *T. limneticus* and *T. rhabdomantis*, to outline synapomorphies and also to reveal if the *riopreto* group should be maintained.

### *Tanytarsus clivosus* Reiss, 1972

(Figs 17-18)

*Tanytarsus rothi* Brundin (1956) nomen nudum.

Type material. Holotype [not examined]: 1 adult male, South Chile, Los Lagos, Lago Riñihue, marginal vegetation, collected with hand-net, 6.XI.1969, slide mounted in Euparal (NHRS). Paratypes [examined]: 2 adult males as holotype; 1 adult male, South Chile, Villarrica, Lago Villarrica, 17.X.1953, slide mounted in Euparal, leg. L. Brundin; 1 pupal exuviae as previous; 1 pharate male, South Chile, Lago Rupanco, 8.I.1954, slide mounted in Euparal, leg. L. Brundin; 2 adult males, Argentina, Bariloche, Arroyo Lopez, 31.I.1954, slide mounted in Euparal, leg. F. Brundin; 1 pharate male, South Chile, Villarrica, Lago Villarrica, mouth of Rio Tólten, lentic marginal area, sediment, 3.XI.1969, slide mounted in Euparal, leg. F. Reiss; 2 adult males as previous except collected at Lago Villarrica; 2 pupal exuviae, South Chile, Chiloé Insel, Lago Huillingo, 22.XI.1969, slide mounted in Euparal, leg. F. Reiss; 1 adult male, Argentina, Bariloche, Lago Nahuel Huapi, 13.XII.1969, slide mounted in Euparal, leg. Reiss; 4 pupal exuviae as previous; 1 adult male as previous except 14.XII.1969 (all paratypes at ZSM).
Additional material examined: 1 adult male, Argentina, Bariloche, Los Lagos, Victoria Island, II.-IV.1972, slide mounted in Euparal, leg. J. R. Contreras (ZSM).

**Diagnostic characters.** *Tanytarsus clivosus* can be separated from other *Tanytarsus* species by the following combination of characters.

**Male Imago:** Antennal ratio about 0.87; eyes with dorsomedian extension; large frontal tubercles; wing veins Sc and M bare; tergite IX with double lateral tooth and without microtrichia-free areas; anal tergal bands separate, curved, running parallel on middle of tergite and ending well anterior to anal point base; anal point elongate and pointed at tip, with pair of well-developed anal crests, microtrichia absent; spines placed irregularly between the crests; superior volsella somewhat heart-shaped, without microtrichia, posteromedian corner projecting; longitudinal axes of superior volsella and body at angle of about 52°; digitus long and thumb-like, large, extending well beyond margin of superior volsella; digitus with 2 setae placed on base, one seta seated on tubercle, the other on digitus ventral surface, and with a small sclerotized spot close to apex; median volsella short, with foliate lamellae, not reaching apex of inferior volsella; inferior volsella thin and more or less straight, distal part with an oval to somewhat quadrate subapical swelling; gonostylus elongate, curved and somewhat thick; hypopygium ratio about 0.90.

**Pupa:** Frontal apotome smooth; frontal setae thick, mounted on weakly developed cephalic tubercles, area anterior to cephalic tubercles slightly swelled; pedicel sheath tubercle present; wing sheath with well-developed nose; prealar tubercle well developed, rounded to somewhat quadrate and inwardly folded; thoracic horn smooth and somewhat thick; three precorneals not in triangular pattern, $Pc_1$ placed on a tubercle, $Pc_2$ and $Pc_3$ placed close to each other on margin of tubercle, $Pc_2$ thicker and longer; 1 median and 2 lateral antepronotals; precorneals and antepronotals long and strong; 2 pairs of dorsocentrals, each pair with 1 seta thin and 1 thick, $Dc_4$ stronger than other three Dcs; hook row about 1/2-1/3 width of abdominal segment II; Pedes Spurii B weakly developed on abdominal segment II; tergites I, VII-IX without armament; tergite II with field of spinules sparse medially and laterally; T III with one pair of long bands of longer spines and anterior field of spinules close to the bands, bands more than 1/2 length of tergite; T IV with one pair of long bands of longer spines and with some spinules at anterolateral side of each band, bands more than 1/2 length of tergite; T V and VI with one anterior pair of oval to elongate patches of spines; pleuron of segment II with anterior field of small spines ventrally; posterolateral comb of segment VIII with 6-9 stronger marginal teeth and 15-40 smaller one; abdominal segment I with 2 dorsal longer and taeniate setae and without lateral seta; segment II-V with 3 lateral setae; segment VI with 3 lateral taeniae; segment VII with 4 lateral taeniae; segment VIII with 5 lateral taeniae and 1 ventral taenia; anal fringe with about 42 taeniae.

**Description**

**Male Imago (n=6)**

**Head.** AR 0.83-0.91. Antennal flagellomeres one to twelve 500-556 µm long, thirteen 444-470 µm long, total length 950-1020 µm. Eyes with dorsomedian extension; large frontal tubercles (length 18-25 µm), about 3 times as long as wide; 10-11 temporal setae; clypeus with 12-13 setae; lengths of palpal segments (in µm): 30-34, 38-42, 118-132, 114-136, 154-216, total length 468-560 µm.

**Thorax.** Length 868-990 µm. Scutal tubercle absent; 7-10 dorsocentrals, 11-16 acrostichals, 1 prealar, 6 scutellars. Halteres with 4-5 setae.

**Wing.** Wing length 1650-2180 µm, width 468-620 µm; L/WR 3.23-3.55. Brachiolum with 1 seta setae, Sc bare, R with 26-33 setae, $R_1$ with 24-32 setae, $R_{4+5}$ with 63-75 setae, M bare, $M_{1+2}$ with 73-80 setae, $M_{3+4}$ with 34-41 setae, Cu with 25-30 setae, $Cu_1$ with 20-28 setae, Postcubitus with

32-40 setae and An with 36-44 setae. Cell m with 2-9 setae (+ 16-21 setae on false vein), $r_{4+5}$ with about 180-215 setae, $m_{1+2}$ with about 200-230 setae (+ 60-68 setae on false vein), $m_{3+4}$ with 92-106 setae, cu with 45-52 setae and an with 80-91 setae.

**Legs.** Foreleg bearing single tibial spur (27-29 µm). Lengths of combs of mid tibia 16-18 µm (with 24-26 µm long spur) and 18-20 µm (with 33-37 µm long spur); lengths of combs of hind tibia 16-18 µm (with 30-32 µm spur) and 20-23 µm (with 35-39 µm long spur).

Lengths of segments (in µm):

| | fe | ti | $ta_1$ | $ta_2$ | $ta_3$ | $ta_4$ | $ta_5$ | Total length |
|---|---|---|---|---|---|---|---|---|
| $P_1$ | 800-890 | 450-490 | 990-1060 | 530-575 | 398-448 | 300-340 | 131-145 | 3599-3948 |
| $P_2$ | 820-900 | 640-705 | 390-420 | 249-250 | 174-190 | 118-120 | 89-90 | 2481-2675 |
| $P_3$ | 920-1010 | 841-920 | 602-648 | 370-405 | 289-310 | 170-192 | 98-110 | 3292-3595 |

Leg ratios:

| | LR | BV | SV |
|---|---|---|---|
| $P_1$ | 2.16-2.21 | 1.61-1.71 | 1.26-1.30 |
| $P_2$ | 0.59-0.60 | 2.93-3.11 | 3.74-3.82 |
| $P_3$ | 0.70-0.71 | 2.53-2.60 | 2.89-2.97 |

**Abdomen.** Length 2280-3360 µm.

**Hypopygium (Fig. 17 A-E).** Tergite IX 124-152 µm long with 6-9 median setae (not separated into groups, placed from well anterior to anal point base to close to anal point base, not placed between anal tergal bands), 14-18 apical setae and double lateral tooth. T IX without microtrichia-free areas. Orolateral spine of laterosternite IX present, 3-4 µm. Anal tergal bands separate, curved, running parallel on middle of tergite and ending well anterior to anal point base. Anal point 44-60 µm long, elongate and pointed at tip, with pair of well-developed anal crests (26-34 µm long) extending posterior to tergite IX, microtrichia absent; spines placed irregularly between the crests. Superior volsella somewhat heart-shaped, without microtrichia, with 2-3 wrinkles on lateral margin; anterior and lateral margins curved, median margin concave and posteromedian corner projecting; 5-7 setae on dorsal surface, 1 seta on median margin on ventral tubercle close to anterior margin. Longitudinal axes of superior volsella and body at angle of 51-53°. Digitus long and thumb-like, large, extending well beyond margin of superior volsella, with 2 setae placed on base (one seated on a tubercle, the other on the ventral digitus

surface), and with a small sclerotized spot close to apex. Median volsella 11-12 µm long with 18-24 µm simple setae and 12-16 µm foliate lamellae, not reaching apex of inferior volsella. Inferior volsella 84-90 µm long, thin and more or less straight, with an oval to somewhat quadrate subapical swelling. Gonocoxite length 108-110 µm; gonostylus 110-132 µm, elongate, curved and somewhat thick; hypopygium ratio (HR) 0.83-0.98.

**Pupa (n=5)**

Total length 3420-4280 µm.
Pupal exuviae pale yellow to brownish-yellow, thorax and lateral muscle marks somewhat brownish.

**Cephalothorax (Fig. 18 A-C).** Frontal apotome smooth. Frontal setae thick, 110-128 µm long, mounted apical on weakly developed cephalic tubercles; frontal warts absent, area anterior to cephalic tubercles slightly swelled. Pedicel sheath tubercle present. Thorax smooth, 910-950 µm long, with small points along median suture. Wing sheath with well-developed nose; prealar tubercle well developed, rounded to somewhat quadrate and inwardly folded. Thoracic horn smooth and somewhat thick, 210-360 µm long. Three precorneals not in triangular pattern, $Pc_1$ 124-184 µm, placed on a tubercle, $Pc_2$ and $Pc_3$ (316-360 µm and 270-290 µm respectively) placed close to each other on margin of tubercle, $Pc_2$ thicker and longer; 1 median (180-208 µm) and 2 lateral antepronotals (6-7 µm, 296-355 µm); 2 pairs of dorsocentrals, anterior pair 52-65 µm (thick) and 120-132 µm (thin), posterior pair 96-124 µm (thin) and 68-84 µm (thick), $Dc_4$ stronger than other three Dcs.

**Abdomen (Fig. 18 D-E).** Total length 2510-3360 µm. Tergites I, VII-IX without armament. T II with field of spinules (homogeneous shagreen), sparse medially and laterally. T III with one pair of long bands of longer spines in addition to anterior field of spinules close to the bands, bands more than 1/2 length of tergite. T IV with one pair of long bands of longer spines and some spinules at anterolateral side of each band, bands more than 1/2 length of tergite. T V and VI with one anterior pair of oval to elongate patches of spines. Sternites IV-VII apparently without armament. S I-III with very fine shagreen. S VIII with fine anterolateral shagreen. Conjunctives unarmed. Pleuron of segment II with anterior field of small spines ventrally. Hook row 180-240 µm, about 1/2-1/3 width of segment II. Pedes Spurii A absent; Pedes Spurii B present on

segment II, weakly developed. Posterolateral comb of segment VIII 40-54 µm wide, consisting of 6-9 stronger marginal teeth and 15-40 smaller one. Abdominal setation: segment I with 3 D, 0 L and 1 V, anterior and posterior D-setae longer, taeniate; segment II with 3 D plus 2 dorsal seta marks, 3 L and 4 V; segments III-V with 5 D plus 2 dorsal seta marks, 3 L and 5 V; segment VI with 5 D plus 2 dorsal seta marks, 3 lateral taeniae and 5 V; segment VII with 5 D plus 2 dorsal seta marks, 4 lateral taeniae and 5 V; segment VIII with 1 D, 5 lateral taeniae and 1 ventral taenia. Anal lobe well developed, with complete fringe of 34-55 taeniae in single row and two pairs of dorsal taeniae. Tergites II-VIII with O-setae.

**Distribution and ecological notes**

*Tanytarsus clivosus* is recorded from southern Chile and from the area of Bariloche, Argentina. The immature stages live apparently mainly in lakes, inhabiting 17-95 m-deep sediments (Reiss 1972). However, Reiss (1972) did not consider *T. clivosus* to be a profundal stenobathic species, since larvae and pupae also live in sediments of low, marginal areas of rivers, and the few larval samples taken from lakes do not represent the vertical distribution of this species.

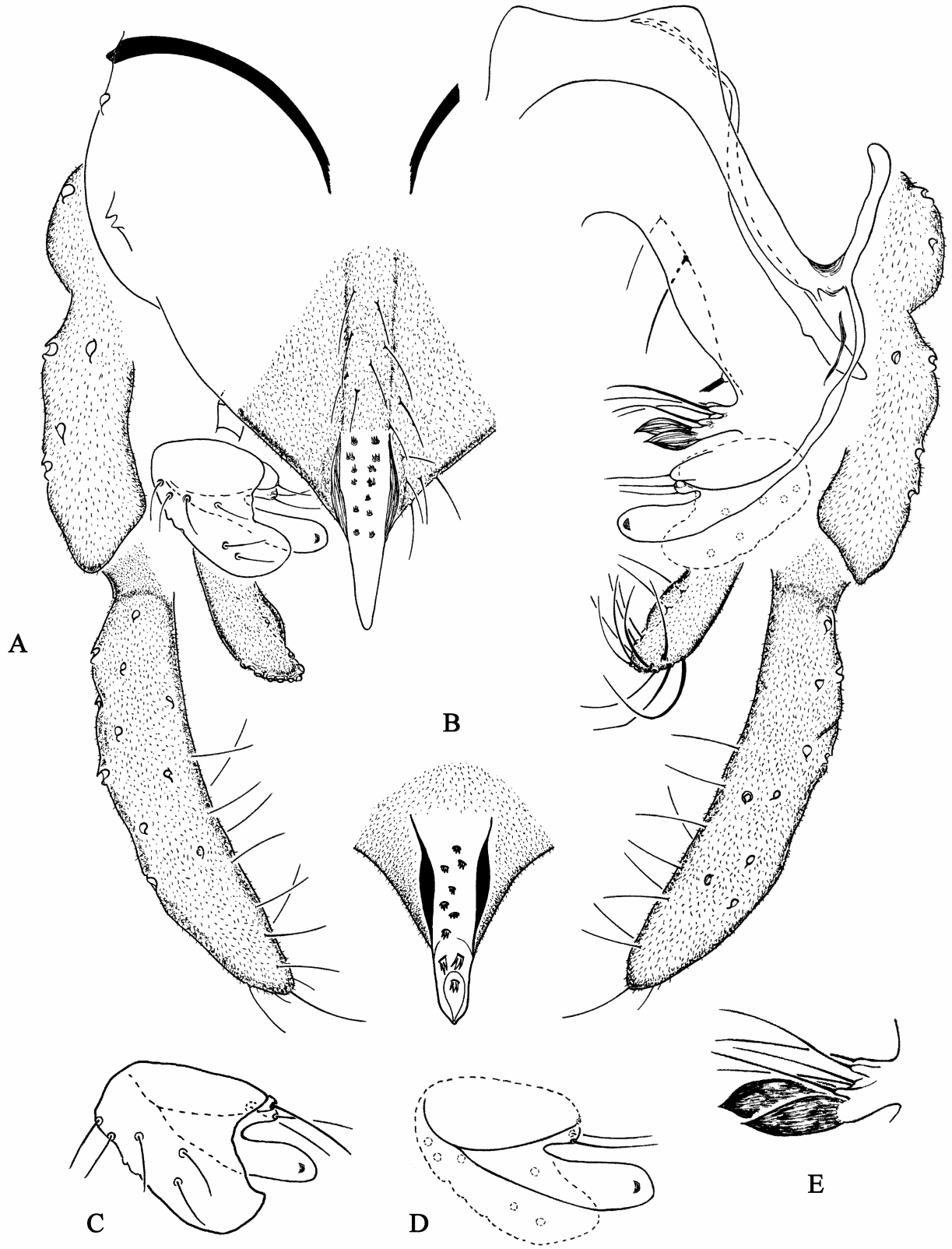



**Fig. 17.** ***Tanytarsus clivosus*** **Reiss, adult male. A: Hypopygium, dorsal view. B: Anal point variation. C: Superior volsella and digitus. D: Digitus. E: Median volsella.**

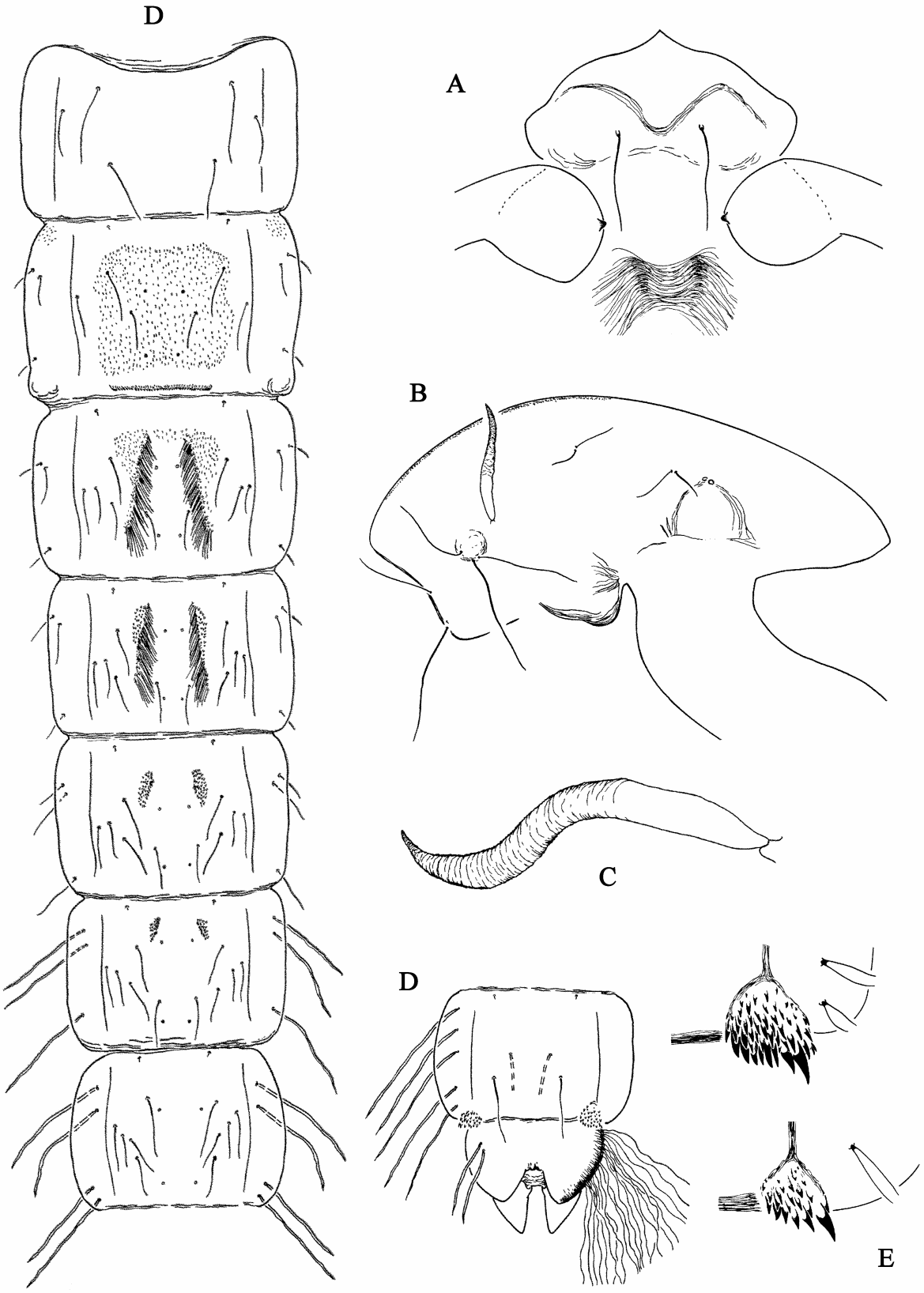



**Fig. 18.** ***Tanytarsus clivosus*** **Reiss, pupa. A: Frontal apotome. B: Thorax. C: Thoracic horn. D: Abdomen, dorsal view. E: Posterolateral comb of abdominal segment VIII, variation.**

### *Tanytarsus hamatus* Reiss, 1972

(Figs 19-20)

Type material. Holotype [not examined]: 1 adult male, South Chile, Lago Llanquihue, close to mouth of Rio Bianco, marginal vegetation, collected with hand-net, 25.XI.1969, slide mounted in Euparal, leg. L. Brundin (NHRS). Paratypes [examined]: 1 adult male as holotype; 2 adult males, South Chile, Rio Petrohue, margin, at light, 12.I.1954, slides mounted in Euparal, leg. L. Brundin; 3 pupal exuviae on same slide, South Chile, Peulla, Lago Todos los Santos, surface drift, 5.XII.1969, slide mounted in Euparal, leg. F. Reiss; 1 male imago and 1 female pupal exuviae on same slide, Argentina, Bariloche, Arroyo Nireco, 28.I.1954, slide mounted in Euparal, leg. L. Brundin (all paratypes in ZSM).

Additional material examined: 1 adult male, South Chile, Chiloé Island, Rio Puntra, 3 km S of Degán, 42°10'S, 73°44'W, 31.I.1986, slide mounted in Euparal, leg. M. Spies; 1 male imago + pupal exuviae (on same slide) as previous; 5 adult males as previous except 100 m, 1.II.1986; 1 male imago + pupal exuviae (on same slide), Chile, Província Cantin, Rio Pirén, 4 km E of Rio Queule, drift (Nr. 17), 3.II.1986, slide mounted in Euparal, leg. M. Spies; 1 prepupa as previous (all ZSM).

**Diagnostic characters.** *Tanytarsus hamatus* can be separated from other *Tanytarsus* species by the following combination of characters.

**Male Imago:** Antennal ratio about 0.80; eyes with dorsomedian extension; small frontal tubercles; wing veins Sc and M bare; tergite IX with double lateral tooth and without microtrichia-free areas; anal tergal bands separate, curved, not running parallel and ending well anterior to anal point base; anal point elongate and pointed to slightly rounded at tip, with pair of well-developed anal crests, microtrichia absent; spines placed irregularly between the crests; superior volsella oval-circular, without microtrichia, posteromedian corner not projecting; longitudinal axes of superior volsella and body at angle of about 42°; digitus long and finger-like, extending well beyond margin of superior volsella, with one seta on base and with a small sclerotized spot close to apex; median volsella short, with foliate lamellae, not reaching apex of inferior volsella; inferior volsella somewhat thick and straight, with some apically split setae, distal part with weakly developed dorsoapical swelling; gonostylus elongate, curved and somewhat thick; hypopygium ratio about 0.83.

**Pupa:** Frontal apotome smooth; frontal setae thick, cephalic tubercles weakly developed, area anterior to cephalic tubercles swelled; pedicel sheath tubercle absent; wing sheath with well-developed nose; prealar tubercle well developed, rectangular and inwardly folded; thoracic horn smooth and somewhat thin; three precorneals not in triangular pattern, $Pc_1$ placed on a tubercle,

$Pc_2$ and $Pc_3$ placed close to each other on margin of tubercle, $Pc_2$ thicker and longer; 1 median and 2 lateral antepronotals; precorneals and antepronotals long and strong; 2 pairs of dorsocentrals, each pair with 1 seta thin and 1 thick; hook row about 1/2-1/3 width of abdominal segment II; Pedes Spurii B weakly developed on abdominal segment II; tergites I, VII-IX without armament; tergite II with homogeneous shagreen; T III with pair of long bands of longer spines and anteromedian field of spinules, bands more than 1/2 length of tergite; T IV with pair of long bands of longer and shorter spines and field of spinules on anterolateral side of each band, bands more than 1/2 length of tergite; T V with anterior pair of elongate patches of spines; T VI with anterior pair of oval patches of spines; pleuron of segments I and II with small spinules; posterolateral comb of segment VIII broad, with 5-11 strong marginal teeth and 33-62 smaller one; abdominal segment I with 2 dorsal taeniae and without lateral setae; segments II-VI with 3 lateral setae; segment VII with variable number of lateral setae and taeniae, but always totaling 4; segment VIII with 5 lateral taeniae and 1 ventral taenia; anal lobe with some granulations, anal fringe with about 70 taeniae.

**Description**

**Male Imago (n=6)**

**Head.** AR 0.78-0.85. Antennal flagellomeres one to twelve 502-540 µm long, thirteen 400-462 µm long, total length 902-1002 µm. Eyes with dorsomedian extension; frontal tubercles small (length 7-10 µm), about 1.5-2 times as long as wide; 9-10 temporals; clypeus with 12-13 setae; lengths of palpal segments (in µm): 30-32, 40-42, 102-114, 110-120, 178-194, total length 460-500 µm.

**Thorax.** Length 800-1050 µm. Scutal tubercle absent; 8-11 dorsocentrals, 10-15 acrostichals, 1 prealar, 4-6 scutellars. Halteres with 8 setae.

**Wing.** Wing length 1762-1810 µm, width 495-512 µm; L/WR 3.53-3.55. Brachiolum with 1 seta setae, Sc bare, R with 21-26 setae, $R_1$ with 24-27 setae, $R_{4+5}$ with 46-67 setae, M bare, $M_{1+2}$ with 66-78 setae, $M_{3+4}$ with 38-42 setae, Cu with 23-26 setae, $Cu_1$ with 22-24 setae, Postcubitus with 36-42 setae and An with 36-38 setae. Cell m with 8-11 setae (+ 14-18 setae on false vein), $r_{4+5}$ with about 190-more than 200 setae, $m_{1+2}$ with about 180-more than 200 setae (+ 50-56 setae on false vein), $m_{3+4}$ with about 100-120 setae, cu with 65-75 setae and an with 80-about 100 setae.

**Legs.** Foreleg bearing single tibial spur (32-34 µm). Lengths of combs of mid tibia 12-14 µm (with 20-22 µm long spur) and 14-15 µm (with 30-32 µm long spur); lengths of combs of hind tibia 16 µm (with 32 µm spur) and 17 µm (with 34 µm long spur).

Lengths of segments (in µm):

| | fe | ti | $ta_1$ | $ta_2$ | $ta_3$ | $ta_4$ | $ta_5$ | Total length |
|---|---|---|---|---|---|---|---|---|
| $P_1$ | 740-890 | 380-495 | 972-1170 | 508-600 | 402-485 | 300-380 | 130-150 | 3434-3709 |
| $P_2$ | 758-900 | 584-725 | 360-445 | 218-270 | 155-200 | 86-125 | 70-95 | 2249-2253 |
| $P_3$ | 850-990 | 760-940 | 545-645 | 344-410 | 260-315 | 150-170 | 90-100 | 2999-3194 |

Leg ratios:

| | LR | BV | SV |
|---|---|---|---|
| $P_1$ | 2.55-2.66 | 1.50-1.55 | 1.13-1.15 |
| $P_2$ | 0.61 | 3.08-3.20 | 3.70-3.72 |
| $P_3$ | 0.71-0.73 | 2.55-2.58 | 2.88-2.95 |

**Abdomen.** Length 2110-2600 µm.

**Hypopygium (Fig. 19 A-D).** Tergite IX 120-150 µm long with 8-10 median setae (not separated into groups, placed from well anterior to anal point base to close to anal point base, not placed between anal tergal bands), 16-21 apical setae and double, fork-like lateral tooth. T IX without microtrichia-free areas. Orolateral spine of laterosternite IX present, 3-4 µm. Anal tergal bands separate, curved, short, not running parallel and ending well anterior to anal point base. Anal point 58-70 µm long, elongate and pointed to slightly rounded at tip, with pair of well-developed anal crests (41-52 µm long) extending posterior to tergite IX; microtrichia absent; spines placed irregularly between the crests. Superior volsella oval-circular, without microtrichia, with 2-3 wrinkles on lateral margin; anterior, lateral and posterior margins curved, median margin somewhat straight and posteromedian corner not projecting; 5-7 setae on dorsal surface, 1 seta on median margin and 1 seta on ventral tubercle. Longitudinal axes of superior volsella and body at angle of 41-43°. Digitus long and finger-like, extending well beyond margin of superior volsella, with one seta on base and with a small sclerotized spot close to apex. Median volsella 16-17 µm long with 18-24 µm simple setae and 17-20 µm foliate lamellae, not reaching apex of inferior volsella. Inferior volsella 81-96 µm long, somewhat thick and straight, with some apically split setae, distal part with weakly developed dorsoapical swelling. Gonocoxite length

110-126 µm; gonostylus 120-135 µm, elongate, curved and somewhat thick; hypopygium ratio (HR) 0.81-0.89.

**Pupa (n=6)**

Total length 3490-4520 µm.

Pupal exuviae pale yellow to brownish-yellow, thorax and lateral muscle marks somewhat brownish.

**Cephalothorax (Fig. 20 A-C).** Frontal apotome smooth. Frontal setae thick, 90-110 µm long, mounted apical on weakly developed cephalic tubercles; frontal warts absent, area anterior to cephalic tubercles well swelled. Pedicel sheath tubercle absent. Thorax smooth, 900-1120 µm long, with few small points/teeth and granulations along median suture. Wing sheath with well-developed nose; prealar tubercle well developed, rectangular and inwardly folded. Thoracic horn smooth and somewhat thin, 270-378 µm long. Three precorneals not in triangular pattern, $Pc_1$ 140-178 µm, placed on a tubercle, $Pc_2$ and $Pc_3$ (344-380 µm and 300-340 µm respectively) placed close to each other on margin of tubercle, $Pc_2$ thicker and longer; 1 median (142-204 µm) and 2 lateral antepronotals (9-13 µm, 188-264 µm); 2 pairs of dorsocentrals, anterior pair 148-188 µm (thin) and 62-72 µm (thick), posterior pair 70-106 µm (thin) and 88-110 µm (thick).

**Abdomen (Fig. 20 D-E).** Total length 2560-3400 µm. Tergites I, VII-IX without armament. T II with field of spinules (homogeneous shagreen). T III with one pair of long bands of longer spines and anteromedian field of small and sparse spinules, bands more than 1/2 length of tergite. T IV with one pair of long bands of longer and shorter spines and spinules at anterolateral side of each band, bands more than 1/2 length of tergite. T V with one anterior pair of elongate patches of spines. T VI with one anterior pair of oval patches of spines. Sternites IV-VII without armament. S I-III with very fine shagreen, on S III sometimes absent. S VIII with fine anterolateral shagreen. Conjunctives unarmed. Pleuron of segment I with few small spinules posteriorly, pleuron of segment II with field of small spinules extending almost to posterior part. Hook row 170-265 µm, about 1/2-1/3 width of segment II. Pedes Spurii A absent; Pedes Spurii B present on segment II, weakly developed. Posterolateral comb of segment VIII broad, 83-100 µm wide, consisting of 5-11 strong marginal teeth and 33-62 smaller one. Abdominal setation: segment I with 2 dorsal taeniae and 1 dorsal seta, 0 L and 1 pair of ventral seta marks; segment II with 3 D

plus 2 dorsal seta marks, 3 L and 3 V plus 1 ventral seta mark; segments III-VI with 5 D plus 2 dorsal seta marks, 3 L and 5 V; segment VII with 5 D plus 2 dorsal seta marks, 1 L and 3 lateral taeniae/ 2 L and 2 lateral taeniae/ 3 L and 1 lateral taenia or 0 L and 4 lateral taeniae, and 5 V; segment VIII with 1 D, 5 lateral taeniae and 1 ventral taenia. Anal lobe well developed, with some granulations, with complete fringe of 62-80 taeniae in single row and two pairs of dorsal taeniae. Tergites II-VIII with O-setae.

**Distribution and ecological notes**

*Tanytarsus hamatus* is recorded from southern Chile and in the area of Bariloche, Argentina. The immature stages appear to live mainly in lakes, but they were also found in a small stream.

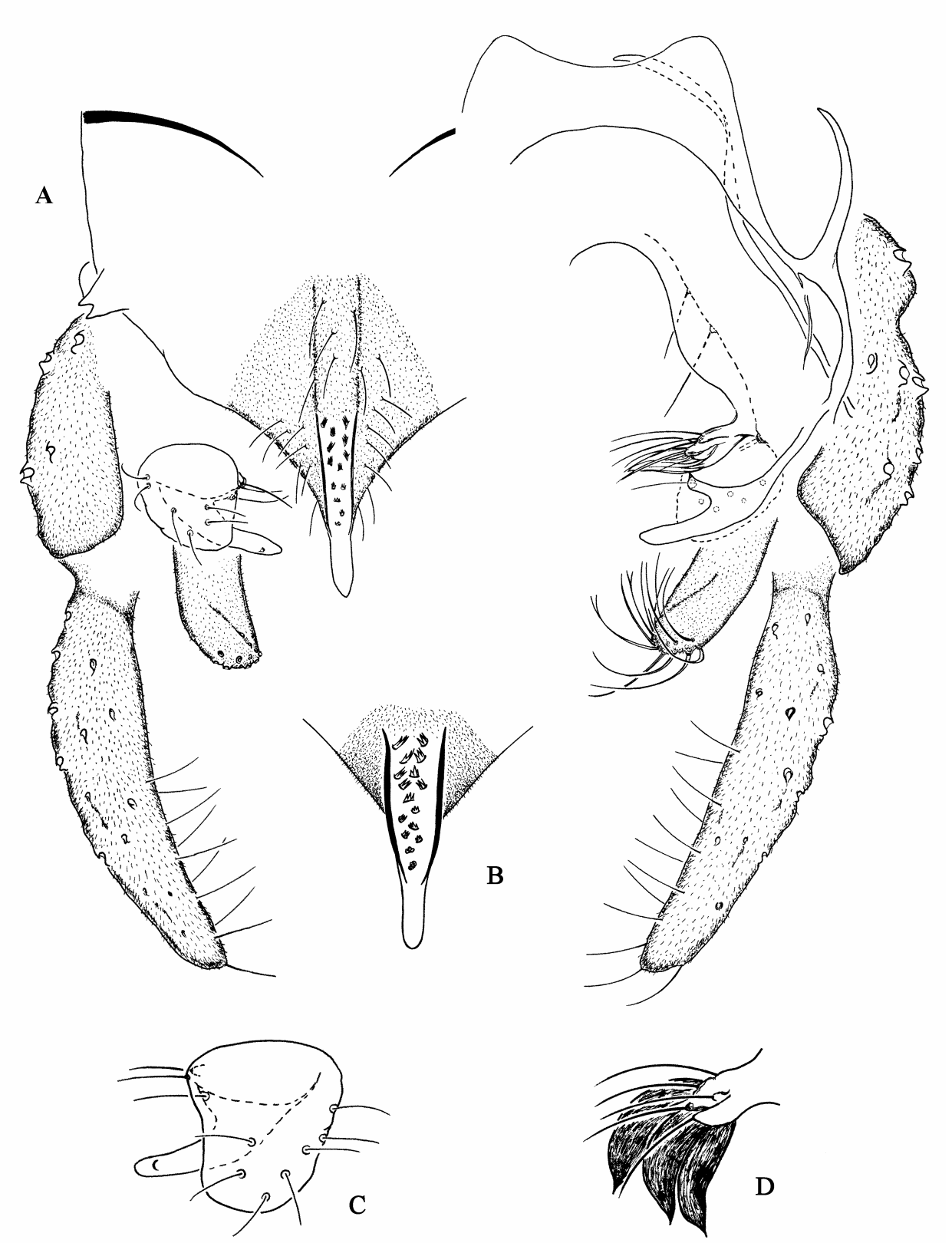



**Fig. 19.** ***Tanytarsus hamatus*** **Reiss, adult male. A: Hypopygium, dorsal view. B: Anal point. C: Superior volsella and digitus. D: Median volsella.**

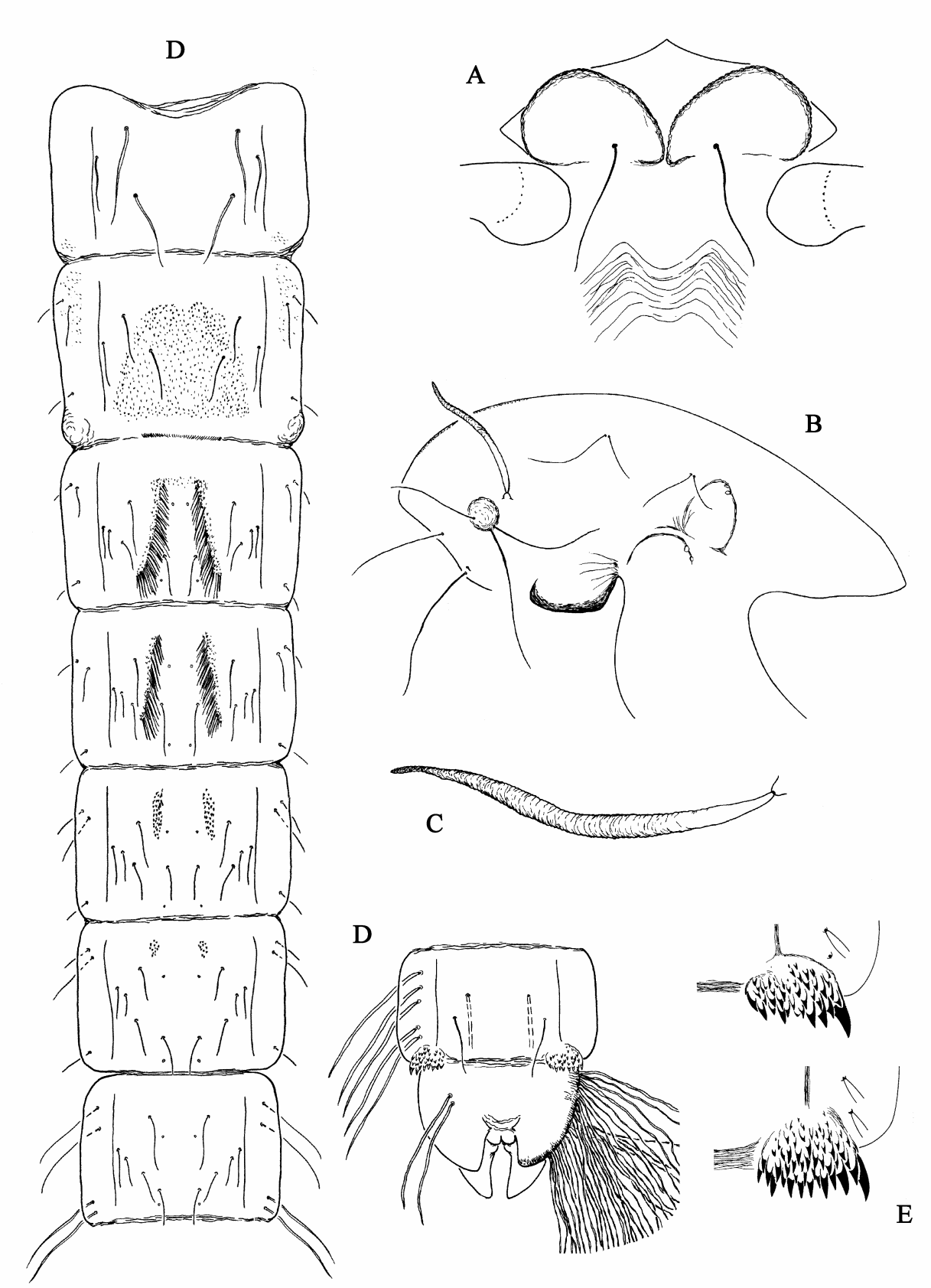



**Fig. 20.** ***Tanytarsus hamatus*** **Reiss, pupa. A: Frontal apotome. B: Thorax. C: Thoracic horn. D: Abdomen, dorsal view. E: Posterolateral comb of abdominal segment VIII, variation.**

**Discussion about *Tanytarsus clivosus* and *Tanytarsus hamatus*, including some comments on the European *Tanytarsus chinyensis* and the Neotropical *Tanytarsus riopreto* species groups**

*Tanytarsus clivosus* corresponds to the species cited by Brundin (1956) under the name *Tanytarsus rothi*, but since no valid description took place, *T. rothi* is to be viewed as nomen nudum (Reiss 1972; Spies & Reiss 1996). Brundin (1956) mentioned that *Tanytarsus rothi* is similar to *Tanytarsus lugens* Kieffer, 1916 and *Tanytarsus bathophilus* Kieffer, 1911; however, except for the presence of spines on the anal point, *T. clivosus* does not resemble *T. lugens* or *T. bathophilus*.

Reiss (1972) considered *T. clivosus* and *T. hamatus* to be closely related. The adult males of both species share similarities such as low antennal ratio, number of setae on wing veins and cells, anal tergite with double lateral tooth and without microtrichia-free areas, form and armament of anal point, absence of microtrichia on superior volsella, digitus development, presence of seta on digitus, presence of foliate lamellae on median volsella and form of gonostylus. *Tanytarsus clivosus* can be separated from *T. hamatus* by the length of frontal tubercles (large in *T. clivosus*, small in *T. hamatus*), by the form of anal tergal bands (in *T. clivosus* running parallel on middle of tergite, in *T. hamatus* shorter and not running parallel), form of superior volsella (heart-shaped in *T. clivosus*, oval-circular in *T. hamatus*) and form of digitus (thumb-like in *T. clivosus*, finger-like in *T. hamatus*).

The pupae of both species are more or less similar, differing in the number of lateral taeniae on abdominal segments, presence/absence of pedicel sheath tubercle and frontal apotome design. *Tanytarsus clivosus* has 5 lateral taeniae on segment VIII, 4 on VII and 3 on VI. *Tanytarsus hamatus* also has 5 on segment VIII, but a variable number (always 4 setae, but varying intraspecifically in strength) of lateral taeniae on VII and 3 lateral setae (not taeniae) on VI. *Tanytarsus clivosus* shows a well-developed pedicel sheath tubercle (Fig. 18 A), which is absent in *T. hamatus* (Fig. 20 A). Moreover, the area anterior to cephalic tubercles is slightly swelled in *T. clivosus* (Fig. 18 A), while in *T. hamatus* the area anterior and around cephalic tubercles is strongly swelled (Fig. 20 A).

*T. clivosus* and *T. hamatus* have been the only species in the Neotropics presenting seta on digitus base so far (Figs 17 and 19, respectively). Reiss and Fittkau (1971) described the occurrence of one seta on the digitus base of *Tanytarsus chinyensis* Goetghebuer, 1934 (Fig. 21 B), member of the *chinyensis* species-group Reiss & Fittkau. The authors mentioned that this feature does not occur in any other European *Tanytarsus*. In fact, the presence of seta on digitus can be observed in other species of the *chinyensis* group too, as in *Tanytarsus brundini*

Lindeberg, 1963, *Tanytarsus cretensis* Reiss, 1987 (Fig. 22 B) and *Tanytarsus curticornis* Kieffer, 1911. Ekrem (2001), in his review of Afrotropical *Tanytarsus*, commented on the presence of one seta on the digitus of *Tanytarsus congus* Lehmann, 1981, *Tanytarsus pseudocongus* Ekrem, 1999 and *Tanytarsus trifidus* Freeman, 1958, and argued that the three species key to the *chinyensis* group. Ekrem (2001) examined material of *T. brundini*, *T. chinyensis*, *T. cretensis* and *T. curticornis*, and also confirmed the presence of seta on digitus; the author stated that this feature together with the presence of two setae on the median margin of the superior volsella might be diagnostic characters for the *T. chinyensis* species group. In his posterior work about the South- and East Asian *Tanytarsus*, Ekrem (2002) described the presence of seta on the digitus of *Tanytarsus akantertius* Sasa & Kamimura, 1987, keying the species to the *chinyensis* group. Ekrem (2002) also keyed *Tanytarsus tusimatneous* Sasa & Suzuki, 1999 to the *chinyensis* group despite the absence of seta on digitus.

Among the species of the *chinyensis* group, adult males of *T. chinyensis* (Fig. 21) and *T. cretensis* (Fig. 22) are similar to *T. clivosus* in having (in addition to the presence of seta on digitus) a more or less heart-shaped superior volsella, a long and thumb-like digitus, a short median volsella, foliate lamellae on median volsella, and anal tergal bands, inferior volsella and gonostylus of similar design. The anal point armament of the three species is similar, but its form is different - the anal point of *T. clivosus* and *T. cretensis* is pointed at tip, while in *T. chinyensis* it is rounded/ slightly quadrate at tip.

The pupae of *T. chinyensis* (Fig. 21 D), *T. clivosus* (Fig. 18 A) and *T. hamatus* (Fig. 20 A), as well as *Tanytarsus palettaris* Verneaux, 1969 (Fig. 23 C), which is also a member of the *T. chinyensis* group, show a pair of rounded swellings anterior and close to cephalic tubercles. However, except for sharing a similar frontal apotome design, pupa of *T. chinyensis* differs from those of *T. clivosus* and *T. hamatus*.

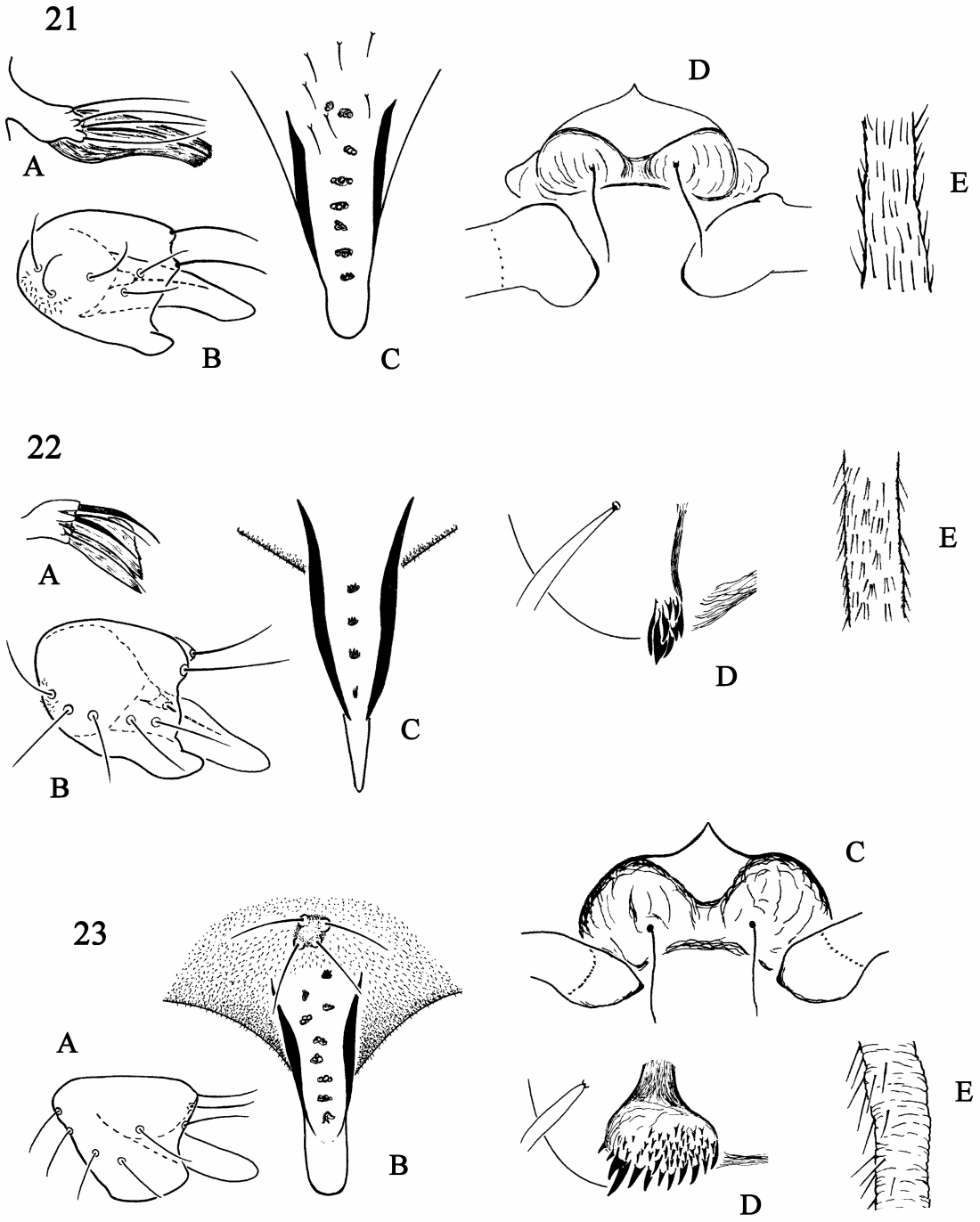
Thus, adult males of *T. clivosus* key to the *T. chinyensis* species group (Cranston *et al.* 1989) and fit the group diagnosis (Reiss & Fittkau 1971) except for having large frontal tubercles. *Tanytarsus hamatus* adult males also key to the *T. chinyensis* species group and fit the group diagnosis.

Sublette & Sasa (1994) argued the placement of *T. clivosus* and *T. hamatus* in the *Tanytarsus riopreto* species group (Fittkau & Reiss 1973), but the adult males of both species do not fit well the group diagnosis (see more comments under the *riopreto* group discussion). Pupae of *T. clivosus* and *T. hamatus* also do not fit well the proposed diagnosis of Sanseverino & Wiedenbrug (2000). The authors stated that the combination of 2 taeniate dorsal setae (or true taeniae) on abdominal segment I, 3 taeniae on segment VIII and a broad anal comb could be

diagnostic for the group. The pupae of *T. clivosus* and *T. hamatus* show two taeniate D-setae on tergite I and *T. hamatus* has a somewhat broad anal comb, but the *T. clivosus* comb is narrower and both species have 5 lateral taeniae on segment VIII.

Sublette & Sasa (1994) discussed the similarity of *Tanytarsus clivosus* with *Tanytarsus pandus* Sublette & Sasa. The authors discussed that *T. pandus* differs from *T. clivosus* in having a thin digitus and more basal spines on the anal point. After studying material of *T. pandus*, the species also differs in the length of frontal tubercles (small in *T. pandus*), form of anal tergal bands and superior volsella, presence of microtrichia on lateral margin of superior volsella and by the absence of seta on digitus. In fact, *T. clivosus* shares only few similarities with *T. pandus*, such as wing with many setae (except for vein M, in *T. pandus* with setae, in *T. clivosus* bare), anal point sharp at tip, and short median volsella with foliate lamellae

A certain placement of *Tanytarsus clivosus* and *T. hamatus* has to await a phylogenetic analysis of the Neotropical species including also some European groups.




**Figs 21-23. Members of the European *Tanytarsus chinyensis* species group. 21. *Tanytarsus chinyensis* Goetghebuer, A-C adult male, D-E pupa. A: Median volsella. B: Superior volsella and digitus. C: Anal point. D: Frontal apotome. E: Detail of thoracic horn armament. 22. *Tanytarsus cretensis* Reiss, A-C adult male, D-E pupa. A: Median volsella. B: Superior volsella and digitus. C: Anal point. D: Posterolateral comb of abdominal segment VIII. E: Detail of thoracic horn armament. 23. *Tanytarsus palettaris* Verneaux, A-B adult male, C-E pupa. A: Superior volsella and digitus. B: Anal point. C: Frontal apotome. D: Posterolateral comb of abdominal segment VIII. E: Detail of thoracic horn armament.**

### *Tanytarsus capitatus* Sublette & Sasa, 1994

(Fig. 24)

Type material. Holotype [examined]: 1 adult male, Guatemala, Medio Monte, 3.II.1981, no. 22a (V-42), slide mounted in gum arabic-chloral (Collection of J. E. Sublette).
Further material examined: 1 adult male, Costa Rica, Baura, XII.1990, slide mounted in Euparal, leg. H. W. Riss (ZSM).

**Diagnostic characters.** The male imago of *Tanytarsus capitatus* can be separated from other *Tanytarsus* species by the following combination of characters. AR about 0.79; eyes with dorsomedian extension; small frontal tubercles; wing vein M and all other veins with setae, Sc bare; all wing cells (except r, "sc" and "cell between $R_1$ and $R_{4+5}$") with many setae; tergite IX without microtrichia-free areas and with double lateral tooth; anal tergal bands separate, curved, running parallel on middle of tergite and ending well anterior to anal point base; anal point elongate and oval at tip, with spines placed in a more or less regular row between well-developed anal crests and few microtrichia on the surface between the crests, mostly anterior; superior volsella with field of microtrichia on lateral and median margins, anterior part ovoid, posterior part elongate and projecting; longitudinal axes of superior volsella and body at angle of about 37°; digitus long and finger-like, extending well beyond margin of superior volsella; median volsella with foliate lamellae, not reaching apex of inferior volsella; inferior volsella elongate, thin and curved, distal part (area carrying setae) slightly wider, with weakly developed dorsoapical swelling; gonostylus elongate, curved and thin; hypopygium ratio about 0.80.

**Description**

**Male Imago (n=2)**

**Head.** AR 0.72-0.86. Antennal flagellomeres one to twelve 590-596 µm long, thirteen 430-518 µm long, total length 1020-1114 µm. Eyes with dorsomedian extension; frontal tubercles present, small (length 3 µm); 9 temporal setae; clypeus with 12-16 setae; lengths of palpal segments (in µm): 30, 37, 142, 140, 235, total length 584 µm.
**Thorax.** Length 1000-1010 µm. Scutal tubercle absent; 11 dorsocentrals, 20-24 acrostichals, 2-3 prealars, 4 scutellars. Halteres with 6-7 setae.

**Wing.** Wing length 1860-2400 µm, width 540-710 µm; L/WR 3.3-3.4. Brachiolum with 1 seta, Sc bare, R with 37-52 setae, $R_1$ with 56-79 setae, $R_{4+5}$ with 78-110 setae, M with 1-3 setae, $M_{1+2}$ with 78-86 setae, $M_{3+4}$ with 60-67 setae, Cu with 39-44 setae, $Cu_1$ with 30-32 setae, Postcubitus with 57-65 setae and An with 60-84 setae. Cell m with 36-59 setae (+15-20 setae on false vein), $r_{4+5}$ with more than 150 setae, $m_{1+2}$ with more than 150 setae (+53-60 setae on false vein), $m_{3+4}$ with more than 150 setae, cu with about 130 setae and an with about 120 setae.

**Legs.** Foreleg bearing single tibial spur (24 µm). Lengths of combs of mid tibia 20 µm (with 32 µm long spur) and 22 µm (with 40 µm long spur); lengths of combs of hind tibiae 21 µm (with 38 µm spur) and 22 µm (with 47 µm long spur).

Lengths of segments (in µm):

| | fe | ti | $ta_1$ | $ta_2$ | $ta_3$ | $ta_4$ | $ta_5$ | Total length |
|---|---|---|---|---|---|---|---|---|
| $P_1$ | 926-1140 | 584-700 | 1320-1660 | 600-726 | 496-600 | 396-500 | 162-200 | 4484-5526 |
| $P_2$ | 920-1145 | 700-880 | 480-600 | 240-310 | 180-250 | 100-140 | 78-100 | 2698-3425 |
| $P_3$ | 980-1280 | 882-1100 | 640-810 | 384-490 | 330-445 | 200-260 | 100-112 | 3516-4497 |

Leg ratios:

| | LR | BV | SV |
|---|---|---|---|
| $P_1$ | 2.26-2.37 | 1.71-1.72 | 1.10-1.14 |
| $P_2$ | 0.68 | 3.28-3.51 | 3.37 |
| $P_3$ | 0.72-0.73 | 2.44-2.46 | 2.90-2.93 |

**Abdomen.** Length 2540-2600 µm.

**Hypopygium (Fig. 24 A-C).** Tergite IX 146-151 µm long with 6-8 median setae (not placed between anal tergal bands, not separated into groups, placed from well anterior to anal point base to close to anal point base), 22-28 apical setae and double, fork-like lateral tooth. T IX without microtrichia-free areas. Orolateral spine of laterosternite IX present, 5 µm long. Anal tergal bands separate, curved, running parallel on middle of tergite and ending well anterior to anal point base. Anal point 60-75 µm long, elongate, posterior part oval, with a lateral constriction; pair of well-developed anal crests (35-48 µm long) extending posterior to tergite IX; few microtrichia present on the surface between the crests, mostly anterior; spines placed more or less linearly aligned between anal crests. Superior volsella with field of microtrichia on lateral and median margins; anterior part ovoid (margins curved), posterior part elongate, median

margin concave, posteromedian corner extremely projecting; 6-7 setae on dorsal surface, 2 setae on median margin and 1 seta on ventral tubercle, close to anterior margin. Longitudinal axes of superior volsella and body at angle of about 37°. Digitus long and finger-like, extending well beyond margin of superior volsella. Median volsella 24-28 µm long with 25-28 µm long simple setae and 26-28 µm long foliate lamellae, not reaching apex of inferior volsella. Inferior volsella 108-112 µm long, elongate, thin and curved, distal part (area carrying setae) slightly wider, with weakly developed dorsoapical swelling. Gonocoxite length 110-127 µm; gonostylus 140-152 µm, somewhat elongate, curved and thin; hypopygium ratio (HR) 0.78-0.83.

**Discussion**

Sublette & Sasa (1994) considered *Tanytarsus capitatus* to be a member of the *riopreto* group (Fittkau & Reiss 1973), but the species does not fit the group diagnosis. *Tanytarsus capitatus* has a distinct general hypopygium design (Fig. 24 A), the form and armament of the anal point are different, and the median volsella (Fig. 24 C) presents foliate lamellae (pectinate lamellae in *riopreto* species).

*T. capitatus* has a quite elongate and narrow anal point with spines placed regularly in one row between the anal crests. All other Neotropical *Tanytarsus* (except *T. amazonicus*) have spines placed irregularly. *Tanytarsus amazonicus* has spines placed regularly in one row, but does not share any other similarity with *T. capitatus* (even the form of spines and anal point of both species are not similar).

The form of *T. capitatus* superior volsella is peculiar (Fig. 24 B), the anterior part is ovoid and the posterior part is unusually elongate. The presence of microtrichia on lateral and median margins of the *T. capitatus* superior volsella is not usual - most Neotropical *Tanytarsus* with microtrichia on the superior volsella present this feature on the lateral margin. *Tanytarsus tumultuarius* also has microtrichia on lateral and median margins, but it does not have any other character in common with *T. capitatus*.

**Distribution and ecological notes**

*Tanytarsus capitatus* is recorded from Guatemala. The species was collected from onchocerciasis endemic areas in the volcanic zone of Escuintla (800-1200 m above sea level).

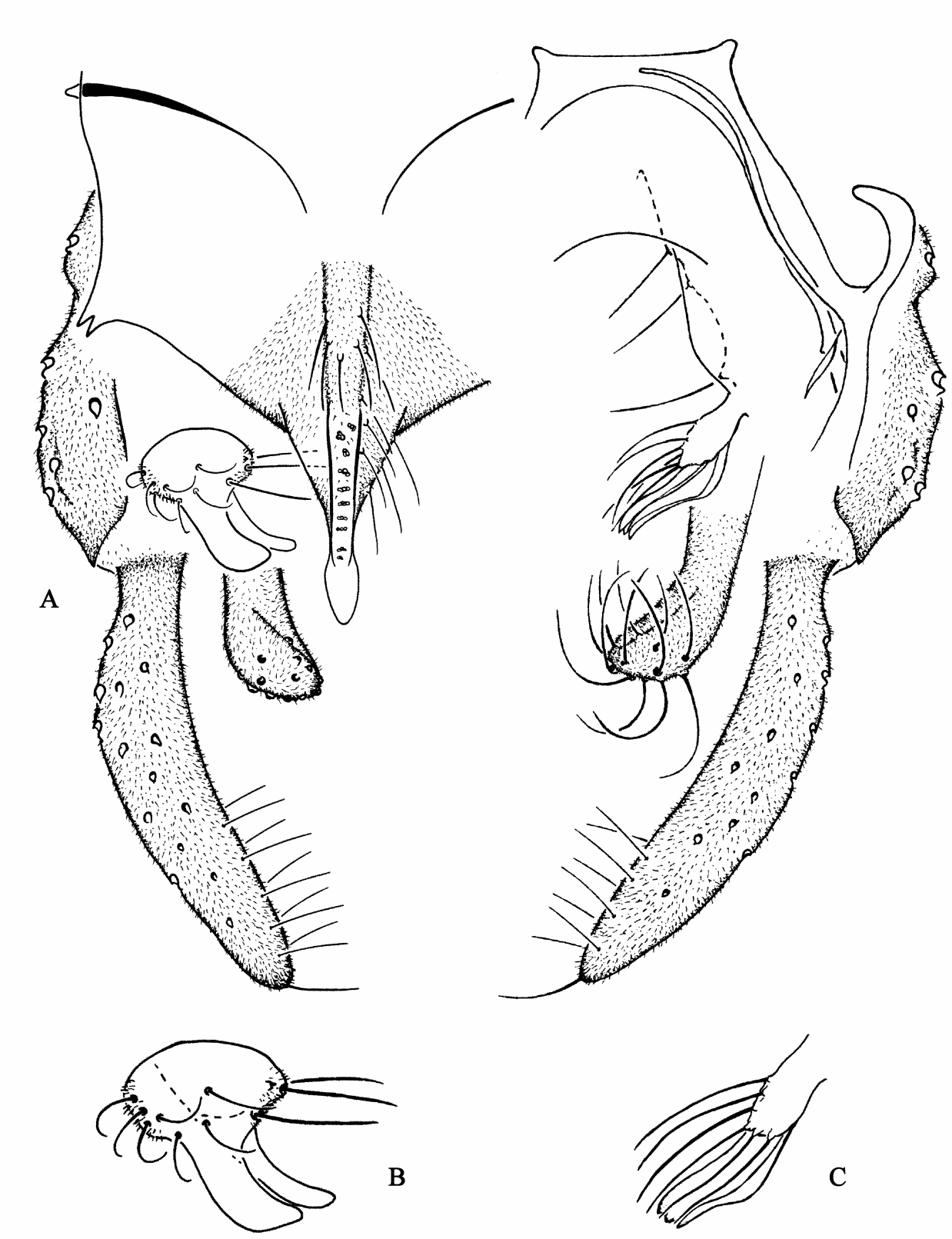



**Fig. 24.** ***Tanytarsus capitatus*** **Sublette & Sasa, adult male. A: Hypopygium, dorsal view. B: Superior volsella and digitus. C: Median volsella.**

### *Tanytarsus guatemalensis* Sublette & Sasa, 1994

(Fig. 25)

Type material. Holotype [examined]: 1 adult male, Guatemala, Medio Monte, 28.I.1981, slide mounted in gum arabic-chloral (Collection of J. E. Sublette).

**Diagnostic characters.** The male imago of *Tanytarsus guatemalensis* can be separated from other *Tanytarsus* species by the following combination of characters. AR 0.96; eyes with dorsomedian extension; small frontal tubercles; thorax with 2 supra-alars; wing veins Sc and M apparently bare, all other veins with setae; all cells (except r, "sc" and "cell between $R_1$ and $R_{4+5}$") with many setae; tergite IX without microtrichia-free areas; anal tergal bands separate, curved, short, not running parallel and ending well anterior to anal point base; anal point elongate and slightly pointed at tip, without microtrichia; anal crests and spines apparently present; superior volsella more or less heart-shaped, with field of microtrichia on lateral margin, posteromedian corner slightly projecting; longitudinal axes of superior volsella and body at angle of 53°; digitus long and thumb-like, extending well beyond margin of superior volsella; median volsella short, with subulate lamellae, not reaching apex of inferior volsella; inferior volsella somewhat thick and slightly curved, distal part (area carrying setae) slightly swelled; gonostylus somewhat elongate, straight and thick; hypopygium ratio about 0.92.

**Description**

**Male Imago (n=1)**

**Head.** AR 0.96. Antennal flagellomeres one to twelve 500 µm long, thirteen 480 µm long, total length 980 µm. Eyes with dorsomedian extension; frontal tubercles present, small (length 3 µm); temporal setae difficult to see, at least 8; clypeus with 15 setae; lengths of palpal segments (in µm): 36, 38, 104, 128, 222, total length 528 µm.

**Thorax.** Length difficult to measure. Scutal tubercle absent; 7-9 dorsocentrals, 20 acrostichals, 1 prealar, 2 supra-alars, 4 scutellars. Halteres with 7 setae.

**Wing.** Wing length about 1600 µm, width 460 µm; L/WR 3.47. Wing setae difficult to count, Brachiolum with 1 seta, Sc bare, R with 30 setae, $R_1$ with 32 setae, $R_{4+5}$ with 38 setae, M bare, $M_{1+2}$ with 44 setae, $M_{3+4}$ with 32 setae, Cu with 18 setae, $Cu_1$ with 22 setae, Postcubitus with 36

setae and An with 38 setae. Cell m with 14 setae (+13 setae on false vein), $r_{4+5}$ with more than 200 setae, $m_{1+2}$ with more than 150 setae (+42 setae on false vein), $m_{3+4}$ with about 130 setae, cu with about 72 setae and an with about 84 setae.

**Legs.** Foreleg bearing single tibial spur (25 µm). Lengths of combs of mid tibia 17 µm (with 32 µm long spur) and 18 µm (with 43 µm long spur); lengths of combs of hind tibiae 22 µm (with 50 µm spur) and 22 µm (with 54 µm long spur).

Lengths of segments (in µm):

| | fe | ti | $ta_1$ | $ta_2$ | $ta_3$ | $ta_4$ | $ta_5$ | Total length |
|---|---|---|---|---|---|---|---|---|
| $P_1$ | 862 | 390 | 1180 | 552 | 425 | 357 | 148 | 3914 |
| $P_2$ | 848 | 650 | 425 | 192 | 144 | 81 | 60 | 2400 |
| $P_3$ | 810 | 770 | 580 | 340 | 300 | 180 | 90 | 3070 |

Leg ratios:

| | LR | BV | SV |
|---|---|---|---|
| $P_1$ | 3.02 | 1.64 | 1.06 |
| $P_2$ | 0.65 | 4.03 | 3.52 |
| $P_3$ | 0.75 | 2.37 | 2.72 |

**Abdomen.** Length 2330 µm.

**Hypopygium.** Tergite IX 138 µm long with 3? median setae (not placed between anal tergal bands, not separated into groups, placed well anterior to anal point base), 14? apical setae (difficult to distinguish median and lateral/apical setae) and without lateral tooth. T IX without microtrichia-free areas. Orolateral spine of laterosternite IX absent. Anal tergal bands separate, curved, short, not running parallel and ending well anterior to anal point base. Anal point 29 µm long, elongate and slightly pointed at tip. According to the original description, anal crests and spines are absent; however, there are some processes on the anal point/ posterior area of T IX that could be interpreted as crest and spines (Fig. 25 B), or could be mounting artifact. Superior volsella (Fig. 25 A) more or less heart-shaped, with field of microtrichia on lateral margin; anterior, lateral and posterior margins curved, median margin concave, posteromedian corner slightly projecting; 6 setae on dorsal surface, 1 seta on median margin and 1 seta on ventral tubercle. Longitudinal axes of superior volsella and body at angle of 53°. Digitus long and thumb-like, extending well beyond margin of superior volsella. Median volsella short, 8-9 µm

long, with 10-13 µm subulate lamellae (Fig. 25 C), not reaching apex of inferior volsella. Inferior volsella 89 µm long, somewhat thick and slightly curved, distal part (area carrying setae) slightly swelled. Gonocoxite length 104 µm; gonostylus 112 µm, somewhat elongate, straight and thick; hypopygium ratio (HR) 0.92.

**Discussion**

According to the original description of *Tanytarsus guatemalensis*, anal crests and spines are absent on the anal point. However, there are some processes on the anal point/ posterior area of T IX that could be interpreted as crests and spines (Fig. 25 B), or could be mounting artifact. The presence of crests and spines on the anal point of *T. guatemalensis* was considered for the adult males' diagnostic key presented in this work.

Apparently the median volsella does not possess simple setae, all setae seem to be in fact subulate lamellae (Fig. 25 C).

Sublette & Sasa considered *T. guatemalensis* to be a member of the *riopreto* group (Fittkau & Reiss 1973), but the species does not fit the group diagnosis. The *T. guatemalensis* superior volsella is more or less heart-shaped (Fig. 25 A), as in the *riopreto* species, but the anal tergal bands are short and do not run parallel (in *riopreto* group they run parallel in the middle of tergite), the anal point shows a different form and armament, and the median volsella has subulate lamellae (pectinate lamellae in *riopreto* species).

**Distribution and ecological notes**

*Tanytarsus guatemalensis* is recorded from Guatemala. The species was collected from onchocerciasis endemic areas in the volcanic zone of Escuintla (800-1200 m above sea level).

### *Tanytarsus pandus* Sublette & Sasa, 1994

(Figs 26-27)

Type material. Holotype [examined]: 1 adult male, Guatemala, Medio Monte, no. 212 (IV-43), 28.I.1981, slide mounted in gum arabic-chloral. Allotype: 1 female [not examined] as holotype, mounted on same slide of holotype together with 1 fragmentary male and 4 pupal exuviae, and 3 pupal fragments of *T. hastatus*. Paratypes [examined]: 2 pupal exuviae as holotype except no. 212 (IV-42). All types at Collection of J. E. Sublette.

**Diagnostic characters.** *Tanytarsus pandus* can be separated from other *Tanytarsus* species by the following combination of characters.

**Male Imago:** AR 0.97; eyes with dorsomedian extension; small frontal tubercles; M vein with setae, Sc bare; tergite IX without microtrichia-free areas; anal tergal bands separate, curved, short, not running parallel and ending well anterior to anal point base; anal point elongate and pointed at tip, with pair of well-developed anal crests; without microtrichia between anal crests; spines placed irregularly between the crests; superior volsella more or less heart-shaped, with field of microtrichia on lateral margin, posteromedian corner projecting; longitudinal axes of superior volsella and body at angle of about 64°; digitus long and pointed, somewhat finger-like, extending well beyond margin of superior volsella; median volsella with foliate lamellae, not reaching apex of inferior volsella; inferior volsella thin and curved, distal part (area carrying setae) with weakly developed dorsoapical swelling; gonostylus somewhat elongate, straight and thin; hypopygium ratio about 0.95.

**Pupa:** Frontal setae thick, cephalic tubercles weakly developed; pedicel sheath tubercle well developed; thoracic horn thin, with few spinules; wing sheath with well-developed nose, prealar tubercle well developed, slightly rounded and inwardly folded; three precorneals not in triangular pattern, $Pc_3$ thicker and longer, basis of $Pc_2$ and $Pc_3$ almost fused; 2 pairs of dorsocentrals, each pair with one seta thicker and thinner, $Dc_4$ stronger than $Dc_{1-3}$; hook row about 1/3 width of abdominal tergite II; Pedes Spurii B well developed on segment II; abdominal tergites I, VII and VIII without armament; T II with median field of homogeneous shagreen; T III-IV with pair of elongate bands of longer spines and some spinules on anterolateral side of each band; T V with pair of spine bands, but not so developed as in T III-IV; T VI with small pair of rounded patches of spines; T IX with oral shagreen interrupted on middle; posterolateral comb of segment VIII somewhat broad, with 9-11 strong teeth on posterior margin and 26-43 smaller one; abdominal segment I without lateral seta, segments II-VII with 3 lateral setae, segment VIII with 4 lateral

taeniae in addition to 1 dorsal somewhat taeniate seta and 1 ventral taenia; anal fringe with about 40 taeniae.

**Description**

According to Sublette & Sasa (1994), *Tanytarsus pandus* has 12 antennal flagellomeres; after reviewing the holotype, the antenna of *T. pandus* has 13 antennal flagellomeres. Consequently, the AR value of *T. pandus* is 0.97 (and not 1.03 as pointed out by the authors).

**Male Imago (n=1)**

**Head.** AR 0.97. Antennal flagellomeres one to twelve 473 µm long, thirteen 462 µm long, total length 935 µm. Eyes with dorsomedian extension; small frontal tubercles (length 10 µm), about 2.5 times as long as wide; 9 temporal setae; clypeus with 14 setae; lengths of palpal segments (in µm): 35, 39, 106, 109, 148, total length 437 µm.

**Thorax.** Length 880 µm. Scutal tubercle absent; 10 dorsocentrals, 12 acrostichals, 2 prealars, 6 scutellars. Halteres setae difficult to see.

**Wing.** Wing length 1400 µm. Brachiolum with 1 seta, Sc bare, R with 36 setae, $R_1$ with 51 setae, $R_{4+5}$ with 86 setae, M with 10 setae, $M_{1+2}$ with 80 setae, $M_{3+4}$ with 41 setae, Cu with 25 setae, $Cu_1$ with 27 setae, Postcubitus with 55 setae and An with 43 setae. Cell m with 24 setae (+ 38 setae on false vein), $r_{4+5}$ with more than 150 setae, $m_{1+2}$ with more than 150 setae (+ 56 setae on false vein), $m_{3+4}$ with about 130 setae, cu with about 90 setae and an with about 110 setae.

**Legs.** Most of segments missing.

**Abdomen.** Length 1880 µm.

**Hypopygium.** Tergite IX 110 µm long with 12 median setae, apical setae difficult to see, at least 16, lateral tooth and orolateral spine of T IX difficult to see. T IX without microtrichia-free areas. Anal tergal bands separate, curved, short, not running parallel and ending well anterior to anal point base. Anal point (Fig. 26 B) 48 µm long, elongate and pointed at tip, with pair of well-developed anal crests (25 µm long) extending posterior to tergite IX; without microtrichia between the crests; spines placed irregularly between anal crests. Superior volsella (Fig. 26 A) more or less heart-shaped, with field of microtrichia on lateral margin; anterior, median, and posterior margins curved, median margin concave, posteromedian corner projecting; 4 setae on dorsal surface, 2 setae on median margin (1 dorsal and 1 on ventral tubercle) and 1 seta on ventral tubercle, the three close to

anterior margin. Longitudinal axes of superior volsella and body at angle of 63-65°. Digitus long and pointed, somewhat finger-like, extending well beyond margin of superior volsella. Median volsella (Fig. 26 C) 13-14 µm long with 21-25 µm long simple setae and 13-14 µm long foliate lamellae, not reaching apex of inferior volsella. Inferior volsella 84 µm long, thin and curved, distal part (area carrying setae) with weakly developed dorsoapical swelling. Gonocoxite length 93 µm; gonostylus 97 µm, somewhat elongate, straight and thin; hypopygium ratio (HR) 0.95.

**Pupa (n=2)**

Pupal exuviae pale yellow, thorax blackish-brown, lateral muscle marks somewhat brownish.

**Cephalothorax (Fig. 27 A-D).** Frontal apotome smooth. Frontal setae short, 43-47 µm long, mounted apical on weakly developed cephalic tubercles; frontal warts absent. Pedicel sheath tubercle well developed. Thorax smooth, with few small points along median suture. Wing sheath with well-developed nose, prealar tubercle well developed, slightly rounded and inwardly folded. Thoracic horn thin, 608-650 µm long, with few spinules. Three precorneals (length difficult to measure) not in triangular pattern, $Pc_3$ thicker and longer, basis of $Pc_2$ and $Pc_3$ almost fused; 1 median (117 µm) and 2 lateral antepronotals (1 difficult to measure, 1 seta mark); 2 pairs of dorsocentrals, anterior pair 90 µm (thin) and 64 µm (thick), posterior pair 75 µm (thin) and 137 µm (thick), $Dc_4$ stronger than other three dorsocentrals.

**Abdomen (Fig. 27 E-F).** Total length 3670 µm. Tergites I, VII and VIII without armament. T II with median field of homogeneous shagreen. T III-IV with pair of elongate bands of longer spines and some spinules on anterolateral side of each band. T V with pair of spine bands, but not so developed as in T III-IV. Tergite VI with small pair of rounded patches of spines. T IX with oral shagreen interrupted on middle. Armament of sternites difficult to see. Conjunctives and pleura unarmed. Hook row 200-240 µm, about 1/3 width of tergite II. Pedes Spurii A absent; Pedes Spurii B well developed on segment II. Posterolateral comb of segment VIII somewhat broad, 85-92 µm wide, with 9-11 strong teeth on posterior margin and 26-43 smaller one. Abdominal setation: segment I with 3 D, 0 L and 0 V, the more anterior and posterior D-seta stronger; segments II-VII with 3 lateral setae; segment VIII with 1 dorsal seta (somewhat taeniate), 4 lateral taeniae and 1 ventral taenia. Anal lobe well developed, with complete fringe of 38-42 taeniae in single row and with two pairs of dorsal taeniae. O-setae difficult to see.

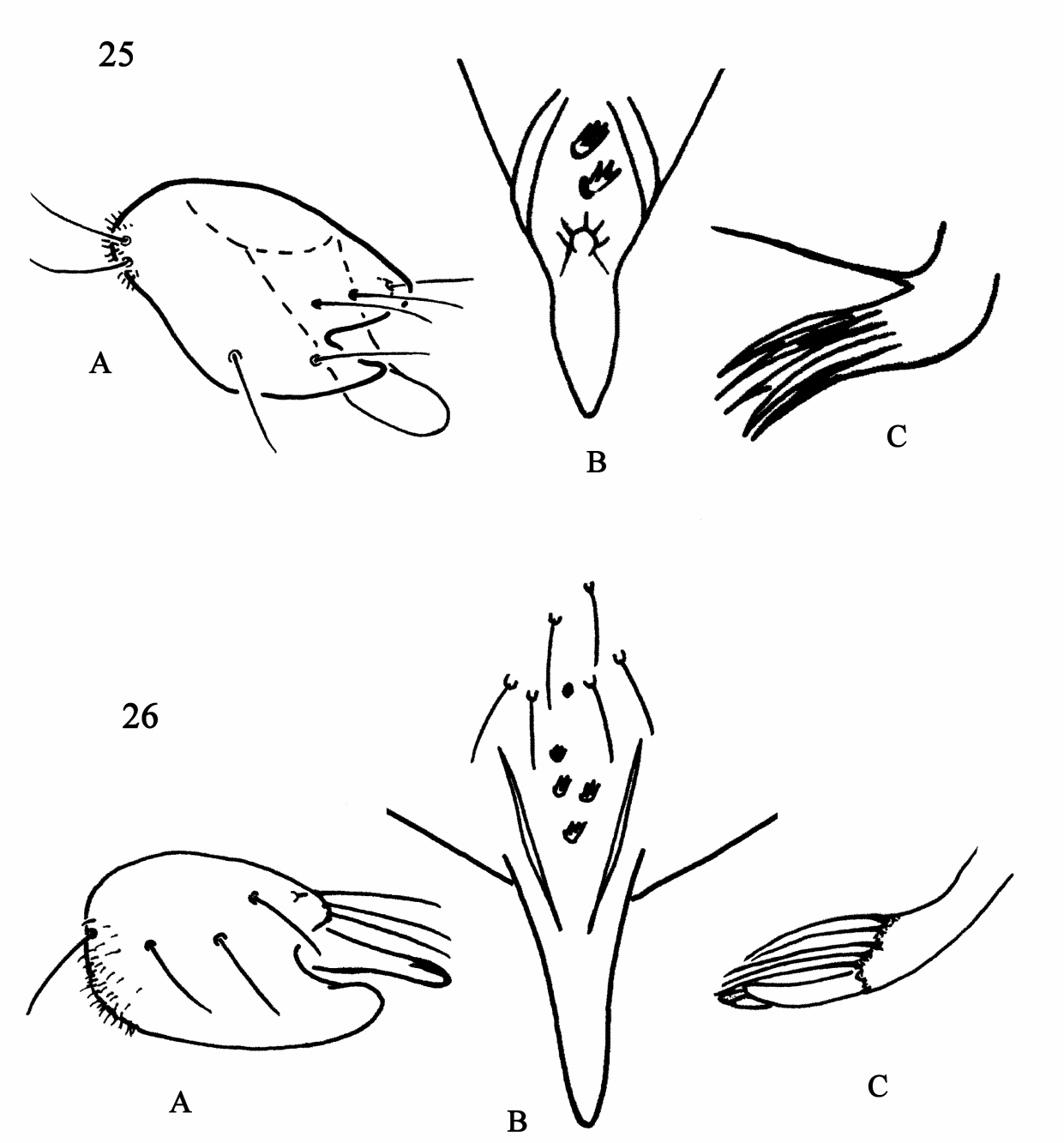
**Discussion**

Sublette & Sasa (1994) considered placing *Tanytarsus pandus* in the *Tanytarsus riopreto* species group (Fittkau & Reiss 1973), but the male adult does not fit the group diagnosis very well. The superior volsella is more or less heart-shaped (Fig. 26 A) and the spines on the anal point are placed irregularly (Fig. 26 B), as in the *riopreto* species, but the anal tergal bands are short and do not run parallel (in *riopreto* group they run parallel in the middle of tergite), and the median volsella (Fig. 26 C) has foliate lamellae (pectinate lamellae in *riopreto* group). The pupa of *T. pandus* does not fit well the group diagnosis proposed by Sanseverino and Wiedenbrug (2000). The *T. pandus* pupa has a somewhat broad anal comb (Fig. 27 F), but different in form compared to the comb of the *riopreto* species *T. cuieirensis* (Fig. 14 D) (Sanseverino & Wiedenbrug 2000). Besides, the dorsal setae of abdominal segment I (Fig. 27 E) are not taeniate (taeniae in *T. cuieirensis*, Fig. 14 B) and the segment VIII has 4 lateral taeniae (3 in *T. cuieirensis*).

Sublette & Sasa discussed the similarity of *Tanytarsus pandus* with *Tanytarsus clivosus*. Both species do not have many characters in common (see more comments under the *T. clivosus* discussion), and share only few similarities such as a wing with many setae (except for vein M, in *T. pandus* with setae, in *T. clivosus* bare), an anal point sharp at tip, and a short median volsella with foliate lamellae.

**Distribution and ecological notes**

*Tanytarsus pandus* is recorded from Guatemala. The species was collected from onchocerciasis endemic areas in the volcanic zone of Escuintla (800-1200 m above sea level).




**Figs 25-26. Adult males. 25. *Tanytarsus guatemalensis* Sublette & Sasa. A: Superior volsella and digitus. B: Anal point. C: Median volsella. 26. *Tanytarsus pandus* Sublette & Sasa. A: Superior volsella and digitus. B: Anal point. C: Median volsella.**

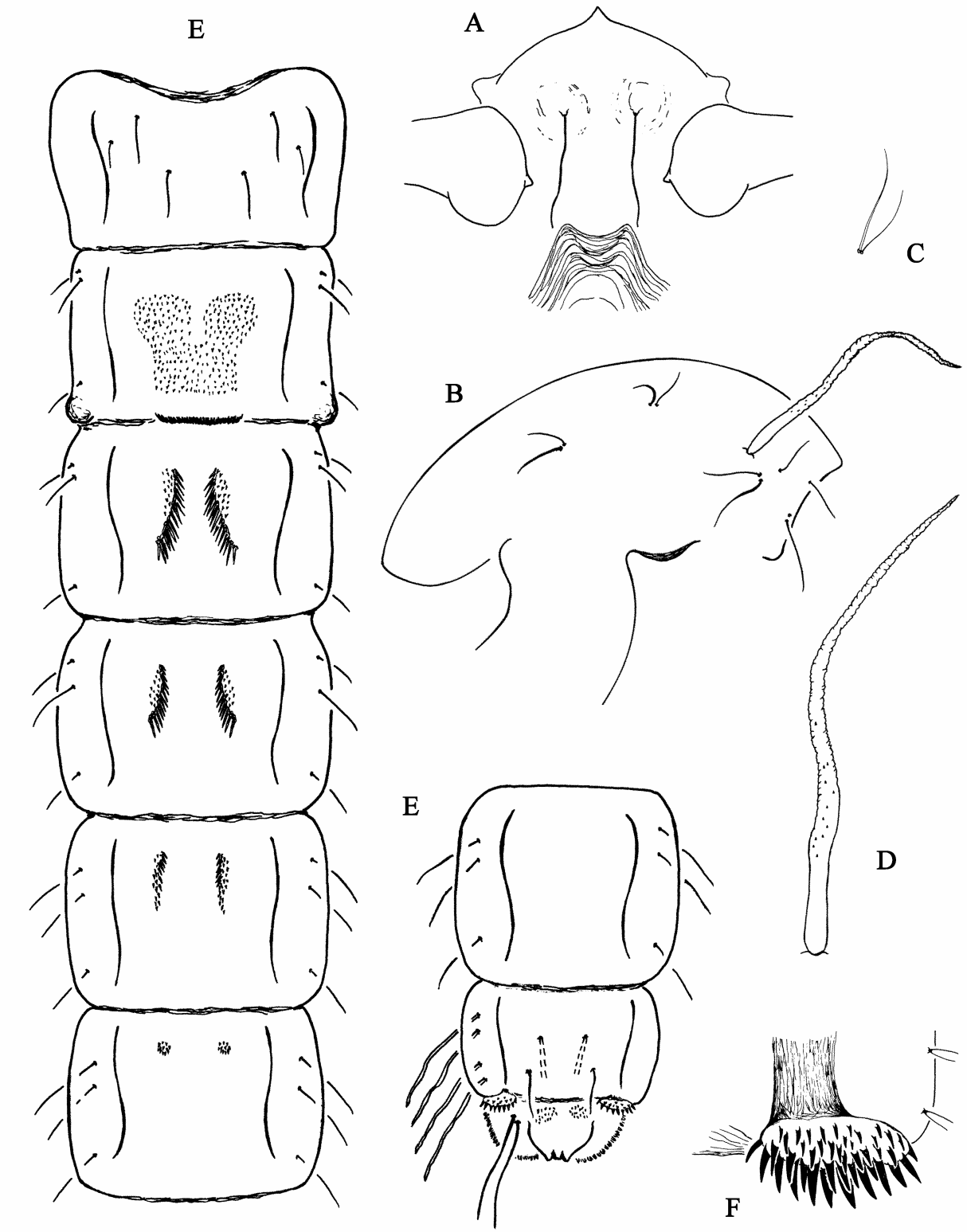



**Fig. 27. *Tanytarsus pandus* Sublette & Sasa, pupa. A: Frontal apotome. B: Thorax. C: $Dc_3$ and $Dc_4$. D: Thoracic horn. E: Abdomen, dorsal view; dorsal setae of segments II-VII not drawn. F: Posterolateral comb of abdominal segment VIII.**

### *Tanytarsus hastatus* Sublette & Sasa, 1994

(Figs 28-29)

Type material. Holotype [examined]: 1 adult male, Guatemala, Medio Monte, no. 205a (IV-39), 28.I.1981, slide mounted in gum arabic-chloral. Allotype: 1 female, pupal exuviae, collected with the holotype, no. 208c (IV-44). Paratype [examined]: 1 male as holotype except no. 205b (IV-38). All types at Collection of J. E. Sublette.

Further material examined: 2 adult males, Brazil, Pará, Belém, at light (sample A3-2), 26.VIII.1960, slides mounted in Canada balsam, leg. E. J. Fittkau; 4 pharate males, Brazil, Pará, Belém, 21.VI.1962, slides mounted in Canada balsam, leg. E. J. Fittkau (sample A391); 2 adult males, Brazil, Northeast, Manoel Tavaris, 01.IV.1935, slides mounted in Canada balsam, leg. F. Lenz; 1 adult male, Ecuador, Galapagos Islands, Isabela, Laguna del Cementerio, 1 m, ECU22, 07.XII.1992, slide mounted in Euparal, leg. H. Gerecke; 2 adult males, Panama, Barro Colorado Island, Allen, II-III.1986, slides mounted in Euparal, leg. H. Malicky; 1 adult male, Peru, San Pedro de Lloc, B6, 15.IV.1997, slide mounted in Euparal, leg. J. A. de Guerra; 1 adult male, USA, California, Coachella Valley, Wilshire, Palm Spring, V.1982, slide mounted in Euparal, leg. F. Bachmaier; 1 adult male, Venezuela, Llanos, Rio Portuguesa, 17.II.1973, slide mounted in Euparal, leg. F. Reiss; 1 adult male with associated pupal and larval exuviae, USA, California, Imperial Co. Wister Wildlife Refuge, small semi-permanent overflow pond, East of Salton Sea, 04.XI.1994, slide mounted in Euparal, leg. R. P. Meyer. All material deposited at ZSM.

**Diagnostic characters.** *Tanytarsus hastatus* can be separated from other *Tanytarsus* species by the following combination of characters.

**Male Imago:** AR about 1.12; eyes with dorsomedian extension; large frontal tubercles; M vein with setae, Sc bare; tergite IX without microtrichia-free areas and with double lateral tooth; anal tergal bands separate, curved, running parallel on middle of tergite and ending well anterior to anal point base; anal point robust and lanceolate, triangular at tip, with pair of well-developed anal crests; without microtrichia between anal crests; many small spines placed irregularly between the crests; superior volsella more or less circular, microtrichia absent, posteromedian corner well projecting; longitudinal axes of superior volsella and body at angle of about 58°; digitus long and pointed, finger-like, extending well beyond margin of superior volsella; median volsella with foliate lamellae, not reaching apex of inferior volsella; inferior volsella thin and somewhat straight, distal part (area carrying setae) with weakly developed oval dorsoapical swelling; gonostylus elongate, curved and slightly thick; hypopygium ratio about 0.90.

**Pupa:** Frontal setae thick, cephalic tubercles well developed, cone-shaped; pedicel sheath tubercle well developed; thoracic horn thin and smooth; wing sheath with well-developed nose, prealar tubercle well developed, somewhat rounded; three precorneals not in triangular pattern, $Pc_1$ stronger and mounted on a rounded tubercle, $Pc_2$ and $Pc_3$ closer to each other; 2 pairs of dorsocentrals, each pair with one seta thicker and one thinner, $Dc_4$ stronger than other Dcs; hook row about 1/3 width of abdominal tergite II; Pedes Spurii B well developed on segment II; abdominal tergites I, VI-VIII without armament; T II with anterior pair of rounded patches of spines and field of shagreen interrupted medially; T III with pair of long bands of longer spines and some spinules close to the bands; T IV with pair of elongate and slightly curved bands of spines, spines on anterior part longer; T V with pair of elongate and slightly curved bands of spines; T IX with oral shagreen; posterolateral comb of segment VIII with 5-6 strong teeth posteriorly and 7-13 smaller one; abdominal segment I without lateral seta, segments II-VII with 3 lateral setae, segment VIII with 4 lateral taeniae in addition to 1 dorsal taeniate seta and 1 ventral taenia; anal fringe with about 37 taeniae.

**Description**

The following description is complementary to Sublette & Sasa (1994); descriptions of colouration, distances and positions of some wing veins and cells as leg ratios are given by Sublette & Sasa.

**Male Imago (n=6)**

**Head.** AR 1.07-1.24 [n=10]. Antennal flagellomeres one to twelve 425-490 µm long, thirteen 464-564 µm long, total length 894-1054 µm. Eyes with dorsomedian extension; large frontal tubercles (length 18-24 µm), about 2.5-3 times as long as wide; 10-11 temporal setae; clypeus with 13-17 setae; lengths of palpal segments (in µm): 36-37, 38-40, 102-105, 107-115, 155-197, total length 444-488 µm.

**Thorax.** Length 780-920 µm. Scutal tubercle absent; 9-10 dorsocentrals, 14-18 acrostichals, 2 prealars, 4-6 scutellars. Halteres with 6 setae.

**Wing.** Wing length 1380-1560 µm, width 420-440 µm; L/WR 3.45-3.71. Brachiolum with 1 seta, Sc bare, R with 30 setae, $R_1$ with 27 setae, $R_{4+5}$ with 45 setae, M with 1-3 setae, $M_{1+2}$ with 50 setae, $M_{3+4}$ with 36 setae, Cu with 21 setae, $Cu_1$ with 20 setae, Postcubitus with 39 setae and An with 37 setae. Cell m with 18 setae (+13 setae on false vein), $r_{4+5}$ with more than 150 setae,

$m_{1+2}$ with more than 150 setae (+38 setae on false vein), $m_{3+4}$ with 95 setae, cu with 74 setae and an with 50 setae.

**Legs.** Foreleg bearing single tibial spur (22-32 µm). Lengths of combs of mid tibia 20-22 µm (with 28-32 µm long spur) and 21-23 µm (with 37-45 µm long spur); lengths of combs of hind tibiae 29-21 µm (with 35-36 µm spur) and 22-24 µm (with 42-50 µm long spur).

Lengths of segments (in µm):

| | fe | ti | $ta_1$ | $ta_2$ | $ta_3$ | $ta_4$ | $ta_5$ | Total length |
|---|---|---|---|---|---|---|---|---|
| $P_1$ | 720-924 | 340-400 | 1015-1210 | 534-600 | 436-478 | 358-376 | 150-165 | 3579-4153 |
| $P_2$ | 780-920 | 588-706 | 400-460 | 200-256 | 158-180 | 96-114 | 70-82 | 2297-2718 |
| $P_3$ | 800-976 | 780-876 | 528-616 | 306-360 | 278-320 | 167-200 | 96-112 | 2955-3460 |

Leg ratios:

| | LR | BV | SV |
|---|---|---|---|
| $P_1$ | 2.74-3.02 | 1.39-1.56 | 1.03-1.11 |
| $P_2$ | 0.63-0.68 | 3.30-3.38 | 3.37-3.58 |
| $P_3$ | 0.67-0.70 | 2.43-2.48 | 2.99-3.00 |

**Abdomen.** Length 2340-3300 µm.

**Hypopygium (Fig. 28 A-D).** Tergite IX 117-142 µm long with 4-8 median setae (not placed between anal tergal bands, not separated into groups, placed close to anal point base), 18-24 apical setae and with double lateral tooth. T IX without microtrichia-free areas. Orolateral spine of T IX absent. Anal tergal bands separate, curved, running parallel on middle of tergite and ending well anterior to anal point base. Anal point 53-70 µm long, robust and lanceolate, triangular at tip, with pair of well-developed anal crests (31-38 µm long) extending posterior to tergite IX; without microtrichia on surface between the crests; many small spines placed irregularly between anal crests. Superior volsella more or less circular, without microtrichia; anterior, and lateral margins curved, posterior margin curved to somewhat straight, median margin concave, posteromedian corner well projecting; 5-8 setae on dorsal surface, 2 setae on median margin (1 close to anterior margin) and 1 seta on ventral tubercle, close to anterior margin. Longitudinal axes of superior volsella and body at angle of 56-60°. Digitus long and pointed, finger-like, extending well beyond margin of superior volsella. Median volsella 14-22 µm long with 20-27 µm long simple setae and 20-26 µm long foliate lamellae, not reaching apex

of inferior volsella. Inferior volsella 82-98 µm long, thin and somewhat straight, distal part (area carrying setae) with weakly developed oval dorsoapical swelling. Gonocoxite length 92-110 µm; gonostylus 103-122 µm, elongate, curved and slightly thick; hypopygium ratio (HR) 0.88-0.91.

**Pupa (n=4)**

Total length 3240-4310 µm. Pupal exuviae pale, thorax and lateral muscle marks somewhat brownish.

**Cephalothorax (Fig. 29 A-B).** Frontal apotome smooth. Frontal setae thick, 90-125 µm long, mounted apically on well-developed cone-shaped cephalic tubercles; frontal warts absent. Pedicel sheath tubercle well developed. Thorax smooth, 880-960 µm long, with few small points along median suture. Wing sheath with well-developed nose; prealar tubercle well developed, somewhat rounded. Thoracic horn thin and smooth, 410-445 µm long. Three precorneals not in triangular pattern, $Pc_1$ stronger (112-148 µm) and mounted on a rounded tubercle/elevation, $Pc_2$ (90-107 µm) and $Pc_3$ (108-115 µm) closer to each other; 1 median (112-125 µm) and 2 lateral antepronotals (1 difficult to measure, 1 seta mark); 2 pairs of dorsocentrals, anterior pair 80-112 µm (thin) and 55-62 µm (thick), posterior pair 72-80 µm (thin) and 78-110 µm (thick), $Dc_4$ stronger than other three dorsocentrals.

**Abdomen (Fig. 29 C-D).** Total length 2360-3350 µm. Tergites I, VI-VIII without armament. T II with anterior pair of rounded patches of spines and field of shagreen interrupted medially. T III with a pair of long bands of longer spines and some spinules on anterolateral side of each band. T IV with pair of elongate and slightly curved bands of spines, spines on anterior part longer. T V with pair of elongate and slightly curved bands of spines. T IX with oral shagreen, sparse medially. Sternites I, IV-VII without armament. S I-VII apparently without armament. S VIII with fine oral-lateral shagreen. Conjunctives and pleura unarmed. Hook row 190-215 µm, about 1/3 width of tergite II. Pedes Spurii A absent; Pedes Spurii B well developed on segment II. Posterolateral comb of segment VIII 57-70 µm wide, with 5-6 strong teeth posteriorly and 7-13 smaller one. Abdominal setation: segment I with 3 D, 0 L and 0 V, the more anterior and posterior D-setae stronger; segments II-VII with 3 lateral setae; segment VIII with 1 dorsal taeniate seta, 4 lateral taeniae and 1 ventral taenia. Anal lobe well developed, with complete fringe of 34-41 taeniae in single row and with two pairs of dorsal taeniae. O-setae difficult to see.

**Discussion**

Sublette & Sasa considered *Tanytarsus hastatus* to be a member of the *riopreto* group (Fittkau & Reiss 1973), but the species do not fit the group diagnosis. The anal tergal bands run parallel on middle of tergite but not so markedly as in the *riopreto* group. The adult male of *T. hastatus* differs from those of the *riopreto* group in having a higher antennal ratio, an anal point somewhat flattened (lanceolate) and triangular at tip, as well as in having many small, minute spines on the anal point (in *riopreto* the spines are larger), a more or less quadrate superior volsella and foliate lamellae on median volsella (pectinate in *riopreto* species). The lanceolate form of the anal point together with the small-sized spines between the anal crests (Fig. 28 A-B) are unique among the described species of Neotropical *Tanytarsus*.

Sanseverino & Wiedenbrug (2000) described the pupa of the *riopreto* species *Tanytarsus cuieirensis* and proposed some characters as diagnostic for the group, namely the combination of 2 taeniate dorsal setae (or true taeniae) on abdominal segment I, 3 taeniae on segment VIII and a broad anal comb. The pupa of *Tanytarsus hastatus* (Fig. 29) does not fit this proposed diagnosis and differs from *T. cuieirensis* in having thinner, not taeniate dorsal setae on segment I, 4 lateral taeniae on segment VIII (3 taeniae in *T. cuieirensis*), a narrower anal comb and a different pattern of spines and spinules on abdominal tergites.

According to Sublette & Sasa, the pupa of *Tanytarsus hastatus* is similar to the ones described from Patagonia for *Tanytarsus clivosus* (Fig. 18) and *Tanytarsus hamatus* (Fig. 20), but differs in having a pair of spines patches on tergite II and lacking them on VI. The three species share some similarities such as a smooth thoracic horn, a well-developed prealar tubercle, three precorneal setae not arranged in a triangular pattern and the placement of the precorneal 1 on tubercle. However, *T. hastatus* differs from *T. clivosus* and *T. hamatus* in having shagreen on tergite IX, in the design of the spine bands on tergites III-V and number of lateral taeniae. *Tanytarsus hastatus* only present lateral taeniae on segment VIII (4 taeniae), while *T. clivosus* has 5 lateral taeniae on segment VIII, 4 on VII and 3 on VI. *Tanytarsus hamatus* has 5 lateral taeniae on segment VIII and a variable number of lateral taeniae on segment VII.

**Distribution and ecological notes**

Among described Neotropical *Tanytarsus*, *T. hastatus* is the only species recorded from Central, South and North America. In Guatemala the species was collected from onchocerciasis endemic areas in the volcanic zone of Escuintla (800-1200 m above sea level). In Central America the species was also found in Panama, on Barro Colorado Island. In South America the species is recorded from Brazil, Ecuador (Galapagos Islands), Peru and Venezuela. In Brazil the pharate males were found in an artificial pond. *Tanytarsus hastatus* is also recorded from California in the USA, where adult males with associated immature stages were found in a small semi-permanent overflow pond.

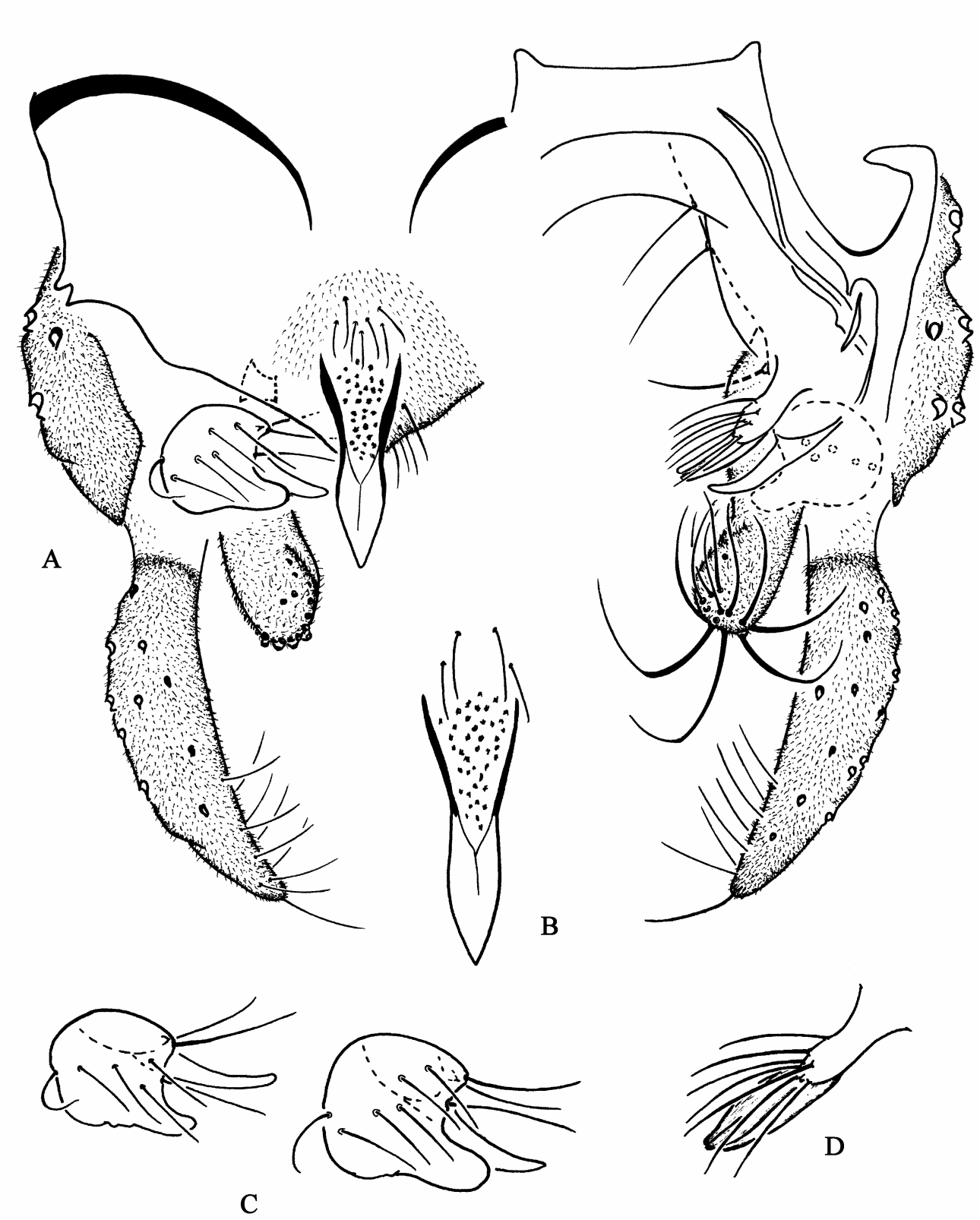



**Fig. 28.** ***Tanytarsus hastatus*** **Sublette & Sasa, adult male. A: Hypopygium, dorsal view. B: Anal point. C: Superior volsella and digitus, variation. D: Median volsella.**

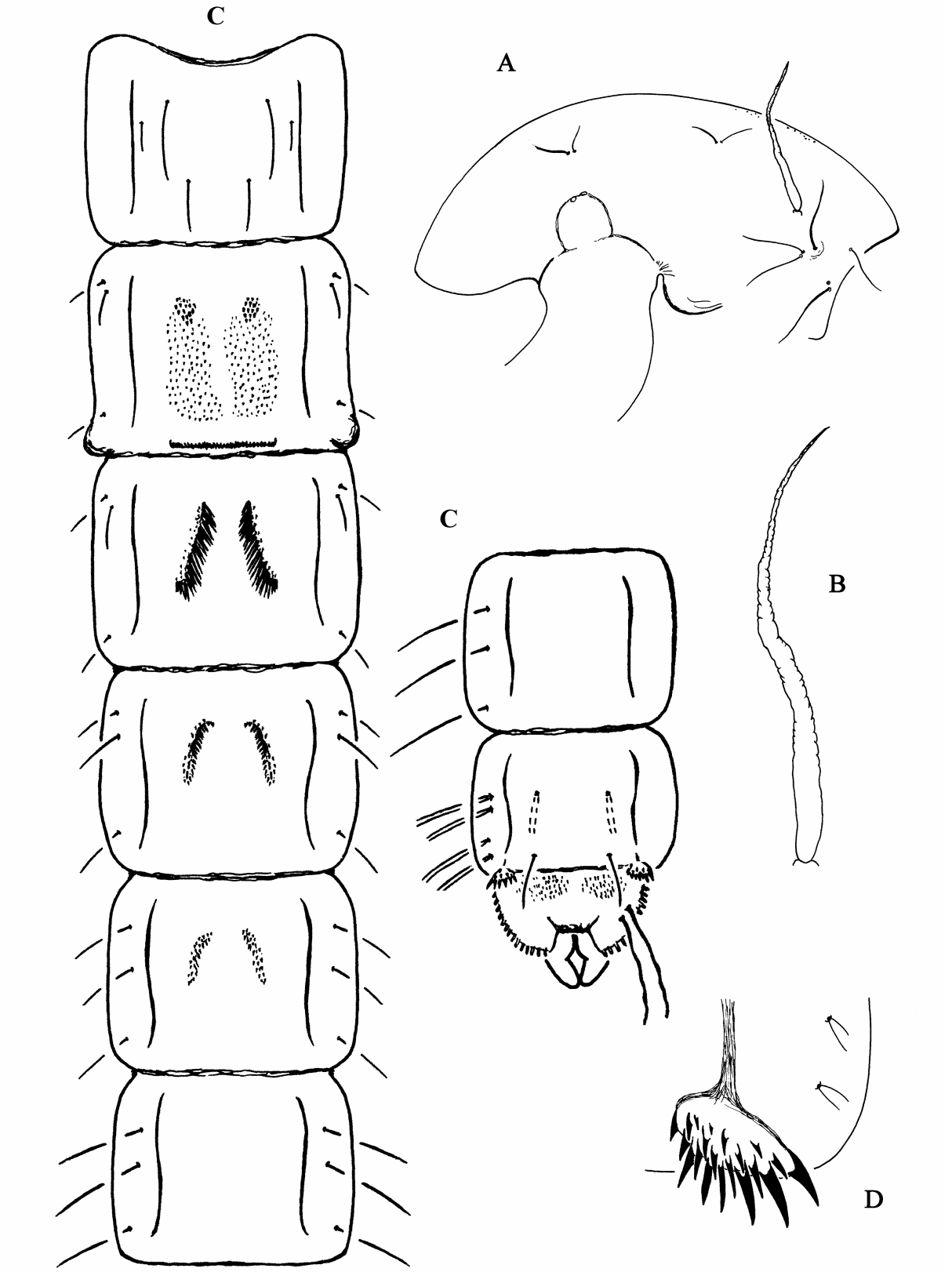



**Fig. 29.** ***Tanytarsus hastatus*** **Sublette & Sasa, pupa. A: Thorax. B: Thoracic horn. C: Abdomen, dorsal view; dorsal setae of segments II-VII not drawn. D: Posterolateral comb of abdominal segment VIII.**

### *Tanytarsus limneticus* Sublette, 1964

(Figs 30-31)

*Nimbocera pinderi* (Steiner & Hulbert, 1982); 4th instar larvae. Synonymised by Epler (1992).

Type material (USA). Paratypes: 1 adult male, Louisiana, Natchitoches, U.S. Fish Hatchery, 20.IX.1958, leg. R. F. Tyler (Collection of J. E. Sublette); 1 adult male as previous except 12.IX.1958, specimen remounted in Euparal, leg. J. E. Sublette (Collection of J. E. Sublette).
Additional material examined: *Nimbocera pinderi* (Steiner & Hulbert, 1982): 1 adult male, USA, Florida, Boca Grande, a lab pond, 27.XII.1982, R. Rutter (ZMBN); 1 adult male plus 1 pupal exuviae as previous, 2 pharate males as previous.

**Diagnostic characters.** *Tanytarsus limneticus* can be separated from other *Tanytarsus* species by the following combination of characters.

**Male Imago:** AR about 1.37; eyes with dorsomedian extension; large frontal tubercles; dorsocentrals in one row, close to scutellum in a group of 2-4 setae; high number of acrostichals and scutellars; 2-3 prealars; M and Sc veins with setae; tergite IX without microtrichia-free areas; anal tergal bands separate, curved, running parallel on middle of tergite IX and ending well anterior to anal point base; anal point elongate and rounded to slightly pointed at tip, with pair of well-developed anal crests; field of microtrichia on entire surface between the crests; spines placed irregularly between anal crests, 2 shorter setae are present anteriorly between crests; superior volsella more or less heart-shaped, with small to large field of microtrichia on anterolateral margin, posteromedian corner projecting; longitudinal axes of superior volsella and body at angle of about 31°; digitus pointed, triangular to somewhat cone-like, not extending or extending a little beyond margin of superior volsella; median volsella with foliate lamellae, not reaching apex of inferior volsella; inferior volsella somewhat thick and slightly straight, distal part (area carrying setae) oval, very slightly swelled; gonostylus somewhat elongate, straight and thin; hypopygium ratio about 0.94.

**Pupa:** Frontal apotome smooth, with some wrinkles; frontal setae short, cephalic tubercles weakly developed; pedicel sheath tubercle well developed; wing sheath with weakly-developed nose, prealar tubercle well developed, somewhat rounded/quadrate and inwardly folded; thoracic horn thin and with spinules; three precorneals not in triangular pattern, placed on an tubercle, $Pc_2$ and $Pc_3$ closer to each other, $Pc_3$ thicker and longer; 2 pairs of dorsocentrals, each pair with one seta thicker and one thinner; hook row about 1/2 width of abdominal tergite II; Pedes Spurii B

weakly developed on segment II; tergites I and VII without armament; T II with median homogeneous shagreen; T III with pair of long bands of longer spines placed on posterior half of tergite and lateral fields of fine shagreen, bands anteriorly straight, posteriorly curving outward; T IV with bracket-shaped pair of long bands of spines, anterior part with thin short spines directed to caudal and median, occasionally sparse or absent, posterior part with longer spines directed to oral; T V-VI with anterior pair of rounded patches of spines; T VIII with fine anterolateral shagreen; T IX with anterior shagreen, sparse or interrupted on median part; posterolateral comb of segment VIII quite broad, with 9-14 stronger marginal teeth and 28-42 smaller one; abdominal segment I with 2 dorsal long taeniae and without lateral seta, segment II-VII with 3 lateral setae, segment VIII with 3 lateral taeniae, 1 dorsal seta and 1 ventral taenia; anal fringe with about 18 taeniae.

**Description**

**Male Imago (n=4)**

**Head.** AR 1.33-1.44. Antennal flagellomeres one to twelve 442-470 µm long, thirteen 590-680 µm long, total length 1032-1150 µm. Eyes with dorsomedian extension; large frontal tubercles (length 16-18 µm), about 2.5 times as long as wide; 12-13 temporal setae; clypeus with 19-23 setae; lengths of palpal segments (in µm): 32-40, 38-44, 80-90, 98-118, 168-192, total length 416-484 µm.

**Thorax.** Length 1140-1230 µm. Scutal tubercle absent; 12-15 dorsocentrals in one row + group of 2-4 dorsocentrals posteriorly, 23-30 acrostichals, 2-3 prealars, 13 scutellars. Halteres with 6-8 setae.

**Wing.** Wing length 1780-1882 µm, width 548-575 µm; L/WR 3.21-3.24. Brachiolum with 1 seta, Sc with 1-5 setae, R with 46-56 setae, $R_1$ with 50-67 setae, $R_{4+5}$ with 80-105 setae, M with 16-28 setae, $M_{1+2}$ with 74-92 setae, $M_{3+4}$ with 47-63 setae, Cu with 18-39 setae, $Cu_1$ with 24-34 setae, Postcubitus with 42-63 setae and An with 44-70 setae. Cell m with 35-44 setae (+20-26 setae on false vein), $r_{4+5}$ with more than 200 setae, $m_{1+2}$ with more than 200 setae (+43-55 setae on false vein), $m_{3+4}$ with about 182 setae, cu with about 134 setae and an with about 142 setae.

**Legs.** Foreleg bearing single tibial spur (22-28 µm). Lengths of combs of mid tibia 20-23 µm (with 32-35 µm long spur) and 21-23 µm (with 40-42 µm long spur); lengths of combs of hind tibia 23-28 µm (with 42-46 µm spur) and 22-26 µm (with 44-48 µm long spur).

Lengths of segments (in µm):

| | fe | ti | $ta_1$ | $ta_2$ | $ta_3$ | $ta_4$ | $ta_5$ | Total length |
|---|---|---|---|---|---|---|---|---|
| $P_1$ | 910-990 | 508-560 | 1074-1190 | 610-638 | 550-562 | 478-495 | 180-190 | 4447-4480 |
| $P_2$ | 920-952 | 760-794 | 498-530 | 298-310 | 235-252 | 148-170 | 100-107 | 2959-3102 |
| $P_3$ | 953-1000 | 949-964 | 670-695 | 400-420 | 330-342 | 210-213 | 127-130 | 3639-3752 |

Leg ratios:

| | LR | BV | SV |
|---|---|---|---|
| $P_1$ | 2.11-2.15 | 1.36-1.46 | 1.23-1.39 |
| $P_2$ | 0.65-0.66 | 2.74-2.78 | 3.28-3.37 |
| $P_3$ | 0.70-0.72 | 2.40-2.43 | 2.82-2.83 |

**Abdomen.** Length 2950-3060 µm.

**Hypopygium (Fig. 30 A-D).** Tergite IX 186-200 µm long with 9-10 median setae (not placed between anal tergal bands, not separated into groups, placed from well anterior to anal point base to close to anal point base), 18-20 apical setae and apparently without lateral tooth. T IX without microtrichia-free areas. Orolateral spine of T IX present, 2-3 µm long. Anal tergal bands separate, curved, short, not running parallel and ending well anterior to anal point base. Anal point 80-84 µm long, elongate and rounded to slightly pointed at tip, with pair of well-developed anal crests (34-50 µm long); field of microtrichia on entire surface between the crests; spines placed irregularly between anal crests; 2 shorter setae are present anteriorly between crests. Superior volsella more or less heart-shaped, posteromedian corner projecting, with small to large field of microtrichia on anterolateral margin; anterior, median and posterior margins curved, median margin concave; 6-14 setae on dorsal surface, 2-3 setae on median margin and 1 seta on a ventral tubercle, close to anterior margin. Longitudinal axes of superior volsella and body at angle of 28-34°. Digitus pointed, triangular to somewhat cone-like, not extending or extending a little beyond margin of superior volsella. Median volsella 24-30 µm long, surpassing superior volsella but not reaching apex of inferior volsella, with 26-33 µm long simple setae and 30-40 µm long foliate lamellae. Inferior volsella 130-135 µm long, somewhat thick and slightly straight, distal part (area carrying setae) oval, very slightly swelled. Gonocoxite length 138-150 µm; gonostylus 150-156 µm, somewhat elongate, straight and thin; hypopygium ratio (HR) 0.92-0.98.

**Pupa (n=4)**

All pupa measurements are from the slides of *Nimbocera pinderi* (Steiner & Hulbert, 1982), which is considered junior synonym of *Tanytarsus limneticus* (Epler 1992).

Total length 5135-5800 µm.
Pupal exuviae pale brown, thorax and lateral muscle marks somewhat brownish.

**Cephalothorax (Fig. 31 A-D).** Frontal apotome smooth, with some wrinkles. Frontal setae short, 49-52 µm long, mounted apically on weakly developed cephalic tubercles; frontal warts absent. Pedicel sheath tubercle well developed. Thorax smooth, 1290- 1320 µm long, with small teeth along median suture and granulation close to the basis of thoracic horn. Wing sheath with weakly developed nose, prealar tubercle well developed, somewhat rounded/quadrate and inwardly folded. Thoracic horn thin, 680-720 µm long, with spinules. Three precorneals not in triangular pattern, placed on a tubercle. Anterior precorneal 170-238 µm, $Pc_2$ (196-204 µm) and $Pc_3$ (212-248 µm) closer to each other, $Pc_3$ thicker and longer; 1 median (136-154 µm) and 2 lateral antepronotals (100-110 µm, 1 seta mark); 2 pairs of dorsocentrals, anterior pair 102-140 µm (thin) and 69-82 µm long (thick), posterior pair 100-104 µm (thin) and 94-96 µm (thick).

**Abdomen (Fig. 31 E-F).** Total length 3845-4480 µm. Tergites I and VII without armament. T II with median homogeneous shagreen, sparse/interrupted medially. T III with one pair of long bands of longer spines placed on posterior half of tergite and lateral fields of fine shagreen, bands anteriorly straight, posteriorly curving outward. T IV with bracket-shaped pair of long bands of spines, anterior part with thin short spines directed to caudal and median, occasionally sparse or absent, posterior part with longer spines directed to oral. T V-VI with one anterior pair of rounded patches of spines. T VIII with fine anterolateral shagreen. T IX with anterior shagreen, sparse or interrupted on median part. Sternites I-VII apparently without armament. S VIII with fine oral-lateral shagreen. Conjunctives and pleura unarmed. Hook row 280-372 µm, about 1/2 width of tergite II. Pedes Spurii A absent; Pedes Spurii B present on segment II, weakly developed. Posterolateral comb of segment VIII broad, 112-120 µm wide, consisting of 9-14 stronger marginal teeth and 28-42 smaller one. Abdominal setation: segment I with 2 dorsal taeniae and 1 dorsal seta, 0 L and 1 pair of ventral seta marks; segment II with 3 D, the most

anterior and posterior setae somewhat taeniate, and two pairs of dorsal seta marks, 3 L and 4 V; segment III with 5 D, the most anterior and posterior setae somewhat taeniate, and two pairs of dorsal seta marks, 3 L and 5 V; segments IV-VII with 3 L, dorsal and ventral setae difficult to see; segment VIII with 1 D, 3 lateral taeniae and 1 ventral taenia. Anal lobe well developed, with complete fringe of 18-20 taeniae in single row and with two pairs of dorsal taeniae. Tergites II-VIII with O-setae.

**Discussion, distribution and ecological notes**

*Tanytarsus limneticus* was described based on adult male by Sublette (1964). Some years later, Steiner & Hulbert (1982) described the North American *Nimbocera pinderi*, which was synonymised with *Tanytarsus limneticus* by Epler (1995) after associations of immature stages.

The adult male and immature stages of *T. limneticus* (Figs 30 and 31) share many similarities with *Tanytarsus rhabdomantis* (Figs 32 and 33), and both species seem to be closely related. Pupa and larva of *T. limneticus* have some diagnostic characters in common with *Nimbocera patagonica*, but the adults of both species can be easily separated. More detailed comments are given in the discussion of *Nimbocera patagonica*, *Tanytarsus limneticus* and *Tanytarsus rhabdomantis*.

Sublette & Sasa (1994) considered *T. limneticus* to be a member of the *riopreto* group (Fittkau & Reiss 1973), but the species does not fit well the group diagnosis (see comments under the *riopreto* group discussion).

*Tanytarsus limneticus* is a Nearctic species recorded from the United States of America. Caldwell *et al*. (1997) pointed out that "although originally listed by Hudson *et al.* (1990) as occurring in lakes, rivers, and streams, *T. limneticus* appears to occur only in lentic habitats. Larvae of similar, typically stream dwelling species (possibly *Tanytarsus guerlus* Roback or similar species), have probably been confused with *T. limneticus*". Epler (2001) mentioned that most *T. limneticus* larvae collected by him are from bottom sediments of eutrophic ponds or slow flowing rivers.


**Fig. 30.** ***Tanytarsus limneticus*** **Sublette, adult male. A: Hypopygium, dorsal view. B: Anal point, dorsal view. C: Superior volsella and digitus variation. D: Median volsella.**

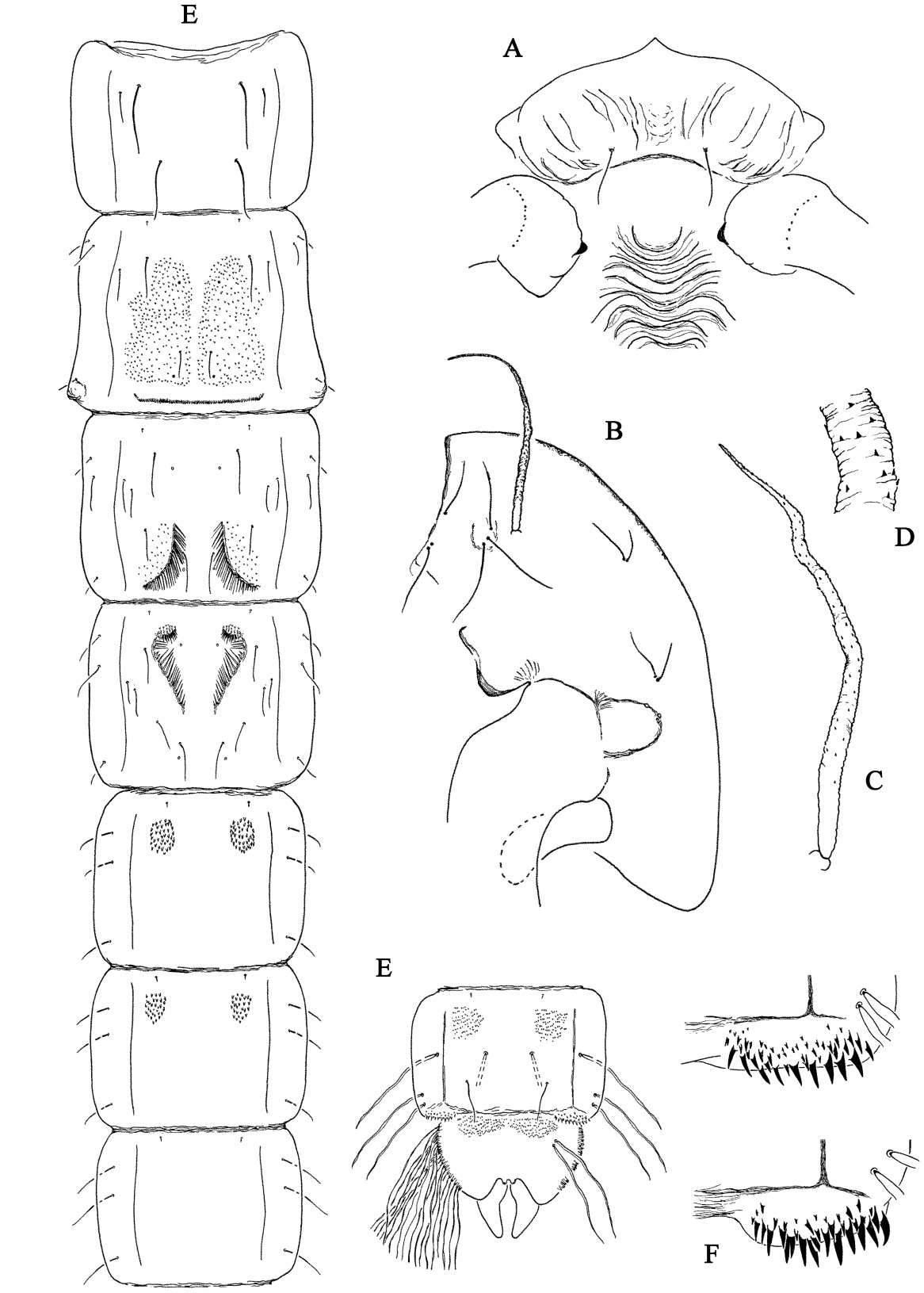



**Fig. 31.** ***Tanytarsus limneticus*** **Sublette, pupa. A: Frontal apotome. B: Thorax. C: Thoracic horn. D: Detail of thoracic horn armament. E: Abdomen, dorsal view; dorsal setae of segments V-VII not drawn. F: Posterolateral comb of abdominal segment VIII.**

***Tanytarsus rhabdomantis* (Trivinho-Strixino & Strixino, 1991)**

(Figs 32-33)

*Nimbocera rhabdomantis* Trivinho-Strixino & Strixino 1991; 4th instar larvae. Combined by Trivinho-Strixino & Sanseverino (2003).

Paratypes examined (Brazil, São Paulo State): four 4th instar larvae, Quinta da Felicidade reservoir, São Carlos (21o 57'S 47o 54'W), March, 1987; leg. S. T. Strixino.

Additional material examined (Brazil, São Paulo State): 1 adult male, 3 pupae with pharate males, 1 4th instar larva with pharate pupa, São Carlos, Quinta da Felicidade reservoir, 14.IV.1984, leg. S. Trivinho-Strixino; 5 adult males, São Carlos, Lagoa Mayaca (21º 59'S 47º 54'W), 23.V.1993, leg. S. Trivinho-Strixino; 2 4th instar larvae, Itirapina, Represa do Lobo (22º 10'S 47º 54'W), 1986, leg. S. Trivinho-Strixino; 1 adult male, Luiz Antônio, Lagoa do Infernão (21º 35'S 47º 49'W), 01.X.1996, leg. K. C. Sonoda; 2 pupal exuviae, São Carlos, Lagoa Mayaca, 3.VIII.2002, leg. T. Siqueira. All material located at UFSCar.

Full descriptions of male and pupa including measurements are given in Tables I-VIII. Drawings are presented here and as well as a complete diagnosis of the male imago and pupa. The larva of *Tanytarsus rhabdomantis* is described in detail by Trivinho-Strixino & Strixino (1991). Larval diagnosis and considerations on larval morphology of *T. rhabdomantis* are presented here.

**Diagnostic characters.** *Tanytarsus rhabdomantis* can be separated from other *Tanytarsus* species by the following combination of characters.

**Male Imago (Fig. 32 A-D):** Antennal ratio about 1.26; eyes with dorsomedian extension; large frontal tubercles; wing vein M with setae, Sc bare in most specimens, in one with two setae; tergite IX with double lateral tooth and without microtrichia-free areas; anal tergal bands separate, curved, short, not running parallel and ending well anterior to anal point base; anal point elongate and pointed/triangular at tip, with a pair of well-developed anal crests; field of microtrichia present between crests; spines absent, 6-9 short, thick setae between anal crests; superior volsella without microtrichia, anterior part oval, posterior part projecting and somewhat elongate; longitudinal axes of superior volsella and body at angle of about 47°; digitus finger-like, not extending or extending a little beyond margin of superior volsella; median volsella with

foliate lamellae, not reaching apex of inferior volsella; inferior volsella somewhat thick and slightly straight, with some apically split setae, distal part (area carrying setae) oval, very slightly swelled; gonostylus elongate, straight and thick; hypopygium ratio about 0.97.

**Pupa (Fig. 33 A-E):** Frontal apotome smooth, some wrinkles near cephalic tubercles; frontal setae thin and short, cephalic tubercles weakly developed; pedicel sheath tubercle apparently absent; thoracic horn thin, with small spines along most of length; wing sheath with well-developed nose, prealar tubercle weakly protuberant; three precorneals in triangular pattern, not placed on tubercle, anterior precorneal stronger, $Pc_2$ and $Pc_3$ closer to each other; 2 pairs of dorsocentrals, $Dc_4$ much stronger than $Dc_{1-3}$; hook row about 1/3 width of abdominal segment II; Pedes Spurii B weakly developed on abdominal segment II; tergite I without armament in most of the specimens, in few ones pair of posterolateral field of small, fine spines; T II with homogeneous shagreen, interrupted/ sparse medially; T III with long spines in long spine bands beginning in anterior half of tergite, bands anteriorly straight, posteriorly curved outward; T IV with long spines in bracket-shaped, long spine bands, most of the spines orally directed, anterior spines slightly shorter and caudally and medially directed; T V-VI with spines in oval patches anteriorly; T VII with very fine anterolateral shagreen; T VIII-IX with fine shagreen in anterolateral patches; posterolateral comb of segment VIII quite broad with numerous marginal teeth; abdominal segment I without lateral seta, segments II-VII with 3 lateral setae, segment VIII with 3 lateral taeniae, 1 dorsal seta and 1 ventral taeniate seta; anal fringe with about 12 taeniae.

**Larva:** Antenna very long, placed on prominent base; AR about 1.38; antennal base without spur; segment 2 of antenna with narrow, unsclerotized ring near base; antennal blade about 1/4 length of segment 2; Lauterborn organs small, situated on apex of very long and slim pedicels, which are annulated for about 4/5 of their length; mandible with 3 inner teeth; mentum with eleven teeth; median tooth pale and trifid.

**Discussion, distribution and ecological notes**

*Nimbocera rhabdomantis* was described based on larvae by Trivinho-Strixino & Strixino (1991). After rearing and re-examination of material, Trivinho-Strixino & Sanseverino (2003) transferred *N. rhabdomantis* to the genus *Tanytarsus*.

*Tanytarsus rhabdomantis* seems to be closely related to the Nearctic *Tanytarsus limneticus* Sublette. More detailed remarks on *T. rhabdomantis* are presented in the discussion about *Nimbocera patagonica*, *Tanytarsus limneticus* and *Tanytarsus rhabdomantis*.

*Tanytarsus rhabdomantis* is recorded from São Paulo State (Southeast Brazil). Larvae of *T. rhabdomantis* are found in shallow lakes, ponds and reservoirs (littoral area), associated with aquatic plants and inhabiting sandy substrate preferentially. Larvae are detritivores, feeding on decomposing fine particulate organic matter.

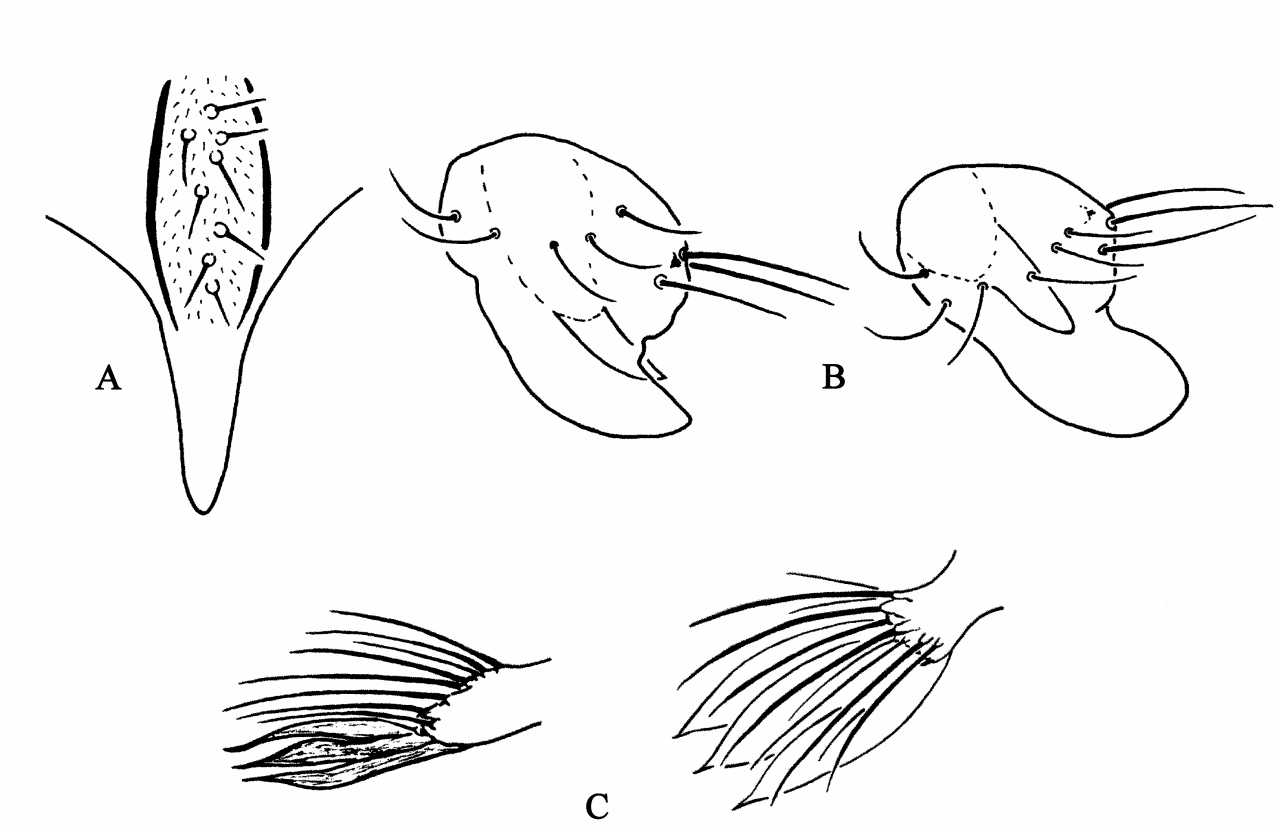



**Fig. 32. *Tanytarsus rhabdomantis* (Trivinho-Strixino & Strixino), adult male. A: Anal point, dorsal view. B: Superior volsella and digitus, variation. C: Median volsella, variation.**

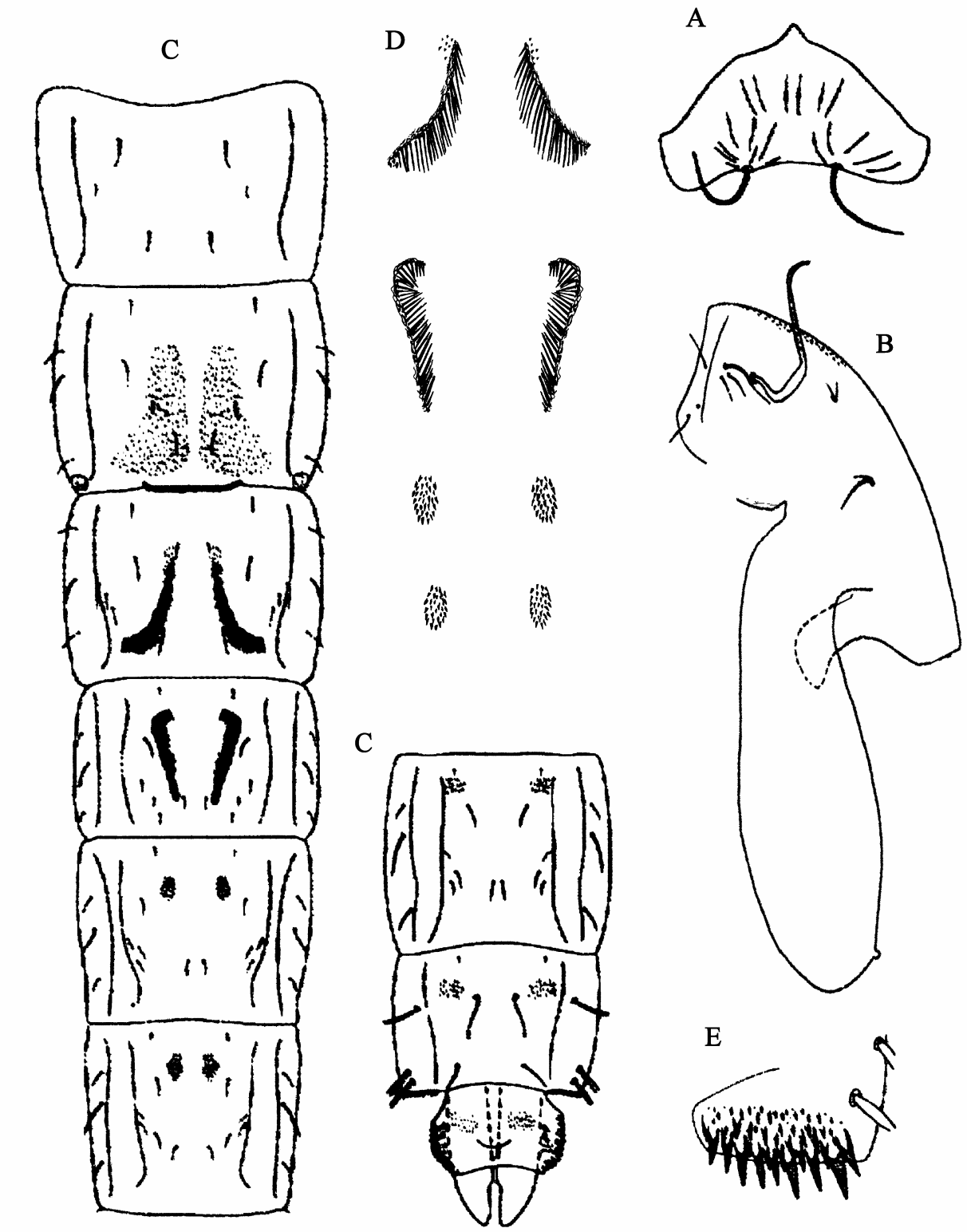



**Fig. 33.** ***Tanytarsus rhabdomantis*** **(Trivinho-Strixino & Strixino), pupa (after Trivinho-Strixino & Sanseverino 2003). A: Frontal apotome. B: Thorax. C: Abdomen, dorsal view. D: Spine patches on abdominal tergites III-VI. E: Posterolateral comb of abdominal segment VIII.**

### *Nimbocera patagonica* Reiss, 1972

(Figs 34-36)

Type material Holotype [not examined]: 1 adult male, South Chile, Puerto Natales, Province of Magallanes, Laguna Diana, shore ponds, 2.I.1970, slide mounted in Euparal, leg. F. Reiss (NHRS). Paratypes [examined]: 4 adult males, same as holotype except deposited at ZSM; 4 pupal exuviae, same as holotype except deposited at ZSM; 2 pharate males as holotype except deposited at ZSM; 1 pharate male, South Chile, Lago Villarrica, 3.XI.1969, slide mounted in Euparal, leg. F. Reiss; 2 pupal exuviae, Lago Pellaifa, drift, 5.XII.1953, slides mounted in Euparal, leg. L. Brundin; 3 adult males, Argentina, Bariloche, Laguna Trebol (shallow littoral lake), 17.XI.1969, slides mounted in Euparal, leg. F. Reiss; 2 pupal exuviae as previous (all paratypes at ZSM).
Additional material examined: 1 adult male, Chile, 21.8.1970, slide mounted in Euparal; 1 pharate male, South Chile, Puerto Natales, Province of Magallanes, Laguna Diana, shore pond, 1. I.1970, slide mounted in Euparal, leg. F. Reiss; 1 adult male as previous (all material deposited at ZSM).

**Diagnostic characters.** *Nimbocera patagonica* can be separated from other species by the following combination of characters.

**Male Imago:** antenna short (brachycer), plume reduced; low AR (about 0.50); eyes with dorsomedian extension; large frontal tubercles; palp reduced; wing somewhat reduced and cuneate, wing vein $R_{2+3}$ distinct (ending midway between apices of $R_1$ and $R_{4+5}$); wings with few setae, wing veins Sc, M, $R_{2+3}$, $M_{3+4}$, Cu, $Cu_1$ and Postcubitus bare, wing cells m, false vein, cu and an bare, all wing setae shorter than those observed in Neotropical *Tanytarsus*; tarsomere 4 of mid leg cordiform; tergite IX without median setae, with microtrichia-free areas on each side of anal point; anal tergal bands separate, curved, running parallel and ending "somewhat together" on the middle of tergite, more or less close to anal point; anal point elongate and circular at tip, with pair of weakly developed, low anal crests; with field of microtrichia on entire surface between the crests; spines absent, 5-7 shorter setae between anal crests; superior volsella circular, posteromedian margin well projecting and thumb-like, without microtrichia; longitudinal axes of superior volsella and body at angle of about 38°; digitus short and circular, not reaching median margin of superior volsella; median volsella with ramose lamellae, not reaching apex of inferior volsella; inferior volsella elongate and thick, expanded in distal half, area carrying setae with moderately large dorsoapical swelling; gonostylus large, thick and curved inwards, distally rounded; hypopygium ratio about 0.80.

**Pupa:** Frontal apotome smooth, some wrinkles near cephalic tubercles; frontal setae thin and short, cephalic tubercles weakly developed; pedicel sheath tubercle well developed; wing sheath without nose, prealar tubercle well developed, rectangular; thoracic horn thin, with small, weakly sclerotized spines; three precorneals not in triangular pattern, placed on a tubercle, $Pc_1$ stronger, $Pc_2$ and $Pc_3$ closer to each other; 1 median and 2 lateral antepronotals, small and rounded tubercle near median antepronotal; 2 pairs of dorsocentrals, each pair with 1 seta thin and 1 thick, Dc4 stronger than other three; Pedes Spurii B on abdominal segment II; hook row about 1/2 width of abdominal tergite II; tergites I and VII without armament; T II with homogeneous shagreen, interrupted/ sparse medially; T III with pair of long bands of longer spines on posterior half of tergite, bands curving outward; T IV with bracket-shaped pair of long bands of longer spines directed to caudal, median and oral; T V and T VI with elongate patches of spines; T VIII-IX with fine oral-lateral shagreen; posterolateral comb of segment VIII with 4-6 stronger marginal teeth and 12-17 smaller one; abdominal segment I without lateral seta; segment II-VII with 3 lateral setae; segment VIII with 4 lateral taeniae, 2 dorsal setae and 1 ventral seta and 1 ventral taenia; anal fringe with about 18 taeniae.

**Description**

**Male Imago (n=6)**

**Head (Fig. 34 A-B).** AR 0.45-0.53. Antenna short (brachycer) and more or less curved, plume reduced. Antennal flagellomeres one to twelve 400-428 µm long, thirteen 188-197 µm long, total length 588-625 µm. Eyes with dorsomedian extension; large frontal tubercles (length 18-22 µm), about 2.5 times as long as wide; 9-10 temporal setae; clypeus with 20-24 setae; lengths of palpal segments (in µm): 35-37, 38-40, 58-66, 60-61, 68-72, total length 259-276 µm.

**Thorax.** Length 892-1000 µm. Scutal tubercle absent; 7-8 dorsocentrals, 8-12 acrostichals, 1 prealar, 4-6 scutellars. Halteres with 4-5 setae.

**Wing (Fig. 34 C).** Weak brachyptery, length 1500-1700 µm, width about 640 µm; L/WR about 2.53. Brachiolum with 1 seta, Sc bare, R with 14 setae, $R_1$ with 9 setae, $R_{2+3}$ distinct, bare, ending midway between apices of $R_1$ and $R_{4+5}$, $R_{4+5}$ with 10 setae, M bare setae, $M_{1+2}$ with 14 setae, $M_{3+4}$, Cu, $Cu_1$ and Postcubitus bare, An with 2 setae. Cell m and false vein bare, $r_{4+5}$ with 42 setae, $m_{1+2}$ with 32 setae (false vein bare), $m_{3+4}$ with 5 setae, cu and an bare.

**Legs (Fig. 34 D-E).** Fore tibia without spur (in the original description with small scales distal frayed), mid tibia with pair of small, separated combs (12 µm long), only 1 comb with spur, hind

tibia with 2 separated combs (12 µm long) without spur, according to Cranston *et al.* (1989) occasionally 1 spur is present. Tarsomeres of mid (principally) and hind leg shorter, tarsomere 4 of mid leg cordiform.

Lengths of segments (in µm):

| | fe | ti | $ta_1$ | $ta_2$ | $ta_3$ | $ta_4$ | $ta_5$ | Total length |
|---|---|---|---|---|---|---|---|---|
| $P_1$ | 800-815 | 518-580 | 670-700 | 310-330 | 268-295 | 240-255 | 150-165 | 2956-3140 |
| $P_2$ | 667-700 | 510-560 | 150-165 | 90-100 | 70-90 | 51-60 | 68-75 | 1606-1750 |
| $P_3$ | 800-840 | 660-700 | 260-280 | 160-185 | 168-190 | 92-100 | 91-100 | 2231-2395 |

In the original description the length of tarsomere 1 of fore leg is 435 µm.

Leg ratios:

| | LR | BV | SV |
|---|---|---|---|
| $P_1$ | 1.20-1.29 | 2.00-2.05 | 1.96-1.99 |
| $P_2$ | 0.29 | 4.38-4.75 | 7.63-7.84 |
| $P_3$ | 0.39-0.40 | 3.16-3.36 | 5.50-5.61 |

**Abdomen.** Length 2340-3140 µm.

**Hypopygium (Fig. 35 A-D).** Tergite IX 172-200 µm long, without median setae and with 28-32 apical setae, lateral tooth absent. T IX with microtrichia-free areas on each side of anal point. Orolateral spine of laterosternite IX present, 4-5 µm long. Anal tergal bands separate, curved, running parallel and ending "somewhat together" on the middle of tergite, more or less close to anal point. Anal point 57-70 µm long, elongate and circular at tip, with pair of weakly developed, low anal crests (29-37 µm long) not extending posterior to tergite IX; with field of microtrichia on entire surface between the crests; spines absent, 5-7 shorter setae between anal crests. Superior volsella circular, posteromedian margin well projecting and thumb-like, without microtrichia; anterior, median, lateral and posterior margins curved; 13-14 setae on dorsal surface, 1-2 setae proximal on projection of posteromedian margin, 4 setae on median margin (1-2 dorsal, 2-3 ventral) and 1 seta ventral, close to anterior margin. Longitudinal axes of superior volsella and body at angle of 36-40°. Digitus short and circular, not reaching median margin of superior volsella. Median volsella 22-27 µm long with 18-25 µm long simple setae and 32-40 µm long ramose lamellae, not reaching apex of inferior volsella. Inferior volsella 150-153 µm long elongate and thick, expanded in distal half, area carrying setae with moderately large dorsoapical swelling. Gonocoxite length 148-155 µm;

gonostylus 185-198 µm, large, thick and curved inwards, distally rounded; hypopygium ratio (HR) 0.77-0.82.

**Pupa (n=5)**

Total length 3840-4510 µm long.
Pupal exuviae pale brown, thorax and lateral muscle marks somewhat brownish.

**Cephalothorax (Fig. 36 A-C).** Frontal apotome smooth, with wrinkles on area of cephalic tubercles. Frontal setae thin and short, 50-62 µm long, mounted apical on weakly developed cephalic tubercles; frontal warts absent. Pedicel sheath tubercle well developed. Thorax smooth, 1040-1100 µm long, with points along median suture; a small, rounded tubercle is present anteriorly near median antepronotal. Thoracic horn thin, 292-373 µm long, with small, weakly sclerotized spines. Wing sheath without nose, prealar tubercle well developed, rectangular. Three precorneals not in triangular pattern, apparently placed on a tubercle, another small tubercle is present close to $Pc_3$. Anterior precorneal stronger (100-125 µm), $Pc_2$ (85-102 µm) and $Pc_3$ (92-110 µm) closer to each other; 1 median (100-115 µm) and 2 lateral antepronotals (4-5 µm and 62-79 µm, the latter one difficult to measure, appearing to be broken in most of the specimens); 2 pairs of dorsocentrals, anterior pair 73-100 µm (thin) and 42-53 µm (thick), posterior pair 68-76 µm (thin) and 110-120 (thick), the latter one stronger than other three.

**Abdomen (Fig. 36 D-E).** Total length 2800-3420 µm. Tergites I and VII without armament. T II with homogeneous shagreen, interrupted/ sparse medially. T III with a pair of long bands of longer spines placed on posterior half of tergite, bands curving outward. T IV with bracket-shaped pair of long bands of longer spines directed to caudal, median and oral. T V and T VI with elongate patches of spines. T VIII-IX with fine oral-lateral shagreen. Sternites I, IV-VII without armament. S II-III with very fine oral-lateral shagreen. S VIII with fine oral-lateral shagreen. Conjunctives and pleura unarmed. Hook row 204-260 µm, about 1/2 width of tergite II. Pedes Spurii A absent; Pedes Spurii B present on segment II. Posterolateral comb of segment VIII 60-76 µm wide, with 4-6 stronger marginal teeth and 12-17 smaller one. Abdominal setation: segment I with 3 D, the most anterior longer, 0 L and 0 V; segment II with 4 D, 3 L and 4 V; segments III-VII with 5 D, 3 L and 5 V; segment VIII with 2 D, 4 lateral taeniae and 1 V

and 1 ventral taenia. Anal lobe well developed, with fringe of 17-20 taeniae in single row and with two pairs of dorsal taeniae. Tergites II-VIII with O-setae.

**Discussion**

The pupa and imago of *Nimbocera patagonica* are truly associated (pharate male), while the larva should be considered "tentatively associated" since no rearing was made. Reiss (1972) found many larvae occurring in sediments at the same place where imagines and pupae of *N. patagonica* were encountered, and he believed these larvae belong to *N. patagonica.* In the present study the adult male and pupa of *N. patagonica* are redescribed and diagnosed, while the larva is compared with other species and discussed below.

*N. patagonica* is the only valid species in *Nimbocera*, all other species described later were synonymised or combined (Trivinho-Strixino & Sanseverino 2003).

Some diagnostic characters of *Nimbocera* adult male (Cranston *et al.* 1989) should be corrected. The eyes of *N. patagonica* show a small dorsomedian extension (in the diagnosis of Cranston *et al.* the eyes did not show dorsomedian extension), the thorax presents 1 prealar (in Cranston *et al.* prealars are absent) and the wing vein $R_{2+3}$ is "fused" with $R_{4+5}$ on its 2/3 basal portion, ending midway between apices of $R_1$ and $R_{4+5}$.

More detailed comments on the species and the genus *Nimbocera* are given below, under the discussion about *Nimbocera patagonica*, *Tanytarsus limneticus* and *Tanytarsus rhabdomantis*, and about the genus validity.

**Distribution and ecological notes**

*Nimbocera patagonica* is recorded from southern Chile and Argentina (Patagonia), near the Magallanes Strait. Larvae and pupae were found inhabiting ponds, lakes and coastal lagoons. According to Reiss (1972), *Nimbocera* larvae probably live in nutrient-rich sediments of standing-waters, where mass-developments can occur. Since imagines were never trapped at the surrounding vegetation of the corresponding water-body, and due to characters of the adult male (see comments on validity of *Nimbocera*), Reiss presumed that *Nimbocera* males do not form swarms and the mating probably takes place on water surface.

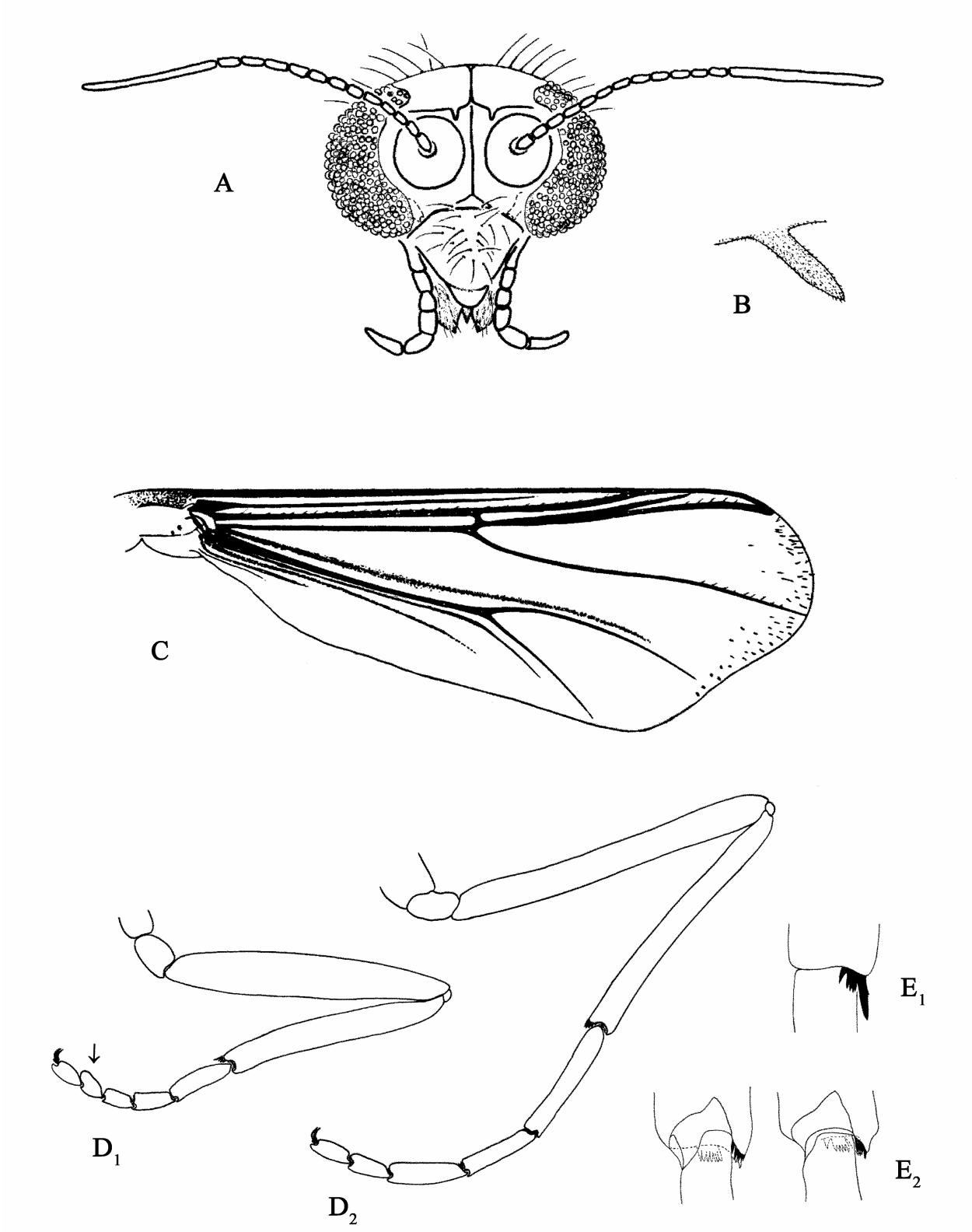



**Fig. 34.** ***Nimbocera patagonica*** **Reiss, adult male. A: Head. B: Frontal tubercle. C: Wing (after Reiss 1972). $D_1$: Mid leg, cordiform tarsomere 4 marked by arrow. $D_2$: Hind leg. $E_1$: Comb of mid tibia. $E_2$: Comb of hind tibia.**

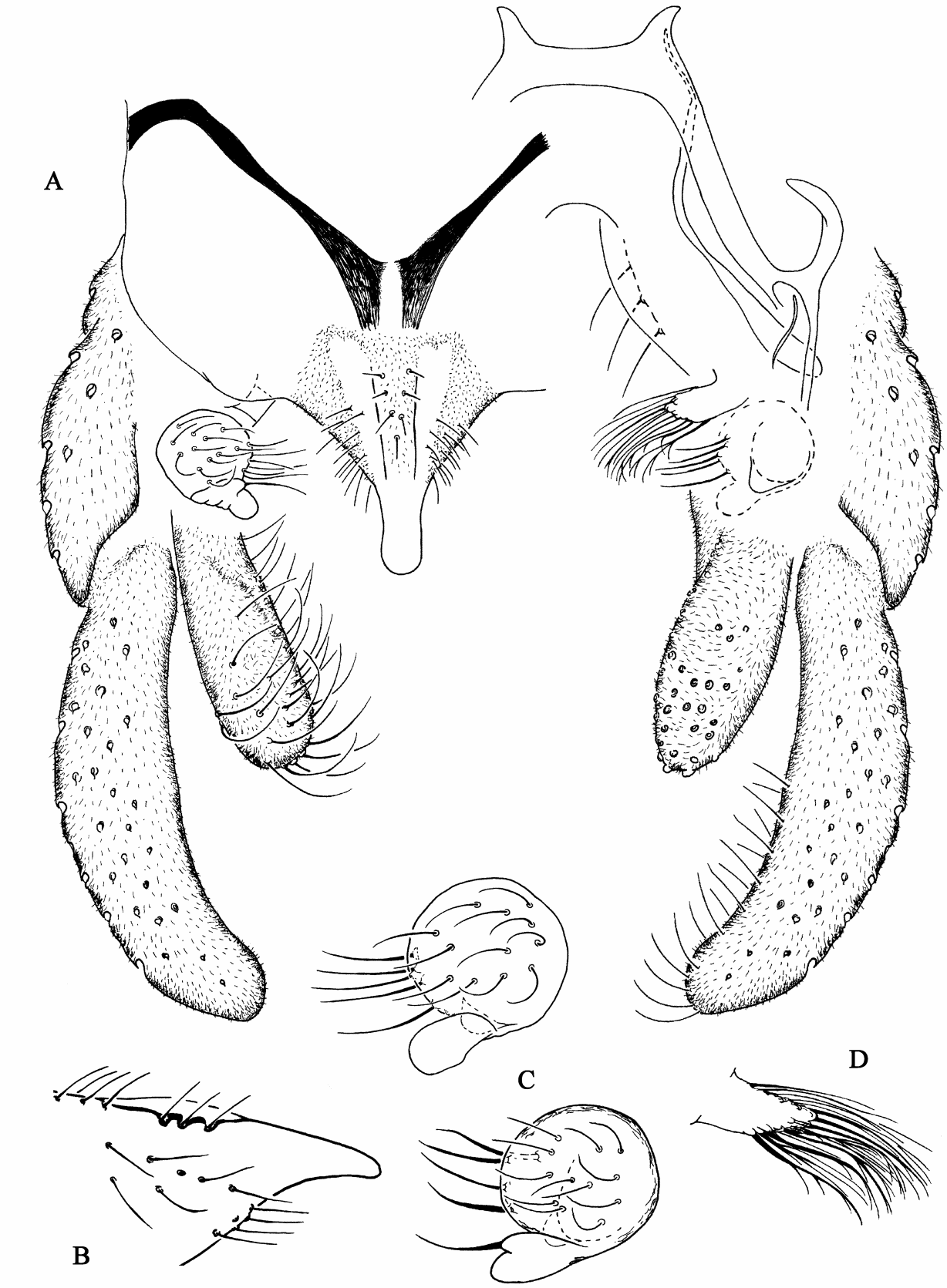



**Fig. 35.** ***Nimbocera patagonica*** **Reiss, adult male. A: Hypopygium, dorsal view. B: Anal point, lateral view. C: Superior volsella and digitus, variation. D: Median volsella.**

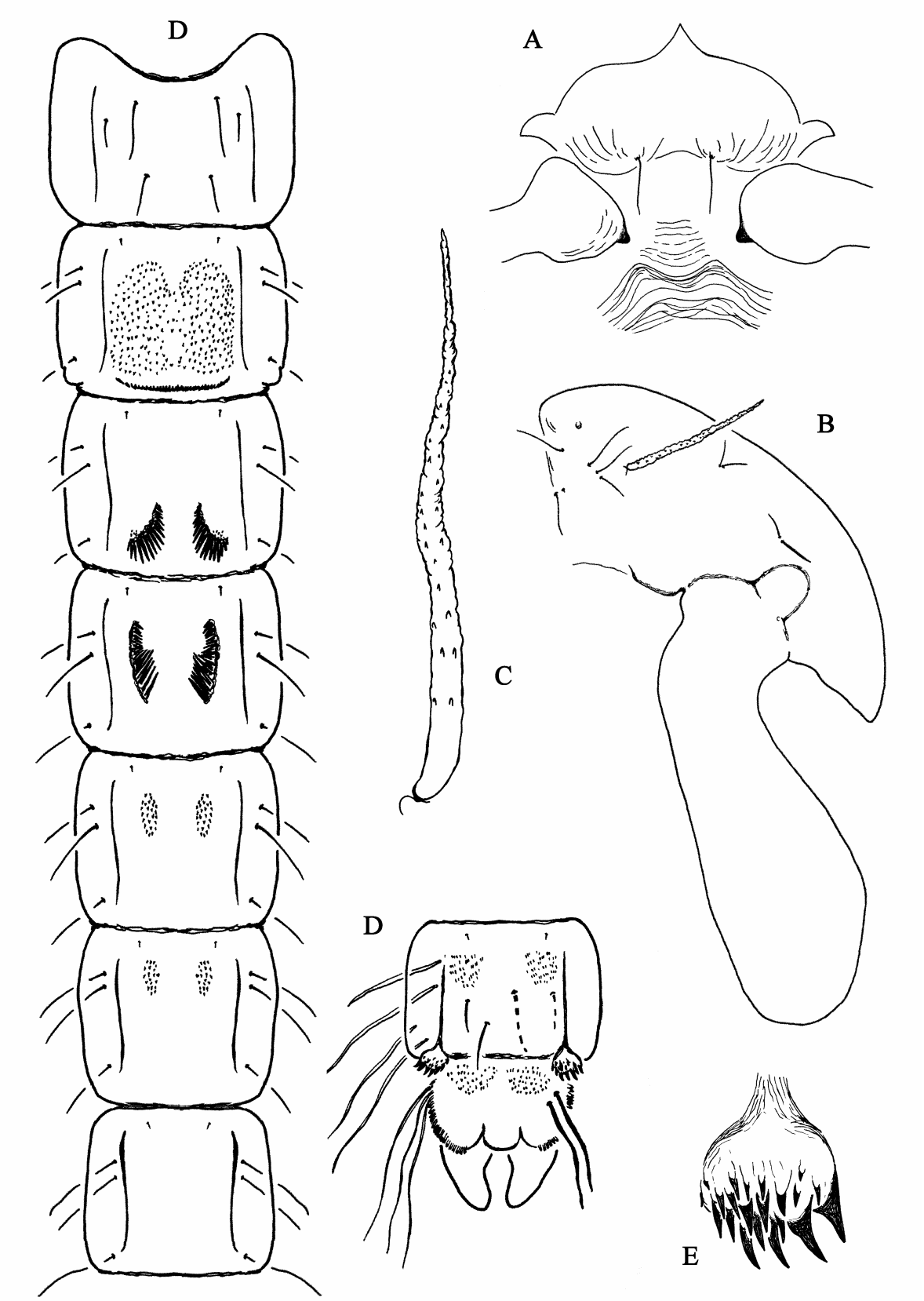



**Fig. 36.** ***Nimbocera patagonica*** **Reiss, pupa. A: Frontal apotome. B: Thorax. C: Thoracic horn. D: Abdomen, dorsal view; dorsal setae of segments II-VII not drawn. E: Posterolateral comb of abdominal segment VIII.**

**Discussion about *Nimbocera patagonica*, *Tanytarsus limneticus* and *Tanytarsus rhabdomantis***

Reiss (1972) described the genus *Nimbocera* based on larva, pupa and male imago of one single species, *Nimbocera patagonica*. The principal characters used by Reiss to delimit *Nimbocera* were the reduced and cuneate wing, short antenna and palp, low antennal ratio, the reduction of tarsomeres of mid and hind legs, tibial combs and spurs of the male imago, the spines pattern on pupal tergites, especially the bracket-shape pair of bands of spines directed to caudal and oral on tergite IV, and the annulated Lauterborn organ pedicels of the larva. The keys and diagnoses of adult male, pupa and larva of *Nimbocera* also take these characters into account (Cranston *et al.* 1989; Pinder & Reiss 1986; Pinder & Reiss 1983, respectively).

The interpretation of the presence of Lauterborn organs with annulated pedicels as diagnostic for *Nimbocera* larva has been led to misidentification in taxonomical and ecological studies. Steiner & Hulbert (1982) described the North American *Nimbocera pinderi* and Trivinho-Strixino & Strixino (1991) the Brazilian *Nimbocera paulensis* and *Nimbocera rhabdomantis*. Based on associated life stages, Epler (1995) showed that *N. pinderi* is actually *Tanytarsus limneticus*, which was described based on adult male by Sublette (1964). *N. pinderi* was first placed as a junior synonym of *Nimbocera limnetica* by Epler (1992), who later (1995) returned the species to the genus *Tanytarsus* (Caldwell *et al*. 1997). Also after associations of all life stages, *N. paulensis* was synonymised with *Caladomyia ortoni* (Trivinho-Strixino & Strixino 2003), and *N. rhabdomantis* was combined to *Tanytarsus rhabdomantis* (Trivinho-Strixino & Sanseverino 2003).

As mentioned above, Reiss (1972) considered the bracket-shaped bands of spines caudally and orally directed on pupal tergite IV to be diagnostic and unique to *Nimbocera* (Fig. 36 D). However, *Tanytarsus limneticus* (Fig. 31 E) and *Tanytarsus rhabdomantis* (Fig. 33 C-D) present bands of spines on tergite IV directed to oral and caudal, as pupae of *Tanytarsus cuieirensis* (Sanseverino & Wiedenbrug 2000) (Fig. 14 B-C) and the North American species in the *Tanytarsus confusus* aggregate (Ekrem 2003).

Thus, the annulation of Lauterborn organs pedicels and the bands of spines caudally and orally directed on pupal tergite IV are not exclusive for *Nimbocera*, as also pointed out by Epler (2001) Ekrem *et al.* (2003) and Trivinho-Strixino & Sanseverino (2003).

Larvae of *Nimbocera patagonica*, *Tanytarsus limneticus* and *Tanytarsus rhabdomantis* are similar in having small Lauterborn organs on apex of annulated pedicels, the 2nd antenna segment with narrow, unsclerotized ring near base, mandible with 3 inner teeth and mentum with

11 teeth. The species can be separated by the antennal length (*N. patagonica* 290 µm, *T. limneticus* 323 µm and *T. rhabdomantis* 601 µm), antennal ratio (*N. patagonica* 1.82 µm, *T. limneticus* 1.66 µm and *T. rhabdomantis* 1.38 µm), length of antennal blade (in *N. patagonica* and *T. limneticus* blade about as long as segment 2, while in *T. rhabdomantis* blade about 1/4 length of segment 2), spur of antennal base (present in *N. patagonica*, absent in *T. limneticus* and *T. rhabdomantis*) and indentation and colour of median tooth of mentum (trifid in *N. patagonica* and *T. rhabdomantis*, pentafid in *T. limneticus*, dark in *N. patagonica* and pale in *T. limneticus* and *T. rhabdomantis*).

Pupae of *T. limneticus*, *T. rhabdomantis* and *N. patagonica* share some similarities such as the armament of abdominal tergites (Figs 31 E, 33 C-D and 36 D, respectively), but they can be separated by the form of the posterolateral comb on segment VIII (broad in *T. limneticus* and *T. rhabdomantis*, Figs 31 F and 33 E, narrower in *N. patagonica*, Fig. 36 E), setation of segment VIII (3 lateral taeniae, 1 dorsal seta and 1 ventral taenia/ taeniate seta in *T. limneticus* and *T. rhabdomantis*, 4 lateral taeniae, 2 dorsal and 1 ventral setae plus 1 ventral taenia in *N. patagonica*) and presence of wing sheath nose in *T. limneticus* and *T. rhabdomantis* (absent in *N. patagonica*). A broad anal comb is also found in *T. cuieirensis* (Fig. 14 D) as well as in the genus *Virgatanytarsus* (see discussion about the *riopreto* group).

Characters of the adult males of *T. limneticus* and *T. rhabdomantis* show that both species seem to be closely related. The species have many features in common: high antennal ratio, large frontal tubercles, wing vein M with setae, anal tergal bands of similar form, well-developed anal crests (Figs 30 A-B and 32 A-B), a more or less heart-shaped superior volsella (Figs 30 C and 32 C), foliate lamellae on median volsella (Figs 30 D and 32 D), and anal point tip, inferior volsella and gonostylus of similar design (Figs 30 A-B and 32 A-B). The digitus of *T. limneticus* (Fig. 30 C) and *T. rhabdomantis* (Fig. 32 C) do not extend or extend a little beyond margin of the superior volsella, but in *T. limneticus* the digitus is somewhat shorter and triangular to cone-shaped (in *T. rhabdomantis* it is finger-like). *Tanytarsus limneticus* can be separated from *T. rhabdomantis* by the armament of anal point (*T. limneticus* has spines and two shorter setae between anal crests, while *T. rhabdomantis* does not have spines but short, thick setae between crests), by the presence of microtrichia on the superior volsella (absent in *T. rhabdomantis*) and wing setosity (wing of *T. limneticus* with much more setae). The males of both species do not have much in common with *N. patagonica*. Trivinho-Strixino & Sanseverino (2003) pointed out that *T. rhabdomantis* shares only one character with *N. patagonica*, i.e. the presence of short setae between the crests on the anal point (Figs 32 A-B and 35 A-B), and can be separated by having a higher antennal ratio, setose wing veins and cells, normally developed

antennae, wings, palps, tarsomeres of mid and hind legs, tibial combs and spurs (all reduced or shorter in *N. patagonica*), and by having a differently shaped superior volsella, digitus, and median volsella. Regarding *T. limneticus*, not even the character "short setae on the anal point" is shared, since the species has spines and only two short setae between the anal crests.

**Should *Nimbocera* be considered a non-valid genus?**

As discussed above, the diagnostic characters used for delimiting the immature stages of *Nimbocera* (Reiss 1972; Pinder & Reiss 1983, 1986) do not hold up and are found in other *Tanytarsus* species as well as in other Tanytarsini. This led to the problem of describing a new genus based on a single species, because the diagnostic features of a monotypic genus are in fact diagnostic characters at species level. Cranston *et al.* (1989) pointed out that since only one species is known in the adult stage, the diagnosis of *Nimbocera* may require extension or revision when others are described. Some authors question the validity of *Nimbocera* (Epler 1995) and the importance of a phylogenetic analysis to show if the genus should be maintained or the species should be placed in *Tanytarsus* (Ekrem *et al.* 2003).

The adult male of *N. patagonica* (Figs 34 and 35) can be mainly diagnosed by the low antennal ratio, short antenna (brachycery), a somewhat reduced antennal plume, reduced palps and wings (brachyptery), low ratio of wing length to width (more than 3.1 in most Neotropical *Tanytarsus*, about 2.5 in *Nimbocera*), few and short wing setae (shorter than those observed in Neotropical *Tanytarsus*), shortened tarsomeres of mid and hind legs, low leg ratio (LR), high "Beinverhältnis" (BV) and "Schenkel-Schieneverhältnis" (SV), by the cordiform 4th tarsomere of mid leg, absence of median setae on tergite IX, presence of short setae on the anal point (spines absent) and a peculiar superior volsella, robust inferior volsella and gonostylus.

Reductions of structures should be treated carefully before the creation of a new genus or taxon. In regard to *Nimbocera*, it is difficult to decide if such peculiar features and reduced characters of the adult are sufficient to diagnose the genus, because of its already-mentioned monotypy and its geographical distribution. The species is recorded from the southern part of South America, near the Magallanes Strait, occurring in coastal lagoons and ponds. If this medium is interpreted as a restricted habitat or extreme environment, then the reductions and modifications could be associated with limitations or adaptations for such environment.

Oliver & Dillon (1997) studied collections of chironomids from the Arctic zone and reported some groups with structural reductions and modifications such as shortened or modified antennae, enlarged and rotated hypopygia, brachyptery, strengthened legs, flattened scutum and shortened palps. According to the authors, these structural modifications are usually associated

with loss of aerial mating habit and with mating on the ground or other substrate. Oliver & Dillon (1997) also mentioned a *Tanytarsus* species (Butler *et al.* 1980) with modifications from this Arctic area. This species was described later by Butler (2000) as *Tanytarsus aquavolans*, which shows a peculiar hypopygium and morphological reductions.

The reductions observed in *Tanytarsus aquavolans* are somewhat similar to those of *Nimbocera patagonica*. The species has shortened antenna and reduced antennal plume, short palps, legs and wings, low LR, few setae on wings, the hypopygium is robust in form and does not have median setae on anal the tergite, microtrichia or spine groups between anal point crests are absent, digitus is lacking and the superior volsella is "divided" into two distinct portions. Butler (2000) pointed out that such developments are generally considered adaptations to pelagic swarming or surface mating, or reductions of structures could be beneficial under strong selection pressure against flight, as in habitats subjected to persistent high winds. Some sensillar structures of the antenna interpret wind speed in normally plumed males; non-plumed males are poor fliers or brachypterous, and normally mate on the ground of water surface (Sublette 1979). Reiss (1972) presumed that other features of *N. patagonica*, besides its slight brachyptery and brachycery, would be an indicative that the copula occurs on water-body surface and the *Nimbocera* males apparently do not form swarms. As observed by Butler *et al.* (1980) in the lately described *T. aquavolans*, the structures most involved in flight, swarm behavior and aerial location of a mate are also reduced in *N. patagonica* while the genitalia is relatively robust. Furthermore, comparing *N. patagonica* with all described Neotropical *Tanytarsus*, the species shows the lowest LR and the highest BV and SV; these ratio values of the legs could be more an indicative that the mating occurs on the ground or on water surface.

According to Ashe & Cranston (1990), where male swarming is limited, particularly in extreme environments, there is associated variable feminization of the male antennae, and there may be brachyptery or aptery in both sexes. Lloyd (1999) pointed out that the strand habitat (shorelines of lakes, rivers and oceans, and around islands) has often been associated with wing reduction and loss; since flyers can be blown away over open water, wings may often be "fatal" in such situations. Geographical isolation, high energetic cost of flight and habitat stability are probably the major factors thought to be responsible for the loss of flight in insects (Roff 1990).

In view of modifications and reductions of the *Nimbocera* adult male, apparently related to its habitat and distribution, the difficulty to find diagnostic characters to delimit the genus, its similarity with the genus *Tanytarsus* and its monotypy, descriptions of new species and a phylogenetic analysis are necessary to test the validity of the genus.

***Tanytarsus marauia* Sanseverino, Wiedenbrug & Fittkau, 2002**

(Figs 37-38)

Type material (Brazil, Amazonas State, leg. E. J. Fittkau). Holotype: pharate male, Rio Marauiá, Seringueiro Tapiri, drift net (sample A453), 2.I.1963, slide mounted in Euparal (INPA). Paratype: 1 pharate male, Rio Marauiá, Cachoeira Santo Antônio, drift net (sample A466), 7.-8.I.1963, slide mounted in Euparal (ZSM).

A full description of male and pupa of *Tanytarsus marauia* including measurements is given in Tables I-VIII. Drawings are presented here and as well as a complete diagnosis of the male imago and pupa.

**Diagnostic characters.** *Tanytarsus marauia* can be separated from the other *Tanytarsus* species by the following combination of characters.

**Male Imago (Fig. 37):** Antennal ratio 0.93; eyes with dorsomedian extension; tergite IX with double lateral tooth and without microtrichia-free areas; anal tergal bands separate, short, not running parallel (not reaching middle of tergite) and ending well anterior to anal point base; anal point elongate and rounded at tip, with spines placed irregularly between well-developed anal crests; field of microtrichia on anterior half of the surface between the crests; spine-bearing surface slightly raised in posterior portion; superior volsella ovoid to somewhat quadrate, without microtrichia, posteromedian corner slightly projecting; longitudinal axes of superior volsella and body at angle of about 21°; digitus long and pointed, somewhat finger-like, extending well beyond margin of superior volsella; median volsella with pectinate lamellae; inferior volsella thick and curved, distal part not swelled; gonostylus elongate, straight and thin; hypopygium ratio about 0.87.

**Pupa (Fig. 38 A-C):** Frontal apotome slightly rugose; frontal setae thin and short, cephalic tubercles weakly developed; thoracic horn elongate and thin, with few small spinules; wing sheath with developed nose; three precorneals not in triangular pattern, placed on tubercle; anterior precorneal stronger, $Pc_1$ and $Pc_2$ closer to each other; 2 pairs of dorsocentrals, the two setae of each pair inserted contiguously, $Dc_1$ and $Dc_4$ thicker, $Dc_4$ longer than $Dc_{1-3}$; hook row on tergite II less than 1/3 segment width; Pedes Spurii B well developed on segment II; tergites II-V with homogeneous shagreen arranged in transverse rows, shagreen on T V sparse posteromedially; tergites VI-VII with shagreen anteromedially; tergites VIII-IX with

anterolateral patches of fine shagreen; segment VIII with four lateral taeniae; posterolateral comb of segment VIII consisting of one strong tooth and adjacent teeth decreasing in size anteriorly, comb extending from posterior to anterior 2/3 on lateral; abdominal segment I without lateral seta, segments II-IV with 3 lateral setae, segments V-VI with 3 lateral taeniae, segments VII-VIII with 4 lateral taeniae; segment VIII with 1 dorsal seta and 1 ventral taenia; anal fringe with ca. 40 taeniae.

**Distribution and ecological notes**

*Tanytarsus marauia* is recorded from River Marauiá, a tributary of River Negro situated in the National Park of Pico da Neblina in the northwestern corner of Amazonas (Brazil). The source of the River Marauiá is located close to the boundary between Brazil and Venezuela, the area is surrounded by an undisturbed evergreen forest and is one of the wettest parts of the Amazon region, with an annual precipitation of about 4000 mm.

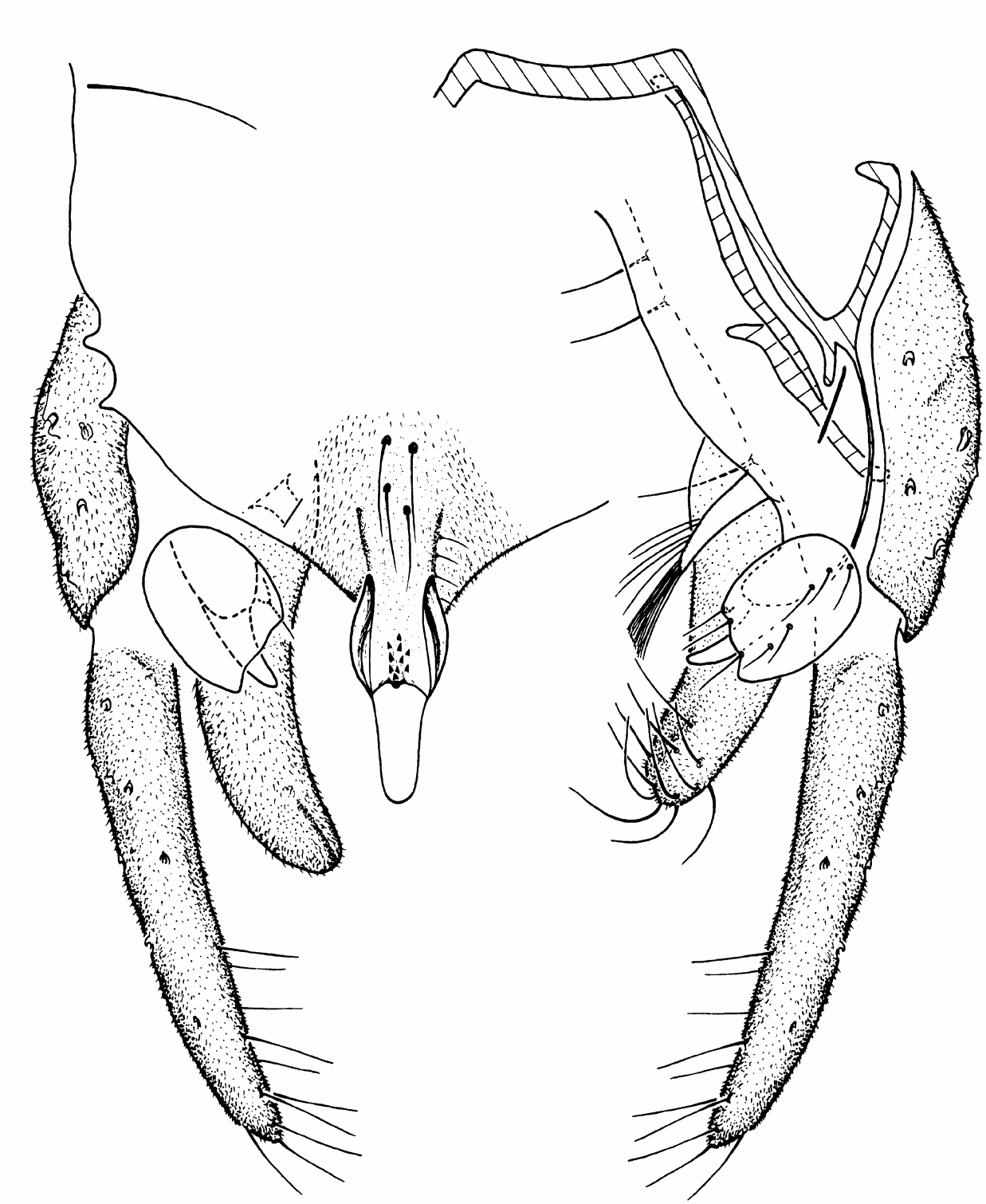


**Fig. 37.** ***Tanytarsus marauia*** **Sanseverino, Wiedenbrug & Fittkau, adult male (after Sanseverino** ***et al.*** **2002). Dorsal view of hypopygium.**

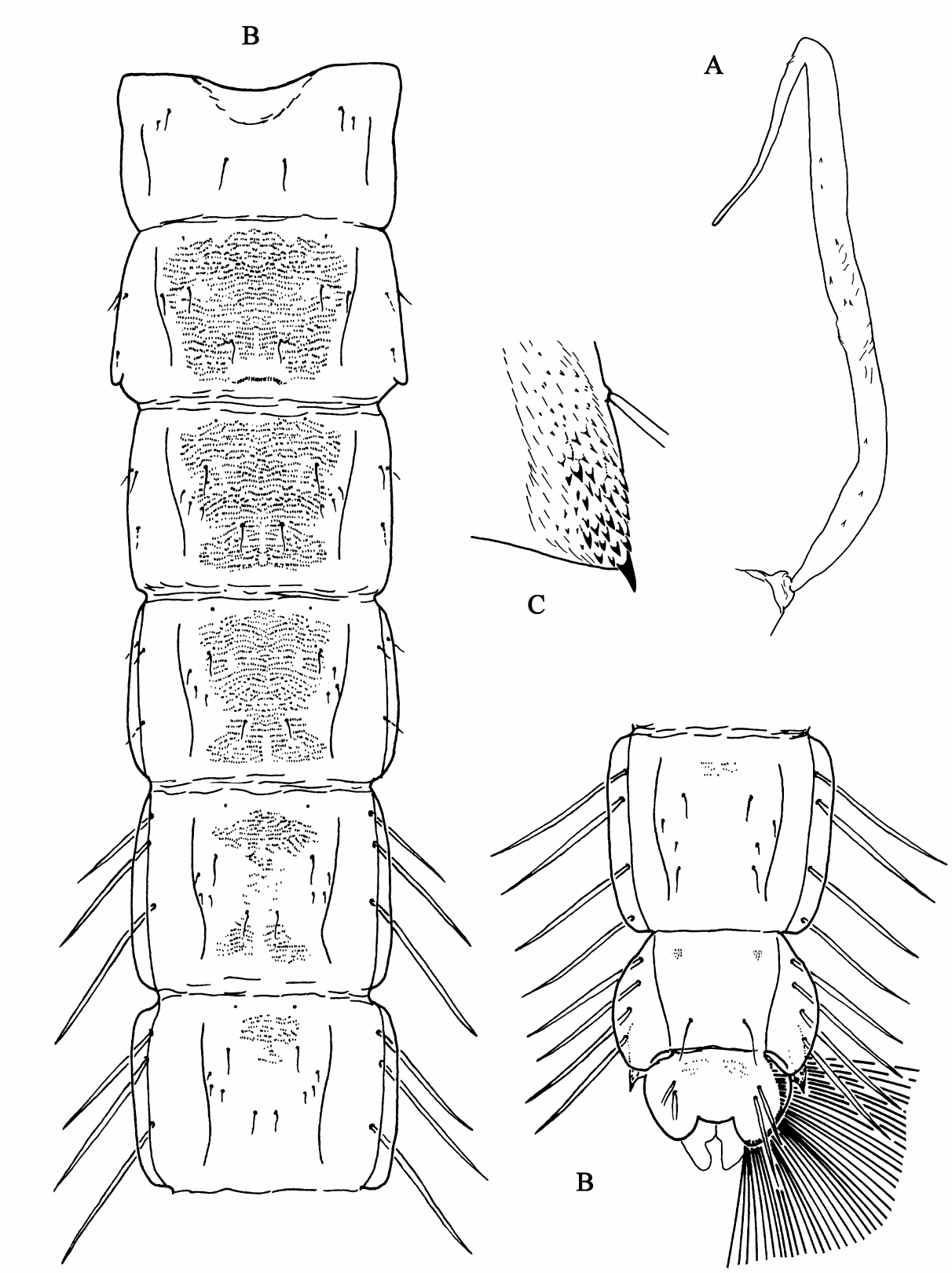



**Fig. 38.** ***Tanytarsus marauia*** **Sanseverino, Wiedenbrug & Fittkau, pupa (after Sanseverino** ***et al.*** **2002). A: Thoracic horn. B: Abdomen, dorsal view. C: Posterolateral comb of abdominal segment VIII.**

***Tanytarsus revolta* Sanseverino, Wiedenbrug & Fittkau, 2002**

(Figs 39-40)

Type. Holotype: pharate male, Brazil, Rio de Janeiro State, Rio Paquequer, Vale da Revolta, surber, 15.I.1991, slide mounted in Euparal, leg. J. L. Nessimian (IOC/FIOCRUZ).

A full description of male and pupa of *Tanytarsus revolta* including measurements is given in Tables I-VIII. Drawings and a complete diagnosis of the male and pupa are presented.

**Diagnostic characters.** *Tanytarsus revolta* can be separated from other *Tanytarsus* species by the following combination of characters.

**Male Imago (Fig. 39 A-B):** Antennal ratio 0.40; eyes with dorsomedian extension; tergite IX with double lateral tooth and without microtrichia-free areas; anal tergal bands separate, short, not running parallel (not reaching middle of tergite) and ending well anterior to anal point base; anal point somewhat circular, with spines placed irregularly between well-developed anal crests; field of microtrichia on entire surface between anal crests; spine-bearing surface slightly raised in posterior portion; superior volsella somewhat quadrate, without microtrichia, posteromedian corner not projecting; longitudinal axes of superior volsella and body at angle of about 55°; digitus long and thumb-like, thicker basally and distally, extending well beyond margin of superior volsella; median volsella with pectinate lamellae; inferior volsella thin and curved, distal part slightly swelled; gonostylus elongate, straight and thin; hypopygium ratio about 0.90.

**Pupa (Fig. 40 A-B):** Thoracic horn thick, covered with spinules; three precorneals not in triangular pattern, placed on tubercle; anterior precorneal stronger, $Pc_2$ and $Pc_3$ closer to each other; hook row on tergite II less than 1/3 segment width; Pedes Spurii B well developed on segment II; tergites II-IV with more or less homogeneous shagreen, posterior median area without shagreen; mid area of shagreen on T II consisting of elongate spinules not arranged in rows; tergite VII with fine shagreen, median area apparently without shagreen; segments II-IV with 3 lateral setae, segments V-VI with 3 lateral taeniae, segment VII with 4 lateral taeniae.

**Distribution and ecological notes**

*Tanytarsus revolta* is recorded from Rio de Janeiro State, Brazil. The species (pharate male) was collected from a first-order tributary in "Serra do Mar" (Coastal Range) at about 1100 m above sea level. The area is surrounded by the Atlantic Forest, an evergreen pluvial forest.

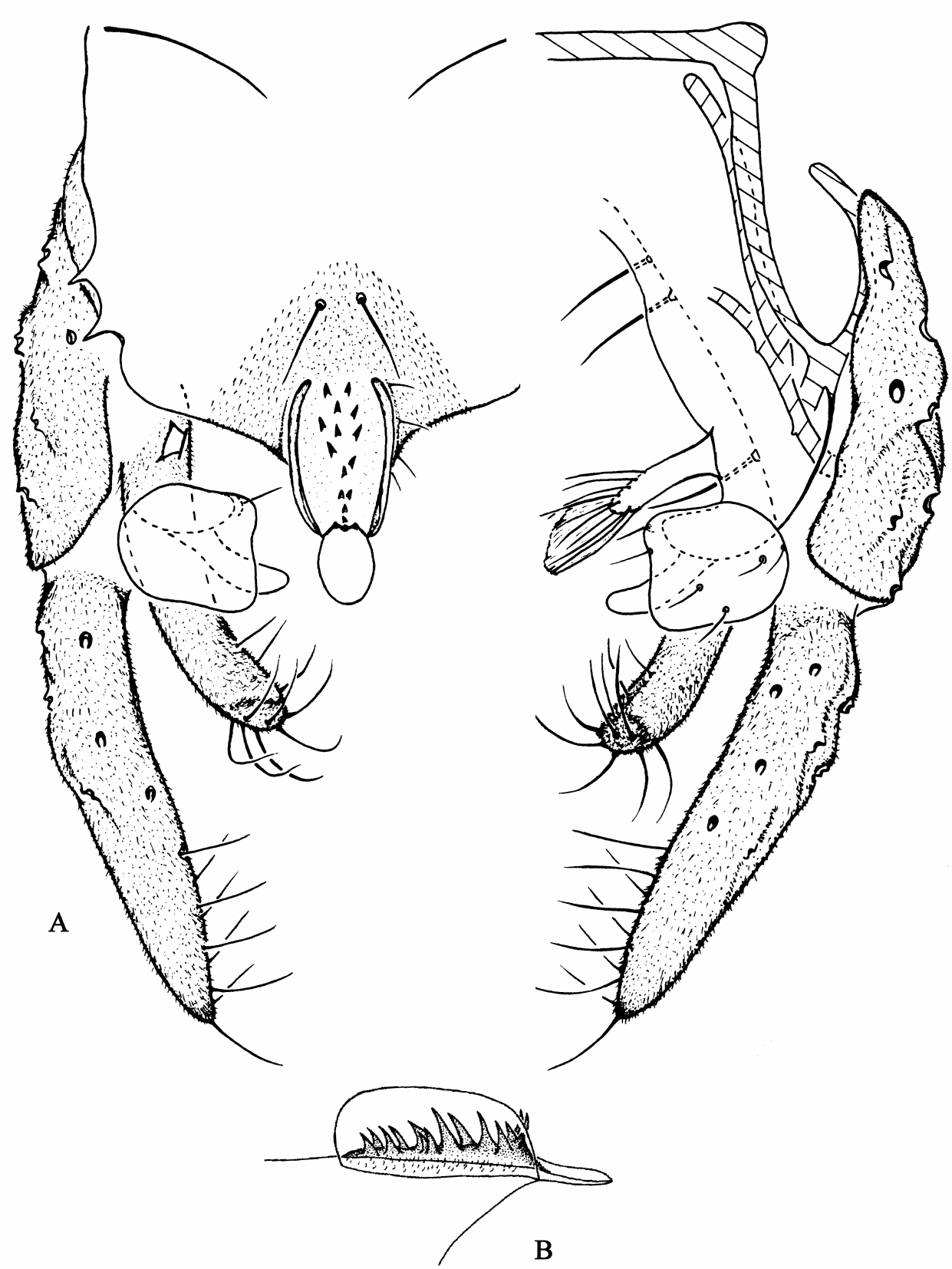



**Fig. 39.** ***Tanytarsus revolta*** **Sanseverino, Wiedenbrug & Fittkau, adult male (after Sanseverino** ***et al.*** **2002). A: Hypopygium, dorsal view. B: Anal point, lateral view.**

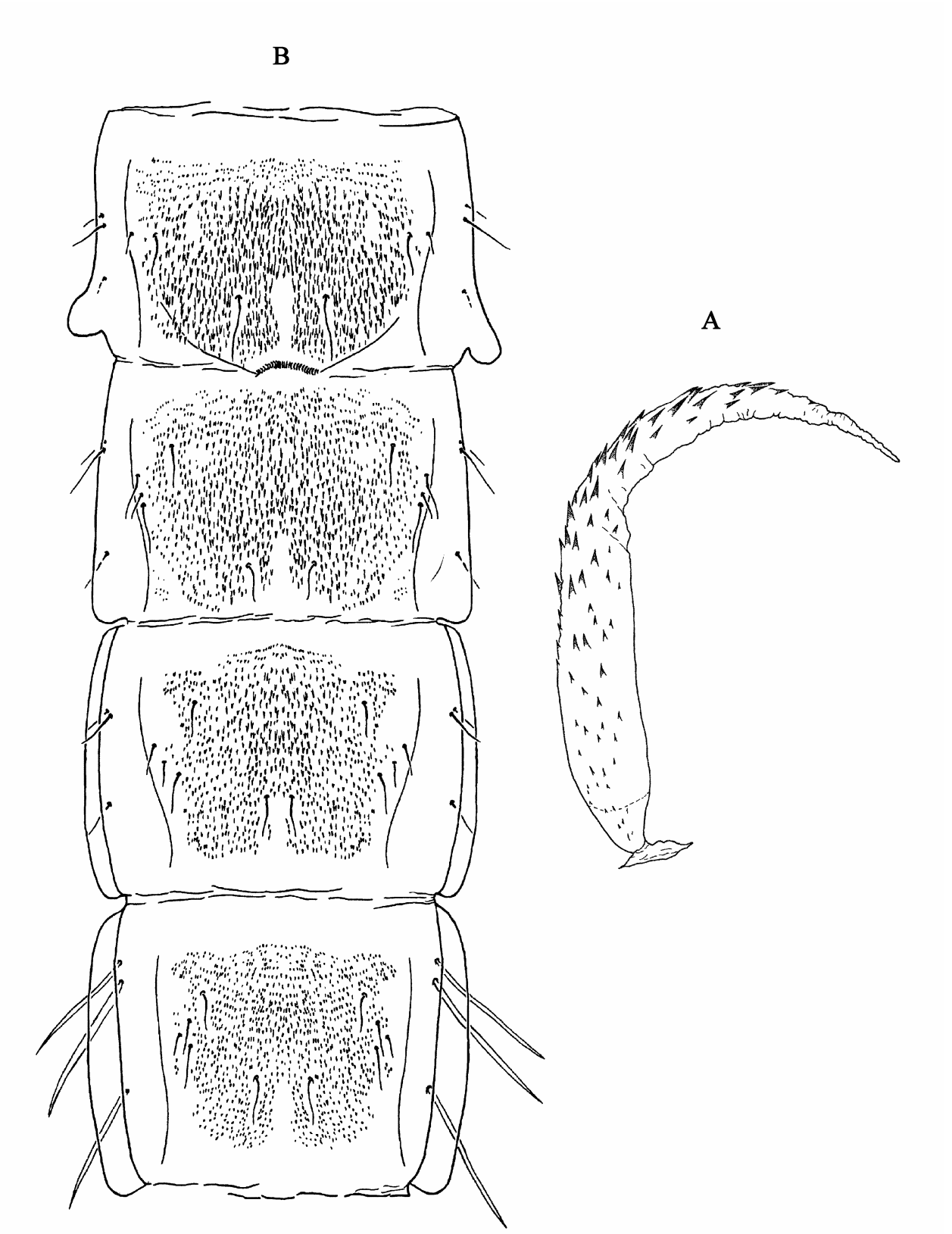



Fig. 40. *Tanytarsus revolta* Sanseverino, Wiedenbrug & Fittkau, pupa (after Sanseverino *et al.* 2002). A: Thoracic horn. B: Abdominal segments II-V, dorsal view.

### *Tanytarsus waika* Sanseverino, Wiedenbrug & Fittkau, 2002

(Figs 41-42)

Type material (Brazil, Amazonas State, leg. E. J. Fittkau). Holotype: pharate male, Rio Marauiá, Cachoeira Santo Antônio, drift net (sample A466), 7.-8.I.1963, slide mounted in Euparal (INPA). Paratypes: 2 adult males, Rio Marauiá, Missão Santo Antônio, at light (sample A473), 9.I.1963, slide mounted in Canada balsam (all ZSM).

A full description of male and pupa of *Tanytarsus waika* including measurements is given in Tables I-VIII. Drawings are presented here and as well as a complete diagnosis of the male imago and pupa.

**Diagnostic characters.** *Tanytarsus waika* can be separated from other *Tanytarsus* species by the following combination of characters.

**Male Imago (Fig. 41):** Antennal ratio about 0.51; eyes with dorsomedian extension; frontal tubercles small; wing veins Sc, M, Cu, Postcubitus and An bare; wing cells m, cu and an bare; tergite IX with double lateral tooth and without microtrichia-free areas; anal tergal bands separate, short, not running parallel (not reaching middle of tergite) and ending well anterior to anal point base; anal point elongate and rounded at tip, with spines placed irregularly between well-developed anal crests; field of microtrichia on anterior half of the surface between anal crests; spine-bearing surface slightly raised in posterior portion; superior volsella somewhat quadrate, posteromedian corner not projecting; longitudinal axes of superior volsella and body at angle of about 48°; digitus short and pointed, not reaching median margin of superior volsella; median volsella with pectinate lamellae; inferior volsella slightly thick and straight, distal part not swelled; gonostylus short, straight and thin; hypopygium ratio about 0.87.

**Pupa (Fig. 42 A-D):** Frontal apotome rugose; frontal setae thin and short, cephalic tubercles absent; thoracic horn elongate and thin, sparsely covered with small spinules; wing sheath with nose; three precorneals not in triangular pattern, placed on tubercle; anterior precorneal stronger, distances between $Pc_1$ and $Pc_2$ and between $Pc_2$ and $Pc_3$ similar; 2 pairs of dorsocentrals, setae of each pair inserted contiguously; hook row on tergite II less than 1/3 segment width; Pedes Spurii B well developed on segment II; tergites II-V with homogeneous shagreen arranged in transverse rows, shagreen on T V sparse posteromedially; tergites VI and VIII-IX with anterolateral shagreen composed of few spinules; posterolateral comb of segment VIII consisting of one

strong tooth and few adjacent spinules; abdominal segment I without lateral seta, segments II-IV with 3 lateral setae, segments V-VI with 3 lateral taeniae, segments VII-VIII with 4 lateral taeniae; segment VIII with 1 dorsal seta and 1 ventral taenia; anal fringe with ca. 40 taeniae.

**Distribution and ecological notes**

*Tanytarsus waika* is recorded, as *T. marauia*, from Rio Marauiá, a tributary of the River Negro located in the National Park of Pico da Neblina, Amazonas State (Brazil).

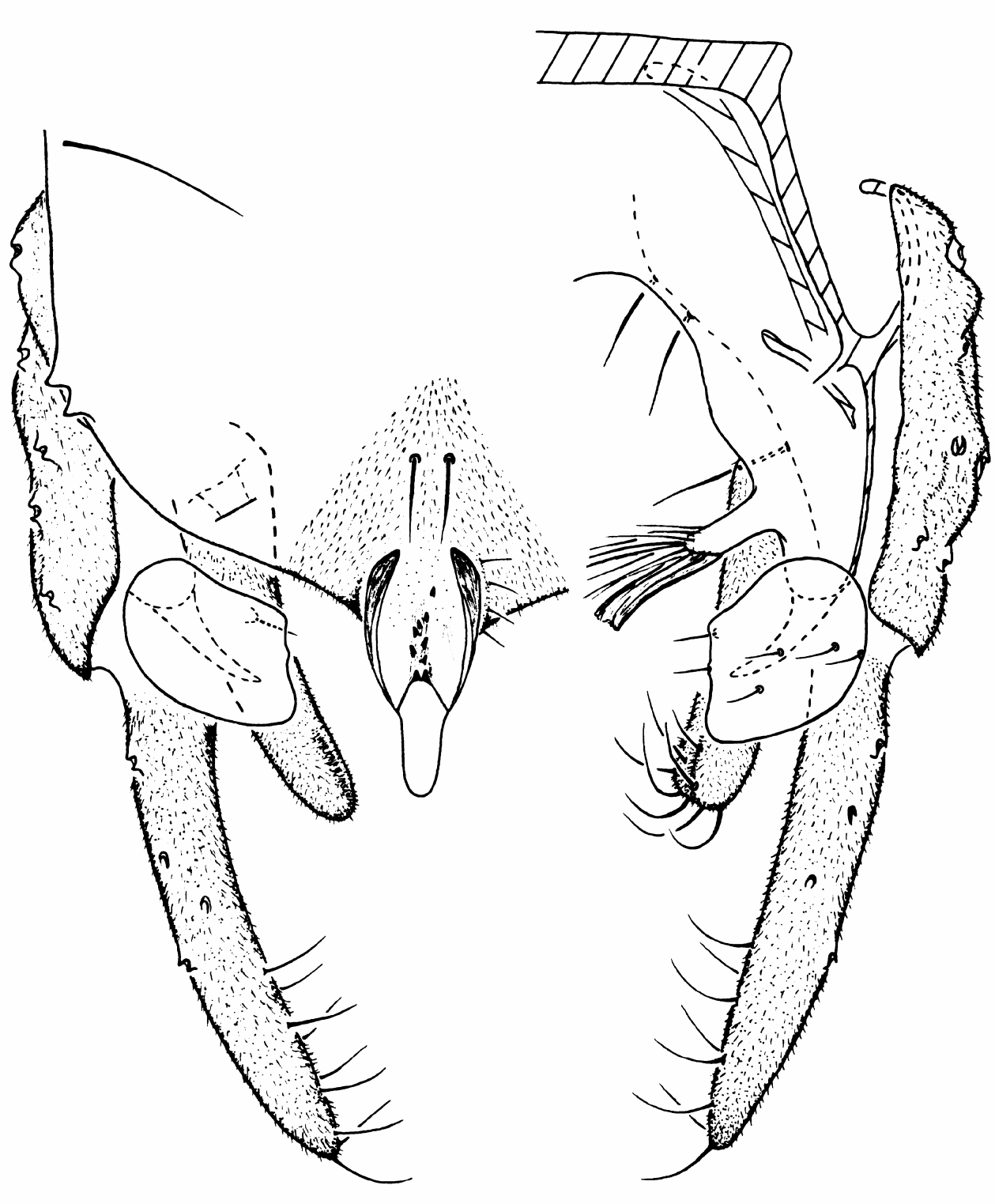


**Fig. 41.** ***Tanytarsus waika*** **Sanseverino, Wiedenbrug & Fittkau, adult male (after Sanseverino** ***et al.*** **2002). Dorsal view of hypopygium.**

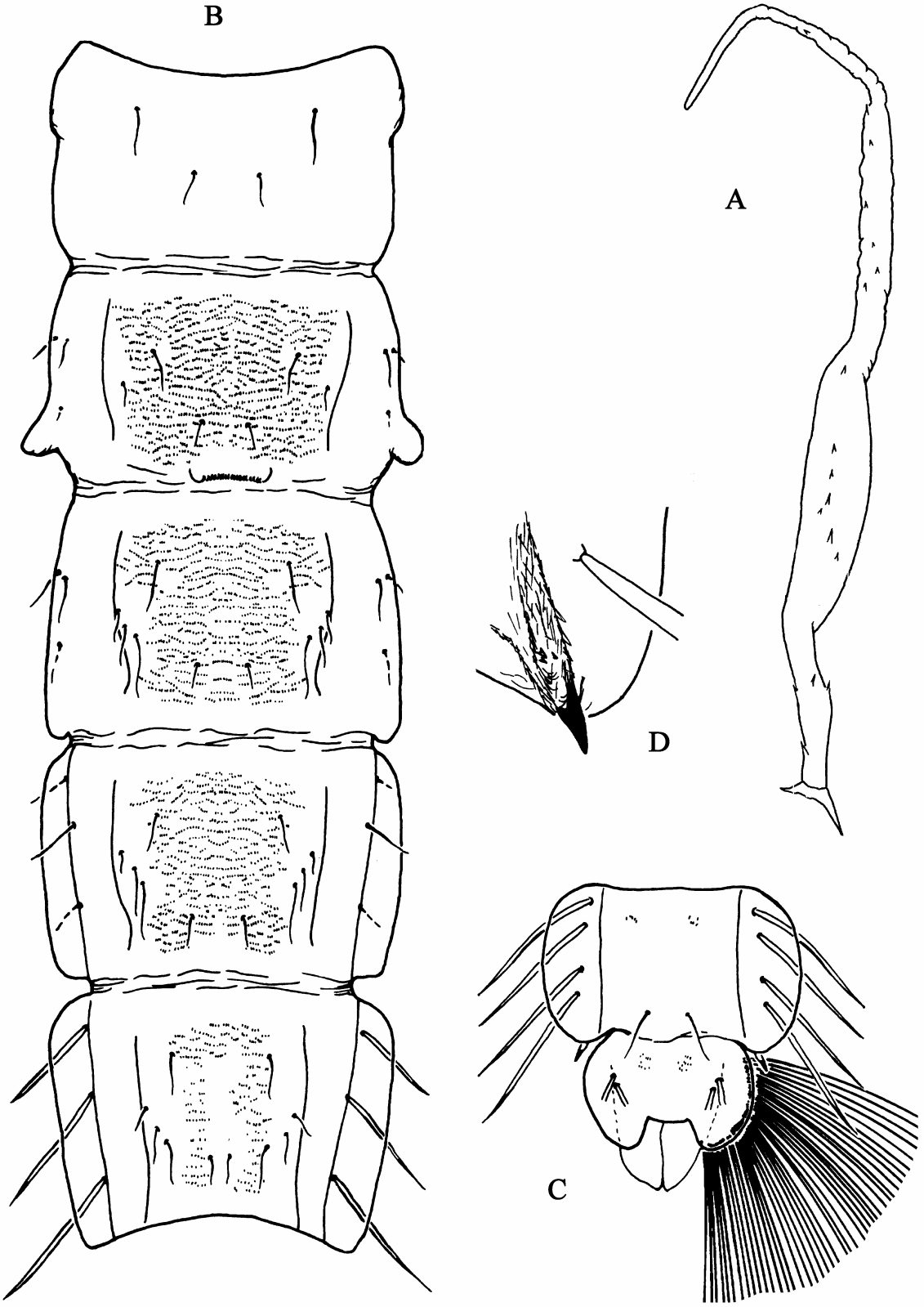



**Fig. 42.** ***Tanytarsus waika*** **Sanseverino, Wiedenbrug & Fittkau, pupa (after Sanseverino** ***et al.*** **2002). A: Thoracic horn. B: Abdominal segments I-V, dorsal view. C: Abdominal segments VIII-IX, dorsal view. D: Posterolateral comb of abdominal segment VIII.**

***Tanytarsus xingu* Sanseverino, Wiedenbrug & Fittkau, 2002**

(Figs 43-44)

Type material (Brazil, leg. E. J. Fittkau). Holotype: 1 pharate male, Mato Grosso State, Rio Xingú, drift net (sample A558-3), 16.VIII.1965, slide mounted in Euparal (INPA). Paratypes: 2 adult males, Pará State, Igarapé Kumadueni, at light (sample A377), 19.IV.1962, slides mounted in Canada balsam; 2 adult males, Pará State, Rio Parú, at light (sample A366-1), 20.IV.1962, slides mounted in Canada balsam (all ZSM).

A full description of male and pupa of *Tanytarsus xingu* including measurements is given in Tables I-VIII. Drawings are presented here and as well as a complete diagnosis of the male imago and pupa.

**Diagnostic characters.** *Tanytarsus xingu* can be separated from other *Tanytarsus* species by the following combination of characters.

**Male Imago (Fig. 43 A-C):** Antennal ratio about 1.10; eyes with dorsomedian extension; frontal tubercles small; wing veins Sc, M, Cu, $Cu_1$, Postcubitus and An bare; wing cells m and cu bare; tergite IX with double lateral tooth and without microtrichia-free areas; anal tergal bands separate, short, not running parallel (not reaching middle of tergite) and ending well anterior to anal point base; anal point elongate and rounded at tip, with spines placed irregularly between well-developed anal crests; field of microtrichia on the beginning of anterior half of the surface between the crests; spine-bearing surface raised and forming a conspicuous hump in posterior portion; superior volsella somewhat quadrate, posteromedian corner not projecting; longitudinal axes of superior volsella and body at angle of about 46°; digitus short and pointed, not reaching median margin of superior volsella; median volsella with pectinate lamellae; inferior volsella thick and curved, distal part wider, with dorsoapical oval swelling; gonostylus elongate, straight and thin; hypopygium ratio about 0.82.

**Pupa (Fig. 44 A-C):** Thoracic horn elongate and thin, with very few small spinules; three precorneals not in triangular pattern; wing sheath with nose; hook row on tergite II about 1/3 segment width; Pedes Spurii B well developed on segment II; tergites II-V with median field of more or less homogenous shagreen, anterior band wider, consisting of somewhat stronger shagreen merging with a median field of finer shagreen, shagreen on T V sparse posteromedially; posterolateral comb of segment VIII consisting of one strong tooth and about

ca. 15 smaller teeth; segments II-IV with 3 lateral setae; segments V-VI with 3 lateral taeniae, segments VII with 4 lateral taeniae, segment VIII with 5 lateral taeniae.

**Distribution and ecological notes**

*Tanytarsus xingu* is recorded from Mato Grosso and Pará States, Brazil. Pharate males were found in the River Xingú, a river that rises on the plateau of Mato Grosso in the drainage basin framed by Serra do Roncador and Serra Formosa mountain ranges. Formed by several headwaters, the Xingú meanders run circa 2100 Km and empty into the Amazon river. The environment is heterogeneous with several smaller, black-water rivers carrying few or no suspended sediments, and their banks sometimes flood creating white-sand Igapó forest. Black-water Rivers are poor in nutrients; the brown colouration of the water comes from the break-down of plant debris within the forest (Sioli 1965). In Pará State, male imagines were collected from an area of "Igarapé", a black-water forest stream, and from River Parú, a river that rises on the southern slopes of the Tumucumaque mountains, on the Suriname border, flows for about 800 Km south-southeastward through Pará State and empties into the lower Amazon river.

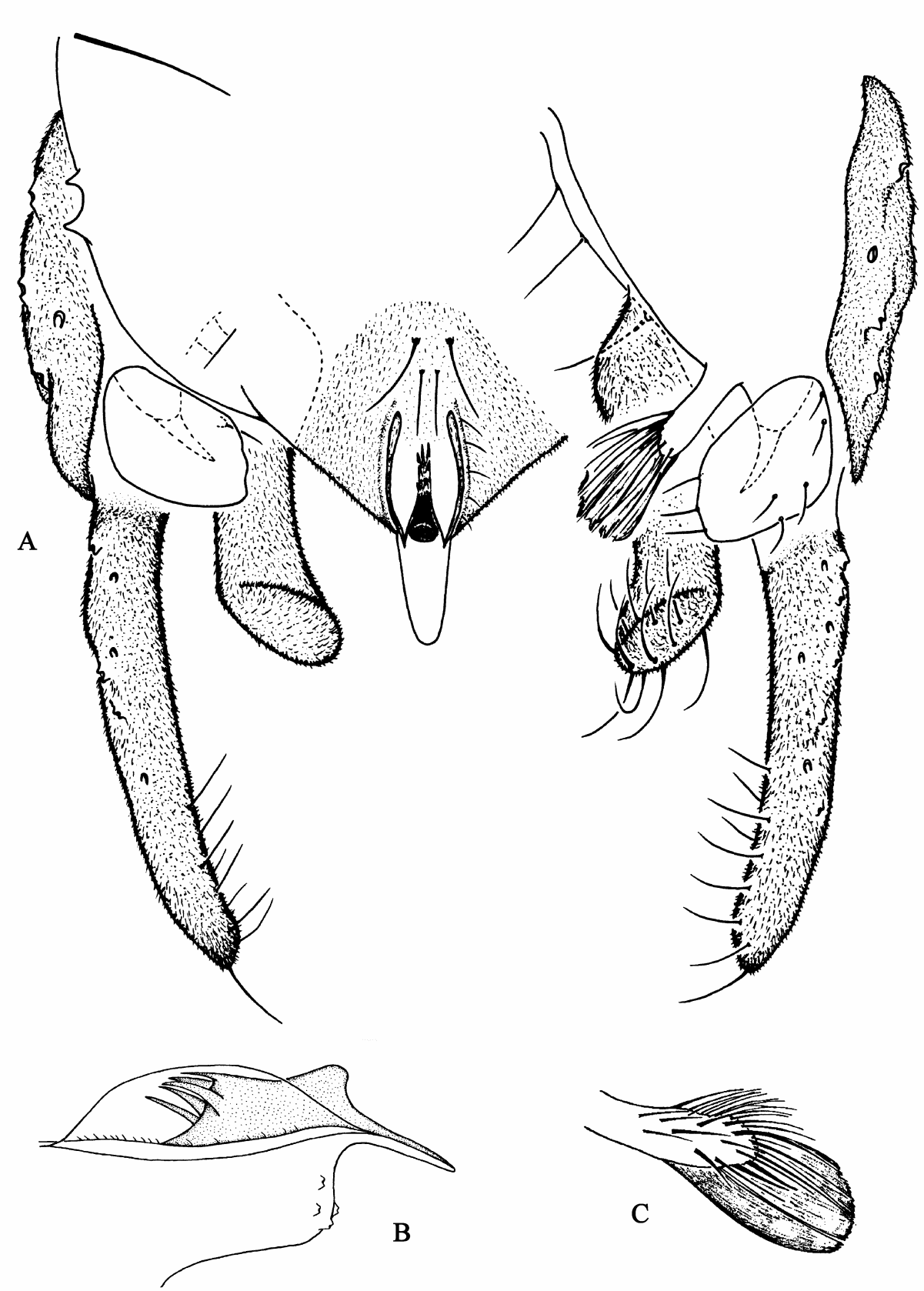



**Fig. 43.** ***Tanytarsus xingu*** **Sanseverino, Wiedenbrug & Fittkau, adult male (after Sanseverino** ***et al.*** **2002). A: Hypopygium, dorsal view. B: Anal point, lateral view. C: Median volsella.**

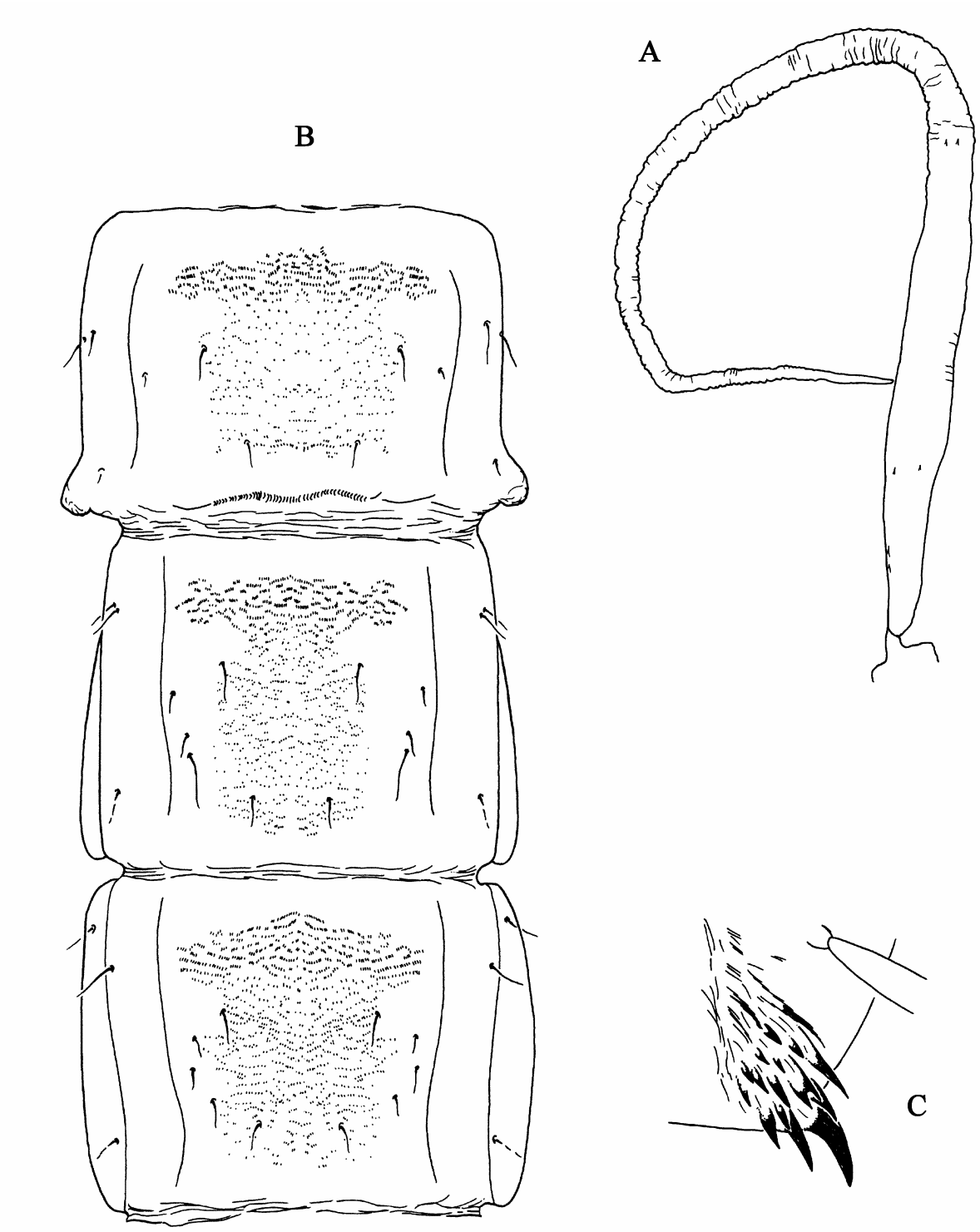



**Fig. 44.** ***Tanytarsus xingu*** **Sanseverino, Wiedenbrug & Fittkau, pupa (after Sanseverino** ***et al.*** **2002). A: Thoracic horn. B: Abdominal segments II-IV, dorsal view. C: Posterolateral comb of abdominal segment VIII.**

**Discussion about *Tanytarsus marauia, Tanytarsus revolta, Tanytarsus waika* and *Tanytarsus xingu*, members of the *marauia* species group**

*Tanytarsus marauia, Tanytarsus revolta, Tanytarsus waika* and *Tanytarsus xingu* were placed in the *marauia* species group based on a combination of pupal and imaginal characters (Sanseverino *et al.* 2002). The genus *Tanytarsus*, as a whole, presents the armament of the pupal abdominal tergites (at least tergites III-V) consisting of paired patches or bands of points or spines (Pinder & Reiss 1986). The pupal abdominal tergites of *T. marauia*, *T. revolta*, *T. waika* and *T. xingu* show an armament of homogeneous shagreen (Figs 38 B, 40 B, 42 B and 44 B), a pattern, among described *Tanytarsus*, only observed in these species until now. The pupal morphotypes ET 126, 127, 128 from Central Amazonian streams (Ospina-Torres 1992) and the genus 10 sp1 from mountain streams in Rio Grande do Sul (Wiedenbrug 2000) also show homogeneous shagreen on abdominal tergites and could possibly be included in the *marauia* group, but a decision about the systematic position of these pupal morphotypes must await correct associations with their adult males.

In the Holarctic key for Chironomidae pupae (Pinder & Reiss 1986), the *marauia* group would key to *Neostempellina* Reiss, 1984. The genus *Neostempellina* is, however, clearly differentiated from the *marauia* group by the presence of thoracic horn with lateral fringe of long chaetae, one precorneal and four antepronotal setae, segment VIII with 3 lateral taeniae and the absence of pedes spurii B.

Among the described Tanytarsini pupae from the Neotropics, *Caladomyia friederi* Trivinho-Strixino & Strixino, 2000 appears to be similar to the *marauia* group, but differs in having 3 lateral taeniae on segment IV (in the *marauia* group the lateral setae on segment IV are not taeniate).

In regard to imaginal characters, *T. marauia*, *T. revolta* and *T. waika* show the spine-bearing surface of the anal point slightly raised in the posterior portion (Figs 37, 39 A-B and 41), while in *T. xingu* this anal point posterior portion is distinctly raised, forming a conspicuous hump (Fig. 43 A-B). These species share some morphological characters with members of the Neotropical *riopreto* group Fittkau & Reiss, but they can be separated by the extension of anal tergal bands, the posteriorly raised spine-bearing surface of the anal point and the shape of the superior volsella.

Among the four species, *T. marauia* and *T. waika* seem to be more related. The adults of both species have a similar hypopygium design, differing in the digitus length (shorter in *T. waika*). The pupae of *T. marauia* and *T. waika* are also similar, differing in the form of the

posterolateral armament of segment VIII: in *T. marauia* the armament consists of a tooth with adjacent patch of spinules decreasing in size anteriorly (Fig. 38 C), while *T. waika* has a tooth with few adjacent spinules (Fig. 42 D).

A certain placement of *Tanytarsus marauia*, *T. revolta*, *T. waika* and *T. xingu* has to await a phylogenetic analysis of the Neotropical species.

### ***Tanytarsus amazonicus* spec. nov.**

(Figs 45-46)

Type material (Brazil, Amazonas State). Holotype: 1 pharate male, Rio Demeni, Igapó Curitiaú, collected from leaves at 20-30 cm depth (sample A332-5), 6.II.1962, slide mounted in Euparal, leg. E. J. Fittkau (INPA). Paratype: 1 adult male, slide mounted in Euparal, Manaus, Rio Tarumã, 3.IX.1972, leg. U. Irmler (ZSM).

**Etymology.** *Tanytarsus amazonicus* is named after its type locality, Amazonas state.

**Diagnostic characters.** *Tanytarsus amazonicus* can be separated from other *Tanytarsus* species by the following combination of characters.

**Male Imago:** Antennal ratio 1.11-1.12; eyes with dorsomedian extension; small frontal tubercles; wing veins Sc and M bare, wing cells cu and an bare; tergite IX with single lateral tooth and without microtrichia-free areas; anal tergal bands separate, curved, running parallel on middle of tergite and ending well anterior to anal point base; anal point elongate and slightly quadrate at tip, with spines placed regularly in one row between well-developed anal crests, microtrichia absent; superior volsella rectangular, with wrinkles/ rugosities in posterior margin, without microtrichia; longitudinal axes of superior volsella and body at angle of about 73°; digitus long and thick, thumb-like, extending well beyond margin of superior volsella; median volsella with subulate lamellae, not reaching apex of inferior volsella; inferior volsella thin and and slightly medially curved, distal part (area carrying setae) straight, not swelled; gonostylus elongate, straight and thick; hypopygium ratio about 0.97.

**Pupa:** Frontal apotome smooth; frontal setae thin and short, cephalic tubercles weakly developed; wing sheath with well-developed nose; prealar tubercle well developed, cone-shaped; thoracic horn thin, with small spines; three short precorneals in triangular pattern, $Pc_1$ thicker than the other two, small tubercle close to precorneals; 2 pairs of dorsocentrals, each pair with 1 seta thin and 1 thick, $Dc_4$ stronger than other three; hook row about 1/4 width of abdominal tergite II; Pedes Spurii B on segment II bare and well developed; tergites I, VII-IX without armament; T II with homogeneous shagreen, bare medially; T III-V with anterior pair of oval/elongate patches of spines; T VI with small rounded pair of fine spinules anteriorly; posterolateral comb of segment VIII with 4-5 strong teeth and 5-6 smaller one; abdominal segment I without lateral seta; segment II-V with 3 lateral setae; segment VI with 4 lateral setae; segment VIII with 5 lateral taeniae, 1 dorsal seta slightly taeniate and 1 ventral seta; anal fringe with about 19 taeniae.

**Description**

**Male Imago (n=2)**

**Head.** AR 1.11-1.12. Antennal flagellomeres one to twelve 416-447 µm long, thirteen 468-498 µm long, total length 884-945 µm. Eyes with dorsomedian extension; small frontal tubercles (length 9-10 µm), about two times as long as wide; 9 temporal setae; clypeus with 8-10 setae; lengths of palpal segments (in µm): 29-31, 36-38, 89-100, 110-112, 200-204, total length 464-485 µm.

**Thorax.** Length 687-710 µm. Scutal tubercle absent; 6-8 dorsocentrals, 13-14 acrostichals, 1 prealar, 4 scutellars. Halteres with 3-4 setae.

**Wing.** Wing length 1190-1268 µm, width 350-380 µm; L/WR 3.3-3.4. Brachiolum with 1 seta, Sc bare, R with 13-16 setae, $R_1$ with 13-21 setae, $R_{4+5}$ with 26-37 setae, M bare, $M_{1+2}$ with 28-39 setae, $M_{3+4}$ with 15-22 setae, Cu with 0-2 setae, $Cu_1$ with 11-16 setae, Postcubitus bare and An with 16-21 setae. Cell m bare (false vein bare), $r_{4+5}$ with 107-118 setae, $m_{1+2}$ with 83-90 setae (+ 14-22 setae on false vein), $m_{3+4}$ with 4-17 setae, cu and an bare.

**Legs.** Foreleg bearing single tibial spur (18-24 µm). Lengths of combs of mid tibia 12-14 µm (with 23-24 µm long spur) and 13 µm (with 36 µm long spur); lengths of combs of hind tibia 18 µm (with 39-40 µm spur) and 18-19 µm (with 42-43 µm long spur).

Lengths of segments (in µm):

| fe | ti | $ta_1$ | $ta_2$ | $ta_3$ | $ta_4$ | $ta_5$ | Total length |
|---|---|---|---|---|---|---|---|

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| $P_1$ | 650-698 | 266-300 | 870-969 | 428-445 | 366-381 | 308-320 | 122-127 | 3010-3240 |
| $P_2$ | 571-629 | 473-527 | 302-328 | 132-136 | 98-100 | 60-61 | 40-42 | 1676-1823 |
| $P_3$ | 624-690 | 568-602 | 457-491 | 259-268 | 248-250 | 150-161 | 70-71 | 2376-2533 |

Leg ratios:

| | LR | BV | SV |
|---|---|---|---|
| $P_1$ | 3.23-3.27 | 1.46-1.54 | 1.02-1.05 |
| $P_2$ | 0.62-0.63 | 4.01-4.44 | 3.45-3.52 |
| $P_3$ | 0.80-0.81 | 2.26-2.38 | 2.60-2.63 |

**Abdomen.** Length about 1830 µm.

**Hypopygium (Fig. 45 A-C).** Tergite IX 106-114 µm long with 6-11 median setae (not placed between anal tergal bands, not separated into groups, placed from well anterior to anal point base to close to anal point base, the two more posterior setae shorter), 10-12 apical setae and single lateral tooth. Tergite IX without microtrichia-free areas. Orolateral spine of laterosternite IX difficult to see (probably absent). Anal tergal bands separate, curved, running parallel on middle of tergite and ending well anterior to anal point base. Anal point 38-42 µm long, elongate and slightly quadrate at tip, with pair of well-developed anal crests (29-31 µm long) extending posterior to tergite IX, microtrichia absent; spines placed regularly in one row between anal crests. Superior volsella rectangular, somewhat oblong, with wrinkles/ rugosities in posterior margin, without microtrichia; anterior, lateral and posterior margins straight, parallel to each other, median margin straight to slightly convex; 4-5 setae on dorsal surface, 2 setae on median margin (1 placed on dorsal surface and 1 with ventral insertion) and 1 seta on ventral tubercle on anteromedian margin. Longitudinal axes of superior volsella and body at angle of 72-73°. Digitus long and thick, thumb-like, extending well beyond margin of superior volsella. Median volsella 13 µm long with 11-14 µm simple setae and 12-14 µm subulate lamellae, not reaching apex of inferior volsella. Inferior volsella 64-66 µm long, thin and somewhat straight, distal part (area carrying setae) straight, not swelled. Gonocoxite length 92-96 µm; gonostylus 95-98 µm, elongate, straight and thick; hypopygium ratio (HR) 0.96-0.97.

**Pupa (n=1)**

Total length about 2.70 mm. Pupal exuviae pale, thorax and lateral muscle marks somewhat brownish.

**Cephalothorax (Fig. 46 A-C).** Frontal apotome smooth. Frontal setae thin, 47 µm long, mounted apically on weakly developed cephalic tubercles; frontal warts absent. Pedicel sheath tubercle difficult to see. Thorax smooth, 725 µm long, with small points along median suture. Wing sheath with well-developed nose, prealar tubercle well developed, cone-shaped. Thoracic horn thin, 282 µm long, with small spines. Three quite short precorneals in triangular pattern, $Pc_1$ thicker (42 µm long) than $Pc_2$ and $Pc_3$ (37 µm and 39 µm respectively); small tubercle close to precorneals; 1 median antepronotal (52 µm), stronger, and 1 lateral antepronotal (24 µm); 2 pairs of dorsocentrals, anterior pair 39 µm (thick) and 41 µm (thin), posterior pair 61 µm (thin) and 70 µm (thick), the latter one ($Dc_4$) stronger than other three.

**Abdomen (Fig. 46 D-G).** Total length 2051 µm. Tergites I, VII-IX without armament. T II with homogeneous shagreen, bare medially. T III-V with one pair of oval/elongate patches of spines anteriorly. T VI with one anterior pair of small, rounded patches of fine spinules. Sternites, conjunctives and pleura unarmed. Hook row 98 µm long, about 1/4 width of tergite II. Pedes Spurii B bare and well developed, present on segment II. Posterior lateral comb of segment VIII 23 µm wide, with 4-5 strong teeth and 5-6 smaller one. Abdominal setation: segment I with 3 D, 0 L and 0 V; segment II with 4 D, 3 L and 2 V; segment III with 5 D, 3 L and 3 V; segment IV with 5 D, 3 L and 4 V; segment V with 3 L, dorsal and ventral setae difficult to see; segment VI with 4 L, dorsal and ventral setae difficult to see; segment VII difficult to see; segment VIII with 1 D, somewhat taeniate, 5 lateral taeniae and 1 V; anal lobe well developed, with complete fringe of 19 taeniae in single row and with two pairs of dorsal taeniae; T II-VIII with O-setae.

**Discussion**

*Tanytarsus amazonicus* does not seem to be closely related to any other described *Tanytarsus* species. The male of *T. amazonicus* has a distinct, rectangular superior volsella (Fig. 45 B), with wrinkles along posterior margin. In addition, *T. amazonicus* has spines placed regularly in one row between the anal point crests (Fig. 45 A), a feature only found, among Neotropical *Tanytarsus*, in *T. capitatus* Sublette & Sasa, 1994 (Fig. 24 A); all other Neotropical *Tanytarsus* have spines irregularly placed. However, except for this character, *T. amazonicus*

does not have any other features in common with *T. capitatus*, and even the shape of the spines and the anal point differs.

The presence of spines in a regular row on the anal point has been seen in members of the Holarctic *Tanytarsus eminulus* and *Tanytarsus gregarius* species groups (Reiss & Fittkau 1971; Cranston *et al.* 1989). However, *T. amazonicus* does not fit the diagnosis of either of these species groups. The male of *T. amazonicus* do not have an oval superior volsella or an anal point with microtrichia between the anal crests, features pointed by Ekrem (2003) in his work of phylogeny of *Tanytarsus* as characteristic for the *T. eminulus* group. Besides, the pupa of *T. amazonicus* is very different from those known from species in the *T. eminulus* and *T. gregarius* groups, and does not fit the groups diagnoses (Ekrem 2003).

*Tanytarsus amazonicus* would key to the Holarctic *Tanytarsus mendax* group (Cranston *et al.* 1989) due to the absence of microtrichia between the anal crests on anal point, in having separate anal tergal bands and well-developed digitus, but it does not fit well the group diagnosis in having a rectangular superior volsella. Pupae of *T. amazonicus* and *T. mendax* Kieffer (Ekrem *et al.* 2003) have similar spine patches on the abdominal tergites. However, both species can clearly be separated by the thoracic setation, thoracic horn armament, abdominal setation and form of posterolateral comb of abdominal segment VIII. The pupa of *T. amazonicus* superficially resembles that of the Neotropical *Tanytarsus* spec. 5 (Wiedenbrug 2000) in the armament on abdominal T III–VI, but can easily be separated by the number of abdominal lateral setae as *T. amazonicus* has 4 lateral setae on segment VI and 5 lateral taeniae on segment VIII, while *T.* spec. 5 has 3 lateral setae and 4 lateral taeniae on segments VI and VIII respectively, on the thoracic horn armament which is smooth in *T.* spec. 5 and on the presence of a well-developed prealar tubercle, which is reduced in *T.* spec. 5.

Among described pupae of Neotropical *Tanytarsus*, pupa of *T. amazonicus* is the only showing 4 lateral setae on abdominal tergite VI; all other species present 3 lateral setae (or taeniae) on tergite VI.

**Distribution and ecological notes**

*Tanytarsus amazonicus* is recorded from Amazonas State, Brazil. The species was found in black-water streams and flooded forests (“Igapó”) in the catchment area of the River Negro in Central Amazon.

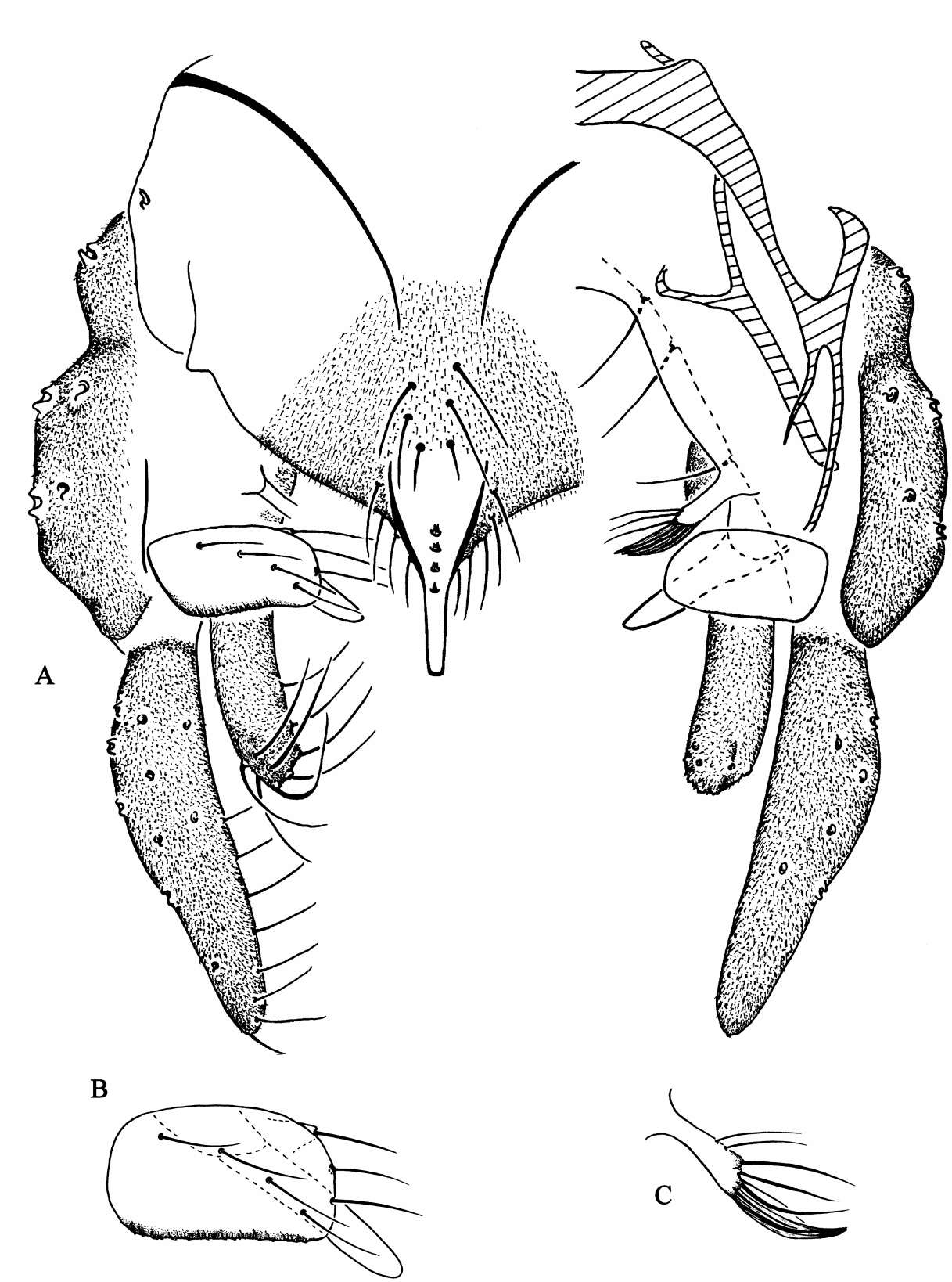



**Fig. 45.** ***Tanytarsus amazonicus*** **spec. nov., adult male. A: Hypopygium, dorsal view. B: Superior volsella and digitus. C: Median volsella.**

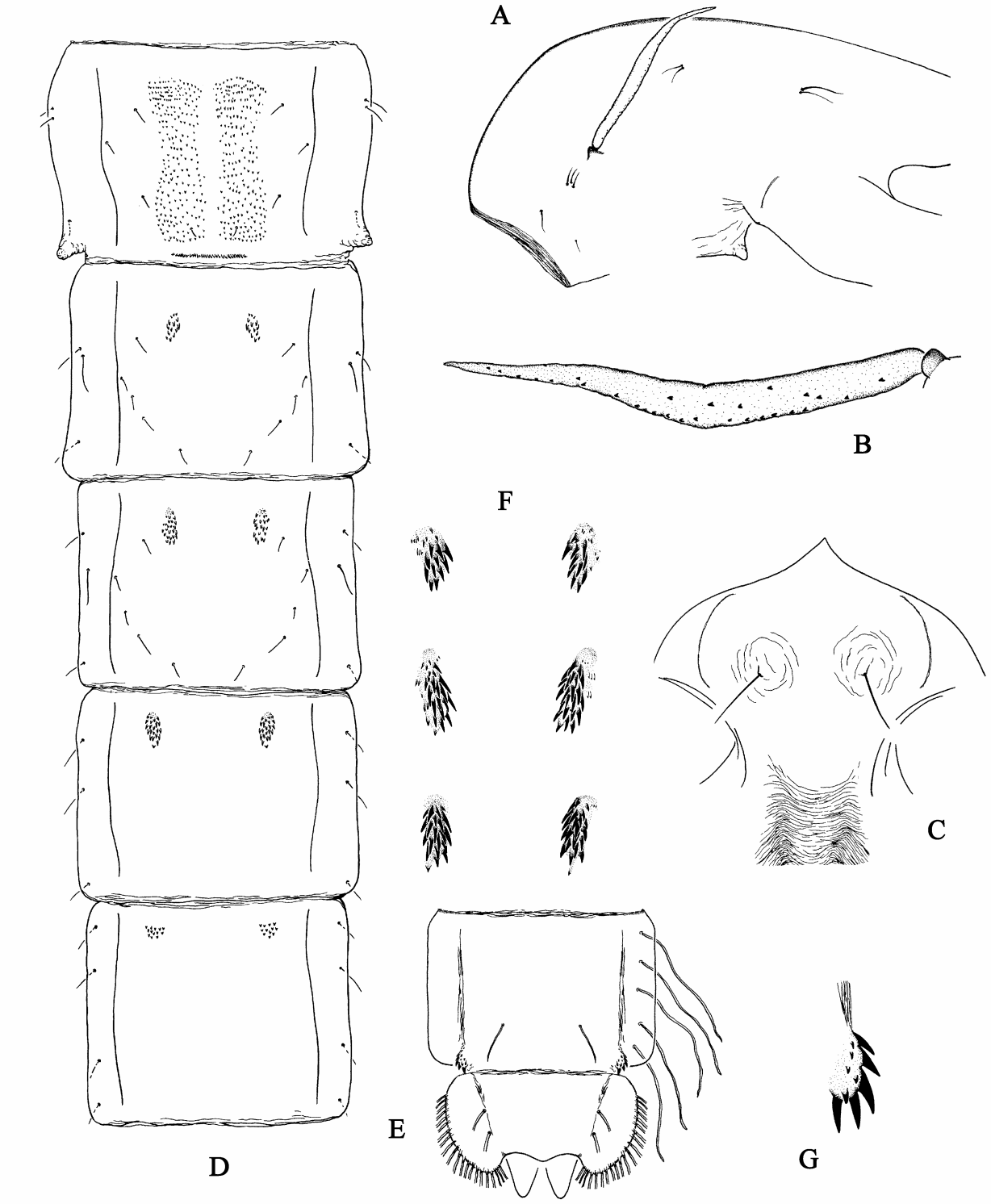



**Fig. 46.** ***Tanytarsus amazonicus*** **spec. nov., pupa. A: Thorax. B: Thoracic horn. C: Frontal apotome. D: Abdominal segments II-VI, dorsal view; dorsal setae of segments V-VI not drawn. E: Abdominal segments VIII-IX, dorsal view. F: Spine patches on abdominal tergites III-V. G: Posterolateral comb of abdominal segment VIII.**

### *Tanytarsus friburgensis* spec. nov.

(Fig. 47)

Type. Holotype: 1 adult male, Brazil, Rio de Janeiro, Nova Friburgo city, Rio Cascatinha, Vale do Caledônia, about 1020 m a.s.l., Coastal Range, Atlantic Forest, Drift-net, 24.VIII.1995, slide mounted in Euparal, leg. E. J. Fittkau (INPA).

**Etymology.** *Tanytarsus friburgensis* is named after its type locality, Nova Friburgo.

**Diagnostic characters.** *Tanytarsus friburgensis* can be separated from other adult males of *Tanytarsus* by the following combination of characters. Antennal ratio 0.58; eyes with dorsomedian extension; medium-sized frontal tubercles; wings extensively covered with setae, wing vein Sc bare, M vein with seta; tergite IX with double lateral tooth and large microtrichia-free areas posteriorly; anal tergal bands separate, curved, running parallel on middle of tergite and ending well anterior to anal point base; anal point elongate and triangular at tip, with spines placed irregularly between well-developed anal crests and microtrichia on anterior half of the surface between crests; superior volsella ovoid, without microtrichia; longitudinal axes of superior volsella and body at angle of about 53°; digitus long and thumb-like, thicker distally, extending well beyond margin of superior volsella; median volsella with pectinate lamellae, not reaching apex of inferior volsella; inferior volsella thick and curved, distal part (area carrying setae) rounded, slightly thicker; gonostylus elongate, curved and thin; hypopygium ratio 0.91.

**Description**

**Male Imago (n=1)**

**Head.** AR 0.58. Antennal flagellomeres one to twelve 536 µm long, thirteen 312 µm long, total length 848 µm. Eyes with dorsomedian extension; medium-sized frontal tubercles (length 13 µm), about 2.5 times as long as wide; 9 temporal setae; clypeus with 18 setae; lengths of palpal segments (in µm): 31, 42, 116, 121, 152, total length 462 µm.

**Thorax.** Length 853 µm. Scutal tubercle absent; 8 dorsocentrals, 24 acrostichals, 1 prealar, 8 scutellars. Halteres with 5 setae.

**Wing.** Wing length 1561 µm, width 483 µm; L/WR 3.23. Brachiolum with 1 seta, Sc bare, R with 36 setae, $R_1$ with 40 setae, $R_{4+5}$ with 68 setae, M with 1 seta, $M_{1+2}$ with 60-62 setae, $M_{3+4}$ with 41 setae, Cu with 27-29 setae, $Cu_1$ with 20-22 setae, Postcubitus with 49-52 setae and An with 37-41 setae. Cell m with 17-19 setae (+ 40-41 setae on false vein), $r_{4+5}$ with more than 200 setae, $m_{1+2}$ with more than 200 setae (+ about 54 setae on false vein), $m_{3+4}$ with about 145 setae, cu with about 110 setae and an with about 160 setae.

**Legs.** Foreleg bearing single tibial spur (34 µm). Lengths of combs of mid tibia 18 µm (with 28 µm long spur) and 19 µm (with 38 µm long spur); lengths of combs of hind tibia 22 µm (with 35 µm spur) and 24 µm (with 42 µm long spur).

Lengths of segments (in µm); tarsal segments missing:

| | fe | ti | $ta_1$ | $ta_2$ | $ta_3$ | $ta_4$ | $ta_5$ |
|---|---|---|---|---|---|---|---|
| $P_1$ | 820 | 379 | - | - | - | - | - |
| $P_2$ | 791 | 593 | - | - | - | - | - |
| $P_3$ | 818 | 739 | - | - | - | - | - |

**Abdomen.** Length 1840 µm.

**Hypopygium (Fig. 47 A-C).** Tergite IX 116 µm long with 7 median setae (not placed between anal tergal bands, not separated into groups, placed well anterior to anal point base), 14 apical setae, double lateral tooth and large microtrichia-free areas posteriorly. Orolateral spine of laterosternite IX difficult to see (probably absent). Anal tergal bands separate, curved, running parallel on middle of tergite and ending well anterior to anal point base. Anal point 41 µm long, elongate and triangular at tip, with pair of well-developed anal crests (20 µm long) extending posterior to tergite IX, microtrichia on anterior half of the surface between crests and spines placed irregularly. Superior volsella ovoid, without microtrichia; anterior, median, lateral and posterior margins curved; 4 setae on dorsal surface and 3 setae on median margin, seta and ventral tubercle absent. Longitudinal axes of superior volsella and body at angle of 53°. Digitus long and thumb-like, thicker distally, extending well beyond margin of superior volsella. Median volsella 19 µm long with 16-18 µm simple setae and 20-22 µm pectinate lamellae, not reaching apex of inferior volsella. Inferior volsella 76 µm long, somewhat thick and curved, distal part (area carrying setae) rounded, slightly thicker. Gonocoxite length 95 µm; gonostylus 104 µm, elongate, curved and thin; hypopygium ratio (HR) 0.91.

**Discussion**

*Tanytarsus friburgensis* does not seem to be closely related to any described *Tanytarsus* species. The male imago is superficially similar to those of the Neotropical *Tanytarsus riopreto* species group (Fittkau & Reiss 1973) in the general hypopygium design, with separate anal tergal bands, which are curved and running parallel in the middle of the tergite, anal point with anal crests and spines, well developed digitus, and median volsella with pectinate lamellae, but differs from the *riopreto* species in the shape of superior volsella. The species also differs from those of the Neotropical *Tanytarsus marauia* group (Sanseverino *et al.* 2002) in the form of superior volsella and anal point armament. In addition, the superior volsella of *T. friburgensis* does not have a ventral seta, which is always placed on a tubercle or directly on the ventral surface of the volsella. However, since *T. friburgensis* is described based on a single specimen only the absence of this seta should not be given much weight until more material is available.

*Tanytarsus friburgensis* will key to the Holarctic *T. mendax* species group in Cranston *et al.* (1989) due to the absence of microtrichia between the anal point crests, the presence of spines on anal point, the separate anal tergal bands, the long median volsella and digitus, but the species does not match well the group diagnosis due to the form of superior volsella, which is elongate and narrowed distally in *mendax* group members. *Tanytarsus friburgensis* also presents characters stated by Ekrem (2003) as typical to *mendax* species, namely median tergite setae placed at some distance from anal point base, large microtrichia free areas around anal point base and absence of microtrichia between anal point crests. However, *T. friburgensis* does not resemble any species of the *mendax* group, the species differs from *mendax* species by the form of superior volsella, form of anal point and by having spines irregularly arranged on anal point. A certain placement of *T. friburgensis* will thus have to await the discovery of the immatures.

**Distribution and ecological notes**

*Tanytarsus friburgensis* is recorded from Rio de Janeiro State, Brazil. The species was collected from the River Cascatinha, located in Nova Friburgo city, at about 1020 m above sea level in the "Serra do Mar" (Coastal Range). The area is covered with Atlantic rainforest, and has many small streams and rivers.

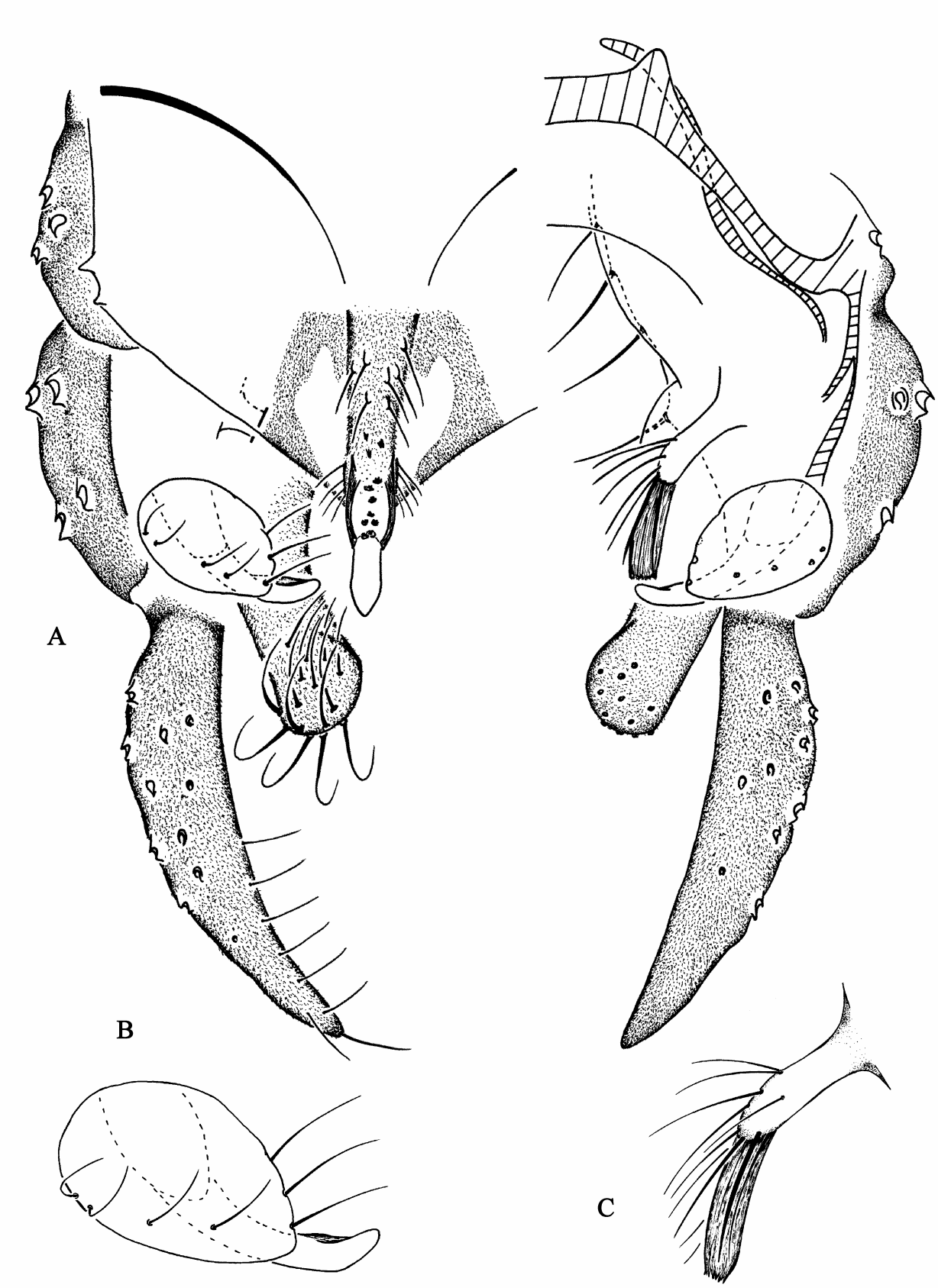



**Fig. 47.** ***Tanytarsus friburgensis*** **spec. nov., adult male. A: Hypopygium, dorsal view. B: Superior volsella and digitus. C: Median volsella.**

***Tanytarsus digitatus* spec. nov.**

(Fig. 48)

Type. Holotype: 1 adult male, Brazil, Rio de Janeiro, Teresópolis city, Rio Paquequer, Vale da Revolta, about 1100 m a.s.l., Serra do Mar (Coastal Range), Atlantic Forest, at light, 7.VII.1996, slide mounted in Euparal, leg. J. L. Nessimian (DZRJ).

**Etymology.** From Latin *digitus*, finger, and the suffix *–atus*, equipped with, referring to the large digitus.

**Diagnostic characters.** *Tanytarsus digitatus* can be separated from other adult males of *Tanytarsus* by the following combination of characters. Antennal ratio 0.72; eyes with dorsomedian extension; large frontal tubercles; wings extensively covered with setae, wing vein Sc bare, M vein with seta; tergite IX with double lateral tooth and large microtrichia-free areas posteriorly; median setae of TIX short and placed quite close to anal point; anal tergal bands separate, curved, not running parallel (not reaching middle of tergite) and ending well anterior to anal point base; anal point peculiar, elongate and somewhat wide, notched posteriorly and slightly quadrate at tip, with spines placed irregularly between well-developed anal crests, spines placed very close to each other on posterior half; field of microtrichia on anterior half of the surface between the crests; superior volsella ovoid, slightly triangular, without microtrichia; longitudinal axes of superior volsella and body at angle of about 56°; digitus thick and leaf-like, quite wide in the middle, extending beyond margin of superior volsella; median volsella with subulate lamellae, not reaching apex of inferior volsella; inferior volsella somewhat lanceolate, wider on posterior half and pointed at tip; gonostylus elongate, straight and thick; hypopygium ratio 0.86.

**Description**

**Male Imago (n=1)**

**Head.** AR 0.72. Antennal flagellomeres one to twelve 516 µm long, thirteen 376 µm long, total length 892 µm. Eyes with dorsomedian extension; large frontal tubercles (length 16 µm), about 3 times as long as wide; temporal setae difficult to see, at least 5; clypeus with at least 14 setae;

lengths of palpal segments (in µm): 32, 38, 157, 138, 230 (4th palpal segment shorter than 3rd), total length 595 µm.

**Thorax.** Length about 725 µm. Scutal tubercle absent; dorsocentrals difficult to see, at least 5, acrostichals difficult to distinguish, 1 prealar, 6 scutellars. Halteres with at least 4 setae.

**Wing.** Wing length 1730 µm, width 468 µm; L/WR 3.69. Brachiolum with 1 seta, Sc bare, R with 33 setae, $R_1$ with 48 setae, $R_{4+5}$ with 82 setae, M with 1 seta, $M_{1+2}$ with 78 setae, $M_{3+4}$ with 37 setae, Cu with 35 setae, $Cu_1$ with 25 setae, Postcubitus with about 50 setae and An with 36 setae. Cell m with 24 setae (+ about 30 setae on false vein), $r_{4+5}$ with more than 150 setae, $m_{1+2}$ with more than 200 setae (+ about 80 setae on false vein), $m_{3+4}$ with more than 150 setae, cu with about 120 setae and an with about 160 setae.

**Legs.** Foreleg bearing single tibial spur (25 µm). Lengths of combs of mid tibia 20 µm (with 26 µm long spur) and 20 µm (with 39 µm long spur); lengths of combs of hind tibia 20 µm (with 40 µm spur) and 22 µm (with 47 µm long spur).

Lengths of segments (in µm):

| | fe | ti | $ta_1$ | $ta_2$ | $ta_3$ | $ta_4$ | $ta_5$ | Total length |
|---|---|---|---|---|---|---|---|---|
| $P_1$ | 900 | 453 | 1192 | 570 | 450 | 379 | 160 | 4104 |
| $P_2$ | 878 | 667 | 412 | 220 | 141 | 87 | 62 | 2467 |
| $P_3$ | 910 | 850 | 600 | 376 | 320 | 198 | 100 | 3354 |

Leg ratios:

| | LR | BV | SV |
|---|---|---|---|
| $P_1$ | 2.63 | 1.63 | 1.13 |
| $P_2$ | 0.61 | 3.83 | 3.75 |
| $P_3$ | 0.70 | 2.37 | 2.93 |

**Abdomen.** Length 1180 µm.

**Hypopygium (Fig. 48 A-C).** Tergite IX 149 µm long with 3 median setae (shorter, not placed between anal tergal bands, not separated into groups, placed close to anal point base), 16 apical setae, fork-like double lateral tooth and large microtrichia-free areas posteriorly. Orolateral spine of laterosternite IX difficult to see (probably absent). Anal tergal bands separate, curved, not running parallel (not reaching middle of tergite) and ending well anterior to anal point base. Anal point 46 µm long, elongate and somewhat wider, notched posteriorly and slightly quadrate at tip,

with pair of well-developed anal crests (32 µm long) extending posterior to tergite IX; field of microtrichia on anterior half of the surface between the crests; spines placed irregularly between anal crests. Superior volsella ovoid, slightly triangular, without microtrichia; anterior and median margins straight to slightly curved, lateral and posterior margins curved; 4 setae on dorsal surface, 3 setae on median margin and 1 seta on ventral tubercle on anteromedian margin. Longitudinal axes of superior volsella and body at angle of 56°. Digitus thick and leaf-like, quite wide in the middle, extending beyond margin of superior volsella. Median volsella 20 µm long with 14-16 µm long simple setae and 19-20 µm subulate lamellae, not reaching apex of inferior volsella. Inferior volsella 98 µm long, somewhat lanceolate, wider on posterior half and pointed at tip. Gonocoxite length 100 µm; gonostylus 116 µm, elongate, straight and thick; hypopygium ratio (HR) 0.86.

**Discussion**

*Tanytarsus digitatus* is not similar to any other described *Tanytarsus* species. The male imago fails to match the diagnoses of the Neotropical *Tanytarsus riopreto* group (Fittkau & Reiss 1973), the *Tanytarsus marauia* group (Sanseverino *et al.* 2002) and the various Holarctic *Tanytarsus* species groups (Cranston *et al.* 1989) due to the following characteristics in the hypopygium: The anal tergite median setae are short and placed quite close to the anal point, the anal tergal bands are short and separate, and the anal point has microtrichia between the anal crests and irregularly arranged spines. Moreover, the distinct shape of the anal point (Fig. 48 A), which is elongate and wide medially notched subapically and with broadly rounded tip, together with the oval to subtriangular superior volsella and the large, leaf-like digitus (Fig. 48 C) is an unique combination among known *Tanytarsus* species.

**Distribution and ecological notes**

*Tanytarsus digitatus* is recorded from the state of Rio de Janeiro, Brazil. The species was collected with a light-trap close to a first-order tributary of the River Paquequer in "Serra do Mar" (Coastal Range), parallel to the coast at about 1100 m above sea level. The area is covered with Atlantic rainforest, an evergreen pluvial forest, and presents many small streams and rivers.

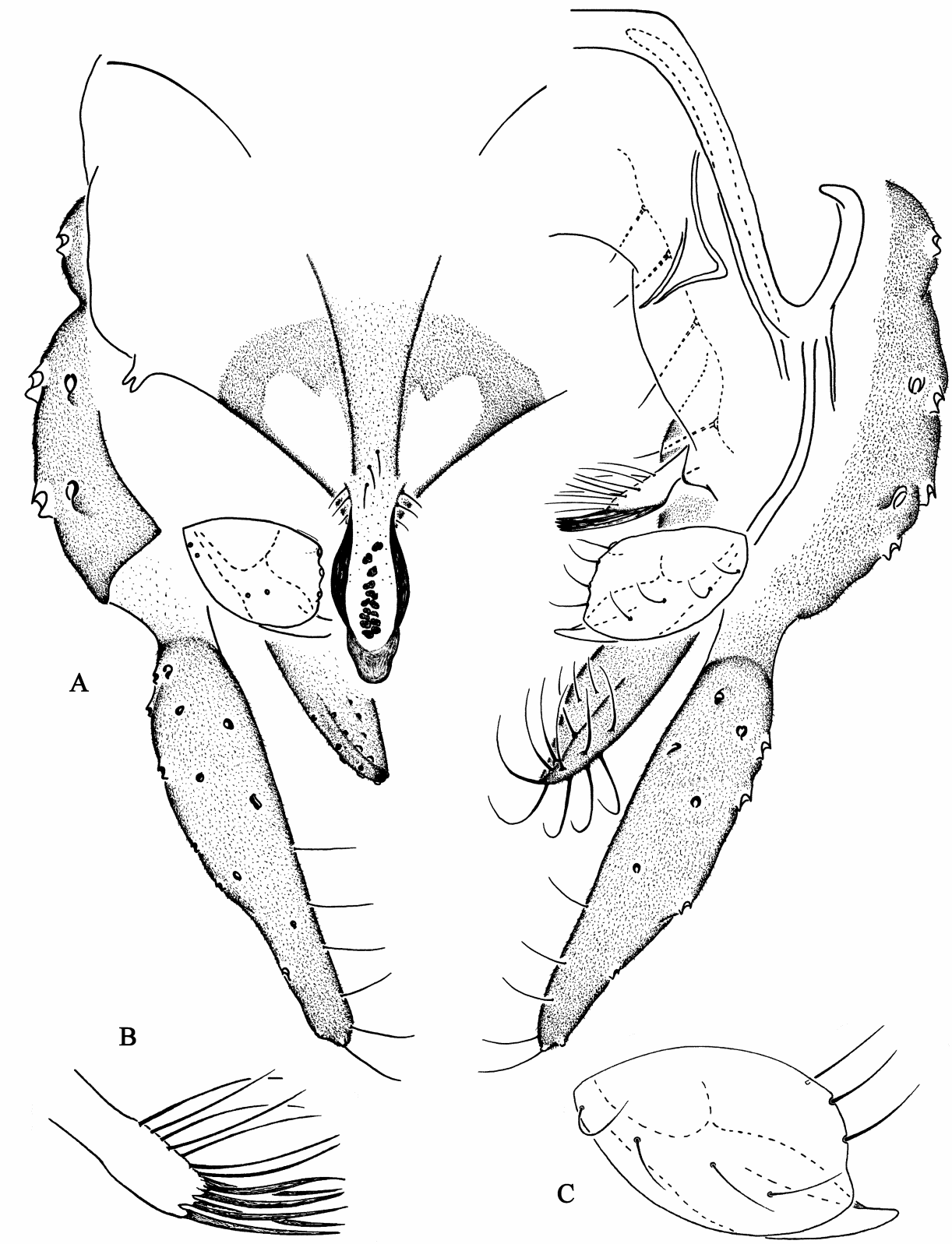



**Fig. 48.** ***Tanytarsus digitatus*** **spec. nov., adult male. A: Hypopygium, dorsal view. B: Median volsella. C: Superior volsella and digitus.**

***Tanytarsus jacaretingensis* spec. nov.**

(Fig. 49)

Type material. Holotype: 1 adult male, Brazil, Amazonas State, lower Rio Solimões, Lago Jacaretinga, collected on margin (rearing), 24.XII.1971, slide mounted in Euparal, leg. F. Reiss (INPA). Paratypes: 4 adult males as holotype except 28.XII.1971 (ZSM); 2 adult males as previous; 1 adult male, as holotype but 11.I.1972 (ZSM); 1 adult male together with 2 pupal exuviae on same slide, as holotype but 12.I.1972 (ZSM); 1 adult male, Brazil, São Carlos (São Paulo State), Fazenda Canchim (EMBRAPA), Represa da Colônia, 12.II.2001, leg. S. Trivinho Strixino (UFSCar); 1 adult male as previous except 17.II.2001 (UFSCar); 1 adult male, French Guyana, Mana, swamp, , 29.XII.2002, slide mounted in Euparal, leg. M. Kotrba (ZSM).

**Etymology.** *Tanytarsus jacaretingensis* is named after its type locality, Lake Jacaretinga.

**Diagnostic characters.** *Tanytarsus jacaretingensis* can be separated from other males of *Tanytarsus* by the following combination of characters: Antennal ratio 1.02-1.25; eyes without dorsomedian extension; large frontal tubercles; wings with few setae, wing veins Sc, $R_{1,}$ M, $M_{3+4}$, Cu, false vein (close to Cu and $M_{3+4}$), $Cu_1$, Postcubitus and An bare, wing cells m, $m_{3+4,}$ cu and an bare; tergite IX with somewhat large microtrichia-free areas on each side of anal point; anal tergal bands Y-type, "fused" on median part of tergite, ending well anterior to anal point base; anal point elongate and rounded at tip, with 1-2 spines (1 spine in most of the specimens) between well-developed anal crests, microtrichia absent; superior volsella rugose, without microtrichia, with wrinkles and rugosities on median, lateral and posterior margins, lateral margin with wrinkled flap-like projection, anteromedian portion quite projecting; longitudinal axes of superior volsella and body at angle of about 32°; digitus small, difficult to distinguish; median volsella with pectinate lamellae, not reaching apex of inferior volsella; inferior volsella thin and somewhat straight, distal part (area carrying setae) oval, slightly swelled; gonostylus elongate, curved and somewhat thick; hypopygium ratio about 0.99.

**Description**

**Male Imago (n=6)**

**Head.** AR 1.08-1.19 (media 1.12). Antennal flagellomeres one to twelve 421-460 µm long, thirteen 465-550 µm long, total length 903-990 µm. Eyes without dorsomedian extension; large frontal tubercles (length 16-20 µm), about 3 times as long as wide; 9-10 temporal setae; clypeus with 10-13 setae; lengths of palpal segments (in µm): 24-30, 32-40, 74-88, 79-94, 130-154, total length 345-402 µm.

**Thorax.** Length 738-840 µm. Scutal tubercle present; 6-7 dorsocentrals, 2-5 acrostichals, 1 prealar, 4 scutellars. Halteres with 4-5 setae.

**Wing.** Wing length 1330-1553 µm, width 398-430 µm; L/WR 3.34-3.61. Brachiolum with 1 seta, Sc bare, R with 1-4 setae, $R_1$ bare, $R_{4+5}$ with 2-3 setae, M bare, $M_{1+2}$ with 6-17 setae, $M_{3+4}$, Cu, $Cu_1$, Postcubitus and An bare. Cell m bare (false vein bare), $r_{4+5}$ with 19-35 setae, $m_{1+2}$ with 1-7 setae (false vein bare), $m_{3+4}$, cu and an bare.

**Legs.** Foreleg bearing single tibial spur (22-26 µm). Lengths of combs of mid tibia 11-14 µm (with 21-22 µm long spur) and 12-14 µm (with 23-26 µm long spur); lengths of combs of hind tibia 13-15 µm (with 24-28 µm spur) and 14-16 µm (with 26-32 µm long spur).

Lengths of segments (in µm):

| | fe | ti | $ta_1$ | $ta_2$ | $ta_3$ | $ta_4$ | $ta_5$ | Total |
|---|---|---|---|---|---|---|---|---|
| $P_1$ | 540-605 | 279-310 | 756-812 | 348-408 | 308-340 | 222-243 | 94-104 | 2578-2812 |
| $P_2$ | 546-612 | 450-509 | 270-312 | 122-150 | 95-113 | 62-78 | 44-60 | 1597-1834 |
| $P_3$ | 630-704 | 570-689 | 402-463 | 235-265 | 220-249 | 150-170 | 80-98 | 2299-2638 |

Leg ratios:

| | LR | BV | SV |
|---|---|---|---|
| $P_1$ | 2.55-2.73 | 1.58-1.63 | 1.07-1.12 |
| $P_2$ | 0.51-0.61 | 3.57-3.85 | 3.59-3.74 |
| $P_3$ | 0.61-0.70 | 2.31-2.45 | 2.98-3.22 |

**Abdomen.** Length 1710-2060 µm.

**Hypopygium (Fig. 49 A-D).** Tergite IX 114-124 µm long with 4-8 median setae (not separated into groups, placed from well anterior to anal point base, on each side of anal tergal band, to more or less close to anal point base), 12-14 apical setae and microtrichia-free areas posteriorly; tergite without lateral tooth. Orolateral spine of laterosternite IX difficult to see (probably absent). Anal tergal bands Y-type, "fused" on median part of tergite, not reaching anal point.

Anal point 51-54 µm long, elongate and rounded at tip, with pair of well-developed anal crests (22-25 µm long) not extending posterior to tergite IX; posterior part of anal point dorsally sclerotized, microtrichia absent; 1-2 spines (1 spine in most of the specimens) placed regularly between anal crests. Superior volsella rugose, without microtrichia, with wrinkles and rugosities on median, lateral and posterior margins; anteromedian portion quite projecting, posteromedian part elongate and wrinkled, lateral margin with flap-like projection and also wrinkled; 4-6 setae on dorsal surface (one of them placed on anteromedian projection), 1 seta on median margin and 1 seta on a well-developed ventral tubercle on anteromedian margin. Longitudinal axes of superior volsella and body at angle of 30-34°. Digitus small, difficult to distinguish. Median volsella 10-14 µm long with 15-22 µm simple setae and 16-18 µm pectinate lamellae, not reaching apex of inferior volsella. Inferior volsella 69-82 µm long, thin and somewhat straight, distal part (area carrying setae) oval, slightly swelled. Gonocoxite length 98-118 µm; gonostylus 100-120 µm, elongate, curved and somewhat thick; hypopygium ratio (HR) 0.96-1.02.

**Discussion**

*Tanytarsus jacaretingensis* appears to be related to the Neotropical *Tanytarsus monospinosus* Ekrem & Reiss, 1999. The males of both species have many characters in common such as large frontal tubercles, almost bare wings, anal tergal bands of Y-type, an elongate and blunt anal point without microtrichia and with one single spine between anal crests (Fig. 49 A-C), a peculiar superior volsella with wrinkles, rugosities and a flap-like wrinkled projection (Fig. 49 D), a small digitus, and a similar shape of the inferior volsella and gonostylus (Fig. 49 A). Further, while all other described Neotropical *Tanytarsus* species have eyes with dorsomedian elongation, both *T. monospinosus* and *T. jacaretingensis* lack eye elongation. *Tanytarsus jacaretingensis* differs from *T. monospinosus* by the presence of a scutal tubercle, by having median volsella, which is reduced in *T. monospinosus*, presence of acrostichals, which is lacking in *T. monospinosus*, and by lacking long anteromedian anal tergite setae while *T. monospinosus* has 4–6 very long median setae placed anterior on the anal tergite in addition to to usual median setae.

*Tanytarsus jacaretingensis* is the only Neotropical *Tanytarsus* species with a scutal tubercle. In Cranston *et al.* (1989) the genus *Tanytarsus* is diagnosed without a scutal tubercle, but Stur and Ekrem (2000) and Ekrem (2001) described two *Tanytarsus* species having this character: *Tanytarsus luctuosus* Freeman, 1958 and *T. elisabethae* Ekrem, 2001 respectively.

Stur and Ekrem (2000) emended the generic diagnosis of *Tanytarsus* to also include species with a scutal tubercle.

**Distribution and ecological notes**

*Tanytarsus jacaretingensis* is recorded from Brazil and French Guyana. In Brazil the species was found in Lake Jacaretinga (Amazonas State), and in a reservoir in São Paulo State. Lake Jacaretinga is a 'Várzea', a whitewater floodplain lake, located in a floodplain area in Central Amazon. In French Guyana the species was collected in a swampy area in Mana. Like its close relative *T. monospinosus*, *T. jacaretingensis* seems to prefer lentic and flooded areas.

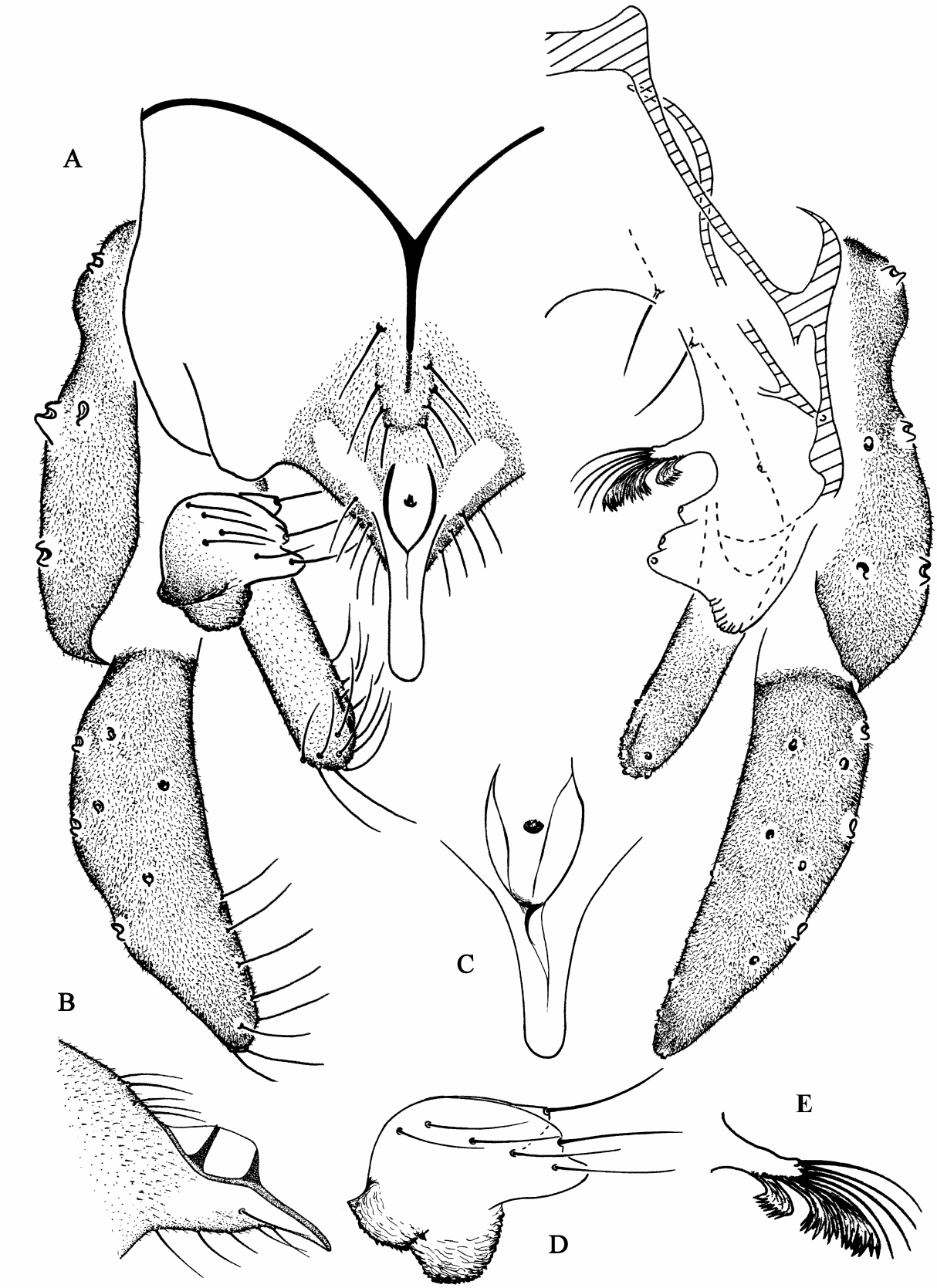



**Fig. 49.** ***Tanytarsus jacaretingensis*** **spec. nov., adult male. A: Hypopygium, dorsal view. B: Anal point, lateral view. C: Anal point, dorsal view. D: Superior volsella. E: Median volsella.**

### *Tanytarsus monospinosus* Ekrem & Reiss, 1999

Type material (Brazil, leg. E. J. Fittkau). Holotype [examined]: 1 adult male, Mato Grosso, Serra do Roncador, Lago Kamaiurá ("Cameiura" in Ekrem & Reiss), 4.IX.1965, slide mounted in Euparal (ZSM). Paratypes [examined]: 5 adult males as holotype (4 paratypes ZSM, 1 paratype ZMBN).

Detailed descriptions and drawings of *Tanytarsus monospinosus* are given by Ekrem & Reiss (1999). A full description of the adult male including measurements is given in Tables I-V. A complete diagnosis is presented here as well as some considerations on *T. monospinosus*.

**Diagnostic characters.** The male imago of *Tanytarsus monospinosus* can be separated from other *Tanytarsus* species by the following combination of characters. Antennal ratio 0.92-1.02; eyes without dorsomedian extension; frontal tubercles large; thorax with brown marks; wings with few setae, wing veins Sc, R, $R_1$, M, $M_{3+4}$, Cu, false vein (close to Cu and $M_{3+4}$), $Cu_1$, Postcubitus and An bare, wing cells m, $m_{1+2}$, $m_{3+4}$, cu and an bare; tergite IX with somewhat large microtrichia-free areas on each side of anal point; anal tergal bands Y-type, "fused" on median part of tergite, ending well anterior to anal point base; tergite IX with 4-6 very long median setae, placed anterior on each side of anal tergal band, and 2-4 shorter one, placed more or less close to anal point base; anal point elongate and rounded at tip, with 1 single spine between well-developed anal crests, microtrichia absent; short transverse sternapodeme; superior volsella rugose, without microtrichia, with wrinkles and rugosities on median, lateral and posterior margins, lateral margin with wrinkled flap-like projection, anteromedian portion quite projecting; longitudinal axes of superior volsella and body at angle of about 35°; digitus small, difficult to distinguish; median volsella missing or reduced to a minute, bare knob; inferior volsella thin and straight, distal part oval, slightly swelled; gonostylus elongate, curved and thick.

**Discussion**

*Tanytarsus monospinosus*, together with *Tanytarsus tumultuarius* Ekrem & Reiss, are the unique *Tanytarsus* in the Neotropical Region that show a reduction of the median volsella. Ekrem & Reiss (1999) also reported this reduction in *Tanytarsus tamaoctavus* Sasa, 1980 and *Tanytarsus abnormis* Lehmann, 1981, and in the genus *Friederia* Sæther & Andersen, 1998.

Ekrem & Reiss (1999) pointed out that regarding the reduced median volsella and the almost hairless wings as synapomorphies would make *Tanytarsus monospinosus* and *Tanytarsus tumultuarius* sister species, but since both species present many differences, a monophyletic group formed by them could not be justified.

*Tanytarsus monospinosus* shows one single, true spine between the anal crests on the anal point. This character was misinterpreted in *Tanytarsus rinihuensis* Reiss, 1972, which possess does not a spine but one single stout seta between the anal crests. Ekrem & Reiss (1999) compared *T. monospinosus* with *T. rinihuensis* and concluded that they should not be considered sister species since they differ in important diagnostic characters (see more comments under *Tanytarsus rinihuensis* discussion).

*T. monospinosus* seems to be related to *Tanytarsus jacaretingensis* spec. nov. Both species have large frontal tubercles, wings with few setae, Y-type anal tergal bands, an anal point with similar design and armament, a superior volsella with wrinkles, rugosities and a flap-like wrinkled projection, a small digitus, and an inferior volsella and gonostylus with similar design. Besides, the eyes of *T. monospinosus* and *T. jacaretingensis* do not present a dorsomedian extension, a feature that is found in all other described Neotropical *Tanytarsus*. *Tanytarsus monospinosus* differs from *T. jacaretingensis* in having unusual long median setae on the anal tergite, lacking a thoracic frontal tubercle and acrostichals, and in the reduction of median volsella.

**Distribution and ecological notes**

*Tanytarsus monospinosus* is recorded from Serra do Roncador, Mato Grosso State, Brazil. The immature stages are unknown, the adults were collected close to a Lake Kamaiurá. Serra do Roncador is located in upper Xingú, in a transitional zone between the moist forests to the south and grassland savannas ("cerrado") to the west. Part of this area is under water during the flood season.

### *Tanytarsus tumultuarius* Ekrem & Reiss, 1999

Type material (Brazil, leg. E. J. Fittkau). Holotype [examined]: 1 adult male, Pará State, Rio Cururú, at light close to Missão Cururú house, 19.I.1961, slide mounted in Canada Balsam (sample A88-5). Paratypes [examined]: 3 adult males as holotype; 1 adult male as holotype (sample A88-1), 12.I.1961; 1 adult male as holotype (sample A88-3), 16.I.1961; 5 adult males, Amazonas State, mid Rio Negro, Ilha Marará, at light (sample A339), 7.II.1962; 11 adult males, Amazonas State, mid Rio Negro, Rio Itu, Acampamento II, at light (sample A349), 13.II.1962 (all ZSM); 1 adult male, Amazonas State, upper Rio Negro, 2 km downstream of Tapuruquara, drift, 6.II.1963 (ZMBN).

Detailed description and drawings of *Tanytarsus tumultuarius* are given by Ekrem & Reiss (1999). A full description of adult male including measurements is given in Tables I-V. A complete diagnosis is presented here as well as some considerations on *T. tumultuarius*.

**Diagnostic characters.** The male imago of *Tanytarsus tumultuarius* can be separated from other *Tanytarsus* species by the following combination of characters. Antennal ratio 0.80-1.01; eyes with dorsomedian extension; frontal tubercles large; thorax with brown marks; wings with few setae, wing veins Sc, R, $R_1$, M, $M_{3+4}$, Cu, $Cu_1$, Postcubitus, An and false vein (close to Cu and $M_{3+4}$) bare, wing cells m, $m_{3+4}$, cu and an bare, $m_{1+2}$ bare or with occasionally with 1 seta; tergite IX with an enlarged apex, without microtrichia-free areas; anal tergal bands curved towards median part of tergite, in some specimens bands in contact on the middle of tergite, ending separated more or less close to anal point base; anal point short and triangular at tip, with 2 spines placed regularly between well-developed anal crests, microtrichia absent; superior volsella circular, with field of microtrichia dorsolaterally and ventromedially; longitudinal axes of superior volsella and body at angle of about 39°; digitus long and pointed, finger-like, extending well beyond margin of superior volsella; median volsella missing; inferior volsella thin and curved, distal part straight, not swelled; gonostylus elongate, straight and thin.

**Discussion**

*Tanytarsus tumultuarius* shows a reduction of the median volsella; such peculiarity is also observed in *Tanytarsus monospinosus* Ekrem & Reiss (see more comments under *T. monospinosus* discussion).

As pointed out by Ekrem & Reiss (1999), the singular hypopygium of *Tanytarsus tumultuarius* does not show similarities with any other described Neotropical species. The form of anal tergal bands, which are curved towards median part of tergite and sometimes in contact, the circular form of *T. tumultuarius* superior volsella and the presence of microtrichia on its lateral and median margins are quite peculiar; most of Neotropical *Tanytarsus* with microtrichia on superior volsella present this feature on the lateral margin. *Tanytarsus capitatus* Sublette & Sasa, 1994 also has a superior volsella with microtrichia on lateral and median margins, but does not have any other character in common with *T. tumultuarius*. The spines on the anal point of *T. tumultuarius* and *T. capitatus* are placed regularly, but I do not consider it to be a comparable character since *T. tumultuarius* present only two spines, while *T. capitatus* has many more placed in a '"typical" regular row.

Another interesting aspect observed in *Tanytarsus tumultuarius* is the anal tergite and the anal point. In general, it is difficult to observe the separation between the anal tergite and the anal point, but in this case the posterior margin of the tergite and the base of anal point are well delineated. Both structures are also peculiar, the apex of anal tergite under the anal point is enlarged, and the anal point is short and triangular, carrying two spines.

**Distribution and ecological notes**

*Tanytarsus tumultuarius* is recorded from Amazonas and Pará State, Brazil. The immature stages are unknown, but they probably inhabit rivers and streams of the Amazon lowlands.

### *Tanytarsus rinihuensis* Reiss, 1972

(Figs 50-51)

Type material. Holotype [not examined]: 1 adult male, Chile, Los Lagos/Valdívia, Limnological Station (Institute of Zoology, University of Valdívia), Lago Riñihue, marginal vegetation of lake helocrene, collected with hand-net, 5.XI.1969, slide mounted in Euparal, leg. F. Reiss (NHRS). Paratypes [examined]: 3 adult males as holotype (ZSM).

Additional material examined: 1 adult male, Chile, Província Malleco, Arroyo Pehuenco, ca. Marimenuco, 12.XII.1963, slide mounted in Euparal, leg. Edmunds; 6 pupal exuviae, Chile, Los Lagos/Valdívia, Limnological Station (Institute of Zoology, University of Valdívia), Lago Riñihue, collected in lake helocrene, 5.XI.1969, slides mounted in Euparal, leg. F. Reiss (all ZSM).

**Diagnostic characters.** *Tanytarsus rinihuensis* can be separated from other *Tanytarsus* species by the following combination of characters.

**Male Imago:** Antennal ratio 0.67-0.68; eyes with dorsomedian extension; small frontal tubercles; wings extensively covered with setae, veins Sc and M with setae; tergite IX with microtrichia-free area around and anterior to base of anal point; anal tergal bands separate, curved, running parallel on middle of tergite and ending anterior to anal point base; anal point elongate and rounded at tip, with one short, strong seta placed in a grub between weakly developed anal crests, spines absent, microtrichia absent; superior volsella ovoid, with field of microtrichia on lateral margin, posteromedian corner somewhat projecting; longitudinal axes of superior volsella and body at angle of about 34°; digitus short and oval/rounded, not reaching margin of superior volsella; median volsella with simple lamellae, not reaching apex of inferior volsella; inferior volsella elongate, thin and somewhat straight, distal part (area carrying setae) oval, slightly swelled; gonostylus elongate, curved and slightly thick; hypopygium ratio about 0.90.

**Pupa:** Frontal apotome with a swelled rectangular area and with fine granulation; frontal setae thin, cephalic tubercles weakly developed or reduced; pedicel sheath tubercle small; wing sheath without nose; prealar tubercle well developed, anvil-shaped and inwardly folded; thoracic horn long, smooth and thin; three precorneals not in triangular pattern, placed on a tubercle, $Pc_1$ stronger, $Pc_2$ and $Pc_3$ placed close to each other; 1 median and 2 lateral antepronotals; 2 pairs of dorsocentrals, each pair with 1 seta thin and 1 thick; hook row more than 1/2 width of abdominal segment II; Pedes Spurii B weakly developed on abdominal segment II; tergites I and VII without armament; T II with homogeneous field of spinules, sparse medially and laterally,

spinules of anterior and posterior portion slightly stronger; T III with pair of long bands of longer and shorter spines and field of spinules lateral to each band, bands more than 1/2 length of tergite; T IV with pair of long bands of longer and shorter spines and field of spinules lateral to each band, bands more than 1/2 length of tergite; T V with pair of elongate bands of spines and field of spinules around and posterior to each band; T VI with pair of oval to elongate patches of small spines; T VIII with pair of anterolateral shagreen; T IX with anterior shagreen, sparse or interrupted medially; posterolateral comb of segment VIII somewhat broad, with 7-10 strong marginal teeth and 6-20 smaller one; abdominal segment I without lateral setae; segment II-IV with 3 lateral setae; segments V-VI with 3 lateral taeniae; segment VII with 4 lateral taeniae; segment VIII with 2 dorsal setae, the more posterior somewhat taeniate, 5 lateral taeniae and 1 ventral taenia; anal fringe with about 46 taeniae.

**Description**

**Male Imago (n=5)**

**Head.** AR 0.67-0.68. Antennal flagellomeres one to twelve 552-566 µm long, thirteen 370-386 µm long, total length 922-952 µm. Eyes with dorsomedian extension; frontal tubercles small (length 6-10 µm); 11-12 temporal setae; clypeus with 18-23 setae; lengths of palpal segments (in µm): 38-50, 46-62, 134-137, 138-145, 215-232, total length 591-601 µm.

**Thorax.** Length 1016-1080 µm. Scutal tubercle absent; 10-14 dorsocentrals, 18-22 acrostichals, 1-3 prealars, 8-10 scutellars. Halteres with 8-15 setae.

**Wing.** Wing length 2120-2200 µm, width 580-610 µm; L/WR 3.60-3.65. Brachiolum with 1 seta setae, Sc with 4-8 setae, R with 37-42 setae, $R_1$ with 35-41 setae, $R_{4+5}$ with 65-78 setae, M with 0-4 setae, $M_{1+2}$ with 93-98 setae, $M_{3+4}$ with 37-51 setae, Cu with 33-34 setae, $Cu_1$ with 23-24 setae, Postcubitus with 48-52 setae and An with 45-47 setae. Cell m with 46-58 setae (+ 21-26 setae on false vein), $r_{4+5}$ with more than 300 setae, $m_{1+2}$ with more than 300 setae (+ 57-65 setae on false vein), $m_{3+4}$ with about 180 setae, cu with about 108 setae and an with about 220 setae.

**Legs.** Foreleg bearing single tibial spur (36-38 µm). Lengths of combs of mid tibia 15-18 µm (with 28-30 µm long spur) and 16-18 µm (with 32-38 µm long spur); lengths of combs of hind tibia 17-18 µm (with 30-35 µm spur) and 18-19 µm (with 35-40 µm long spur).

Lengths of segments (in µm):

| | fe | ti | $ta_1$ | $ta_2$ | $ta_3$ | $ta_4$ | $ta_5$ | Total length |
|---|---|---|---|---|---|---|---|---|
| $P_1$ | 940-950 | 570-590 | 1120-1138 | 528-543 | 420-445 | 302-320 | 140-152 | 4048-4119 |
| $P_2$ | 950-960 | 800-820 | 442-454 | 260-270 | 210-218 | 136-140 | 97-102 | 2912-2957 |
| $P_3$ | 1120-1160 | 1030-1034 | 660-668 | 411-422 | 340-351 | 200-218 | 120-128 | 3926-3959 |

Leg ratios:

| | LR | BV | SV |
|---|---|---|---|
| $P_1$ | 1.90-1.99 | 1.82-1.91 | 1.33-1.36 |
| $P_2$ | 0.55 | 3.04-3.15 | 3.92-3.95 |
| $P_3$ | 0.64 | 2.51-2.67 | 3.25-3.29 |

**Abdomen.** Length 2600-2740 µm.

**Hypopygium (Fig. 50 A-D).** Tergite IX 146-164 µm long with 2-4 median setae (not placed between anal tergal bands, not separated into groups, placed more or less close to anal point base) and 16-20 apical setae, lateral tooth absent, a tubercle carrying three large setae is present close to this area. T IX with microtrichia-free area around and anterior to base of anal point. Orolateral spine of laterosternite difficult to see, probably absent. Anal tergal bands separate, curved, running parallel on middle of tergite and ending anterior to anal point base. Anal point 54-62 µm long, elongate and rounded at tip, with pair of weakly developed, low anal crests (26-39 µm long) extending posterior to tergite IX; without microtrichia between the crests; spines absent, one single short, strong seta placed in a grub between anal crests. Superior volsella ovoid, with field of microtrichia on lateral margin; anterior, lateral and posterior margins curved, median margin slightly convex, posteromedian corner somewhat projecting; 10-13 setae on dorsal surface, 3 setae on median margin and 1 seta on ventral tubercle, close to anterior margin. Longitudinal axes of superior volsella and body at angle of 32-35°. Digitus short and oval/rounded, not reaching margin of superior volsella. Median volsella 20-24 µm long with 25-32 µm long simple setae and 32-36 µm long simple lamellae, not reaching apex of inferior volsella. Inferior volsella 109-118 µm long, elongate, thin and somewhat straight, distal part (area carrying setae) oval, slightly swelled. Gonocoxite length 130-132 µm; gonostylus 144-148 µm, elongate, curved and slightly thick; hypopygium ratio (HR) 0.90-0.91.

**Pupa (n=6)**

Total length 4365-4525 µm.
Pupal exuviae pale brown, thorax and lateral muscle marks brownish.

**Cephalothorax (Fig. 51 A-C).** Frontal apotome with a swelled rectangular area and with fine granulation. Frontal setae thin, 98-128 µm long, cephalic tubercles weakly developed or reduced; frontal warts absent. Pedicel sheath tubercle small. Thorax smooth, 1150-1205 µm long, with small teeth along median suture and granulations close to basis of thoracic horn. Wing sheath without nose; prealar tubercle well developed, anvil-shaped and inwardly folded. Thoracic horn long, smooth and thin, 644-840 µm. Three precorneals not in triangular pattern, placed on a tubercle, $Pc_1$ stronger (113-140 µm), $Pc_2$ and $Pc_3$ (112-128 µm and 108-120 µm respectively) placed close to each other; 1 median (114-136 µm) and 2 lateral antepronotals (4-6 µm, 102-117 µm); 2 pairs of dorsocentrals, anterior pair 80-96 µm (thin) and 36-48 µm (thick), posterior pair 68-82 µm (thin) and 50-78 µm (thick).

**Abdomen (Fig. 51 D-E).** Total length 3120-3320 µm. Tergites I and VII without armament. T II with homogeneous field of spinules, sparse medially and laterally, spinules of anterior and posterior portion slightly stronger. T III with one pair of long bands of longer and shorter spines in addition to field of spinules lateral to each band, bands more than 1/2 length of tergite. T IV with one pair of long bands of longer and shorter spines and field of spinules lateral to each band, bands more than 1/2 length of tergite. T V with one anterior pair of elongate bands of spines and field of spinules around and posterior to each band. T VI with one anterior pair of oval to elongate patches of small spines. T VIII with pair of anterolateral fields of shagreen. T IX with anterior shagreen, sparse or interrupted medially. Sternites IV-VII without armament. S I with very fine shagreen. S II-III with fine shagreen. S VIII with fine anterolateral shagreen. Conjunctives and pleura unarmed. Hook row 350-470 µm, more than 1/2 width of segment II. Pedes Spurii A absent; Pedes Spurii B present on segment II, weakly developed. Posterolateral comb of segment VIII somewhat broad, 80-96 µm wide, with 7-10 strong marginal teeth and 6-20 smaller one. Abdominal setation: segment I with 3 D, 0 L and 1 pair of ventral seta marks; segment II with 3 D plus 2 dorsal seta marks, 3 L and 3 V; segments III-IV with 5 D plus 2 dorsal seta marks, 3 L and 5 V; segments V-VI with 5 D plus 2 dorsal seta marks, 3 lateral taeniae and 5 V; segment VII with 1 D and 2 dorsal seta marks, 4 lateral taeniae and 4 V (in one exuviae with 5 V); segment VIII with 2 D, the more posterior somewhat taeniate, 5 lateral

taeniae and 1 ventral taenia. Anal lobe well developed, with complete fringe of 40-52 taeniae in single row and two pairs of dorsal taeniae. Tergites II-VIII with O-setae.

**Discussion**

Among Neotropical *Tanytarsus*, the presence of setae on wing vein Sc is not common. Only *Tanytarsus rinihuensis*, *Tanytarsus impar* Trivinho-Strixino & Strixino, 2004 and *Tanytarsus magnus* Trivinho-Strixino & Strixino, 2004 show setae on this vein. In *Tanytarsus rhabdomantis* (Trivinho-Strixino & Strixino, 1991) the Sc vein is bare in most specimens, but one exemplar has two setae. The Nearctic *Tanytarsus limneticus* Sublette, 1964 also shows setae on Sc wing vein.

In the description of the *Tanytarsus rinihuensis* adult male, Reiss (1972) described the presence of one single stout spine placed in a grub between the anal crests. Such spine seems to be in fact a short, thick seta, arising from a cup-shaped base, which can be better evidenced in lateral view (Fig. 50 B).

The presence of one single spine on the anal point between the anal crests is observed in *Tanytarsus monospinosus* Ekrem & Reiss, 1999, in this case a true spine. Ekrem & Reiss compared *Tanytarsus monospinosus* to *Tanytarsus rinihuensis*, considering that the latter presents one spine on the anal point. The two species, according to Ekrem & Reiss (1999), are similar in having curved gonostylus, straight inferior volsella, small digitus and one "spine" on the anal point, but they can be separated by the different form of apodemes, setation on the anal tergite, shape of anal point, shape of superior volsella and wings setosity (many setae in *T. rinihuensis*, very few in *T. monospinosus*). Ekrem & Reiss pointed out that the shape of superior volsella and wings setosity are very important characters to consider both species sisters. Besides, as mentioned above, *T. rinihuensis* has a seta on the anal point, while *T. monospinosus* presents a spine. Finally, *T. rinihuensis* differs from *T. monospinosus* in the dorsomedian extension of the eyes (in *T. monospinosus* without such elongation), length of frontal tubercles (small in *T. rinihuensis*, large in *T. monospinosus*), form of anal tergal bands (separate in *T. rinihuensis*, connected in the middle of tergite in *T. monospinosus*) and median volsella (absent in *T. monospinosus*). Thus, the two species share few diagnostic characters to be closely related or even to take part in the same species group.

*Tanytarsus rinihuensis* is more related to the two new species described here, *T. pseudorinihuensis* and *T. pararinihuensis*. More comments on the similarities and differences

among the three species are given in the discussions of *T. pseudorinihuensis* and *T. pararinihuensis*.

The pupa of *Tanytarsus rinihuensis* is not "truly associated" since it was described based on exuviae. However, Reiss (1972) believed that these exuviae belong to *T. rinihuensis* because many exuviae of one single *Tanytarsus* species were found in the same place where adults of *T. rinihuensis* were collected. Besides, among all investigated places in southern Chile and Patagonia, only in Lake Riñihue such pupal morphotypes and adults of *T. rinihuensis* were encountered. In addition, Roback and Coffman (1983) described one *Tanytarsus* morphotype ("*Tanytarsus* sp.") based on male imago and pupa which seems to be identical to *T. rinihuensis.* The adult and pupa of this species are truly associated (pharate male). Unfortunately I did not have the opportunity to see this material, but according to the description and drawings of Roback and Coffman, adult males of "*Tanytarsus* sp." and *T. rinihuensis* have a very similar design of anal point, superior volsella, digitus, median volsella and inferior volsella, and the pupae have the same abdominal armament pattern (Fig. 51 D), similar anal comb form (Fig. 51 E), a smooth thoracic horn (Fig. 51 C) and a prealar tubercle (Fig. 51 B) of peculiar form (anvil-shaped). Among Neotropical *Tanytarsus*, *T. rinihuensis* is the only species which does not show any nose in the wing sheath; the wing sheath nose is also absent in Roback & Coffman' morphotype. Thus, I believe that the pupa described by Reiss truly belongs to *T. rinihuensis*.

**Distribution and ecological notes**

*Tanytarsus rinihuensis* is recorded from the area of Los Lagos in southern Chile. The adults were collected from the surrounding vegetation of Lake Riñihue, where pupal exuviae and larvae were found, over a helocrene. According to Ward (1992), helocrenes are marshy areas formed by diffuse seepage. Reiss (1972) cited that the immature stages live in helocrenes, the larvae inhabit sediments composed by gravel, sand and detritus at the depth of 30 cm. The larval tubes are constructed superficially and horizontally in the sediment. The water temperature was 10.3$^{o}$ C during the sampling and the current flow was very slow. Regarding that the morphospecies described by Roback and Coffman (1983) corresponds to *T. rinihuensis*, the species also occurs in Peru and Bolivia.

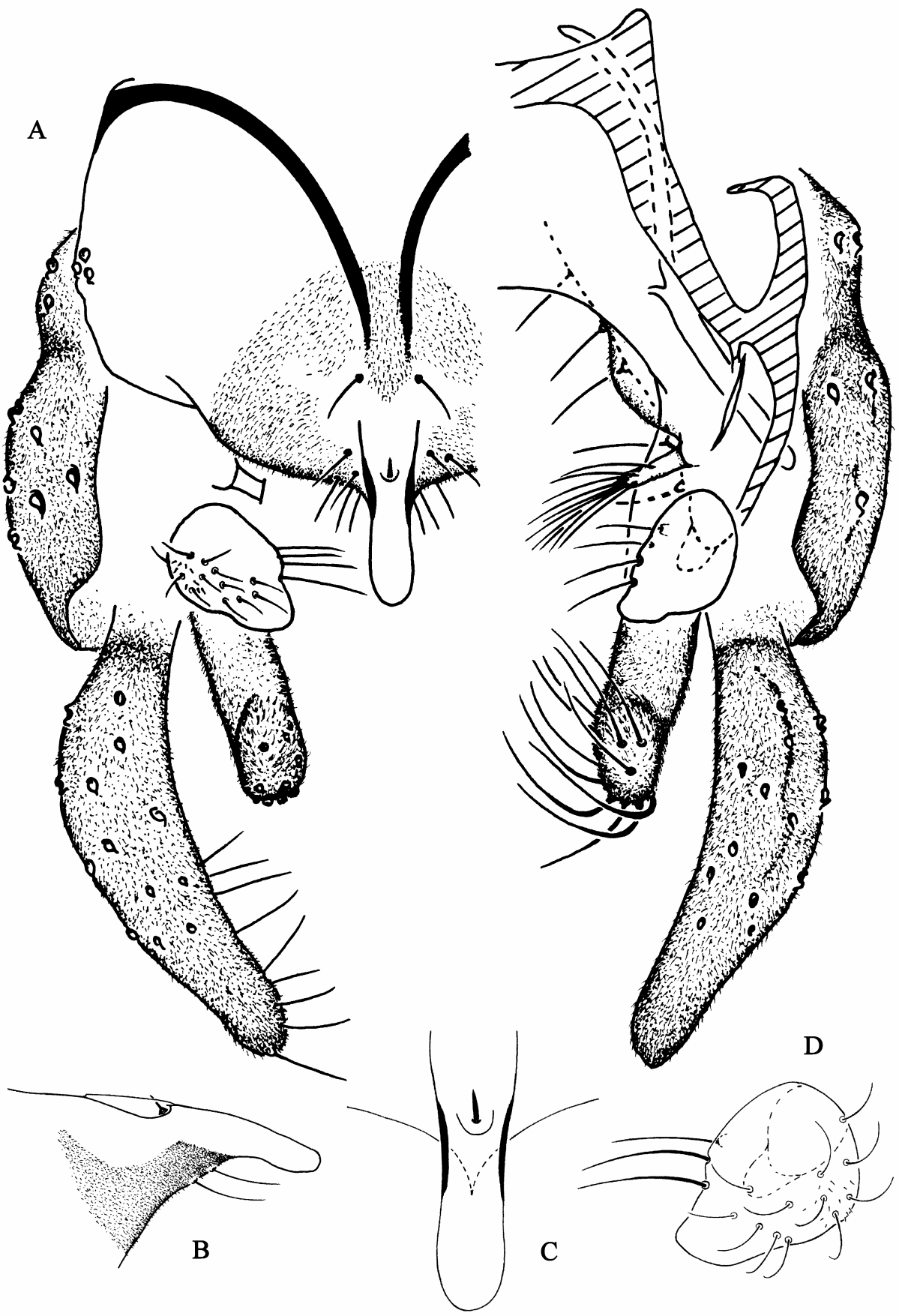



**Fig. 50.** ***Tanytarsus rinihuensis*** **Reiss, adult male. A: Hypopygium, dorsal view. B: Anal point, lateral view. C: Anal point, dorsal view. D: Superior volsella and digitus.**

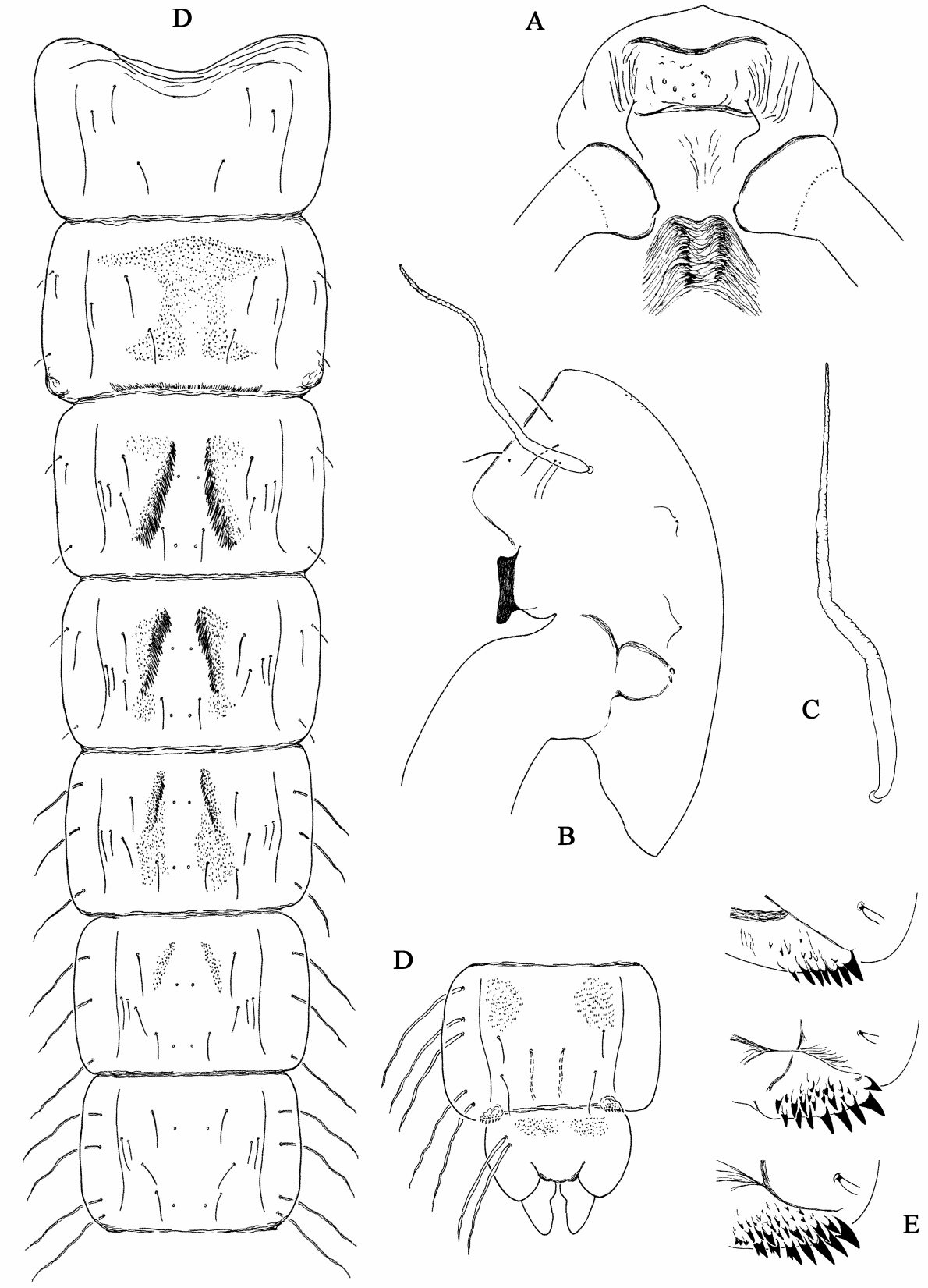



**Fig. 51.** ***Tanytarsus rinihuensis*** **Reiss, pupa. A: Frontal apotome. B: Thorax. C: Thoracic horn. D: Abdomen, dorsal view. E: Posterolateral comb of abdominal segment VIII, variation.**

***Tanytarsus pseudorinihuensis* spec. nov.**

(Fig. 52)

Type material. Holotype: 1 adult male, Argentina, Terra del Fuego, Rio Ewan (S) at Pte. Judicia, 150m, 54°13'S, 67°15'W, 18.I.1986, slide mounted in Euparal (labeled and identified as *Tanytarsus rinihuensis*), leg. M. Spies (ZSM). Paratype: 1 adult male, Bolivia, B8a, leg. E. J. Fittkau (ZSM).

**Etymology.** The species name "*pseudorinihuensis*" refers to its similarity with *Tanytarsus rinihuensis*.

**Diagnostic characters.** The male imago of *Tanytarsus pseudorinihuensis* can be separated from other *Tanytarsus* species by the following combination of characters. Antennal ratio 0.75; eyes with dorsomedian extension; small frontal tubercles; wing veins Sc and M apparently bare; tergite IX with microtrichia-free area anterior to base of anal point; anal tergal bands separate, curved, not running parallel and ending well anterior to anal point base; anal point elongate and rounded at tip, with 1 short, thin seta placed in a grub between weakly developed anal crests, spines absent, microtrichia absent; superior volsella slightly heart-shaped, posteromedian corner projecting, without microtrichia; longitudinal axes of superior volsella and body at angle of about 41°; digitus short and oval/rounded, not reaching margin of superior volsella; median volsella with simple lamellae, not reaching apex of inferior volsella; inferior volsella thick and slightly curved, distal part (area carrying setae) with rounded swelling; gonostylus elongate, thick and slightly curved; hypopygium ratio 0.88.

**Description**

**Male Imago (n=2)**

**Head.** AR 0.75. Antennal flagellomeres one to twelve 548-616 µm long, thirteen 412-464 µm long, total length 960-1080 µm. Eyes with dorsomedian extension; frontal tubercles small (length 5-6 µm); 11 temporal setae; clypeus with 15-16 setae; lengths of palpal segments (in µm): 38-40, 56-58, 134-138, 136-138, 194-220, total length 558-594 µm.

**Thorax.** Length 950-1120 µm. Scutal tubercle absent; 10 dorsocentrals, acrostichals difficult to see, 2 prealars, 6 scutellars. Halteres setae difficult to see.

**Wing.** Number of setae on veins and cells difficult to count due to position on slide. Comparing with the extensive wing setation of *T. rinihuensis*, *T. pseudorinihuensis* seems to present fewer setae on wing veins and cells, and Sc and M veins seem to be bare.

**Legs.** Foreleg bearing single tibial spur (38 µm). Lengths of combs of mid tibia 17 µm (with 29 µm long spur) and 18 µm (with 37 µm long spur); lengths of combs of hind tibia 18 µm (with 34 µm spur) and 18 µm (with 39 µm long spur).

Lengths of segments (in µm):

| | fe | ti | $ta_1$ | $ta_2$ | $ta_3$ | $ta_4$ | $ta_5$ | Total length |
|---|---|---|---|---|---|---|---|---|
| $P_1$ | 985 | 630 | 1190 | 560 | 440 | 318 | 130 | 4253 |
| $P_2$ | 995 | 850 | 460 | 285 | 220 | 140 | 110 | 3060 |
| $P_3$ | 1208 | 1110 | 670 | 450 | 362 | 220 | 130 | 4150 |

Leg ratios:

| | LR | BV | SV |
|---|---|---|---|
| $P_1$ | 1.88 | 1.93 | 1.35 |
| $P_2$ | 0.54 | 3.05 | 4.01 |
| $P_3$ | 0.60 | 2.57 | 3.45 |

**Abdomen.** Length 2440-2960 µm.

**Hypopygium (Fig. 52 A-D).** Tergite IX 176-182 µm long with 2-3 median setae (not placed between anal tergal bands, not separated into groups, placed anterior to anal point base) and 16-18 apical setae, lateral tooth absent, a tubercle carrying three large setae is present close to this area. T IX with microtrichia-free area anterior to base of anal point. Orolateral spine of laterosternite present, 8 µm long. Anal tergal bands separate, curved, not running parallel and ending well anterior to anal point base. Anal point 58-60 µm long, elongate and rounded at tip, with pair of weakly developed, low anal crests (30 µm long); without microtrichia between the crests; spines absent, 1 shot, thin seta placed in a grub between anal crests. Superior volsella slightly heart-shaped, posteromedian corner projecting, without microtrichia; anterior, lateral and posterior margins curved, median margin concave; 7-9 setae on dorsal surface, 3-4 (2-3 dorsal, 1 ventral) setae on median margin and 1 seta on ventral tubercle, close to anterior margin. Longitudinal axes of superior volsella and body at angle of 41-42°. Digitus short and oval/rounded, not reaching margin of superior volsella. Median volsella 18-21 µm long with 24-

29 µm long simple setae and 30-35 µm long simple lamellae, not reaching apex of inferior volsella. Inferior volsella 111-114 µm long, thick and slightly curved, distal part (area carrying setae) with rounded swelling. Gonocoxite length 126-132 µm; gonostylus 144-150 µm, elongate, thick and slightly curved; hypopygium ratio 0.85-0.91.

**Discussion**

After studying material in the ZSM, I noticed that one specimen was wrongly identified as *Tanytarsus rinihuensis*. This specimen is in fact new to science and described here as *Tanytarsus pseudorinihuensis*. The possible reason for this misidentification is the similar hypopygium design of *T. pseudorinihuensis* and *T. rinihuensis.* Both species share many similarities such as low antennal ratio, small frontal tubercles, form and armament of anal point (elongate and rounded at tip, anal crests weakly developed, one short seta placed in a grub, microtrichia and spines absent), short and oval-rounded digitus, simple lamellae on median volsella and a curved and somewhat thick gonostylus. *Tanytarsus pseudorinihuensis* differs from *T. rinihuensis* in the form of anal tergal bands (Figs 50 A and 52 A), i.e. bands running parallel in *T. rinihuensis,* not running parallel in *T. pseudorinihuensis*, form of superior volsella (Figs 50 D and 52 B) (ovoid in *T. rinihuensis*, slightly heart-shaped, posteromedian corner projecting in *T. pseudorinihuensis*), and absence of microtrichia on superior volsella (present in *T. rinihuensis*). In addition, *T. pseudorinihuensis* presents fewer setae on wing veins and cells, and Sc and M veins seem to be bare, while in *T. rinihuensis* the wing is extensively covered with setae, and Sc and M veins present setae.

*Tanytarsus pseudorinihuensis* seems to be more related to *Tanytarsus pararinihuensis*, only differing from the latter in the form of superior volsella.

**Distribution and ecological notes**

*Tanytarsus pseudorinihuensis* is recorded from Terra del Fuego, Argentina, and Bolivia. The immature stages are unknown.

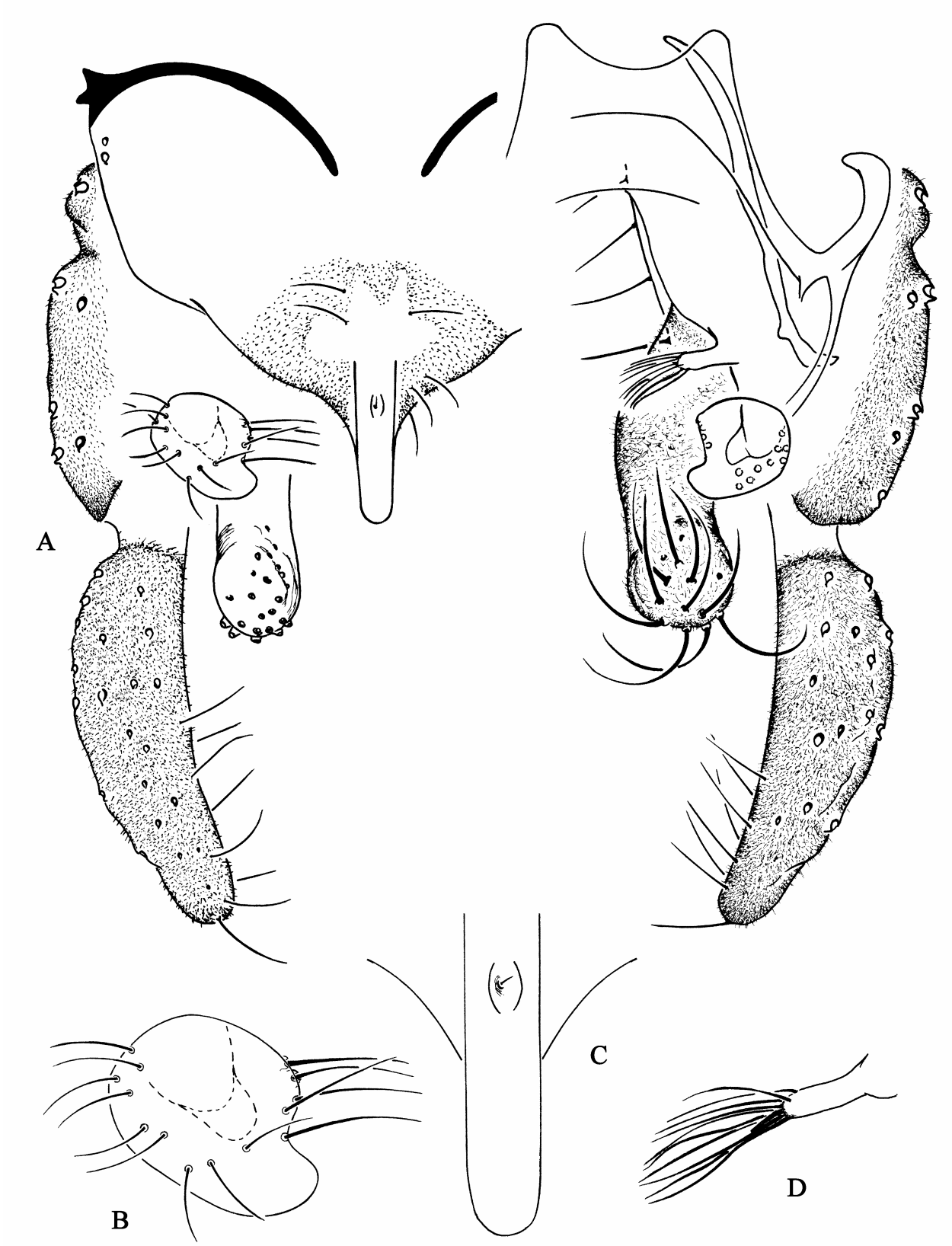



**Fig. 52.** ***Tanytarsus pseudorinihuensis*** **spec. nov., adult male. A: Hypopygium, dorsal view. B: Superior volsella and digitus. C: Anal point, dorsal view. D: Median volsella.**

***Tanytarsus pararinihuensis* spec. nov.**

(Fig. 53)

Type. Holotype: 1 adult male, *Tanytarsus "rinihuensis? A. Sanseverino"*, "**?**", Bolivia, B8a, leg. E. J. Fittkau (ZSM).

**Etymology.** The name *"pararinihuensis"* is provisory and refers to the similarity of the species with *Tanytarsus rinihuensis*.

**Diagnostic characters.** The male imago of *Tanytarsus pararinihuensis* can be separated from other *Tanytarsus* species by the following combination of characters. Antennal ratio 0.69; eyes with dorsomedian extension; small frontal tubercles; wing veins Sc and M apparently bare; tergite IX with microtrichia-free area around and anterior to base of anal point; anal tergal bands separate, curved, not running parallel and ending well anterior to anal point base; anal point elongate and rounded at tip, with 1 short, thin seta placed in a grub between weakly developed anal crests, spines absent, microtrichia absent; superior volsella somewhat period-like, without microtrichia, posteromedian corner well projecting; longitudinal axes of superior volsella and body at angle of about 36°; digitus short and oval/rounded, not reaching margin of superior volsella; median volsella with simple lamellae, not reaching apex of inferior volsella; inferior volsella thick and straight, distal part (area carrying setae) slightly swelled; gonostylus elongate, somewhat curved and thick; hypopygium ratio about 0.80.

**Description**

**Male Imago (n=1)**

**Head.** AR 0.69. Antennal flagellomeres one to twelve 558 µm long, thirteen 390 µm long, total length 948 µm. Eyes with dorsomedian extension; frontal tubercles small (length 5 µm); 11 temporal setae; clypeus setae difficult to count; palpal segments difficult to measure.

**Thorax.** Length 915 µm. Scutal tubercle absent; 10 dorsocentrals, acrostichals, prealars and scutellars difficult to see. Halteres with 8 setae.

**Wing.** Number of setae on veins and cells difficult to count due to position on slide. Comparing with the extensive wing setation of *T. rinihuensis*, *T. pararinihuensis* seems to present fewer setae on veins and cells, and Sc and M cells seem to be bare.

**Legs**. Legs segments, tibial combs and spurs difficult to measure due to position on slide.

**Abdomen.** Length 2450 µm.

**Hypopygium (Fig. 53 A-D).** Tergite IX 163 µm long with 2 median setae (not placed between anal tergal bands, not separated into groups, placed close to anal point base) and 20 apical setae, lateral tooth absent. T IX with microtrichia-free area around and anterior to base of anal point. Orolateral spine of laterosternite difficult to see, probably absent. Anal tergal bands separate, curved, not running parallel and ending well anterior to anal point base. Anal point 58 µm long, elongate and rounded at tip, with pair of weakly developed, low anal crests (31 µm long); without microtrichia between the crests; spines absent, 1 short, thin seta placed in a grub between anal crests. Superior volsella somewhat period-like, without microtrichia; anterior, lateral and posterior margins curved, median margin concave, posteromedian corner well projecting; 7 setae on dorsal surface, 2 setae on median margin and 1 seta on ventral tubercle, close to anterior margin. Longitudinal axes of superior volsella and body at angle of 35-37°. Digitus short and oval/rounded, not reaching margin of superior volsella. Median volsella 19 µm long with 21-24 µm long simple setae and 30-32 µm long simple lamellae, not reaching apex of inferior volsella. Inferior volsella 102 µm long, thick and straight, distal part (area carrying setae) slightly swelled. Gonocoxite length 109 µm; gonostylus 136 µm, elongate, somewhat curved and thick; hypopygium ratio (HR) 0.80.

**Discussion**

*Tanytarsus pararinihuensis* is closely related to *Tanytarsus pseudorinihuensis* and to *Tanytarsus rinihuensis* (Figs 53, 52 and 50, respectively). The adult males of the three species share similarities such as low antennal ratio, small frontal tubercles, form and armament of anal point, length and form of digitus, presence of simple lamellae on median volsella and form of gonostylus. *Tanytarsus pararinihuensis* differs from *T. rinihuensis* in the form of anal tergal bands (bands running parallel in *T. rinihuensis*, not running parallel in *T. pararinihuensis*), form of superior volsella (ovoid in *T. rinihuensis*, period-shaped in *T. pararinihuensis*), and absence of microtrichia on superior volsella. As in *T. pseudorinihuensis*, the wing of *T. pararinihuensis*

presents fewer setae, and Sc and M veins are apparently bare, while in *T. rinihuensis* the wing has more setae, including in Sc and M veins. *Tanytarsus pseudorinihuensis* seems to be the closest relative of *T. pararinihuensis*. Both species differ only in the form of superior volsella. In *T. pararinihuensis* the posteromedian corner of the superior volsella is more projecting than in *T. pseudorinihuensis*, and its anterior part is somewhat circular, giving the appearance of a "period".

**Distribution and ecological notes**

*Tanytarsus pararinihuensis* is recorded from Bolivia. The immature stages are unknown.

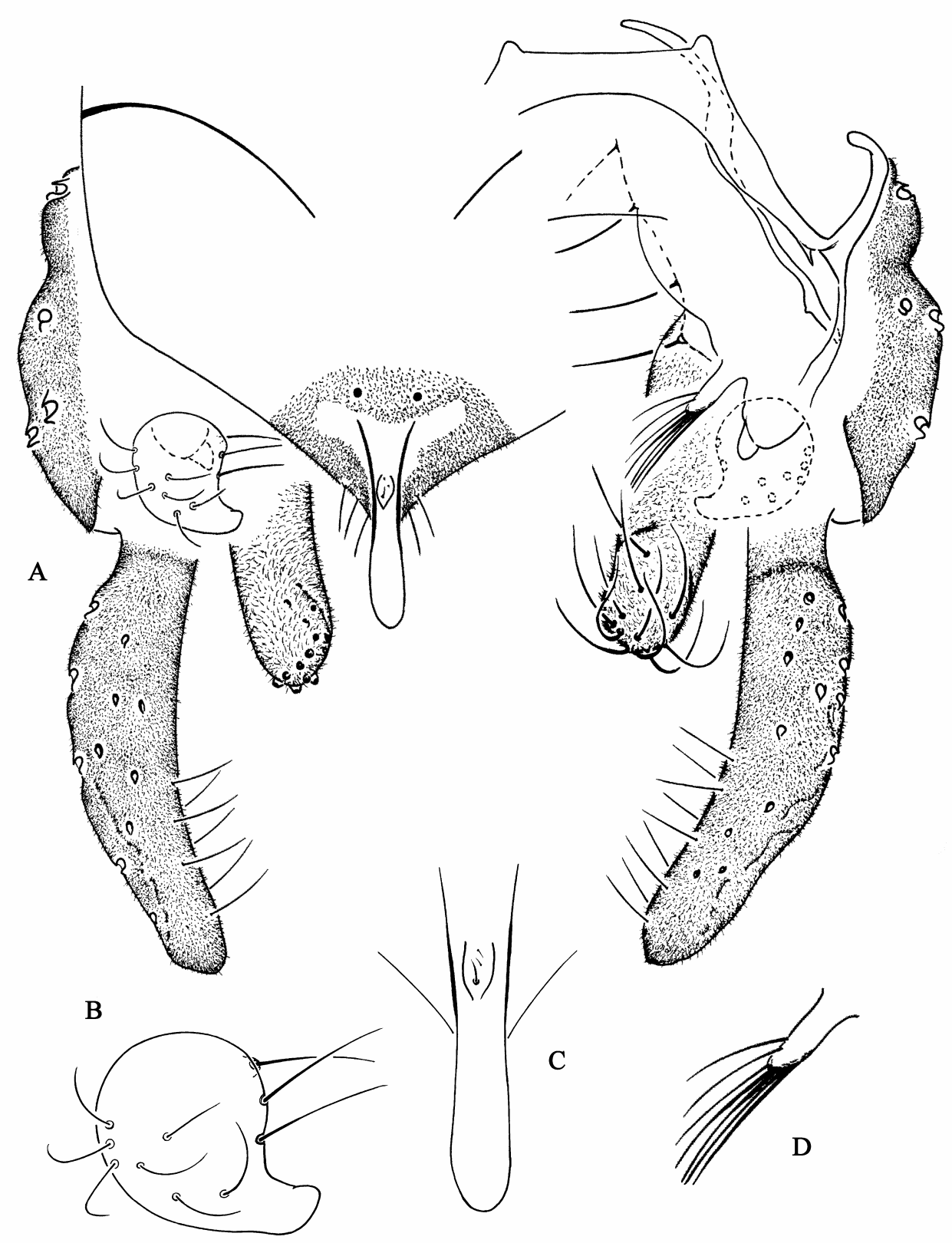



**Fig. 53.** ***Tanytarsus pararinihuensis*** **spec. nov., adult male. A: Hypopygium, dorsal view. B: Superior volsella. C: Anal point, dorsal view. D: Median volsella.**

### *Tanytarsus ligulatus* Reiss, 1972

(Figs 54-55)

Type material (Brazil, leg. E. J. Fittkau). Holotype [examined]: 1 adult male, Pará State, northeastern Amazon close to Suriname frontier, ca. 400m a.s.l., upper Rio Parú do Oeste, Malloca Apicó, at light (sample A366-1), 20.IV.1962, slide mounted in Canada Balsam (INPA). Paratypes [examined]: 5 adult males as holotype except slides mounted in Euparal and deposited at ZSM; 2 adult males as holotype except 7.IV.1962 (sample A364-2) and deposited at ZSM; 1 adult male, Pará State, northeastern Amazon close to Suriname frontier, ca. 400m a.s.l., upper Rio Parú do Oeste, Mission Tiriyos, at light (sample A361-8), 3.IV.1962, slide mounted in Euparal (ZSM); 3 adult males, Pará State, upper Rio Parú do Oeste, Igarapé Okueima, at light (sample A371), 17.-18.IV.1962, slides mounted in Euparal (ZSM); 1 adult male as previous except 18.IV.1962 (sample A371-1).
One paratype labeled *Tanytarsus ligulatus* (sample A413) was treated separately as *Tanytarsus* cf. *ligulatus* (see discussion of *T.* cf. *ligulatus*).

Additional material examined (Brazil): 9 adult males, Pará State, northeastern Amazon close to Suriname frontier, ca. 400m a.s.l., upper Rio Parú do Oeste, Malloca Apicó, at light (sample A366-1), 20.IV.1962, slides mounted in Canada Balsam (ZSM); 4 adult males, Pará State, northeastern Amazon close to Suriname frontier, ca. 400m a.s.l., upper Rio Parú do Oeste, Mission Tiriyos, at light (sample A361-8), 3.IV.1962, slide mounted in Euparal, leg. E. J. Fittkau (ZSM); 7 adult males as previous except 9.IV.1962 (sample 361-9); 2 adult males as previous except 29.III.1962 (sample 361-6); 1 adult male as previous except 28.III.1962 (sample 361-5); 1 adult male as previous except 31.III.1962 (sample 361-7); 1 adult male as previous except 21.IV.1962 (sample 361-10); 6 adult males, Pará State, upper Rio Parú do Oeste, Igarapé Okueima, at light (sample A371-1), 18.IV.1962, slides mounted in Euparal, leg. E. J. Fittkau (ZSM); 1 adult male as previous except 17.-18. IV.1962 (sample A371); 3 adult males, Amazonas State, Rio Cuieiras, Igarapé Tukunaré, at light (sample A413), 19.XII.1961, slides mounted in Euparal, leg. E. J. Fittkau (ZSM); 2 adult males, area of lower Rio Madeira, Rio Luna Açu, at light (sample A24-2), 25.IX.1960, slides mounted in Euparal, leg. E. J. Fittkau (ZSM); 2 pharate males, Mato Grosso State, Chavantina, Rio das Mortes (sample A561-9), 19.-20.VIII.1965 slides mounted in Euparal, leg. E. J. Fittkau (ZSM). 2 adult males, São Paulo State, São Carlos, Represa da Colônia, Fazenda Canchim, 17.II.2001, slides mounted in Euparal, leg. S. Trivinho-Strixino (UFSCar).

**Diagnostic characters.** *Tanytarsus ligulatus* can be separated from other *Tanytarsus* species by the following combination of characters.

**Male Imago:** Antennal ratio about 1.16; eyes with dorsomedian extension; very large frontal tubercles; wing veins Sc, M and Postcubitus bare, wing cell an bare; tergite IX with one pair of median setae placed very close to anal point base, and with large microtrichia-free area anterior to anal point; anal tergal bands T-type, "fused" on median part of tergite, ending more or less close to anal point base; anal point elongate and thin, microtrichia and spines absent, apex wider and spoon-like, the distal portion of the "spoon" is slightly toothed; a pair of anal crests placed on apex forms such contour and gives the "spoon" appearance; superior volsella somewhat triangular, heart-shaped, without microtrichia, posteromedian corner slightly projecting; longitudinal axes of superior volsella and body at angle of about 36°; digitus long and somewhat thumb-like, extending well beyond margin of superior volsella; median volsella with quite fringed pectinate lamellae, not reaching apex of inferior volsella; inferior volsella thick and straight, distal part (area carrying setae) with rounded to somewhat triangular/quadrate swelling; gonostylus elongate, straight and somewhat thin; hypopygium ratio about 0.91.

**Pupa:** Frontal apotome with fine granulation; frontal setae thick, cephalic tubercles conical, well developed; pedicel sheath tubercle very small, weakly developed; thoracic horn large, with spines along most of length; wing sheath with well-developed nose; prealar tubercle weakly developed, slightly rounded; three precorneals not forming a triangular pattern, anterior precorneal stronger, placed on tubercle, $Pc_2$ and $Pc_3$ closer to each other, placed on tubercle margin; 1 median antepronotal seta and 1 lateral antepronotal plus 1 seta mark; 2 pairs of dorsocentrals, each pair with 1 thin and 1 strong seta; hook row about 1/3 width of abdominal segment II; Pedes Spurii B reduced; tergites I and VII without armament; tergite II with pair of oval patches of spines anteriorly and median field of fine spinules; tergites III-VI with pair of elongate patches of spines anteriorly and median, sparse, field of fine spinules; patches of spines on T VI smaller, median part without shagreen or with few spinules; T VIII with anterolateral shagreen; T IX with shagreen interrupted on median part, posterolateral shagreen stronger; posterolateral comb of segment VIII with 3-4 strong teeth posteriorly, the most apical tooth stronger, and 6-10 smaller one; abdominal segment I without lateral seta, segments II-III with 3 lateral setae, segments IV-VII with 3 lateral taeniae and segment VIII with 5 lateral taeniae; segment VIII without ventral seta, with 2 dorsal taeniae, the more anterior one stronger; anal lobe fringe with about 24 taeniae in single row.

## Description

### Male Imago (n=5)

**Head.** AR 1.12-1.19. Antennal flagellomeres one to twelve 420-460 µm long, thirteen 500-518, total length 920-978 µm. Eyes with dorsomedian extension; frontal tubercles present, very large (length 37-40 µm), about 3.5 times as long as wide; 9-10 temporal setae; clypeus with 15-17 setae; lengths of palpal segments (in µm): 32-34, 38-39, 108-112, 119-134, 226-228, palp total length 527-543 µm.

**Thorax.** Length 760-815 µm. Scutal tubercle absent; 7 dorsocentrals, 10-12 acrostichals, 1 prealar, 4 scutellars. Halteres with 4-5 setae.

**Wing.** Wing length 1403-1500 µm, width 380-407 µm; L/WR 3.45-3.69. Brachiolum with 1 seta, Sc bare, R with 21-24 setae, $R_1$ with 23-24 setae, $R_{4+5}$ with 48-52 setae, M bare, $M_{1+2}$ with 37-40 setae, $M_{3+4}$ with 24-26 setae, Cu with 2-7 setae, $Cu_1$ with 14-17 setae, Postcubitus bare and An with 22 setae. Cell m with 6-7 setae (+ 0-1 seta on false vein), $r_{4+5}$ with about 135-160 setae, $m_{1+2}$ with about 135-150 setae (+ 23-30 setae on false vein), $m_{3+4}$ with 32-41 setae, cu with 1 seta and an bare.

**Legs.** Foreleg bearing single tibial spur (35-36 µm). Lengths of combs of mid tibia 16 µm (with 24 µm long spur) and 17 µm (with 33 µm long spur); lengths of combs of hind tibia 17-19 µm (with 26-28 µm spur) and 18-20 µm (with 44-49 µm long spur).

Lengths of segments (in µm):

| | fe | ti | $ta_1$ | $ta_2$ | $ta_3$ | $ta_4$ | $ta_5$ | Total length |
|---|---|---|---|---|---|---|---|---|
| $P_1$ | 710-716 | 340-348 | 1060-1078 | 461-472 | 402-412 | 320-330 | 130 | 3447-3462 |
| $P_2$ | 700-710 | 530-550 | 365-370 | 150-157 | 100-108 | 59-63 | 50-52 | 1961-1999 |
| $P_3$ | 750-760 | 680-685 | 560 | 293-300 | 251-262 | 140 | 78-80 | 2767-2772 |

Leg ratios:

| | LR | BV | SV |
|---|---|---|---|
| $P_1$ | 3.04-3.17 | 1.59-1.60 | 0.97-1.00 |
| $P_2$ | 0.68 | 4.35 | 3.36 |
| $P_3$ | 0.81-0.82 | 2.54-2.63 | 2.55-2.58 |

**Abdomen.** Length 1940-2340 µm.

**Hypopygium (Fig. 54 A-D).** Tergite IX 99-102 µm long, without lateral tooth, with large microtrichia-free area posteriorly, and with one pair of median setae placed very close to anal

point base plus 8 apical setae. Orolateral spine of laterosternite IX difficult to see (probably absent). Anal tergal bands T-type, "fused" on median part of tergite, ending more or less close to anal point base. Anal point 30-32 µm long, elongate and thin, microtrichia and spines absent, apex wider and spoon-like; the distal portion of the "spoon" is slightly toothed. The "spoon" appearance is given by spoon-like anal crests (a pair of anal crests, according to Reiss 1972) placed on apex and forming such contour. Superior volsella somewhat triangular, heart-shaped, without microtrichia; anterior portion wider, posteromedian corner slightly projecting, median margin concave; 5-6 setae on dorsal surface, 2-3 setae on median margin (one-two dorsal and one ventral) and 1 seta on small ventral tubercle close to anterior margin. Longitudinal axes of superior volsella and body at angle of 35-37°. Digitus long and somewhat thumb-like, extending well beyond margin of superior volsella. Median volsella 21 µm long with 21-24 µm long simple setae and 17 µm long, quite fringed, pectinate lamellae, not reaching apex of inferior volsella. Inferior volsella 70-79 µm long, thick and straight, distal part (area carrying setae) with rounded to somewhat triangular/quadrate swelling. Gonocoxite length 98-103 µm; gonostylus 106-114 µm, elongate, straight and somewhat thin; hypopygium ratio (HR) 0.90-0.92.

**Pupa (n=2)**

Total length 2.95-3.16 mm. Pupal exuviae pale, thorax and lateral muscle marks somewhat brownish.

**Cephalothorax (Fig. 55 A-C).** Frontal apotome with fine granulation. Frontal setae thick, 98-112 µm long, mounted apical on well-developed conical cephalic tubercles (60-73 µm); frontal warts absent. Pedicel sheath tubercle very small. Thorax smooth, 762-820 µm long, with small teeth along median suture. Wing sheath with well-developed nose; prealar tubercle weakly developed, slightly rounded. Thoracic horn large, 625 µm long, with spines; the thoracic horn is missing in all exuviae except one. Three precorneals not forming a triangular pattern, anterior precorneal 132-134 µm long, placed on a rounded tubercle, $Pc_2$ 120-125 µm and $Pc_3$ 102-110 µm, both close to thoracic horn; 1 median antepronotal (158 µm long), strong, and 2 lateral antepronotals (42 µm and 1 seta mark); 2 pairs of dorsocentrals, each pair with 1 thin and 1 strong seta, anterior pair 59-62 µm (thin) and 64-67 µm (thick), posterior pair 60-64 µm (thin) and 55-58 µm (thick).

**Abdomen (Fig. 55 D-E).** Length 2197-2348 µm. Tergites I and VII without armament. T II with pair of oval patches of spines anteriorly and median field of fine spinules. T III-VI with pair of elongate patches of spines anteriorly and median, sparse field of fine spinules; patches of spines on T VI smaller, median part without shagreen or with few spinules. T VIII with anterolateral shagreen. T IX with shagreen interrupted on median part, posterolateral shagreen stronger. Sternites I-III with very fine, sparse shagreen anteriorly. Sternites IV-IX without armament. Conjunctives and pleura unarmed. Hook row 142-156 µm long, about 1/3 width of segment II. Pedes Spurii B reduced. Posterolateral comb of segment VIII 22-24 µm wide, with 3-4 strong teeth posteriorly, the most apical tooth stronger, and 6-10 smaller one. Abdominal setation: segment I with 2 D, 0 L and 1 V; segment II with 3 D, 3 L and 3 V; segment III with 5 D, 3 L and 3 V; segments IV-VII with 5 D, 3 lateral taeniae and 4 V; segment VIII with 2 dorsal taeniae, the more anterior stronger, 5 lateral taeniae and 0 V; anal lobe well developed, with complete fringe of 22-24 taeniae in single row and two pairs of dorsal taeniae. T II-VIII with O-setae.

**Discussion**

*Tanytarsus ligulatus* is recorded from Brazil and is the only non-Chilean *Tanytarsus* described by Reiss (1972) in his work about the Tanytarsini from southern Chile and western Patagonia. *Tanytarsus ligulatus* is closest related to the southern Chilean *Tanytarsus paraligulatus* Reiss. The adult male of *T. ligulatus* (Fig. 54 A-D) differs from the male of *T. paraligulatus* (Fig. 56 A-D) in the length of frontal tubercles (both species present very large frontal tubercles, but in *T. paraligulatus* they are even larger), well-developed anal crests giving to anal point a "spoon" appearance (less developed in *T. paraligulatus*, "spoon" appearance not so marked), as well as in having a more heart-shaped superior volsella (in *T. paraligulatus* more triangular, median margin straight) and a thumb-like digitus (finger-like in *T. paraligulatus*).

In regard to the pupa of *Tanytarsus ligulatus*, the size of the thoracic horn, very large (625 µm) in comparison with other pupae, somewhat robust and more chitinized, should be focused. The pupal abdominal tergite II presents, in addition to median field of spinules, one pair of oval patches of spines anteriorly, a character found also in *Tanytarsus hastatus* Sublette & Sasa. Except for sharing the presence of paired spines patches on tergite II, *T. ligulatus* differs in all other aspects from *T. hastatus*.

Among material of *T. ligulatus* deposited at Zoologische Staatssammlung München (ZSM), one paratype and some specimens identified as *T. ligulatus* are somewhat smaller and

different. Thus, I decided to treat this paratype and the specimens separately as *Tanytarsus* cf. *ligulatus* (see discussion of *T.* cf. *ligulatus*).

The pupa of *T. ligulatus* has been unknown to science so far. Unpublished pharate males from Chavantina, Mato Grosso State (collected by Fittkau in 1965), and pupal exuviae from Lake Magalhães, Roraima State (collected by Reiss in 1971), identified as *T. ligulatus* were found in the collection (ZSM). The pharate males are undoubtedly *T. ligulatus*, but the pupal exuviae from Lake Magalhães are slightly different. The exuviae from Lake Magalhães are smaller (i.e., thorax, abdomen and other features such as cephalic tubercles which are smaller in size) and the hook row is shorter. However, in spite of the smaller size of these pupal exuviae, there are no differences in the measurements of thoracic setae, antepronotals, precorneals and dorsocentrals; all showed similar lengths to the pharate pupae of *T. ligulatus*. The most markedly difference is observed in the abdominal setation: the segment VII of the pharate male has 3 lateral taeniae, while in the exuviae from Lake Magalhães the segment VII presents 4 lateral setae.

Because of their smaller size and occurrence at the same locality, the pupal exuviae from Lake Magalhães could be related to the males of *T.* cf. *ligulatus*, but such association could lead to a wrong conclusion since they are not truly associated. Thus, the exuviae from Lake Magalhães will not be described in this work.

**Distribution and ecological notes**

Reiss (1972) recorded male adults of *Tanytarsus ligulatus* from central and northeastern Amazon basin areas (Brazil). In addition, pharate males from Chavantina (Mato Grosso State) and adult males from São Carlos (São Paulo State) are newly recorded. Reiss (1972) mentioned that all Amazonian samples were taken at the end of the dry period, when all water-bodies at the corresponding sample localities showed the lowest water depths. This condition permits to conclude that the *T. ligulatus* immature stages inhabit middle-sized streams. Central Amazon rivers and streams are poor in electrolytes and present a strongly acidic water with a high content of humic substances (black waters), while northeastern Amazon streams are somewhat richer in electrolytes (clear waters).

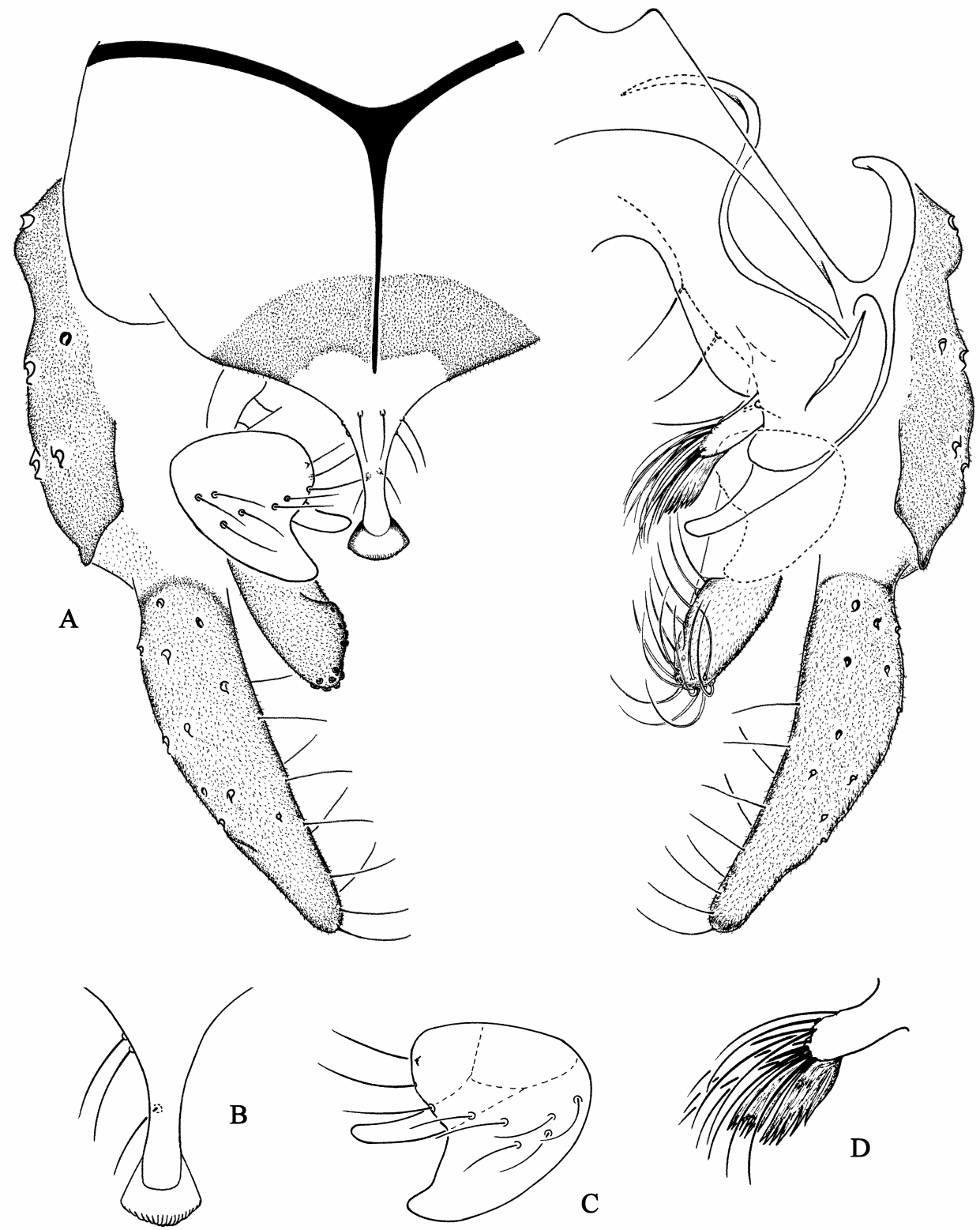



**Fig. 54.** ***Tanytarsus ligulatus*** **Reiss, adult male. A: Hypopygium, dorsal view. B: Anal point, dorsal view. C: Superior volsella and digitus. D: Median volsella.**

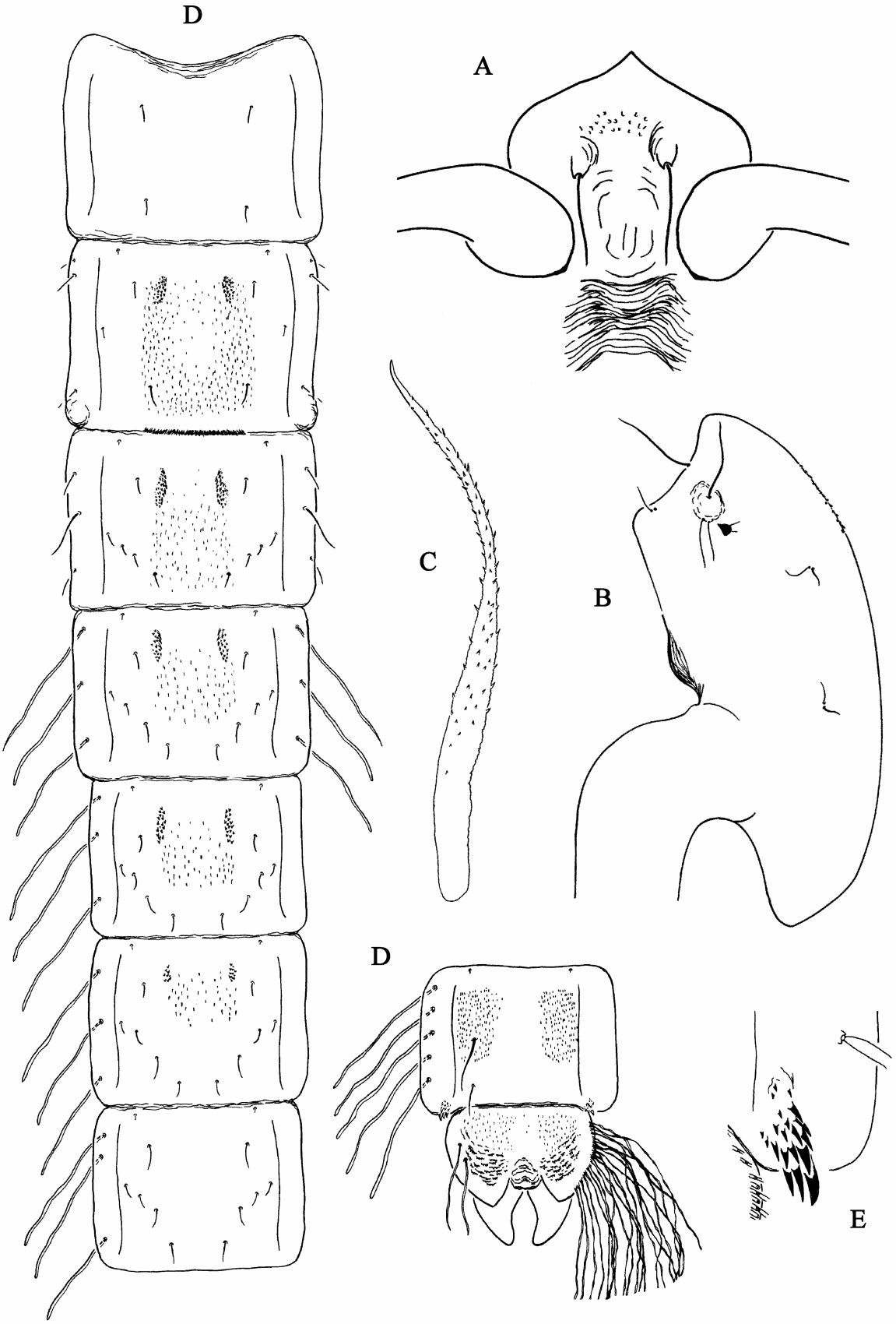



**Fig. 55.** ***Tanytarsus ligulatus*** **Reiss, pupa. A: Frontal apotome. B: Thorax. C: Thoracic horn. D: Abdomen, dorsal view. E: Posterolateral comb of abdominal segment VIII.**

### *Tanytarsus* cf. *ligulatus* Reiss, 1972

(Fig. 56)

Material examined (Brazil). Paratype labeled as *Tanytarsus ligulatus*: 1 adult male, Amazonas State, Igarapé Cachoeira, mouth at Rio Cuieiras, at light (sample A413), 23.IX.1962, slide mounted in Euparal, leg. E. J. Fittkau (ZSM).

Additional material examined (Brazil): 1 adult male as holotype; 2 adult males, Roraima State, Boa Vista, Lago Magalhães, 7.XII.1971, slide mounted in Euparal, leg. F. Reiss; 12 adult males as previous except 10.XII.1971.

**Diagnostic characters.** The male imago of *Tanytarsus* cf. *ligulatus* can be separated from other *Tanytarsus* species by the following combination of characters. Antennal ratio about 0.80; eyes with dorsomedian extension; very large frontal tubercles; wing veins Sc, M, Cu and Postcubitus bare, wing cells m, $m_{3+4}$, cu and an bare; tergite IX with one pair of median setae placed very close to anal point base, and with microtrichia-free area anterior to anal point; anal tergal bands T-type, "fused" on median part of tergite, ending more or less close to anal point base; anal point elongate and thin, somewhat spoon-like, apex slightly wider, microtrichia and spines absent; anal crests placed on the anal point apex, distal portion of the crests slightly serrated; the anal crests are smaller and the idea of a spoon-like apex is not so marked like in *T. ligulatus*; superior volsella somewhat triangular, heart-shaped, without microtrichia, posteromedian corner slightly projecting; longitudinal axes of superior volsella and body at angle of about 38°; digitus long and pointed, finger-like, extending well beyond margin of superior volsella; median volsella with quite fringed pectinate lamellae, not reaching apex of inferior volsella; inferior volsella somewhat curved and thin, distal part with rounded to somewhat quadrate swelling; gonostylus elongate, straight and thin; hypopygium ratio about 0.92.

**Description**

**Male Imago (n=5)**

**Head.** AR 0.80-0.84. Antennal flagellomeres one to twelve 416-442 µm long, thirteen 336-360 µm long, total length 752-802 µm. Eyes with dorsomedian extension; frontal tubercles present, very large (length 36 µm), about 3.5 times as long as wide; 8 temporal setae; clypeus with 11-12

setae; lengths of palpal segments (in µm): 24-26, 26-30, 54-60, 61-81, 130-150, palp total length 304-346 µm.

**Thorax.** Length 623-681 µm. Scutal tubercle absent; 3-5 dorsocentrals, at least 5-6 acrostichals (difficult to see), 1 prealar, 2 scutellars. Halteres with at least 4 setae.

**Wing.** Wing length 1058-1109 µm, width 328-341 µm; L/WR 3.13-3.38. Brachiolum with 1 seta, Sc bare, R with 10-12 setae, $R_1$ with 11-12 setae, $R_{4+5}$ with 6-9 setae, M bare, $M_{1+2}$ with 9-17 setae, $M_{3+4}$ with 3-6 setae, Cu bare, $Cu_1$ with 1 seta, Postcubitus bare and An with 5-9 setae. Cell m bare (false vein bare), $r_{4+5}$ with 36-49 setae, $m_{1+2}$ with 24-27 setae (+ 3-9 setae on false vein), $m_{3+4}$ bare (one specimen presents 1 seta on one of the wings), cu and an bare.

**Legs.** Foreleg bearing single tibial spur (20-22 µm). Lengths of combs of mid tibia 10-11 µm (with 18-20 µm long spur) and 11-12 µm (with 24-25 µm long spur); lengths of combs of hind tibia 11-12 µm (with 20-21 µm spur) and 15-16 µm (with 30-32 µm long spur).

Lengths of segments (in µm):

| | fe | ti | $ta_1$ | $ta_2$ | $ta_3$ | $ta_4$ | $ta_5$ | Total length |
|---|---|---|---|---|---|---|---|---|
| $P_1$ | 458-490 | 217-230 | 600-700 | 270-348 | 230-279 | 170-210 | 80-88 | 2025-2335 |
| $P_2$ | 478-510 | 371-392 | 210-241 | 98-103 | 68-70 | 41-48 | 39-41 | 1305-1402 |
| $P_3$ | 526-540 | 464-491 | 339-368 | 187-220 | 179-190 | 110-120 | 60-61 | 1865-1989 |

Leg ratios:

| | LR | BV | SV |
|---|---|---|---|
| $P_1$ | 2.64-3.18 | 1.52-1.70 | 1.01-1.15 |
| $P_2$ | 0.56-0.61 | 4.22-4.41 | 3.74-4.13 |
| $P_3$ | 0.72-0.74 | 2.37-2.49 | 2.80-2.92 |

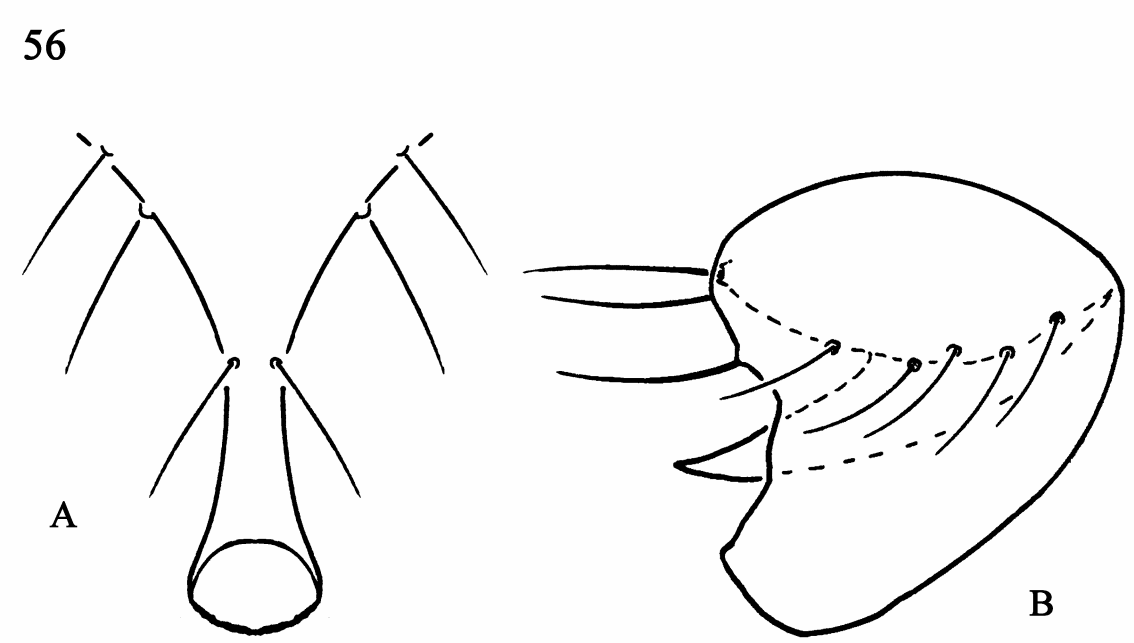
**Abdomen.** Length 1390-1530 µm.

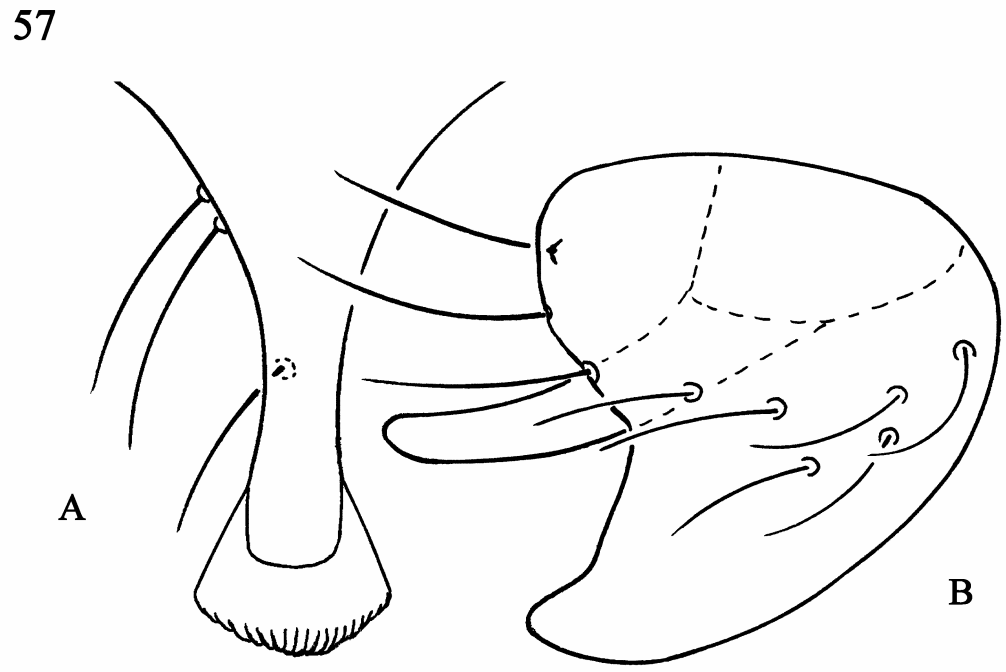
**Hypopygium (Fig. 56 A-B).** Tergite IX 86-89 µm long, without lateral tooth, with microtrichia-free area posteriorly, and with one pair of median setae placed very close to anal point base plus 8 apical setae. Orolateral spine of laterosternite IX difficult to see (probably absent). Anal tergal bands T-type, "fused" on median part of tergite, ending more or less close to anal point base. Anal point 26-28 µm long, elongate and thin, microtrichia and spines absent, apex slightly wider and more or less spoon-like; the distal portion of the "spoon" is slightly serrated. Small, spoon-like anal crests are placed on apex and give the "spoon" appearance, but here the anal crests are

smaller and the idea of a spoon-like apex is not so marked like in *T. ligulatus*. Superior volsella somewhat triangular, heart-shaped, without microtrichia; anterior portion wider, posteromedian corner slightly projecting, median margin concave; 5 setae on dorsal surface, 2 setae on median margin (one dorsal and one ventral) and 1 seta on ventral tubercle, close to anterior margin. Longitudinal axes of superior volsella and body at angle of 38-40°. Digitus long and pointed, finger-like, extending beyond margin of superior volsella. Median volsella 15-18 µm long with 14-18 µm long simple setae and 12-14 µm long, quite fringed, pectinate lamellae, not reaching apex of inferior volsella. Inferior volsella 53-57 µm long, somewhat curved and thin, distal part (area carrying setae) with rounded to somewhat quadrate swelling. Gonocoxite length 78-82 µm; gonostylus 85-88 µm, elongate, straight and somewhat thin; hypopygium ratio (HR) 0.91-0.93.

**Discussion and distribution**

In the original work of Tanytarsini from southern Chile and western Patagonia, Reiss (1972) described one species, *Tanytarsus ligulatus*, collected by E. J. Fittkau between 1961 and 1962 in central and northeastern areas in the Amazon basin (Brazil). Further material from Fittkau's samples (1960-1963, 1965) and also specimens collected by Reiss in 1971 (Lake Magalhães, Roraima State) were included and deposited at Zoologische Staatssammlung München as *Tanytarsus ligulatus*. After reviewing all the material of *T. ligulatus*, I noticed that one adult male paratype (sample A413, leg. E. J. Fittkau) and the male specimens collected by Reiss from Lake Magalhães are somewhat different from those designed as *T. ligulatus*. The paratype and the specimens from Lake Magalhães, here described as "*Tanytarsus* cf. *ligulatus*", are smaller, some proportions are different, such as lower AR (about 0.82; in *T. ligulatus* about 1.16), the wings present fewer setae on veins and cells, the anal crests on the anal point of are smaller so that the idea of a spoon-like apex is not so marked as in *T. ligulatus* (Figs 56 A and 57 A, respectively), the digitus (Fig. 56 B) is more pointed, finger-like (thumb-like in *T. ligulatus*, Fig. 57 B) and the inferior volsella is thinner and somewhat curved (thick and straight in *T. ligulatus*). I am not sure if such differences are sufficient to delimit species, although I consider antennal ratio and wing setation to be good features to separate species. The smaller anal crests could also be a good diagnostic character to separate these specimens from *T. ligulatus*. A phylogenetic analysis is necessary to elucidate if *Tanytarsus* cf. *ligulatus* should be placed in *Tanytarsus ligulatus* or should be considered a new species.




**Figs 56-57. Differences between two similar specimens of *Tanytarsus*, adult males. 56. *Tanytarsus cf. ligulatus*. A: Anal point, dorsal view. B: Superior volsella and digitus. 57. *Tanytarsus ligulatus* Reiss. A: Anal point, dorsal view. B: Superior volsella and digitus.**

### *Tanytarsus paraligulatus* Reiss, 1972

(Fig. 58)

Type material. Holotype [not examined]: 1 adult male, South Chile, Villarrica, Lago Villarrica, 19.II.1954, slide mounted in Euparal, leg. L. Brundin (NHRS). Paratypes [examined]: 5 adult males as holotype; 1 adult male, Chile, Província Valparaíso, Rio Maga-Marga, 4.XI.1963, slide mounted in Euparal, leg. Edmunds; 2 adult males, South Chile, Los Lagos, Lago Riñihue, 9.II.1990, slides mounted in Euparal, Leg. H. Campos (all ZSM).

**Diagnostic characters.** The male imago of *Tanytarsus paraligulatus* can be separated from other *Tanytarsus* species by the following combination of characters. Antennal ratio about 1.15; eyes with dorsomedian extension; very large frontal tubercles; wing veins Sc, M, Cu and Postcubitus bare; wing cells m, cu and an bare; tergite IX with one pair of median setae placed very close to anal point base, and with microtrichia-free area anterior to anal point; anal tergal bands T-type, "fused" on median part of tergite, ending more or less close to anal point base; anal point elongate and thin, more or less spoon-like, apex slightly wider, microtrichia and spines absent; anal crests placed on the anal point apex, distal portion of the crests slightly toothed; here the anal crests are smaller and the idea of a spoon-like apex is not so marked like in *T. ligulatus*, but more than in *T.* cf. *ligulatus*; superior volsella triangular, without microtrichia, median margin straight, posteromedian corner not projecting; longitudinal axes of superior volsella and body at angle of about 31°; digitus long and pointed, finger-like, extending well beyond margin of superior volsella; median volsella with quite fringed pectinate lamellae, not reaching apex of inferior volsella; inferior volsella somewhat straight, distal part (area carrying setae) with rounded to triangular swelling; gonostylus elongate, thick and curved; hypopygium ratio about 0.86.

**Description**

**Male Imago (n=4)**

**Head.** AR 1.10-1.18. Antennal flagellomeres one to twelve 497-508 µm long, thirteen 550-570 µm long, total length 1050-1068 µm. Eyes with dorsomedian extension; frontal tubercles present, very large (length 60-68 µm), about four times as long as wide; 10-11 temporal setae;

clypeus with 25-26 setae; lengths of palpal segments (in µm): 32-36, 44-45, 111-115, 124-134, 214-218, palp total length 533-546 µm.

**Thorax.** Length 1045-1078 µm. Scutal tubercle absent; 8-10 dorsocentrals, 12-18 acrostichals, 1 prealar, 6 scutellars. Halteres with at least 4-5 setae.

**Wing.** Wing length 1970-2040 µm, width 590-600 µm; L/WR 3.33-3.40. Brachiolum with 1 seta, Sc bare, R with 20-22 setae, $R_1$ with 18-22 setae, $R_{4+5}$ with 22-25 setae, M bare, $M_{1+2}$ with 38-42 setae, $M_{3+4}$ with 20-23 setae, Cu bare, $Cu_1$ with 11-13 setae, Postcubitus bare and An with 21-29 setae. Cell m bare (false vein bare), $r_{4+5}$ with about 120-140 setae, $m_{1+2}$ with 95-about 120 setae (+ 18-23 setae on false vein), $m_{3+4}$ with 8-20 setae, cu and an bare.

**Legs.** Foreleg bearing single tibial spur (32-38 µm). Lengths of combs of mid tibia 16-18 µm (with 21-26 µm long spur) and 17-19 µm (with 23-30 µm long spur); lengths of combs of hind tibia 17-19 µm (with 24-30 µm spur) and 18-20 µm (with 31-35 µm long spur).

Lengths of segments (in µm):

| | fe | ti | $ta_1$ | $ta_2$ | $ta_3$ | $ta_4$ | $ta_5$ | Total |
|---|---|---|---|---|---|---|---|---|
| $P_1$ | 798-810 | 451-460 | 967-995 | 458-470 | 400-420 | 276-280 | 132-138 | 3482-3553 |
| $P_2$ | 832-869 | 690-700 | 370-381 | 194-205 | 140-150 | 98-100 | 72-76 | 2399-2480 |
| $P_3$ | 928-952 | 940-950 | 603-628 | 370-371 | 325-334 | 200-208 | 114-122 | 3492-3564 |

Leg ratios:

| | LR | BV | SV |
|---|---|---|---|
| $P_1$ | 2.13-2.16 | 1.71-1.77 | 1.27-1.29 |
| $P_2$ | 0.53-0.54 | 3.66-3.75 | 4.09-4.12 |
| $P_3$ | 0.64-0.66 | 2.42-2.46 | 3.02-3.10 |

**Abdomen.** Length about 2460 µm.

**Hypopygium (Fig. 58 A-D).** Tergite IX 130-142 µm long, without lateral tooth, with microtrichia-free area anterior to anal point base, and with one pair of median setae placed very close to anal point base plus 12 apical setae. Orolateral spine of laterosternite IX difficult to see (probably absent). Anal tergal bands T-type, "fused" on median part of tergite, ending more or less close to anal point base. Anal point 32-41 µm long, elongate and thin, microtrichia and spines absent, apex slightly wider and more or less spoon-like; the distal portion of the "spoon" is slightly toothed. The "spoon" appearance is given by spoon-like anal crests (a pair of anal

crests, according to Reiss 1972) placed on apex, but here is not so marked as in *T. ligulatus*. Superior volsella triangular, without microtrichia; anterior margin curved, lateral and posterior margins curved, median margin somewhat straight; 7 setae on dorsal surface, 2 setae on median margin (one dorsal and one ventral), and one seta on ventral surface. Longitudinal axes of superior volsella and body at angle of 30-32°. Digitus long pointed, and finger-like, extending well beyond margin of superior volsella. Median volsella 22-25 µm long with 25-32 µm long simple setae and 22-24 µm long, quite fringed, pectinate lamellae, not reaching apex of inferior volsella. Inferior volsella 92-94 µm long, somewhat straight, distal part (area carrying setae) with rounded to triangular swelling. Gonocoxite length 120-130 µm; gonostylus 140-148 µm, elongate, thick and curved; hypopygium ratio (HR) 0.85-0.87.

**Discussion and distribution**

*Tanytarsus paraligulatus* is recorded from southern Chile and is closest related to the Brazilian *Tanytarsus ligulatus* and *Tanytarsus* cf. *ligulatus* (Figs 58, 54 and 56, respectively), differing from the latter ones in having larger frontal tubercles (the three species present very large frontal tubercles, but in *T. paraligulatus* they are even larger) and more clypeals (about 25; in *T. ligulatus* and *T.* cf. *ligulatus* about 16 and 12, respectively), as well as in having a more triangular superior volsella with straight median margin (heart-shaped in *T. ligulatus* and *T.* cf. *ligulatus*). The anal crests of *T. paraligulatus* are smaller than those of *T. ligulatus*, but more developed than the crests of *T.* cf. *ligulatus* (consequently the idea of spoon-like anal point apex is not so marked as in *T. ligulatus*, but more marked than in *T.* cf. *ligulatus*). Furthermore, *T. paraligulatus* and *T.* cf. *ligulatus* have a finger-like digitus, while *T. ligulatus* has a thumb-like one and the wings of *T. paraligulatus* and *T. ligulatus* present more setae than those of *T.* cf. *ligulatus*. The pupa and larva of *T. paraligulatus* are unknown.

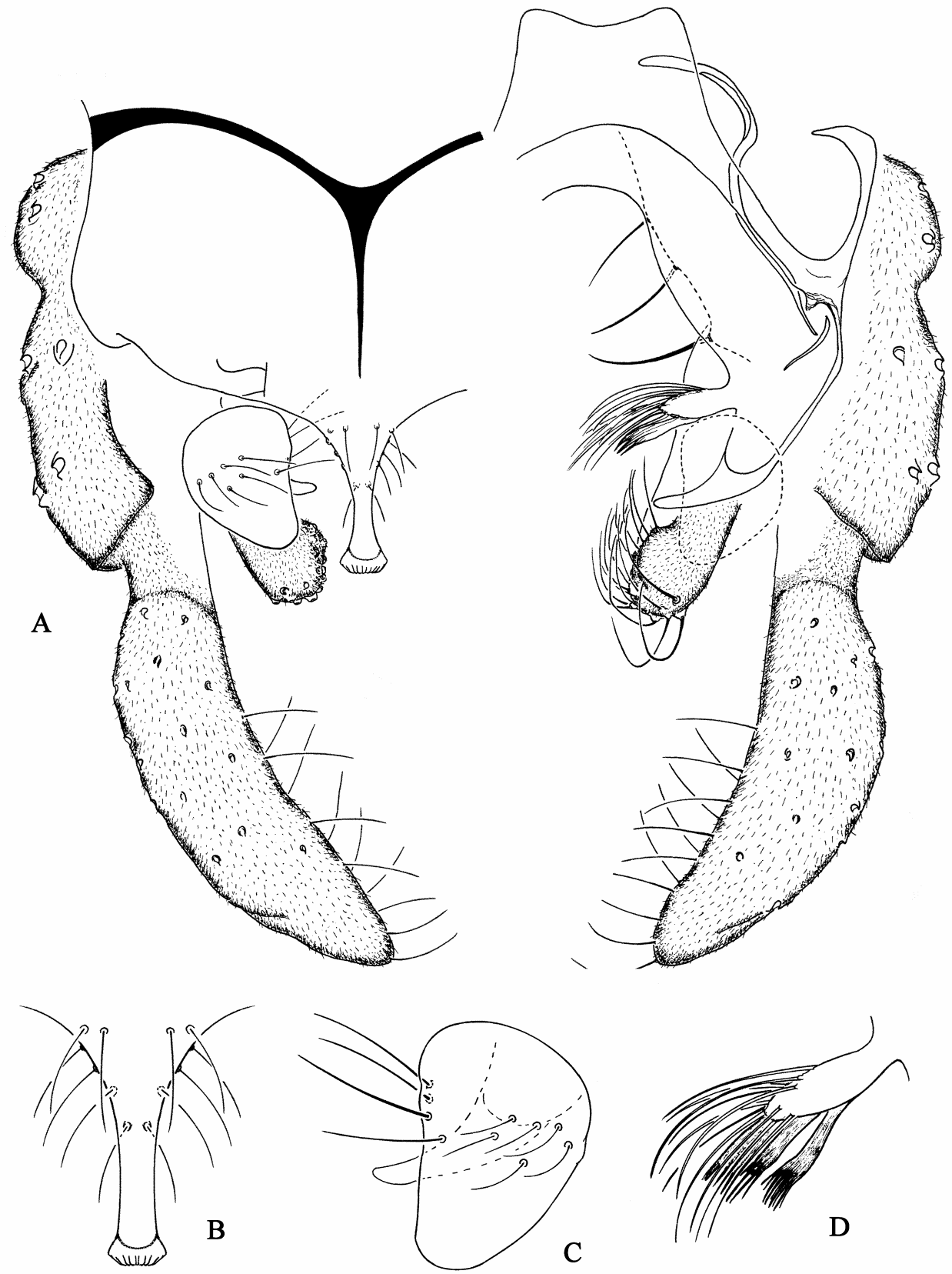



**Fig. 58.** ***Tanytarsus paraligulatus*** **Reiss, adult male. A: Hypopygium, dorsal view. B: Anal point, dorsal view. C: Superior volsella and digitus. D: Median volsella.**

### *Tanytarsus fastigatus* Reiss, 1972

(Figs 59-60)

Type material. Holotype [not examined]: 1 adult male, South Chile, Chiloé Island, south of Castro, Lago Tarahuin, collected in marginal vegetation using a hand-net, 23.XI.1969, slide mounted in Euparal, leg. F. Reiss (NHRS). Paratypes [examined]: 1 adult male as holotype (ZSM); 1 adult male, South Chile, Lago Riñihue, hand-net, 6.XI.1969, slide mounted in Euparal, leg. F. Reiss; 2 pupal exuviae as previous; 3 adult males, South Chile, 15 km NE of Valdívia, Rio Callumapu, margin, 7.XI.1969, slides mounted in Euparal, leg. F. Reiss; 2 pupal exuviae, South Chile, Valdívia, Rio Cruces, 11.XI.1969, slides mounted in Euparal, leg. F. Reiss; 1 adult male, South Chile, Peulla, Lago Todos los Santos, margin, 5.XII.1969, slide mounted in Euparal, leg. F. Reiss; 2 adult males, Argentina, Bariloche, Laguna Trebol (a shallow lagoon, water surface temperature 28° C), 17.XII.1969, slides mounted in Euparal, leg. F. Reiss; 3 pupal exuviae as previous; 1 pharate male, South Chile, Magallanes, Paine-region, Lago Pehue, drift, 17.II.1954, slide mounted in Euparal, leg. L. Brundin (all paratypes at ZSM).
Additional material examined: 2 pupal exuviae, South Chile, Peulla, Lago Todos los Santos, drift, 5.XII.1969, slide mounted in Euparal, leg. F. Reiss (ZSM).

**Diagnostic characters.** *Tanytarsus fastigatus* can be separated from other *Tanytarsus* species by the following combination of characters.

**Male Imago:** Antennal ratio about 0.85; eyes with dorsomedian extension; medium-sized frontal tubercles; wing veins Sc and M bare; tergite IX without setae, with microtrichia-free area posteriorly; anal tergal bands short, curved, ending almost in contact or in contact on the middle of tergite (not running parallel and ending well anterior to anal point base); anal point elongate and thin, pointed at tip, with about 10 setae, anal crests, spines and microtrichia absent; superior volsella quadrate, without microtrichia, median margin straight, posteromedian corner not projecting; longitudinal axes of superior volsella and body at angle of about 48°; digitus long and thumb-like, extending beyond margin of superior volsella; median volsella with foliate lamellae, not reaching apex of inferior volsella. Inferior volsella thin and straight, distal part (area carrying setae) with triangular swelling; gonostylus elongate, somewhat thick and straight; hypopygium ratio about 0.98.

**Pupa:** Frontal apotome with fine granulation; frontal setae thin, cephalic tubercles weakly developed; pedicel sheath tubercle well developed; thoracic horn thin, with more or less elongate, fine spines along most of length; wing sheath with well-developed nose; prealar tubercle weakly protuberant, wrinkles present on this area, in some exuviae slightly rounded;

three precorneals in a more or less triangular pattern, placed on a rounded tubercle, $Pc_2$ and $Pc_3$ close to each other; 1 median antepronotal seta and 2 lateral antepronotals; 2 pairs of dorsocentrals, each pair with 1 thin and 1 strong seta; hook row about 1/3 width of abdominal segment II; Pedes Spurii B present on segment II; tergites I and VII without armament; tergite II with median field of fine spinules; tergites III and IV with anterior pair of short bands of long and short spines in addition to median and lateral field of spinules; tergite V with anterior pair of oval/elongate patches of short and long spines in addition to median and lateral field of spinules patches ( in some exuviae, patches on T III-V without long spines); tergite VI with anterior pair of oval/elongate patches of short spines and anteromedian and anterolateral field of spinules; tergite VIII with fine anterolateral shagreen; tergite IX with anterior shagreen, in some exuviae interrupted on median part; posterolateral comb of segment VIII with 2-4 strong teeth posteriorly and 9-17 smaller one; abdominal segment I without lateral seta; segments II-IV with 3 lateral setae, segments V-VI with 3 lateral taeniae, segment VII with 4 lateral taeniae, segment VIII with 5 lateral taeniae; segment VIII with 2 dorsal taeniae, the more anterior stronger, and 1 ventral taenia; anal lobe well developed, with complete fringe of about 26 taeniae in single row.

**Description**

**Male Imago (n=5)**

**Head.** AR 0.77-0.92. Antennal flagellomeres one to twelve 400-492, thirteen 370-418 µm long, total length 770-910 µm. Eyes with dorsomedian extension; medium-sized frontal tubercles (length 12-15 µm), about 2.5 times as long as wide; 9 temporal setae; clypeus with 9-11 setae; lengths of palpal segments (in µm): 23-28, 33-34, 102-105, 94-110, 131-152, palp total length 383-429 µm.

**Thorax.** Length 724-798 µm. Scutal tubercle absent; 7-9 dorsocentrals, 10-12 acrostichals, 1 prealar, 4 scutellars. Halteres with 4-5 setae.

**Wing.** Wing length 1364-1682 µm, width 386-460 µm; L/WR 3.53-3.56. Brachiolum with 1 seta, Sc bare, R with 22-25 setae, $R_1$ with 17-28 setae, $R_{4+5}$ with 35-54 setae, M bare, $M_{1+2}$ with 39-65 setae, $M_{3+4}$ with 28-35 setae, Cu with 17-21 setae, $Cu_1$ with 16-24 setae, Postcubitus with 46-53 setae and An with 25-40 setae. Cell m with 9-11 setae (+ 16-33 setae on false vein), $r_{4+5}$ with about 130-170 setae, $m_{1+2}$ with about 110-150 setae (+ 53-57 setae on false vein), $m_{3+4}$ with 57-87 setae, cu with 39-68 setae and an with 42-75 setae.

**Legs.** Foreleg bearing single tibial spur (21-22 µm). Lengths of combs of mid tibia 12-14 µm (with 20-23 µm long spur) and 13-15 µm (with 24-29 µm long spur); lengths of combs of hind tibia 12-14 µm (with 26-30 µm spur) and 14-16 µm (with 27-36 µm long spur).

Lengths of segments (in µm):

| | fe | ti | $ta_1$ | $ta_2$ | $ta_3$ | $ta_4$ | $ta_5$ | Total length |
|---|---|---|---|---|---|---|---|---|
| $P_1$ | 610-690 | 327-376 | 639-752 | 360-430 | 288-339 | 220-249 | 100-118 | 2544-2954 |
| $P_2$ | 618-698 | 507-553 | 260-300 | 153-170 | 109-122 | 78-82 | 60-70 | 1785-1995 |
| $P_3$ | 670-758 | 650-718 | 390-471 | 244-292 | 217-273 | 148-179 | 82-97 | 2401-2788 |

Leg ratios:

| | LR | BV | SV |
|---|---|---|---|
| $P_1$ | 1.95-2.00 | 1.60-1.62 | 1.41-1.46 |
| $P_2$ | 0.51-0.54 | 3.49-3.51 | 4.17-4.32 |
| $P_3$ | 0.60-0.65 | 2.31-2.47 | 3.13-3.38 |

**Abdomen.** Length 1830-2070 µm.

**Hypopygium (Fig. 59 A-C).** Tergite IX 86-98 µm long, without lateral tooth, with microtrichia-free area posteriorly; median and apical setae absent. Orolateral spine of laterosternite IX difficult to see (probably absent). Anal tergal bands short, slightly curved, ending almost in contact (in some specimens ending in contact) on the middle of tergite (not running parallel and ending well anterior to anal point base). Anal point 48-49 µm long, elongate and thin, pointed at tip, with 10 setae; anal crests, spines and microtrichia absent. Superior volsella quadrate, without microtrichia; anterior, posterior and median margins somewhat straight, lateral margin more or less curved; 5 setae on dorsal surface, 3 setae on median margin (all ventral, two of them close to anterior margin), and 1 seta on ventral tubercle. Longitudinal axes of superior volsella and body at angle of 47-50°. Digitus long and thumb-like, extending beyond margin of superior volsella. Median volsella 13-15 µm long with 17-20 µm long simple setae and 15-18 µm long foliate lamellae, not reaching apex of inferior volsella. Inferior volsella 68-70 µm long, thin and straight, distal part (area carrying setae) with triangular swelling. Gonocoxite length 86-94 µm; gonostylus 87-96 µm, elongate, somewhat thick and straight; hypopygium ratio (HR) 0.97-0.98.

**Pupa (n=5)**

Total length 2.95-3.47 mm. Pupal exuviae pale brown, with darker areas on thorax, lateral muscle marks and around spine patches.

**Cephalothorax (Fig. 60 A-C).** Frontal apotome with fine granulation. Frontal setae thin, 84-100 µm long, mounted apical on weakly developed cephalic tubercles (2-4 µm long); frontal warts absent. Pedicel sheath tubercle well developed. Thorax smooth, 778-890 µm long, with few small teeth along median suture. Wing sheath with well-developed nose; prealar tubercle weakly protuberant, wrinkles present on this area, in some exuviae slightly rounded. Thoracic horn thin, 192-216 µm long, with more or less elongate, fine spines along most of length. Three precorneals (92-104 µm, 167-186 µm and 154-171 µm long) in a more or less triangular pattern, placed on a rounded tubercle, $Pc_2$ and $Pc_3$ close to each other; 1 median antepronotal seta (102-120 µm long) and 2 lateral antepronotals (22-40 µm and 106-118 µm long); 2 pairs of dorsocentrals, each pair with 1 thin and 1 strong seta, anterior pair 33-44 µm (thick) and 76-92 µm (thin), posterior pair 32-46 µm (thick) and 59-72 µm (thin).

**Abdomen (Fig. 60 D-E).** Length 2180-2594 µm. Tergites I and VII without armament. T II with median field of fine spinules. T III and T IV with anterior pair of short bands of short and long spines in addition to median and lateral field of spinules; T V with anterior pair of oval/elongate patches of short and long spines in addition to median and lateral field of spinules patches (bands/ patches on T III-V without long spines in some exuviae, probably broken); T VI with anterior pair of oval/elongate patches of short spines and anteromedian and anterolateral field of spinules. T VIII with fine anterolateral shagreen. T IX with anterior shagreen, in some exuviae interrupted on median part. Sternite I with median field of fine shagreen. S II-III and VIII with very fine shagreen laterally. S IV-VII and IX without armament. Conjunctives and pleura unarmed. Hook row 158-176 µm long, about 1/3 width of segment II. Pedes Spurii B present on segment II. Posterolateral comb of segment VIII 25-31 µm wide, with 2-4 strong teeth posteriorly and 9-17 smaller one. Abdominal setation: segment I with 3 D, 0 L and 0 V; segment II with 4 D, 3 L and 2 V; segments III-IV with 5 D, 3 L and 4 V; segments V-VI with 5 D, 3 lateral taeniae and 4 V; segment VII with 5 D, 4 lateral taeniae and 4 V; segment VIII with 2 dorsal taeniae, the more anterior stronger, 5 lateral taeniae and 1 ventral taenia; anal lobe well developed, with complete fringe of 22-30 taeniae in single row and two pairs of dorsal taeniae. T II-VIII with O-setae.

## Discussion

*Tanytarsus fastigatus* does not seem to have any closely related species among the described Neotropical *Tanytarsus* species. The combination of absence of setae (median and apical) on the anal tergite and presence of setae on the anal point has only been registered for this species (Fig. 59 A) in the Neotropics so far. Such features can be found in the Holarctic *Tanytarsus recurvatus* species group (Reiss & Fittkau 1971; Cranston *et al.* 1989): *Tanytarsus glabrescens* Edwards, 1929, *Tanytarsus quadridentatus* Brundin, 1947 and *Tanytarsus recurvatus* Brundin, 1947 do not possess setae on tergite IX and present setae on the anal point, and the general hypopygium design of these species resembles that of *T. fastigatus*. The species of the *recurvatus* group present a quadrate superior volsella and a thumb-like digitus similar to *T. fastigatus* (Fig. 59 B), but they differ from *T. fastigatus* in having separate anal tergal bands, not ending together on middle of tergite, and pectinate lamellae on median volsella (foliate in *T. fastigatus*, Fig. 59 C).

Paggi (1992) described *Tanytarsus reissi* and considered the species to be closely related to *Tanytarsus fastigatus* because of the absence of spines and anal crests on the anal point, but in fact both species present remarkable differences to be regarded as sisters (see more comments under the *Tanytarsus reissi* discussion).

## Distribution and ecological notes

Reiss (1972) mentioned that *Tanytarsus fastigatus* inhabits standing waters, occurring in lakes and ponds in southern Chile and Patagonia, as well as in lentic, marginal areas of large rivers. The author reported the noticeable mass-appearance of *T. fastigatus* in the very cold, glacial Lake Nordenskjöld at the base of Cerro Paine (South Patagonia), where *T. fastigatus* together with an unknown chironomid species (Tanypodinae) was the most frequent species of Chironomidae.

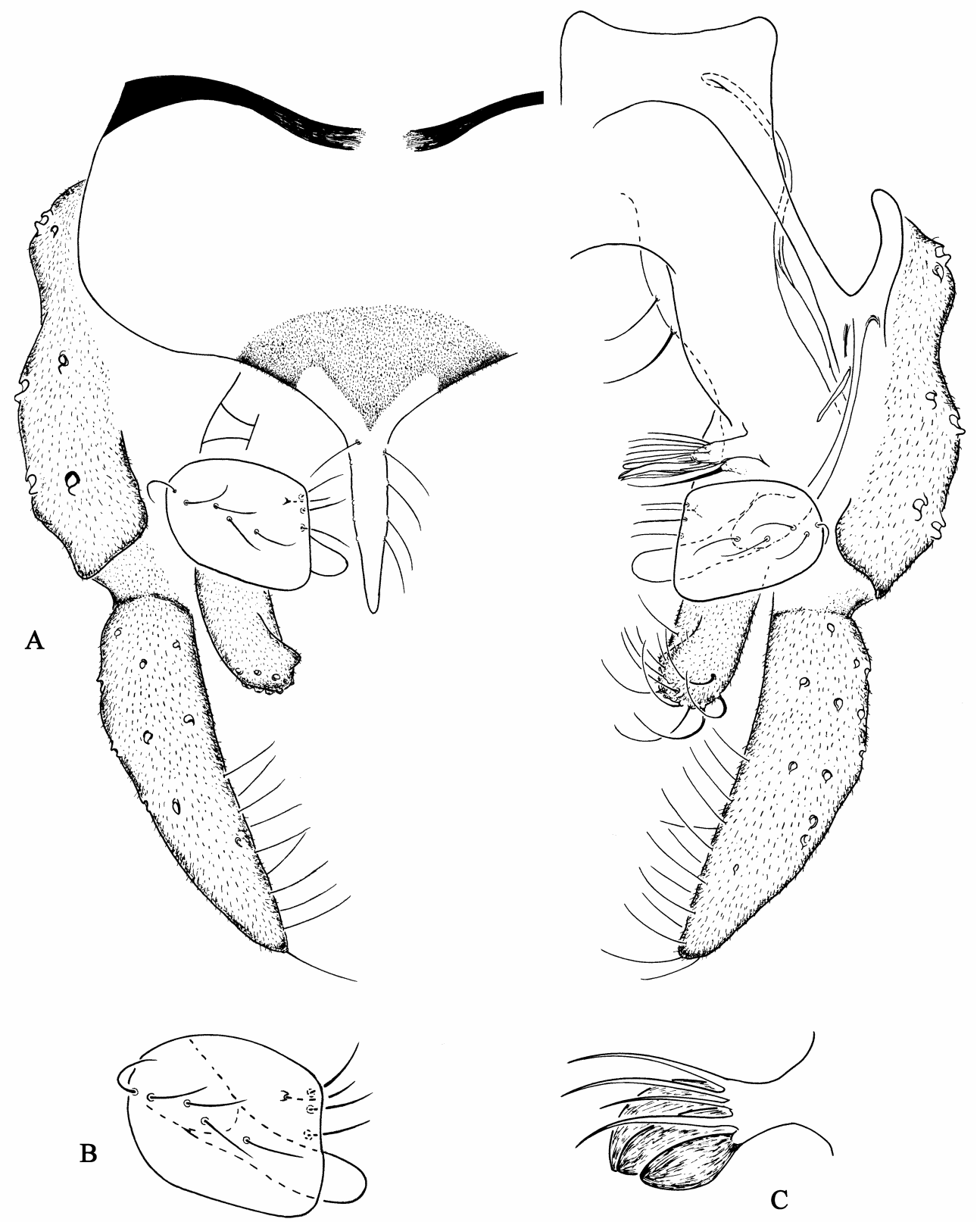



**Fig. 59.** ***Tanytarsus fastigatus*** **Reiss, adult male. A: Hypopygium, dorsal view. B: Superior volsella and digitus. C: Median volsella.**

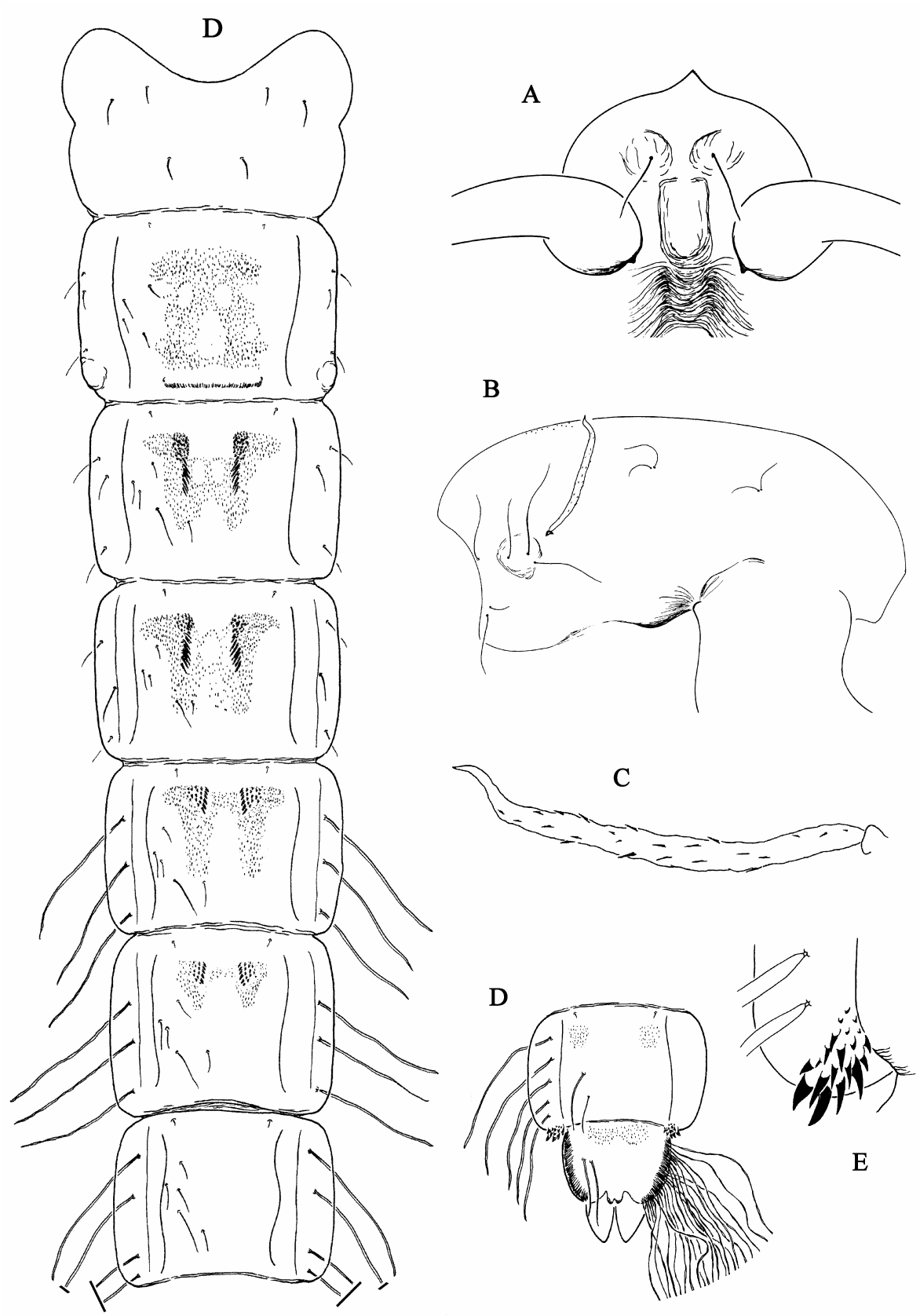



**Fig. 60.** ***Tanytarsus fastigatus*** **Reiss, pupa. A: Frontal apotome. B: Thorax. C: Thoracic horn. D: Abdomen, dorsal view. E: Posterolateral comb of abdominal segment VIII.**

### *Tanytarsus reissi* Paggi, 1992

(Fig. 61)

Type material (Argentina). Holotype [not examined]: 1 adult male, Province of Rio Negro, Lago Pellegrini, 20.III.1978, slide mounted in Canada Balsam, Coscaron col. (MCNLP). Paratypes: 9 adult males [1 examined] as holotype, deposited at the Instituto de Limnologia "Dr. Raúl A. Ringuelet".

**Diagnostic characters.** The male imago of *Tanytarsus reissi* can be separated from other *Tanytarsus* species by the following combination of characters. Antennal ratio about 1.22; eyes with dorsomedian extension; medium-sized frontal tubercles; wings with many setae, wing vein M and all other veins with setae, Sc bare, all wing cells (except r, "sc" and "cell between $R_1$ and $R_{4+5}$") with many setae; tergite IX without microtrichia-free areas; anal tergal bands separate, curved, ending parallel on middle of tergite well anterior to anal point base; anal point elongate and pointed/triangular at tip; anal point with field of microtrichia, spines as well as anal crests absent; superior volsella pear-shaped, elongate, without microtrichia, median margin straight to slightly convex, posteromedian corner slightly projecting; longitudinal axes of superior volsella and body at angle of about 22°; digitus short and rounded, not reaching median margin of superior volsella; median volsella with slightly subulate lamellae, not reaching apex of inferior volsella; inferior volsella large and straight, distal part (area carrying setae) with rounded swelling; gonostylus large and straight; hypopygium ratio 0.76.

**Description**

**Male Imago (n=1)**

**Head.** AR 1.15 (Paggi: AR mean= 1.22, range 1.12-1.31). Antennal flagellomeres one to twelve 460 µm long, thirteen 532 µm long, total length 992 µm. Eyes with dorsomedian extension; medium-sized frontal tubercles (length 13 µm), about 2-2.5 times as long as wide; 11 temporal setae; clypeus with 17 setae; palpal segments missing.

**Thorax.** Length 1000 µm. Scutal tubercle absent; 9 dorsocentrals, 15 acrostichals, 1 prealar, 5 scutellars. Halteres with 6 setae.

**Wing.** Wing length 1840 µm, width 520 µm; L/WR 3.53. Brachiolum with 1 seta, Sc bare, R with 38 setae, $R_1$ with 52 setae, $R_{4+5}$ with 63 setae, M with 14 setae, $M_{1+2}$ with 82 setae, $M_{3+4}$

with 58 setae, Cu with 32 setae, $Cu_1$ with 28 setae, Postcubitus with 31 setae and An with 47 setae. Cell m with 32 setae (+ 24 setae on false vein), $r_{4+5}$ with more than 200 setae, $m_{1+2}$ with more than 150 setae (+ 50 setae on false vein), $m_{3+4}$ with 90 setae, cu with 54 setae and an with 73 setae.

**Legs.** Foreleg bearing single tibial spur (30 µm). Lengths of combs of mid tibia 15 µm (with 25 µm long spur) and 15 µm (with 31 µm long spur); lengths of combs of hind tibiae 15 µm (with 25 µm spur) and 17 µm (with 38 µm long spur).

Lengths of segments (in µm):

| | fe | ti | $ta_1$ | $ta_2$ | $ta_3$ | $ta_4$ | $ta_5$ | Total length |
|---|---|---|---|---|---|---|---|---|
| $P_1$ | 800 | 452 | 1064 | 517 | 430 | 340 | 148 | 3751 |
| $P_2$ | 840 | 710 | 400 | 242 | 193 | 141 | 90 | 2616 |
| $P_3$ | 960 | 900 | 602 | 324 | - | - | - | - |

Leg ratios:

| | LR | BV | SV |
|---|---|---|---|
| $P_1$ | 2.35 | 1.61 | 1.17 |
| $P_2$ | 0.56 | 2.92 | 3.87 |
| $P_3$ | 0.66 | - | 3.08 |

**Abdomen.** Length 1840 µm.

**Hypopygium (Fig. 61 A-C).** Tergite IX 155 µm long, with 4 median setae and 18 apical setae, without lateral tooth and without microtrichia-free area. Orolateral spine of laterosternite IX difficult to see (probably absent). Anal tergal bands separate, curved, ending parallel on middle of tergite well anterior to anal point base. Anal point 45 µm long, elongate and pointed/triangular at tip, with field of microtrichia on surface; spines as well as anal crests absent. Superior volsella pear-shaped, elongate, without microtrichia; anterior and lateral margins curved, posterior margin somewhat straight, median margin straight to slightly convex, posteromedian corner slightly projecting; 5 setae on dorsal surface, 2 setae on median margin and 1 seta on ventral surface close to anteromedian margin. Longitudinal axes of superior volsella and body at angle of 20-23°. Digitus short and rounded, not reaching median margin of superior volsella. Median volsella 15 µm long with 35-38 µm long simple setae and 35-37 µm long slightly subulate lamellae, not reaching apex of inferior volsella. Inferior volsella 110 µm long, thick and straight,

distal part (area carrying setae) with rounded swelling. Gonocoxite length 93 µm; gonostylus 122 µm, elongate, thick (large) and straight; hypopygium ratio (HR) 0.76.

**Discussion**

Paggi (1992) commented on the original description that *Tanytarsus reissi* would appear to be closely related to *Tanytarsus fastigatus* Reiss, 1972, because of the similar form of anal tergal bands and the absence of spines and anal crests on the anal point. In fact the anal tergal bands are slightly different, in *T. fastigatus* the bands end almost in contact in the middle of tergite (Fig. 59 A), while in *T. reissi* the bands end parallel (Fig. 61 A). Anal tergal bands with similar design can also be found in different species that are not closely related, and the same is observed in species with an anal point without spines and crests. Thus, it would be a mistake to consider that *T. reissi* and *T. fastigatus* are closely related, principally because both species present remarkable differences, some of them also pointed out by Paggi. *Tanytarsus reissi* differs from *T. fastigatus* in having higher AR (1.15 in *T. reissi*, 0.85 in *T. fastigatus*) and LR (2.35 in *T. reissi*, 1.98 in *T. fastigatus*), median setae on tergite IX (absent in *T. fastigatus*), microtrichia on the anal point (absent in *T. fastigatus*), shorter digitus (Fig. 61 B) (long, thumb-like digitus in *T. fastigatus*, Fig. 59 B), slightly-subulate lamellae (Fig. 61 C) on median volsella (foliate lamellae in *T. fastigatus*, Fig. 59 C), as well as the different form of superior volsella, inferior volsella and gonostylus.

**Distribution and ecological notes**

*Tanytarsus reissi* is recorded from the Patagonian Region, Argentina.

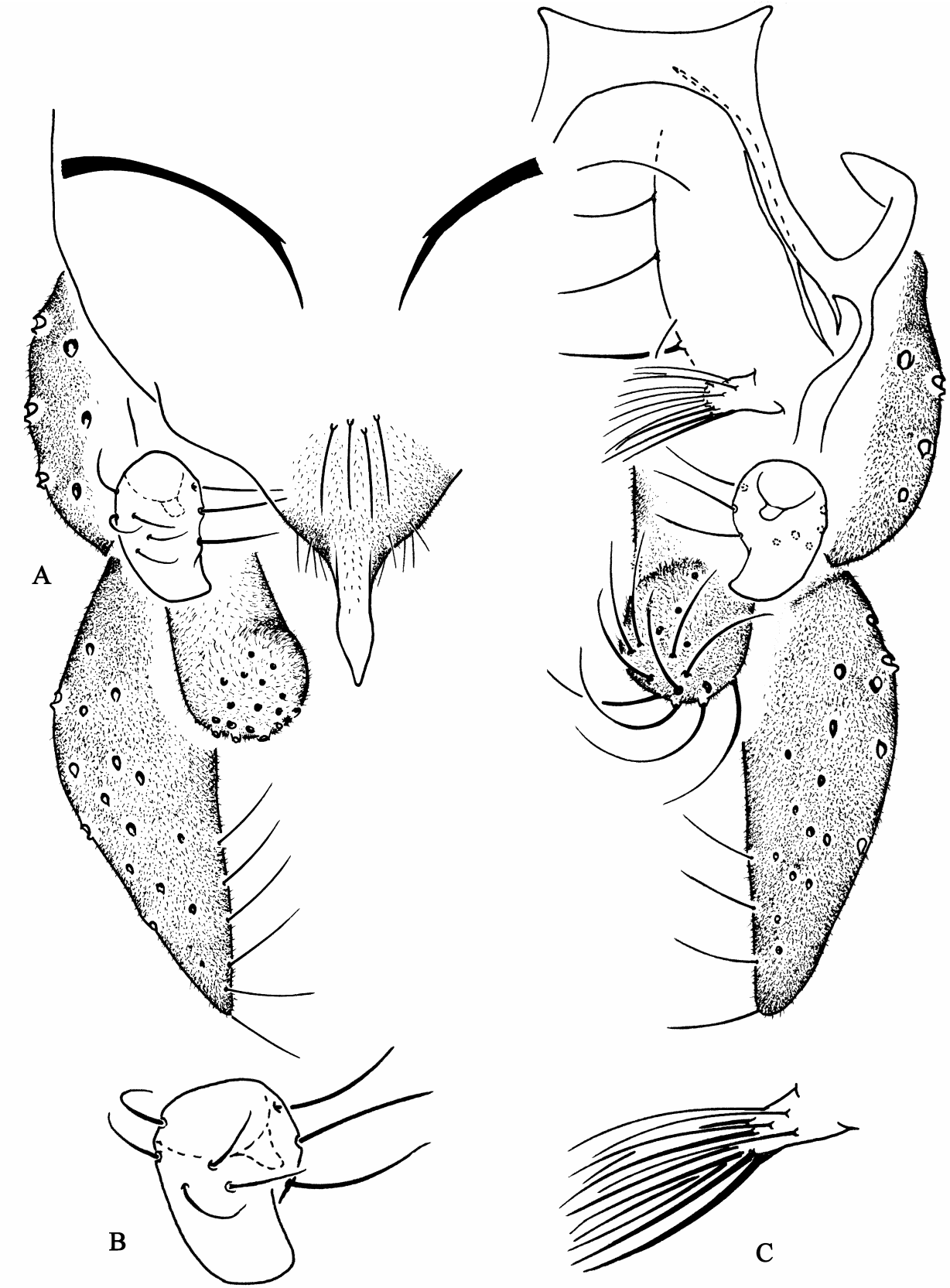



**Fig. 61.** ***Tanytarsus reissi*** **Paggi, adult male. A: Hypopygium, dorsal view. B: Superior volsella and digitus. C: Median volsella.**

### *Tanytarsus impar* Trivinho-Strixino & Strixino, 2004

Type material. Holotype [examined]: 1 adult male, Brazil, São Paulo, São Carlos, campus of Universidade Federal de São Carlos, riparian zone of Fazzari stream, 23.IX.1999, slide mounted in Euparal, leg. F. O. Roque. Paratypes [examined except female and larvae]: 3 adult males as holotype except 21.IX.1998; 2 adult females as holotype except 29.III.2001, leg. L. C. Correia; 1 adult female as holotype except 05.IX.1997; 1 pupa with pharate male as holotype except 29.III.2001, leg. L. C. Correia; 1 pupal exuviae as holotype except 05.IX.1997, leg. S. Trivinho-Strixino; 5 larvae as holotype except 05.IX.1997, leg. S. Trivinho-Strixino. Holotype and most paratypes deposited at UFSCar; 1 adult male at MZUSP; 1 adult male at ZSM.

Drawings of *Tanytarsus impar* adult male and pupa are given by Trivinho-Strixino & Strixino (2004). Detailed diagnoses of the adult male and pupa are presented here as well as some considerations on *T. impar*. A full description of male and pupa including measurements is given in Tables I-VIII.

**Diagnostic characters.** *Tanytarsus impar* can be separated from other *Tanytarsus* species by the following combination of characters.

**Male Imago:** Antennal ratio about 1.71; eyes with dorsomedian extension; frontal tubercles apparently absent; wings extensively covered with setae, veins Sc and M with setae; fore femur with middle and distal brown bands, mid and hind femur with proximal and distal brown bands; fore tibia with proximal and distal brown bands, mid and hind tibia with proximal band; tarsal segments with distal brown band; tergite IX with double lateral tooth, without microtrichia-free areas; median setae placed very close to anal point; anal tergal bands separate, curved and short, not reaching middle of tergite; anal point elongate and pointed at tip, anal crests, spines and microtrichia absent; superior volsella heart-shaped, with dorsal and lateral fields of microtrichia, median margin concave, posteromedian corner projecting; longitudinal axes of superior volsella and body at angle of about 31°; digitus thick, somewhat S-shaped, extending well beyond margin of superior volsella; median volsella with subulate lamellae, not reaching apex of inferior volsella; inferior volsella curved and thick, distal part clubbed; gonostylus elongate, curved and somewhat thin; hypopygium ratio about 0.88.

**Pupa:** Frontal apotome smooth; frontal setae thin, mounted apically on weakly developed cephalic tubercles; pair of large swellings present on area anterior to cephalic tubercles, probably frontal warts; pedicel sheath tubercle absent; wing sheath with weakly developed nose; prealar

tubercle well developed, triangular; thoracic horn smooth; three precorneals in a triangular pattern, placed on a tubercle, $Pc_1$ thicker and longer; 1 median and 2 lateral antepronotals (1 thick and long, 1 seta mark); 2 pairs of dorsocentrals, each pair with 1 seta thin and 1 thick; hook row about 2/3 width of abdominal segment II; Pedes Spurii B weakly developed on abdominal segment II; tergites I and VII without armament; T II with anterior field of fine spinules; T III-VI with anterior pair of oval to elongate patches of spines; T VIII with fine anterolateral shagreen; T IX anteriorly with fine and sparse shagreen; posterolateral comb of segment VIII with 6-7 stronger marginal teeth and 5-8 smaller one; abdominal segment I with 3 dorsal setae and without lateral and ventral setae; segment II-V with 3 lateral setae; segment VI with 3 lateral taeniae; segment VII with 4 lateral taeniae; segment VIII with 4 lateral taeniae, 1 dorsal seta, 1 ventral seta and 1 ventral taenia; anal fringe with about 78 taeniae.

### *Tanytarsus magnus* Trivinho-Strixino & Strixino, 2004

Type material. Holotype [examined]: 1 adult male, Brazil, São Paulo, São Carlos, campus of Universidade Federal de São Carlos, riparian zone of Fazzari stream, 05.IX.1997, slide mounted in Euparal, leg. F. O. Roque. Paratypes [examined except female and larvae]: 4 adult males as holotype; 2 adult females as holotype; 1 pupa with pharate male as holotype except 07.VII.1998, leg. S. Trivinho-Strixino; 1 female pupa as holotype except 07.VII.1998, leg. S. Trivinho-Strixino; 3 larvae as holotype except 07.VII.1998, leg. S. Trivinho-Strixino. Holotype and most paratypes deposited at UFSCar; 1 adult male at MZUSP; 1 adult male at ZSM (Germany).

Drawings of *Tanytarsus magnus* are given by Trivinho-Strixino & Strixino (2004). Full descriptions of male and pupa including measurements are given in Tables I-VIII. Detailed diagnoses of the adult male and pupa are presented here as well as some considerations on *T. magnus*.

**Diagnostic characters.** *Tanytarsus magnus* can be separated from other *Tanytarsus* species by the following combination of characters.

**Male Imago:** Antennal ratio about 1.44; eyes with dorsomedian extension; frontal tubercles apparently absent; high number of clypeals, wings extensively covered with setae, veins Sc and M with many setae (Sc with about 45 setae); leg segments with distal brown bands; tergite IX

with double lateral tooth, without microtrichia-free areas; median setae placed very close to anal point; anal tergal bands separate, curved and short, not reaching middle of tergite; anal point elongate and pointed at tip, anal crests, spines and microtrichia absent; superior volsella elongate and oval, without microtrichia, median margin concave, posteromedian corner projecting; digitus long and S-shaped, extending beyond margin of superior volsella; median volsella with subulate lamellae, not reaching apex of inferior volsella; inferior volsella curved and thick, distal part clubbed; gonostylus elongate, curved and somewhat thin; hypopygium ratio about 0.80.

**Pupa:** Frontal apotome smooth; frontal setae apparently absent; cephalic tubercles cone-shaped; pair of large swellings present on area anterior to cephalic tubercles, probably frontal warts; pedicel sheath tubercle absent; wing sheath with weakly developed nose; prealar tubercle well developed, triangular; thoracic horn smooth; three precorneals not in a triangular pattern, placed close to each other, $Pc_1$ thicker and longer; 1 median and 2 lateral antepronotals (1 seta mark); 2 pairs of dorsocentrals, each pair with 1 seta thin and 1 thick; hook row about 2/3 width of abdominal segment II; Pedes Spurii B weakly developed on abdominal segment II; tergites I and VII without armament; T II with anterior field of spinules, field larger in the middle of tergite; T III with anterior pair of oval patches of spines and anterolateral field of fine spinules; T IV-VI with anterior pair of oval patches of spines; T VIII with fine anterolateral shagreen; T IX with fine and sparse shagreen anteriorly; posterolateral comb of segment VIII with 4-6 stronger marginal teeth and 8-10 smaller one; abdominal segment I with 3 dorsal setae and without lateral and ventral setae; segment II-V with 3 lateral setae; segment VI with 3 lateral taeniae; segment VII with 4 lateral taeniae; segment VIII with 4 lateral taeniae, 1 dorsal seta, 1 ventral seta and 1 ventral taenia; anal fringe with about 78 taeniae.

**Discussion about *Tanytarsus impar* and *Tanytarsus magnus***

*Tanytarsus impar* and *Tanytarsus magnus* seem to be closely related. The adult males of both species share many similarities such as high antennal ratio, reduced frontal tubercles, wings extensively covered with setae (veins Sc and M with many setae), placement of median anal tergite setae close to anal point, form and extension of anal tergal bands, form and armament of anal point (elongate and pointed at tip, anal crests, microtrichia and spines absent), median volsella with subulate lamellae, similar design of median and inferior volsella and gonostylus. *Tanytarsus impar* differs from *T. magnus* in the pattern of brown bands on legs, the form of superior volsella (heart-shaped in *T. impar*, elongate and oval in *T. magnus*) and in the presence of microtrichia on the superior volsella (absent in *T. magnus*).

Like *Tanytarsus fastigatus* Reiss and *Tanytarsus reissi* Paggi, *T. impar* and *T. magnus* neither present spines nor crests on the anal point. Except for sharing an anal point without spines and crests, *T. impar* and *T. magnus* differ in all other aspects from *T. fastigatus* and *T. reissi.*

Pupae of *T. impar* and *T. magnus* are very similar and difficult to separate. Both species present one pair of large swellings on the area anterior to the cephalic tubercles, smooth thoracic horn, weakly developed wing nose, triangular prealar tubercle, similar abdominal armament and identical abdominal setation. *Tanytarsus impar* differs from *T. magnus* in having frontal seta (apparently absent in *T. magnus*) weakly developed/reduced frontal tubercles and by the placement of precorneal setae (in *T. impar* they form a triangular pattern, in *T. magnus* not arranged in pattern). Both species differ slightly in the armament of abdominal tergites II and III. In *T. magnus* the anterior field of spinules on T II is larger in the middle of tergite, and T III has an anterolateral field of fine spinules (absent in *T. impar*).

In the descriptions of *T. impar* and *T. magnus* (Trivinho-Strixino & Strixino 2004), the abdominal tergites VIII and IX do not present armament. However, after studying material of *T. impar* and *T. magnus*, both species have in fact a pair of anterolateral fields of fine spinules on tergite VIII and anterior field of fine, sparse spinules on tergite IX.

Wiedenbrug (2000) described a pupal exuviae morphotype under the name *Tanytarsus* spec. 16, which resembles the pupa of *T. magnus*. Both species are similar in having large pairs of swellings anterior to cephalic tubercles, a smooth thoracic horn, precorneals not arranged in a pattern, and similar anal comb design. The armament of abdominal tergites II-III is somewhat similar: the tergite II of *Tanytarsus magnus* shows a shagreen field only anteriorly, and this field is larger in the middle, while *T.* spec. 16 also only presents an anterior field of shagreen, but this field is interrupted in the middle of tergite, where it seems to show a paired spine patches; the tergite III of both species shows an anterior pair of oval patches of spines and anterolateral fields of shagreen. *Tanytarsus* spec. 16 can be separated from *T. magnus* by the presence of anterolateral fields of shagreen on tergites IV-VI, absence of armament on tergites VIII and IX, and number of lateral taeniae on segment VIII (5 lateral taeniae in *T.* spec. 16, 4 lateral taeniae in *T. magnus*).

**Distribution and ecological notes**

*Tanytarsus impar* and *Tanytarsus magnus* are recorded from São Paulo State (Southeast Brazil). According to Trivinho-Strixino & Strixino (2004), the immature stages of both species

were found in small temporary and semi-permanent pools, living on detritus bed. Larvae of *T. impar* and *T. magnus* construct robust cases of coarse detritus. Adult emergence of both species showed a seasonal pattern, following the regional climatic condition: higher densities occurred at the end of Dry season (September), while lower densities were observed during the Wet season (October-March) (Trivinho-Strixino & Strixino 2004).

### *Tanytarsus curvicristatus* Contreras-Lichtenberg, 1988

(Fig. 62)

Type material. Holotype [not examined]: 1 adult male, Colombia, Central Andes, south of Nevado del Ruiz, trout pound station "El Cederal", Rio Otún (2115 m a.s.l.), 25 km eastward of Pereira, 17.VI.1976, slide mounted in Euparal, leg. Lichtenberg (MNW). Paratypes: 7 adult males as holotype (MNW) [not examined]; 1 adult male as holotype (ZSM) [examined]; 1 adult male, as holotype (ICN) [not examined]. Further material examined: 1 adult male, Peru, Panguana, rearing from stream C, 21.II.1974, slide mounted in Euparal, leg. H. Kurz (ZSM).

**Diagnostic characters.** The adult male of *Tanytarsus curvicristatus* can be separated from other *Tanytarsus* species by the following combination of characters. Antennal ratio about 0.69; eyes with dorsomedian extension; frontal tubercles absent; wing veins Sc, M, Cu and An bare, wing cells m, cu and an bare; tergite IX without microtrichia-free areas; anal tergal bands separate, curved, running parallel and ending well anterior to anal point base; tergite IX with median setae separated into two groups at the ends of the anal tergal bands; anal point elongate and slightly quadrate at tip, with pair of anal crests placed anterior, crests oval and curved; pit present under the crests; two single bars present, one shorter, placed anterior and posteriorly directed, the other longer, serrated at tip, placed posterior on the anal point and anteriorly directed; superior volsella without microtrichia, in most part circular, posteromedian corner well projecting; longitudinal axes of superior volsella and body at angle of about 76°; digitus short and pointed (cone-shaped/triangular), not reaching median margin of superior volsella; median volsella with ramose lamellae, not reaching apex of inferior volsella; inferior volsella straight and thick, distal part slightly thicker; gonostylus curved, somewhat elongate and thin; hypopygium ratio about 0.91.

**Description**

**Male Imago (n=2)**

Measurements marked with "*" were taken from the original description (Contreras-Lichtenberg 1988).

**Head.** AR 0.74-0.93 (0.51-0.86, range= 0.69)*. Antennal flagellomeres one to twelve 450-550 µm long, thirteen 410-420 µm long, total length 870-960 µm. Eyes with dorsomedian extension; frontal tubercles absent; 9 temporal setae; clypeus with 12 setae (10-15, range= 13)*; lengths of palpal segments (in µm): 31-37, 46-60, 88-115, 90-120, 130-160, total length 385-492 µm.

**Thorax.** Length 790 µm. Scutal tubercle absent; 6-10 dorsocentrals, 10-16 acrostichals, 1-2 prealars, 4-6 scutellars. Halteres with 8 setae.

**Wing.** Wing length 1325-2060 µm (1800-2300, range= 2020 µm)*, width 368-560 µm; L/WR 3.60-3.67. Brachiolum with 1 seta, Sc bare, R with 18-23 setae, $R_1$ with 15-20 setae, $R_{4+5}$ with 22-36 setae, M bare, $M_{1+2}$ with 40-53 setae, $M_{3+4}$ with 2-23 setae, Cu bare, $Cu_1$ with 2-13 setae, Postcubitus with 0-6 setae and An bare. Cell m bare (+0-4 setae on false vein), $r_{4+5}$ with 85-142 setae, $m_{1+2}$ with 54-110 setae (+12-33 setae on false vein), $m_{3+4}$ with 0-13 setae, cu and an bare.

**Legs.** Foreleg bearing single tibial spur (25 µm). Lengths of combs of mid tibia 13 µm (with 23 µm long spur) and 14 µm (with 40 µm long spur); lengths of combs of hind tibiae 15 µm (with 30 µm spur) and 15 µm (with 44 µm long spur).

Lengths of segments (in µm):

| | fe | ti | $ta_1$ | $ta_2$ | $ta_3$ | $ta_4$ | $ta_5$ | Total length |
|---|---|---|---|---|---|---|---|---|
| $P_1$ | 682 | 293 | - | - | - | - | - | |
| $P_2$ | 660 | 500 | 290 | 145 | 100 | 60 | 53 | 1808 |
| $P_3$ | 721 | 600 | 390 | 240 | 230 | 132 | 74 | 2387 |

Leg ratios:

| | LR | BV | SV |
|---|---|---|---|
| $P_1$ | - | - | - |
| $P_2$ | 0.58 | 4.05 | 4.00 |
| $P_3$ | 0.65 | 2.53 | 3.38 |

According to Contreras-Lichtenberg (1988), the Leg Ratio of the fore leg is 2.4.

**Abdomen.** Length 1720-2500 µm.

**Hypopygium (Fig. 62 A-D).** Tergite IX 97-102 µm long with 4-5 median setae, separated into two groups at the ends of the anal tergal bands, and 12 apical setae; lateral tooth absent. Tergite IX without microtrichia-free areas. Orolateral spine of laterosternite IX present, 6 µm long. Anal tergal bands separate, curved, running parallel on middle of tergite and ending well anterior to anal point base. Anal point 41-44 µm long, elongate and slightly quadrate at tip, without microtrichia, with pair of anal crests placed anterior, crests oval and curved; a pit is present under the crests, and a single bar pointed in posterior direction is placed on that pit; another single bar, serrated at tip, longer and pointed in anterior direction, is placed distally on the anal point. Superior volsella without microtrichia, in most part circular, posteromedian corner well projecting; 5-6 setae on dorsal surface (1 closer to median margin), 2-3 setae on median margin (1 dorsal, 2 ventral) and 1 seta on ventral tubercle, close to anterior margin. Longitudinal axes of superior volsella and body at angle of 72-78°. Digitus short and pointed (cone-shaped/triangular), not reaching median margin of superior volsella. Median volsella short, 7-9 µm long with 23-26 µm long simple setae and 21-25 µm long ramose lamellae, not reaching apex of inferior volsella. Inferior volsella straight and thick, 63-75 µm long, distal part slightly thicker. Gonocoxite length 89-114 µm; gonostylus 98-125 µm, curved, somewhat elongate and thin; hypopygium ratio (HR) 0.90-0.91.

**Discussion**

Among the described Neotropical *Tanytarsus*, *Tanytarsus curvicristatus* is the only species that shows the median setae of anal tergite divided in two groups located at the ends of the anal tergal bands (Fig. 62 A). This feature is found in many species of *Paratanytarsus* Thienemann & Bause (in Bause 1913), as illustrated by Reiss & Säwedal (1981). Contreras-Lichtenberg (1988) mentioned in the species diagnosis that, regarding the curved anal crests, *T. curvicristatus* could belong to the genus *Paratanytarsus*, but in view of other characters the species belongs to *Tanytarsus*. In fact, *T. curvicristatus* has only the arrangement of the median anal tergite setae in common with *Paratanytarsus*; all other features such as armament of anal point, superior volsella, digitus and median volsella are different.

Reiss & Fittkau (1971) and Cranston *et al.* (1989) considered that the European species *Tanytarsus signatus* van der Wulp, 1858, presents a subapical, transverse crest on the anal point,

but after studying the material of *T. signatus*, I noticed that this transverse crest is in fact a bar-like structure (Fig. 63 A-C). In the same manner, Glover (1973) mentioned in his description of the Australian *Tanytarsus liepae*, that the species has a distal, crest-like structure, which is actually a bar (Fig. 64 A-B).

Thus, bar-like processes on Tanytarsini anal point are found in *Tanytarsus curvicristatus*, *Tanytarsus liepae*, *Tanytarsus signatus*, *Virgatanytarsus* Pinder, 1982 and *Caladomyia* Säwedal, 1981. *Tanytarsus curvicristatus* has two bars, one small and placed proximal on a pit under the anal crests, the other longer, placed distally on the anal point and anteriorly directed, which is in the present work compared with the bars of other species. The bars of *T. liepae*, *T. signatus* and *Virgatanytarsus* are also seated distally on the anal point and are anteriorly directed, while in *Caladomyia* the bars are seated orally and posteriorly directed.

In regard to form and length, the bars of *Virgatanytarsus arduennensis* Kugler & Reiss, 1973, *Virgatanytarsus maroccanus* Kugler & Reiss, 1973, *Virgatanytarsus subreflexens* Freeman, 1955 and *Virgatanytarsus triangularis* Goetghebuer, 1928 are paired and quite longer than that of *T. curvicristatus*. The *T. curvicristatus* bar shares more similarity with those of *T. liepae* and *T. signatus*, since in both species the bars are apparently single and serrated at tip like in *T. curvicristatus*.

**Discussion concerning the placement of *Tanytarsus curvicristatus* in the genus *Tanytarsus* and some comments on the European *Tanytarsus signatus* van der Wulp and the Australian *Tanytarsus liepae* Glover**

In a revision of European *Tanytarsus* species, Reiss and Fittkau (1971) placed adult males with anteriorly directed bars in the *triangularis* group of the genus *Tanytarsus*. Some years later Pinder (1982) elevated the *triangularis* group to the genus *Virgatanytarsus*, supported mainly by the presence of anteriorly directed bars (or 'rods', as called by Pinder) or homologous structures on the anal point.

As mentioned above, in the genus *Tanytarsus* the presence of bars on the anal point is found besides *Tanytarsus curvicristatus* only in *Tanytarsus signatus* and *Tanytarsus liepae* (Figs 62 A-B, 63 and 64, respectively). As the occurrence of bars supported the creation of *Caladomyia* (Säwedal 1981) and *Virgatanytarsus* (Pinder 1982), it leads to the question if *T. curvicristatus* (and maybe also *T. liepae* and *T. signatus*) should be placed in *Tanytarsus* or be raised to generic rank. In my opinion the creation of a new genus or even a new species group

should be made after investigation of synapomorphies also in the immature stages, and since larva and pupa of *T. curvicristatus* are unknown the species should be maintained in *Tanytarsus*. Pupae of *T. signatus* (Pagast 1931, Langton 1991) and *T. liepae* (Cranston 1996) fit the diagnosis of the genus *Tanytarsus* (Pinder & Reiss 1986).

Additionally to this discussion, *Tanytarsus signatus* is considered to be the type species of the genus *Tanytarsus*. According to Reiss and Fittkau (1971), this was an unfortunate choice since the morphology of *T. signatus* does not represent well the adult male general design of *Tanytarsus*. Reiss and Fittkau (1971) also commented that due to coloration and hypopygial features (mainly the armament of anal point), *T. signatus* corresponds to an isolated form without any closely related species among the European *Tanytarsus* species groups. The *signatus* group designated by Reiss and Fittkau is in the Holarctic region monotypic, and the authors believe that related species could exist in Tropical and Subtropical regions.

Such observation, in addition to the presence of anteriorly directed, distally placed anal point bars, led me to compare *T. curvicristatus*, *T. liepae* and *T. signatus*.

*Tanytarsus curvicristatus* only has the anal point bars in common with *T. liepae* and *T. signatus*; all other hypopygial structures are different. *Tanytarsus liepae* and *T. signatus* share more similarities. As pointed out above, the subapical transverse crest on the anal point of *T. signatus* (Reiss & Fittkau 1971, Cranston *et al.* 1989) and the distal crest-like structure of *T. liepae* (Glover 1973) are in fact anal point bars. Besides, Reiss & Fittkau (1971) and Cranston *et al.* (1989) interpreted that *T. signatus* presents paired longitudinal crests, which are divided into several lappets, and Glover illustrates that *T. liepae* possesses several peculiar digitiform structures on either side on the anal point basal half. The "digitiform structures" of Glover are actually paired longitudinal crests, which are divided into lappets like in *T. signatus*, looking somewhat serrate. Both species do not present median setae on the anal tergite either. The superior volsella of *T. liepae* and *T. signatus* is quite similar, somewhat rectangular/quadrate and transverse to the anal point, and the median volsella has foliate lamellae. The two species present a peculiar coloration, with brown/dark-brown bands on thorax, and brown rings on femurs and tibiae (these rings were only observed in *T. signatus* and in some specimens close to *T. signatus* from USA, deposited at ZSM; difficult to observe in the material of *T. liepae* because it is a pharate male). Regarding differences, *T. liepae* shows one seta placed on digitus basis, which is absent in *T. signatus*. However, the specimens close to *T. signatus* from USA have one seta on digitus basis. In light of these morphological features, the two species could be considered closely related or part of the same species group.

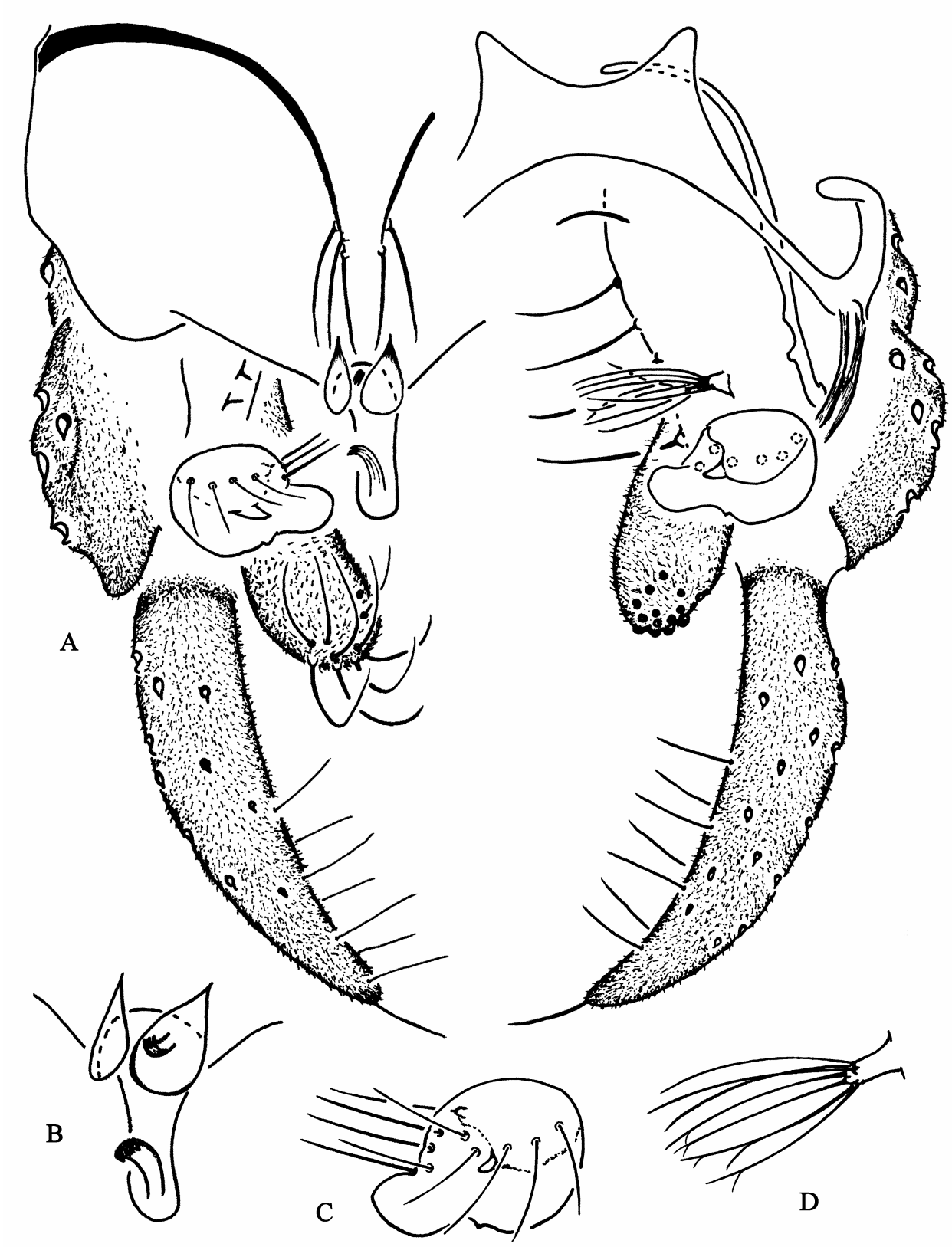
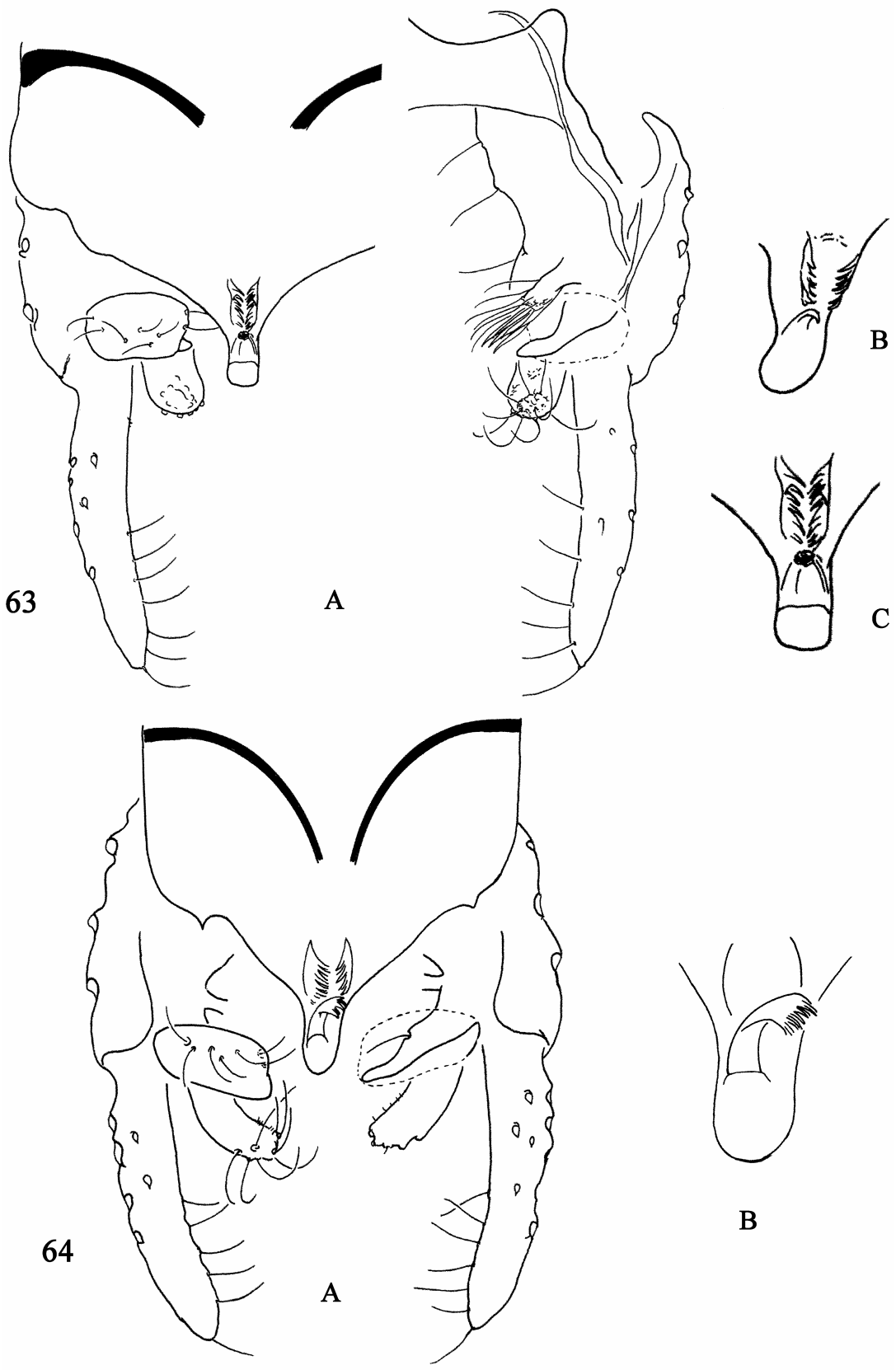



**Fig. 62.** ***Tanytarsus curvicristatus*** **Contreras-Lichtenberg, adult male. A: Hypopygium, dorsal view. B: Anal point, dorsal view. C: Superior volsella and digitus. D: Median volsella.**




**Figs 63-64. Two non-Neotropical *Tanytarsus*, adult males. 63. *Tanytarsus signatus* van der Wulp. A: Hypopygium, dorsal view. B: Anal point, dorsolateral view. C: Anal point, dorsal view. 64. *Tanytarsus liepae* Glover. A: Hypopygium, dorsal view. B: Detail of anal point bar.**

### *Caladomyia alata* (Paggi, 1992) comb. nov.

(Fig. 65)

*Tanytarsus alatus* Paggi, 1992; adult male. New combination.

Type material (Argentina). Holotype [not examined]: 1 adult male, Neuquén, Embalse Arroyito, 18.III.1978, slide mounted in Canada Balsam, Coscaron col., (MCNLP). Paratypes: 5 adult males [not examined] as holotype, deposited at the Instituto de Limnologia "Dr. Raúl A. Ringuelet"; 13 adult males [1 examined], Province of Neuquén, Mari Menuco Dam, 19.III.1978, slide mounted in Canada Balsam, Coscaron col. (MCNLP).

**Diagnostic characters.** The male imago of *Caladomyia alata* can be separated from other species by the following combination of characters. Antennal ratio about 0.90 eyes with dorsomedian extension; large frontal tubercles; wing veins Sc, M and Postcubitus bare, wing cell m bare; tergite IX with microtrichia-free area close and anterior to anal point; posterior margin of tergite IX with shoulders; anal tergal bands Y-type, "fused" on median part of tergite and reaching anal point; tergite IX with one pair of median setae, fused part of anal tergal bands running between median setae; anal point elongate and rounded at tip, distal part narrower, proximal part of anal point expanded and wider, with pair of short bars posteriorly directed, tips of bars simple, and with setae on lateral margins; anal point without anal crests, spines or microtrichia; superior volsella heart-shaped, without microtrichia, median margin somewhat straight, posteromedian corner projecting; longitudinal axes of superior volsella and body at angle of about 50°; digitus short and pointed, finger-like, almost reaching median margin of superior volsella; median volsella with subulate and pectinate lamellae, not reaching apex of inferior volsella; inferior volsella somewhat thick and straight, distal part (area carrying setae) not swelled; gonostylus somewhat short, straight and slightly thick; hypopygium ratio 1.02.

**Description**

**Male Imago (n=1)**

**Head.** AR 0.90. Antennal flagellomeres one to twelve 420 µm long, thirteen 378 µm long, total length 798 µm. Eyes with dorsomedian extension; large frontal tubercles (length 17 µm), about

2.5 times as long as wide; 9 temporal setae; clypeus with 14 setae; length of palpal segments (in µm): 30, 36, 77, 90, 161, total length 394 µm.

**Thorax.** Length difficult to measure. Scutal tubercle absent; 6 dorsocentrals, 10 acrostichals, 1 prealar, 6 scutellars. Halteres setae difficult to see.

**Wing.** Wing length 1520 µm, width 440 µm; L/WR 3.45. Brachiolum with 1 seta, Sc bare, R with 18-20 setae, $R_1$ with 21 setae, $R_{4+5}$ with 19 setae, M bare, $M_{1+2}$ with 40 setae, $M_{3+4}$ with 17 setae, Cu with 6 setae, $Cu_1$ with 16 setae, Postcubitus bare and An with 19 setae. Cell m bare (false vein bare), $r_{4+5}$ with about 130 setae, $m_{1+2}$ with about 65 setae (+ about 32 setae on false vein), $m_{3+4}$ with about 25 setae, cu with 0-1 seta and an bare (in the description Paggi mentioned that cu and an have setae; as I examined only 1 paratype I consider that both wing cells present setae).

**Legs.** Since most of the legs segments are missing in the examined paratype, the measurements below are from the original work; the ratios (LR, BV and SV) were calculated after these values. Lengths of segments (in µm):

| | fe | ti | $ta_1$ | $ta_2$ | $ta_3$ | $ta_4$ | $ta_5$ | Total length |
|---|---|---|---|---|---|---|---|---|
| $P_1$ | 636 | 362 | 789 | 397 | 318 | 227 | 108 | 2837 |
| $P_2$ | 686 | 549 | 309 | 255 | 125 | 83 | 61 | 2068 |
| $P_3$ | 745 | 723 | 470 | 281 | 245 | 154 | 91 | 2709 |

Leg ratios:

| | LR | BV | SV |
|---|---|---|---|
| $P_1$ | 2.17 | 1.70 | 1.26 |
| $P_2$ | 0.56 | 2.94 | 3.99 |
| $P_3$ | 0.65 | 2.51 | 3.12 |

**Hypopygium (Fig. 65 A-E).** Tergite IX 112 µm long with one pair of median setae, fused part of anal tergal bands running between median setae, apical setae absent (setae placed on the anal point); lateral tooth absent. Tergite IX with microtrichia-free area close and anterior to anal point, posterior margin with well developed shoulders. Orolateral spine of laterosternite IX present, 3 µm long. Anal tergal bands Y-type, "fused" on median part of tergite and reaching anal point. Anal point 38 µm long, elongate and rounded at tip, distal part of anal point narrow, proximal part horizontally expanded, wider, with pair of short bars (11-12 µm) posteriorly directed, tips of bars simple, and 12 setae on lateral margins; field of microtrichia, anal crests and

spines absent. Superior volsella heart-shaped, without microtrichia; anterior and lateral margins curved, median and posterior margins somewhat straight, posteromedian corner projecting; 5 setae on dorsal surface, 2 setae on median margin (one dorsal, one ventral) and 1 seta on ventral surface, not placed on tubercle. Longitudinal axes of superior volsella and body at angle of 48-53°. Digitus pointed, finger-like, almost reaching median margin of superior volsella. Median volsella 12 µm long with 18-20 µm long simple setae, 22-23 µm long subulate lamellae in addition to 15-16 µm long pectinate lamellae, not reaching apex of inferior volsella. Inferior volsella 80 µm long, somewhat thick and straight, distal part (area carrying setae) not swelled. Gonocoxite length 90 µm; gonostylus 88 µm, somewhat short, straight and slightly thick; hypopygium ratio (HR) 1.02.

**Discussion**

Morphological and taxonomic considerations and the placement of *Caladomyia alata* in the genus *Caladomyia* are discussed after the description of *Caladomyia tuberculata* comb. nov.

**Distribution and ecological notes**

*Caladomyia alata* was collected from the area of Mari Menuco Dam, in Argentinean Patagonia.

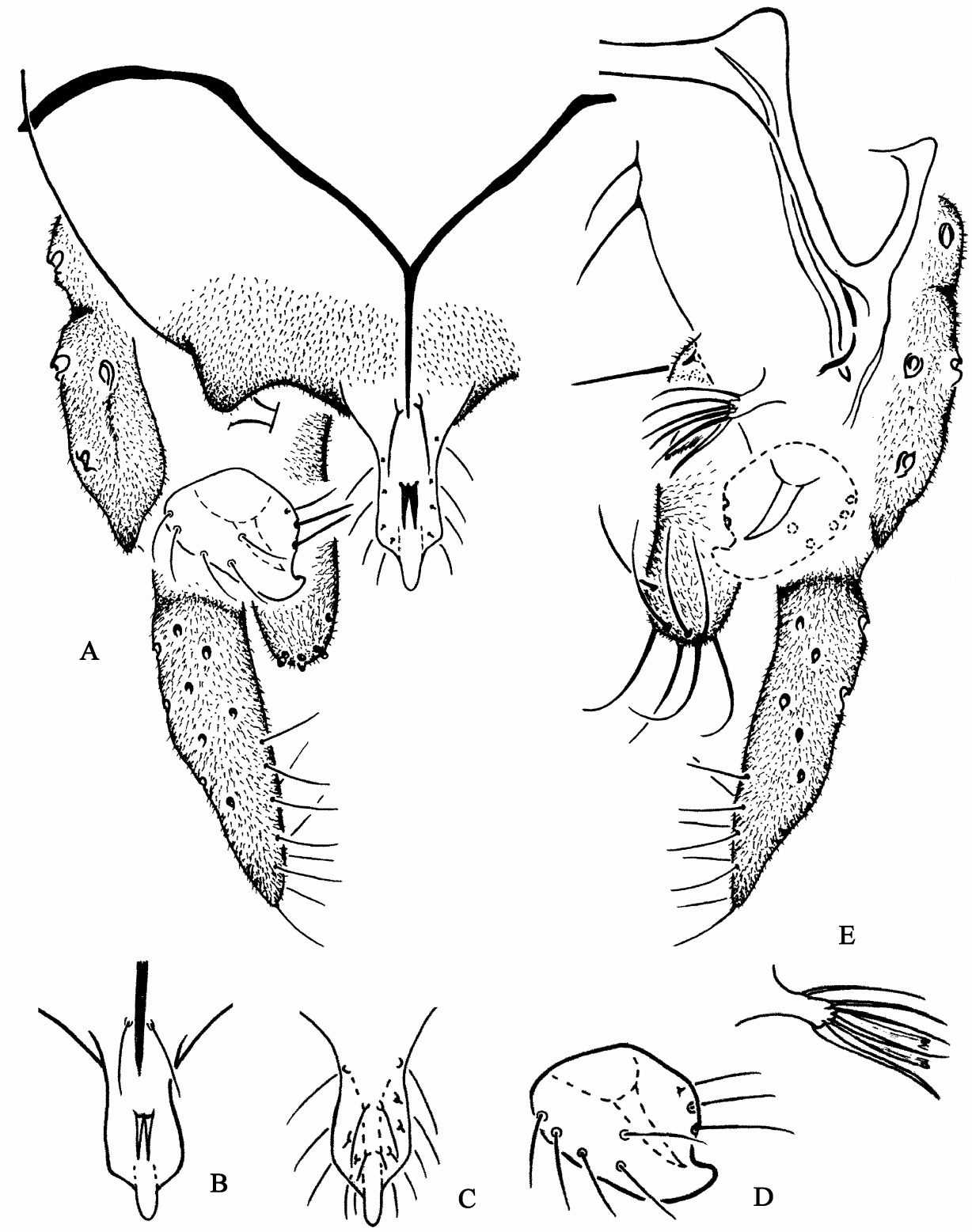



**Fig. 65.** ***Caladomyia alata*** **(Paggi) comb. nov., adult male. A: Hypopygium, dorsal view. B: Anal point, dorsal view. C: Anal point, ventral view. D: Superior volsella and digitus. E: Median volsella.**

***Caladomyia tuberculata* (Reiss, 1972) comb. nov.**

(Figs 66-69)

*Tanytarsus tuberculatus* Reiss, 1972; adult male and pupa. New combination.

Type material (South Chile). Holotype [not examined]: 1 adult male, Villarrica, Lago Villarrica, marginal vegetation, collected with hand-net, 2.XI.1969, slide mounted in Euparal, leg. F. Reiss (NHRS). Paratypes [examined]: 1 adult male as holotype; 1 adult male as holotype except 1.XI.1969; 1 pupal exuviae as holotype except small pond at margin, 1.XI.1969; 2 pupal exuviae, Los Lagos, Lago Riñihue, margin, exuviae-trap, 5.XI.1969, slide mounted in Euparal, leg. F. Reiss; 2 adult males as previous except adult-trap, 6.XI.1969; 2 adult males, Chiloé Island, Lago Tarahuin, 23.XI.1969, slides mounted in Euparal, leg. F. Reiss; 2 pupal exuviae as previous; 2 pupal exuviae, Lago Llanquihue, small pond at margin, 25.XI.1969, slide mounted in Euparal, leg. F. Reiss; 2 pharate males, Lago Pellaifa, eutrophic west bay of the lake, drift, 5.XII.1953, slides mounted in Euparal, leg. L. Brundin (all paratypes at ZSM).

**Diagnostic characters.** *Caladomyia tuberculata* can be separated from other species by the following combination of characters.

**Male Imago:** Antennal ratio about 0.95; eyes with dorsomedian extension; large frontal tubercles; wing veins Sc and M bare; tergite IX without microtrichia-free areas; posterior margin of tergite IX with shoulders; anal tergal bands Y-type, "fused" on median part of tergite and reaching anal point; tergite with one pair of median setae, fused part of anal tergal bands running between median setae; anal point elongate and rounded at tip, lateral margins with setae and on distal half with flap-like enlargement; anal point without crests, microtrichia, spines or bars; superior volsella somewhat rectangular, without microtrichia, median margin somewhat straight, posteromedian corner very slightly projecting; longitudinal axes of superior volsella and body at angle of about 53°; digitus short and pointed, somewhat finger-like, not reaching median margin of superior volsella; median volsella with subulate lamellae, not reaching apex of inferior volsella; inferior volsella thin and curved, distal part with oval to rounded swelling; gonostylus somewhat short in relation to gonocoxite, straight and slightly thick; hypopygium ratio about 1.01.

**Pupa:** Frontal apotome smooth, with fine granulation close to cephalic tubercles; frontal setae strong, cephalic tubercles conical, well developed; pedicel sheath tubercle weakly developed; thoracic horn thin and smooth; wing sheath with well-developed nose; prealar tubercle weakly to somewhat developed, slightly rounded/triangular; three precorneals in triangular pattern, placed

on a rounded tubercle, anterior precorneal stronger, $Pc_2$ and $Pc_3$ closer to each other; 1 median and 2 lateral antepronotals present; 2 pairs of dorsocentrals, all setae with same thickness; hook row about 1/2 width of abdominal segment II; Pedes Spurii B developed on segment II; tergites I and VII without armament; T II with median field of spinules, sparse medially; T III with pair of long bands of longer and shorter spines, bands 1/3-1/2 length of tergite; T IV-V with anterior pair of oval/elongate patches of spines, some individual spines close to each other or placed on the same base, giving an appearance of "multiple" spines; T VI with pair of rounded to elongate patches of spines, patches also with appearance of "multiple" spines; T VIII with anterolateral field of fine and sparse shagreen; T IX with median field of shagreen; posterolateral comb of segment somewhat oval/triangular, lateral, posterior and median margins with strong teeth in addition to smaller one; abdominal segment I without lateral seta; segments II-III with 3 lateral setae; segment IV with 2 lateral setae and 1 lateral taenia; segment V-VI with 3 lateral taeniae; segment VII with 4 lateral taeniae; segment VIII with 1 dorsal seta, somewhat taeniate, 5 lateral taeniae and 1 ventral taenia; anal fringe with about 32 taeniae in single row.

**Description**

**Male Imago (n=5)**

**Head.** AR 0.91-1.04. Antennal flagellomeres one to twelve 496-520 µm long, thirteen 463-498 µm long, total length 965-1018 µm. Eyes with dorsomedian extension; large frontal tubercles (length 22-23 µm), about 2.5 times as long as wide; 9-11 temporal setae; clypeus with 14-18 setae; lengths of palpal segments (in µm): 28-38, 35-50, 108-121, 118-123, 156-170, palp total length 467-488 µm.

**Thorax.** Length 978-1004 µm. Scutal tubercle absent; 8-9 dorsocentrals, 8-12 acrostichals, 1-2 prealars, 2-4 scutellars. Halteres with 5-6 setae.

**Wing.** Wing length 1968-2085 µm, width 520-600 µm; L/WR 3.47-3.78. Brachiolum with 1 seta, Sc bare, R with 18-21 setae, $R_1$ with 21-23 setae, $R_{4+5}$ with 26-30 setae, M bare, $M_{1+2}$ with 48-54 setae, $M_{3+4}$ with 29-30 setae, Cu with 4-5 setae, $Cu_1$ with 19-20 setae, Postcubitus with 25-28 setae and An with 25-32 setae. Cell m with 2-4 setae (+ 13-22 setae on false vein), $r_{4+5}$ with about 150-175 setae, $m_{1+2}$ with about 110-135 setae (+ 35-43 setae on false vein), $m_{3+4}$ with 66-72 setae, cu with 34-36 setae and an with 50-60 setae.

**Legs.** Foreleg bearing single tibial spur (32-34 µm). Lengths of combs of mid tibia 16-19 µm (with 31-34 µm long spur) and 17-19 µm (with 33-36 µm long spur); lengths of combs of hind tibia 16-20 µm (with 34-40 µm spur) and 17-21 µm (with 36-44 µm long spur).

Lengths of segments (in µm):

| | fe | ti | $ta_1$ | $ta_2$ | $ta_3$ | $ta_4$ | $ta_5$ | Total length |
|---|---|---|---|---|---|---|---|---|
| $P_1$ | 813-840 | 443-482 | 840-950 | 448-502 | 378-400 | 259-270 | 122-130 | 3314-3574 |
| $P_2$ | 853-887 | 690-730 | 340-370 | 217-228 | 160-170 | 108-119 | 80-90 | 2487-2594 |
| $P_3$ | 940-980 | 910-942 | 591-623 | 352-400 | 310-327 | 200-218 | 110-120 | 3413-3610 |

Leg ratios:

| | LR | BV | SV |
|---|---|---|---|
| $P_1$ | 1.85-2.00 | 1.68-1.74 | 1.39-1.50 |
| $P_2$ | 0.50-0.53 | 3.27-3.40 | 4.17-4.37 |
| $P_3$ | 0.64-0.66 | 2.38-2.51 | 3.08-3.13 |

**Abdomen.** Length 2258-2430 µm.

**Hypopygium (Figs 66 A-B, 67 A-B).** Tergite IX 112-114 µm long with one pair of median setae, fused part of anal tergal bands running between median setae, apical setae absent (setae on the anal point); lateral tooth difficult to see, a tubercle is present on this area. Tergite IX without microtrichia-free areas, posterior margin with well-developed shoulders. Orolateral spine of laterosternite IX present, 6-8 µm long. Anal tergal bands Y-type, "fused" on median part of tergite and reaching anal point. Anal point 43-54 µm long, elongate and rounded at tip, lateral margins with 12 setae, distal half with flap-like enlargement, anal crests, bars, microtrichia and spines absent. Superior volsella somewhat rectangular, without microtrichia; anterior, median, and posterior margins somewhat straight, lateral margin curved, posteromedian corner slightly projecting; 7-8 setae on dorsal surface, 2 setae on median margin (one dorsal, one ventral close to anterior margin) and 1 seta on ventral tubercle, also close to anterior margin. Longitudinal axes of superior volsella and body at angle of 50-56°. Digitus short and pointed, somewhat finger-like, not reaching median margin of superior volsella. Median volsella 17-20 µm long with 18-22 µm long simple setae and 17-20 µm long subulate lamellae, not reaching apex of inferior volsella. Inferior volsella 80-82 µm long, thin and curved, anterior half somewhat thicker, distal part (area carrying setae) with oval to rounded swelling. Gonocoxite length 100-

102 µm; gonostylus 99-102 µm, somewhat elongate, straight and slightly thick; hypopygium ratio (HR) 0.98-1.03.

**Pupa (n=8)**

Total length 3.20-3.79 mm. Pupal exuviae pale, thorax and lateral muscle marks somewhat brownish.

**Cephalothorax (Fig. 68 A-D).** Frontal apotome smooth, with fine granulation close to cephalic tubercles. Frontal setae strong, 110-148 µm long, mounted apical on well-developed, conical cephalic tubercles (28-45 µm); frontal warts absent. Pedicel sheath tubercle weakly developed. Thorax smooth, 750-990 µm long, with small points along median suture. Wing sheath with well-developed nose (in two exuviae weakly developed); prealar tubercle weakly to somewhat developed, slightly rounded/triangular. Thoracic horn thin and smooth, 442-552 µm long. Three precorneals in triangular pattern, placed on a rounded tubercle, anterior precorneal stronger (144-172 µm long), $Pc_2$ and $Pc_3$ closer to each other (120-150 µm and 118-128 µm long); 1 median antepronotal, strong (110-136 µm long) and 2 lateral antepronotals (6-8 µm and 56-88 µm long); 2 pairs of dorsocentrals, all setae present the same thickness, anterior pair 116-150 µm and 36-62 µm, posterior pair 30-50 µm and 50-60 µm.

**Abdomen (Fig. 69 A-C).** Length 2370-2910 µm. Tergites I and VII without armament. T II with median field of spinules, sparse medially. T III with pair of long bands of longer and shorter spines, bands 1/3-1/2 length of tergite. T IV-V with anterior pair of oval/elongate patches of spines, some individual spines close to each other or placed on the same base, giving an appearance of "multiple" spines. T VI with pair of rounded to elongate patches of spines, patches also with spines close to each other or placed on same base. T VIII with anterolateral field of fine and sparse shagreen. T IX with median field of shagreen. S I-II with median field of fine shagreen, shagreen of S II finer and sparse. S III-IX without armament. Conjunctives and pleura unarmed. Hook row 240-290 µm long, about 1/2 width of segment II. Pedes Spurii A absent; Pedes Spurii B present on segment II. Posterolateral comb of segment VIII 40-62 µm wide, somewhat oval/triangular; lateral, posterior and median margins with 6-9 strong teeth in addition to 9-33 smaller one.

Abdominal setation: segment I with 2 D, 0 L and 1 V; segment II with 4 D, 3 L and 3 V; segment III with 5 D and 1 dorsal seta mark, 3 L and 3 V; segment IV with 6 D, 2 L, 1 lateral taenia and 3 V; segment V with 5 D, 3 lateral taeniae and 4 V; segment VI with 5 D, 3 lateral taeniae and 4 V; segment VII with 5 D, 4 lateral taeniae and 4 V; segment VIII with 1 dorsal seta, somewhat taeniate, 5 lateral taeniae and 1 ventral taenia. Anal lobe well developed, with complete fringe of 28-35 taeniae in single row and two pairs of dorsal taeniae. Tergites II-VIII with O-setae.

**Distribution and ecological notes**

*Caladomyia tuberculata* is recorded from southern Chile, Patagonia and Argentina, living in small and shallow ponds close to lakes, and from southern Brazil, inhabiting a reservoir surrounded by Araucaria forest.

***Caladomyia tuberculata* (Reiss) and *Caladomyia alata* (Paggi): some systematic considerations and discussion about their placement in the genus *Caladomyia***

The presence of bars on the anal point supported the creation of the genus *Caladomyia* by Säwedal (1981). *Virgatanytarsus* Pinder, 1982, *Tanytarsus curvicristatus* Contreras-Lichtenberg, 1988 (Fig. 62), *Tanytarsus signatus* van der Wulp, 1858 (Fig. 63) and *Tanytarsus liepae* Glover, 1973 (Fig. 64) also have bars on the anal point but they are anteriorly directed and placed differently.

The occurrence of posteriorly directed bars has been unique in *Caladomyia* so far, and Säwedal considered this character state to be an autapomorphy for the genus. However, Reiff (2000) mentioned, in her review of *Caladomyia*, that material collected from southern Brazil by S. Wiedenbrug contains males which resemble *Caladomyia* but they do not present anal point bars. I had the opportunity to see that material and, after comparisons, I noticed that some of those males are similar to *T. tuberculatus*.

This fact conducted to the supposition that *Tanytarsus tuberculatus* could belong to the genus *Caladomyia*. Besides, all other hypopygial features of *T. tuberculatus* fit the diagnosis of *Caladomyia*, namely the presence of Y-type anal tergal bands, anal tergite with 2 median setae posteriorly (fused part of anal tergal bands running between median setae), shoulders on posterior margin of anal tergite, superior volsella elongate and more or less transverse to median

line, median volsella with subulate lamellae, and the form of inferior volsella and gonostylus (Figs 66 and 67).

Reiff (2000) pointed out that anal crests are present in the specimens collected by Wiedenbrug, although Säwedal (1981) stated in his diagnostic description that anal crests are always absent in *Caladomyia*. In the same way, Reiss (1972) described the presence of anal crests on the *T. tuberculatus* anal point. In both cases the anal crests are short and low. After examinations of the adult males collected by Wiedenbrug and *T. tuberculatus*, the so-called "anal crests" of Reiff and Reiss are in fact small flap-like enlargements of the anal point margins. Such "enlargement" of the anal point is well developed and clearly observed in most *Caladomyia* species. This character was included in the emended diagnosis of the genus *Caladomyia* by Reiff (2000), who elucidated that the anal point combines characteristically two elements, a horizontally expanded part and a vertically expanded part. The horizontally expanded part (the "enlargement" here described) is proximal on the anal point, which becomes wider in this section, while the vertically one is distal and the anal point is narrower in this section.

Although not observed in two *Caladomyia* pupae (*Caladomyia friederi* Trivinho-Strixino & Strixino, 2000 and *C. riotarumensis*), the occurrence of short spines on pupal abdominal tergites (tergites IV-VI) close to each other or placed on the same base, giving an appearance of multiple spines, could be used to recognize *Caladomyia* pupae. The pupae of *Caladomyia spixi* Säwedal, 1981 and *C. ortoni* show "multiple spines" on tergites IV-VI and V-VI, respectively (Säwedal 1981; Strixino & Trivinho-Strixino 2003). The pupa of *Tanytarsus tuberculatus* also presents "multiple spines" on tergites IV-VI (Fig. 17), and the presence of this character corroborated to the placement of the species in the genus *Caladomyia*.

Wiedenbrug (2000) described a pupal exuviae morphotype under the name *Tanytarsus* spec. 14, collected from a reservoir in the same locality of the supposed *Caladomyia* males without bars (above mentioned). After comparing the material, I noticed that *T.* spec. 14 is actually *C. tuberculata.*

*Tanytarsus alatus* was described by Paggi (1992) based on adult males from Argentina. Paggi illustrated the presence of strong-developed anal crests on the anal point of *T. alatus* and two strong spines between the crests. However, according to the figures in Paggi's work and to one analyzed paratype, the anal crests are actually the expanded proximal part of the anal point, which was also misinterpreted as in the case above discussed about the supposed presence of anal crests in *Caladomyia* and *T. tuberculatus*. The two strong spines described by Paggi are in fact anal point bars (Fig. 65 A-B), which are somewhat shorter and thicker in contrast to other *Caladomyia* species.

Except for the heart-shaped shape of the superior volsella and the presence of pectinate lamellae in addition to subulate ones on the median volsella, all other hypopygial features of *Tanytarsus alatus* match the diagnosis of *Caladomyia*. *Tanytarsus alatus* has Y-type anal tergal bands, fused part of anal tergal bands running between pair of median setae, posterior margin of anal tergite with well-developed shoulders and anal point bars posteriorly directed.

*Caladomyia alata* and *C. tuberculata* do not resemble any described *Caladomyia* species. As in *C. alata*, the anal point of *C. kraussi* Säwedal, 1981 has short bars with simple tips. However, except for this character, *C. alata* and *C. kraussi* are not morphologically similar (even the bars position on the anal point is different – in *C. kraussi* placed on the anal point base, close to the end of anal tergal band).

The genus *Caladomyia* seems to be speciose in the Neotropical region. Many undescribed males and probably new species of *Caladomyia* are in the Zoologische Staatssammlung, Munich (Reiff 2000; Sanseverino *pers. obs.*). Reiff (2000) mentioned that several colleagues have also reported the occurrence of possibly new species. However, despite the apparent species richness, only few ecological or faunistic studies (Nessimian *et al.* 2003; Roque *et al.* 2004) have recorded the presence of *Caladomyia* in the Neotropics. Unassociated larvae and pupae of *Caladomyia* have probably been misidentified as *Tanytarsus* or other closely related genus, since little is know about the *Caladomyia* immature stages - only *Caladomyia friederi*, *C. ortoni* and *C. riotarumensis* are know from larva and pupa and *C. spixi*, and *C. tuberculata* from pupa. Descriptions of larvae and pupae with associated reared adult males are necessary to confirm the existence of generic diagnostic characters.

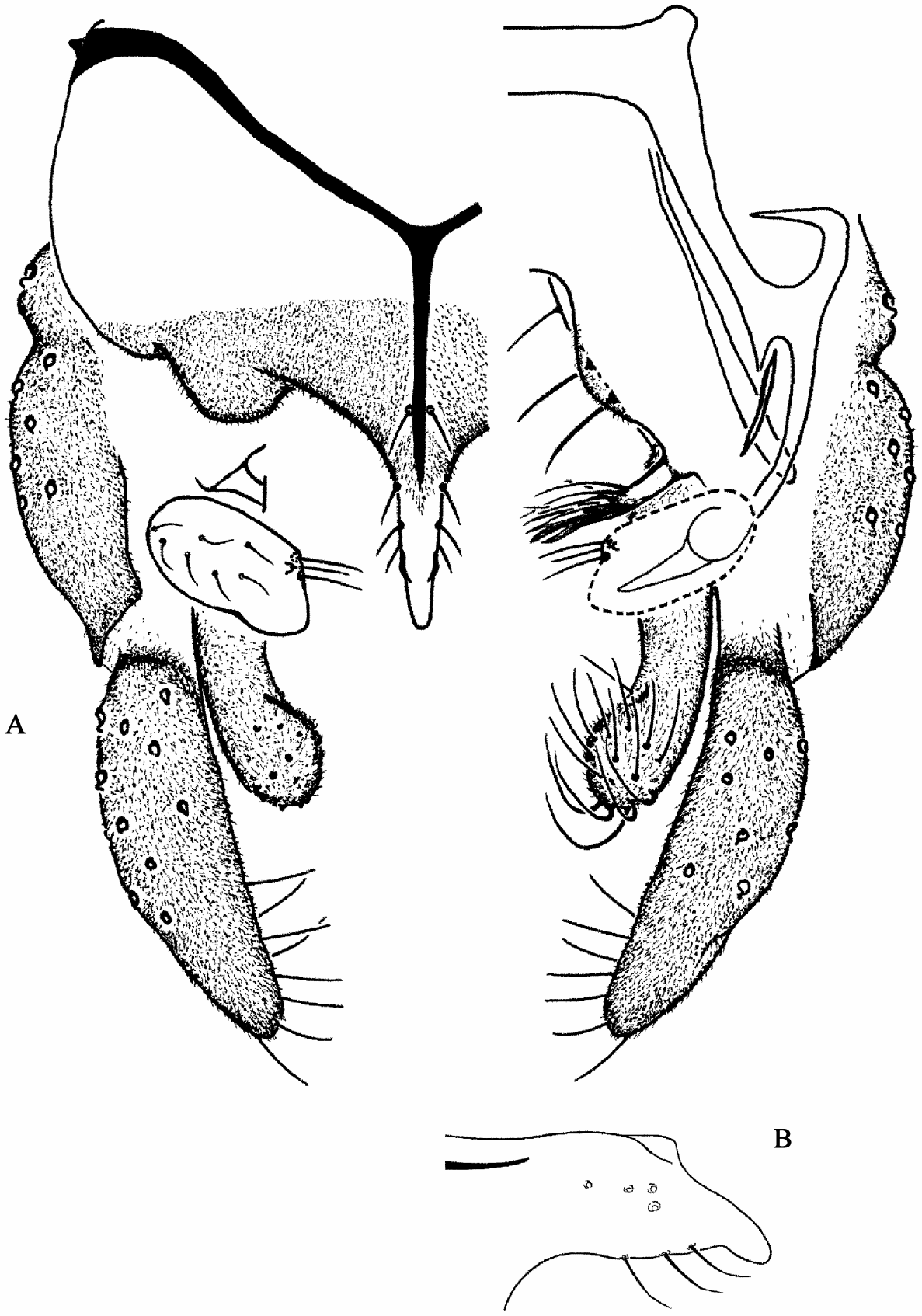



**Fig. 66.** ***Caladomyia tuberculata*** **(Reiss) comb. nov., adult male. A: Hypopygium, dorsal view. B: Anal point, lateral view.**

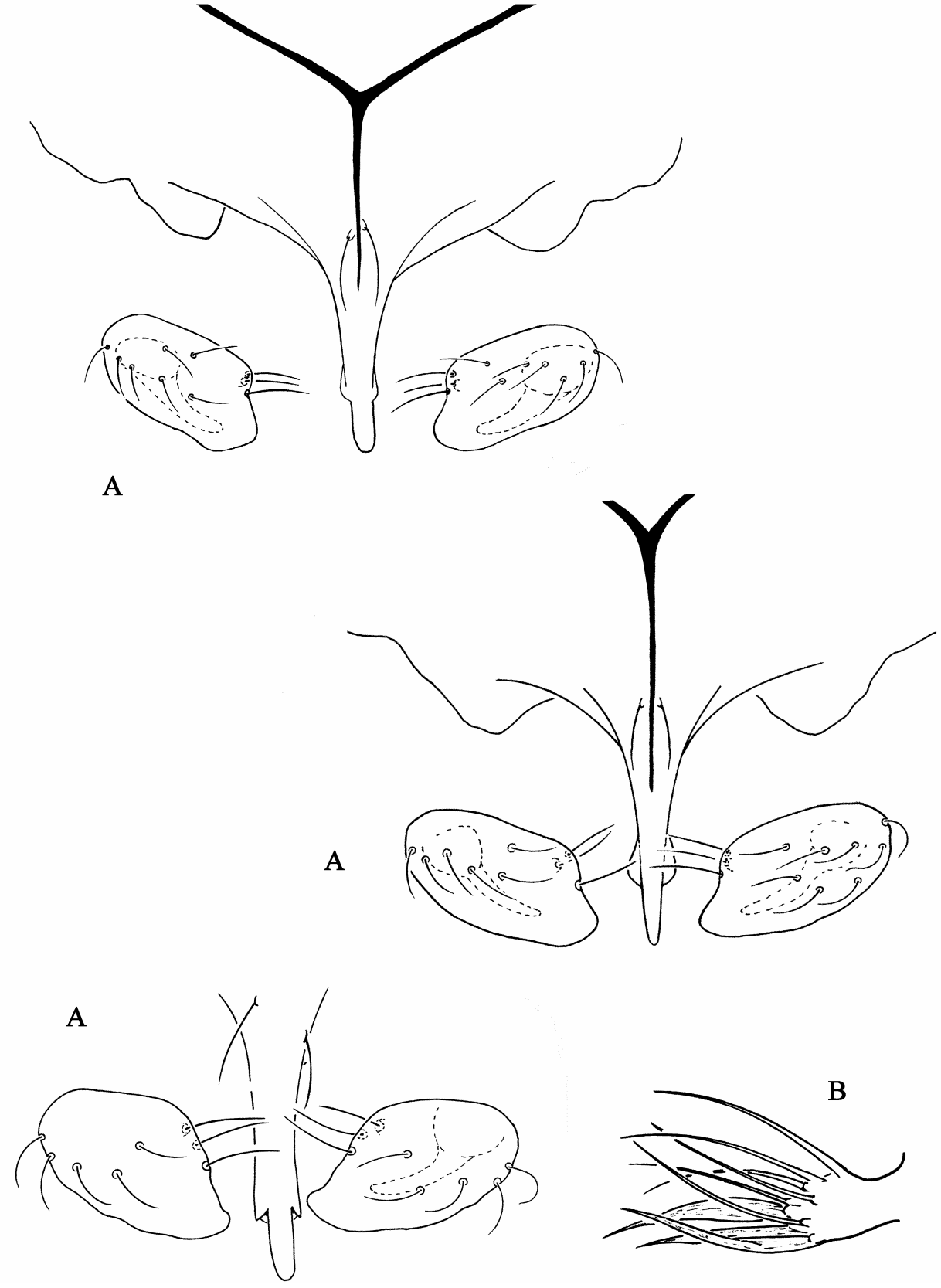



**Fig. 67.** ***Caladomyia tuberculata*** **(Reiss) comb. nov., adult male. A: Superior volsella and digitus, variation. B: Median volsella.**

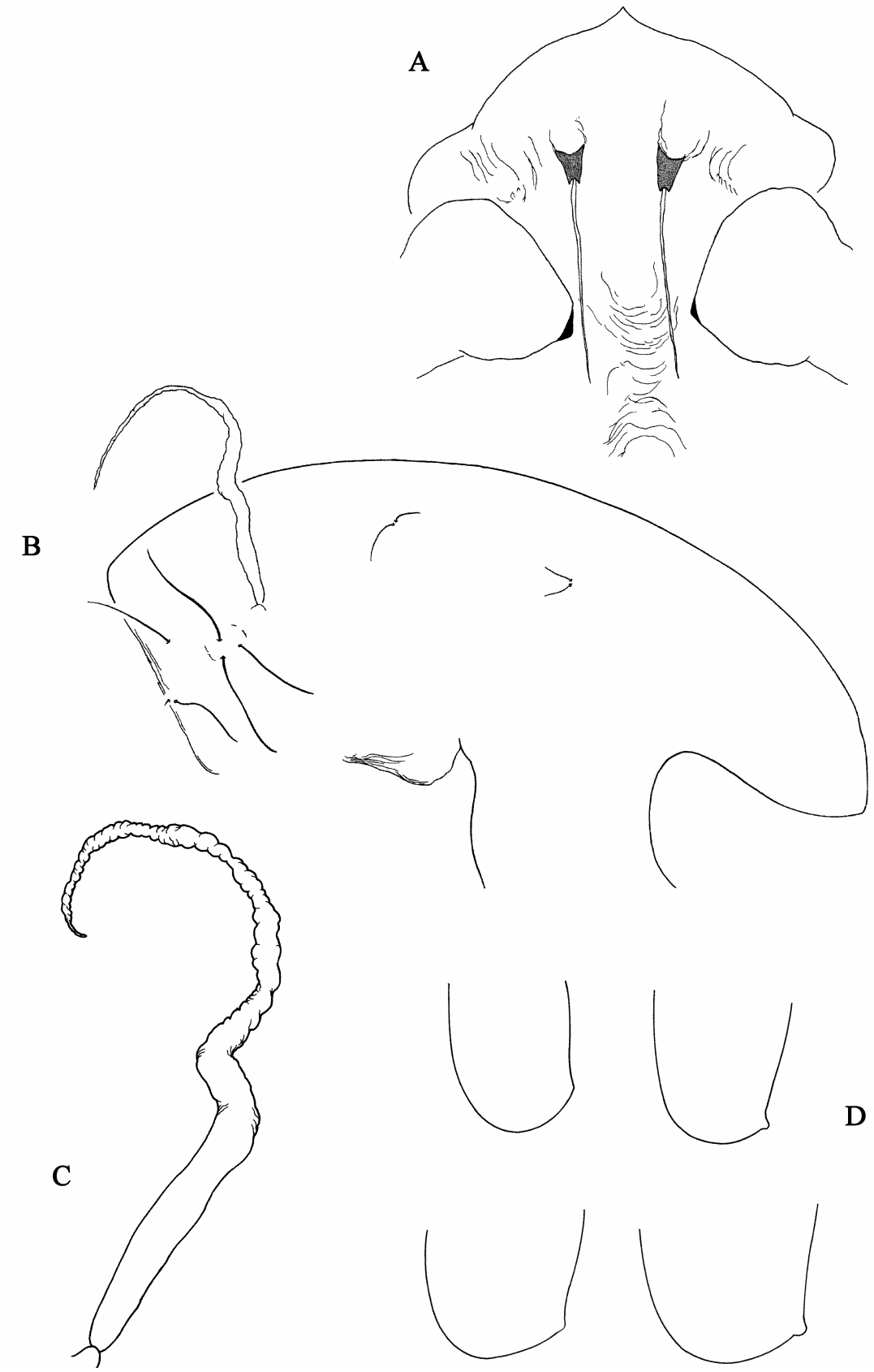



**Fig. 68. *Caladomyia tuberculata* (Reiss) comb. nov., pupa, cephalothorax. A: Frontal apotome. B: Thorax. C: Thoracic horn. D: Wing sheath nose, variation.**

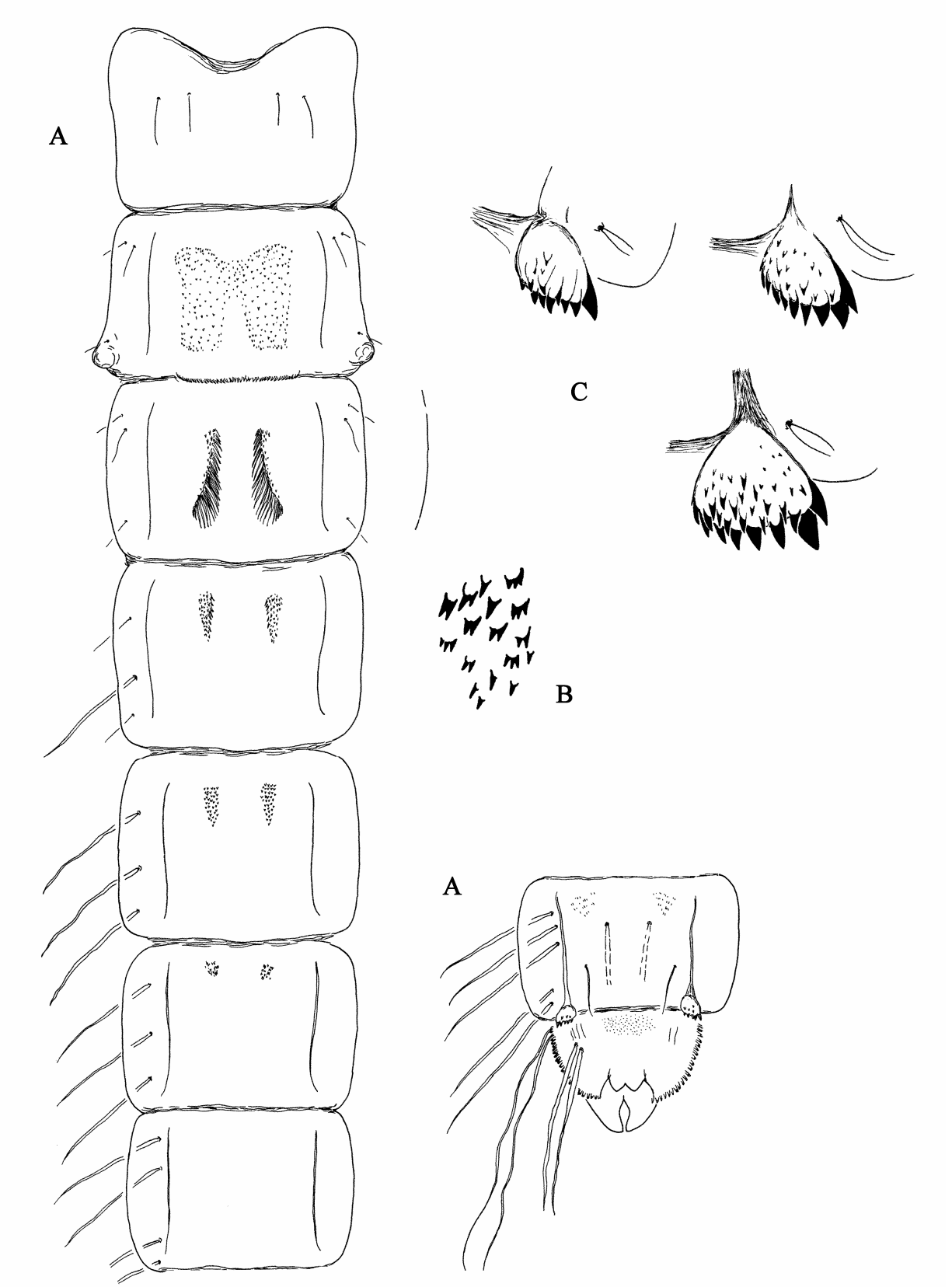



**Fig. 69.** ***Caladomyia tuberculata*** **(Reiss) comb. nov., pupa, abdomen. A: Abdomen, dorsal view; dorsal setae of segments II-VII not drawn. B: "Multiple" spines on abdominal tergites IV-VI. C: Posterolateral comb of abdominal segment VIII, variation.**

## 5. KEYS

### 5.1. Key to adult males

The diagnostic key comprises all imagines of the Neotropical *Tanytarsus* species revised in this work, including also the Nearctic *Tanytarsus limneticus*, as well as the Neotropical *Nimbocera patagonica* and two *Tanytarsus* species which are transferred here to the genus *Caladomyia*.

**1** Anal crests absent, anal point without spines ..... **2**

**—** Anal crests present, anal point with or without spines ..... **7**

**2** Anal tergal bands "fused" on median part of tergite, Y-type; posterior margin of tergite IX with well-developed shoulders; tergite IX with one pair of median setae, fused part of anal tergal bands running between median setae (Figs 65 A-B, 66 A) ..... **3**

**—** Anal tergal bands separate, not "fused"; posterior margin of tergite IX without shoulders; median setae absent or differently arranged (Figs 61 A, 59 A) ..... **4**

**3** Anal point with one pair of short bars posteriorly directed; proximal part of anal point horizontally expanded, very wide; superior volsella heart-like; tergite IX with microtrichia-free area anterior to anal point (Fig. 65 A-D) ..... ***Caladomyia alata*** (Paggi) **comb. nov.**

**—** Anal point apparently without bars; proximal part of anal point only slightly expanded; superior volsella oval to rectangular; tergite IX without microtrichia-free area (Figs 66 A, 67 A) ..... ***Caladomyia tuberculata*** (Reiss) **comb. nov.**

**4** Median anal tergite setae absent; anal tergal bands ending almost in contact on middle of tergite; anal point with setae (Fig. 59 A); superior volsella quadrate (Fig. 59 B); median volsella with foliate lamellae (Fig. 59 C); antennal ratio less than 1.0 (Tab. I); wing vein M bare (Tab. III) ..... ***Tanytarsus fastigatus*** Reiss

**—** Median anal tergite setae present; anal tergal bands not reaching tergite middle, if reaching, then ending parallel (Fig. 61 A), not almost in contact; superior volsella elongate (Fig. 61 A-B) or heart-like; median volsella with subulate lamellae (Fig. 61 C); antennal ratio more than 1.0 (Tab. I); wing vein M with setae (Tab. III) ..... **5**

**5** Anal tergal bands reaching middle of tergite; median anal tergite setae placed on middle of tergite, not close to anal point; anal point with microtrichia (Fig. 61 A); digitus short and rounded (Fig. 61 B); wing vein Sc bare (Tab. III) ..... ***T. reissi*** Paggi

**—** Anal tergal bands shorter, not reaching middle of tergite; median anal tergite setae placed close to anal point; anal point without microtrichia; digitus long and S-shaped (Tab. V); wing vein Sc with setae (Tab. III) ..... **6**

**6** Superior volsella heart-like, with dorsal and lateral fields of microtrichia (Tab. V); leg segments with middle and distal or proximal and distal or proximal or distal brown bands ..... ***T. impar*** Trivinho-Strixino & Strixino

**—** Superior volsella elongate and oval, without microtrichia (Tab. V); leg segments with distal brown bands ..... ***T. magnus*** Trivinho-Strixino & Strixino

**7** Anal point with 2 single bars, one shorter, placed anterior and posteriorly directed, the other longer, placed posterior and anteriorly directed (Fig. 62 A-B); anal crests oval and curved, placed anterior on anal point; median anal tergite setae separated into 2 groups, each group sited on end of each anal tergal band (Fig. 62 A) ..... ***T. curvicristatus*** Contreras-Lichtenberg

**—** Anal point without bars; anal crests elongate and parallel, placed lateral on anal point (Figs 19 A-B, 50 A-B), or crests fused to form spoon-shaped anal point, placed on anal point apex (Figs 54 A, 58 A); median anal tergite setae not separated into groups ..... **8**

**8** Anal crests fused to form spoon-shaped anal point and placed on anal point apex; anal tergal bands fused on median part of tergite, T-type (Figs 54 A, 58 A) ..... **9**

**—** Anal crests neither fused nor placed on anal point apex, crests parallel on lateral margins of anal point (Figs 19 A-B, 50 A); anal tergal bands separate, V-type (Figs 16 A, 19 A, 24 A), if bands fused on median part of tergite, then Y-type (Fig. 49 A) ..... **11**

**9** Anal crests weakly developed, anal point form not markedly spoon-like (Fig. 58 A-B); superior volsella triangular, median margin straight (Fig. 58 C); gonostylus thick and curved, apex rounded (Fig. 58 A) ..... ***T. paraligulatus*** Reiss

**—** Anal point markedly spoon-like or not, anal crests well-developed or not (Figs 54 A-B, 56 A); superior volsella heart-like, median margin concave (Figs 54 C, 56 B); gonostylus elongate and straight, apex slightly constricted (Fig. 54 A) ..... **10**

**10** Anal point markedly spoon-like, anal crests well-developed (Figs 54 A-B); digitus with rounded apex (Fig. 54 C); antennal ratio more than 1.10 (Tab. I) ..... ***T. ligulatus*** Reiss

**—** Anal point not markedly spoon-like, anal crests weakly developed (Fig. 56 A); digitus with pointed apex (Fig. 56 B); antennal ratio less than 0.90 (Tab. I) ..... ***T. cf. ligulatus***

**11** Anal tergal bands fused medially, Y- type (Fig. 49 A); superior volsella with wrinkles and rugosities on median, lateral and posterior margins, lateral margin with wrinkled flap-like projection (Fig. 49 A, D); eyes without dorsomedian extension (Tab. I) ..... **12**

**—** Anal tergal bands not fused to form Y-type, bands separate, V-type (Figs 16 A, 24 A, 35 A, 39 A), or touching each other but not fused; superior volsella neither with wrinkles nor with flap-like projection (Figs 16 B, 24 B, 35 C), if wrinkles present, then only on posterior margin (Fig. 45 B); eyes with dorsomedian extension (Tab. I) ..... **13**

**12** Median volsella well-developed, with pectinate lamellae (Fig. 49 E); all median anal tergite setae of about same length (Fig. 49 A); thorax with few acrostichals (Tab. II) ..... ***T. jacaretingensis*** spec. nov.

**—** Median volsella missing or reduced to a minute bare knob (Tab. V); median anal tergite setae of different length, 4-6 extraordinary long, anterior setae in addition to 2-4 shorter setae (Tab. V); acrostichals absent (Tab. II) ..... ***T. monospinosus*** Ekrem & Reiss

**13** Anal tergal bands running parallel on middle of tergite and sometimes touching each other; median volsella absent; anal tergite with enlarged apex (Tab. V) ..... ***T. tumultuarius*** Ekrem & Reiss

**—** Anal tergal bands short, reaching or not middle of tergite (Figs 19 A, 39 A), or running parallel but never touching each other (Figs 16 A, 35 A); median volsella present (Figs 16 A, C, 19 A, D, 30 A, D); apex of anal tergite not enlarged ..... **14**

**14** Anal point with one single short seta placed in a grub between anal crests (Figs 50 A-C, 52 A, C); median volsella with simple lamellae (Figs 52 D, 53 D) ..... **15**

**—** Anal point with two or more short setae (Fig. 35 A-B), with spines and short setae (Fig. 30 A-B) or with spines between anal crests (Figs 16 A, 19 A-B), grub absent; median volsella lamellae not simple, lamellae foliate, pectinate, ramose or subulate, (Figs 19 D, 16 C, 35 D, 45 C) ..... **17**

**15** Anal tergal bands running parallel on middle of tergite; superior volsella ovoid, median margin convex, microtrichia present (Fig. 50 A, D) ..... ***T. rinihuensis*** Reiss

**—** Anal tergal bands shorter, not running parallel; superior volsella not ovoid, somewhat heart-like or period-like, median margin concave, microtrichia absent (Figs 52 A-B, 53 A-B) ..... **16**

**16** Superior volsella slightly heart-like, with 3-4 setae on median margin, posteromedian corner weakly projecting (Fig. 52 B) ..... ***T. pseudorinihuensis*** spec. nov.

**—** Superior volsella period-like, with 2 setae on median margin, posteromedian corner well projecting (Fig. 53 B) ..... ***T. pararinihuensis*** spec. nov.

**17** Anal point only with short, spiniform setae between anal crests (Figs 32 A, 35 A-B), or with spines and short setae between crests (Fig. 30 A-B) ..... **18**

**—** Anal point only with spines between anal crests (Figs 19 A-B, 24 A, 48 A) ..... **20**

**18** Median anal tergite setae absent; anal tergal bands running parallel and ending somewhat together on middle of tergite close to anal crests (Fig. 35 A); superior volsella circular, posterior part thumb-like and well projecting; digitus short and rounded (Fig. 35 C); wings with few setae (Fig. 34 C); antennal ratio low, less than 0.60 (Tab. I); fore tibia without spur (Tab. IV); tarsomere 4 of mid leg cordiform (Fig. 34 $D_1$) ..... ***Nimbocera patagonica*** Reiss

**—** Median anal tergite setae present; anal tergal bands shorter, not running parallel and ending far from anal crests (Fig. 30 A); superior volsella somewhat heart-like, posterior part not thumb-like; digitus long and pointed (Figs 30 A, C, 32 B); wings with many setae (Tab. III); antennal ratio high, more than 1.20 (Tab. I); fore tibia with spur (Tab. IV); tarsomere 4 of mid leg not cordiform ..... **19**

**19** Anal point with short setae between anal crests, spines absent; superior volsella without microtrichia (Fig. 32 A-B); wing cells cu and an together with less than 100 setae (Tab. III) ..... ***Tanytarsus rhabdomantis*** (Trivinho-Strixino & Strixino)

**—** Anal point with spines and two short setae between anal crests (Fig. 30 A-B); superior volsella with microtrichia (Fig. 30 C); wing cells cu and an together with more than 200 setae (Tab. III) ..... ***T. limneticus*** Sublette

**20** Spine-bearing surface of anal point slightly to distinctly raised in posterior portion; anal tergal bands short, not reaching middle of tergite; superior volsella somewhat quadrate (Figs 37, 39 A-B, 41, 43 A-B) ……..……..…… **21**

**—** Spine-bearing surface of anal point not raised; anal tergal bands short or long (Figs 12 A, 19 A, 47 A); superior volsella not quadrate, volsella heart-like, oval or rectangular (Figs 16 B, 19 A, C, 45 B) ……...…….……. **24**

**21** Spine-bearing surface on anal point raised and forming a conspicuous hump in posterior portion (Fig. 43 B); anal point with microtrichia on beginning of anterior half of the surface between crests (Fig. 43 A) ..... ***T. xingu*** Sanseverino *et al.*

**—** Spine-bearing surface on anal point only slightly raised, not forming a hump; anal point microtrichia on entire anterior half or on entire surface between crests (Figs 37, 39 A-B, 41) ……...……..…….. **22**

**22** Digitus short and pointed, not reaching median margin of superior volsella (Fig. 41) ……...…....……. ***T. waika*** Sanseverino *et al.*

— Digitus long and finger- or thumb-like, extending beyond median margin of superior volsella (Fig. 37) ……...……..…… **23**

**23** Digitus thumb-like, thicker basally and distally; anal point wide, apex circular (Fig. 39 A); antennal ratio low, less than 0.50 (Tab. I) .....… ***T. revolta*** Sanseverino *et al.*

— Digitus finger-like, apex pointed; anal point elongate, apex rounded (Fig. 37); antennal ratio higher, more than 0.90 (Tab. I) ……..... ***T. marauia*** Sanseverino *et al.*

**24** Digitus with one or two setae on base and with a small sclerotized spot close to apex (Figs 17 C-D, 19 C) ..... **25**

— Digitus neither with setae nor with sclerotized spot (Figs 13 B, 28 C, 45 B) ..... **26**

**25** Anal tergal bands ending parallel on middle of tergite (Fig. 17 A); superior volsella heart-like, median margin concave, posteromedian corner projecting (Fig. 17 C); digitus thumb-like, apex rounded, base with two setae (Fig. 17 D) ..... ***T. clivosus*** Reiss

— Anal tergal bands shorter, not ending parallel on middle of tergite (Fig. 19 A); superior volsella oval, median margin straight, posteromedian corner not projecting (Fig. 19 C); digitus finger-like, apex pointed, base with one setae (Fig. 19 C) ..... ***T. hamatus*** Reiss

**26** Digitus distinctly broad, leaf-like, quite wide in the middle (Fig. 48 C); anal point elongate, somewhat wide and notched posteriorly; median anal tergite setae short and placed posterior on tergite, close to anal point; apexes of anal point spines almost in contact; apex of inferior volsella pointed (Fig. 48 A) ..... ***T. digitatus*** spec. nov.

— Digitus neither broad nor wide in the middle, digitus finger- or thumb-like (Figs 13 B, 28 C, 45 B, 47 B); anal point elongate but neither wide nor notched posteriorly; median anal tergite setae longer, placed on middle of tergite, from well anterior to close to anal point; apexes of anal point spines not close to each other; apex of inferior volsella rounded or swelled (Figs 13 A, 16 A, 24 A, 28 A-B, 45 A, 47 A) ..... **27**

**27** Anal point somewhat quadrate at tip; anal point with spines aligned in one regular row between crests; distal part of inferior volsella straight, not swelled (Fig. 45 A); superior volsella rectangular, posteromedian corner not projecting, with wrinkles/ rugosities on posterior margin (Fig. 45 B) ..... ***T. amazonicus*** spec. nov.

— Anal point not quadrate at tip, anal point rounded, triangular or pointed at tip; anal point with spines placed irregularly or in a more or less regular row between crests; distal part of inferior volsella slightly to distinctly swelled (Figs 16 A, 24 A, 28 A-B, 47 A); superior volsella heart-like, circular or ovoid, posteromedian corner projecting or not, wrinkles/ rugosities absent ..... **28**

**28** Spines placed in a more or less regular row between anal point crests; posterior part of anal point oval, with a lateral constriction; superior volsella with microtrichia on anterolateral and anteromedian margins; anterior part of superior volsella ovoid and wider, posterior part elongate and slender (Fig. 24 A-B) .... ***T. capitatus*** Sublette & Sasa

— Spines placed irregularly between anal point crests; posterior part of anal point not constricted; superior volsella without microtrichia or with microtrichia only on lateral margin (Figs 16 A, 25 A, 28 A-C); form of superior volsella different, if posterior part elongate, then volsella without microtrichia (Fig. 13 A-B) ..... **29**

**29** Superior volsella ovoid, median margin convex, with 3 setae (Fig. 47 A-B); antennal ration low, less than 0.60 (Tab. I) ..... ***T. friburgensis*** spec. nov.

— Superior volsella not ovoid, median margin concave, with 1-2 setae (Figs 12 A-B, 15 A, C); antennal ration higher, more than 0.70 (Tab. I) ..... **30**

**30** Anal point with many (more than 25) small spines between crests; anal point robust and lanceolate; superior volsella circular, without microtrichia, posteromedian corner elongate and well projecting (Fig. 28 A-C) ..... ***T. hastatus*** Sublette & Sasa

— Anal point with fewer (less than 15) larger spines between crests; anal point thinner, elongate, not lanceolate (Figs 13 A, 15 A, 25 B); superior volsella heart-like (Figs 15 B, 16 B, 25 A) or somewhat T-shaped (Fig. 13 B), microtrichia absent or present, posteromedian corner only slightly projecting or not projecting, if well projecting then volsella with microtrichia (Fig. 26 A) ..... **31**

**31** Anal tergal bands short, not running parallel, ending well anterior to anal point (Tab. V); median volsella with subulate or foliate lamellae (Figs 25 C, 26 C); superior volsella with microtrichia (Figs 25 A, 26 A); wing vein M with setae (Tab. III) ..... **32**

— Anal tergal bands long, running parallel and ending more or less close to anal point (Figs 12 A, 13 A, 15 A, 16 A); median volsella with pectinate lamellae (Figs 12 C, 16 C); superior volsella with (Fig. 15 B) or without microtrichia (Figs 12 B, 13 B, 16 B); wing vein M with or without setae (Tab. III) ..... **33** (*T. riopreto* species group)

**32** Median volsella with subulate lamellae (Fig. 25 C); digitus long and thumb-like (Fig. 25 A) ..... ***T. guatemalensis*** Sublette & Sasa

— Median volsella with foliate lamellae (Fig. 26 C); digitus long and pointed, finger-like (Fig. 26 A) ..... ***T. pandus*** Sublette & Sasa

**33** Anal tergite with microtrichia-free areas posteriorly; anal point with microtrichia (Figs 13 A, 15 A) ..... **34**

— Anal tergite without microtrichia-free areas; anal point without microtrichia (Figs 12 A, 16 A) ..... **35**

**34** Superior volsella T-shaped, without microtrichia, posterior part elongate, setae placed mainly on anterior part (Fig. 13 B); wing veins M, Cu, Postcubitus and wing cells m, cu and an bare (Tab. III) ..... ***T. cuieirensis*** Fittkau & Reiss

— Superior volsella heart-like, with microtrichia, posterior part not elongate, setae placed mainly on posterior part (Fig. 15 B); wing veins M, Cu, Postcubitus and wing cells m, cu and an with setae (Tab. III) ..... ***T. cururui*** Fittkau & Reiss

**35** Anal point rounded at tip (Fig. 12 A); anterior margin of superior volsella convex (Fig. 12 B) ..... ***T. branquini*** Fittkau & Reiss

— Anal point pointed at tip (Fig. 16 A); anterior margin of superior volsella straight (Fig. 16 B) ..... ***T. riopreto*** Fittkau & Reiss

## 5.2. Key to pupae

The diagnostic key comprises all pupae of the Neotropical *Tanytarsus* species revised in this work, as well as pupae of the Nearctic *Tanytarsus limneticus*, of the Neotropical *Nimbocera patagonica* and of two *Tanytarsus* species which are transferred here to the genus *Caladomyia*. The term "shagreen" is used for pattern/ field of spinules on abdominal segments.

**1** Abdominal tergites III-IV with median field of shagreen extending from anterior to posterior part of tergite; paired bands or patches of spines absent (Fig. 38 B) ..... **2** (*Tanytarsus marauia* species group)

**—** Abdominal tergites III-IV without median field of shagreen extending from anterior to posterior part of tergite; if shagreen present, then paired bands or patches of spines present (Figs 55 D, 60 D); paired bands or patches of spines present (Figs 18 D, 46 D) ..... **5**

**2** Hook row on tergite II about 1/3 width of tergite II; tergites II-IV with anterior band of somewhat stronger shagreen merging with a median field of finer shagreen (Fig. 44 B) ..... ***Tanytarsus xingu*** Sanseverino *et al.*

**—** Hook row on tergite II about 1/5 width of tergite II; tergites II-VI with relatively homogeneous shagreen (Figs 38 B, 40 B, 42 B) ..... **3**

**3** Mid area of shagreen on tergite II consisting of elongated spinules not arranged in rows (Fig. 40 B); thoracic horn less than 10 times as long as wide, with strong spinules (Fig. 40 A) ..... ***T. revolta*** Sanseverino *et al.*

**—** Mid area of shagreen on T II consisting of spinules clearly arranged in rows (Figs 38 B, 42 B); thoracic horn more than 10 times as long as wide, with small spinules (Fig. 38 A, 42 A) ..... **4**

**4** Posterolateral comb of segment VIII consisting of one posterior strong tooth and adjacent spines decreasing in size anteriorly, comb extending from posterior to anterior 2/3 on lateral (Fig. 38 C) ..... ***T. marauia*** Sanseverino *et al.*

**—** Posterolateral com of segment VIII with one posterior strong tooth and few adjacent spinules, comb not extending on lateral (Fig. 42 D) ..... ***T. waika*** Sanseverino *et al.*

**5** Tergite III with pair of long bands of long spines (Figs 18 D, 27 E), bands more than 1/3 length of tergite ..... **6**

— Tergite III without long bands of long spines, with oval to elongate patches of short spines (Figs 46 D, 55 D); if bands of spines present on T III, than bands shorter, less than 1/3 length of tergite (Fig. 60 D) ……..……...…….…… **15**

**6** Tergite IV with pair of bracket-shaped bands of spines, spines directed to caudal and oral (Figs 31 E, 36 D) ..... **7**

— Tergite IV without bracket-shaped bands of caudally and orally directed spines; T IV with pair of straight to slightly curved bands of spines (Figs 18 D, 29 C) or with oval/elongate patches of spines (Fig. 69 A) ..... **10**

**7** Posterolateral comb of segment VIII somewhat rounded, about as wide as long (Fig. 36 E); wing sheath without nose (Fig. 36 B) ..... ***Nimbocera patagonica*** Reiss

— Posterolateral comb of segment VIII somewhat rectangular, quite broad, 3-5 times wider than long (Figs 14 D, 31 F); wing sheath with nose ..... **8**

**8** Anterior part of tergite IV bracket-shaped bands with thin, elongate spines directed to caudal, mid part with short spines directed to median, occasionally sparse or absent, posterior part with short spines directed to median, lateral and caudal, short spines of mid and posterior section cone-shaped (Fig. 14 B-C); tergite V with pair of elongate patches of spines (Fig. 14 B) ..... ***T. cuieirensis*** Fittkau & Reiss

— Bracket-shaped bands of tergite IV without cone-shaped spines, anterior part with thin, shorter spines directed to caudal and median, posterior part with longer spines directed to oral (Fig. 31 E); tergite V with pair of rounded to oval patches of spines ..... **9**

**9** Abdominal segment I with 2 dorsal taeniae and 1 dorsal seta (Fig. 31 E); tergite III with spine bands on posterior half; tergite VII without armament; prealar tubercle well developed, somewhat rounded/quadrate (Fig. 31 B) ..... ***T. limneticus*** Sublette

— Abdominal segment I without dorsal taeniae, all three dorsal setae shorter (Fig. 33 C); tergite III with spine bands extending from anterior to posterior half of tergite; tergite VII with anterolateral shagreen; prealar tubercle weakly protuberant, wrinkles present on this area (Fig. 33 B) ..... ***T. rhabdomantis*** (Trivinho-Strixino & Strixino)

**10** Tergite IV with pair of oval/elongate patches of short spines, some spines placed closer to each other or on same base, giving an appearance of "multiple" spines (Fig. 69 A-B); segment IV with 1 lateral taenia and 2 lateral setae (Fig. 69 A); precorneal setae placed in triangular pattern (Fig. 68 B) ..... ***Caladomyia tuberculata*** (Reiss)

— Tergite IV with pair of bands of longer and shorter spines (Figs 18 D, 29 C), without "multiple" spines; segment IV without lateral taenia, all three lateral setae shorter and not taeniate; precorneals not in triangular pattern (Figs 18 B, 29 A) ..... **11**

**11** Abdominal segment VIII with 5 lateral taeniae; abdominal segment VII with 4 lateral setae, all four setae, or at least one, taeniae; spine bands on tergite IV more than 1/2 length of tergite (Figs 18 D, 20 D, 51 D); frontal apotome with swelled area (Figs 18 A, 20 A, 51 A) ..... **12**

— Abdominal segment VIII with 4 lateral taeniae; abdominal segment VII with 3 lateral setae, all setae long but not taeniae; spine bands on tergite IV less than 1/2 length of tergite (Figs 27 E, 29 C); frontal apotome without swelled area (Fig. 27 A) ..... **14**

**12** Abdominal segment V with 3 lateral taeniae; abdominal segment I with 3 dorsal, short setae; tergite VIII with anterolateral fields of shagreen; tergite IX with anterior field of shagreen (Fig. 51 D); prealar tubercle peculiar, anvil-shaped (Fig. 51 B); wing sheath without nose (not figured) ..... ***T. rinihuensis*** Reiss

— Abdominal segment V without lateral taeniae, with 3 lateral setae; segment I with 2 dorsal long taeniate setae or taeniae and 1 dorsal seta; tergites VIII and IX without armament (Figs 18 D, 20 D); prealar tubercle not anvil-shaped, rounded to rectangular (Figs 18 B, 20 B); wing sheath with well-developed nose (not figured) ..... **13**

**13** Abdominal segment VI with 3 lateral taeniae (Fig. 18 D); pedicel sheath tubercle present (Fig. 18 A); area anterior to cephalic tubercles slightly swelled (Fig. 18 A) ..... ***T. clivosus*** Reiss

— Abdominal segment VI with 3 lateral setae (Fig. 20 D), not taeniae; pedicel sheath tubercle absent (Fig. 20 A); area anterior and around cephalic tubercles strongly swelled (Fig. 20 A) ..... ***T. hamatus*** Reiss

**14** Tergite II with anterior pair of rounded patches of spines and field of shagreen interrupted medially; tergite VI without armament (Fig. 29 C); thoracic horn smooth (Fig. 29 A); posterolateral comb of segment VIII oval, 1.5 times wider than long (Fig. 29 D); cephalic tubercles well developed, cone-shaped (not figured) ..... ***T. hastatus*** Sublette & Sasa

— Tergite II without paired patches of spines, with median field of shagreen; tergite VI with pair of rounded patches of spines (Fig. 27 E); thoracic horn with few spinules (Fig. 27 D); posterolateral comb of segment VIII broad, 3 times wider than long (Fig. 27 F); cephalic tubercles weakly developed (Fig. 27 A) ..... ***T. pandus*** Sublette & Sasa

**15** Abdominal segment VIII with 5 lateral taeniae; tergite II with median field of shagreen extending from anterior to posterior part of tergite (Figs 46 D, 55 D); thoracic horn with armament (Figs 46 B, 60 C); anal lobe fringe with less than 40 taeniae (Figs 46 E, 60 D);

hook row less than 1/2 width of abdominal segment II (Figs 46 D, 55 D); frontal apotome without large swellings (Figs 46 C, 55 A) ..... **16**

— Abdominal segment VIII with 4 lateral taeniae; tergite II with field/band of shagreen only on anterior part of tergite (not figured, Table VIII); thoracic horn smooth, without armament (Tab. VII); anal lobe fringe with more than 70 taeniae (Tab. VIII); hook row more than 1/2 width of abdominal segment II (Tab. VIII); frontal apotome with large swellings (Tab. VI) ..... **18**

**16** Tergites III-IV with pair of oval/elongate patches of spines, field of shagreen absent (Fig. 46 D); tergites VIII and IX without armament (Fig. 46 E); abdominal segment V with 3 short lateral setae; segment VI with 4 short lateral setae; segment VIII with 1 pair of dorsal setae; prealar tubercle well developed, cone-shaped (Fig. 46 A) ..... ***T. amazonicus*** spec. nov.

— Tergites III-IV with pair of oval/elongate patches or short bands of spines in addition to field of shagreen; tergites VIII and IX with armament (Figs 55 D, 60 D); abdominal segments V and VI with 3 long lateral taeniae; segment VIII with 2 pairs of dorsal setae; prealar tubercle weakly developed, somewhat rounded (Figs 55 B, 60 B) ..... **17**

**17** Tergite II with anterior pair of oval patches of spines and median field of shagreen; tergites III-IV with patches of short spines; tergite IX with shagreen extending from anterior to posterior part, shagreen on posterior part stronger; abdominal segments IV and VII with 3 lateral taeniae (Fig. 55 D) ..... ***T. ligulatus*** Reiss

— Tergite II with median field of shagreen, without patches of spines; patches on tergites III-IV with short bands of short and long spines; tergite IX with shagreen only on anterior part; abdominal segment IV with 3 lateral setae, segment VII with 4 lateral taeniae (Fig. 60 D) ..... ***T. fastigatus*** Reiss

**18** Frontal setae present; cephalic tubercles weakly developed (Tab. VI); precorneals placed in triangular pattern (Tab. VII); tergite II with anterior field of shagreen; tergite III only with pair of oval/elongate patches of spines, without field of shagreen (Tab. VIII) ..... ***T. impar*** Trivinho-Strixino & Strixino

— Frontal setae apparently absent; cephalic tubercles cone-shaped (Tab. VI); precorneals not in triangular pattern (Tab. VII); tergite II with anterior field of shagreen, field larger at middle of tergite; tergite III with pair of oval patches of spines in addition to anterolateral field of shagreen (Tab. VIII) ..... ***T. magnus*** Trivinho-Strixino & Strixino

# 6. FINAL DISCUSSION

The family Chironomidae is important not least for its high species diversity and world-wide distribution, including Antarctica. These two features are partially explained by the wide variety of ecological conditions to which chironomids are adapted, and by the great age of the family (Coffman 1995).

The immature stages, the larvae and pupae, inhabit a wide range of habitats, freshwater, brackish, marine and terrestrial environments. The notable species richness of the family within particular biotopes, especially aquatic ones, is mainly explained by the success of chironomid larvae in exploiting a wide spectrum of trophic, temporal and micro-spatial aspects of the ecosystems in which they occur (Coffman 1995). However, the larvae of relatively few species show conspicuous morphological adaptations to their life mode (Pinder 1995). In general, chironomid larvae are morphologically diagnosable at genus level, but in some cases that is not possible; for example, within the tribe Tanytarsini, recently described larvae of the genus *Caladomyia* (Trivinho-Strixino & Strixino 2000b; Trivinho-Strixino & Strixino 2003) can not be separated from those of *Tanytarsus* van der Wulp and/ or *Nimbocera* Reiss.

The chironomid pupal stage is short, rarely exceeding 72 hours in duration (Langton 1989), with the exception of some Podonominae, whose time spent as pupae may be up to 12 days (Cranston & Edward 1992). According to Langton (1989), this short period would seem unlikely to generate a diversity of detail in structure, which allows identification not only to genus, but also to species. Langton (1989) indicated that there are three pupal habitats: within the larval cuticle, within the pupal tube and free-living on the way to surface for imaginal ecdysis. The pupal structure is highly functional (Langton 1989) and many features are related to respiration and locomotion (Fittkau 1960). Relatively higher evolutionary conservatism, and consequently well-defined phylogenetic and taxonomic boundaries, can be expected in the pupal stage due to the apparently lack of strong selection pressures for feeding and reproduction and the degree of genetic uniqueness (Coffman 1979): except for respiratory and locomotory structures, selection pressure on the pupa is probably weak, permitting the development and retention of novelties.

Most chironomid adults live for a few days, but some species survive up to two weeks. The imaginal stage serves the purposes of reproduction and dispersal (Coffman & Ferrington 1996). The emergence of the adult midge from the pupal skin is rapid and the adult is able to fly almost immediately (Armitage 1995). Some morphological and physiological variation is

associated with the broad ranges of environmental conditions to which members of a given species are exposed.

The external features of chironomid adults are very diverse and usually permit differentiation of species and recognition of diagnostic characters. In the tribe Tanytarsini, generic separation is based mostly upon features of the male genitalia, supported by characteristics of the larvae and pupae (Cranston 1997). Among the Tanytarsini, the genus *Tanytarsus* is particularly speciose, with more than 300 species world-wide (Ekrem 2003). The genus has a global distribution and occurs in a wide range of biotopes. *Tanytarsus* exhibits considerable morphological variation in the male genitalia and in the pupae, so that not a single synapomorphy for the genus is known (Ekrem 2003).

The adult male genitalia of *Tanytarsus* show species-specific variation and, together with other characters - such as antennal, leg and wing ratios, thorax setation and coloration, wing venation and setosity and legs armament (combs and spurs) - allow taxonomic and phylogenetic predictions. Such variety of morphological features is also observed among the Neotropical members of *Tanytarsus*. Thus, after detailed investigation it was possible to distinguish diagnostic characters in the adult males and associated pupae of Neotropical *Tanytarsus* and closely related taxa, and to delimit species based on morphology.

A phylogenetic analysis of the Neotropical *Tanytarsus* species would be necessary to clarify the systematic positions of many taxa and to test the validity of postulated groups and relations to other genera. However, given the heterogeneity of Neotropical *Tanytarsus* and some probable similarities among Neotropical and non-Neotropical species, such an analysis would only make sense if some taxa from other zoogeographical regions were included, and when more life stages of the species treated are available for analysis. Although a phylogenetic analysis was not performed, potentially useful characters were tentatively selected and presented as follows. The selection of characters and their states was based on pupae and adult males of the reviewed Neotropical *Tanytarsus*, including also the Nearctic *T. limneticus* Sublette and the Neotropical *Caladomyia alata* (Paggi) comb. nov., *Caladomyia tuberculata* (Reiss) comb. nov. and *Nimbocera patagonica* Reiss. The selected characters and their states were compared among the studied species and are discussed below. Characters which are intraspecifically variable, or which show continuous variation, rendering the delimitation of states difficult and subjective, were not included.

**A preliminary list of characters and character states, with notes and comments on character variations among the reviewed Neotropical *Tanytarsus*, *Nimbocera patagonica*, *Caladomyia alata*, *Caladomyia tuberculata* and the Nearctic *Tanytarsus limneticus***

## Male Imago

### Head

1. Antennal ratio. AR <0.7 (0), AR 0.71-1.05 (1), AR > 1.05 (2).

In about 53% of the studied taxa present the antennal ratio varies between 0.71 and 1.05, while 31 % have an antennal ratio higher than 1.05 and 16% lower than 0.7.

2. Antennal plume. Normal, well-developed (0), reduced (1)

Some sensillar structures of the antenna interpret wind speed in normally plumed males; non-plumed males are poor fliers or brachypterous, and normally mate on the ground or water surface (Sublette 1979). *Nimbocera patagonica* is the only included species with reduced antennal plume; all other studied taxa have normal, well-developed antennal plume.

3. Eyes. Without dorsomedian extension (0), with dorsomedian extension (1).

Among the studied species, only the eyes of *Tanytarsus jacaretingensis* spec. nov. and *Tanytarsus monospinosus* do not show a dorsomedian elongation; all other taxa present eyes with dorsomedian extension.

4. Frontal tubercles. Absent (0), small, ≤ 10 µm (1), medium sized, 11-15 µm (2), large, 15-25 µm (3), very large > 35 µm (4).

Frontal tubercles are absent in *Tanytarsus curvicristatus*, *T. impar*, *T. magnus* and *T. tumultuarius*. Most of the studied taxa have small or medium-sized or large frontal tubercles. Very large frontal tubercles are observed in *Tanytarsus ligulatus* and *Tanytarsus paraligulatus*.

5. Number of clypeal setae. < 32 setae (0), > 38 (1).

Most of the studied taxa have fewer than 32 setae on the clypeus. Only *Tanytarsus magnus* presents more than 38 clypeal setae.

6. Palp length. Length <280 µm (0), length 290-600 µm (1), length > 610 µm (2).

*Nimbocera patagonica* is the only species with a short palp (shorter than 280 µm). Most of the studied taxa can be placed in the group in which the palpal length varies between 290-595 µm. *Tanytarsus impar* and *Tanytarsus magnus* have palps longer than 610 µm.

**Thorax**

7. Scutal tubercle. Absent (0), present (1).

Among the studied taxa, only *Tanytarsus jacaretingensis* spec. nov. has a tubercle on the scutum.

8. Number of acrostichals. Absent (0), present (1).

Only *Tanytarsus monospinosus* does not have acrostichals.

9. Wing length/ wing width ratio. L/WR ≤ 2.8 (0), L/WR > 3.10 (1).

Almost all studied taxa have a wing length/ width ratio higher than 3.10; only *Nimbocera patagonica* shows a lower ratio (less than 2.8).

10. Wing vein Sc. Bare (0), with setae (1).
11. Wing vein M. Bare (0), with setae (1).
12. Wing vein $M_{3+4}$. Bare (0), with setae (1).
13. Wing vein Cu. Bare (0), with setae (1).
14. Wing vein $Cu_1$. Bare (0), with setae (1).
15. Wing vein Postcubitus. Bare (0), with setae (1).
16. Wing vein An. Bare (0), with setae (1).
17. Wing cell $m_{3+4}$. Bare (0), with setae (1).
18. Wing cells cu and an together. Bare (0), with setae (1).

The setosity of wing veins and cells can give taxonomic and phylogenetic information (Cranston 1995b). The presence/absence of setae on some veins and in some cells shows interspecific variation in the studied taxa.

19. Armament of tibiae. Tibiae with normal spurs and combs, i.e. fore tibia with spur, mid and hind tibiae with one pair of well separated combs, each comb with spur (0), tibiae with

reduced spurs and combs, i.e. spurs absent or present in one or two of the tibial combs (always absent on fore tibia), combs smaller and narrowly separated (1).

Only *Nimbocera patagonica* shows reductions of tibial spurs and combs. All other studied taxa have "normal" tibial spurs and combs.

The following ratios (characters 20-22) of some or all leg segments could be useful to understand swarming and mating behaviour. These ratios may give an indication of species habits and habitats, since they reflect the contact between the leg segments and the environment surface. According to Armitage (1995), mating can take place in the air by swarming, in the aerial swarm or on the ground by searching, or swarming is omitted and mating takes place only on the ground (or water) by searching.

20. Leg ratio (LR) of fore leg. LR < 1.3 (0), LR 1.8-3.2 (1), LR > 3.2 (2).

Most of the studied taxa can be placed in the groups with states 1 or 2. *Nimbocera patagonica* is the only species in which the leg ratio is lower than 1.3.

21. Beinverhältnis (BV) values of fore leg. BV < 1.95 (0), BV ≥ 2.0 (1).

Pagast (1947) defined the BV to express the proportions of the fore leg segments not touching the ground versus those on the ground in the resting adult; high BV values mean that the leg parts off the ground are relatively longer. All studied taxa except *Nimbocera patagonica* have BV values which are lower than 1.95; *N. patagonica* shows a higher BV (≥ 2.0).

22. Schenkel-Schieneverhältnis (SV) of fore leg. SV ≤ 1.5 (0), SV > 1.9 (1).

The SV primarily indicates whether the metatarsus is elongated with no concurrent extension of the tibia of the femur (Pagast 1947). Analogous to the preceding character, all studied taxa except *Nimbocera patagonica* have SV values which are lower than 1.5; only *N. patagonica* shows a higher SV (≥ 2.0).

**Hypopygium**

23. Median setae of tergite IX. Absent (0), present (1).

The median setae of tergite IX are absent in *Tanytarsus fastigatus* and in *Nimbocera patagonica*, present in all other studied taxa.

The combination of absence of median setae on anal tergite and presence of setae on anal point (see characters 37 and 38) has been registered in the Neotropics for *T. fastigatus* only. These features are found in the Holarctic *Tanytarsus recurvatus* species group, in which the general hypopygium design resembles that of *T. fastigatus*.

The absence of median anal tergite setae in *N. patagonica* could be interpreted as a reduction, since the species shows many other reduced features which are somewhat similar to those observed in the Nearctic *Tanytarsus aquavolans* Butler. The latter species also lacks median setae on the anal tergite.

24. Arrangement of median setae of tergite IX. Separated into groups (0), not separated into groups (1).

*Tanytarsus curvicristatus* is the only species that shows the median anal tergite setae separated into two groups located at the ends of the anal tergal bands. All other studied taxa do not show grouped median setae.

Grouped median anal tergite setae are found in many species of *Paratanytarsus* Thienemann & Bause. Contreras-Lichtenberg (1988) discussed that *T. curvicristatus* could belong to the genus *Paratanytarsus,* but in view of other characters the species belongs to *Tanytarsus*. In fact, *T. curvicristatus* has only the arrangement of the median anal tergite setae in common with *Paratanytarsus*; all other features such as armament of anal point, superior volsella, digitus and median volsella are different.

25. Anal tergal bands. V-type (0), T-type (1), Y-type (2).

The design of the anal tergal bands can distinguish species groups or even genus-group taxa. Most of the studied taxa have V-type anal tergal bands. Y-type bands are found in *Caladomyia alata* comb. nov., *C. tuberculata* comb. nov., *Tanytarsus jacaretingensis* spec. nov. and *Tanytarsus monospinosus,* while T-type anal tergal bands are observed in *Tanytarsus ligulatus, T. paraligulatus* and *T.* cf. *ligulatus*.

26. Extension of V-type anal tergal bands. Not reaching middle of tergite (0), ending almost in contact on middle of tergite (1), ending parallel and well anterior to anal point base (2), ending parallel and close to anal point base (3).

In taxa with V-type anal tergal bands, the length of the tergal bands shows interspecific variation and could be helpful in species diagnosis.

27. Microtrichia-free area on tergite IX. Absent (0), present (1).

Among the studied taxa, 58% do not present a microtrichia-free area on the anal tergite, while 42% present a small to large microtrichia-free area.

28. Shoulders on posterior margin of tergite IX. Absent (0), present (1).

The presence of shoulders on the anal tergite was only observed in *Caladomyia alata* comb. nov. and *Caladomyia tuberculata* comb. nov.

29. Form of anal point tip. Pointed (0), rounded (1), quadrate (2), spoon-like (3).

The shape of the anal point apex seems to be species-specific, although some variation can occur intraspecifically. *Tanytarsus hamatus* and *T. limneticus* have the anal point pointed to slightly rounded at tip, and rounded to slightly pointed at tip, respectively. A spoon-shaped anal point is observed only in *Tanytarsus ligulatus*, *T. paraligulatus* and *T.* cf. *ligulatus*.

The anal point armament of Tanytarsini is the most diverse in the Chironomidae. The presence, form and placement of crests, microtrichia, spines, setae and bars (characters 30-40) have been used to separate species, species groups and even genera, and are commented on as follows.

30. Pair of anal point crests. Absent (0), present (1).

The presence of crests on the anal point is helpful to delimit groups of *Tanytarsus* species and even other genera. *Nimbocera patagonica* and most of the studied *Tanytarsus* have a pair of anal crests. *Tanytarsus fastigatus*, *T. impar*, *T. magnus* and *T. reissi* do not present anal point crests, neither do *Caladomyia alata* comb. nov. and *Caladomyia tuberculata* comb. nov. In the diagnostic description of the genus *Caladomyia*, Säwedal (1981) stated that anal point crests are always absent.

31. Placement of anal point crests. Parallel, placed lateral on anal point (extending from anterior to posterior part of anal point) (0), placed on the anterior origin of the anal point (1), placed on the tip of the anal point (2).

Among the species with anal point crests, most present the crests placed parallel and lateral on the anal point. *Tanytarsus curvicristatus* has crests placed anterior on the anal point, while the anal crests of *Tanytarsus ligulatus*, *Tanytarsus* cf. *ligulatus* and *Tanytarsus paraligulatus* are placed on the anal point apex.

32. Microtrichia on anal point. Absent (0), present (1).

The presence of microtrichia on the anal point is observed in *Nimbocera patagonica*, *Tanytarsus capitatus*, *T. cuieirensis*, *T. cururui*, *T. digitatus*, *T. friburgensis*, *T. limneticus*, *T. marauia*, *T. revolta*, *T. rhabdomantis*, *T. waika* and *T. xingu*. Among the studied taxa, the occurrence of microtrichia on the anal point has been observed in species which also present anal point crests, i.e. not all species with anal point crests present microtrichia on the anal point, but almost all species with microtrichia on the anal point present anal point crests as well. The only exception is *Tanytarsus reissi*, which presents microtrichia on the anal point but no anal point crests.

33. Extent of microtrichia on anal point. On anterior half of anal point (0), on anterior and posterior half (1).

Although in some cases difficult to delimit, the extent of microtrichia on the anal point seems to vary interspecifically among the studied taxa.

34. Spines on anal point. Absent (0), present (1).
35. Number of spines on anal point. 1-2 spines (0), > 4 spines (1).
36. Arrangement of spines on anal point. Irregular (0), regular (in one row) (1).

The occurrence, number and arrangement of spines on the anal point can be useful to separate species and groups of *Tanytarsus* species. Reiss & Fittkau (1971) and Cranston *et al.* (1989) separated Holarctic groups of *Tanytarsus* based on a combination of features, including the absence or presence of spines, and the arrangement of spines on the anal point (irregularly arranged or arranged in regular longitudinal row).

About 59% of the studied taxa show spines on the anal point. The following species do not have such spines on anal point: *Caladomyia alata* comb. nov., *C. tuberculata* comb. nov., *Nimbocera patagonica*, *Tanytarsus curvicristatus*, *T. fastigatus*, *T. impar*, *T. ligulatus*, *T.* cf. *ligulatus*, *T. magnus*, *T. paraligulatus*, *T. pararinihuensis*, *T. pseudorinihuensis*, *T. reissi*, *T. rhabdomantis* and *T. rinihuensis*.

Most of the species with spines on the anal point present more than 4 spines. Only *Tanytarsus jacaretingensis*, *T. monospinosus* and *T. tumultuarius* show 1-2 spines.

Only two species show spines regularly arranged in one row, namely *Tanytarsus amazonicus* and *T. capitatus*. Except for the spines arrangement, *T. amazonicus* does not

have any other feature in common with *T. capitatus*; even the spines and the anal points of both species are not similar in form.

37. Setae on anal point. Absent (0), present (1).
38. Setae on anal point. Long (0), short, spiniform (1).

Few of the studied taxa show setae on the anal point; among these taxa, the form of the setae varies and seems to be indicative of relationships. *Caladomyia alata* comb. nov. and *Caladomyia tuberculata* comb. nov. have long setae on the anal point, as also observed in other species of *Caladomyia*. *Tanytarsus fastigatus* also has long setae, and shares the combination of absence of median setae on the anal tergite and presence of setae on the anal point with species of the Holarctic *Tanytarsus recurvatus* group. As mentioned above, *C. alata* comb. nov., *C. tuberculata* comb. nov. and *T. fastigatus* do not present anal point crests. In contrast, *Tanytarsus rhabdomantis* and *Nimbocera patagonica* have many short, spiniform setae between the anal point crests, while *Tanytarsus limneticus* has only 2 short, spiniform setae and many spines between the anal point crests.

39. Bars on anal point. Absent (0), present (1).
40. Orientation of bars on anal point. Anteriorly directed (0), posteriorly directed (1).

The occurrence of bars on the anal point supported the creation of the genus *Caladomyia* by Säwedal (1981) and the genus *Virgatanytarsus* by Pinder (1982). In *Caladomyia* the bars are posteriorly directed, while in *Virgatanytarsus* they are anteriorly directed. Among the studied taxa, only *Caladomyia alata* comb. nov. and *Tanytarsus curvicristatus* show bars on the anal point. *Caladomyia alata* comb. nov. has one pair of short, posteriorly directed bars, while *T. curvicristatus* has two single bars, one shorter, placed anterior and posteriorly directed, the other longer, placed posterior on anal the point and anteriorly directed.

41. Form of superior volsella. Anterior part broader than posterior one (0), anterior part narrower than posterior one (1), anterior and posterior parts of equal width (2).
42. Median margin of superior volsella. Concave (0), convex (1), straight (2).
43. Posteromedian corner of superior volsella. Not projecting (0), projecting (1).
44. Angle between longitudinal axes of superior volsella and body. Lower than 45° (0), higher than 45° (1).

Although I have tried to describe the shape of the superior volsella for all taxa in the present study, an exact classification into “heart-shaped”, “quadrate”, “oval”, “rectangular”,

etc., is sometimes difficult and subjective. Characters 41-45 all concern the superior volsella shape and do not seem to vary intraspecifically. Ekrem (2003) used several characters related to the shape of the superior volsella; as pointed out by the author, these characters seem to be independent of each other, and thus they will not upweight a particular shape of the superior volsella. Also according to Ekrem (2003), the direction of the superior volsella in relation to body appears to be a good character.

The shape of the superior volsella has been used by many authors (e.g. Reiss & Fittkau 1971; Fittkau & Reiss 1973; Ekrem 2003) to separate species and to distinguish species groups. The Neotropical *riopreto* species group of the genus *Tanytarsus* was described by Fittkau & Reiss (1973) based mainly on hypopygial characters, among them a heart-shaped superior volsella with its longitudinal axis directed at an angle of more than 45° to the longitudinal body axis. Sublette & Sasa (1994) argued for placement of the Guatemalan species *Tanytarsus capitatus*, *T. guatemalensis*, *T. hastatus*, *T. pandus*, the Patagonian *T. clivosus* and *T. hamatus* and the Nearctic *T. limneticus* in the *riopreto* group; these authors also gave attention to the heart-like form of the superior volsella. However, among the taxa mentioned by Sublette & Sasa as potential *riopreto*-group members, only *T. clivosus*, *T. guatemalensis*, *T. limneticus* and *T. pandus* show a somewhat heart-shaped superior volsella. In the "typical" heart-shaped superior volsella the anterior part is broader than the posterior, the median margin is concave and the posteromedian corner is slightly projecting, as observed in *Tanytarsus riopreto*, or not projecting, as in *T. cururui*.

45. Lateral flap-like projection on superior volsella. Absent (0), present (1).

*Tanytarsus jacaretingensis* spec. nov. and *Tanytarsus monospinosus* are the two only species whose superior volsellae have a well-developed lateral flap-like projection.

46. Rugosities/ wrinkles on surface of superior volsella. Absent (0), present on posterior margin (1), present on almost entire surface (2).

*Tanytarsus jacaretingensis* spec. nov. and *Tanytarsus monospinosus* are the two only species which have many wrinkles and rugosities on the superior volsella surface, namely on the lateral, posterior and median margins and on the dorsal surface. *Tanytarsus amazonicus* shows wrinkles only on the posterior margin. All other studied taxa do no present rugosities/ wrinkles on the superior volsella.

47. Microtrichia on superior volsella. Absent (0), present (1).

48. Placement of microtrichia on superior volsella. On dorsolateral surface (0), on dorsolateral and dorsomedian surfaces (1), on dorsolateral and ventromedian surfaces (2).

Most of the studied taxa do not present microtrichia on the superior volsella. *Tanytarsus cururui*, *T. guatemalensis*, *T. impar*, *T. limneticus*, *T. pandus* and *T. rinihuensis* have microtrichia only on dorsolateral surface of superior volsella. *Tanytarsus capitatus* is the only species with microtrichia on the dorsolateral and dorsomedian surfaces of the volsella, while *Tanytarsus tumultuarius* is the only one with microtrichia on the dorsolateral and ventromedian surfaces.

49. Number of setae on median margin of superior volsella. 1-2 setae (0), 3 or more setae (1).

The number of setae on the superior volsella median margin is largely species-specific, although some variation can occur intraspecifically. *Tanytarsus curvicristatus* and *T. limneticus* are the only species in which this character would be coded as polymorphic.

50. Placement of ventral seta of superior volsella. On surface (0), on tubercle (1).

The ventral seta of the superior volsella has its basis on the volsellar surface or arises from a weakly to well-developed ventral tubercle. In most of the studied species have the ventral seta of superior volsella placed on a tubercle. In *Caladomyia alata*, *Nimbocera patagonica*, *Tanytarsus monospinosus*, *T. paraligulatus*, *T. reissi* and *T. tumultuarius* the ventral seta is placed on the superior volsella surface.

51. Digitus form. Oval/ rounded (0), finger-like (1), thumb-like (2), leaf-like (3).

52. Digitus development. Very short, difficult to distinguish (0), developed, but not reaching median margin of superior volsella (1), extending a little beyond margin of superior volsella (2), extending well beyond margin of superior volsella (3).

The form and extension of the digitus have been used by many authors to separate species and to characterize species groups. Most of the taxa in the present study have a discernible digitus, varying interspecifically from not reaching the median volsellar margin to extending well beyond this margin. Only *Tanytarsus jacaretingensis* spec. nov. and *Tanytarsus monospinosus* present a small digitus, in fact difficult to distinguish.

53. Digitus basis. Without seta (0), with seta (1).

*Tanytarsus clivosus* and *Tanytarsus hamatus* are the only species presenting seta on digitus base; all other studied taxa do not present such a seta. The occurrence of this seta is diagnostic, and is also observed in species of the Holarctic *Tanytarsus chinyensis* group.

54. Median volsella. Present (0), absent (1).

Among the studied taxa, *Tanytarsus monospinosus* and *Tanytarsus tumultuarius* are the only species that show a reduction of the median volsella. This character should be interpreted carefully and it is questionable whether it should be used in a phylogenetic analysis. Reduction of the median volsella is also observed in other taxa and, as pointed out by Ekrem & Reiss (1999), a reduction of such a complex structure does not have to be regarded as a synapomorphy of all taxa sharing this feature.

55. Form of median volsella lamellae. Ramose (0), subulate (1), foliate (2), pectinate (3), simple (4).

The form of the lamellae of the median volsella is species-specific, and can be helpful to recognize closely related taxa or, in some cases, groups of species. Most of the investigated species show foliate, pectinate or subulate lamellae. Only *Caladomyia alata* comb. nov. has both subulate and pectinate lamella on the median volsella. *Tanytarsus rinihuensis*, *T. pararinihuensis* and *T. pseudorinihuensis* have simple lamellae, while *Nimbocera patagonica* and *Tanytarsus curvicristatus* have ramose lamellae on the median volsella.

56. Inferior volsella thickness. Thin (0), thick (1).
57. Inferior volsella form. Straight (0), curved (1).
58. Distal part of inferior volsella. Without swelling (0), with small swelling (1), with well-developed swelling (2).
59. Gonostylus thickness. Thin (0), thick (1).
60. Gonostylus form. Straight (0), curved (1).
61. Gonostylus apex. Pointed (0), rounded (1).

The respective thickness and form of the inferior volsella and gonostylus show interspecific variation. However, since the delimitation of thin versus thick and straight versus curved is sometimes arbitrary, the use of these characters in a phylogenetic analysis should be considered with caution.

In contrast, the distal part of the inferior volsella seems to be useful to diagnose species and, in some cases, to recognize related ones. For instance, *Tanytarsus ligulatus* and *T.*

*paraligulatus* show similar somewhat rounded-quadrate swellings on the inferior volsella. Most of the studied species have a small or well-developed swelling on the inferior volsella distal portion. *Caladomyia alata* comb. nov., *Tanytarsus amazonicus*, *T. marauia*, *T. tumultuarius* and *T. waika* do not present a swelling on the inferior volsella.

**Pupa**

**Cephalothorax**

62. Frontal seta. Present (0), absent (1).
63. Frontal seta thickness. Thin (0), thick (1).
64. Cephalic tubercles. Reduced or weakly developed (0), well-developed (1).

The thickness of the frontal seta and whether it is seated on a weakly or well-developed tubercle can be useful to separate species and even species groups. Half of studied pupae show a somewhat thick frontal seta, the other half a thin one. *Tanytarsus magnus* was the only species which apparently does not present a frontal seta. Most of the pupae have weakly developed cephalic tubercles. Well-developed, cone-shaped cephalic tubercles are found in *Caladomyia tuberculata* comb. nov., *Tanytarsus hastatus*, *T. ligulatus* and *T. magnus*.

65. Pedicel sheath tubercle. Absent (0) weakly developed (1), well-developed (1).

Most of the studied species show a weakly or well-developed pedicel sheath tubercle. The antennal sheaths of *Tanytarsus hamatus*, *T. impar*, *T. marauia* and *T. rhabdomantis* do not present a tubercle at the pedicel.

66. Thoracic horn armament. Without armament (0), with armament (1).

The presence or absence of armament on the thoracic horn has been used (e.g. Ekrem 2003; Ekrem *et al.* 2003) to separate species and to characterize species groups. Most of the studied pupae have a thoracic horn armed with spinules or spines. A smooth thoracic horn is observed in *Tanytarsus clivosus*, *T. hamatus*, *T. hastatus* and *T. rinihuensis*.

67. Wing sheath nose. Absent (0), nose weakly developed (1), nose well-developed (2).

Most of the studied taxa present either a weakly or a well-developed wing sheath nose. Only *Nimbocera patagonica* and *Tanytarsus rinihuensis* do not show any such nose.

68. Prealar tubercle. Weakly developed (0), well developed (1).

A well-developed prealar tubercle is observed in most of the studied pupae. Although not considered as a suitable character here, the form of the prealar tubercle can be helpful to identify some species. For instance, *Tanytarsus rinihuensis* shows a peculiar anvil-shaped prealar tubercle, and *Tanytarsus amazonicus* a cone-shaped one.

69. Arrangement of precorneal setae. Without pattern (0), in triangular pattern (1).

The arrangement of the precorneal setae seems to be species-specific. The precorneals do not show an arrangement pattern in 60% of the studied taxa, while in 40% they are arranged in a triangular pattern.

70. Thickness of dorsocentral setae. All setae of same thickness (0), each pair of setae with one seta thin and one thick (1).

Although the thickness of the dorsocentrals is sometimes difficult to determine, the presence of at least one thicker and longer dorsocentral is reported in many *Tanytarsus* species. All studied *Tanytarsus* as well as *Nimbocera patagonica* show one seta thin and one thick in each pair of dorsocentrals. Only *Caladomyia tuberculata* comb. nov. presents dorsocentrals all of equal thickness.

**Abdomen**

The armament of the abdominal segments, i.e. the presence/absence of pattern of spinules on abdominal segments (shagreen) as well as the presence/absence and form of paired patches of spines, etc., has been used by many authors (Säwedal 1981; Pinder & Reiss 1986; Langton 1991; Cranston 1996; Ekrem 2003) to separate species, characterize species groups and even to recognize some genera of Tanytarsini. The armament of each abdominal segment shows interspecific variation.

71. Shagreen on abdominal tergite II. Shagreen extending from anterior to posterior area, interrupted or sparse medially (0), shagreen extending from anterior to posterior part, not interrupted medially (1), shagreen only anterior (2).

Most of the studied pupae show shagreen on tergite II, which extends from anterior to posterior parts of the tergite and is or is not interrupted medially. *Tanytarsus impar* and *Tanytarsus magnus* are the only species with shagreen only on the anterior part of the tergite.

72. Paired patches of spines on abdominal tergite II. Absent (0), present (1).

Only *Tanytarsus ligulatus* and *Tanytarsus hastatus* present, in addition to a median field of shagreen, one pair of oval patches of spines anteriorly. Except for sharing this feature, the pupa of *T. ligulatus* differs in all other aspects from *T. hastatus*.

Among the abdominal segments, the armament of tergites III, IV and V exhibits the most diverse species-specific variation in many characters, allowing not only species delimitation but also recognition of closely related ones. The armament of these tergites and its variation among the studied taxa are discussed below, after character 83.

73. Shagreen on abdominal tergite III. Absent (0), shagreen sparse, antero/postero-lateral or antero-median (1), shagreen more extensive (2).
74. Paired patches of spines on tergite III. Absent (0), present (1).
75. Form of paired patches on tergite III. Oval to elongate patches of spines (0), short bands of short and long spines (1), long bands of short and long spines (2).
76. Bands of longer spines on tergite III. Bands straight (0), bands curved (1).
77. Shagreen on abdominal tergite IV. Absent (0), shagreen sparse, antero/postero-lateral or antero-median (1), shagreen more extensive (2).
78. Paired patches of spines on tergite IV. Absent (0), present (1).
79. Form of paired patches on tergite IV. Oval to elongate patches of spines (0), short bands of short and long spines (1), long bands of long spines (2).
80. Bands of longer spines on tergite IV. Bands with spines posteriorly directed (0), bands with spines anteriorly, medially and posteriorly directed (1).
81. Length of bands of spines on tergite IV. Spine bands less than 1/2 length of tergite (0), spine bands more than 1/2 length of tergite (1).
82. Shagreen on abdominal tergite V. Absent (0), shagreen sparse, antero/postero-lateral or antero-median (1), shagreen more extensive (2).
83. Paired patches of spines on tergite V. Absent (0), present (1).

Abdominal tergite III as well as tergites IV and V of *Tanytarsus marauia*, *T. revolta*, *T. waika* and *T. xingu* show an armament consisting of a more or less rectangular, median field of shagreen, without paired patches of spines. The four species form the *Tanytarsus marauia*

species group. Among the studied taxa, such armament of tergites III-V is only observed in the *marauia* group. The abdominal tergites III-V of all other species present paired spine patches, which can vary in form and length. In addition to the paired spine patches, some species show a median and/or lateral field of shagreen anteriorly.

Tergites III-V of *Tanytarsus amazonicus* and *Tanytarsus impar* are armed with only one pair of oval to elongate patches of spines.

*Tanytarsus magnus* has oval patches of spines and antero-lateral shagreen on tergite III, and only oval patches of spines on tergites IV and V.

*Tanytarsus ligulatus* presents oval to elongate paired spine patches on tergites III-V, in addition to a median, more extensive field of shagreen.

Pupae of *Nimbocera patagonica*, *Tanytarsus cuieirensis*, *T. limneticus* and *T. rhabdomantis* have a somewhat similar armament of tergites III-V: Tergite III in all four species has curved long bands of long spines, and antero-lateral fields of shagreen close to the bands; tergite IV armament is quite peculiar, consisting of long bands with spines anteriorly, medially and posteriorly directed, without shagreen; tergite V shows a pair of patches of spines, shagreen is absent.

Tergites III-V of *Tanytarsus hastatus* and *Tanytarsus pandus* show a similar armament: Tergites III-IV are armed each with a pair of long bands of longer spines and some shagreen on the antero-lateral side of each band, length of the bands on tergite IV less than 1/2 tergite length; tergite V has only paired spine patches.

*Tanytarsus clivosus* and *Tanytarsus hamatus* have a pair of long bands of longer spines and sparse, anteromedian and/ or antero-lateral shagreen on tergites III and IV, the length of the bands on tergite IV is less than 1/2 length of tergite. Tergite V in *T. clivosus* and *T. hamatus* has paired spine patches. A similar pattern of armament of tergites III and IV is found in *Tanytarsus rinihuensis*, with tergite V showing paired spine patches and shagreen.

Abdominal tergites III and IV of *Tanytarsus fastigatus* present a pair of short bands of short and long spines in addition to median and lateral shagreen, while tergite V has paired patches of spines anteriorly and median and lateral shagreen.

*Caladomyia tuberculata* comb. nov. has long bands of spines on tergite III, and oval to elongate patches of spines on tergites IV and V.

84. Shagreen on abdominal tergite VI. Absent (0), present (1).
85. Paired patches of spines on tergite VI. Absent (0), present (1).

Most of the investigated taxa show rounded/oval/elongate paired patches of spines on tergite VI and no additional shagreen. The *marauia* group species, i.e. *Tanytarsus marauia*, *T. revolta*, *T. waika* and *T. xingu*, do not possess paired patches of spines but a field of shagreen. *Tanytarsus hastatus* is the only species which does not present armament (neither shagreen nor spine patches) on tergite VI.

86. Shagreen on abdominal tergite VII. Absent (0), present (1).

Only *Tanytarsus marauia*, *T. revolta* and *T. rhabdomantis* show shagreen on tergite VII.

87. Shagreen on abdominal tergite VIII. Absent (0), present (1).

Only the pupae of *Tanytarsus amazonicus*, *T. clivosus*, *T. hamatus*, *T. hastatus* and *T. pandus* do not present shagreen on tergite VIII.

88. Shagreen on abdominal tergite IX. Absent (0), present (1).

Only *Tanytarsus amazonicus*, *T. clivosus* and *T. hamatus* do not have shagreen on tergite IX.

89. Armament on abdominal pleura. Absent (0), present (1).

Only *Tanytarsus clivosus*, *T. cuieirensis* and *T. hamatus* show armament on abdominal pleura.

90. Form of posterolateral armament of segment VIII. One strong posterior tooth and smaller anterior teeth (0), "true comb" (strong teeth on postero-lateral margin of segment VIII and smaller teeth anterior, together forming a contiguous comb) (1).

91. Width of posterolateral comb of segment VIII. Width < 80 µm (0), width > 80 µm (1).

The postero-lateral margins of segment VIII are armed with a comb of teeth, or with a stout tooth and additional smaller ones. The shape and arrangement of the comb or teeth are used to separate species, groups of species and even genera.

Most of the studied pupae have a comb consisting of posterior stronger teeth and more anterior smaller ones. Only *Tanytarsus marauia* and *Tanytarsus waika* show one strong posterior tooth and smaller more anterior teeth.

*Tanytarsus cuieirensis*, *T. hamatus*, *T. limneticus*, *T. pandus*, *T. rhabdomantis* and *T. rinihuensis* have an unusual broad anal comb (width > 80 µm). As discussed in this dissertation, the presence of an unusually broad anal comb could be considered diagnostic for

the *riopreto* group. However, such a comb is neither exclusive to this group nor even to the genus *Tanytarsus*. A peculiar, broad anal comb can be found in pupae of the Palaearctic-Afrotropical *Virgatanytarsus* Pinder. Cranston (2000) reported the presence of broad combs in pupae of Australian *Tanytarsus*.

The number and development (if "seta" or "taenia") of lateral setae on the abdominal segments allow species delimitations and recognition of close-related taxa.

Almost all studied pupae have 3 lateral setae or taeniae on abdominal segments IV-VI. *Tanytarsus amazonicus* is the only one showing 4 lateral setae on abdominal tergite VI, but this character was not consider since only one pupa of *T. amazonicus* has been investigated. Variation in development (seta or taenia) is observed in abdominal segments IV-VII, while variation in number are found in segments VII and VIII. All species have an invariable number of 3 lateral setae on segments II and III, and a variable number (species-specific) of lateral taeniae on segment VIII.

92. Lateral taeniae on segment IV. Absent (0), present (1).

Most of the studied taxa have lateral setae on segment IV (taenia absent). Only *Caladomyia tuberculata* comb. nov. and *Tanytarsus ligulatus* show lateral taeniae on segment IV. *Caladomyia tuberculata* has 2 lateral setae and 1 lateral taenia, while *T. ligulatus* has 3 lateral taeniae.

93. Lateral taeniae on segment V. Absent (0), present (1).

*Caladomyia tuberculata* comb. nov., *Tanytarsus fastigatus*, *T. ligulatus* and *T. rinihuensis* as well as the four species of the *marauia* group (*T. marauia, T. revolta, T. waika* and *T. xingu*) present lateral taeniae on segment V. All other taxa do not show lateral taeniae but setae on segment V.

94. Lateral taeniae on segment VI. Absent (0), present (1).

Most of the studied species have lateral taeniae on segment VI. *Nimbocera patagonica*, *Tanytarsus amazonicus, T. cuieirensis, T. hamatus, T. hastatus, T. limneticus, T. pandus* and *T. rhabdomantis* do not present taeniae on this segment.

95. Lateral taeniae on segment VII. Absent (0), 3 lateral taeniae (1), 4 lateral taeniae (2).

Most of the studied taxa have lateral taeniae on segment VII. *Nimbocera patagonica*, *Tanytarsus cuieirensis*, *T. hastatus*, *T. limneticus*, *T. pandus* and *T. rhabdomantis* do not present taeniae.

Among the species with lateral taeniae on segment VII, *Tanytarsus hamatus* is the only species which shows intraspecific variation – the number of lateral setae developed as taeniae varies from one to four (i.e. 3 setae and 1 lateral taenia/ 2 setae and 2 lateral taeniae/ 1 seta and 3 lateral taeniae/ 0 seta and 4 lateral taeniae). *Tanytarsus ligulatus* presents 3 lateral taeniae, while all other taxa show 4 lateral taeniae.

96. Lateral taeniae on segment VIII. 3 lateral taeniae (0), 4 lateral taeniae (1), 5 lateral taeniae (2).

The studied species can be placed in the following groups by the number of lateral taeniae on segment VIII:

Species showing 3 lateral taeniae on segment VIII: *Tanytarsus cuieirensis*, *T. limneticus* and *T. rhabdomantis*;

Species with 4 lateral taeniae on segment VIII: *Nimbocera patagonica*, *Tanytarsus hastatus*, *T. impar*, *T. magnus*, *T. marauia*, *T. pandus* and *T. waika*;

Species with 5 lateral taeniae on segment VIII: *Caladomyia tuberculata* comb. nov., *Tanytarsus amazonicus*, *T. clivosus*, *T. fastigatus*, *T. hamatus*, *T. ligulatus*, *T. rinihuensis* and *T. xingu*.

97. Dorsal setae on tergite VIII. 1 dorsal seta (0), 2 dorsal setae (1), 2 dorsal taeniae (2).

The number and development of dorsal setae on tergite VIII are species-specific and seem to be of diagnostic importance.

Most of the studied taxa have one dorsal seta on tergite VIII. *Nimbocera patagonica* and *Tanytarsus rinihuensis* have 2 dorsal setae, while *Tanytarsus ligulatus* and *T. fastigatus* show 2 dorsal taeniae.

98. Number of taeniae in anal lobe fringe. < 60 taeniae (0), > 60 taeniae (1).

The anal lobe fringe of most of the studied pupae has fewer than 60 taeniae. *Tanytarsus hamatus*, *T. impar* and *T. magnus* present more than 60 taeniae in the anal lobe fringe.

# 7. ABSTRACT

*Tanytarsus* is one of the most abundant and diverse genus of Chironomidae. The delimitation of species is based mainly on features of the male genitalia, supported by pupal diagnostic characters. The main purpose of this study was to review all described *Tanytarsus* species from the Neotropical Region, including some closely related taxa, in order to contribute to the knowledge of the genus *Tanytarsus* and to the comprehension of the chironomid systematic.

The present dissertation is the first review of the genus *Tanytarsus* in the Neotropical Region. The revision includes more complete diagnoses, morphological descriptions and diagnostic keys to adult males and pupae, as well as new drawings, more detailed measurements, discussions, notes on distribution and, as far as possible, ecological remarks.

Pupae and adult males of *Nimbocera patagonica* Reiss, 1972, *Tanytarsus clivosus* Reiss, 1972, *Tanytarsus cuieirensis* Fittkau & Reiss, 1973, *Tanytarsus fastigatus* Reiss, 1972, *Tanytarsus hamatus* Reiss, 1972, *Tanytarsus hastatus* Sublette & Sasa, 1994, *Tanytarsus impar* Trivinho-Strixino & Strixino, 2004, *Tanytarsus ligulatus* Reiss, 1972, *Tanytarsus limneticus* Sublette, 1964, *Tanytarsus magnus* Trivinho-Strixino & Strixino, 2004, *Tanytarsus marauia* Sanseverino, Wiedenbrug & Fittkau, 2002, *Tanytarsus pandus* Sublette & Sasa, 1994, *Tanytarsus revolta* Sanseverino, Wiedenbrug & Fittkau, 2002, *Tanytarsus rhabdomantis* (Trivinho-Strixino & Strixino, 1991), *Tanytarsus rinihuensis* Reiss, 1972, *Tanytarsus waika* Sanseverino, Wiedenbrug & Fittkau, 2002, and *Tanytarsus xingu* Sanseverino, Wiedenbrug & Fittkau, 2002 as well as adult males of *Tanytarsus branquini* Fittkau & Reiss, 1973, *Tanytarsus capitatus* Sublette & Sasa, 1994, *Tanytarsus cururui* Fittkau & Reiss, 1973, *Tanytarsus curvicristatus* Contreras-Lichtenberg, 1988, *Tanytarsus guatemalensis* Sublette & Sasa, 1994, *Tanytarsus monospinosus* Ekrem & Reiss, 1999, *Tanytarsus paraligulatus* Reiss, 1972, *Tanytarsus reissi* Paggi, 1992, *Tanytarsus riopreto* Fittkau & Reiss, 1973, and *Tanytarsus tumultuarius* Ekrem & Reiss, 1999 are reviewed, redescribed and diagnosed.

The pupa of *Tanytarsus ligulatus* Reiss is described for the first time. One paratype and some specimens of *Tanytarsus ligulatus* Reiss are slightly different from the holotype, and thus are described separately as *Tanytarsus* cf. *ligulatus*.

The pupa and adult male of *Tanytarsus amazonicus* spec. nov. as well as adult males of *Tanytarsus digitatus* spec. nov., *Tanytarsus friburgensis* spec. nov., *Tanytarsus jacaretingensis*

spec. nov., *Tanytarsus pararinihuensis* spec. nov. and *Tanytarsus pseudorinihuensis* spec. nov. are described as new to science.

*Caladomyia tuberculata* (Reiss, 1972) comb. nov. and *Caladomyia alata* (Paggi, 1992) comb. nov. were previously placed in *Tanytarsus* and are transferred to the genus *Caladomyia* Säwedal, 1981. The pupa and adult male of *C. tuberculata* as well as the adult male of *C. alata* are also redescribed and diagnosed, and their placement in the genus *Caladomyia* is discussed.

The *Tanytarsus riopreto* and *Tanytarsus marauia* species groups are discussed in the light of imaginal and pupal morphology. The diagnostic characters proposed for each group are discussed and compared among their members.

In the past, the immature stages of the Nearctic *Tanytarsus limneticus* as well as those of the Neotropical *Tanytarsus rhabdomantis* were erroneous placed in the monotypic genus *Nimbocera*. A detailed discussion about *Nimbocera patagonica*, *Tanytarsus limneticus* and *Tanytarsus rhabdomantis* is presented, including comparisons of immatures and adults and considerations about the validity of the genus *Nimbocera*.

Some Neotropical species seem to share diagnostic characters with Holarctic *Tanytarsus* species groups. Thus, some Holarctic groups are also discussed and, as far as possible, figured.

It was in the scope of this study the recognition and selection of useful characters in imaginal and immature stages in order to improve the systematic of the genus, to discuss the existence of groups of species, to construct diagnostic keys and to allow systematic predictions.

The selected morphological features, measurements and terminology used in the present dissertation are described, commented and figured.

Keys to adult males and pupae of the studied species were constructed based on diagnostic characters and are presented here for the first time.

Potential morphological characters and their states were tentatively selected and commented in the final discussion of the current dissertation.

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# 10. APPENDIX

**Table I. Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica*, *Caladomyia alata*, *C. tuberculata* and the Nearctic *Tanytarsus limneticus* adult males: Head. AR, antennal ratio.**

| | AR | Antenna length (µm) | Eyes dorsomedian extension | Frontal tubercles (µm) | Number of clypeals | Palp total length (µm) |
|---|---|---|---|---|---|---|
| ***T. branquini*** | 0.77 | 789 | present | 10 | 12 | 375 |
| ***T. cuieirensis*** | 0.71-0.75 | 700-720 | present | 9-10 | 9-11 | 373-391 |
| ***T. cururui*** | 0.91-0.92 | 958-975 | present | 11-13 | 15 | 462-496 |
| ***T. riopreto*** | 0.90-1.01 | 856-947 | present | 17-18 | 14-16 | 404-489 |
| ***T. clivosus*** | 0.83-0.91 | 950-1020 | present | 18-25 | 12-13 | 468-560 |
| ***T. hamatus*** | 0.78-0.85 | 902-1002 | present | 7-10 | 12-13 | 460-500 |
| ***T. capitatus*** | 0.72-0.86 | 1020-1114 | present | 3 | 12-16 | 584 |
| ***T. guatemalensis*** | 0.96 | 980 | present | 3 | 15 | 528 |
| ***T. pandus*** | 0.97 | 935 | present | 10 | 14 | 437 |
| ***T. hastatus*** | 1.07-1.24 | 894-1054 | present | 18-24 | 13-18 | 444-488 |
| ***T. limneticus*** | 1.33-1.44 | 1032-1150 | present | 16-18 | 19-23 | 416-484 |
| ***T. rhabdomantis*** | 1.21-1.32 | 1000-1120 | present | 16-19 | 17-20 | 380-421 |
| ***Nimbocera patagonica*** | 0.45-0.53 | 588-625 | present | 18-22 | 20-24 | 259-276 |
| ***T. marauia*** | 0.93 | 852 | present | - | 11 | - |
| ***T. revolta*** | 0.40 | 688 | present | - | 14 | 347 |
| ***T. waika*** | 0.51-0.52 | 669-690 | present | 5 | 11 | 314-338 |
| ***T. xingu*** | 1.06-1.15 | 1175-1250 | present | 6 | 14-15 | 488-502 |
| ***T. amazonicus*** | 1.11-1.12 | 884-945 | present | 9-10 | 8-10 | 464-485 |
| ***T. friburgensis*** | 0.58 | 848 | present | 13 | 18 | 462 |
| ***T. digitatus*** | 0.72 | 892 | present | 16 | 14 | 595 |
| ***T. jacaretingensis*** | 1.08-1.19 | 903-990 | absent | 14-20 | 10-13 | 345-398 |
| ***T. monospinosus*** | 0.92-1.02 | 792 | absent | 12 | 8-15 | 326-385 |
| ***T. tumultuarius*** | 0.80-1.01 | 745 | present | absent | 12-16 | 295-346 |
| ***T. rinihuensis*** | 0.67-0.68 | 922-952 | present | 6-10 | 18-23 | 591-601 |
| ***T. pararinihuensis*** | 0.69 | 948 | present | 5 | - | - |
| ***T. pseudorinihuensis*** | 0.75 | 960-1080 | present | 5-6 | 15-16 | 558-594 |
| ***T. ligulatus*** | 1.12-1.19 | 920-978 | present | 37-40 | 15-17 | 527-543 |
| ***T.* cf. *ligulatus*** | 0.80-0.84 | 752-802 | present | 36 | 11-12 | 304-346 |
| ***T. paraligulatus*** | 1.10-1.18 | 1050-1068 | present | 60-68 | 25-26 | 533-546 |
| ***T. fastigatus*** | 0.77-0.92 | 770-910 | present | 12-15 | 9-11 | 383-429 |
| ***T. reissi*** | 1.15-1.31 | 992 | present | 13 | 17 | - |
| ***T. impar*** | 1.36-1.96 | 1020-1185 | present | absent | 25-30 | 611-749 |
| ***T. magnus*** | 1.34-1.46 | 1276-1475 | present | absent | 40 | 728-874 |
| ***T. curvicristatus*** | 0.74-0.93 | 870-960 | present | absent | 12 | 385-492 |
| ***Caladomyia alata*** | 0.90 | 798 | present | 17 | 14 | 394 |
| ***Caladomyia tuberculata*** | 0.92-1.04 | 965-1018 | present | 22-23 | 14-18 | 467-488 |

**Table II. Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica, Caladomyia alata, C. tuberculata* and the Nearctic *Tanytarsus limneticus* adult males: Thorax. Length and setation.**

| | Thorax length (µm) | Nº. acrostichals | Nº. dorsocentrals | Nº. scutellars | Nº. prealars |
|---|---|---|---|---|---|
| ***T. branquini*** | 540 | 12 | 6 | 4 | 2 |
| ***T. cuieirensis*** | 565-598 | 10 | 5-6 | 4 | 1 |
| ***T. cururui*** | 636-648 | 16-17 | 10 | 6 | 3-4 |
| ***T. riopreto*** | 730-788 | 12-15 | 7 | 5-6 | 2-3 |
| ***T. clivosus*** | 868-990 | 11-16 | 7-10 | 6 | 1 |
| ***T. hamatus*** | 800-998 | 10-15 | 8-11 | 4-6 | 1 |
| ***T. capitatus*** | 1000-1010 | 20-24 | 11 | 4 | 2-3 |
| ***T. guatemalensis*** | - | 20 | 7-9 | 4 | 1 |
| ***T. pandus*** | 880 | 12 | 10 | 6 | 2 |
| ***T. hastatus*** | 780-920 | 14-18 | 9-10 | 4-6 | 2 |
| ***T. limneticus*** | 1140-1230 | 23-30 | 12-15 in one row + 2-4 posteriorly | 13 | 2-3 |
| ***T. rhabdomantis*** | 1015-1184 | 14-17 | 7-10 | 5-6 | 1 |
| ***Nimbocera patagonica*** | 892-1000 | 8-12 | 7-8 | 4-6 | 1 |
| ***T. marauia*** | 702 | 8 | 5 | 4 | 1 |
| ***T. revolta*** | 694 | 14 | 8 | 6 | 1 |
| ***T. waika*** | 491-530 | 6-7 | 5 | 2 | 1 |
| ***T. xingu*** | 830-843 | at least 6-8 | 5 | 4 | 1 |
| ***T. amazonicus*** | 687-710 | 13-14 | 6-8 | 4 | 1 |
| ***T. friburgensis*** | 853 | 24 | 8 | 8 | 1 |
| ***T. digitatus*** | 725 | - | - | 6 | 1 |
| ***T. jacaretingensis*** | 738-840 | 2-5 | 6-7 | 4 | 1 |
| ***T. monospinosus*** | 755 | 0 | 6-7 | 4 | 1 |
| ***T. tumultuarius*** | 640 | 6-8 | 5-8 | 4 | 1 |
| ***T. rinihuensis*** | 1016-1080 | 18-22 | 10-14 | 8-10 | 1-3 |
| ***T. pseudorinihuensis*** | 950-1120 | - | 10 | 6 | 1 |
| ***T. pararinihuensis*** | 915 | - | 10 | - | - |
| ***T. ligulatus*** | 760-815 | 10-12 | 7 | 4 | 1 |
| ***T.* cf. *ligulatus*** | 623-681 | at least 5-6 | 3-5 | 2 | 1 |
| ***T. paraligulatus*** | 1045-1078 | 12-18 | 8-10 | 6 | 1 |
| ***T. fastigatus*** | 724-798 | 10-12 | 7-9 | 4 | 1 |
| ***T. reissi*** | 1000 | 15 | 9 | 5 | 1 |
| ***T. impar*** | 1300 | 20-25 | 9-10 | 7-9 | 3-4 |
| ***T. magnus*** | 1350 | 22-28 | 8-10 | 6 | 3 |
| ***T. curvicristatus*** | 790 | 10-16 | 6-10 | 2-4 | 1-2 |
| ***Caladomyia alata*** | - | 10 | 6 | 6 | 1 |
| ***Caladomyia tuberculata*** | 978-1004 | 8-12 | 8-9 | 2-4 | 1-2 |

**Table III. Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica*, *Caladomyia alata*, *C. tuberculata* and the Nearctic *Tanytarsus limneticus* adult males: Wing. Lengths and widths in µm; L/WR, Length/Width Ratio.**

| Wing | *T. branquini* | *T. cuieirensis* | *T. cururui* | *T. riopreto* | *T. clivosus* | *T. hamatus* | *T. capitatus* |
|---|---|---|---|---|---|---|---|
| **Length (µm)** | 1040 | 1030- 1093 | 1293- 1296 | 1290-1370 | 1650-2180 | 1762-1810 | 1860-2400 |
| **Width (µm)** | 300 | 305-315 | 361-375 | 380- 410 | 468-620 | 495-512 | 540-710 |
| **L/WR** | 3.4 | 3.37-3.46 | 3.45-3.58 | 3.34-3.39 | 3.23-3.55 | 3.53-3.55 | 3.3-3.4 |
| **Veins (no. setae)** | | | | | | | |
| **Brachiolum** | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **Sc** | bare | bare | bare | bare | bare | bare | bare |
| **R** | 20 | 13-15 | 26-29 | 25-30 | 26-33 | 21-26 | 37-52 |
| **$R_1$** | 23 | 15-16 | 44-45 | 27-34 | 24-32 | 24-27 | 56-79 |
| **$R_{4+5}$** | 44 | 11-13 | 66-72 | 47-58 | 63-75 | 46-67 | 78-110 |
| **M** | bare | bare | 9-10 | bare | bare | bare | 1-3 |
| **$M_{1+2}$** | 32 | 18-19 | 48-54 | 35-46 | 73-80 | 66-78 | 78-86 |
| **$M_{3+4}$** | 20 | 6-9 | 37-38 | 24-33 | 34-41 | 38-42 | 60-67 |
| **Cu** | 16 | bare | 23-28 | 12-19 | 25-30 | 23-26 | 39-44 |
| **$Cu_1$** | 13 | 8-9 | 19-22 | 12-19 | 20-28 | 22-24 | 30-32 |
| **Postcubitus** | with setae | bare | 50-55 | 7-9 | 32-40 | 36-42 | 57-65 |
| **An** | with setae | 11-15 | 26-32 | 20-24 | 36-44 | 36-38 | 60-84 |
| **Cells (no. setae)** | | | | | | | |
| **m** | 3 | bare | 16 | 8-14 | 2-9 | 8-11 | 36-59 |
| **false vein** | 6 | bare | 19-23 | 6-7 | 16-21 | 14-18 | 15-20 |
| **$r_{4+5}$** | 120 | 59-64 | > 150 | > 150 | about 180-215 | about 190-more than 200 | > 150 |
| **$m_{1+2}$** | 100 | 40-50 | > 150 | > 150 | about 200-230 | about 180-more than 200 | > 150 |
| **false vein** | 28 | 13-15 | 50-60 | 28-35 | 60-68 | 50-56 | 53-60 |
| **$m_{3+4}$** | 70 | 1-5 | > 100 | 63-98 | 92-106 | 100-120 | > 150 |
| **cu** | 25 | bare | 80 | 34-58 | 45-52 | 65-75 | about 130 |
| **an** | with setae | bare | 100 | 28-57 | 80-91 | 80-about 100 | about 120 |

**Table III (Cont.). Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica, Caladomyia alata*, *C. tuberculata* and the Nearctic *Tanytarsus limneticus* adult males: Wing. Lengths and widths in µm; L/WR, Length/Width Ratio.**

| Wing | *T. guatemalensis* | *T. pandus* | *T. hastatus* | *T. limneticus* | *T. rhabdomantis* | *N. patagonica* | *T. marauia* | *T. revolta* |
|---|---|---|---|---|---|---|---|---|
| **Length (µm)** | 1600 | 1400 | 1380-1560 | 1780-1882 | 1540-1820 | 1500-1700 | - | - |
| **Width (µm)** | 460 | - | 420-440 | 548-575 | 450-500 | 640 | - | - |
| **L/WR** | 3.47 | - | 3.45-3.71 | 3.21-3.24 | 3.32-3.95 | 2.53 | - | - |
| **Veins (no. setae)** | | | | | | | | |
| **Brachiolum** | 1 | 1 | 1 | 1 | 1 | 1 | - | - |
| **Sc** | bare | bare | bare | 1-5 | 0-2 | bare | - | - |
| **R** | 30 | 36 | 30 | 46-56 | 24-34 | 14 | - | - |
| **$R_1$** | 32 | 51 | 27 | 50-67 | 25-36 | 9 | - | - |
| **$R_{4+5}$** | 38 | 86 | 45 | 80-105 | 41-55 | 10 | - | - |
| **M** | bare | 10 | 1-3 | 16-28 | 2-11 | bare | - | - |
| **$M_{1+2}$** | 44 | 80 | 50 | 74-92 | 50-59 | 14 | - | - |
| **$M_{3+4}$** | 32 | 41 | 36 | 47-63 | 35-39 | bare | - | - |
| **Cu** | 18 | 25 | 21 | 18-39 | 18-20 | bare | - | - |
| **$Cu_1$** | 22 | 27 | 20 | 24-34 | 16-21 | bare | - | - |
| **Postcubitus** | 36 | 55 | 39 | 42-63 | 18-23 | bare | - | - |
| **An** | 38 | 43 | 37 | 44-70 | 31-37 | 2 | - | - |
| **Cells (no. setae)** | | | | | | | | - |
| **m** | 14 | 24 | 18 | 35-44 | 14 | bare | - | - |
| **false vein** | 13 | 38 | 13 | 20-26 | 9 | bare | - | - |
| **$r_{4+5}$** | more than 200 | more than 150 | more than 150 | more than 200 | more than 150 | 42 | - | - |
| **$m_{1+2}$** | more than 150 | more than 150 | more than 150 | more than 200 | more than 150 | 32 | - | - |
| **false vein** | 42 | 56 | 38 | 43-55 | 28 | bare | - | - |
| **$m_{3+4}$** | about 130 | about 130 | 95 | about 182 | 75 | 5 | - | - |
| **cu** | about 72 | about 90 | 74 | about 134 | 52 | bare | - | - |
| **an** | about 84 | about 110 | 50 | about 142 | 34 | bare | - | - |

**Table III (Cont.). Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica, Caladomyia alata*, *C. tuberculata* and the Nearctic *Tanytarsus limneticus* adult males: Wing. Lengths and widths in µm; L/WR, Length/Width Ratio.**

| Wing | *T. waika* | *T. xingu* | *T. amazonicus* | *T. friburgensis* | *T. digitatus* | *T. jacaretingensis* | *T. monospinosus* | *T. tumultuarius* |
|---|---|---|---|---|---|---|---|---|
| **Length (µm)** | 940-980 | 1650-1740 | 1190-1268 | 1561 | 1730 | 1330-1553 | 1300 | 1060 |
| **Width (µm)** | 262-290 | 455-462 | 350-380 | 483 | 468 | 398-430 | 360 | 300 |
| **L/WR** | 3.37-3.58 | 3.62-3.76 | 3.3-3.4 | 3.23 | 3.69 | 3.34-3.61 | 3.61 | 3.53 |
| **Veins (no. setae)** | | | | | | | | |
| **Brachiolum** | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **Sc** | bare | bare | bare | bare | bare | bare | bare | bare |
| **R** | 11 | 15-18 | 13-16 | 36 | 33 | 1-4 | bare | bare |
| **$R_1$** | 11-12 | 21 | 13-21 | 40 | 48 | bare | bare | bare |
| **$R_{4+5}$** | 9-11 | 18-21 | 26-37 | 68 | 82 | 2-3 | 1-3 | 2 |
| **M** | bare | bare | bare | 1 | 1 | bare | bare | bare |
| **$M_{1+2}$** | 14-16 | 24-31 | 28-39 | 60-62 | 78 | 6-17 | 0-2 | 1-9 |
| **$M_{3+4}$** | 2 | 10 | 15-22 | 41 | 37 | bare | bare | bare |
| **Cu** | bare | bare | 0-2 | 27-29 | 35 | bare | bare | bare |
| **$Cu_1$** | 1 | bare | 11-16 | 20-22 | 25 | bare | bare | bare |
| **Postcubitus** | bare | bare | bare | 49-52 | about 50 | bare | bare | bare |
| **An** | bare | bare | 16-21 | 37-41 | 36 | bare | bare | bare |
| **Cells (no. setae)** | | | | | | | | |
| **m** | bare | bare | bare | 17-19 | 24 | bare | bare | bare |
| **false vein** | bare | bare | bare | 40-41 | about 30 | bare | bare | bare |
| **$r_{4+5}$** | 34-40 | 78-83 | 107-118 | > 200 | > 150 | 19-35 | 11-16 | 3-18 |
| **$m_{1+2}$** | 26-33 | 61 | 83-90 | > 200 | > 200 | 1-7 | bare | 0-1 |
| **false vein** | 9-10 | 11-15 | 14-22 | about 54 | about 80 | bare | bare | bare |
| **$m_{3+4}$** | 2-3 | 2-3 | 4-17 | about 145 | > 150 | bare | bare | bare |
| **cu** | bare | bare | bare | about 110 | about 120 | bare | bare | bare |
| **an** | bare | 3 | bare | about 160 | about 160 | bare | bare | bare |

**Table III (Cont.). Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica, Caladomyia alata*, *C. tuberculata* and the Nearctic *Tanytarsus limneticus* adult males: Wing. Lengths and widths in µm; L/WR, Length/Width Ratio.**

| Wing | *T. rinihuensis* | *T. pseudorinihuensis* | *T. pararinihuensis* | *T. ligulatus* | *T.* cf. *ligulatus* | *T. paraligulatus* | *T. fastigatus* |
|---|---|---|---|---|---|---|---|
| **Length (µm)** | 2120-2160 | - | - | 1403-1500 | 1058-1109 | 1970-2040 | 1364-1682 |
| **Width (µm)** | 580-600 | - | - | 380-407 | 328-341 | 590-600 | 386-460 |
| **L/WR** | 3.60-3.65 | - | - | 3.45-3.69 | 3.13-3.38 | 3.33-3.40 | 3.53-3.56 |
| **Veins (no. setae)** | | | | | | | |
| **Brachiolum** | 1 | - | - | 1 | 1 | 1 | 1 |
| **Sc** | 4-6 | - | - | bare | bare | bare | bare |
| **R** | 37-42 | - | - | 21-24 | 10-12 | 20-22 | 22-25 |
| **$R_1$** | 35-41 | - | - | 23-24 | 11-12 | 18-22 | 17-28 |
| **$R_{4+5}$** | 65-67 | - | - | 48-52 | 6-9 | 22-25 | 35-54 |
| **M** | 0-4 | - | - | bare | bare | bare | bare |
| **$M_{1+2}$** | 93-98 | - | - | 37-40 | 9-17 | 38-42 | 39-65 |
| **$M_{3+4}$** | 37-51 | - | - | 24-26 | 3-6 | 20-23 | 28-35 |
| **Cu** | 33-34 | - | - | 2-7 | bare | bare | 17-21 |
| **$Cu_1$** | 23-24 | - | - | 14-17 | 1 | 11-13 | 16-24 |
| **Postcubitus** | 48-52 | - | - | bare | bare | bare | 46-53 |
| **An** | 45-47 | - | - | 22 | 5-9 | 21-29 | 25-40 |
| **Cells (no. setae)** | | | | | | | |
| **m** | 46-58 | - | - | 6-7 | bare | bare | 9-11 |
| **false vein** | 21-26 | - | - | 0-1 | bare | bare | 16-33 |
| **$r_{4+5}$** | > 300 | - | - | about 135-160 | 36-49 | about 120-140 | about 130-170 |
| **$m_{1+2}$** | > 300 | - | - | about 135-150 | 24-27 | 95- about 120 | about 110-150 |
| **false vein** | 57-65 | - | - | 23-30 | 3-9 | 18-23 | 53-57 |
| **$m_{3+4}$** | about 180 | - | - | 32-41 | bare | 8-20 | 57-87 |
| **cu** | about 108 | - | - | 1 | bare | bare | 39-68 |
| **an** | About 220 | - | - | bare | bare | bare | 42-75 |

**Table III (Cont.). Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica, Caladomyia alata*, *C. tuberculata* and the Nearctic *Tanytarsus limneticus* adult males: Wing. Lengths and widths in µm; L/WR, Length/Width Ratio.**

| Wing | *T. reissi* | *T. impar* | *T. magnus* | *T. curvicristatus* | *C. alata* | *C. tuberculata* |
|---|---|---|---|---|---|---|
| **Length (µm)** | 1840 | 1575-2080 | 2308-2385 | 1806-2060 | 1520 | 1968-2085 |
| **Width (µm)** | 520 | 435-520 | 538-646 | 502-560 | 440 | 520-600 |
| **L/WR** | 3.53 | 3.62-4.00 | 3.69-4.28 | 3.60-3.67 | 3.45 | 3.47-3.78 |
| **Veins (no. setae)** | | | | | | |
| **Brachiolum** | 1 | 1 | 1 | 1 | 1 | 1 |
| **Sc** | bare | 18 | 47 | bare | bare | bare |
| **R** | 38 | many | many | 18-23 | 18-20 | 18-21 |
| **$R_1$** | 52 | many | many | 15-20 | 21 | 21-23 |
| **$R_{4+5}$** | 63 | many | many | 22-36 | 19 | 26-30 |
| **M** | 14 | 15 | 28 | bare | bare | bare |
| **$M_{1+2}$** | 82 | many | many | 40-53 | 40 | 48-54 |
| **$M_{3+4}$** | 58 | many | many | 2-23 | 17 | 29-30 |
| **Cu** | 32 | many | many | bare | 6 | 4-5 |
| **$Cu_1$** | 28 | many | many | 2-13 | 16 | 19-20 |
| **Postcubitus** | 31 | many | many | 0-6 | bare | 25-28 |
| **An** | 47 | many | many | bare | 19 | 25-32 |
| **Cells (no. setae)** | | | | | | |
| **m** | 32 | many | many | bare | bare | 2-4 |
| **false vein** | 24 | many | many | 0-4 | bare | 13-22 |
| **$r_{4+5}$** | > 200 | many | many | 85-142 | about 130 | about 150-175 |
| **$m_{1+2}$** | > 150 | many | many | 54-110 | about 65 | about 110-135 |
| **false vein** | 50 | many | many | 12-33 | about 32 | 35-43 |
| **$m_{3+4}$** | 90 | many | many | 0-13 | about 25 | 66-72 |
| **cu** | 54 | many | many | bare | 0-1 | 34-36 |
| **an** | 73 | many | many | bare | with setae* | 50-60 |

**Table IV. Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica*, *Caladomyia alata*, *C. tuberculata* and the Nearctic *Tanytarsus limneticus* adult males: Legs. LR, Leg ratio; BV, Beinverhältnis; SV, Schenkel-Schieneverhältnis; $P_1$, fore leg; $P_2$, mid leg; $P_3$, hind leg; $T_1$, spur of fore tibia; $T_{2a}$, $T_{2b}$, spurs of mid tibia combs; $T_{3a}$, $T_{3b}$, spurs of hind tibia combs.**

| Legs | Total length (µm) | | | LR | | | BV | | | SV | | | Spurs (µm) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $P_1$ | $P_2$ | $P_3$ | $P_1$ | $P_2$ | $P_3$ | $P_1$ | $P_2$ | $P_3$ | $P_1$ | $P_2$ | $P_3$ | $T_1$ | $T_{2a}$ | $T_{2b}$ | $T_{3a}$ | $T_{3b}$ |
| ***T. branquini*** | - | 1484 | 1964 | - | 0.59 | 0.84 | - | 4.86 | 2.58 | - | 4.08 | 2.77 | 24 | 24 | 36 | 47 | 51 |
| ***T. cuieirensis*** | 2491-2583 | 1353-1416 | 1908-2010 | 3.32-3.56 | 0.57-0.58 | 0.74-0.75 | 1.48-1.57 | 4.40-4.70 | 2.47-2.56 | 0.98-1.04 | 3.89-4.01 | 2.86-2.93 | 24 | 21 | 31 | 23 | 36 |
| ***T. cururui*** | 4055 | 2054-2100 | 2691-2746 | 3.83-3.87 | 0.62-0.64 | 0.90-0.92 | 1.60 | 4.36-4.42 | 2.48-2.50 | 0.95 | 3.62-3.77 | 2.52-2.54 | 33-36 | 27-30 | 50-52 | 56-62 | 68-72 |
| ***T. riopreto*** | 3390-3841 | 1713-1953 | 2288-2661 | 3.60-3.70 | 0.59-0.62 | 0.90 | 1.44-1.55 | 4.25-4.59 | 2.39-2.49 | 0.94 | 3.79-3.94 | 2.49-2.52 | 31-36 | 22-29 | 34-42 | 50-60 | 56-62 |
| ***T. clivosus*** | 3599-3948 | 2481-2675 | 3292-3595 | 2.16-2.21 | 0.59-0.60 | 0.70-0.71 | 1.61-1.71 | 2.93-3.11 | 2.53-2.60 | 1.26-1.30 | 3.74-3.82 | 2.89-2.97 | 27-29 | 24-26 | 33-37 | 30-32 | 35-39 |
| ***T. hamatus*** | 3434-3709 | 2249-2253 | 2999-3194 | 2.55-2.66 | 0.61 | 0.71-0.73 | 1.50-1.55 | 3.08-3.20 | 2.55-2.58 | 1.13-1.15 | 3.70-3.72 | 2.88-2.95 | 32-34 | 20-22 | 30-32 | 32 | 34 |
| ***T. capitatus*** | 4484-5526 | 2698-3425 | 3516-4497 | 2.26-2.37 | 0.68 | 0.72-0.73 | 1.71-1.72 | 3.28-3.51 | 2.44-2.46 | 1.10-1.14 | 3.37 | 2.90-2.93 | 24 | 32 | 40 | 38 | 47 |
| ***T. guatemalensis*** | 3914 | 2400 | 3070 | 3.02 | 0.65 | 0.75 | 1.64 | 4.03 | 2.37 | 1.06 | 3.52 | 2.72 | 25 | 32 | 43 | 50 | 54 |
| ***T. pandus*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| ***T. hastatus*** | 3579-4153 | 2297-2718 | 2955-3460 | 2.74-3.02 | 0.63-0.68 | 0.67-0.70 | 1.39-1.56 | 3.30-3.38 | 2.43-2.48 | 1.03-1.11 | 3.37-3.58 | 2.99-3.00 | 22-32 | 28-32 | 37-45 | 35-36 | 42-50 |
| ***T. limneticus*** | 4447-4480 | 2959-3102 | 3639-3752 | 2.11-2.15 | 0.65-0.66 | 0.70-0.72 | 1.36-1.46 | 2.74-2.78 | 2.40-2.43 | 1.23-1.39 | 3.28-3.37 | 2.82-2.83 | 22-28 | 32-35 | 40-42 | 42-46 | 44-48 |
| ***T. rhabdomantis*** | 3286-3521 | 2054-2461 | 2885-3405 | 2.43-2.90 | 0.56-0.64 | 0.56-0.76 | 1.48-1.62 | 2.91-3.16 | 2.07-2.36 | 1.09-1.12 | 3.43-3.90 | 2.55-3.35 | - | - | - | - | - |
| ***N. patagonica*** | 2956-3140 | 1606-1750 | 2231-2395 | 1.20-1.29 | 0.29 | 0.39-0.40 | 2.00-2.05 | 4.38-4.75 | 3.16-3.36 | 1.96-1.99 | 7.63-7.84 | 5.50-5.61 | absent | 25 | absent | absent | absent |
| ***T. marauia*** | - | - | - | - | - | - | - | - | - | - | - | - | 24 | 20 | 32 | - | 40 |
| ***T. revolta*** | 2291 | 1482 | 1935 | 2.12 | 0.60 | 0.58 | 1.54 | 4.11 | 2.51 | 1.33 | 3.73 | 3.54 | 20 | 24 | 32 | 30 | 36 |
| ***T. waika*** | 2318 | 1204-1290 | 1632-1762 | 3.65 | 0.53-0.54 | 0.68-0.72 | 1.55 | 4.97-5.37 | 2.69-2.79 | 0.99 | 4.42-4.45 | 3.05-3.14 | 19-22 | 19-20 | 22-24 | 19-21 | 24-26 |
| ***T. xingu*** | 4745-4891 | 2654-2766 | 3419-3501 | 3.92-4.05 | 0.69-0.72 | 0.75-0.78 | 1.6 | 3.96-4.13 | 2.70-2.74 | 0.90-0.93 | 3.16-3.23 | 2.84-2.92 | 39-41 | 26-32 | 40-49 | 29-37 | 45-56 |
| ***T. amazonicus*** | 3010-3240 | 1676-1823 | 2376-2533 | 3.23-3.27 | 0.62-0.63 | 0.80-0.81 | 1.46-1.54 | 4.01-4.44 | 2.26-2.38 | 1.02-1.05 | 3.45-3.52 | 2.60-2.63 | 18-24 | 23-24 | 36 | 39-40 | 42-43 |
| ***T. friburgensis*** | - | - | - | - | - | - | - | - | - | - | - | - | 34 | 28 | 38 | 35 | 42 |

**Table IV (Cont.). Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica, Caladomyia alata, C. tuberculata* and the Nearctic *Tanytarsus limneticus* adult males: Legs. LR, Leg Ratio; BV, Beinverhältnis; SV, Schenkel-Schieneverhältnis; $P_1$, fore leg; $P_2$, mid leg; $P_3$, hind leg; $T_1$, spur of fore tibia; $T_{2a}$, $T_{2b}$, spurs of mid tibia combs; $T_{3a}$, $T_{3b}$, spurs of hind tibia combs.**

| Legs | Total length (µm) | | | LR | | | BV | | | SV | | | Spurs (µm) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $P_1$ | $P_2$ | $P_3$ | $P_1$ | $P_2$ | $P_3$ | $P_1$ | $P_2$ | $P_3$ | $P_1$ | $P_2$ | $P_3$ | $T_1$ | $T_{2a}$ | $T_{2b}$ | $T_{3a}$ | $T_{3b}$ |
| ***T. digitatus*** | 4104 | 2467 | 3354 | 2.63 | 0.61 | 0.70 | 1.63 | 3.83 | 2.37 | 1.13 | 3.75 | 2.93 | 25 | 26 | 39 | 40 | 47 |
| ***T. jacaretingensis*** | 2578-2812 | 1597-1834 | 2299-2638 | 2.55-2.73 | 0.51-0.61 | 0.61-0.70 | 1.58-1.63 | 3.57-3.85 | 2.31-2.45 | 1.07-1.12 | 3.59-3.74 | 2.98-3.22 | 22-26 | 21-22 | 23-26 | 24-28 | 26-32 |
| ***T. monospinosus*** | 2281 | 1453 | 2228 | 2.18-2.40 | 0.51-0.58 | 0.60-0.71 | 1.63-1.73 | 3.79-4.27 | 2.28-2.40 | 1.16-1.22 | 3.49-3.93 | 2.80-3.24 | 10-23 | 16-19 | 19-23 | 23-26 | 23-26 |
| ***T. tumultuarius*** | - | 1359 | 1940 | 1.82-2.24 | 0.54-0.74 | 0.63-0.71 | 1.64-1.88 | 3.68-4.41 | 2.25-2.29 | 1.28-1.49 | 3.01-4.16 | 2.92-3.39 | 16-26 | 192 6 | 19-32 | 19-32 | 23-32 |
| ***T. rinihuensis*** | 4048-4119 | 2912-2957 | 3926-3959 | 1.90-1.99 | 0.55 | 0.64 | 1.82-1.91 | 3.04-3.1 | 2.51-2.67 | 1.33-1.36 | 3.92-3.95 | 3.25-3.29 | 36-38 | 28-30 | 32-38 | 30-35 | 35-40 |
| ***T. pseudorinihuensis*** | 4253 | 3060 | 4150 | 1.88 | 0.54 | 0.60 | 1.93 | 3.05 | 2.57 | 1.35 | 4.01 | 3.45 | 38 | 29 | 37 | 34 | 39 |
| ***T. pararinihuensis*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| ***T. ligulatus*** | 3447-3462 | 1961-1999 | 2767-2772 | 3.04-3.17 | 0.68 | 0.81-0.82 | 1.59-1.60 | 4.35 | 2.54-2.63 | 0.97-1.00 | 3.36 | 2.55-2.58 | 35-36 | 24 | 33 | 26-28 | 44-49 |
| ***T.* cf. *ligulatus*** | 2025-2335 | 1305-1402 | 1865-1989 | 2.64-3.1 | 0.56-0.61 | 0.72-0.74 | 1.52-1.70 | 4.22-4.41 | 2.37-2.49 | 1.01-1.15 | 3.74-4.13 | 2.80-2.92 | 20-22 | 18-20 | 24-25 | 20-21 | 30-32 |
| ***T. paraligulatus*** | 3482-3553 | 2399-2480 | 3492-3564 | 2.13-2.16 | 0.53-0.54 | 0.64-0.66 | 1.71-1.77 | 3.66-3.75 | 2.42-2.46 | 1.27-1.29 | 4.09-4.12 | 3.02-3.10 | 32-38 | 21-26 | 23-30 | 24-30 | 31-35 |
| ***T. fastigatus*** | 2544-2954 | 1785-1995 | 2401-2788 | 1.95-2.00 | 0.51-0.54 | 0.60-0.65 | 1.60-1.62 | 3.49-3.51 | 2.31-2.47 | 1.41-1.46 | 4.17-4.32 | 3.13-3.38 | 21-22 | 20-23 | 24-29 | 26-30 | 27-36 |
| ***T. reissi*** | 3751 | 2616 | - | 2.35 | 0.56 | 0.66 | 1.61 | 2.92 | - | 1.17 | 3.87 | 3.08 | 28 | 25 | 31 | 25 | 38 |
| ***T. impar*** | 4520-5725 | 2535-3045 | 3345-4240 | 2.38-2.58 | 0.62-0.64 | 0.67-0.70 | 1.49-1.66 | 3.38-3.73 | 2.32-2.53 | 1.25-1.56 | 3.47-3.54 | 3.10-3.15 | - | - | - | - | - |
| ***T. magnus*** | 6014-6660 | 3553-3898 | 4575-5046 | 2.59-2.66 | 0.62-0.72 | 0.69-0.76 | 1.48-1.52 | 3.34-3.69 | 2.38-2.54 | 1.14-1.15 | 3.43 | 3.05-3.10 | - | - | - | - | - |
| ***T. curvicristatus*** | - | 1808 | 2387 | 2.4 | 0.58 | 0.65 | - | 4.05 | 2.53 | - | 4.00 | 3.38 | 25 | 23 | 40 | 30 | 44 |
| ***C. alata*** | 2837 | 2068 | 2709 | 2.02-2.17 | 0.56 | 0.65 | 1.70 | 2.94 | 2.51 | 1.26 | 3.99 | 3.12 | 22 | - | - | - | - |
| ***C. tuberculata*** | 3314-3574 | 2487-2594 | 3413-3610 | 1.85-2.00 | 0.50-0.53 | 0.64-0.66 | 1.68-1.74 | 3.27-3.40 | 2.38-2.51 | 1.39-1.50 | 4.17-4.37 | 3.08-3.13 | 32-34 | 31-34 | 33-36 | 34-40 | 36-44 |

**Table V. Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica, Caladomyia alata, C. tuberculata* and the Nearctic *Tanytarsus limneticus* adult males: Hypopygium. ATB, anal tergal bands; Orolat. spine LS IX, orolateral spine of laterosternite IX; Sup. vols., superior volsella.**

| | *T. branquini* | *T. cuieirensis* | *T. cururui* | *T. riopreto* | *T. clivosus* | *T. hamatus* |
|---|---|---|---|---|---|---|
| **Abdomen length** | about 1270 µm | 1260 µm | about 1750 µm | about 1700 µm | 2280-3360 µm | 2110-2600 µm |
| **Hypopygium** | | | | | | |
| **Tergite IX length** | 84 µm | 85-96 µm | 109-120 µm | 106-112 µm | 124-152 µm | 120-150 µm |
| **No. median setae** | 7 | 3 | 9 | 6-9 | 6-9 | 8-10 |
| **No. apical setae** | 10 | 8-10 | 11 | 12-15 | 14-18 | 16-21 |
| **Placement of median setae** | not-grouped, from well anterior to anal point (between ATB) to close to anal point | not-grouped, not between ATB, on middle of tergite anterior to anal point base | not-grouped, from well anterior to anal point (between ATB) to close to anal point | not-grouped, from well anterior to anal point (between ATB) to close to anal point | not-grouped, not between ATB, from well anterior to close to anal point | not-grouped, not between ATB, from well anterior to close to anal point |
| **Lateral tooth** | difficult to see | difficult to see | double | double | double | double, fork-like |
| **Microtrichia-free area** | without | small microtrichia-free areas lateral to anal point | large microtrichia-free areas lateral to anal point | without | without | without |
| **Orolat. spine LS IX** | present, 2 µm | difficult to see | difficult to see | difficult to see | present, 3-4 µm | present, 3-4 µm |
| **Form of anal tergal bands** | separate (V-type), curved, running parallel on middle of tergite, ending close to anal point | separate (V-type), curved, running parallel on middle of tergite, ending more or less close to anal point | separate (V-type), curved, running parallel on middle of tergite, ending more or less close to anal point | separate (V-type), curved, running parallel on middle of tergite, ending more or less close to anal point | separate (V-type), curved, running parallel on middle of tergite, ending well anterior to anal point | separate (V-type), curved, short, not running parallel, ending well anterior to anal point |
| **Shoulders on posterior margin of anal tergite** | absent | absent | absent | absent | absent | absent |
| **Anal point length** | 40 µm | 36-37 µm | 42-48 µm | 42-58 µm | 44-60 µm | 58-70 µm |
| **Anal point form** | elongate and rounded at tip | elongate and rounded at tip | elongate and rounded at tip | elongate and pointed at tip | elongate and pointed at tip | elongate and pointed to slightly rounded at tip |
| **Microtrichia on anal point** | absent | field of microtrichia reaching the posterior half of surface between crests | field of microtrichia on the anterior half of the surface between the crests | absent | absent | absent |
| **Anal point crests or pit** | pair of well developed anal crests (23 µm) | pair of well developed anal crests (26-28 µm) | pair of well developed anal crests (27-29 µm) | pair of well developed anal crests (22-36 µm) | pair of well developed anal crests (26-34 µm) | pair of well developed anal crests (41-52 µm) |
| **Spines on anal point** | placed irregularly between the crests | placed irregularly between the crests | placed irregularly between the crests | placed irregularly between the crests | placed irregularly between the crests | placed irregularly between the crests |
| **Spiniform setae on anal point** | without | without | without | without | without | without |
| **Normal setae on anal point** | without | without | without | without | without | without |
| **Bars on anal point** | without | without | without | without | without | without |
| **Superior volsella form** | more or less heart-shaped | T-shaped, posterior part narrower | more or less heart-shaped | somewhat heart-shaped | somewhat heart-shaped | oval-circular |
| **Microtrichia on superior volsella** | absent | absent | on dorsolateral surface | absent | absent | absent |

**Table V (Cont.). Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica, Caladomyia alata, C. tuberculata* and the Nearctic *Tanytarsus limneticus* adult males: Hypopygium. ATB, anal tergal bands; Orolat. spine LS IX, orolateral spine of laterosternite IX; Sup. vols., superior volsella.**

| | *T. branquini* | *T. cuieirensis* | *T. cururui* | *T. riopreto* | *T. clivosus* | *T. hamatus* |
|---|---|---|---|---|---|---|
| **Median margin of superior volsella** | concave | concave | slightly concave | concave | concave | straight |
| **Rugosities/ wrinkles on sup. vols.** | absent | absent | absent | absent | absent | absent |
| **Posteromedian corner of superior volsella** | more developed than anteromedian one | not projecting | not projecting | slightly projecting | projecting | not projecting |
| **Lateral flap-like projection on sup. vols.** | without | without | without | without | without | without |
| **No. setae on dorsal surface of sup. volsella** | 6 | 5-7 | 9-10 | 5-6 | 5-7 | 5-7 |
| **No. setae on median margin of sup. volsella** | 2 setae (both ventral) | 2 setae (1 dorsal, 1 ventral) | 2 setae (both ventral) | 2 setae (1 dorsal, 1 ventral) | 1 seta | 1 seta |
| **Ventral seta of superior volsella** | on ventral tubercle | on ventral tubercle | on ventral tubercle | on ventral tubercle | on ventral tubercle | on ventral tubercle |
| **Longitudinal axes of sup. volsella and body** | 58-59° | 30-31° | 43-45° | 41-43° | 51-53° | 41-43° |
| **Seta on digitus basis** | without | without | without | without | 2 setae, 1 on digitus ventral surface | 1 seta |
| **Digitus form** | long and pointed | long and finger-like | long and finger-like | long and finger-like | long and thumb -like, large | long and finger-like |
| **Digitus development** | extending beyond margin of sup. volsella | extending well beyond margin of sup. volsella | extending well beyond margin of sup. volsella | extending well beyond margin of sup. volsella | extending well beyond margin of sup. volsella | extending well beyond margin of sup. volsella |
| **Median volsella length** | 13 µm | 17-19 µm | 17-20 µm | 15-19 µm | 11-12 µm | 16-18 µm |
| **Length of simple setae** | 13-16 µm | 12-15 µm | 16-18 µm | 15-18 µm | 18-24 µm | 18-25 µm |
| **Length of lamellae** | 13-14 µm | 12-15 µm | 15-17 µm | 14-17 µm | 12-16 µm | 17-20 µm |
| **Form of median volsella lamellae** | pectinate | pectinate | pectinate | pectinate | foliate | foliate |
| **Inferior volsella length** | 44 µm | 53-55 µm | 60-64 µm | 61-64 µm | 84-90 µm | 81-96 µm |
| **Inferior volsella form** | thin and somewhat straight, thicker posterior | thin and straight | thin and somewhat straight, thicker posterior | thin and straight | thin and more or less straight | somewhat thick and straight, with some apically split setae |
| **Distal part of inferior volsella** | with weakly-developed dorsoapical swelling | with very slight sub-apical swelling | with rounded dorsoapical swelling | with very slight sub-apical swelling | with oval to somewhat quadrate subapical swelling | with weakly-developed dorsoapical swelling |
| **Gonocoxite length** | 64 µm | 68-70 µm | 74-76 µm | 72-84 µm | 108-110 µm | 110-126 µm |
| **Gonostylus length** | 68 µm | 74-76 µm | 90-96 µm | 86-103 µm | 110-132 µm | 120-144 µm \ |
| **Gonostylus form** | somewhat short, straight and thin | somewhat short, straight and thin | somewhat elongate, straight and thin | elongate, straight and thin | elongate, curved and somewhat thick | elongate, curved and somewhat thick |
| **Hypopygium ratio** | 0.94 | 0.91-0.92 | 0.79-0.82 | 0.78-0.83 | 0.83-0.98 | 0.76-0.89 |

**Table V (Cont.). Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica, Caladomyia alata, C. tuberculata* and the Nearctic *Tanytarsus limneticus* adult males: Hypopygium. ATB, anal tergal bands; Orolat. spine LS IX, orolateral spine of laterosternite IX; Sup. vols., superior volsella.**

| | *T. capitatus* | *T. guatemalensis* | *T. pandus* | *T. hastatus* | *T. limneticus* | *T. rhabdomantis* | *N. patagonica* |
|---|---|---|---|---|---|---|---|
| **Abdomen length** | 2540-2600 µm | 2330 µm | 1880 µm | 2340-3300 µm | 2950-3060 µm | 2310-2750 µm | |
| **Hypopygium** | | | | | | | |
| **Tergite IX length** | 146-151 µm | 138 µm | 110 µm | 117-142 µm | 186-200 µm | 176-200 µm | 172-200µm |
| **No. medi an setae** | 6-8 | 3 | 12 | 4-8 | 9-10 | 7-12 | absent |
| **No. apical setae** | 22-28 | 14 | at least 16 | 18-24 | 18-20 | 18-24 | 28-32 |
| **Placement of median setae** | not-grouped, not between lines of ATB, from well anterior to close to anal point base | not-grouped, not between lines of ATB, placed well anterior to anal point base | not-grouped, not between lines of ATB, from well anterior to close to anal point base | not-grouped, not between lines of ATB, placed close to anal point base | not-grouped, not between lines of ATB, from well anterior to close to anal point base | not-grouped, not between lines of ATB, from well anterior to close to anal point base | Median setae absent |
| **Lateral tooth** | double, fork-like | absent | difficult to see | double | apparently absent | double | absent |
| **Microtrichia-free area on tergite IX** | without | without | without | without | without | without | large microtrichia-free areas lateral to anal point |
| **Orolat. spine LS IX** | present, 5 µm | absent | difficult to see | absent | present, 2-3 µm | probably absent | present, 4-5 µm |
| **Form of anal tergal bands** | separate (V-type), curved, running parallel on middle of tergite, ending well anterior to anal point | separate (V-type), curved, short, not running parallel, ending well anterior to anal point base | separate (V-type), curved, short, not running parallel, ending well anterior to anal point base | separate (V-type), curved, running parallel on middle of tergite, ending well anterior to anal point base | separate (V-type), curved, short, not running parallel, ending well anterior to anal point base | separate (V-type), curved, short, not running parallel, ending well anterior to anal point base | separate (V-type), curved, running parallel, ending somewhat together on middle of tergite close to anal point |
| **Shoulders on post. margin of anal tergite** | absent | absent | absent | absent | absent | absent | absent |
| **Anal point length** | 60-75 µm | 29 µm | 48 µm | 53-70 µm | 80-84 µm | 44-52 µm | 57-70 µm |
| **Anal point form** | elongate and oval at tip | elongate and slightly pointed at tip | elongate and slightly pointed at tip | elongate, somewhat flattened and triangular at tip | elongate and rounded to slightly pointed at tip | elongate and slightly pointed at tip | elongate and circular at tip |
| **Microtrichia on anal point** | few microtrichia present on the surface between the crests, mostly anterior | absent | absent | absent | field of microtrichia on entire surface between the crests | field of microtrichia on entire surface between the crests | field of microtrichia on entire surface between the crests |
| **Anal point crests or pit** | pair of well developed anal crests (35-48 µm) | absent? present? | pair of well developed anal crests (25 µm) | pair of well developed anal crests (31-38 µm) | pair of well developed anal crests (34-50 µm) | pair of well developed anal crests (30-35 µm) | pair of weakly developed, low anal crests (29-37 µm) |

**Table V (Cont.). Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica, Caladomyia alata, C. tuberculata* and the Nearctic *Tanytarsus limneticus* adult males: Hypopygium. ATB, anal tergal bands; Orolat. spine LS IX, orolateral spine of laterosternite IX; Sup. vols., superior volsella.**

| | *T. capitatus* | *T. guatemalensis* | *T. pandus* | *T. hastatus* | *T. limneticus* | *T. rhabdomantis* | *N. patagonica* |
|---|---|---|---|---|---|---|---|
| **Spines on anal point** | placed in a more or less regular row between anal crests | absent? present? | placed irregularly between the crests | many small spines placed irregularly between anal crests | placed irregularly between the crests | absent | absent |
| **Spiniform/ shorter setae on anal point** | without | without | without | without | 2 shorter setae anterior, between crests | placed irregularly between the crests | placed irregularly between the crests |
| **Normal setae on anal point** | without | without | without | without | without | without | without |
| **Bars on anal point** | without | without | without | without | without | without | without |
| **Form of superior volsella** | anterior part ovoid, posterior part elongate | more or less heart-shaped | more or less heart-shaped | more or less circular, posteromedian corner projecting | more or less heart-shaped | more or less heart-shaped | circular, posterior part projecting |
| **Microtrichia on superior volsella** | on dorsolateral and dorsomedian surface | on dorsolateral surface | on dorsolateral surface | absent | on dorsolateral surface | absent | absent |
| **Median margin of superior volsella** | concave | concave | concave | concave | concave | concave | convex |
| **Rugosities/ wrinkles on sup. vols.** | absent | absent | absent | absent | absent | absent | absent |
| **Posteromedian corner of superior volsella** | extremely projecting | slightly projecting | well projecting | well-projecting | projecting | projecting | well projecting and thumb-like |
| **Lateral flap-like projection on sup. vols.** | without | without | without | without | without | without | without |
| **No. setae on dorsal surface of sup. vols.** | 6-7 | 7 | 4 | 5-8 | 10-14 | 5-6 | 13-14, plus 1-2 setae on posteromedian corner |
| **No. setae on median margin of sup. vols.** | 2 | 1 | 2 | 2 | 2-3 | 2 (one dorsal, one ventral) | 4 (1-2 dorsal, 2-3 ventral) |
| **Ventral seta of sup. vols.** | on tubercle | on tubercle | on tubercle | on tubercle | on tubercle | on tubercle | on surface |
| **Longitudinal axes of sup. vols. and body** | about 37° | 53° | 62-64° | 56-60° | 28-34° | 45-49° | 36-40° |
| **Seta on digitus basis** | without | without | without | without | without | without | without |
| **Digitus form** | long and finger-like | long and thumb-like | long and pointed, somewhat finger-like | long and pointed, finger-like | long and pointed, somewhat cone-like | long and pointed, somewhat finger-like | short and circular |

**Table V (Cont.). Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica*, *Caladomyia alata*, *C. tuberculata* and the Nearctic *Tanytarsus limneticus* adult males: Hypopygium. ATB, anal tergal bands; Orolat. spine LS IX, orolateral spine of laterosternite IX; Sup. vols., superior volsella.**

| | *T. capitatus* | *T. guatemalensis* | *T. pandus* | *T. hastatus* | *T. limneticus* | *T. rhabdomantis* | *N. patagonica* |
|---|---|---|---|---|---|---|---|
| **Digitus development** | extending well beyond median margin of sup. volsella | extending well beyond median margin of sup. volsella | extending well beyond median margin of sup. volsella | extending well beyond median margin of superior volsella | extending a little beyond median margin of sup. volsella | not extending/ extending a little beyond median margin of sup. volsella | not reaching median margin of sup. volsella |
| **Median volsella length** | 24-28 µm | 8-9 µm | 13-14 µm | 14-22 µm | 24-30 µm | 20-24 µm | 22-27 µm |
| **Length of simple setae** | 25-28 µm | without | 21-25 µm | 20-27 µm | 26-33 µm | 26-30 µm | 18-25 µm |
| **Length of lamellae** | 26-28 µm | 11-13 µm | 13-14 µm | 20-26 µm | 30-40 µm | 24-26 µm | 20-40 µm |
| **Form of median volsella lamellae** | foliate | subulate | foliate | foliate | foliate | foliate | ramose |
| **Inferior volsella length** | 108-112 µm | 89 µm | 84 µm | 82-102 µm | 130-135 µm | 115-120 µm | 150-153 µm |
| **Inferior volsella form** | elongate, thin and curved | somewhat thick and slightly curved | thin and curved | thin and somewhat straight | somewhat thick and slightly straight | somewhat thick and slightly straight, with some apically split setae | elongate and thick, expanded in distal half |
| **Distal part of inferior volsella** | slightly wider, with weakly-developed dorsoapical swelling | slightly swelled | slightly wider, with weakly-developed dorsoapical swelling | with weakly-developed oval dorsoapical swelling | oval, very slightly swelled | oval, very slightly swelled | moderately large dorsoapical swelling |
| **Gonocoxite length** | 110-127 µm | 104 µm | 93 µm | 92-110 µm | 138-150 µm | 94-126 µm | 148-155 µm |
| **Gonostylus length** | 140-152 µm | 112 µm | 97 µm | 103-122 µm | 150-156 µm | 120-133 µm | 185-198 µm |
| **Gonostylus form** | elongate, curved and thin | elongate, straight and thick | elongate, straight and thin | elongate, curved and slightly thick | elongate, straight and thin | elongate, straight and thick | large, thick and curved inwards, distally rounded |
| **Hypopygium ratio** | 0.78-0.83 | 0.92 | 0.95 | 0.88-0.91 | 0.88-0.98 (0.94) | 0.94-1.1 | 0.77-0.82 |

**Table V (Cont.). Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica, Caladomyia alata, C. tuberculata* and the Nearctic *Tanytarsus limneticus* adult males: Hypopygium. ATB, anal tergal bands; Orolat. spine LS IX, orolateral spine of laterosternite IX; Sup. vols., superior volsella.**

| | *T. marauia* | *T. revolta* | *T. waika* | *T. xingu* | *T. amazonicus* | *T. friburgensis* |
|---|---|---|---|---|---|---|
| **Abdomen length** | 2360 µm | 2260 µm | 1360-1398 µm | 2340-2450 µm | about 1830 µm | 1840 µm |
| **Hypopygium** | | | | | | |
| **Tergite IX length** | 105-113 µm | 102 µm | 84-86 µm | 112-120 µm | 106-114 µm | 116 µm |
| **No. median setae** | 3-4 | 2 | 2-4 | 2-4 | 6-11 | 7 |
| **No. apical setae** | 16-18 | 14 | 10-12 | 20-22 | 10-12 | 14 |
| **Placement of median setae** | not grouped, not between anal tergal bands, placed more or less close to anal point base | not between anal tergal bands, placed more or less close to anal point base | not between anal tergal bands, placed more or less close to anal point base | not between anal tergal bands, placed more or less close to anal point base | not-grouped, not between lines of ATB, from well anterior to close to anal point base | not-grouped, not between lines of ATB, placed well anterior to anal point base |
| **Lateral tooth** | double | double | double | double | single | double |
| **Microtrichia-free area on tergite IX** | without | without | without | without | without | large microtrichia-free areas |
| **Orolat. spine LS IX** | - | - | - | - | probably absent | probably absent |
| **Form of anal tergal bands** | separate, short, not running parallel (not reaching middle of tergite), ending well anterior to anal point | separate, short, not running parallel (not reaching middle of tergite), ending well anterior to anal point | separate, short, not running parallel (not reaching middle of tergite), ending well anterior to anal point | separate, short, not running parallel (not reaching middle of tergite), ending well anterior to anal point base | separate, curved, running parallel on middle of tergite, ending well anterior to anal point | separate, curved, running parallel on middle of tergite, ending well anterior to anal point |
| **Shoulders on post. margin of anal tergite** | absent | absent | absent | absent | absent | absent |
| **Anal point length** | 39-43 µm | 44 µm | 32 µm | 52-64 µm | 38-42 µm | 41 µm |
| **Anal point form** | elongate and rounded at tip, spine-bearing surface slightly raised in posterior portion | circular at tip, spine-bearing surface slightly raised in posterior portion | elongate and rounded at tip, spine-bearing surface slightly raised in posterior portion | elongate and rounded at tip, spine-bearing surface raised and forming a conspicuous hump in posterior portion | elongate and slightly quadrate at tip | elongate and triangular at tip |
| **Microtrichia on anal point** | extending beyond anterior half of the surface between crests | on entire surface between crests | on anterior half of the surface between crests | on beginning of anterior half of the surface between crests | absent | on anterior half of the surface between crests |
| **Anal point crests or pit** | with pair of well developed anal crests (28-30 µm) | with pair of well developed anal crests (32 µm) | with pair of well developed anal crests (22-24 µm) | with pair of well developed anal crests (30-42 µm) | with pair of well developed anal crests (29-31 µm) | with pair of well developed anal crests (20 µm) |
| **Spines on anal point** | placed irregularly between the crests | placed irregularly between the crests | placed irregularly between the crests | placed irregularly between crests | placed regularly in one row between anal crests | placed irregularly between the crests |
| **Spiniform/ shorter setae on anal point** | without | without | without | without | without | without |
| **Normal setae on anal point** | without | without | without | without | without | without |
| **Bars on anal point** | without | without | without | without | without | without |

**Table V (Cont.). Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica, Caladomyia alata, C. tuberculata* and the Nearctic *Tanytarsus limneticus* adult males: Hypopygium. ATB, anal tergal bands; Orolat. spine LS IX, orolateral spine of laterosternite IX; Sup. vols., superior volsella.**

| | *T. marauia* | *T. revolta* | *T. waika* | *T. xingu* | *T. amazonicus* | *T. friburgensis* |
|---|---|---|---|---|---|---|
| **Form of superior volsella** | ovoid to quadrate | somewhat quadrate | somewhat quadrate | somewhat quadrate | rectangular/oblong | ovoid |
| **Microtrichia on superior volsella** | absent | absent | absent | absent | absent | absent |
| **Median margin of superior volsella** | straight to slightly concave | straight | straight | somewhat convex | straight to slightly convex | convex |
| **Rugosities/ wrinkles on sup. vols.** | absent | absent | absent | absent | present on posterior margin | absent |
| **Posteromedian corner of superior volsella** | not projecting | not projecting | not projecting | not projecting | not projecting | not projecting |
| **Lateral flap-like projection on sup. vols.** | without | without | without | without | without | without |
| **No. setae on dorsal surface of sup. vols.** | 5 | 4 | 4 | 5 | 4-5 | 4 |
| **No. setae on median margin of sup. vols.** | 3 | 2 | 2 | 3 | 2 | 3 |
| **Ventral seta of sup. vols.** | on tubercle | on tubercle | on tubercle | on tubercle | on tubercle | absent |
| **Longitudinal axes of sup. vols. and body** | 21° | 55° | 48° | 46° | 72-73° | 53° |
| **Seta on digitus basis** | without | without | without | without | without | without |
| **Digitus form** | long and pointed, finger-like | long and thumb -like | short and pointed | short and pointed | long and thick, thumb -like | long and thumb -like, thicker distally |
| **Digitus development** | extending well beyond median margin of sup. vols. | extending well beyond median margin of sup. vols. | not reaching median margin of superior vols. | not reaching median margin of sup. vols. | extending well beyond margin of sup. volsella | extending well beyond margin of sup. volsella |
| **Median volsella length** | 20-22 µm | 20 µm | 10 µm | 30-40 µm | 13 µm | 19 µm |
| **Length of simple setae** | 14-16 µm | 16 µm | 14 µm | 19-24 µm | 11-14 µm | 16-18 µm |
| **Length of lamellae** | 16-18 µm | 18 µm | 15 µm | 22-28 µm | 12-14 µm | 20-22 µm |
| **Form of median volsella lamellae** | pectinate | pectinate | pectinate | pectinate | subulate | pectinate |
| **Inferior volsella length** | 68 µm | 64 µm | 44-46 µm | 74-78 µm | 64-66 µm | 76 µm |
| **Inferior volsella form** | thick and curved | thin and curved | slightly thick and straight | thick and curved | thin and slightly curved | somewhat thick and curved |
| **Distal part of inferior volsella** | straight, not swelled | slightly swelled | straight, not swelled | wider, with dorsoapical oval swelling | straight, not swelled | rounded, slightly thicker |
| **Gonocoxite length** | 76-80 µm | 74 µm | 56 µm | 90-96 µm | 92-96 µm | 95 µm |
| **Gonostylus length** | 86-92 µm | 82 µm | 64 µm | 108-116 µm | 95-98 µm | 104 µm |
| **Gonostylus form** | elongate, straight and thin | elongate, straight and somewhat thin | short, straight and thin | elongate, straight and thin | elongate, straight and thick | elongate, curved and thin |
| **Hypopygium ratio** | 0.86-0.88 | 0.90 | 0.87 | 0.82-0.83 | 0.96-0.97 | 0.91 |

**Table V (Cont.). Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica*, *Caladomyia alata*, *C. tuberculata* and the Nearctic *Tanytarsus limneticus* adult males: Hypopygium. ATB, anal tergal bands; Orolat. spine LS IX, orolateral spine of laterosternite IX; Sup. vols., superior volsella.**

| | *T. digitatus* | *T. jacaretingensis* | *T. monospinosus* | *T. tumultuarius* | *T. rinihuensis* | *T. pseudorinihuensis* | *T. pararinihuensis* |
|---|---|---|---|---|---|---|---|
| **Abdomen length** | 1180 µm | 1710-2060 µm | 1620 µm | 1330 µm | 2600-2740 µm | 2440-2960 µm | 2450 µm |
| **Hypopygium** | | | | | | | |
| **Tergite IX length** | 149 µm | 114-124 µm | 86-96 µm | 74-100 µm | 146-164 µm | 176-182 µm | 163 µm |
| **No. median setae** | 3 | 4-8 | 5-10 | 2-4 | 2-4 | 2-3 | 2 |
| **No. apical setae** | 17 | 12-14 | 8-12 | 8-14 | 16-20 | 16-18 | |
| **Placement of median setae** | shorter, not-grouped, not between lines of ATB, placed close to anal point base | not grouped, from well anterior to anal point base (on each side of anal tergal band) to more or less close to anal point | not grouped, 4-6 extraordinary long, anterior setae (on each side of anal tergal band) and 2-4 shorter setae, more or less close to anal point | not grouped, not between anal tergal bands, placed close to anal point base | not placed between anal tergal bands, not separated into groups, placed more or less close to anal point base | not placed between anal tergal bands, not separated into groups, placed anterior to anal point base | not placed between anal tergal bands, not separated into groups, placed close to anal point |
| **Lateral tooth** | double, fork-like | absent | absent | absent | absent | absent | absent |
| **Microtrichia-free area on tergite IX** | large microtrichia-free areas | somewhat large areas on each side of anal point | with microtrichia-free areas on each side of anal point | without | with microtrichia-free area around and anterior to base of anal point | with microtrichia-free area anterior to base of anal point | with microtrichia-free area around and anterior to base of anal point |
| **Orolat. spine LS IX** | probably absent | absent | absent | absent | probably absent | present, 8 µm | probably absent |
| **Form of anal tergal bands** | separate, curved, short, not running parallel (not reaching middle of tergite), ending well anterior to anal point | Y-type, fused on median part of tergite, not reaching anal point | Y-type, fused on median part of tergite, not reaching anal point, connecting between median setae, in some species splitting up again towards anal crests | separate, running parallel on middle of tergite, sometimes touching each other, ending close to anal point | separate, curved, running parallel on middle of tergite, ending anterior to anal point base | separate, curved, not running parallel, ending well anterior to anal point base | separate, curved, not running parallel, ending well anterior to anal point base |
| **Shoulders on post. margin of anal tergite** | absent | absent | absent | absent; anal tergite with enlarged apex | absent | absent | absent |
| **Anal point length** | 46 µm | 51-54 µm | 49-53 µm | 21-25 µm | 54-62 µm | 58-60 µm | 58 µm |
| **Anal point form** | elongate and somewhat wider, notched posteriorly and slightly quadrate at tip | elongate and rounded at tip, posterior part of anal point dorsally sclerotized | elongate and rounded at tip, posterior part of anal point dorsally sclerotized | short and triangular at tip | elongate and rounded at tip | elongate and rounded at tip | elongate and rounded at tip |
| **Microtrichia on anal point** | on anterior half of the surface between the crest | absent | absent | absent | absent | absent | absent |
| **Anal point crests or pit** | with pair of well-developed anal crests (32 µm) | with a pair of well developed anal crests (22-25 µm) | with pair of well developed anal crests (20 µm) | with pair or well developed anal crests (19 µm) | with pair of weakly developed, low anal crests (26-39 µm) | with pair of weakly developed, low anal crests (30 µm) | with pair of weakly developed, low anal crests (31 µm) |

**Table V (Cont.). Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica*, *Caladomyia alata*, *C. tuberculata* and the Nearctic *Tanytarsus limneticus* adult males: Hypopygium. ATB, anal tergal bands; Orolat. spine LS IX, orolateral spine of laterosternite IX; Sup. vols., superior volsella.**

| | *T. digitatus* | *T. jacaretingensis* | *T. monospinosus* | *T. tumultuarius* | *T. rinihuensis* | *T. pseudorinihuensis* | *T. pararinihuensis* |
|---|---|---|---|---|---|---|---|
| **Spines on anal point** | placed irregularly between crests, almost in contact | 1 spine between anal crests; rarely 2 spines | 1 single strong spine between anal crests | 2 spines placed regularly between crests | absent | absent | absent |
| **Spiniform/ shorter setae on anal point** | without | without | without | without | 1 short, strong seta placed in a grub between anal crests | 1 short, thin seta placed in a grub between anal crests | 1 short, thin seta placed in a grub between anal crests |
| **Normal setae on anal point** | without | without | without | without | without | without | without |
| **Bars on anal point** | without | without | without | without | without | without | without |
| **Form of superior volsella** | ovoid, slightly triangular | somewhat lozenge | somewhat lozenge | circular | ovoid | slightly heart-shaped | somewhat period-like |
| **Microtrichia on superior volsella** | absent | absent | absent | microtrichia on dorsolateral and ventromedian surfaces | microtrichia on dorsolateral surface | absent | absent |
| **Median margin of superior volsella** | straight to slightly convex | (neither concave nor convex) anteromedian portion quite projecting, posteromedian part elongate | (neither concave nor convex) anteromedian portion quite projecting, posteromedian part elongate | convex | slightly convex | concave | concave |
| **Rugosities/ wrinkles on sup. vols.** | absent | with wrinkles and rugosities on median, lateral and posterior margins | with wrinkles and rugosities on median, lateral and posterior margins | absent | absent | absent | absent |
| **Posteromedian corner of sup. vols.** | not projecting | not projecting | not projecting | not projecting | somewhat project | projecting | well projecting |
| **Lateral flap-like projection on sup. vols.** | without | with flap-like, wrinkled projection | with flap-like, wrinkled projection | without | without | without | without |
| **No. setae on dorsal surface of sup. vols.** | 4 | 4-6 setae (one of them placed on anteromedian projection) | 5 setae (one of them placed on anteromedian projection) | 3-6 | 10-13 | 7-9 | 7 |
| **No. setae on median margin of sup. volsella** | 3 | 1 | 1 | 3 | 3 | 3-4 | 2 |
| **Ventral seta of sup. vols.** | on tubercle | on tubercle | on surface | on surface | on tubercle | on tubercle | on tubercle |
| **Longitudinal axes of sup. vols. and body** | 56° | 30-34° | 33-36° | 37-40° | 32-35° | 41-42° | 35-37° |

**Table V (Cont.). Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica, Caladomyia alata, C. tuberculata* and the Nearctic *Tanytarsus limneticus* adult males: Hypopygium. ATB, anal tergal bands; Orolat. spine LS IX, orolateral spine of laterosternite IX; Sup. vols., superior volsella.**

| | *T. digitatus* | *T. jacaretingensis* | *T. monospinosus* | *T. tumultuarius* | *T. rinihuensis* | *T. pseudorinihuensis* | *T. pararinihuensis* |
|---|---|---|---|---|---|---|---|
| **Seta on digitus basis** | without | without | without | without | without | without | without |
| **Digitus form** | thick and leaf-like, quite wide in the middle | small, difficult to distinguish | small, difficult to distinguish | long and pointed, finger-like | short and oval/rounded | short and oval/rounded | short and oval/rounded |
| **Digitus development** | extending beyond margin of superior volsella | short, not reaching median margin of superior volsella | short, not reaching median margin of superior volsella | extending well beyond median margin of superior volsella | not reaching margin of superior volsella | not reaching margin of superior volsella | not reaching margin of superior volsella |
| **Median volsella length** | 20 µm | 10-14 µm | missing or reduced to a minute bare knob | missing | 20-24 µm | 18-21 µm | 19 µm |
| **Length of simple setae** | 14-16 µm | 15-22 µm | without | without | 25-32 µm | 24-29 µm | 21-24 µm |
| **Length of lamellae** | 19-20 µm | 16-18 µm | without | without | 32-36 µm | 30-35 µm | 29-31 µm |
| **Form of median volsella lamellae** | subulate | pectinate | without | without | simple | simple | simple |
| **Inferior volsella length** | 100 µm | 69-82 µm | 62-72 µm | 68-90 µm | 109-118 µm | 111-114 µm | 102 µm |
| **Inferior volsella form** | somewhat lanceolate, wider on posterior half | thin and straight | thin and straight | thin and curved | elongate, thin and somewhat straight | thick and slightly curved | thick and straight |
| **Distal part of inferior volsella** | lanceolate, wider and pointed at tip | oval, slightly swelled | oval, slightly swelled | straight, not swelled | oval, slightly swelled | with rounded swelling | slightly swelled |
| **Gonocoxite length** | 100 µm | 98-118 µm | 107-117 µm | 86-104 µm | 130-132 µm | 126-132 µm | 109 µm |
| **Gonostylus length** | 116 µm | 100-120 µm | 103-109 µm | 90-104 µm | 144-148 µm | 144-150 µm | 136 µm |
| **Gonostylus form** | elongate, straight and thick | elongate, curved and thick | elongate, curved and thick | elongate, straight and thin | elongate, curved and slightly thick | elongate, thick and slightly curved | elongate, somewhat curved and thick |
| **Hypopygium ratio** | 0.86 | 0.96-1.02 | 1.02-1.11 | 0.93-1.02 | 0.90-0.91 | 0.85-0.91 | |

**Table V (Cont.). Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica, Caladomyia alata, C. tuberculata* and the Nearctic *Tanytarsus limneticus* adult males: Hypopygium. ATB, anal tergal bands; Orolat. spine LS IX, orolateral spine of laterosternite IX; Sup. vols., superior volsella.**

| | *T. ligulatus* | *T.* cf. *ligulatus* | *T. paraligulatus* | *T. fastigatus* | *T. reissi* |
|---|---|---|---|---|---|
| **Abdomen length** | 1940-2340 µm | 1390-1530 µm | about 2460 µm | 1830-2070 µm | 1840 µm |
| **Hypopygium** | | | | | |
| **Tergite IX length** | 99-102 µm | 86-89 µm | 130-142 µm | 86-98 µm | 155 µm |
| **No. median setae** | one pair | one pair | one pair | absent | 4 |
| **No. apical setae** | 8 | 8 | 12 | absent | 18 |
| **Placement of median setae** | very close to anal point base | very close to anal point base | very close to anal point base | -- | not placed between anal tergal bands, not separated into groups, placed anterior to anal point base |
| **Lateral tooth** | absent | absent | absent | absent | absent |
| **Microtrichia-free area on tergite IX** | large microtrichia-free area anterior to anal point | microtrichia-free area anterior to anal point | microtrichia-free area anterior to anal point | with microtrichia-free area posteriorly | without |
| **Orolat. spine LS IX** | probably absent | probably absent | probably absent | probably absent | absent |
| **Form of anal tergal bands** | T-type, fused on median part of tergite, ending more or less close to anal point | T-type, fused on median part of tergite, ending more or less close to anal point | T-type, fused on median part of tergite, ending more or less close to anal point | short, slightly curved, ending almost in contact on middle of tergite (not running parallel, ending well anterior to anal point) | short, separate, curved, ending parallel on middle of tergite well anterior to anal point |
| **Shoulders on post. margin of anal tergite** | absent | absent | absent | absent | absent |
| **Anal point length** | 30-32 µm | 26-28 µm | 32-41 µm | 48-49 µm | 45 µm |
| **Anal point form** | elongate and thin, apex wider and spoon-like | elongate and thin, apex slightly wider and more or less spoon-like, spoon-like form not so marked like in *T. ligulatus* | elongate and thin, apex slightly wider and more or less spoon-like, spoon-like form not so marked like in *T. ligulatus*, but more than in *T.* cf. *ligulatus* | elongate and thin, pointed at tip | elongate and pointed/triangular at tip |
| **Microtrichia on anal point** | absent | absent | absent | absent | present |
| **Anal point crests or pit** | pair of rounded, spoon-like anal crests placed on apex, the distal portion slightly toothed | pair of rounded, spoon-like anal crests placed on apex, the distal portion lightly toothed | pair of rounded, spoon-like anal crests placed on apex, the distal portion slightly toothed | absent | absent |
| **Spines on anal point** | absent | absent | absent | absent | absent |
| **Spiniform/ shorter setae on anal point** | without | without | without | absent | absent |
| **Normal setae on anal point** | without | without | without | 10 setae | absent |
| **Bars on anal point** | without | without | without | without | without |
| **Form of superior volsella** | heart-shaped | heart-shaped | triangular | quadrate | pear-shaped, elongate |

**Table V (Cont.). Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica, Caladomyia alata, C. tuberculata* and the Nearctic *Tanytarsus limneticus* adult males: Hypopygium. ATB, anal tergal bands; Orolat. spine LS IX, orolateral spine of laterosternite IX; Sup. vols., superior volsella.**

| | *T. ligulatus* | *T.* cf. *ligulatus* | *T. paraligulatus* | *T. fastigatus* | *T. reissi* |
|---|---|---|---|---|---|
| **Microtrichia on superior volsella** | absent | absent | absent | absent | absent |
| **Median margin of superior volsella** | concave | concave | straight | straight | straight to slightly convex |
| **Rugosities/ wrinkles on sup. vols.** | absent | absent | absent | absent | absent |
| **Posteromedian corner of superior volsella** | slightly projecting | slightly projecting | not projecting | not projecting | slightly projecting |
| **Lateral flap-like projection on sup. vols..** | without | without | without | without | without |
| **No. setae on dorsal surface of sup. vols.** | 5-6 | 5 | 7 | 5 | 5 |
| **No. setae on median margin of sup. volsella** | 2-3 | 2 | 2 | 3 | 2 |
| **Ventral seta of sup. vols.** | on small tubercle | on tubercle | on surface | on tubercle | on surface |
| **Longitudinal axes of sup. vols. and body** | 35-37° | 38-40° | 30-32° | 47-50° | 20-23° |
| **Seta on digitus basis** | without | without | without | without | without |
| **Digitus form** | long and thumb-like | long and pointed, finger-like | long and pointed, finger-like | long and thumb-like | short and rounded |
| **Digitus development** | extending well beyond margin of superior volsella | extending well beyond margin of superior volsella | extending well beyond margin of superior volsella | extending well beyond margin of superior volsella | not reaching margin of superior volsella |
| **Median volsella length** | 21 µm | 15-18 µm | 22-25 µm | 13-15 µm | 15 µm |
| **Length of simple setae** | 21-24 µm | 14-18 µm | 25-32 µm | 17-20 µm | 35-38 µm |
| **Length of lamellae** | 17 µm | 12-14 µm | 22-24 µm | 15-18 µm | 35-37 µm |
| **Form of median volsella lamellae** | quite fringed pectinate lamellae | quite fringed pectinate lamellae | quite fringed pectinate lamellae | foliate | slightly subulate |
| **Inferior volsella length** | 70-79 µm | 53-57 µm | 92-94 µm | 68-70 µm | 110 µm |
| **Inferior volsella form** | thick and straight | somewhat curved and thin | thick and straight | thin and straight | thick (large) and straight |
| **Distal part of inferior volsella** | with rounded to slightly triangular/quadrate swelling | with rounded to somewhat quadrate swelling | with rounded to triangular swelling | with triangular swelling | with rounded swelling |
| **Gonocoxite length** | 98-103 µm | 78-82 µm | 120-130 µm | 86-94 µm | 93 µm |
| **Gonostylus length** | 106-114 µm | 83-88 µm | 140-148 µm | 87-96 µm | 112 µm |
| **Gonostylus form** | elongate, straight and somewhat thin | elongate, straight and somewhat thin | elongate, thick and curved, distally rounded | somewhat thick and straight | elongate, thick (large) and straight |
| **Hypopygium ratio** | 0.90-0.92 | 0.92-0.93 | 0.85-0.87 | 0.97-0.98 | 0.76 |

**Table V (Cont.). Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica, Caladomyia alata, C. tuberculata* and the Nearctic *Tanytarsus limneticus* adult males: Hypopygium. ATB, anal tergal bands; Orolat. spine LS IX, orolateral spine of laterosternite IX; Sup. vols., superior volsella.**

| | *T. impar* | *T. magnus* | *T. curvicristatus* | *C. alata* | *C. tuberculata* |
|---|---|---|---|---|---|
| **Abdomen length** | 2260 µm | 2800 µm | 1720-2500 µm | - | 2258-2430 µm |
| **Hypopygium** | | | | | |
| **Tergite IX length** | 137 µm | 170 µm | 97-102 µm | 112 µm | 112-114 µm |
| **No. median setae** | 4 | 5 | 4-5 | 2 | 2 |
| **No. apical setae** | 10 | | 12 | absent, setae on anal point | absent, setae on anal point |
| **Placement of median setae** | very close to anal point | very close to anal point | separated into 2 groups on the end of the anal tergal bands | each seta on each side of the anal tergal band | each seta on each side of the anal tergal band |
| **Lateral tooth** | double lateral tooth | double lateral tooth | absent | absent | difficult to see, a tubercle is present on this area |
| **Microtrichia-free area on tergite IX** | without | without | without | close and anterior to anal point | without |
| **Orolat. spine LS IX** | absent | very small | present, 6 µm | present, 3 µm | present, 6-8 µm |
| **Form of anal tergal bands** | separate, curved and short, not reaching middle of tergite | separate, curved and short, not reaching middle of tergite | separate, curved, running parallel, ending well anterior to anal point base | Y-type, fused on median part of tergite and reaching anal point | Y-type, fused on median part of tergite and reaching anal point |
| **Shoulders on post. margin of anal tergite** | absent | absent | absent | present | present |
| **Anal point length** | 34 µm | 35 µm | 41-44 µm | 38 µm | 43-54 µm |
| **Anal point form** | elongate and pointed at tip | elongate and pointed at tip | elongate and slightly quadrate at tip | elongate and rounded at tip, proximal part wider | elongate and rounded at tip |
| **Microtrichia on anal point** | absent | absent | absent | absent | absent |
| **Anal point crests or pit** | absent | absent | pair of curved, oval anal crests placed anterior | absent | absent |
| **Spines on anal point** | absent | absent | absent | absent | absent |
| **Spiniform/ shorter setae on anal point** | absent | absent | absent | absent | absent |
| **Normal setae on anal point** | absent | absent | absent | 12 | 12 |
| **Bars on anal point** | absent | absent | one anterior short bar pointed in posterior direction, plus one posterior long bar, serrated at tip, pointed in anterior direction | 1 pair of bars posteriorly directed | without |
| **Form of superior volsella** | heart-shaped | elongate and oval | in most part circular | heart-shaped | rectangular |
| **Microtrichia on superior volsella** | microtrichia on dorsolateral surface | absent | absent | absent | absent |

**Table V (Cont.). Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica, Caladomyia alata*, *C. tuberculata* and the Nearctic *Tanytarsus limneticus* adult males: Hypopygium. ATB, anal tergal bands; Orolat. spine LS IX, orolateral spine of laterosternite IX; Sup. vols., superior volsella.**

| | *T. impar* | *T. magnus* | *T. curvicristatus* | *C. alata* | *C. tuberculata* |
|---|---|---|---|---|---|
| **Median margin of superior volsella** | concave | concave | convex | straight | straight |
| **Rugosities/ wrinkles on sup. vols.** | absent | absent | absent | absent | absent |
| **Posteromedian corner of superior volsella** | projecting | projecting | well projecting | projecting | very slightly projecting |
| **Lateral flap-like projection on sup. vols.** | without | without | without | without | without |
| **No. setae on dorsal surface of sup. vols.** | 6 | 6 | 5-6 | 5 | 7-8 |
| **No. setae on median margin of sup. volsella** | 2 | 2 | 2-3 | 2 | 2 |
| **Ventral seta of sup. vols.** | on tubercle | on tubercle | on tubercle | on surface | on tubercle |
| **Longitudinal axes of sup. vols. and body** | 31° | 23° | 72-78° | 48-53° | 50-56° |
| **Seta on digitus basis** | absent | absent | absent | absent | absent |
| **Digitus form** | digitus thick, somewhat S-shaped | digitus long and S-shaped | short and pointed (cone-shaped/triangular) | short and pointed, finger-like | short and pointed, somewhat finger-like |
| **Digitus development** | extending well beyond margin of superior volsella | extending beyond margin of superior volsella | not reaching median margin of superior volsella | not reaching median margin of superior volsella | not reaching median margin of superior volsella |
| **Median volsella length** | 34 µm | 35 µm | 7-9 µm | 12 µm | 17-20 µm |
| **Length of simple setae** | 25-30 µm | 26-30 µm | 23-26 µm | 18-20 µm | 18-22 µm |
| **Length of lamellae** | 22-26 µm | 20-26 µm | 21-25 µm | 22-23 µm | 17-20 µm |
| **Form of median volsella lamellae** | subulate | subulate | ramose | subulate + pectinate | subulate |
| **Inferior volsella length** | 113 µm | 140 µm | 63-75 µm | 80 µm | 80-82 µm |
| **Inferior volsella form** | curved and thick | curved and thick | thick and straight | thick and straight | thin and curved |
| **Distal part of inferior volsella** | clubbed | clubbed | slightly thicker | not swelled | with oval to rounded swelling |
| **Gonocoxite length** | 115 µm | 147 µm | 89-114 µm | 90 µm | 100-102 µm |
| **Gonostylus length** | 130 µm | 164 µm | 98-125 µm | 88 µm | 99-102 µm |
| **Gonostylus form** | elongate, curved and somewhat thin | elongate, curved and somewhat thin | elongate, somewhat curved and thin | somewhat short, straight and slightly thick | somewhat elongate, straight and slightly thick |
| **Hypopygium ratio** | 0.88 | 0.80 | 0.90-0.91 | 1.02 | 1.01 |

**Table VI. Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica*, *Caladomyia tuberculata* and the Nearctic *Tanytarsus limneticus* pupae: Cephalic area.**

| | Frontal apotome | Frontal setae | Cephalic tubercles | Frontal warts | Pedicel sheath tubercle |
|---|---|---|---|---|---|
| ***T. cuieirensis*** | rugose | thick, 99 µm, mounted apically on cephalic tubercles | weakly developed | absent | well developed, cone-shaped |
| ***T. clivosus*** | smooth | thick, 110-128 µm, mounted apically on cephalic tubercles | weakly developed | absent, area anterior to cephalic tubercles slightly swelled | well developed t |
| ***T. hamatus*** | smooth | thick, 90-110 µm, mounted apically on cephalic tubercles | weakly developed | absent, area around and anterior to cephalic tubercles swelled | absent |
| ***T. pandus*** | smooth | thick, 43-50 µm, mounted apically on cephalic tubercles | weakly developed | absent | well developed |
| ***T. hastatus*** | smooth | thick, 90-125 µm long, mounted apically on cephalic tubercles | well-developed cone-shaped cephalic tubercles | absent | well developed |
| ***T. limneticus*** | smooth, with some wrinkles | thin and short, 49-52 µm long, mounted apically on cephalic tubercles | weakly developed | absent | well developed |
| ***T. rhabdomantis*** | smooth, area of cephalic tubercles with some wrinkles | thin and short, 90-98 µm, mounted apically on cephalic tubercles | very weakly developed | absent | apparently absent |
| ***N. patagonica*** | smooth, area of cephalic tubercles with wrinkles | thin and short, 50-62 µm long, mounted apically on cephalic tubercles | weakly developed cephalic tubercles | absent | well developed |
| ***T. marauia*** | slightly rugose | thin, 77 µm, mounted apically on cephalic tubercles | weakly developed | absent | absent |
| ***T. revolta*** | -- | -- | -- | -- | -- |
| ***T. waika*** | rugose | thin, 72 µm | absent | absent | -- |
| ***T. xingu*** | -- | -- | -- | -- | -- |
| ***T. amazonicus*** | smooth | thin and short, 47 µm, mounted apically on cephalic tubercles | weakly developed | absent | difficult to see |
| ***T. rinihuensis*** | with an elevated rectangular area and with fine granulation | thin, 98-128 µm | weakly developed or reduced | absent | small |

**Table VI (Cont.). Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica, Caladomyia tuberculata* and the Nearctic *Tanytarsus limneticus* pupae: Cephalic area.**

| | Frontal apotome | Frontal setae | Cephalic tubercles | Frontal warts | Pedicel sheath tubercle |
|---|---|---|---|---|---|
| ***T. ligulatus*** | with fine granulation | thick, 98-112 µm, mounted apically on cephalic tubercles | well-developed conical cephalic tubercles (60-73 µm) | absent | very small, weakly developed |
| ***T. fastigatus*** | with fine granulation | thin, 84-100 µm, mounted apically on cephalic tubercles | weakly developed (2-4 µm) | absent | well developed |
| ***T. impar*** | smooth | thin, 63 µm, mounted on cephalic tubercles | weakly developed | present? with pair of large swellings anterior to cephalic tubercles | absent |
| ***T. magnus*** | smooth | apparently absent | cone-shaped | present? with pair of large swellings anterior to cephalic tubercles | difficult to see |
| ***C. tuberculata*** | smooth, with fine granulation close to cephalic tubercles | thick, quite strong, 110-148 µm, mounted apically on cephalic tubercles | well-developed, conical cephalic tubercles (28-45 µm) | absent | weakly developed. |

**Table VII. Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica, Caladomyia tuberculata* and the Nearctic *Tanytarsus limneticus* pupae: Thorax. Ant./ post. pair, anterior/ posterior pair of dorsocentrals; Dcs/ $Dc_{1-4}$, dorsocentrals 1-4; Aps, antepronotals; $Pcs_{1-3}$, precorneals 1-3; Th horn, thoracic horn.**

| | Thorax (µm) | Thorax ornament | Wing sheath nose | Prealar tubercle | Thoracic horn (µm) | Th horn armament | Precorneals pattern | Pcs lengths (µm) | Antepronotals (µm) | Dorsocentrals (µm) |
|---|---|---|---|---|---|---|---|---|---|---|
| ***T. cuieirensis*** | 667 | over median suture rugose with small spinules | well developed | well developed, rectangular and inwardly folded | 260 | sparsely covered with spinules | in a triangular pattern, $Pc_2$ and $Pc_3$ closer to each other, $Pc_2$ thicker and longer | $Pc_1$ 111, $Pc_2$ 243, $Pc_3$ 128 | 1 median about 195 and 2 lateral Aps, (about 195, and 4-6) | ant. pair 95 (thin) and 88 (thick), posterior pair, 56 (thin) and 111 (thick), $Dc_4$ stronger than $Dc_1$-$Dc_3$ |
| ***T. clivosus*** | 910-950 | smooth, with small points along median suture | well developed | well developed, rounded to somewhat quadrate and inwardly folded | 210-360, somewhat thick | smooth | not in a triangular pattern, placed on a tubercle, $Pc_2$ and $Pc_3$ placed close to each other on margin of tubercle, $Pc_2$ thicker and longer | $Pc_1$ 124-184, $Pc_2$ and $Pc_3$ 316-360 and 270-290 | 1 median 180-208 and 2 lateral Aps 6-7, 296-355 | ant. pair 52-65 (thick) and 120-132 (thin), post. pair 96-124 (thin) and 68-84 (thick), $Dc_4$ stronger than $Dc_1$-$Dc_3$ |
| ***T. hamatus*** | 900-1120 | smooth, with few small points/teeth and granulations along median suture | well developed | well developed, rectangular and inwardly folded | 270-378, somewhat thin | smooth | not in a triangular pattern, placed on a tubercle, $Pc_2$ and placed close to each other on margin of tubercle, $Pc_2$ thicker and longer | $Pc_1$ 140-178, $Pc_2$ and $Pc_3$ 344-380 and 300-340 | 1 median 142-204 and 2 lateral Aps 9-13, 188-264 | ant. pair 148-188 (thin) and 62-72, (thick), post. pair 70-106 (thin) and 88-110 (thick). |
| ***T. pandus*** | --- | smooth, with few small points along median suture | well developed | well developed, slightly rounded and inwardly folded | 608-650, thin | with few spinules | not in a triangular pattern, $Pc_3$ thicker and longer, basis of $Pc_2$ and $Pc_3$ almost fused | length difficult to measure | 1 median 117 and 2 lateral Aps (1 difficult to measure, 1 seta mark | ant. pair 90 (thin) and 64 (thick), post. pair 75 (thin) and 137 (thick), $Dc_4$ stronger than $Dc_1$-$Dc_3$ |
| ***T. hastatus*** | 880-960 | smooth, with few small point along median suture | well developed | well developed, somewhat rounded | 410-445, thin | smooth | not in a triangular pattern, $Pc_1$ stronger and mounted on a rounded tubercle, $Pc_2$ and $Pc_3$ closer to each other | $Pc_1$ 112-148, $Pc_2$ 90-107 and $Pc_3$ 108-115 | 1 median 112-125 and 2 lateral Aps (1 difficult to measure, 1 seta mark) | ant. pair 80-112 (thin) and 55-62 (thick), post. pair 72-80 (thin) and 78-110 (thick), $Dc_4$ stronger than $Dc_1$-$Dc_3$ |

**Table VII (Cont.). Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica*, *Caladomyia tuberculata* and the Nearctic *Tanytarsus limneticus* pupae: Thorax. Ant./ post. pair, anterior/ posterior pair of dorsocentrals; Dcs/ $Dc_{1-4}$, dorsocentrals 1-4; Aps, antepronotals; $Pcs_{1-3}$, precorneals 1-3; Th horn, thoracic horn.**

| | Thorax (µm) | Thorax armament | Wing sheath nose | Prealar tubercle | Thoracic horn (µm) | Th horn armament | Precorneals pattern | Pcs lengths (µm) | Antepronotals (µm) | Dorsocentrals (µm) |
|---|---|---|---|---|---|---|---|---|---|---|
| ***T. limneticus*** | 1290-1320 | smooth, with small teeth along median suture | weakly developed | well developed, somewhat rounded/ quadrate and inwardly folded | 680-720 | with spinules | not in a triangular pattern, placed on a tubercle, $Pc_2$ and $Pc_3$ closer to each other, $Pc_3$ thicker and longer | $Pc_1$ 170-238, $Pc_2$ 196-204 and $Pc_3$ 212-248 | 1 median 136-154 and 2 lateral Aps (100-110, 1 seta mark) | ant. pair 102-140 (thin) and 69-82 (thick), post. pair 100-104 (thin) and 94-96 (thick) |
| ***T. rhabdomantis*** | 1046-1184 | smooth, with small points along median suture; two small, rounded tubercles anteriorly near median Aps | well developed | weakly protuberant, wrinkles present on this area | 356-450, thin | with small spines | in a triangular pattern, not on tubercle; small tubercle close to $Pc_3$; $Pc_1$ stronger, $Pc_2$ and $Pc_3$ closer to each other | --- | 1 median and 2 lateral Aps (1 seta mark) | $Dc_1$ thick, Dc2 thin, $Dc_3$ thin, $Dc_4$ thick, much stronger than $Dc_1$-$Dc_3$ |
| ***N. patagonica*** | 1040-1100 | smooth, with points along median suture; small, rounded tubercle present anteriorly near median Aps | without nose | well developed, rectangular | 292-373 | with small, weakly sclerotized spines | not in a triangular pattern, apparently placed on a tubercle, another small tubercle is present close to $Pc_3$; $Pc_1$ stronger, $Pc_2$ and $Pc_3$ closer to each other | $Pc_1$ 100-125, $Pc_2$ 85-102 and $Pc_3$ 92-110 | 1 median 100-115 and 2 lateral Aps 4-5 and 62-79 | ant. pair 73-100 (thin) and 42-53 (thick), post. pair 68-76 (thin) and 110-120 (thick), $Dc_4$ stronger than $Dc_1$-$Dc_3$ |
| ***T. marauia*** | --- | smooth, over median suture slightly rugose | with nose | ---- | 341, elongate and thin | with small spinules | Pc1 thicker, distance between $Pc_1$ and $Pc_2$ 1 µm and between $Pc_2$ and $Pc_3$ 6 µm | $Pc_1$ 100, $Pc_2$ 68 and $Pc_3$ 28 | 1 median (43) and 2 lateral Aps | $Dc_1$ 76, $Dc_2$ 60, $Dc_3$ 62, $Dc_4$ 91, $Dc_1$ and $Dc_4$ thicker |
| ***T. revolta*** | ---- | slightly granulose | with nose | ----- | 242, relatively short and thick(?) | covered with spinules | $Pc_1$ thicker, distance between $Pc_1$ and $Pc_2$ 26 µm and between $Pc_2$ and $Pc_3$ 8 µm; | $Pc_1$ 74, $Pc_2$ 47 and $Pc_3$ 51 | 1 median Aps 59, 2 lateral Aps (40, 1 seta mark) | $Dc_1$ 45 m (thin), $Dc_2$ 36 (thicker) |
| ***T. waika*** | ---- | smooth | with nose | ---- | 298, elongate and thin | sparsely covered with spinules | $Pc_1$ thicker, distance between $Pc_1$ and $Pc_2$ 6 µm and between $Pc_2$ and $Pc_3$ 8 µm | $Pc_1$ 62, $Pc_2$ 45, $Pc_3$ 47 | 1 median Aps 81, 2 lateral Aps (32, 1 seta mark) | $Dc_1$ 79, Dc2 missing, $Dc_3$ 57, $Dc_4$ 62, Dc4 thicker |
| ***T. xingu*** | ----- | smooth, over median suture slightly rugose | with nose | ----- | 448, elongate and thin | with spinules | ---- | ---- | 1 median Aps 109 | $Dc_1$ 48 |

**Table VII (Cont.). Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica, Caladomyia tuberculata* and the Nearctic *Tanytarsus limneticus* pupae: Thorax. Ant./ post. pair, anterior/ posterior pair of dorsocentrals; Dcs/ $Dc_{1-4}$, dorsocentrals 1-4; Aps, antepronotals; $Pcs_{1-3}$, precorneals 1-3; Th horn, thoracic horn.**

| | Thorax (µm) | Thorax armament | Wing sheath nose | Prealar tubercle | Thoracic horn (µm) | Th horn armament | Precorneals pattern | Pcs lengths (µm) | Antepronotals (µm) | Dorsocentrals (µm) |
|---|---|---|---|---|---|---|---|---|---|---|
| ***T. amazonicus*** | 725 | smooth, with small points along median suture | well developed | well developed, cone-shaped | 282 | small spines | in a triangular pattern, $Pc_1$ thicker than $Pc_2$ and $Pc_3$, small tubercle close to Pcs | $Pc_1$ 42, $Pc_2$ 37 and $Pc_3$ 39 | 1 median (52), stronger, and 1 lateral (24) | ant. pair 39 (thick) and 41 (thin), post. pair 61 (thin) and 70 (thick), $Dc_4$ stronger than $Dc_1$-$Dc_3$ |
| ***T. rinihuensis*** | 1150-1205 | smooth, with small teeth along median suture and granulations close to basis of thoracic horn | without nose | well developed, anvil-shaped and inwardly folded | 644-840, long and thin | smooth | not in a triangular pattern, placed on a tubercle, $Pc_1$ stronger, $Pc_2$ and $Pc_3$ placed close to each other | $Pc_1$ 113-140, $Pc_2$ 112-128, $Pc_3$ 108-120 | 1 median 114-136 and 2 lateral Aps (4-6, 102-117) | ant. pair 80-96 (thin) and 36-48 (thick), post. pair 68-82 (thin) and 50-78 (thick) |
| ***T. ligulatus*** | 762-820 | smooth, with small teeth along median suture | well developed | weakly developed, slightly rounded | large, 625 | with spines | not forming a triangular pattern, $Pc_1$ thicker and longer, placed on a rounded tubercle, $Pc_2$ and $Pc_3$ close to thoracic horn | $Pc_1$ 132-134, $Pc_2$ 120-125, $Pc_3$ 102-110 | 1 median 158, strong, and 2 lateral Aps (42 and 1 seta mark) | ant. pair 59-62 (thin) and 64-67 (strong), post. pair 60-64 (thin) and 55-58 (strong) |
| ***T. fastigatus*** | 778-890 | smooth, with few small teeth along median suture | well developed | weakly developed, wrinkles present on this area, very slightly rounded | 192-216 | with more or less elongate, fine spines along most of length | in a more or less triangular pattern, placed on a rounded tubercle, $Pc_2$ thicker and longer $Pc_2$ and $Pc_3$ close to each other | $Pc_1$ 92-104, $Pc_2$ 167-186, $Pc_3$ 154-171 | 1 median 102-120 and 2 lateral Aps 22-40 and 106-118 µm | ant. pair 33-44 (strong) and 76-92 (thin), post. pair 32-46 (strong) and 59-72 (thin) |

**Table VII (Cont.). Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica*, *Caladomyia tuberculata* and the Nearctic *Tanytarsus limneticus* pupae: Thorax. Ant./ post. pair, anterior/ posterior pair of dorsocentrals; Dcs/ $Dc_{1-4}$, dorsocentrals 1-4; Aps, antepronotals; $Pcs_{1-3}$, precorneals 1-3; Th horn, thoracic horn.**

| | Thorax (µm) | Thorax armament | Wing sheath nose | Prealar tubercle | Thoracic horn (µm) | Th horn armament | Precorneals pattern | Pcs lengths (µm) | Antepronotals (µm) | Dorsocentrals (µm) |
|---|---|---|---|---|---|---|---|---|---|---|
| ***T. impar*** | 800 | smooth, with points/ granulation along median suture | weakly developed | well developed, triangular | --- | smooth | in a triangular pattern, placed on a tubercle | --- | 1 median and two lateral Aps (1 thick and long, 1 seta mark) | --- |
| ***T. magnus*** | 1100 | smooth, with points/ granulation along median suture | weakly developed | well developed, triangular | --- | smooth | not in a triangular pattern, placed close to each other, Pc1 stronger | --- | 1 median and two lateral Aps (1 thick and long, 1 seta mark | --- |
| ***C. tuberculata*** | 750-990 | smooth, with small points along median suture | well developed | weakly to somewhat developed, slightly rounded/ triangular | 442-552, thin | smooth | in a triangular pattern, placed on a rounded tubercle, anterior precorneal stronger, Pc2 and Pc3 closer to each other | $Pc_1$ 144-172, $Pc_2$ 120-150, $Pc_3$ 118-128 | 1 median, strong (110-136 and 2 lateral Aps (6-8 and 56-88) | all setae of same thickness, ant. pair 116-150 and 36-62, post. pair 30-50 and 50-60 |

**Table VIII. Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica, Caladomyia tuberculata* and the Nearctic *Tanytarsus limneticus* pupae: Abdomen. S I-VIII, sternites I-VIII; segm., segment; T I-IX, tergites I-IX; D, L, V, dorsal, lateral, ventral setae.**

| Abdomen | *T. cuieirensis* | *T. clivosus* | *T. hamatus* | *T. pandus* | *T. hastatus* |
|---|---|---|---|---|---|
| **Total length** | 1642 µm | 2510-3360 µm | 2560-3400 µm | 3670 µm | 2360-3350 µm |
| **Sternites** | S I, IV-VII without armament, S II-III medially with very fine shagreen, S VIII with fine oral-lateral shagreen | S IV-VII without armament, S I-III with very fine shagreen, S VIII with fine anterolateral shagreen | S IV-VII without armament. S I-III with very fine shagreen, on S III sometimes absent. S VIII with fine anterolateral shagreen | armament of sternites difficult to see | S I-VII apparently without armament, S VIII with fine oral-lateral shagreen |
| **Conjunctives and pleura** | conjunctives without armament, pleuron of segment II with anterior field of sparse spinules | conjunctives without armament, pleuron of segment II with anterior field of small spines ventrally | pleuron of segm. I with few small spinules posteriorly, pleuron of segm. II with field of small spinules extending almost to posterior | without armament | without armament |
| **Tergite I** | without armament | without armament | without armament | without armament | without armament |
| **Tergite II** | median field of homogeneous shagreen, sparse medially | median field of spinules (homogeneous shagreen), sparse medially and laterally | median field of spinules (homogeneous shagreen) | median field of homogeneous shagreen | anterior pair of rounded patches of spines and field of shagreen interrupted medially |
| **Tergite III** | one pair of long bands of longer spines and pair of lateral fields of fine shagreen close to bands, bands anteriorly straight, posteriorly curving outward | one pair of long bands of longer spines length in addition to anteromedian-anterolateral field of spinules close to the bands, bands more than 1/2 length of tergite | one pair of long bands of longer spines and anteromedian field of small and sparse spinules, bands more than 1/2 length of tergite | pair of long bands of longer spines and some spinules on anterolateral side of each band | pair of long bands of longer spines and some spinules on anterolateral side of each band |
| **Tergite IV** | bracket-shaped pair of long bands of spines, anterior band section of thin, elongate spines directed to caudal, mid section with short spines directed to median, occasionally sparse or absent, posterior section with short spines directed to median, lateral and caudal; spines of mid and posterior section cone-shaped. | one pair of long bands of longer spines and some spinules at anterolateral side of each band, bands more than 1/2 length of tergite | one pair of long bands of longer and shorter spines and smaller spinules at anterolateral side of each band, bands more than 1/2 length of tergite | pair of elongate bands of longer spines and spinules on anterolateral side of each band, bands less than 1/2 length of tergite | pair of elongate and slightly curved bands of spines, spines on anterior part longer, bands less than 1/2 length of tergite |
| **Tergite V** | with pair of elongate patches of spines, sometimes anteriorly slightly curved | one anterior pair of oval to elongate patches of spines | one anterior pair of elongate patches of spines | pair of spine bands, but not so developed as in T III-IV | pair of elongate and slightly curved bands of spines |

**Table VIII (Cont.). Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica, Caladomyia tuberculata* and the Nearctic *Tanytarsus limneticus* pupae: Abdomen. S I-VIII, sternites I-VIII; segm., segment; T I-IX, tergites I-IX; D, L, V, dorsal, lateral, ventral setae.**

| Abdomen | *T. cuieirensis* | *T. clivosus* | *T. hamatus* | *T. pandus* | *T. hastatus* |
|---|---|---|---|---|---|
| **Tergite VI** | with pair of rounded to elongate patches of spines | with anterior pair of oval to elongate patches of spines | with anterior pair of oval patches of spines | with anterior pair of rounded patches of spines | without armament |
| **Tergite VII** | without armament | without armament | without armament | without armament | without armament |
| **Tergite VIII** | with oral-lateral shagreen | without armament | without armament | without armament | without armament |
| **Tergite IX** | with oral-lateral shagreen | without armament | without armament | with oral shagreen interrupted on middle | with oral shagreen, sparse medially |
| **Hook row** | 120 µm, about 1/3 width of segm. II | 180-240 µm, about 1/2-1/3 width of segm. II | 170-265 µm, about 1/2-1/3 width of segm. II | 200-240 µm, about 1/3 width of segm. II | 190-215 µm, about 1/3 width of segm. II |
| **Pedes spurii B** | on segment II, well developed | on segment II, weakly developed | on segment II, weakly developed | well developed on segment II | well developed on segment II |
| **Anal comb** | unusually broad posterolateral comb 80 µm, consisting of numerous small marginal teeth | 40-54 µm wide, consisting of 6-9 stronger marginal teeth and 15-40 smaller one | broad, 83-100 µm wide, consisting of 5-11 strong marginal teeth and 33-62 smaller one | somewhat broad, 85-92 µm wide, with 9-11 strong teeth on posterior margin and 26-43 smaller one | 57-70 µm wide, with 5-6 strong teeth posteriorly and 7-13 smaller one |
| **Setation** | | | | | |
| **Segm. I** | 3 D, 0 L and 1 V, D-setae taeniate and unusually long | 3 D, 0 L and 1 V, anterior and posterior D-setae longer, taeniate | 2 dorsal taeniae and 1 dorsal seta, 0 L and 1 pair of ventral seta marks | 3 D, 0 L and 0 V, the more anterior and posterior D-setae stronger | 3 D, 0 L and 0 V, , the more anterior and posterior D-setae stronger |
| **Segm. II** | 3 L | 3 L | 3 L | 3 L | 3 L |
| **Segm. III** | 3 L | 3 L | 3 L | 3 L | 3 L |
| **Segm. IV** | 3 L | 3 L | 3 L | 3 L | 3 L |
| **Segm. V** | 3 L | 3 L | 3 L | 3 L | 3 L |
| **Segm. VI** | 3 L | 3 lateral taeniae | 3 L | 3 L | 3 L |
| **Segm. VII** | 3 L, seta $L_3$ taeniate and thicker | 4 lateral taeniae | 1 L and 3 lateral taeniae/ 2 L and 2 lateral taeniae/ 3 L and 1 lateral taenia or 0 L and 4 lateral taeniae | 3 L | 3 L |
| **Segm. VIII** | 1 D, 3 lateral taeniae and 2 ventral taeniae, the more posterior stronger | 1 D, 5 lateral taeniae and 1 ventral taenia | with 1 D, 5 lateral taeniae and 1 ventral taenia | with 1 dorsal seta (somewhat taeniate), 4 lateral taeniae and 1 ventral taenia | 1 dorsal taeniate seta, 4 lateral taeniae and 1 ventral taenia |
| **Anal lobe** | well developed, with complete fringe of ca. 20 taeniae in single row and two pairs of dorsal taeniae | well developed, with complete fringe of 34-55 taeniae in single row and two pairs of dorsal taeniae | well developed, with some granulations, with complete fringe of 62-80 taeniae in single row and two pairs of dorsal taeniae | well developed, with complete fringe of 38-42 taeniae in single row and two pairs of dorsal taeniae | well developed, with complete fringe of 34-41 taeniae in single row and two pairs of dorsal taeniae |

**Table VIII (Cont.). Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica*, *Caladomyia tuberculata* and the Nearctic *Tanytarsus limneticus* pupae: Abdomen. S I-VIII, sternites I-VIII; segm., segment; T I-IX, tergites I-IX; D, L, V, dorsal, lateral, ventral setae.**

| Abdomen | *T. limneticus* | *T. rhabdomantis* | *N. patagonica* | *T. marauia* | *T. revolta* | *T. waika* | *T. xingu* |
|---|---|---|---|---|---|---|---|
| **Total length** | 3845-4480 µm | 2615-3843 µm | 2800-3420 µm | 2741 µm | --- | --- | ----- |
| **Sternites** | S I-VII apparently without armament. S VIII with fine anterolateral shagreen | S I, IV-VII without armament, S II-III with very fine anterolateral shagreen, S VIII with fine anterolateral shagreen | S I, IV-VII without armament. S II-III with very fine oral-lateral shagreen. S VIII with fine anterolateral shagreen | Sternite II with fine medial shagreen, S III-IV with anterior fine shagreen, S V-VII unarmed, S VIII with anterolateral patches of fine shagreen | difficult to see | Sternites I-VII without armament; S VIII with some anterolateral shagreen spinules | Sternites II-IV with fine shagreen. Sternite V without armament other segments missing or difficult to see |
| **Conjunctives and pleura** | without armament | without armament | without armament | without armament | without armament | without armament | without armament |
| **Tergite I** | without armament | without armament in most of the specimens, few specimens present pair of posterolateral field of small spines | without armament | without armament | difficult to see | without armament | --- |
| **Tergite II** | with median homogeneous shagreen, sparse/interrupted medially | median field of homogeneous shagreen, interrupted/ sparse medially | median field of homogeneous shagreen, interrupted/ sparse medially | with a more or less rectangular median field of shagreen arranged in transverse rows | with more or less rectangular median field of shagreen not arranged in rows, posterior median area without armament, shagreen progressively finer in post. segments | with more or less rectangular median field of shagreen arranged in transverse rows | with a more or less rectangular median field of shagreen, anterior band wider of somewhat stronger shagreen, merging with a median field of finer shagreen |
| **Tergite III** | with one pair of long bands of longer spines placed on posterior half of tergite, bands anteriorly straight, posteriorly curving outward, and lateral fields of fine shagreen close to the bands | with long spines in long bands beginning in anterior half of tergite, bands anteriorly straight, posteriorly curved outward, and small field of shagreen close and antero-lateral to bands | with a pair of long bands of longer spines placed on posterior half of tergite, bands curving outward, and small field of shagreen lateral and close to the bands | with a more or less rectangular median field of shagreen arranged in transverse rows | with more or less rectangular median field of shagreen not arranged in rows, posterior median area without armament, shagreen progressively finer in post. segments | with more or less rectangular median field of shagreen arranged in transverse rows | with a more or less rectangular median field of shagreen, anterior band wider of somewhat stronger shagreen, merging with a median field of finer shagreen |

**Table VIII (Cont.). Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica, Caladomyia tuberculata* and the Nearctic *Tanytarsus limneticus* pupae: Abdomen. S I-VIII, sternites I-VIII; segm., segment; T I-IX, tergites I-IX; D, L, V, dorsal, lateral, ventral setae.**

| Abdomen | *T. limneticus* | *T. rhabdomantis* | *N. patagonica* | *T. marauia* | *T. revolta* | *T. waika* | *T. xingu* |
|---|---|---|---|---|---|---|---|
| **Tergite IV** | with bracket-shaped pair of long bands of spines, ant. part with thin short spines directed to caudal and median, occasionally sparse or absent, post. part with longer spines directed to oral | with long spines in bracket-shaped, long bands, most of spines orally directed, anterior spines slightly shorter and caudally and medially directed | with bracket-shaped pair of long bands of longer spines directed to caudal, median and oral | with a more or less rectangular median field of shagreen arranged in transverse rows | with more or less rectangular median field of shagreen not arranged in rows, posterior median area without armament, shagreen | with more or less rectangular median field of shagreen arranged in transverse rows | with a more or less rectangular median field of shagreen, anterior band wider of somewhat stronger shagreen, merging with a median field of finer shagreen |
| **Tergite V** | with one anterior pair of rounded patches of spines | with spines in oval patches | with elongate patches of spines | with a more or less rectangular median field of shagreen arranged in transverse rows, shagreen on tergite V sparse medially | with more or less rectangular median field of shagreen not arranged in rows, posterior median area without armament, shagreen | with more or less rectangular median field of shagreen arranged in transverse rows, median posterior area without armament | with a more or less rectangular median field of shagreen, anterior band wider of somewhat stronger shagreen, merging with a median field of finer shagreen, median posterior area without armament |
| **Tergite VI** | with one anterior pair of rounded patches of spines | with spines in oval patches | with elongate patches of spines | with shagreen anteromedially | with more or less rectangular median field of shagreen not in rows, posterior median area without armament | with anterolateral shagreen composed of few spinules | missing/ difficult to see |
| **Tergite VII** | without armament | with very fine anterolateral shagreen | without armament | with shagreen anteromedially | with fine shagreen, median area apparently without armament | without armament | missing/ difficult to see |
| **Tergite VIII** | with fine oral-lateral shagreen | with fine anterolateral shagreen | with fine oral-lateral shagreen | with fine anterolateral shagreen | missing | with fine anterolateral shagreen | missing/ difficult to see |
| **Tergite IX** | with anterior shagreen, sparse or interrupted on median part | with fine anterolateral shagreen | with fine oral-lateral shagreen | anterolateral patches of fine shagreen | missing | with anterolateral shagreen of few spinules | missing/ difficult to see |

**Table VIII (Cont.). Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica, Caladomyia tuberculata* and the Nearctic *Tanytarsus limneticus* pupae: Abdomen. S I-VIII, sternites I-VIII; segm., segment; T I-IX, tergites I-IX; D, L, V, dorsal, lateral, ventral setae.**

| Abdomen | *T. limneticus* | *T. rhabdomantis* | *N. patagonica* | *T. marauia* | *T. revolta* | *T. waika* | *T. xingu* |
|---|---|---|---|---|---|---|---|
| **Hook row** | 280-372 µm, about 1/2 width of segm. II | about 1/3 width of segm. II | 204-260 µm, about 1/2 width of segm. II | about 1/5 width of segm. II | about 1/5 width of segm. II | about 1/5 width of segm. II | about 1/3 width of segm. II |
| **Pedes spurii B** | present on segment II, weakly developed | weakly developed on segment II | present on segment II, well developed | well developed on segment II | well developed on segment II | well developed on segment II | well developed on segment II |
| **Anal comb** | broad, 112-120 µm wide, consisting of 9-14 stronger marginal teeth and 28-42 smaller one | quite broad, 87-106 µm wide, with 8-11 strong marginal teeth and 29-40 smaller one | 60-76 µm wide, with 4-6 stronger marginal teeth and 12-17 smaller one | one strong tooth and adjacent teeth decreasing in size anteriorly, comb extending from posterior to anterior 2/3 on lateral | missing | one strong tooth and few adjacent teeth | with 2-3 strong teeth posteriorly, the most apical tooth stronger, with one strong tooth and ca. 15 smaller teeth |
| **Setation** | | | | | | | |
| **Segm. I** | 2 dorsal taeniae and 1 dorsal seta, 0 L and 1 pair of ventral seta marks | 3 D, 0 L and 0 V | 3 D, the most anterior longer, 0 L and 0 V | 3 D, 0 L and 0 V | missing | 2 D, 0 L and 0 V | ----- |
| **Segm. II** | 3 L | 3 L | 3 L | 3 L | 3 L | 3 L | 3 L |
| **Segm. III** | 3 L | 3 L | 3 L | 3 L | 3 L | 3 L | 3 L |
| **Segm. IV** | 3 L | 3 L | 3 L | 3 L | 3 L | 3 L | 3 L |
| **Segm. V** | 3 L | 3 L | 3 L | 3 lateral taeniae | 3 lateral taeniae | 3 lateral taeniae | 3 lateral taeniae |
| **Segm. VI** | 3 L | 3 L | 3 L | 3 lateral taeniae | 3 lateral taeniae | 3 lateral taeniae | 3 lateral taeniae |
| **Segm. VII** | 3L | 3L | 3L | 4 lateral taeniae | 4 lateral taeniae | 4 lateral taeniae | 4 lateral taeniae |
| **Segm. VIII** | with 1 D, 3 lateral taeniae and 1 ventral taenia | with 1 D, 3 lateral taeniae and 1 ventral taenia | 2 D, 4 lateral taeniae and 1 V and 1 ventral taenia | 1 D, 4 lateral taeniae and 1 ventral taenia | missing | 1 D, 4 lateral taeniae and 1 ventral taenia | 5 lateral taeniae, D and V difficult to see |
| **Anal lobe** | well developed, with complete fringe of 18-20 taeniae in single row and with two pairs of dorsal taeniae | well developed, two pairs of dorsal taeniae; anal fringe with 7-15 taeniae in single row | well developed, with fringe of 17-20 taeniae in single row and with two pairs of dorsal taeniae | well developed, with complete fringe of ca. 40 taeniae in single row and with two pairs of dorsal taeniae | missing | well developed, complete fringe of ca. 40 taeniae in single row and two pairs of dorsal taeniae | ----- |

**Table VIII (Cont.). Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica*, *Caladomyia tuberculata* and the Nearctic *Tanytarsus limneticus* pupae: Abdomen. S I-VIII, sternites I-VIII; segm., segment; T I-IX, tergites I-IX; D, L, V, dorsal, lateral, ventral setae.**

| Abdomen | *T. gregarionus* | *T. rinihuensis* | *T. ligulatus* | *T. fastigatus* | *T. impar* | *T. magnus* | *C. tuberculata* |
|---|---|---|---|---|---|---|---|
| **Total length** | 2051 µm | 3120-3320 µm | 2197-2348 µm | 2180-2594 µm | 2920 µm | 4630 µm | 2370-2910 µm |
| **Sternites** | without armament | S I with very fine shagreen, S II-III with fine shagreen, S IV-VII without armament, S VIII with fine anterolateral shagreen | S I-III with very fine, sparse shagreen anteriorly; S IV-IX without armament. | S I with median field of fine shagreen, S II-III and VIII with very fine shagreen laterally, S IV-VII and IX without armament | --- | --- | S I-II with median field of fine shagreen, shagreen of S II finer and sparse, S III-IX without armament |
| **Conjunctives and pleura** | without armament | without armament | without armament | without armament | without armament | without armament | without armament |
| **Tergite I** | without armament | without armament | without armament | without armament | without armament | without armament | without armament |
| **Tergite II** | homogeneous shagreen, bare medially | with median homogeneous field of spinules, sparse medially and laterally, spinules of anterior and posterior portion slightly stronger | with pair of oval patches of spines anteriorly and median field of fine spinules | with median field of fine spinules | with anterior field of fine spinules | with anterior field of fine shagreen, field larger in the middle of tergite | with median field of spinules, sparse medially |
| **Tergite III** | with one pair of oval patches of spines anteriorly | with one pair of long bands of longer and shorter spines in addition to field of spinules lateral to each band, bands more than 1/2 length of tergite | with anterior pair of oval/elongate patches of spines and median, sparse field of fine spinules | with pair of short bands of short and long spines anteriorly in addition to median and lateral field of spinules | with anterior pair of oval to elongate patches of spines | with anterior pair of oval patches of spines and anterolateral field of fine spinules | with pair of long bands of longer and shorter spines, bands 1/3-1/2 length of tergite |
| **Tergite IV** | with one pair of oval/elongate patches of spines anteriorly | with one pair of long bands of longer and shorter spines and field of spinules lateral to each band, bands more than 1/2 length of tergite | with anterior pair of oval/elongate patches of spines and median, sparse field of fine spinules | with pair of short bands of short and long spines anteriorly in addition to median and lateral field of spinules | with anterior pair of oval to elongate patches of spines | with anterior pair of oval patches of spines | with anterior pair of oval/elongate patches of short spines, some spines close to each other or placed on the same base, giving an appearance of “multiple” spines |

**Table VIII (Cont.). Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica*, *Caladomyia tuberculata* and the Nearctic *Tanytarsus limneticus* pupae: Abdomen. S I-VIII, sternites I-VIII; segm., segment; T I-IX, tergites I-IX; D, L, V, dorsal, lateral, ventral setae.**

| Abdomen | *T. amazonicus* | *T. rinihuensis* | *T. ligulatus* | *T. fastigatus* | *T. impar* | *T. magnus* | *C. tuberculata* |
|---|---|---|---|---|---|---|---|
| **Tergite V** | with one pair of oval/elongate patches of spines anteriorly | with one anterior pair of elongate bands of spines and field of spinules around and posterior to each band | with pair of oval/elongate patches of spines anteriorly and median, sparse field of fine spinules | with pair of oval/elongate patches of short and long spines anteriorly in addition to median and lateral field of spinules | with anterior pair of oval to elongate patches of spines | with anterior pair of oval patches of spines | anterior pair of oval/elongate patches of short spines, some spines close to each other or placed on the same base, giving an appearance of "multiple" spines |
| **Tergite VI** | with one anterior pair of small, rounded patches of fine spinules | with one anterior pair of oval to elongate patches of small spines | with anterior pair of smaller patches of spines, median part without armament or with few spinules | with pair of oval/elongate patches of short spines anteriorly in addition to anteromedian and anterolateral field of spinules | with anterior pair of oval to elongate patches of spines | with anterior pair of oval patches of spines | pair of rounded to elongate patches of spines, patches also with spines close to each other or placed on the same base |
| **Tergite VII** | without armament | without armament | without armament | without armament | without armament | without armament | without armament |
| **Tergite VIII** | without armament | with anterolateral shagreen | with anterolateral shagreen | with fine anterolateral shagreen | with anterolateral shagreen | with anterolateral shagreen | with anterolateral fine and sparse shagreen |
| **Tergite IX** | without armament | with anterior shagreen, sparse or interrupted medially | with shagreen interrupted on median part, posterolateral shagreen stronger | with anterior shagreen, in some exuviae interrupted on median part | with anterior field of very fine shagreen | with anterior field of very fine and sparse shagreen | with median field of shagreen |
| **Hook row** | 98 µm, about 1/4 width of segm. II | 350-470 µm, more than 1/2 width of segm. II | 142-156 µm long, about 1/3 width of segm. II | 158-176 µm, about 1/3 width of segm. II | about 2/3 width of segm. II | about 2/3 width of segm. II | 240-290 µm long, about 1/2 width of segm. II |
| **Pedes spurii B** | bare and well developed on segment II | present on segment II, weakly developed | reduced | present on segment II, developed | present on segment II, weakly developed | present on segment II, weakly developed | present on segment II, developed |

**Table VIII (Cont.). Measurements and descriptions of the revised Neotropical *Tanytarsus* species, *Nimbocera patagonica, Caladomyia tuberculata* and the Nearctic *Tanytarsus limneticus* pupae: Abdomen. S I-VIII, sternites I-VIII; segm., segment; T I-IX, tergites I-IX; D, L, V, dorsal, lateral, ventral setae.**

| Abdomen | *T. amazonicus* | *T. rinihuensis* | *T. ligulatus* | *T. fastigatus* | *T. impar* | *T. magnus* | *C. tuberculata* |
|---|---|---|---|---|---|---|---|
| **Anal comb** | 23 µm wide, with 4-5 strong teeth and 5-6 smaller one | somewhat broad, 80-96 µm wide, with 7-10 strong marginal teeth and 6-20 smaller one | 22-24 µm wide, with 3-4 strong teeth posteriorly, the most apical tooth stronger, and 6-10 smaller one | 25-31 µm wide, with 2-4 strong teeth posteriorly and 9-17 smaller one | with 6-7 strong teeth posteriorly and 5-8 smaller one | with 4-6 strong teeth posteriorly and 8-10 smaller one | 40-62 µm wide, somewhat oval-triangular; lateral, posterior and median margins with 6-9 strong teeth in addition to 9-33 smaller one |
| **Setation** | | | | | | | |
| **Segm. I** | 3 D, 0 L and 0 V | 3 D, 0 L and 1 pair of ventral seta marks | 2 D, 0 L and 1 V | 3 D, 0 L and 0 V | 3 D, 0 L and 0 V | 3 D, 0 L and 0 V | 2 D, 0 L and 1 V |
| **Segm. II** | 3 L | 3 L | 3 L | 3 L | 3 L | 3 L | 3 L |
| **Segm. III** | 3 L | 3 L | 3 L | 3 L | 3 L | 3 L | 3 L |
| **Segm. IV** | 3 L | 3 L | 3 lateral taeniae | 3 L | 3 L | 3 L | 2 L and 1 lateral taenia |
| **Segm. V** | 3 L | 3 lateral taeniae | 3 lateral taeniae | 3 lateral taeniae | 3 L | 3 L | 3 lateral taeniae |
| **Segm. VI** | 4 L | 3 lateral taeniae | 3 lateral taeniae | 3 lateral taeniae | 3 lateral taeniae | 3 lateral taeniae | 3 lateral taeniae |
| **Segm. VII** | difficult to see | 4 lateral taeniae | 3 lateral taeniae | 4 lateral taeniae | 4 lateral taeniae | 4 lateral taeniae | 4 lateral taeniae |
| **Segm. VIII** | 1 D, somewhat taeniate, 5 lateral taeniae and 1 V | 2 D, the more posterior somewhat taeniate, 5 lateral taeniae and 1 ventral taenia | 2 dorsal taeniae, the more anterior stronger, 5 lateral taeniae and 0 V | 2 dorsal taeniae, the more anterior stronger, 5 lateral taeniae and 1 ventral taenia | 1 dorsal seta, 4 lateral taeniae, 1 ventral seta and 1 ventral taenia | 1 dorsal seta, 4 lateral taeniae, 1 ventral seta and 1 ventral taenia | 1 dorsal seta, somewhat taeniate, 5 lateral taeniae and 1 ventral taenia |
| **Anal lobe** | well developed, fringe of 19 taeniae in single row and 2 pairs of dorsal taeniae | well developed, with complete fringe of 40-52 taeniae in single row and two pairs of dorsal taeniae | well developed, with complete fringe of 22-24 taeniae in single row and two pairs of dorsal taeniae | well developed, with complete fringe of 22-30 taeniae in single row and two pairs of dorsal taeniae | well developed, with complete fringe of 75-80 taeniae in single row and two pairs of dorsal taeniae | well developed, with complete fringe of 75-80 taeniae in single row and two pairs of dorsal taeniae | well developed, with complete fringe of 28-35 taeniae in single row and two pairs of dorsal taeniae |

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Fig. 15. *Tanytarsus cururui* Fittkau & Reiss, adult male. A: Hypopygium, dorsal view. B: Superior volsella and digitus. C: Anal point, lateral view.

Fig. 16. *Tanytarsus riopreto* Fittkau & Reiss, adult male. A: Hypopygium, dorsal view. B: Superior volsella and digitus. C: Median volsella.

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Fig. 18. *Tanytarsus clivosus* Reiss, pupa. A: Frontal apotome. B: Thorax. C: Thoracic horn. D: Abdomen, dorsal view. E: Posterolateral comb of abdominal segment VIII, variation.

Fig. 19. *Tanytarsus hamatus* Reiss, adult male. A: Hypopygium, dorsal view. B: Anal point. C: Superior volsella and digitus. D: Median volsella.

Fig. 20. *Tanytarsus hamatus* Reiss, pupa. A: Frontal apotome. B: Thorax. C: Thoracic horn. D: Abdomen, dorsal view. E: Posterolateral comb of abdominal segment VIII, variation.

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Fig. 28. *Tanytarsus hastatus* Sublette & Sasa, adult male. A: Hypopygium, dorsal view. B: Anal point. C: Superior volsella and digitus, variation. D: Median volsella.

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Fig. 35. *Nimbocera patagonica* Reiss, adult male. A: Hypopygium, dorsal view. B: Anal point, lateral view. C: Superior volsella and digitus, variation. D: Median volsella.

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Fig. 43. *Tanytarsus xingu* Sanseverino, Wiedenbrug & Fittkau, adult male (after Sanseverino *et al.* 2002). A: Hypopygium, dorsal view. B: Anal point, lateral view. C: Median volsella.

Fig. 44. *Tanytarsus xingu* Sanseverino, Wiedenbrug & Fittkau, pupa (after Sanseverino *et al.* 2002). A: Thoracic horn. B: Abdominal segments II-IV, dorsal view. C: Posterolateral comb of abdominal segment VIII.

Fig. 45. *Tanytarsus amazonicus* spec. nov., adult male. A: Hypopygium, dorsal view. B: Superior volsella and digitus. C: Median volsella.

Fig. 46. *Tanytarsus amazonicus* spec. nov., pupa. A: Thorax. B: Thoracic horn. C: Frontal apotome. D: Abdominal segments II-VI, dorsal view; dorsal setae of segments V-VI not drawn. E: Abdominal segments VIII-IX, dorsal view. F: Spine patches on abdominal tergites III-V. G: Posterolateral comb of abdominal segment VIII.

Fig. 47. *Tanytarsus friburgensis* spec. nov., adult male. A: Hypopygium, dorsal view. B: Superior volsella and digitus. C: Median volsella.

Fig. 48. *Tanytarsus digitatus* spec. nov., adult male. A: Hypopygium, dorsal view. B: Median volsella. C: Superior volsella and digitus.

Fig. 49. *Tanytarsus jacaretingensis* spec. nov., adult male. A: Hypopygium, dorsal view. B: Anal point, lateral view. C: Anal point, dorsal view. D: Superior volsella. E: Median volsella.

Fig. 50. *Tanytarsus rinihuensis* Reiss, adult male. A: Hypopygium, dorsal view. B: Anal point, lateral view. C: Anal point, dorsal view. D: Superior volsella and digitus.

Fig. 51. *Tanytarsus rinihuensis* Reiss, pupa. A: Frontal apotome. B: Thorax. C: Thoracic horn. D: Abdomen, dorsal view. E: Posterolateral comb of abdominal segment VIII, variation.

Fig. 52. *Tanytarsus pseudorinihuensis* spec. nov., adult male. A: Hypopygium, dorsal view. B: Superior volsella and digitus. C: Anal point, dorsal view. D: Median volsella.

Fig. 53. *Tanytarsus pararinihuensis* spec. nov., adult male. A: Hypopygium, dorsal view. B: Superior volsella. C: Anal point, dorsal view. D: Median volsella.

Fig. 54. *Tanytarsus ligulatus* Reiss, adult male. A: Hypopygium, dorsal view. B: Anal point, dorsal view. C: Superior volsella and digitus. D: Median volsella.

Fig. 55. *Tanytarsus ligulatus* Reiss, pupa. A: Frontal apotome. B: Thorax. C: Thoracic horn. D: Abdomen, dorsal view. E: Posterolateral comb of abdominal segment VIII.

Figs 56-57. Differences between two similar specimens of *Tanytarsus*, adult males. 56. *Tanytarsus cf. ligulatus*. A: Anal point, dorsal view. B: Superior volsella and digitus. 57. *Tanytarsus ligulatus* Reiss. A: Anal point, dorsal view. B: Superior volsella and digitus.

Fig. 58. *Tanytarsus paraligulatus* Reiss, adult male. A: Hypopygium, dorsal view. B: Anal point, dorsal view. C: Superior volsella and digitus. D: Median volsella.

Fig. 59. *Tanytarsus fastigatus* Reiss, adult male. A: Hypopygium, dorsal view. B: Superior volsella and digitus. C: Median volsella.

Fig. 60. *Tanytarsus fastigatus* Reiss, pupa. A: Frontal apotome. B: Thorax. C: Thoracic horn. D: Abdomen, dorsal view. E: Posterolateral comb of abdominal segment VIII.

Fig. 61. *Tanytarsus reissi* Paggi, adult male. A: Hypopygium, dorsal view. B: Superior volsella and digitus. C: Median volsella.

Fig. 62. *Tanytarsus curvicristatus* Contreras-Lichtenberg, adult male. A: Hypopygium, dorsal view. B: Anal point, dorsal view. C: Superior volsella and digitus. D: Median volsella.

Figs 63-64. Two non-Neotropical *Tanytarsus*, adult males. 63. *Tanytarsus signatus* van der Wulp. A: Hypopygium, dorsal view. B: Anal point, dorsolateral view. C: Anal point, dorsal view. 64. *Tanytarsus liepae* Glover. A: Hypopygium, dorsal view. B: Detail of anal point bar.

Fig. 65. *Caladomyia alata* (Paggi) comb. nov., adult male. A: Hypopygium, dorsal view. B: Anal point, dorsal view. C: Anal point, ventral view. D: Superior volsella and digitus. E: Median volsella.

Fig. 66. *Caladomyia tuberculata* (Reiss) comb. nov., adult male. A: Hypopygium, dorsal view. B: Anal point, lateral view.

Fig. 67. *Caladomyia tuberculata* (Reiss) comb. nov., adult male. A: Superior volsella and digitus, variation. B: Median volsella.

Fig. 68. *Caladomyia tuberculata* (Reiss) comb. nov., pupa, cephalothorax. A: Frontal apotome. B: Thorax. C: Thoracic horn. D: Wing sheath nose, variation.

Fig. 69. *Caladomyia tuberculata* (Reiss) comb. nov., pupa, abdomen. A: Abdomen, dorsal view; dorsal setae of segments II-VII not drawn. B: “Multiple” spines on abdominal tergites IV-VI. C: Posterolateral comb of abdominal segment VIII, variation.

## 11. CURRICULUM

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|---|---|
| Name | Angela Manzolillo Sanseverino |
| Date, place and country of birth | 09.08.1970, Rio de Janeiro, Brazil. |
| School education | 1976-1987 - Colégio Marista São José, Rio de Janeiro, Brazil. |
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