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New species and records of *Nandeva* Wiedenbrug, Reiss *et* Fittkau (Chironomidae: Chironominae)

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Abstract

Nandeva digitifer **sp. n.** from Chile is described and figured as male and female and *N. verruculata* **sp. n.** from Brazil as male. The female of *N. latiloba* Sæther *et* Roque is also described and figured and new Neotropical records of *N. latiloba*, *N. strixinorum* Sæther *et* Roque and *N. tropica* Wiedenbrug, Reiss *et* Fittkau are given. The female of *N. fittkaui* Cranston is re-examined. New generic diagnosis and description are given for the imagines. Some character states from previous parsimony analyses are corrected and new analyses performed indicating *Nandeva* as part of Tanytarsini or as part of the sister group to Tanytarsini.

Key words: Chironomidae, *Nandeva*, new species, new records, Brazil, Chile, Mexico, Venezuela

Introduction

The subfamily Chironominae has been divided into three tribes, the Tanytarsini, the Chironomini and the Pseudochironomini (Sæther 1977). The tribe Tanytarsini can be divided into two fairly distinct groups, the subtribes Zavreliina and Tanytarsina (Sæther 1977). Recently the genera *Friederia* Sæther *et* Andersen and *Seppia* Ekrem *et* Sæther showing reduction in several features were described from the western rainforest of Ghana (Sæther & Andersen 1998; Ekrem & Sæther 2000). Both genera were placed in Zavreliina primarily because of the lacking digitus. However, of these genera no females or immatures are known.

The genus *Nandeva* Wiedenbrug, Reiss *et* Fittkau originally was described as belonging to the tribe Chironomini (Wiedenbrug *et al.* 1998). However, as stated by Sæther and Roque (2004) Wiedenbrug after publication found that the illustration of the wing (Wiedenbrug *et al.* 1998: fig. 1B) was in error and that the wing venation was of Tanytarsini type with RM continuous with R_{4+5} and also with R_{4+5} ending proximal to apex of M_{3+4}. Cranston (1999) found the genus in Australia and suggested that it is associated to a grouping of Gondwanian taxa, namely *Nilodosis* Kieffer, *Imparipecten* Freeman and *Fissimentum* Cranston *et* Nolte. However, both the male and the female described by Cranston were pharate and the wing venation thus not observable. Here we describe two new species and two females and re-examine the female of *N. fittkaui* Cranston from Australia. While the males conform to previously described species, the Neotropical females differ in several details from that of the only previously known female.

Cranston (1999) described the female of *Nandeva* and the present paper describes the females of two additional species. The gonapophysis VIII is divided as in *Micropsectra* Kieffer and related genera, while all genera of the Zavreliina of which the female genitalia are known as well as in all *Tanytarsus* van der Wulp and related genera the gonapophysis VIII is undivided. [Trivinho Strixino and Sonoda (2006), however, mention that gonapophysis VIII in *Tanytarsus obiriciae* is slightly divided, but their drawing contradicts this]. Sæther & Roque (2004) did a parsimony analysis of the tribe Tanytarsini. Their preferred trees had *Nandeva* either as the sister genus of all the Tany-

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tarsini or only *Friederia* more basal. The new species described here show that a digitus may be present and add a number of features to the description of the females.

Material and methods

Morphological nomenclature follows Sæther (1980). All measurements are given as ranges followed by a mean when four or more measurements are made, followed by the number measured in parentheses (n).

The holotype of *N. verruculata* is deposited at Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil (MZUSP); the holotype of *N. digitifer* at the Department of Natural History, University Museum of Bergen, University of Bergen, Bergen, Norway (ZMBN).

For the cladistic analysis data were analyzed under parsimony with PAUP 4.0b.10 (Swofford 2002) and with the help of MacClade 3.08a (Maddison & Maddison 1999) on a Power MacIntosh G5 employing 1,000 random addition sequence replicates. The searches were heuristic with tree bisection-reconnection swapping algorithm and a maximum of 120,000 trees to be saved in each replicate.

Nandeva Wiedenbrug, Reiss *et* Fittkau

Nandeva Wiedenbrug, Reiss *et* Fittkau, 1998: 59

Type species. *Nandeva gaucha* Wiedenbrug, Reiss *et* Fittkau, 1998: 60, by original designation; Brazil [male, pupa].

Other included species:

Nandeva chilena Wiedenbrug, Reiss *et* Fittkau 1998: 65; Chile [pupa].
Nandeva digitifer **sp. n.**; Chile [male, female].
Nandeva fittkaui Cranston, 1999: 296; Australia [male, female, pupa].
Nandeva latiloba Sæther *et* Roque, 2004: 65; Brazil, Venezuela [male, female].
Nandeva strixinorum Sæther *et* Roque, 2004: 67; Brazil, Mexico [male].
Nandeva tropica Wiedenbrug, Reiss *et* Fittkau, 1998: 64; Brazil, Panama, Venezuela [pupa; male (Sæther & Roque 2004: 68)].
Nandeva verruculata **sp. n.**; Brazil [male].

Diagnostic characters. The males are separable from other Tanytarsini by having bare eyes with no dorsomedian elongation, dorsal antepronotal setae, costa ending proximal to distal end of M_{3+4}, subcosta and anal vein normally without setae, 0–4 setae on squama, tibial combs all with spurs, anal point long and parallel-sided or spatulate, median volsella absent, superior volsella at most with a few basal microtrichia, sometimes with apparent digitus. From Chironomini the males differ by having RM oblique to R_{4+5} at least in the Neotropical species, and a combination of antenna with 13 flagellomeres, fore tibial scale with long spur, 0–4 setae on squama, and tergite VIII anteriorly tapered. The females have gonapophysis VIII well divided with straight ventrolateral lobe and short notum. In the Neotropical species the ventrolateral lobe is dorsal to the dorsomesal lobe and with only apical microtrichia conspicuous, the spermathecal ducts has loops or bends, a floor is distinct, and the setae of tergite IX are not divided into two groups. The Australian *N. fittkaui* has the ventrolateral lobe in the same plane as the dorsomesal lobe and covered by strong microtrichia, the spermathecal ducts are nearly straight, a floor apparently is absent, and the setae of tergite IX are divided into two groups. The pupa differs from other Chironominae by lacking thoracic horn, frontal setae, anal lobe fringe, anal spur or comb and pedes spurii A and B, and by having paired or fused anterior spine patches on tergites III–VII or III–V and posterior hook rows on tergites II–V or VI.

Description. *Imagines.* Small species, wing length 0.7–1.2 mm. Coloration pale to dark brown, abdomen usually banded. Eyes without dorsomedian elongation, bare. Male antenna with 13 flagellomeres, fully plumed. Antennal ratio of male 0.2–0.8. Female antenna with 5 flagellomeres, flagellomeres 2–4 flask-shaped. Antennal ratio of female 0.1–0.2. Temporals uniserial, consisting of 4–13 inner verticals and / or frontals, 1–4 outer verticals and 2–4 postorbitals. Clypeus with 6–19 setae. Five long palpomeres, third palpomere with 2–4, lanceolate or scalpellate sensilla chaetica, fourth palpomere shorter than third.

Antepronotal lobes medially reduced, with 2–6 dorsal, 0–4 median, and 2–8 lateral setae. Acrostichals 10–28; dorsocentrals 12–25, partly biserial; prealars 3–7; supraalar absent. Scutellum with 6–12 uniserial setae.

Wing cuneiform. Venation of Tanytarsini type with RM continuous with R_{4+5} and with R_{4+5} ending proximal to M_{3+4} (not known for *N. fittkaui*); membrane clear, with setae in all cells and on all veins except subcosta and anal vein usually bare. VR 1.18–1.39. Costa not extended, postcubitus long with anal vein shorter. Brachiolum with 2–5 setae, subcosta with setae in some *N. strixinorum* only, R with 13–40 setae, R_1 with 6–34, R_{4+5} with 18–52, M with 0–35, M_{1+2} with 20–53, M_{3+4} with 13–50, Cu with 14–53, Cu_1 with 8–32, postcubitus with 13–59 setae. Squama bare in *N. fittkaui*, with 1–4 setae in Neotropical species.

Tibial combs all with spurs; anterior tibia with long, thin slightly curved spur (not known for *N. fittkaui*); tibial combs separate. Leg ratio of male 0.83–1.18. Tarsi with beards on all legs. Pulvilli absent.

Both tergites and sternites with basal, marginal and lateral setae; on sternites basal and marginal setae reduced to anterior and posterior clusters (Wiedenbrug *et al.* 1998: fig. 2A, B). Tergite VIII anteriorly tapered.

Tergal bands of widely separated V-type. Tergite IX of male with 12–22 setae at base of anal point, laterosternite IX with 3–8 setae. Anal point 33–69 µm long, parallel-sided to slightly tapering or, in *N. fittkaui*, spatulate, free of microtrichia. Transverse sternapodeme straight, no oral projections. Phallapodeme 47–85 µm long. Gonocoxite normally 0.7–1.3 times as long as gonostylus, sometimes extending beyond attachment point of gonostylus. Superior volsella 21–57 µm long; with broadened base and narrow, curved extension, extension 3–14 µm wide; bare or at most with a few microtrichia in basal two-thirds; with 1–3 apical setae; inner margin with 0–1 median and 0–1 basal setae; outer margin with 1–3 basal setae, sometimes on tubercle; digitus sometimes present, with 1 apical seta. Median volsella absent. Inferior volsella 38–73 µm long, with 6–14 apical to median setae, 0–2 basal setae and long microtrichia. Gonostylus slender, 95–190 µm long.

Gonocoxapodemes VIII forming well sclerotized complete circles, each encircling 23–33 setae. Floor developed except in the Australian species. Tergite IX of female rounded or somewhat triangular with rounded apex, either with two groups each of about 8–9 setae (*N. fittkaui*) or 17–26 un-grouped setae. Gonocoxite weak to well developed, with about 5 setae. Gonapophysis VIII divided into triangular dorsomesal lobe and straight ventrolateral lobe. Ventrolateral lobe in Neotropical species placed dorsal of dorsomesal lobe, without microtrichia except for a few distinct apical microtrichia; in *N. fittkaui* ventrolateral lobe in the same plane as the dorsomesal lobe and covered with strong microtrichia. Apodeme lobe indistinct to distinct. Postgenital plate sharply triangular. Cerci of moderate size, about as long as the short notum. Seminal capsules usually ovoid to circular; spermathecal ducts with loop, strong bend or, in *N. fittkaui* straight, without bulbs before common opening.

Pupa. As in Wiedenbrug *et al.* (1998) and Cranston (1999).

Remarks. The Australian *N. fittkaui* differs from the Neotropical species in several aspects. In the male there are no lateral antepronotals, the squama is bare, the anal point spatulate and the superior volsella carries more basal setae and strong microtrichia. In the female the gonocoxapodeme is not visible, the coxosternapodeme faint, the gonocoxite IX not developed and tergite IX small with setae divided into lateral groups. In the pupa the anteromedian patches of stronger spinules are lacking on tergites VI–VII. All this may add up to that *Nandeva fittkaui* should be placed in a different genus. However, both the male and the female were described on pharate specimens and the lack of sclerotization of the gonocoxapodeme and the coxosternapodeme in the female as well as some other features such as the lack of lateral antepronotals may be artifacts.

The gonapophysis VIII of the Neotropical species appears unique among chironomids in having the ventral lobe situated dorsal of the dorsomesal lobe and being without microtrichia except at apex. A similar ventrolateral lobe has been described only from *Harnischia curtilamellata* Malloch (Sæther 1977 fig. 89 A, B).

Distribution. The genus previously was known from Brazil, Chile, Panama and Australia. The present paper gives additional records from Mexico and Venezuela.

Systematics. The parsimony analysis in Sæther & Roque (2004) had *Nandeva* either as the sister genus of all the Tanytarsini (Sæther & Roque 2004, fig.13), only *Friederia* Sæther *et* Andersen was more basal in the cladogram (Sæther & Roque 2004, fig.14), or near the base of the Tanytarsina (Sæther & Roque 2004, fig.12). The differences between the Australian *N. fittkaui* and the Neotropical species indicate that the former should be placed in a separate genus and *N. fittkaui* thus is entered separately in the data matrix.

Nandeva fittkaui has a relatively broad, somewhat spatulate anal point. A third character alternative (spatulate) thus is added to character 28.

An additional character for the female tergite IX is added: (0) setae not divided into two groups; (1) divided into two groups. Amongst the taxa included in the data matrix only *N. fittkaui* and *Lauterborniella* Thienemann *et* Bause show character alternative 1.

The new species described here show the presence of a possible digitus in *N. digitifer* and perhaps in *N. verruculata.* The character state of character 32 thus should be changed from 1 to 0&1. A floor is present in the Neotropical species, but not in *N. fittkaui*. Trend 47 thus is scored 0 for *N. fittkaui*, 1 for the other *Nandeva* species. Sæther (1977:142, fig. 63 D) found a large floor in female *Zavrelia* Kieffer. However, Ekrem & Stur (2009) reviewed the genus *Zavrelia* and none of the reviewed and described species presented a vaginal floor. Ekrem & Stur (2009) pointed out that until evidence is presented that associated *Zavrelia* females possess a floor, the lack of a vaginal floor should be diagnostic to *Zavrelia*. Trend 47 for *Zavrelia* thus is changed from 0 to 1.

Some characters both in Sæther and Roque (2004) and in the present analysis are scored with one character alternative even if they really are polymorphic. Character 75 in Sæther and Roque (2004) for instance is for *Micropsectra* scored as if all species had a spur on the antennal pedestal although a few species lack this spur. The lack of a spur almost certainly is secondary and scoring 0&1 will make the trend less informative.

Alternative 0 for character 80 in Sæther and Roque (2004) should be changed to "always simple" as the other alternatives also includes "simple" and really are underlying synapomorphies scored as synapomorphies.

Running the parsimony analysis with these character states altered results in a few changes. Without weighting and after reweighting as in Fig. 12 in Sæther and Roque (2004) the Tanytarsini is divided into two subtribes with *Friederia* as sister group to the other Tanytarsini (Fig. 1). Among other changes are that *Nidnurbia* Säwedal and *Skutzia* Reiss are included in the Zavreliina. With some characters weighted and reweighted as in Sæther and Roque (2004 fig. 14) *Nandeva fittkaui* is the sister to other *Nandeva* plus the remaining Tanytarsini. Zavreliina is monophyletic while the Tanytarsina is not (Fig. 2). The Bremer support is relatively high for Tanytarsini as a monophyletic tribe in Figure 1, for Tanytarsini without *N. fittkaui* in Figure 2.

Nandeva fittkaui differs significantly from the Neotropical species as male, female and pupa. Particularly the female indicates that the species should be placed in a separate genus, and if the wing venation not is of the Tanytarsini type, in a different tribe. However, the result from the parsimony analyses indicates that the species could be closely related to the Neotropical species. The erection of a new genus for *N. fittkaui* should wait for a description of the wing venation and of the tibial spurs.

After the completion of this paper three papers relevant to the analysis have been published. Ekrem *et al.* (2010) suggest that *Krenopsectra* Reiss and *Parapsectra* Reiss should be included in *Micropsectra* and Sanseverino *et al*. (2010) synonymize *Nimbocera* Reiss with *Tanytarsus*. Although we accept these synonyms we have kept the taxa separate in order to check if they are confirmed by our findings. While the inclusion of *Parapsectra* in *Micropsectra* is confirmed and *Nimbocera* in *Tanytarsus* possible, the synonymy of *Krenopsectra* with *Micropsectra* appears more doubtful.

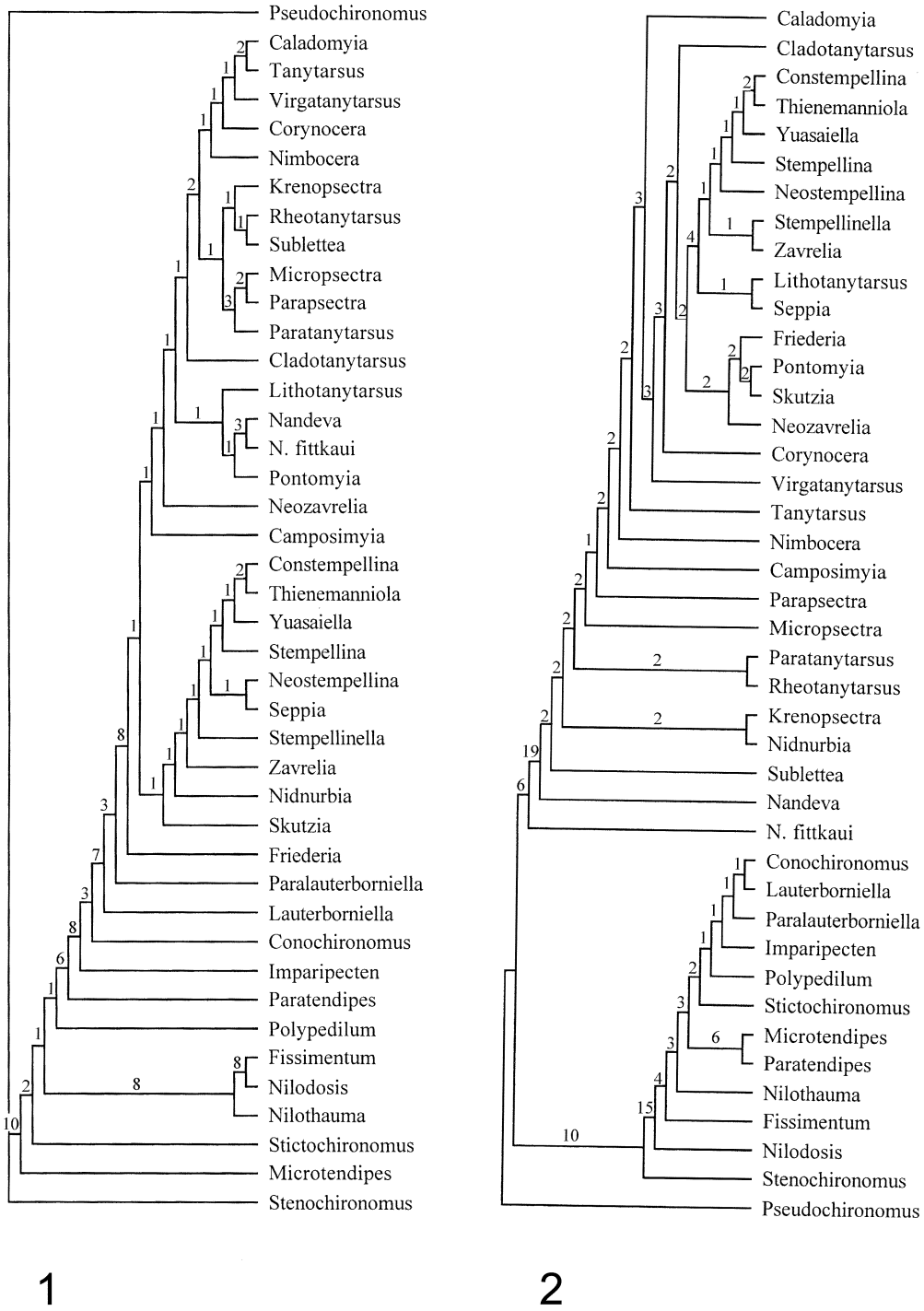
The third paper, a dated molecular phylogeny for the Chironomidae, Cranston *et al.* (2011) suggests that *Nandeva* should be included in the tribe Pseudochironomini. Figure 2 suggests that at least *N. fittkaui* could belong in Pseudochironomini. Making *Pseudochironomus* Malloch plus *Nandeva* a monophyletic sister of Tanytarsini in Fig. 2 will when examined in McClade in fact make the tree one step shorter.

However, several critical taxa of Pseudochironomini and other basal Chironominae remain unsampled and may lead to significantly different results. Prior to the inclusion of *Buchonomyia* Brundin and *Shangomyia* Sæther *et* Wang in the molecular phylogeny Cranston *et. al*. (2000) found: "The major robust finding at subfamilial level is confirmation from both molecules under all constraints of Sæther's postulation of the basal position of the subfamily Telmatogetoninae, as sister to the remaining subfamilies, analyzed with maximum parsimony" and that *Xiaomyia* Sæther *et* Wang was sister to *Corynoneura* van der Wulp.

The disagreement between Brundin and Sæther (1978), Sæther (1989, 2000) and Murray and Ashe (1981, 1985) mainly consists in the importance of presence or absence of a larval premandible as an external sclerite. It was agreed that the premandible had to have been present in the chironomidal ancestor, but while Murray and Ashe thought that the reduction was so important that it could have taken place only once, Brundin and Sæther argued that the weight of other characters made it more likely that the reduction had taken place twice and was an underlying synapomorphy. According to the result of the molecular phylogeny of Cranston *et al.* (2011) the reduction must have taken place three times, i.e. confirming the reduction as an underlying synapomorphy in accordance with Brundin and Sæther. However, the most parsimonious explanation is that the premandible not is homologous with

the premandible of other Diptera. and thus an objective synapomorphy for the Telmatogetoninae plus the Chironomoinae.

The results of Cranston *et al.* (2011) show that there are exceptions to nearly all "objective" synapomorphies in all subfamilies and that different groups mostly are held together by a web of underlying synapomorphies. The larvae of *Nandeva* are known, but undescribed. A future analysis should include the larva and have *Xiaomya* and *Shangomyia* combined as outgroup.



FIGURES 1–2. Revised parsimony analysis of the tribe Tanytarsini of the subfamily Chironominae with *Pseudochironomus* Malloch as outgroup. **1**—The single tree obtained after reweighting according to the rescaled consistency index of the shortest trees obtained without weighing of characters. **2**—Strict consensus tree obtained after reweighting according to the rescaled consistency index of the shortest trees obtained with weighing of characters as in Sæther and Roque (2004). Bremer support for each branch, when character weights are reset to one, is indicated as numbers above the branches.

***Nandeva digitifer* sp. n.**
(Figs 3–16)

Type material. Holotype male, **CHILE: Region VII,** Talca, El Golf, 24–27.xii.1995, at light, T. Andersen (ZMBN Type No. 446). Paratypes: 43 males, 1 female, as holotype (ZMBN).

Diagnostic characters. The apparent digitus together with the broadest extension of the superior volsella of any members of the genus will separate *N. digitifer* from other members of the genus. The species also is characterized by having 13–27 setae on M and an AR of 0.5–0.6. The female differs from *N. latiloba* by its larger size with a wing length of 1.13 mm compared to 0.82 mm and by having 35 setae on M compared to 6 setae in *N. latiloba*.

Etymology. From Latin, *digitus*, finger, and the suffix, *-fer*, carry, bear, referring to the presence of a digitus on the superior volsella.

Male (n = 10). Total length 1.88–2.17, 2.02 mm. Wing length 1.07–1.24, 1.17 mm. Total length / wing length 1.64–1.83, 1.74. Wing length / length of profemur 2.15–2.30, 2.21.

Color. Thorax with pale ground color and brown vittae, lower part of anterior anepisternum II, median anepisternum, anterior part of preepisternum and postnotum dark. Legs stramineous. Abdomen brownish with posterior one-third pale.

Head (Fig. 3). AR 0.52–0.60, 0.56. Ultimate flagellomere 188–229, 217 μm long. Temporal setae 14–17, 15; including 7–12, 9 inner verticals; 2–5, 3 outer verticals; and 2–3, 3 postorbitals. Clypeus with 7–13, 11 setae. Tentorium, stipes and cibarial pump as in Fig. 4. Tentorium 71–101, 93 μm long; 19–23, 22 μm wide. Stipes 79–120, 102 μm long; 19–26, 22 μm wide. Lengths (in μm) of palpomeres: 19–23, 20; 30–38, 34; 146–184, 168; 94–131, 117; 101–158, 142. Third palpomere with 2–3, 3 scalpellate sensilla clavata.

Thorax (Fig. 5). Antepronotum with 3–5, 3 dorsal and 4–8, 6 lateral setae. Dorsocentrals 16–24, 20; acrostichals 13–19, 17; prealars 5–7, 6. Scutellum with 9–12, 11 setae.

Wing (Fig. 6). VR 1.22–1.31, 1.27. Brachiolum with 2–3, 2 setae; Sc and An bare; R with 23–40, 31 setae; R_1 with 15–28, 23; R_{4+5} with 36–52, 44; M with 13–27, 20; M_{1+2} with 32–60, 48; M_{3+4} with 33–50, 41; Cu with 34–53, 44; Cu_1 with 13–32, 20; and postcubitus with 38–59, 50 setae. Cell m_{3+4} with about 120–200 setae; m basally of RM with 45–65, 54 setae. Squama with 2–3, 2 setae.

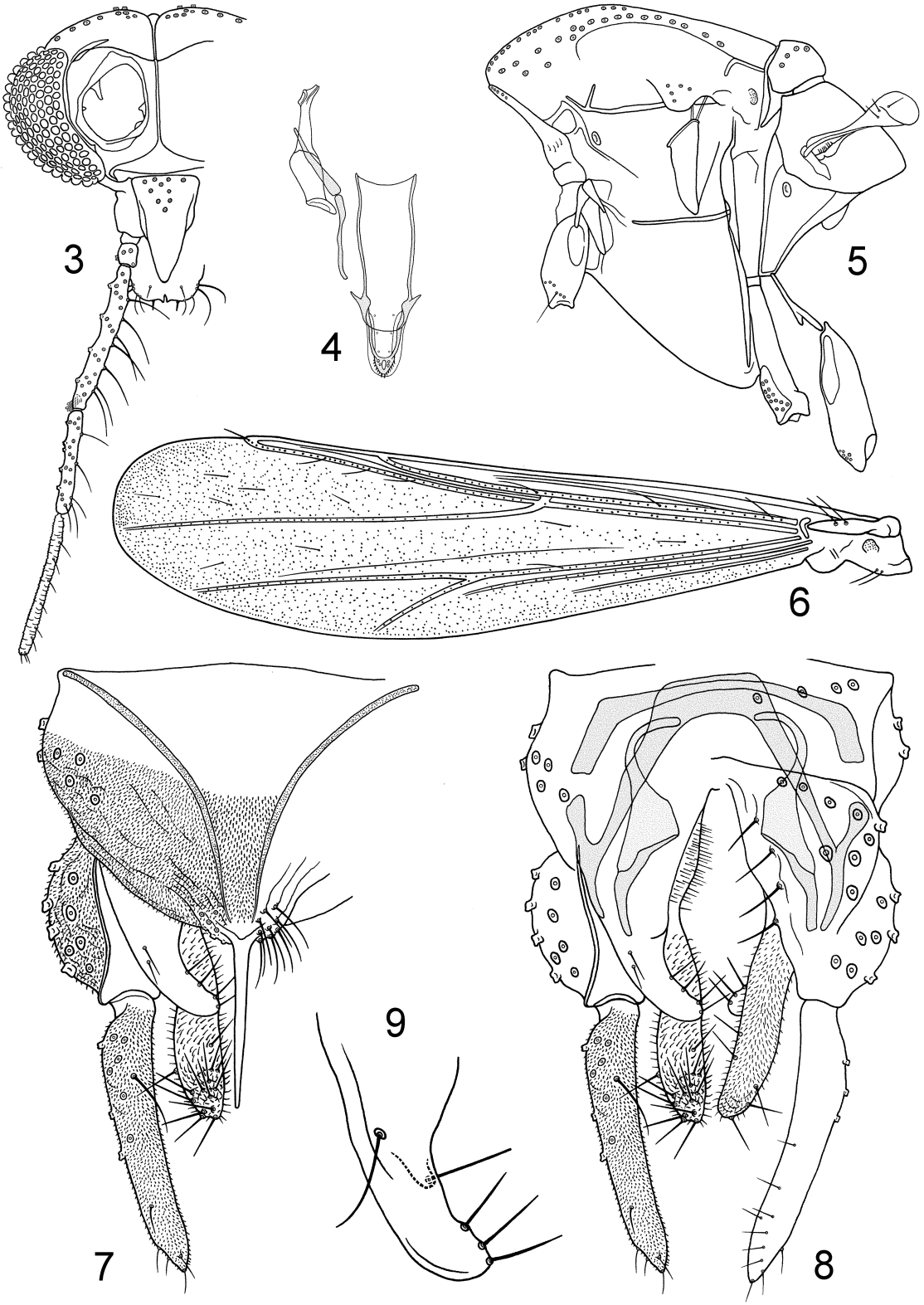
Legs. Scale on fore tibia with 23–26, 24 μm long apical point. Spurs of mid tibia 30–45, 36 μm and 19–30, 24 μm long including combs; of hind tibia 30–49, 39 μm and 23–34, 26 μm long including combs. Width at apex of fore tibia 30–38, 32 μm; of mid tibia 30–36, 33 μm; of hind tibia 34–38, 36 μm. Lengths and proportions of leg segments as in Table 1.

TABLE 1. Lengths (in μm) and proportions of legs of *Nandeva digitifer* **sp. n.,** male (n = 10, except 9 for ta_3–ta_5 on fore- and hind legs).

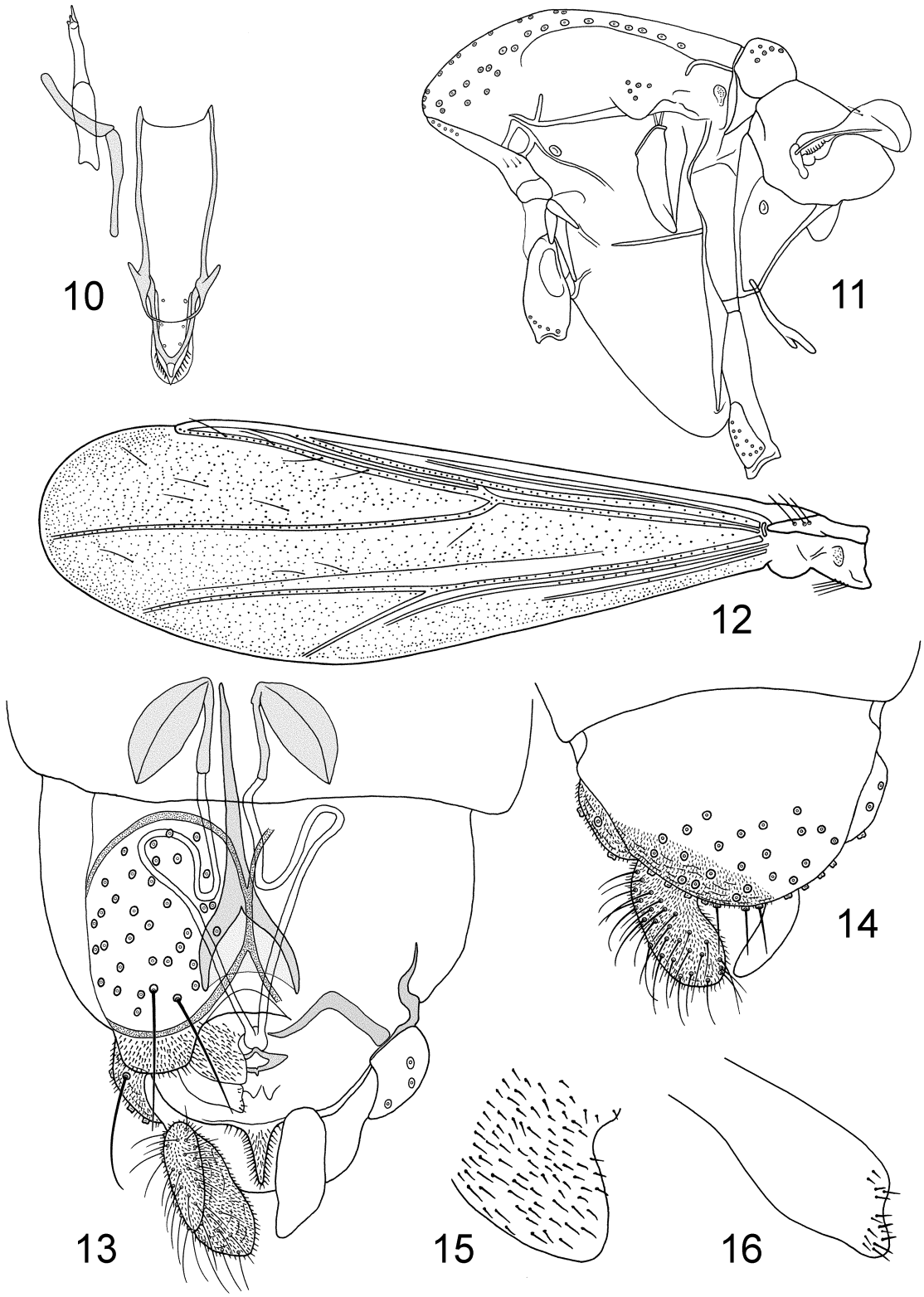
	fe	ti	ta_1	ta_2
p_1	482–558, 526	444–529, 489	454–539, 501	255–293, 279
p_2	501–567, 541	425–491, 456	293–350, 323	161–184, 170
p_3	529–614, 570	576–680, 626	359–425, 389	203–246, 222
	ta_3	ta_4	ta_5	LR
p_1	151–180, 167	85–104, 95	38–57, 46	1.00–1.08, 1.03
p_2	113–142, 130	66–85, 76	38–47, 43	0.68–0.73, 0.71
p_3	189–217, 203	109–132, 122	41–59, 53	0.60–0.64, 0.62
	BV	SV		BR
p_1	2.52–2.69, 2.58	1.96–2.12, 2.04		3.8–7.3, 4.6
p_2	3.00–3.27, 3.16	2.99–3.22, 3.09		4.5–9.0, 6.4
p_3	2.52–2.73, 2.65	3.02–3.15, 3.07		5.0–8.4, 6.9

Hypopygium (Figs 7–9). Tergal band of curved V type, widely separated. Tergite IX with 14–20, 16 setae at base of anal point; laterosternite IX with 4–6, 5 setae. Anal point 47–69, 57 μm long; 7–9, 8 μm wide at base. Phallapodeme 57–76, 70 μm long. Transverse sternapodeme 19–36, 30 μm long; without oral projections. Gonocoxite

76–88, 82 μm long; gonostylus 97–114, 104 μm long. Superior volsella 33–57, 41 μm long, without microtrichia; base with 0–2, 1 short outer setae; extension 11–14, 12 μm wide, with 3 setae apically on inner margin and 0–2, 0 preapical setae; apparent digitus 9–19, 15 μm long, 5–9, 7 μm wide, with apical seta. Inferior volsella 64–73, 69 μm long; 14–16, 14 μm wide; with 14–16, 14 setae in apical third and long microtrichia. HR 0.72–0.83, 0.78; HV 1.82–2.09, 1.95.



FIGURES 3–9. *Nandeva digitifer* **sp. n.,** male. **3—**head; **4—**tentorium, stipes and cibarial pump; **5—**thorax; **6—**wing; **7—**hypopygium, dorsal aspect; **8—**hypopygium with anal point and tergite IX removed, dorsal aspect to the left, ventral aspect to the right; **9—**superior volsella, dorsal view.



FIGURES 10–16. *Nandeva digitifer* **sp. n.**, female. **10—**tentorium, stipes and cibarial pump; **11—**thorax; **12—**wing; **13—**genitalia, ventral aspect; **14—**genitalia, dorsal aspect; **15—**dorsomesal lobe; **16—**ventrolateral lobe.

Female (n = 1). Total length 1.72 mm. Wing length 1.13 mm. Total length / wing length 1.52. Wing length / length of profemur 2.45.

Color. As in male.

Head. AR 0.17. Length (in μm) of flagellomeres: 64, 64, 64, 56, 41. Sensilla chaeticae on flagellomeres 1 to 4 each 41 μm long. Temporal setae 14, including 9 inner verticals, 3 outer verticals, and 2 postorbitals. Clypeus with

16 setae. Tentorium, stipes, and cibarial pump as in Fig. 10. Tentorium 86 µm long, 8 µm wide. Stipes 109 µm long, 34 µm wide. Lengths (in µm) of palpomeres: 23, 30, 143, 109, 131. Third palpomere with 3 scalpellate sensilla clavata.

Thorax (Fig. 11). Antepronotum with 5 dorsal and 6 lateral setae. Dorsocentrals 20, acrostichals 16, prealars 5. Scutellum with 12 setae.

Wing (Fig. 12). VR 1.27. Brachiolum with 3 setae, Sc bare, R with 34 setae, R_1 with 26, R_{4+5} with 44, M with 35, M_{1+2} with 53, M_{3+4} with 55, Cu with 46, Cu_1 with 20, An with 1 and postcubitus with 38–59, 50 setae. Cell m_{3+4} with about 200 setae, m basally of RM with 70 setae. Squama with 4 setae.

Legs. Scale on fore tibia with 30 µm long apical point. Spurs of mid tibia 38 µm and 23 µm long including combs, of hind tibia 41 µm and 26 µm long including combs. Width at apex of fore tibia 34 µm, of mid tibia 34 µm, of hind tibia 38 µm. Lengths and proportions of leg segments as in Table 2.

TABLE 2. Lengths (in µm) and proportions of legs of *Nandeva digitifer* **sp. n.,** female (n = 1).

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	463	444	–	–	–	–	–	–	–	–	–
p_2	510	425	284	137	104	66	43	0.67	3.49	3.30	5.6
p_3	510	586	340	184	170	95	47	0.58	2.90	3.22	6.0

Abdomen. Setae both of tergites and sternites arranged in basal, marginal and lateral setae, with those on tergites more irregular and those of sternites more numerous medially. Number of setae on tergites I–VIII as: 13, 29, 35, 44, 50, 50, 28, 18; on sternites I–VIII as: 0, 7, 28, 52, 55, 53, 28, 66.

Genitalia (Figs 13–16). Gonocoxapodemes VIII forming well sclerotized complete circles, each encircling about 33 setae. Floor developed. Dorsomesal lobe wider than the long and nearly straight ventrolateral lobe. Gonocoxite with 5 setae. Tergite IX somewhat bluntly triangular with 26 setae. Postgenital plate sharply triangular, narrow. Cercus 83 µm long. Seminal capsule about 65 µm long, about 55 µm wide, spermathecal ducts with long loop, without bulbs before common opening. Notum 107 µm long.

Remarks. Although the female not is associated through rearing the presence of setae on squama combined with RM continuous with R_{4+5} and R_{4+5} ending proximal to apex of M_{3+4} assures the placement in *Nandeva*. This new species could conceivably be a synonym of *Nandeva chilena* Wiedenbrug, Reiss *et* Fittkau described on the base of pupal exuviae from Southern Chile near Peulla (Wiedenbrug *et al.* 1998: 65). However, the exuviae of *N. chilena* is considerably larger than the female adult of *N. digitifer.*

Distribution and biology. The species is known only from the type locality in Central Chile where it was collected at light in an area with gardens and farm lands irrigated from water channels.

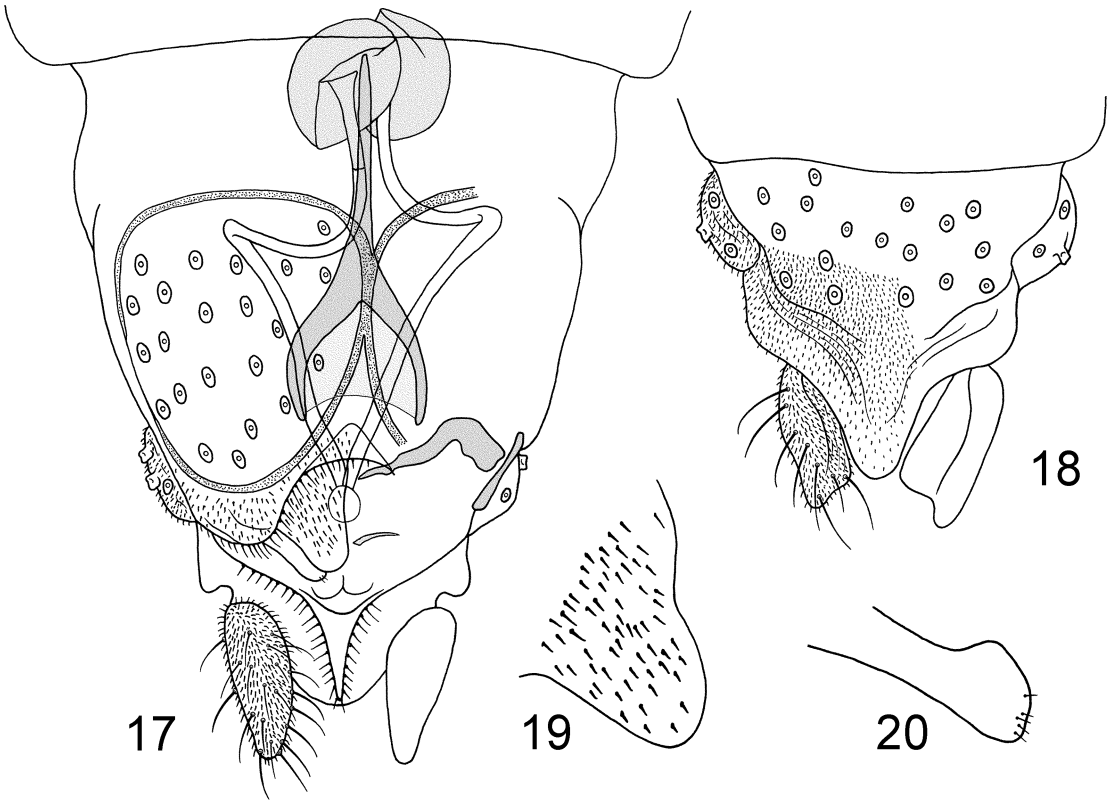
Nandeva latiloba Sæther *et* Roque
(Figs 17–21)

Nandeva latiloba Sæther *et* Roque, 2004: 65.

Additional material. BRAZIL: São Paulo State, Ribeirão Grande, Parque Estadual Intervales; Barra Grande, 24º15'S, 48º10'W, 10 males, 10–13.xii.2000, Malaise trap Ponto B4, M.T. Tavares *et al.* (PEIN 02: BIOTA-FAPESP) (MZUSP); as above except 2 males, 13–16.xii.2000, Malaise trap trilha 1 (PEIN 10: BIOTA-FAPESP); as above except 1 male, Malaise trap trilha 2 (PEIN 07: BIOTA-FAPESP); as above except 1 male, Malaise trap trilha 4 (PEIN 04: BIOTA-FAPESP); as above except 1 female, Malaise trap trilha 5 (PEIN 05: BIOTA-FAPESP). São Paulo State, Salesópolis, Estação Biológica Boracéia, Trilha dos Pilões, 23º39'04.8"S, 45º53'41.8"W, 1 male, 3–5.iv.2001, Malaise trap trilha 3, S.T.P. Amarante *et al.* (BORA 03: BIOTA-FAPESP); as above except 23º39'05.8"S, 45º53'44.6"W, 1 male, 30.iii. – 2.iv.2001, Malaise trap trilha 4 (BORA 02: BIOTA-FAPESP). São Paulo State, Estação Ecológica Juréia-Itatins, Peruibe, 24º31'06"S, 47º12'06"W, 1 male, 6.v.2002, Malaise trap trilha 2, N.W. Perioto *et al.* (PEJU 10: BIOTA-FAPESP). **Rio de Janeiro State,** Reserva Biológica Tinguá, Nova

Iguaçu, 22º34'32"S, 43º26'07.6"W, 1 male, 8–11.iii. 2002, Malaise trap, S.T.P. Amarante *et al.* (BRTIN 18: BIOTA-FAPESP). **Paraná State,** Parque Estadual do Pau Oco, Morretes, 3 males, 7–13.iv.2002, Malaise trap trilha 5, M.T. Tavares *et al.* (BRPR: BIOTA-FAPESP). **VENEZUELA: Falcón State,** Rio Mitare near San Luis, 11º07.930'N, 69º39.184'W, 589 m a.s.l., 1 male, 7.vi.2001, light trap, R.W. Holzenthal *et al.*

Male. As in Sæther and Roque (2004: 65) except that in a few specimens there may be up to 5 setae on vein M. Superior volsella is illustrated in Figure 21.



FIGURES 17–20. *Nandeva latiloba* Sæther *et* Roque, female. **17—**genitalia, ventral aspect; **18—**genitalia, dorsal aspect; **19—**dorsomesal lobe; **20—**ventrolateral lobe.

The figure text in Sæther and Roque (2004) is interchanged; Figure 8 should be *N. strixinorum*, Figure 9 should be *N. latiloba*.

Female (n = 1). Total length 1.56 mm. Wing length 0.82 mm. Total length / wing length 1.91. Wing length / length of profemur 2.28.

Color. Thorax with pale ground color and brown vittae, lower part of anterior anepisternum II, median anepisternum, anterior part of preepisternum and postnotum darker. Abdomen pale brownish with posterior one-quarter pale.

Head. AR 0.18. Length (in μm) of flagellomeres: 54, 49, 49, 41, 34. Sensilla chaeticae on flagellomeres 1 to 4 each 45 μm long. Temporal setae 13, including 6 frontals and inner verticals, 3 outer verticals and 4 postorbitals. Clypeus with 13 setae. Tentorium 79 μm long, 8 μm wide. Stipes 79 μm long, 19 μm wide. Palpomeres lost.

Thorax. Antepronotum with 3 dorsal and 3 lateral setae. Dorsocentrals 23, acrostichals 20, prealars 7. Scutellum with 12 setae.

Wing. VR 1.18. Brachiolum with 2 setae, Sc and An bare, R with 18 setae, R_1 with 15, R_{4+5} with 30, M with 6, M_{1+2} with 38, M_{3+4} with 26, Cu with 23, Cu_1 with 11, and postcubitus with 23 setae. Cell m_{3+4} with about 80 setae, m basally of RM with 30 setae. Squama with 2 setae.

Legs. Scale on fore tibia with 26 μm long apical point. Spurs of mid tibia 34 μm and 23 μm long including combs, of hind tibia 38 μm and 23 μm long including combs. Width at apex of fore tibia 26 μm, of mid tibia 26 μm, of hind tibia 23 μm. Lengths and proportions of leg segments as in Table 3.

TABLE 3. Lengths (in µm) and proportions of legs of *Nandeva latiloba* Sæther *et* Roque, female (n = 1).

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	359	317	274	113	76	47	28	0.87	2.47	3.59	–
p_2	378	331	–	–	–	–	–	–	–	–	–
p_3	387	506	208	104	–	–	–	–	–	–	–

Abdomen. Setae both of tergites and sternites arranged in basal, marginal and lateral setae, with those on tergites more irregular and those of sternites more numerous medially. Number of setae on tergites I–VIII as: 12, 30, 36, 36, 42, 39, 22, 20; on sternites I–VIII as: 0, 0, 18, 29, 37, 33, 27, 45.

Genitalia (Figs 17–20). Gonocoxapodemes VIII forming well sclerotized complete circles, each encircling about 23 setae. Floor developed. Dorsomesal lobe wider than the long, ventrolateral lobe nearly straight with a few weak apical microtrichia. Gonocoxite with 5 setae. Tergite IX somewhat bluntly triangular with 18 setae. Postgenital plate sharply triangular. Cercus 49 µm long. Seminal capsule about 41 µm long, about 41 µm wide, spermathecal ducts with large bend but no loop, without bulbs before common opening. Notum 41 µm long.

Remarks. Although other species of *Nandeva* in addition to *Nandeva latiloba* are present in the same locality and date the association is ascertained by the low number of setae on wing vein M and the presence of frontals.

Distribution. The species previously was known only from São Paulo State in Brazil. The new material extends the distribution to Rio de Janeiro and Paraná states, as well as to Venezuela.

Nandeva strixinorum Sæther *et* Roque
(Figs 22–24)

Nandeva strixinorum Sæther *et* Roque, 2004: 67.

Additional material. BRAZIL: São Paulo State, Ribeirão Grande, Parque Estadual Intervales, Barra Grande, 24º15'S, 48º10'W, 2 males, 10–13.xii.2000, Malaise trap ponto T2, M.T. Tavares *et al*. (PEIN 07: BIOTA-FAPESP); as above except 1 male, Malaise trap ponto T4 (PEIN 04: BIOTA-FAPESP); as above except 1 male, 13–16.xii.2000, Malaise trap ponto T1 (PEIN 10: BIOTA-FAPESP). São Paulo State, Estação Ecológica Juréia-Itatins, Peruíbe, 24º31'06"S, 47º12'06"W, 1 male, 3.v.2002, Malaise trap bosque 7, N.W. Perioto *et al*. (PEJU 12: BIOTA-FAPESP); as above except 6.v.2002, Malaise trap trilha 1 (PEJU 17: BIOTA-FAPESP). **Santa Catarina State,** Urubici, Morro da Igreja, 1.822 m a.s.l., 1 male, 18.ix. – 5.xii.2004, cloud forest, Malaise trap, L.C. Pinho & L.E.M. Bizzo. **MEXICO: Campeche State,** Calakmul, Ejido Nuevo Becan, El Chorro, 18º35'25.5"N, 89º15'28.8"W, 130 m a.s.l., 26 males, 30.iv.1997, light trap, A. Contreras-Ramos *et al*.

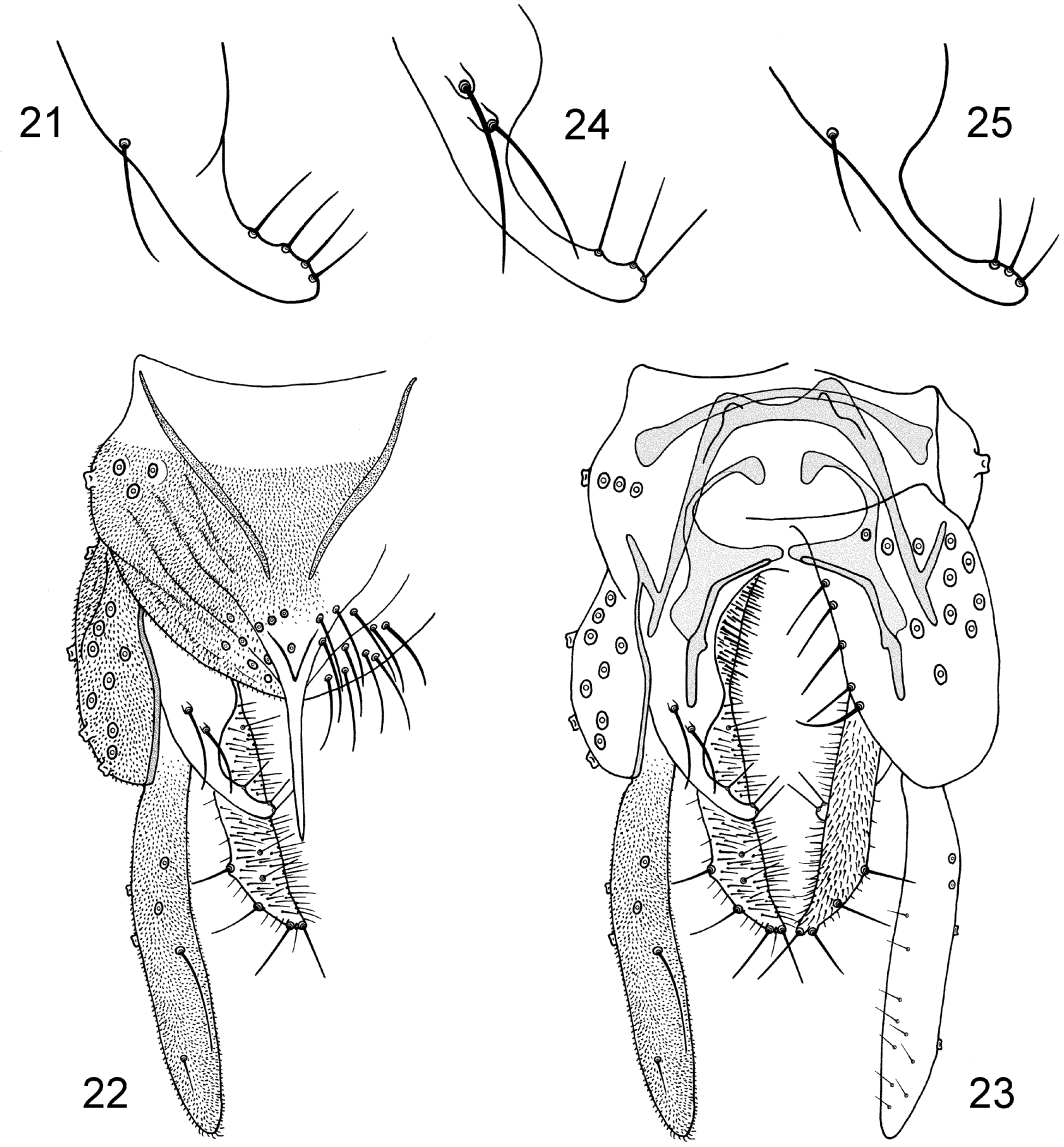
The species was described in detail by Sæther and Roque (2004: 67). The new material may contain more than one species as did also the type material (see Sæther & Roque 2004: 68). Especially the specimens from Peruíbe appear somewhat intermediate between *N. strixinorum* and *N. verruculata* with gonocoxite slightly extended beyond the attachment point of the gonostylus. The male hypopygium and superior volsella are illustrated in Figures 22–24.

Distribution and biology. The species previously was known only from São Paulo State in Brazil. The new material extends the distribution to Santa Catarina State, as well as to Mexico. In Santa Catarina State it was collected at an altitude of about 1.800 m in a fragmented primary cloud forest belonging to the Mata Atlântica forest; in Mexico it was taken in a lowland rain forest at 130 m altitude.

Nandeva cf. *tropica* Wiedenbrug, Reiss *et* Fittkau
(Fig. 25)

Nandeva tropica Wiedenbrug, Reiss *et* Fittkau, 1998: 64.

Additional material. BRAZIL: São Paulo State, Salesópolis, Estação Biológica Boracéia, Salesópolis, Trilha dos Pilões, 23º39'04.8"S, 45º53'41.8"W, 1 male, 3–5.iv.2001, Malaise trap trilha 3, S.T.P. Amarante *et al.* (BORA 03: BIOTA-FAPESP). **VENEZUELA: Aragua State,** Parque Nacional Henri Pittier, road to Choroni, 700 m a.s.l., 1 male, 14.ix.1999, light trap, T. Andersen.



FIGURES 21–25. *Nandeva latiloba* Sæther *et* Roque (**21**), *N. strixinorum* Sæther *et* Roque **(22–24)** and *N.* cf. *tropica* Wiedenbrug, Reiss *et* Fittkau (**25**), males. **22—**hypopygium, dorsal aspect; **23—**hypopygium with anal point and tergite IX removed, dorsal aspect to the left, ventral aspect to the right; **21, 24, 25—**superior volsella, dorsal view.

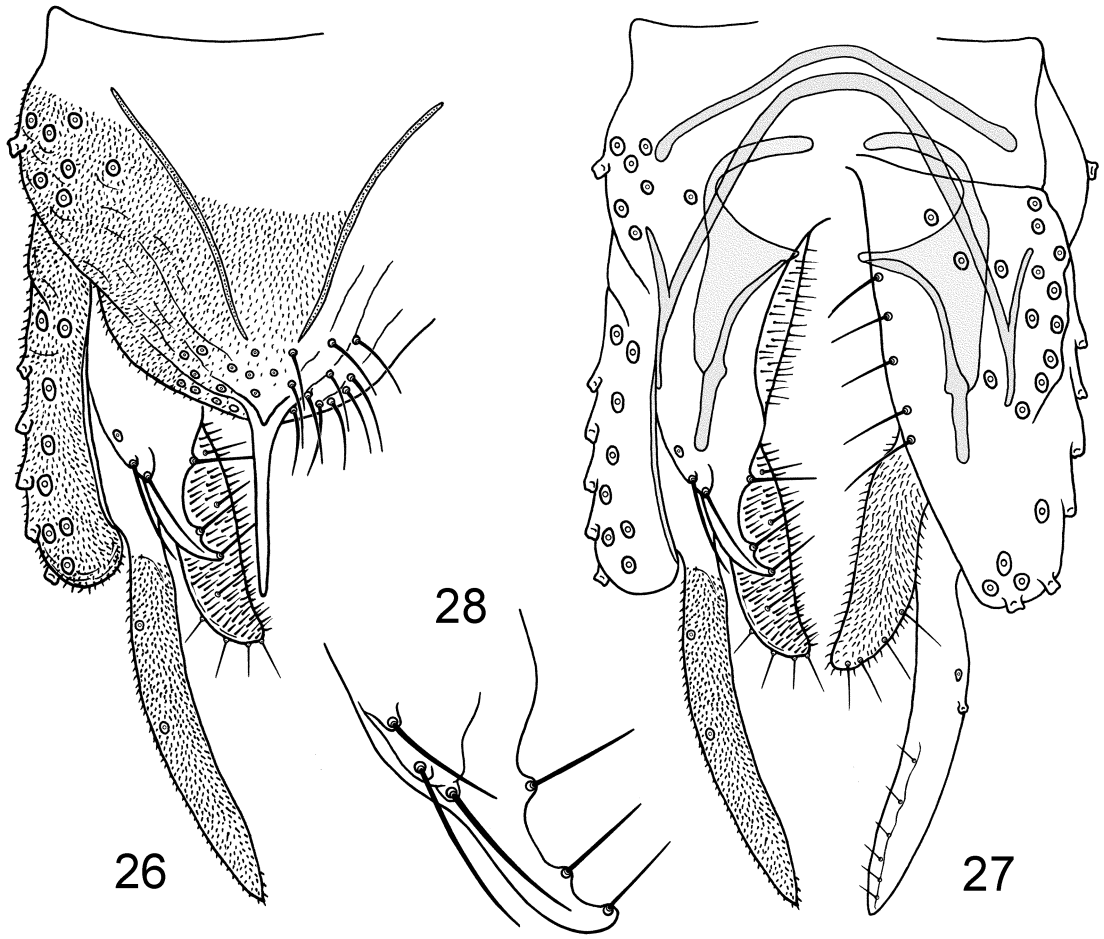
The pupal exuviae was described by Wiedenbrug *et al.* (1998: 64). Sæther & Roque (2004) described the species "*Nandeva* cf. *tropica*" based on males, but the association with the pupa was tentative. Superior volsella is illustrated in Figure 25.

Distribution and biology. The species previously was known only from Brazil and Panama. The new material extends the distribution to include Venezuela where it was taken close to a small, fast flowing stream with stony and sandy bottom substratum.

***Nandeva verruculata* sp. n.**
(Figs 26–28)

Type material. Holotype male, **BRAZIL: Rio de Janeiro State,** Nova Iguaçu, Reserva Biólogica Tinguá, 22º34'32"S, 43º26'07.6"W, 8–11.iii. 2002, Malaise trap, S.T.P. Amarante *et al.* (BRTIN: BIOTA-FAPESP) (MZUSP).

Diagnostic characters. The species differ from other members of the genus except *N. fittkaui* by having small projections carrying setae on the inner margin of the superior volsella, a possible digitus carrying 2–3 setae and gonocoxite with a rounded extension.



FIGURES 26–28. *Nandeva verruculata* **sp. n.**, male. **26—**hypopygium, dorsal aspect; **27—**hypopygium with anal point and tergite IX removed, dorsal aspect to the left, ventral aspect to the right; **28—**superior volsella, dorsal view.

Etymology. From Latin, *verrucula*, small warts, and the suffix *-atus*, equipped with, referring to the small projections carrying setae on the inner margin of the superior volsella.

Male (n = 1). Total length 2.05 mm. Wing length 0.96 mm. Total length / wing length 2.13. Wing length / length of profemur 2.22.

Color. Thorax with pale ground color and brown vittae, lower part of anterior anepisternum II, median anepisternum, anterior part of preepisternum and postnotum dark. Legs stramineous. Abdomen pale brownish with posterior one-quart pale.

Head. AR 0.68. Ultimate flagellomere 233 μm long. Temporal setae 17, including 11 inner verticals, 3 outer verticals and 3 postorbitals. Clypeus with 12 setae. Tentorium 94 μm long, 26 μm wide. Stipes not measurable. Palpomeres lost.

Thorax. Antepronotum with 7 dorsal and 7 lateral setae. Dorsocentrals 24, acrostichals 19, prealars 8. Scutellum with 14 setae.

Wing. VR 1.31. Brachiolum with 2 setae, Sc and An bare, R with 33 setae, R_1 with 29, R_{4+5} with 54, M with 20, M_{1+2} with 54, M_{3+4} with about 40, Cu with 34, Cu_1 with about 20 setae, numbers of setae on postcubitus not clear. Cell m_{3+4} with about 200 setae, m basally of RM with 44 setae. Squama with 4 setae.

Legs. Scale on fore tibia with 34 μm long apical point. Spurs of mid tibia 45 μm and 26 μm long including combs, of hind tibia 56 μm and 41 μm long including combs. Width at apex of fore tibia 30 μm, of mid tibia 34 μm, of hind tibia 36 μm. Lengths and proportions of leg segments as in Table 4.

TABLE 4. Lengths (in μm) and proportions of legs of *Nandeva verruculata* **sp. n.,** male (n = 1, the tarsi may belong to mid leg).

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	435	463	–	–	–	–	–	–	–	–	–
p_2	510	425	–	–	–	–	–	–	–	–	–
p_3	520	539	350	180	142	85	43	0.65	3.14	3.03	4.0

Hypopygium (Figs 26–28). Tergal band of curved V type, widely separated. Tergite IX with 24 setae at base of anal point, laterosternite IX with 8 setae. Anal point 45 μm long, 6 μm wide at base. Phallapodeme 85 μm long. Transverse sternapodeme 31 μm long, without oral projections. Gonocoxite 119 μm long, extending 19 μm beyond attachment of gonostylus; gonostylus 95 μm long. Superior volsella 33 μm long, extension 7 μm wide, with microtrichia in basal two thirds; inner margin of extension with 1 apical, 1 median and 1 basal seta; apparent digitus 17 μm long, 9 μm wide, with 2–3 setae on tubercles. Inferior volsella 62 μm long, 15 μm wide, with 8 apical, 1 median, and 1 basal setae and long microtrichia. HR 1.25, HV 2.16.

Remarks. Also this species appears to have a digitus consisting of 2–3 overlapping tubercles, each with an apical seta. However, it is less clear than in *N. digitifer.*

Distribution and biology. The species is known only from Reserva Biológica Tinguá in the outskirts of Rio de Janeiro City, Brazil. This nature reserve is a mosaic of primary and secondary Mata Atlântica forest.

Nandeva fittkaui Cranston
(Figs 29–33)

Nandeva fittkaui Cranston, 1999: 296.

Material examined. Paratype female in exuviae, **AUSTRALIA**: Clohesy R., 16°59'S 145°38'E, 7-8.ix.1997, McKie (ANIC, Australian National Insect Collection).

It is not possible to add any measurements or many details to the description of this pharate female pupa given by Cranston (1999). The details of the wings and legs are not clear. Accordingly both the Tanytarsini type venation and the typical long spur of the front tibia may not be present in *N. fittkaui*.

The female genitalia (Figs 29–33) differ from other *Nandeva* in several details. A floor apparently is absent, tergite IX has two groups each of about 8–9 setae, the ventrolateral lobe is in the same plane as the dorsomesal lobe and are covered with strong microtrichia, and the spermathecal ducts are straight. When this is added to the significant differences found both in the male and in the pupa *N. fittkau* seems to deserve a separate genus.

Key to the males

1. Anal point spatulate; squama bare (Cranston 1999: fig. 26). Australia. . . . . *N. fittkaui* Cranston
- Anal point parallel-sided to slightly tapering; squama setose. Neotropical 2
2. Gonocoxite with rounded extension; inner margin of the superior volsella with small projections carrying setae (Fig. 26) . . . . . *N. verruculata* **sp. n.**
- Gonocoxite without rounded extension; setae on inner margin of the superior volsella not on projections 3
3. Digitiform extension of superior volsella broad, 6–14 μm wide. 4
- Digitiform extension of superior volsella narrow, at most 6 μm wide. 5

4. Digitiform extension of superior volsella 6–8 μm wide; digitus lacking; M vein at most with 5 seta; 9–13 dorsocentrals (Fig. 21; Sæther & Roque 2004: figs 1–6). . . . . *N. latiloba* Sæther *et* Roque
- Digitiform extension of superior volsella 11–14 μm wide; apparent digitus present; M vein with 13–27 seta; 16–24 dorsocentrals (Figs 3–9) . . . . . *N. digitifer* **sp. n.**
5. Antepronotum with continuous row of 5–9 dorsal to median setae and 3–8 lateral setae; abdomen not banded, all dark; extension of superior volsella with 3 apical and one basal seta on inner margin (Sæther & Roque 2004: fig. 7) . . . . . *N. gaucha* Wiedenbrug, Reiss *et* Fittkau
- Antepronotum with 1–4 dorsal to median setae and 2–3 lateral setae; extension of superior volsella with 2–3 apical and 0–1 median seta on inner margin. 6
6. Antennal ratio 0.49–0.75; ultimate flagellomere 184–263 μm long; abdomen nearly uniformly brown or with dark bands in more than anterior half of tergites II–V. . . . . *N. strixinorum* Sæther *et* Roque
- Antennal ratio 0.30–0.35; ultimate flagellomere 101–113 μm long; abdomen banded with narrow bands on tergites II–V in anterior third to half. . . . . *N.* cf. *tropica* Wiedenbrug, Reiss *et* Fittkau

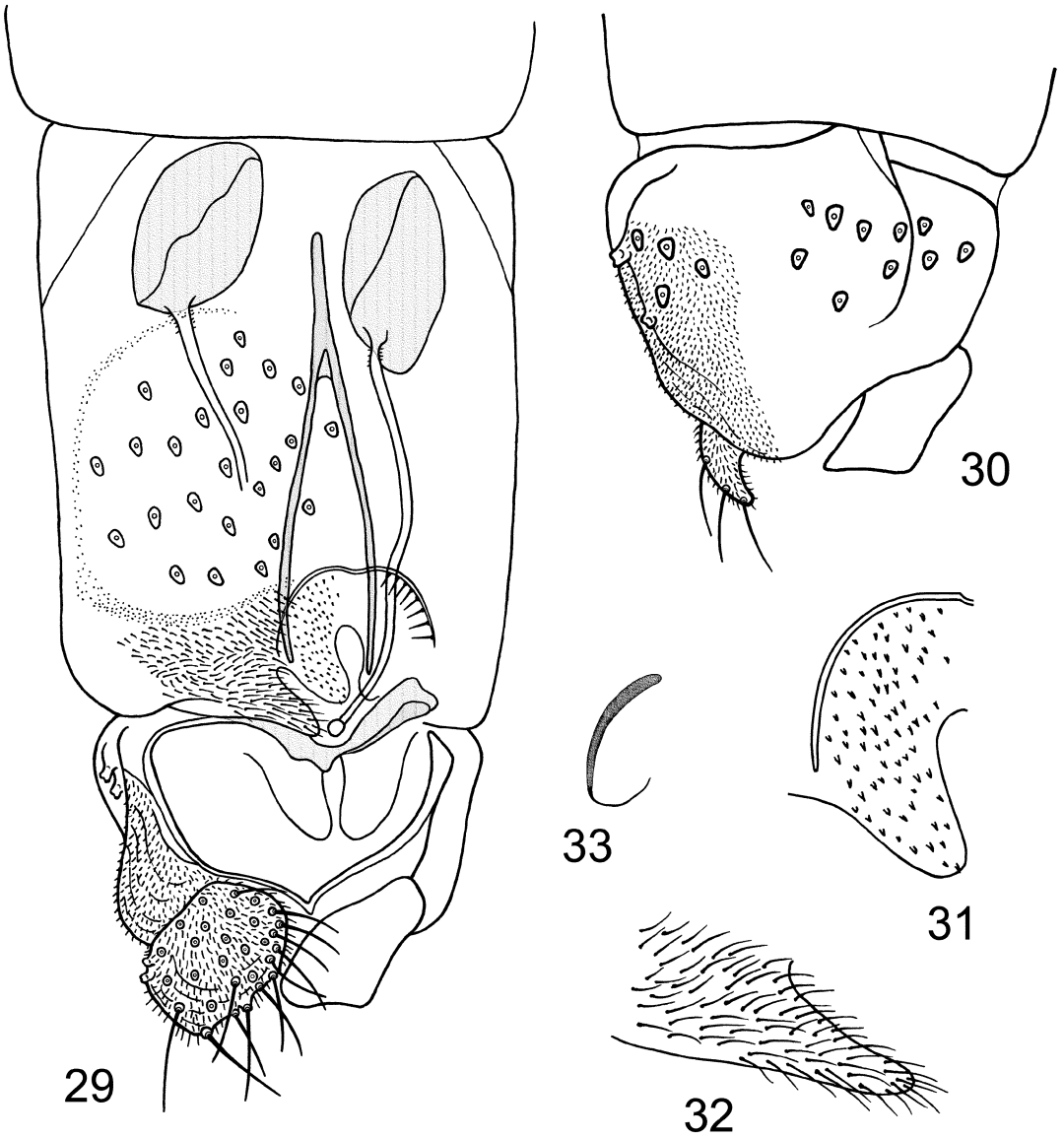


FIGURE 29–33. *Nandeva fittkaui* Cranston, female. **29—**genitalia, ventral aspect; **30—**genitalia, dorsal aspect; **31—**dorsomesal lobe; **32—**ventrolateral lobe; **33—**apodeme lobe.

Key to the females

1. Spermathecal ducts nearly straight; ventrolateral lobe on the same plane as the dorsomesal lobe and covered with long microtrichia; tergite IX triangular with about 20 setae in two groups (Figs 29–33). Australia . . . . . *N. fittkaui* Cranston

- Spermathecal ducts with loop or bend; ventrolateral lobe dorsal to the dorsomesal lobe and with only a few apical microtrichia; tergite IX triangular or rounded with 17–26 un-grouped setae (Figs 13–14, 17–18). Neotropical. 2

2. Wing length 1.13 mm; M with 35 setae; tergite IX rounded. . . . . *N. digitifer* **sp. n.**
- Wing length 0.82 mm; M with 6 setae; tergite IX triangular. . . . . *N. latiloba* Sæther *et* Roque

Acknowledgements

We are indebted to Dr. Carlos J. E. Lamas, Museu de Zoologia, Universidade de São Paulo, and Dr. Dalton S. Amorim, Faculdade de Filosofia Ciências e Letras de Ribeirão Preto, Universidade de São Paulo, Campus Ribeirão Preto for the loan of specimens from the BIOTA-FAPESP project ["Limites geográficos e fatores causais de endemismo na Floresta Atlântica em Diptera" proc. 03/12074–9 within The Biodiversity Virtual Institute Program (www.biota.org)] and to Dr. Peter Cranston, Australia, for the loan of the female paratype of *Nandeva fittkaui*. Gladys Ramirez made the slide preparations.

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