



## Neotropical *Nilothauma* Kieffer, 1921, with the description of thirteen new species (Diptera: Chironomidae)

HUMBERTO FONSECA MENDES & TROND ANDERSEN<sup>1</sup>

The Natural History Collections, Bergen Museum, University of Bergen, Pb. 7800, NO–5020 Bergen, Norway.

E-mails: humberto.mendes@bm.uib.no; trond.andersen@zmb.uib.no

<sup>1</sup>Corresponding author. E-mail: trond.andersen@zmb.uib.no

### Table of content

Abstract .....	2
Introduction .....	2
Material and methods .....	3
Phylogenetic analysis .....	3
Phylogeny .....	7
Biogeography .....	8
<i>Nilothauma</i> Kieffer .....	9
Key to the males of Neotropical <i>Nilothauma</i> Kieffer .....	12
Key to the pupae of Neotropical <i>Nilothauma</i> Kieffer .....	13
<i>Nilothauma amazonense</i> <b>sp. n.</b> .....	13
<i>Nilothauma aripuanense</i> <b>sp. n.</b> .....	15
<i>Nilothauma calori</i> <b>sp. n.</b> .....	18
<i>Nilothauma complicatum</i> <b>sp. n.</b> .....	19
<i>Nilothauma fazzariense</i> <b>sp. n.</b> .....	21
<i>Nilothauma fittkai</i> (Soponis) <b>comb. n.</b> .....	22
<i>Nilothauma involucrum</i> <b>sp. n.</b> .....	24
<i>Nilothauma jaraguaense</i> <b>sp. n.</b> .....	25
<i>Nilothauma longissimum</i> <b>sp. n.</b> .....	26
<i>Nilothauma matogrossense</i> <b>sp. n.</b> .....	28
<i>Nilothauma reissi</i> (Soponis) <b>comb. n.</b> .....	31
<i>Nilothauma roquei</i> <b>sp. n.</b> .....	32
<i>Nilothauma sooretamense</i> <b>sp. n.</b> .....	33
<i>Nilothauma spiesi</i> <b>sp. n.</b> .....	35
<i>Nilothauma strebulosum</i> (Adam et Sæther) <b>comb. n.</b> .....	36
<i>Nilothauma zitoi</i> <b>sp. n.</b> .....	37
<i>Nilothauma</i> sp. 1 (Pupa) .....	38
Acknowledgements .....	42
References .....	42
Appendix .....	44

## Abstract

Thirteen new species to *Nilothauma* Kieffer are described and figured: *N. amazonense*, *N. calori*, *N. complicatum*, *N. fazzariense*, *N. involucrum*, *N. jaraguaense*, *N. longissimum*, *N. roquei*, *N. sooretamense*, and *N. zitoi* from Brazil and *N. spiesi* from Chile as males, and *N. aripuanense* and *N. matogrossense* from Brazil as males and pupae. Type material and other materials of *Paranilothauma reissi* Sponis, *P. strebulosum* Adam et Sæther, *Neelamia fittkai* Sponis, and *N. bergeri* Sponis are examined and the males figured. A phylogenetic analysis of all *Nilothauma*, *Paranilothauma* Sponis, and *Neelamia* Sponis species is performed, showing that the genera *Paranilothauma* and *Neelamia* should be regarded as junior synonyms of *Nilothauma* and the included species are placed in *Nilothauma* as new combinations accordingly. New material further revealed that *N. bergeri* is a synonym of *N. fittkai*. *Nilothauma* is found in all biogeographical regions except Antarctica, and shows an Inabrezian (Northern Gondwana) distribution pattern. The phylogeny combined with the corresponding area cladogram and BPA analysis suggests the Neotropical Region as the area of origin.

**Key words:** Chironomidae, Chironominae, *Nilothauma*, *Paranilothauma*, *Neelamia*, new species, new synonyms, Brazil, Chile, Neotropics

## Introduction

The genus *Nilothauma* was erected by Kieffer (1921a) based on *Nilothauma pictipenne* Kieffer, 1921. The immatures of *Nilothauma* are found in the littoral and sublittoral sediment of standing and flowing waters (Pinder & Reiss 1983, 1986; Cranston *et al.* 1989). Adam and Sæther (1999) revised the genus and recognized 25 species. Recently Yan *et al.* (2005) described an additional species from Oriental China. Up to now 26 species of the genus have thus been described worldwide. Of these 6 species occur in the Palaearctic Region, 4 in the Nearctic Region, 11 in the Afrotropical Region, 5 in the Oriental Region, and 2 in the Australian Region. In addition, two species from Peru, *N. aleta* Roback and *N. duena* Roback, were described in *Nilothauma* by Roback (1960). Watson and Heyn (1992) examined the types of both species and stated that they belong in two new genera which they were going to describe. According to Adam and Sæther (1999) they appear to belong in *Paratendipes* Kieffer, and they did not include them in their revision of *Nilothauma*. In this review of the Neotropical species we agree with this assessment, but both species should be re-examined to ascertain their position.

Adam and Sæther (1999) proposed four species groups in *Nilothauma*, the *duminola*-, *babiyi*-, *brayi*- and *pictipenne* groups, separated mainly on hypopygial features like the number of dorsal, setose projections on tergite IX. The *duminola*- and the *babiyi* groups have one dorsal projection only, while two projections are found in the *brayi*- and *pictipenne* groups. Further, in the *pictipenne* group the wing has dark areas, while in the other groups the wings lack dark spots or markings.

The genus *Nilothauma* together with *Paranilothauma* Sponis, 1987 and *Neelamia* Sponis, 1987 form a closely related group of genera (Adam & Sæther 2000). The genus *Paranilothauma* was erected by Sponis (1987) based on the male and pupa of *P. reissi* Sponis from the Amazonas in Brazil. Later, Adam and Sæther (2000) described a second species, *P. strebulosum*, from Costa Rica. The genus *Neelamia* was erected by Sponis (1987) based on the males of *N. fittkai* Sponis and *N. bergeri* Sponis, both from Brazil.

In this article we describe 13 new species of *Nilothauma* from Brazil and Chile and re-examine *Paranilothauma reissi*, *P. strebulosum* Adam et Sæther, *Neelamia fittkai* and *N. bergeri*. New material revealed that *N. bergeri* is a synonym of *N. fittkai*. Further, the systematic relationships of the *Nilothauma*, *Paranilothauma* and *Neelamia* species are evaluated, resulting in *Paranilothauma* and *Neelamia* being placed as synonyms of *Nilothauma*. The biogeography of the genus is outlined and emended diagnoses to imagines, pupa, and larva as well as keys to the males and pupae of the Neotropical species are provided.

## Material and methods

Adults were collected in Malaise traps, light traps or with sweep nets. Pupae and pupal exuviae were collected using drift nets. The material examined was mounted in Canada balsam or Euparal on slides following the procedures outlined by Sæther (1969) and Pinder (1989). The general terminology follows Sæther (1980). Measurements are given as ranges, followed by the mean when more than three specimens were measured, followed by the number of specimens measured (n) in parenthesis. Coloration is based on cleared specimens.

Types of the species described below and other material examined are deposited in the following institutions:

MZUSP	Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil.
UFSCar	Laboratório de Entomologia Aquática da Universidade Federal de São Carlos, São Carlos, Brazil.
ZMBN	The Natural History Collections, Bergen Museum, University of Bergen, Bergen, Norway.
ZSM	Zoologische Staatssammlung, Munich, Germany.

Other abbreviations:

BIOTA-FAPESP	Project BIOTA, financially supported by Fundação de Amparo a Pesquisa do Estado de São Paulo (FAPESP project numbers 03/10517–9 and 03/12074–9).
IBAMA	Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis.

## Phylogenetic analysis

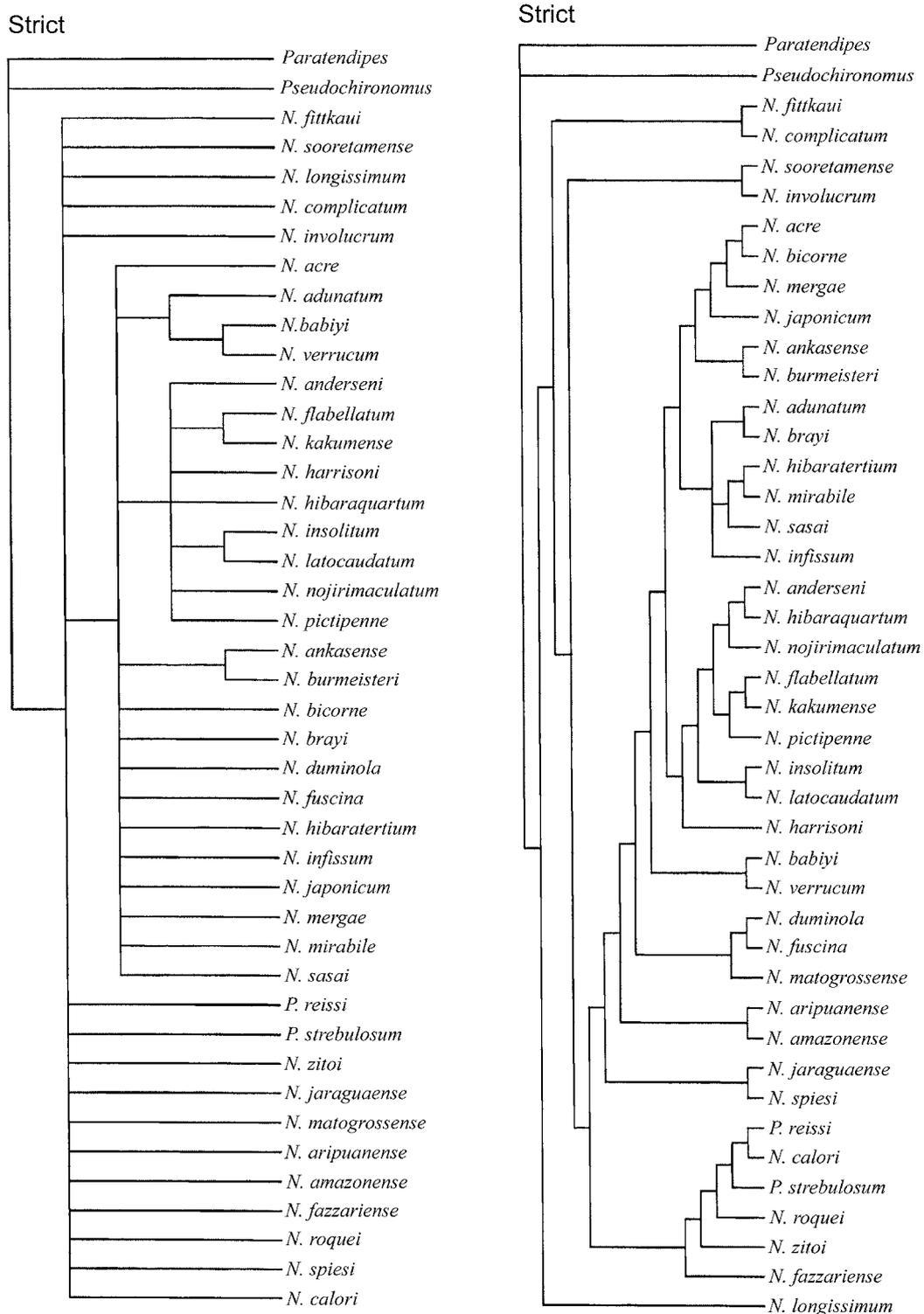
Assessment of the phylogenetic relationship involved compilation of a data matrix for 48 characters and 43 taxa. All species of *Nilothauma* Kieffer, *Paranilothauma* Soptonis, and *Neelamia* Soptonis were entered separately. In addition, the genera *Paratendipes* Kieffer and *Pseudochironomus* Malloch were used as outgroup. Only characters in the males were used as females and immatures are known only in a few species.

The following characters were used in the parsimony analysis:

1. *Wing length*: (0) > 2.0 mm; (1) 1.5–2.0 mm; (2) < 1.5 mm.
2. *Coloration of legs*: (0) uniform; (1) with rings or darker areas apically on femur and/or tibia.
3. *Coloration of thorax*: (0) uniform; (1) with darker areas.
4. *Antennal ratio (male)*: (0) > 0.35; (1) ≤ 0.35.
5. *Antennal ratio (male)*: (0) > 0.35; (1) 0.27–0.34; (2) 0.20–0.26; (3) ≤ 0.20.
6. *Temporal setae*: (0) 7–12; (1) < 6.
7. *Anteprenotal lobes*: (0) without median projection; (1) with median projection.
8. *Dorsocentral setae*: (0) > 10; (1) ≤ 10.
9. *Acrostichal setae*: (0) > 12; (1) ≤ 12.
10. *Coloration of wings*: (0) without darker areas; (1) with darker areas.
11. *Coloration of wings*: (0) with 2–4 darker spots or bands; (1) with 4–6 darker spots or bands. Absence scored as "-".
12. *Number of setae on R*: (0) with 8 or more setae; (1) with less than 8 setae.
13. *Number of setae on R<sub>4+5</sub>*: (0) with 8 or more setae; (1) with less than 8 setae.
14. *Number of setae on R<sub>j</sub>*: (0) with 10 or more setae; (1) 6–10 setae; (2) with 2–5 setae; (3) bare.
15. *Leg ratio of foreleg (LR<sub>j</sub>)*: (0) < 1.30; (1) 1.30–1.50; (2) > 1.50.
16. *Shape of segment VIII*: (0) not tapering anteriorly; (1) slightly triangular, tapering anteriorly, but with truncate or rounded anterior end, or when parallel-sided, widest medially; (2) strongly triangular, widest posteriorly (see Adam & Sæther 1999: 13, fig. 2).

17. *Shape of lateral sternapodeme*: (0) transverse sternapodeme present, well developed, with or without oral projections; (1) transverse sternapodeme absent, lateral sternapodemes meeting medially, rounded; (2) transverse sternapodeme absent, lateral sternapodemes meeting medially, truncate.
18. *Shape of anterior part of lateral sternapodeme when transverse sternapodeme lacking*: (0) not thickened anteriorly; (1) thickened anteriorly; (2) extended anteriorly. Sternapodeme normal scored as "-".
19. *Anterior projections on tergite IX (in addition to anal point)*: (0) absent; (1) present, may be single or divided into two lateral lobes.
20. *Posterior projections on tergite IX (in addition to the anal point)*: (0) absent; (1) present.
21. *Anterior projection of tergite IX*: (0) weak, at most a flat area with strong setae (as in *N. infissum* Adam et Sæther); (1) well developed, undivided or slightly notched; (2) well developed, clearly divided. Absence scored as "-".
22. *Anterior projection of tergite IX*: (0) when divided, with common base; (1) completely separated, without common base. Absence scored as "-".
23. *Setae on anterior projection of tergite IX*: (0) not concentrated near apex; (1) concentrated near apex. Absence scored as "-".
24. *Setae on anterior projection of tergite IX*: (0) setae simple or at most thickened; (1) setae split apically, forming tuff-like structures. Absence scored as "-".
25. *Number of setae on anterior projection of tergite IX*: (0)  $\leq 15$  setae; (1) 16–35 setae; (2)  $> 36$  setae. Absence scored as "-".
26. *Posterior projection of tergite IX*: (0) parallel-sided with narrow base; (1) with conspicuously broad base. Absence scored as "-".
27. *Setae on posterior projection of tergite IX*: (0) with setae covering entire projection; (1) setae restricted to apex; (2) setae lacking. Posterior projection of tergite IX lacking scored as "-".
28. *Anal point*: (0) present; (1) absent or reduced to low protuberance.
29. *Anal point*: (0) with microtrichia; (1) completely hyaline. Absence scored as "-".
30. *Anal point shape*: (0) narrow, nearly parallel-sided; (1) broad, parallel-sided with rounded or 3-pronged apex; (2) lanceolate, widest in the middle. Absence scored as "-".
31. *Disto-medial setae on gonostylus*: (0) all simple; (1) at least one seta split apically.
32. *Disto-medial setae on gonostylus*: (0) 1–3 setae; (1) 4–5 setae; (2)  $\geq 6$  setae.
33. *Outer setae on gonostylus*: (0) present; (1) absent.
34. *Shape of gonostylus*: (0) tapering towards apex; (1) widest subapically.
35. *Hypopygium ratio (HR)*: (0)  $\geq 0.86$ ; (1) 0.60–0.86; (2)  $\leq 0.60$ .
36. *Microtrichia on superior volsella*: (0) microtrichia present; (1) microtrichia completely lacking.
37. *Microtrichia on superior volsella*: (0) microtrichia covering entire volsella; (1) restricted to base; (2) restricted to apex.
38. *Superior volsella*: (0) single; (1) bifurcate with lateral spur.
39. *Setae on superior volsella*: (0)  $> 5$  setae; (1) 3–5 setae; (2) 1–2 setae; (3) bare.
40. *Shape of superior volsella*: (0) straight; (1) L-shaped; (2) pediform with narrow base and medially directed apex; (3) folded.
41. *Prominent seta on outer margin of superior volsella*: (0) absent; (1) present.
42. *Setae on median volsella*: (0)  $\geq 3$  setae; (1) 2 setae; (2) 1 setae.
43. *Shape of median volsella*: (0) single; (1) split apically.
44. *Shape of median volsella*: (0) distinct and separate, even when minute; (1) reduced to few setae on tubercles, absent, or possibly fused with superior volsella.
45. *Microtrichia on inferior volsella*: (0) volsella completely covered with microtrichia; (1) at least apical 1/3 bare.
46. *Shape of inferior volsella*: (0) of same width or tapering towards apex; (1) widest subapically.
47. *Setae on inferior volsella*: (0) simple; (1) split apically.
48. *Lateral spine on laterosternite IX*: (0) absent; (1) present.

No character was given extra weight or ordered. However, both character 4 and 5 concern the antennal ratio (AR), thus adding extra weight to this character. The use of continuous characters has been criticized (see e.g. McKie & Cranston 2005), but as most of the species included did not show polymorphism for these characters, we decided to include both in the analysis.

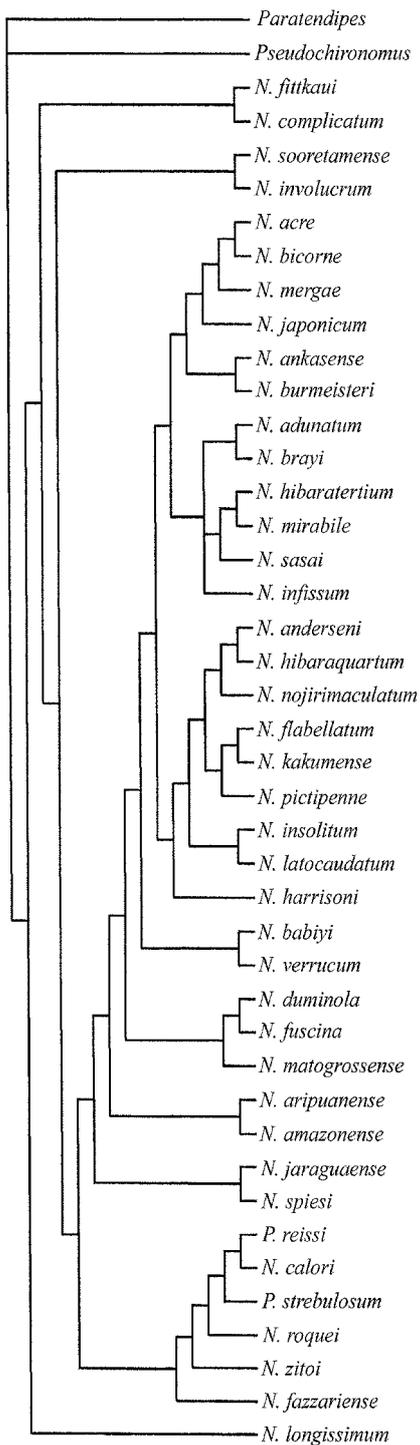


1

2

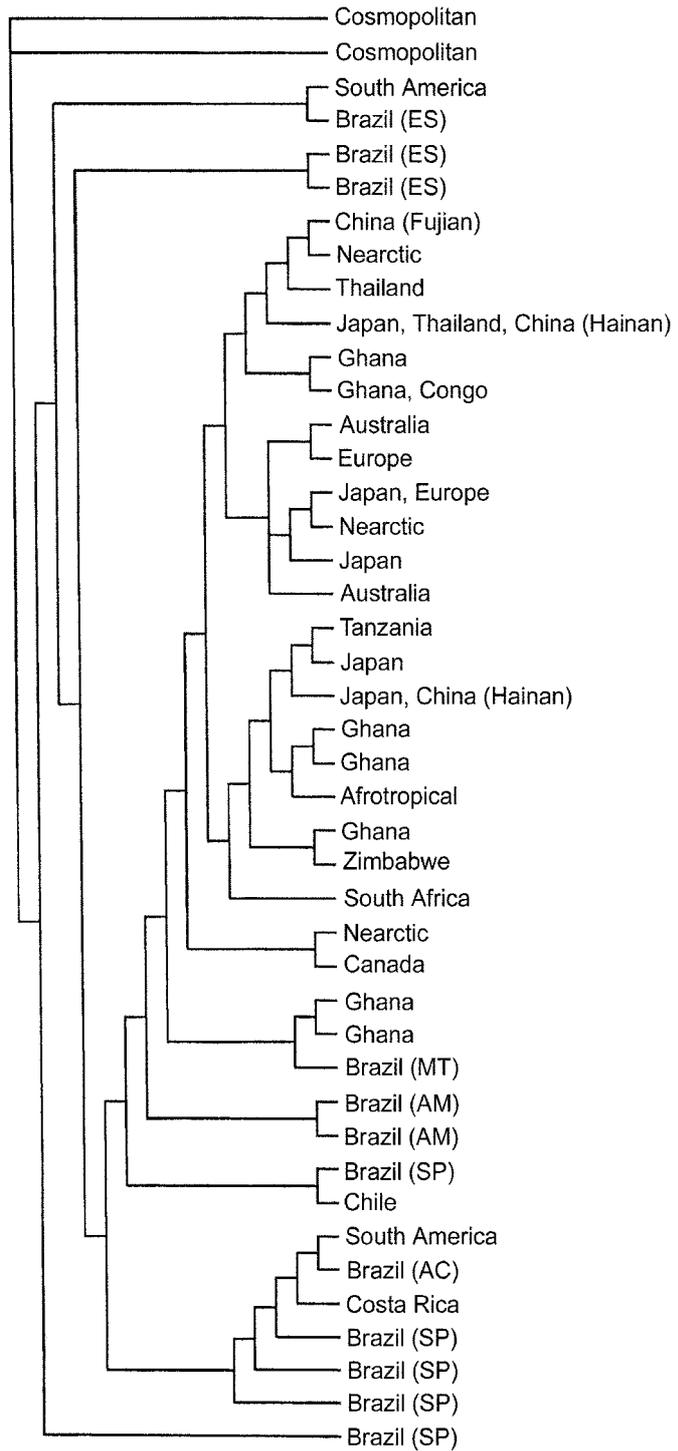
**FIGURES 1–2.** Parsimony analysis of *Nilothauma* Kieffer species with *Paratendipes* Kieffer and *Pseudochironomus* Malloch fixed as outgroup. Characters and character states as in text, matrix of characters as in Appendix 1. **1**—strict consensus of shortest tree. **2**—strict consensus of shortest tree after reweighting according to rescaled consistency index.

Strict



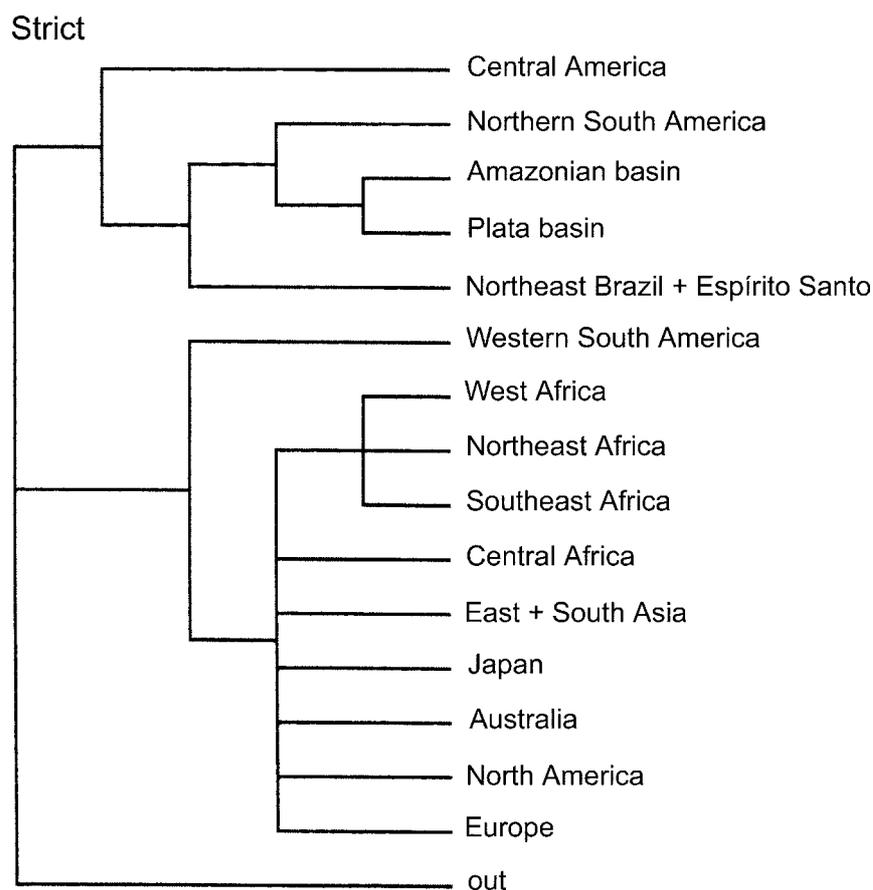
3

Strict



4

**FIGURES 3–4.** Parsimony analysis of *Nilothauma* Kieffer species with *Paratendipes* Kieffer and *Pseudochironomus* Malloch fixed as outgroup. Characters and character states as in text, matrix of characters as in Appendix 1. **3**—strict consensus of shortest tree after reweighting according to rescaled consistency index. **4**—area cladogram based on the consensus tree. Abbreviations: AC = Acre State, AM = Amazonas State, ES = Espírito Santo State, MT = Mato Grosso State, SP = São Paulo State.



5

**FIGURE 5.** Brooks Parsimony Analysis (BPA) of the *Nilothauma* Kieffer species.

Most characters are adapted from Adam and Sæther (1999). Their character T 7: Anteprenotal lobe at most slightly reduced, with at least an indication of a median projection, was not used as it can be difficult to observe. Their character T 25: Posterior projection of tergite IX single or divided, is reinterpreted as an artifact at least in *N. flabellatum* Adam *et* Sæther and *N. kakumense* Adam *et* Sæther and not used. Presence or absence of frontal tubercles could have been used as an additional character, but as the tubercles can be minute and difficult to observe we did not include this character in the analysis.

Parsimony analysis was carried out using PAUP 4.0b10 (Swofford 1998) operating on a Macintosh computer, and employing 1000 random addition sequence replicates. The search method employed was Heuristic-branch-swapping called Tree Bisection and Reconnection (TBR) (Swofford & Olsen 1990).

### Phylogeny

Based on the data matrix in Appendix 1, 85 trees all with 280 steps, consistency index (CI) of 0.24, homoplasy index (HI) of 0.75, retention index (RI) of 0.59, and rescaled consistency index (RC) of 0.14 were obtained; the strict consensus tree is shown in Figure 1. After resetting weights to one, successive reweighting resulted in 3 trees with 351 steps, CI = 0.42, HI = 0.58, RI = 0.81, and RC = 0.34; the strict consensus tree is shown in Figure 2.

At the outset *N. sooretamense* **sp. n.**, *N. longissimum* **sp. n.**, *N. complicatum* **sp. n.**, and *N. involucrum* **sp. n.** were regarded as members of *Neelamia* as they all lack dorsal projection(s) on tergite IX and anal point. In the strict consensus tree *Neelamia fittkaui* Sponis is placed together with *N. complicatum* near the base of the

tree (Fig. 2). However, including all the above mentioned species in *Neelamia* would render the genus paraphyletic.

In the strict consensus tree *Paranilothauma reissi* Sponis and *P. strebulosum* Adam *et* Sæther groups with *N. fazzariense* **sp. n.**, *N. zitoi* **sp. n.**, *N. roquei* **sp. n.**, and *N. calori* **sp. n.** near the base of the tree. All except *N. reissi* have dorsal projections on tergite IX and all except *N. zitoi* lack anal point. Thus, to retain a monophyletic *Paranilothauma* implies that the differences between *Paranilothauma* and *Nilothauma* would become subtle. Further, the pupa of *P. reissi* is described, but apart from having a few more branches on the thoracic horn it is very similar to other known *Nilothauma* pupae, thus giving no support for retaining *Paranilothauma* as a separate genus.

To retain both *Nilothauma* and *Paranilothauma* as monophyletic genera would further imply that a paraphyletic *Neelamia* is retained or that new genera have to be described to accommodate *N. longissimum*, *N. sooretamense*, and *N. involucrum*. So far no immatures are known for any of the included species to give possible support for retaining *Neelamia*. Both *Neelamia* and *Paranilothauma* are therefore placed as junior synonyms of *Nilothauma*.

The species groups suggested by Adam and Sæther (1999) were obtained in the analysis, but the relationship among the species differs. The Brazilian *N. matogrossense* **sp. n.** falls at the base of the *duminola* group together with the two West African species *N. duminola* Adam *et* Sæther and *N. fuscina* Adam *et* Sæther. Species groups for the other Neotropical species are not considered in this paper as it may be premature to assign these species to groups without a better knowledge of the immature stages.

## Biogeography

The area cladogram shown in Figure 4 was obtained by simply replacing the taxon names to the area where they occur in the preferred tree (Fig. 3), following Humphries and Parenti (1999). According to the cladogram, *Nilothauma* originated in the Neotropical region, reinforcing the predictions made by Adam and Sæther (1999). As a Hennigian comb was obtained, it is possible to apply the progression rule to indicate vicariance and range expansion dispersal. According to this rule, the most basal species is expected to occur only in the Neotropical Region, while the most apical ones outside this region.

Among the different methods to infer relationships among different areas (see van Veller *et al.* 1999, 2001), Brooks Parsimony Analyses (BPA) was chosen due to its simplicity and feasibility, as well as its applicability to the data. Despite the errors regarding BPA and assumption 0 analyses, vividly explored by Humphries and Parenti (1999) and Ebach *et al.* (2003), this is the only biogeographical analysis that shows area relationship based on a single set of species, and is thus a possible method for the species treated here. One point to emphasize is that chironomids have not been collected in many regions, including vast parts of South America, and South and East Asia. For this reason, the results presented here must be regarded as merely tentative. The BPA analyses follow Brooks (1990) and Brooks *et al.* (2001, 2004). The preferred cladogram was used as a base for assigning character numbers for use in the analyses. A hypothetical "out"-area, where no species occur, was set as outgroup. The subdivisions of the Palaearctic and Oriental regions into High, East and South Asia follow those proposed by Banareescu (1990, 1991).

The BPA analyses of the *Nilothauma* species gave seven trees, each with 103 steps, CI = 0.63, HI = 0.37, RI = 0.78, and RC = 0.62, the consensus tree is shown in Figure 5. According to this analysis, the genus has two main components, one in the Neotropical Region and a second in the remaining zoogeographical regions also including Western South America. This is in accordance with the results obtained by Adam and Sæther (1999) which showed the Neotropical Region as the sister-group of the remaining areas, and thus the probable place of origin.

In the cladogram obtained, Western South America falls outside the South American + Central American clade, being the sister group of all the remaining parts of the world combined. Following the tracks proposed by Sæther (2000), the genus shows an Inabrezian pattern (Northern Gondwanan connection), with components in the Neotropical, Afrotropical, Australian and Oriental regions. Secondary dispersals to adjacent areas seem to have taken place explaining the occurrence in the Holarctic Region.

In the present analysis Brazil has been subdivided into river basins following Banareescu (1990, 1991, 1995), who considered hydrographic basins as most important for the distribution of the aquatic fauna. Thus, São Paulo State is situated in the Plata River basin, Amazonas State in the Amazonian River basin, while Espírito Santo State (ES) must be regarded as a separate coastal basin and may be more related to the São Francisco River basin than to either the Plata or the Amazonian River basins; thus, in the present analysis the northeastern states of Brazil including Espírito Santo are grouped. The type locality of *N. matogrossense* **sp. n.** is located in the northern part of Mato Grosso State inside the Amazonian River basin.

When looking at the eastern South American + Central American clade in more detail, the Plata River basin appears to be the sister group of the Amazonian River basin; both combined to be the sister group of northern South America including the Orinoco River basin; and these combined the sister group of the northeastern states of Brazil including Espírito Santo. Central America forms the sister group of northern and eastern South America combined.

The BPA analyses used here are primary BPA and as the actual number of species could be highly underestimated, secondary BPA analysis will have to wait until the South American fauna is better known. Most of the species described below are known only in one or two specimens from the type locality, which might indicate a much higher number of rather local species.

### ***Nilothauma* Kieffer**

*Nilothauma* Kieffer, 1921a: 270.

*Nilothauma* Kieffer; Freeman (1957: 424), Sæther (1977: 164), Cranston *et al.* (1989: 394), Adam and Sæther (1999: 5).

*Neelamia* Sponis, 1987: 18. **Syn. n.**

*Neelamia* Sponis; Spies and Reiss (1996: 71).

*Kribioxenus* Goetghebuer, 1928: 18.

*Kribioxenus* Goetghebuer; Edwards (1929: 396), Townes (1945: 34), Niitsuma (1985: 229).

*Paranilothauma* Sponis, 1987: 11. **Syn. n.**

*Paranilothauma* Sponis; Spies and Reiss (1996: 71), Adam and Sæther (2000: 20).

*Toyayusurika* Sasa, Suzuki *et Sakai*, 1998: 52.

**Type species.** *Nilothauma pictipenne* Kieffer, 1921b: 37; by subsequent monotypy (Kieffer 1921b: 37).

**Included species.** *Palaeartic Region:* *N. brayi* (Goetghebuer, 1921: 173) as *Chironomus*, Europe, Japan. *N. hibaragartum* Sasa, 1993: 74, Japan. *N. hibaratertium* Sasa, 1993: 73, Japan; syn. *Tosayusurika simantoefea* Sasa, Suzuki *et Sakai*, 1998: 52 (Adam & Sæther 1999). *N. japonicum* Niitsuma, 1985: 230, Japan, [also Oriental Region]; syn. *Kribioxenus jintuprimum* Sasa, 1990: 32 (Adam & Sæther 1999). *N. nojirimaculatum* Sasa, 1991: 86, Japan, [also Oriental Region]. *N. sasai* Adam *et Sæther*, 1999: 61, Japan.

*Nearctic Region:* *N. babyi* (Rempel, 1937: 274) as *Chironomus*, Canada, USA. *N. bicorne* (Townes, 1945: 35) as *Kribioxenus*, Canada, USA. *N. mirabile* (Townes, 1945: 35) as *Kribioxenus*, USA. *N. verrucum* Adam *et Sæther*, 1999: 35, Canada.

*Afrotropical Region:* *N. anderseni* Adam *et Sæther*, 1999: 75, Tanzania. *N. ankasense* Adam *et Sæther*, 1999: 27, Ghana. *N. burmeisteri* Adam *et Sæther*, 1999: 38, Ghana, D. R. Congo. *N. duminola* Adam *et Sæther*, 1999: 27, Ghana. *N. flabellatum* Adam *et Sæther*, 1999: 90, Ghana. *N. fuscina* Adam *et Sæther*, 1999: 30, Ghana. *N. harrisoni* Adam *et Sæther*, 1999: 87, South Africa. *N. insolitum* Adam *et Sæther*, 1999: 73, Ghana. *N. kakumense* Adam *et Sæther*, 1999: 93, Ghana. *N. latocaudatum* Adam *et Sæther*, 1999: 75, Zimbabwe. *N. pictipenne* Kieffer, 1921b: 37, Sudan, Chad, Guinea, Ivory Coast, Nigeria, Senegal, Togo.

*Oriental Region:* *N. acre* Adam *et Sæther*, 1999: 69, China (Yan *et al.* 2005). *N. mergae* Adam *et Sæther*, 1999: 51, Thailand. *N. japonicum* Niitsuma, 1985: 230, China, Thailand (Adam & Sæther 1999; Wang 2000; Yan *et al.* 2005), [also Palaeartic Region]. *N. nojirimaculatum* Sasa, 1991: 86, China (Wang 2000; Yan *et al.* 2005), [also Palaeartic Region]. *N. quatuorlobum* Yan, Tang *et Wang*, 2005: 214, China.

*Australian Region:* *N. adunatum* Adam *et Sæther*, 1999: 53, Australia. *N. infissum* Adam *et Sæther*, 1999: 55, Australia.

*Neotropical Region*: *N. aleta* Roback, 1960: 101, Peru. *N. amazonense* **sp. n.**, Brazil. *N. aripuanense* **sp. n.**, Brazil. *N. calori* **sp. n.**, Brazil. *N. complicatum* **sp. n.**, Brazil. *N. duena* Roback, 1960: 101, Peru. *N. fazzariense* **sp. n.**, Brazil. *N. fittkaui* (Soponis, 1987: 19) as *Neelamia*, **comb. n.**, Brazil; syn. *Neelamia bergeri* Soponis, 1987: 21, **syn. n.** *N. involucrum* **sp. n.**, Brazil. *N. jaraguaense* **sp. n.**, Brazil. *N. longissimum* **sp. n.**, Brazil. *N. matogrossense* **sp. n.**, Brazil. *N. reissi* (Soponis, 1987: 13) as *Paranilothauma*, **comb. n.**, Brazil. *N. roquei* **sp. n.**, Brazil. *N. sooretamense* **sp. n.**, Brazil. *N. spiesi* **sp. n.**, Chile. *N. strebulosum* (Adam et Sæther, 2000: 21) as *Paranilothauma*, **comb. n.**, Costa Rica. *N. zitoi* **sp. n.**, Brazil.

**Remark.** The gender of the genus name *Nilothauma* is neuter because the final part of this compound word, the Ancient Greek noun 'thauma', is neuter in gender. Thus *Paranilothauma strebulosum* Adam et Sæther, 2000 has been changed accordingly (see ICZN 1999: Article 34.2).

**Diagnostic characters.** Most males can be separated from all other Chironomini by the presence of at least one dorsal lobe on tergite IX. Some Neotropical species lack dorsal lobe(s) on tergite IX, but can be recognized by the absence of anal point and a long digitiform inferior volsella. They differ from other Chironomini except some *Paratendipes* also by the combination of antenna with 13 flagellomeres, antennal ratio generally low (AR < 0.40, except in *N. longissimum* **sp. n.**), bare squama, VR generally high, anterior tibia with long spur, midtibia with one or occasionally two spurs, and hind tibia with two spurs.

The pupae can be separated from all other Chironomini on the shape of the thoracic horn consisting of 4–8 slender branches, segment IV with 1 taeniate lateral seta, segments V–VIII with 4 taeniate lateral setae, and anal lobe with 1 long, taeniate dorsal seta.

The larvae can be separated from all other Chironomini by the bean-shaped head in lateral view, antenna with 6 segments with basal segment shorter than flagellum, Lauterborn organs absent, and pale mental and mandibular teeth.

**Imagines.** Small species, with wing length 0.7–2.8 mm. Body pale or green to golden brown; legs pale or golden brown to brown; in some species forefemur with darker rings basally and apically; in one species (*N. longissimum* **sp. n.**) abdomen with dark oral bands.

**Head.** Eyes bare or occasionally hairy, with dorsomedial parallel-sided extension, almost in contact medially. Male antenna with 13 flagellomeres; with sparse, short plume; stout subapical seta present or absent; antennal ratio generally low (AR < 0.40), one species (*N. longissimum* **sp. n.**) with AR > 1.00. Female antenna with 6 flagellomeres. Frontal tubercles present or absent. Maxillary palp with 5 segments, third segment with 2–5 long sensilla clavata subapically. Temporal setae uniserial consisting of inner verticals, outer verticals, and postorbitals.

**Thorax.** Anteprenotal lobes reduced and dorsally narrowed, occasionally with weak dorsal notch on each side of median suture. Scutal tubercle absent, scutum not overreaching anteprenotum. Dorsocentrals uniserial, few to several, widely spaced; acrostichals present, biserial; prealars and scutellars few.

**Wing.** Wing membrane without macrotrichia, finely punctuated, sometimes with pattern of dark spots, anal lobe reduced to completely lacking. Costa not extended beyond tip of R<sub>4+5</sub>, ending before apex of wing and proximal to M<sub>1+2</sub>; R<sub>2+3</sub> ending midway between tips of R<sub>1</sub> and R<sub>4+5</sub>; Cu<sub>1</sub> curved; FCu far distal to RM resulting in very high venarium ratios. R, R<sub>1</sub>, and R<sub>4+5</sub> generally with setae, R<sub>1</sub> occasionally bare. Squama bare.

**Legs.** Apex of foretibia with narrow conical scale bearing long, curved spur at most only slightly offset from the scale. Apical combs of mid- and hind tibiae well separated, midtibia with one or occasionally two short spurs, hind tibia with two short spurs. Sensilla chaetica apparently absent, or mid ta<sub>1</sub> with few sensilla chaetica (1–4), occasionally also present on hind ta<sub>1</sub>, additional sensilla-like setae distributed along full length of hind tarsi. Pulvilli very short or absent.

**Abdomen.** Abdominal tergites with few setae, often with setae arranged in transverse rows. Segment VIII variably triangular, tapering orally.

**Hypopygium.** Tergite IX without or with medially separated anal tergite bands along anterior margin. Tergite IX without or with one to several dorsal projections. If more than one projection, anterior projection simple, medially divided or split in two separate lobes, generally covered with stout, occasionally apically

split setae; one species (*N. roquei* **sp. n.**) with long lateral projection with microtrichia and few weak apical setae. If present posterior projection simple or double (dorsoventrally), sometimes covered with setae. If dorsal projection(s) absent tergite IX without or generally with few strong dorsal setae; one species (*N. aripuanense* **sp. n.**) with tergite IX more densely covered with strong setae. Posterior margin of tergite IX generally with several short setae, when anal point present often in groups flanking base of anal point. Anal point present or absent; when present, usually broadly lanceolate and slightly to strongly bent ventrad; in some species nearly parallel-sided; often transparent; sometimes with microtrichia in basal half or apparently with median ridge with microtrichia. Laterosternite IX without or with few setae, occasionally with strong thorn.

Inferior volsella slender, digitiform, slightly to strongly curved; in one species (*N. complicatum* **sp. n.**) with subapical branch; with microtrichia at least apically; with apical, strong simple or apically split setae, often sitting on small tubercles. Superior volsella highly variable: generally broadly lobe-shaped to pediform; sometimes curved, digitiform or slender parallel-sided; occasionally diamond-shaped with ventral fold; occasionally with lateral spine; generally totally covered with microtrichia or with microtrichia in apical half, occasionally without microtrichia; generally with few strong to weak apical to subapical setae, occasionally with single strong apical setae or without setae, one species (*N. complicatum* **sp. n.**) with lateral row of flattened setae subapically. Median volsella moderately long to very short, sometimes apparently fused with superior volsella and recognizable only by few strong setae sitting mediobasally on superior volsella, occasionally absent; when present digitiform, tubercle-like or cleft; with or without microtrichia; generally with one to few strong apical setae, often sitting on small tubercles. Median volsella might be asymmetrical with left and right volsellae different in length, position and shape.

Transverse sternapodeme usually absent or when present without oral projections; when absent often with median oral elongation or apodeme thickened medially. Gonocoxite with few (2–7, generally < 5) inner ventral setae. Gonostylus narrow, apically distinctly swollen to tapered; generally with short apical seta sitting on small tubercle; distomedially with row of few thin simple or apically split setae.

*Female genitalia.* Gonocoxapodeme VIII straight, ending on gonapophysis VIII. Gonapophysis VIII apparently divided; ventrolateral lobe usually vestigial and hidden underneath dorsomesal lobe, occasionally better developed and brush-like. Dorsomesal lobe broad, and rounded or straight caudally. Apodeme lobe very weak, perhaps occasionally absent. Tergite IX normal. Gonocoxite IX bare or at most with a few setae. Coxosternapodeme nearly straight. Segment X without setae. Postgenital plate comparatively large, triangular. Cerci of moderate size. Seminal capsules comparatively small, oval with distinct cylindrical neck. Spermathecal ducts straight, conspicuously wide.

**Pupa.** Small to medium sized, 2.6–4.5 mm long. Exuviae pale to light brown with caudal spur brown.

*Cephalothorax.* Cephalic tubercles and frontal warts absent. Frontal setae short, not on tubercles. Frontal apotome smooth or slightly wrinkled anteriomedially. Thoracic horn of 4–8 slender filaments, one of them with few spines; basal ring oval. Prealar tubercle weakly developed. Scutum with few weak tubercles. Wing sheath smooth. Two precorneals, 2–3 anteprenotals and 4 dorsocentrals present.

*Abdomen.* Tergite I bare or with few minute spinules; tergites II–VI with transverse anterior band of somewhat stronger spinules, merging with median field of finer shagreen; anterior band of shagreen on tergite VI separated from posterior shagreen patch; tergite VII generally with anterior patch (absent in *N. aripuanense* **sp. n.**) and 1 posteromedian or 2 smaller posterolateral patches, anterior and posterior patches sometimes connected by band of fine shagreen; tergite VIII with two very small anterior patches (occasionally lacking) and variable large median, usually triangular patch of strong to less strong shagreen, sometimes with posterior shagreen patch separated from or connected with median patch; tergite IX bare. Sternites I–VII bare; sternite VIII with central, longitudinal field of shagreen. Tergite II with continuous row of caudal hooklets, occupying about 2/3 width of segment. Conjunctive III/IV with 4–7 rows of spinules; conjunctive IV/V with 1–7 rows of spinules. Pedes spurii A absent. Pedes spurii B weakly developed on segment II, occasionally absent. Segment VIII with anal comb consisting of one main spur and one to several accessory teeth or more anterior spines.

*Abdominal setation.* Segment I without L setae, occasionally with 1 weak L seta; segments II and III each with 3 hair-like L setae; segment IV with 2 anterior hair-like L setae and 1 posterior taeniate LS seta; segments V–VIII each with 4 taeniate LS seta. Tergites and sternites with 1 pair of O setae.

*Anal lobe.* Well developed with complete fringe of 19–47 long taeniae in single row; 1 long taeniate dorsal setae present.

**Larva.** Small, up to 7 mm long. Color red. With 2 pairs of contiguous eyes. Head rather long, bean-shaped in lateral view.

*Dorsal surface of head.* Frontal apotome and clypeus present, equally broad. Labral sclerites 1 and 2 not discernible.

*Antenna.* With 6 segments, basal segment at most as long as flagellum; antennal segment 2 long, segment 3 shorter than segments 2 and 4; segment 4 slightly shorter to slightly longer than segment 2; segment 5 about as long as segment 3; ultimate segment minute. Basal antennal segment with ring organ situated in distal 1/4; seta absent. Lauterborn organs absent. Style well developed. Blade unusually broad, arising from apex of basal segment, shorter than flagellum. Accessory blade short and slender.

*Labrum.* S I plumose distally; S II simple; S III slender and as long as S II; S IV comparatively large. Labral lamella consisting of 6 isolated toothlets. Pecten epipharyngis trifid, consisting of 3 basally fused toothlets. Seta premandibularis simple. Premandible with 3–4 teeth.

*Mandible.* All teeth pale; dorsal tooth not prominent, but a broad tooth is often present subapically on inner side; with very slender and long apical tooth, not in the same plane as 4 inner teeth; inner teeth occasionally with a common base and dorsal tooth absent. Seta subdentalis slender and long, weakly curved into S-shape distally. Seta interna and pecten mandibularis apparently absent.

*Mentum.* Pale, divided into 3 parts; median teeth set off from lateral parts and in contact with anteriorly produced median ends of ventromental plates; middle part usually consisting of 2 pale, small to minute inner teeth and usually slightly darker pair of outer median teeth. All 4 median teeth may be worn to different degree and may appear as a single median tooth; occasionally middle part consisting of 6 small median teeth; each lateral part of mentum with 6 pairs of slender, pointed, medially curved teeth which become progressively smaller laterad. Ventromental plates medially separated by about 1/2 width of mentum; about 1.5 times as wide as mentum; striae in basal 1/2 of ventromental plates. Setae submenti very long and strong, situated comparatively deep on submentum.

*Abdomen.* Lateral and ventral tubules absent. Anal tubules shorter than posterior parapods, with broad base and convexly tapering to blunt apex. Procercus with 7–12 long anal setae. Supraanal setae long, at least 2/3 as long as anal setae.

**Remarks.** The above diagnoses are based on Adam and Sæther (1999), Cranston *et al.* (1989), and Pinder and Reiss (1983, 1986), including the diagnoses for *Neelamia* and *Paranilothauma* (Adam & Sæther 2000; Sponis 1987). From the Neotropical Region pupae of only three named species are known in addition to two unassociated pupae. No larvae are described from the Neotropical Region. However, Trivinho-Strixino and Strixino (1995) recorded two different *Nilothauma*-type larvae from São Paulo State; according to S. Trivinho-Strixino (personal communication) these larvae do not have mentum with pale median teeth as described above. Some Brazilian larvae identified to *Omisus* Townes might also belong in *Nilothauma*.

### Key to the males of Neotropical *Nilothauma* Kieffer

1. Tergite IX without setose dorsal lobe(s) ..... 2
- Tergite IX with one or two setose dorsal lobes ..... 8
2. Anal point absent ..... 3
- Anal point present (Figs 9–12). Brazil ..... *Nilothauma aripuanense* **sp. n.**
3. Inferior volsella simple ..... 4
- Inferior volsella with subapical branch (Figs 20–23). Brazil. .... *Nilothauma complicatum* **sp. n.**
4. Superior volsella pediform or subquadrangular, without ventral transverse fold, with setae and microtrichia. .... 5

- Superior volsella diamond-shaped, with ventral transverse fold, with microtrichia only. .... 7
- 5. Superior volsella pediform; median and superior volsellae fused; AR < 0.40; abdomen without dark bands. .... 6
- Superior volsella subquadrangular; median volsella distinct; AR > 1.00; abdomen with oral dark bands (Figs 37–40). Brazil ..... *Nilothauma longissimum* **sp. n.**
- 6. Wing vein R<sub>1</sub> with setae; gonostylus nearly parallel-sided in apical 1/2 (Figs 27–29). Brazil, Ecuador. ....  
..... *Nilothauma fittkai* (Soptonis) comb. n.
- Wing vein R<sub>1</sub> bare; gonostylus widest in apical 1/3 (Figs 49–51). Brazil. .... *Nilothauma reissi* (Soptonis) comb. n.
- 7. Apex of superior volsella projecting caudad (Figs 55–57). Brazil. .... *Nilothauma sooretamense* **sp. n.**
- Apex of superior volsella projecting mesad (Figs 30–32). Brazil. .... *Nilothauma involucrum* **sp. n.**
- 8. Anal point lacking or rudimentary and completely covered by microtrichia. .... 9
- Anal point present, with microtrichia at most in basal 1/2. .... 12
- 9. Median volsella distinct and separated from superior volsella; superior volsella digitate, curved, with or without lateral spine. .... 10
- Median volsella fused with superior volsella; superior volsella broadly pediform (Figs 24–26). Brazil. ....  
..... *Nilothauma fazzariense* **sp. n.**
- 10. Dorsal lobes of tergite IX not extended beyond posterior margin of tergite ..... 11
- Dorsal lobes of tergite IX overreaching posterior margin of tergite (Figs 52–54). Brazil. ... *Nilothauma roquei* **sp. n.**
- 11. Superior volsella with lateral spine; laterosternite IX with thorn; inferior volsella with simple stout setae; posterior margin of tergite IX broadly rounded (Figs 17–19). Brazil. .... *Nilothauma calori* **sp. n.**
- Superior volsella without lateral spine; laterosternite IX without thorn; inferior volsella with some apically split setae; posterior margin of tergite IX subrectangular (Figs 61–63). Costa Rica. ....  
..... *Nilothauma strebulosum* (Adam et Sæther) comb. n.
- 12. Tergite IX with two setose dorsal lobes ..... 13
- Tergite IX with single median setose dorsal lobe (Figs 41–44). Brazil. .... *Nilothauma matogrossense* **sp. n.**
- 13. Anal point well developed, lanceolate or parallel-sided; gonostylus nearly parallel-sided in apical 1/2. .... 14
- Anal point short, digitiform, with microtrichia in basal 1/2; gonostylus distinctly widened in apical 1/3 (Figs 64–74). Brazil. .... *Nilothauma zitoi* **sp. n.**
- 14. Anal point lanceolate; laterosternite IX without thorn ..... 15
- Anal point parallel-sided; laterosternite IX with thorn (Figs 58–60). Chile. .... *Nilothauma spiesi* **sp. n.**
- 15. Inferior volsella and gonostylus with apically split setae; median volsella curved, tapering, with microtrichia and setae (Figs 33–36). Brazil ..... *Nilothauma jaraguense* **sp. n.**
- Inferior volsella and gonostylus with simple setae only; median volsella short, parallel-sided, with 2 apical setae, without microtrichia (Figs 6–8). Brazil. .... *Nilothauma amazonense* **sp. n.**

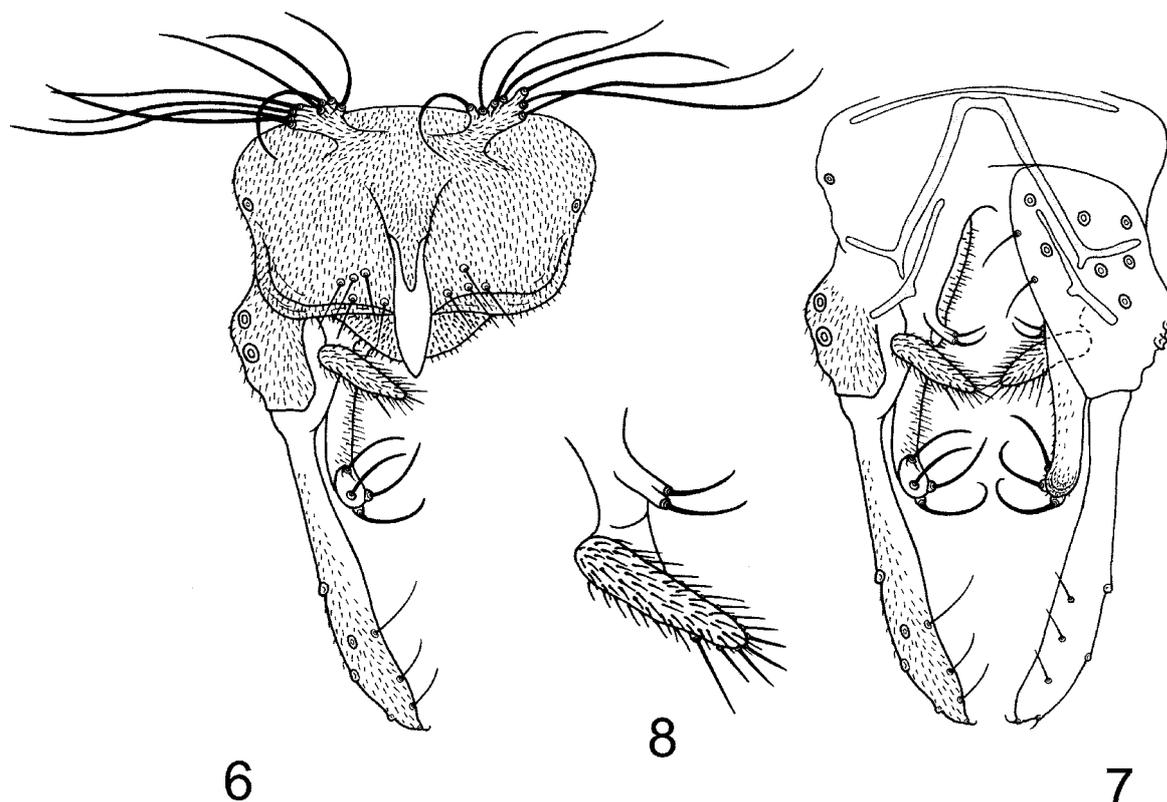
### Key to the pupae of Neotropical *Nilothauma* Kieffer

- 1. Thoracic horn with 5–6 branches; tergite VII with anterior and posterior shagreen patches or only posterior shagreen patch; tergite VIII with anterior and posterior shagreen patches. .... 2
- Thoracic horn with 8 branches; tergites VII–VIII with anterior shagreen patches only (Soptonis 1987: 15, Figs 6–11).  
..... *Nilothauma reissi* (Soptonis) comb. n.
- 2. Tergite VIII with anterior and posterior patches of shagreen connected ..... 3
- Tergite VIII with anterior patch of shagreen completely separated from posterior patch (Wiedenbrug 2000: 248, Fig. 96) ..... *Nilothauma*-complex spec. 1 Wiedenbrug
- 3. Tergite VIII with anterior and posterior patches of shagreen connected by narrow band of fine shagreen. .... 4
- Tergite VIII with anterior and posterior patches of shagreen completely fused (Figs 45–48). ....  
..... *Nilothauma matogrossense* **sp. n.**
- 4. Tergite VII with anterior and posterior patches of shagreen connected by narrow band of fine shagreen (Figs 75–79).  
..... *Nilothauma* sp. 1.
- Tergite VII with posterior patch of shagreen only (Figs 13–16). .... *Nilothauma aripuanense* **sp. n.**

### *Nilothauma amazonense* **sp. n.**

(Figs 6–8)

**Type material.** Holotype male, **BRAZIL:** Amazonas: Rio Negro - Rio Itu, 14.ii.1962, drift net, E. J. Fittkau (ZSM).



**FIGURES 6–8.** *Nilothauma amazonense* sp. n., male. **6**—dorsal aspect of hypopygium. **7**—hypopygium with tergite IX and anal point removed, dorsal view left, ventral view right. **8**—median and superior volsella, dorsal view.

**TABLE 1.** Lengths (in  $\mu\text{m}$ ) and proportions of legs of *Nilothauma amazonense* sp. n., male ( $n = 1$ ).

	fe	ti	ta <sub>1</sub>	ta <sub>2</sub>	ta <sub>3</sub>	ta <sub>4</sub>	ta <sub>5</sub>	LR	BV	SV	BR
P <sub>1</sub>	259	151	245	90	72	54	32	1.62	2.64	1.68	–
P <sub>2</sub>	270	191	90	32	25	18	14	0.47	6.12	5.12	–
P <sub>3</sub>	288	263	133	58	79	40	29	0.51	3.33	4.13	–

**Diagnostic characters.** The two dorsal, setose lobes on tergite IX combined with a lanceolate anal point, pediform superior volsella, well developed median volsella, inferior volsella and gonostylus with simple setae, and hind ta<sub>2</sub> shorter than hind ta<sub>3</sub> will separate the male of *N. amazonense* from all other *Nilothauma* species.

**Etymology.** Named after the Amazonas State.

**Male** ( $n = 1$ ). Total length 1.53 mm.

**Coloration.** Thorax, legs and antenna uniformly pale brown.

**Head.** AR 0.14. Thirteenth flagellomere 43  $\mu\text{m}$  long; stout subapical setae 40  $\mu\text{m}$  long. Temporal setae at least 2 in single row. Frontal tubercles apparently absent. Clypeus with at least 5 setae. Tentorium 79  $\mu\text{m}$  long, 11  $\mu\text{m}$  wide. Stipes not measurable. Palp segment lengths (in  $\mu\text{m}$ ): 11, 11, 59, 68, 77. Third palpomere with 3 sensilla clavata subapically, longest 9  $\mu\text{m}$  long. Fifth palpomere / third palpomere 1.31.

**Thorax.** Dorsocentrals and prealars not discernable, acrostichals 7. Scutellum with 2 setae.

**Wing.** Not measurable.

**Legs.** Spur of foretibia 25  $\mu\text{m}$  long including 11  $\mu\text{m}$  long scale. Midtibia with 1 spur, 20  $\mu\text{m}$  long; hind tibia with 2 spurs, 18  $\mu\text{m}$  and 25  $\mu\text{m}$  long. Combs of midtibia 14  $\mu\text{m}$  long, of hind tibia 12  $\mu\text{m}$  long. Width at apex of foretibia 20  $\mu\text{m}$ , of midtibia 20  $\mu\text{m}$ , of hind tibia 25  $\mu\text{m}$ . Lengths and proportions of legs as in Table 1.

**Abdomen.** Tergites with few setae. Segment VIII long, subrectangular, tapering anteriorly.

*Hypopygium* (Figs 6–7). Tergite IX with subrectangular posterior margin, with 4–5 strong setae on each side close to base of anal point, with pair of dorsal lobes anteriolaterally, each with 7–8 long setae. Anal point lanceolate, 20  $\mu\text{m}$  long, 9  $\mu\text{m}$  wide medially. Laterosternite IX with 1 seta. Phalopodeme 25  $\mu\text{m}$  long; transverse sternapodeme 9  $\mu\text{m}$  long, lacking oral projections. Gonocoxite 79  $\mu\text{m}$  long. Inferior volsella 43  $\mu\text{m}$  long, 7  $\mu\text{m}$  wide at base, 8  $\mu\text{m}$  wide at apex, nearly straight with rounded apex, with microtrichia and 4 strong, subapical to apical setae sitting on small tubercles, all setae simple and curved. Superior volsella (Fig. 8) pediform, 18  $\mu\text{m}$  long, 4  $\mu\text{m}$  wide at base, 3  $\mu\text{m}$  wide at apex, slightly inclined in relation to gonocoxite, covered with microtrichia. Median volsella (Fig. 8) 7  $\mu\text{m}$  long, without basal setae and microtrichia, with 2 apical setae sitting on small tubercles. Gonostylus 57  $\mu\text{m}$  long, slightly wider in apical 1/2, all setae hair-like. HR 1.40, HV 2.68.

**Female and immatures.** Unknown.

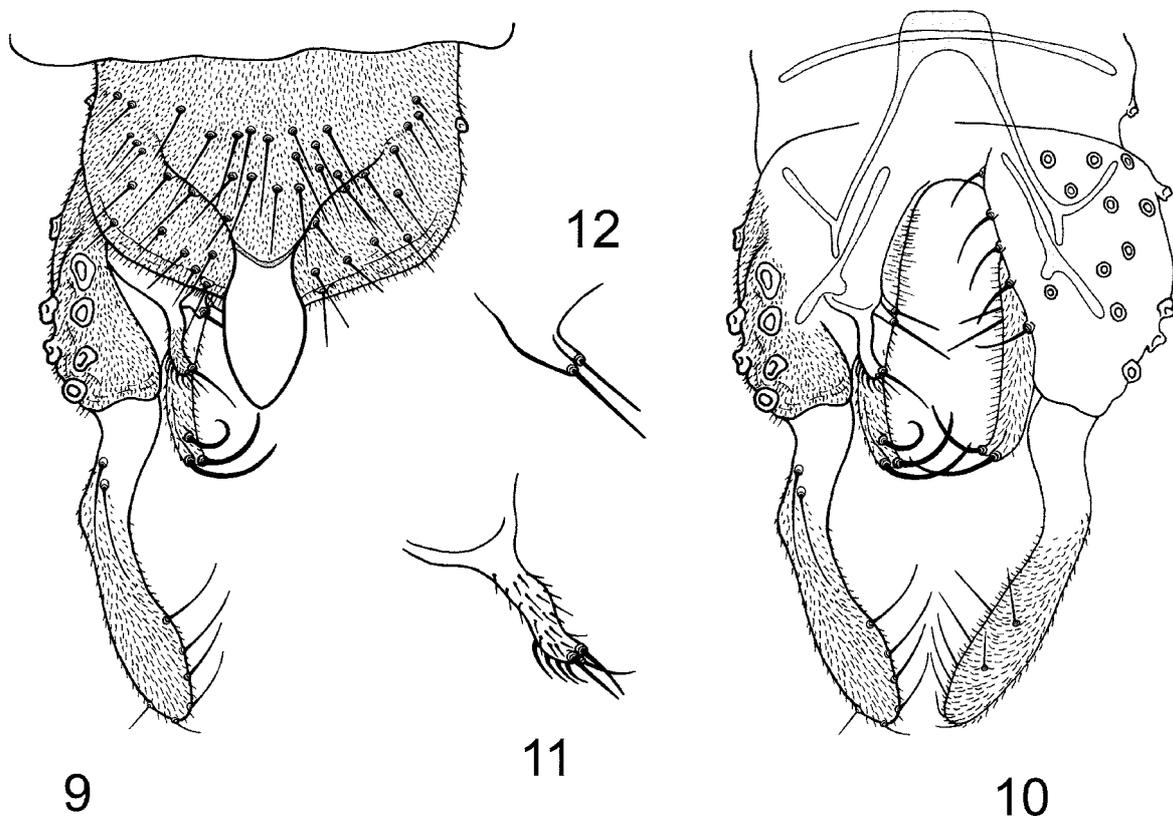
**Distribution.** Known only from the type locality in the Amazonas, Brazil.

*Nilothauma aripuanense* sp. n.

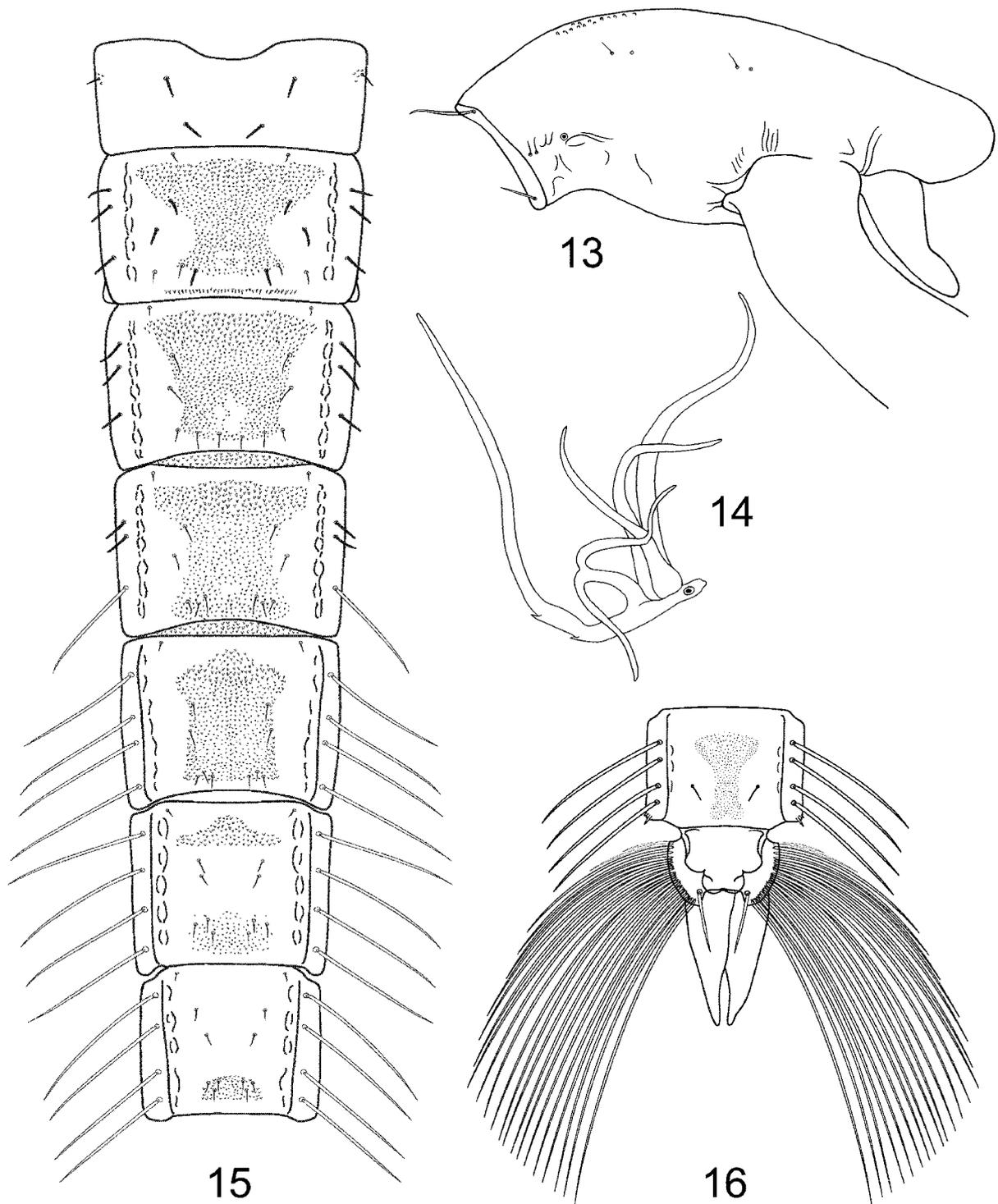
(Figs 9–16)

**Type material.** Holotype male with pupal exuviae (reared), **BRAZIL:** Amazonas: Rio Aripuanã, Igarapé das Pedras, 18.i.1962, E. J. Fittkau (ZSM). Paratype: 1 male, **BRAZIL:** Mato Grosso: Serra dos Parecis, Pensão Alemã, 10–11.x.1965, drift net, E. J. Fittkau (ZSM).

**Diagnostic characters.** The numerous, scattered, strong setae on tergite IX combined with the absence of dorsal lobe(s), a large lanceolate anal point, and a cylindrical microtrichiose superior volsella will separate the male of *N. aripuanense* from all other *Nilothauma* species. The pupa can be separated from other known Neotropical pupae by having a thoracic horn with 6 branches and only 1 posterior shagreen patch on tergite VII.



**FIGURES 9–12.** *Nilothauma aripuanense* sp. n., male. **9**—dorsal aspect of hypopygium. **10**—hypopygium with tergite IX and anal point removed, dorsal view left, ventral view right. **11**—superior volsella, dorsal view. **12**—median volsella, dorsal view.



**FIGURES 13–16.** *Nilothauma aripuanense* sp. n., pupa. **13**—thorax, lateral view. **14**—thoracic horn. **15**—tergites I–VII. **16**—tergite VIII and anal lobe.

**Etymology.** Named after Rio Aripuanã.

**Male** ( $n = 1, 2$  for hypopygium). Total length 2.76 mm. Wing length 1.30 mm. Total length / wing length 2.13. Wing length / length of profemur 2.35.

**Coloration.** Thorax and legs uniformly brown.

**Head.** Antennae lost. Temporal setae 4 in single row including 2 inner verticals and 2 outer verticals. Frontal tubercles well developed. Clypeus with 16 setae. Tentorium 77  $\mu\text{m}$  long, 18  $\mu\text{m}$  wide. Stipes 113  $\mu\text{m}$

long. Palp segment lengths (in  $\mu\text{m}$ ): 20, 27, 91, 132, 166. Third palpomere with 4 sensilla clavata subapically, longest 14  $\mu\text{m}$  long. Fifth palpomere / third palpomere 1.82.

*Thorax.* Dorsocentrals 7 in single row; acrostichals 16, biserial, starting close to anterior margin of scutum; prealars 2. Scutellum with 2 setae.

*Wing.* VR 1.36. Brachiolum with 1 seta, R with 13 setae,  $R_1$  with 8 setae,  $R_{4+5}$  with 14 setae, remaining veins bare.

*Legs.* Spur of foretibia 48  $\mu\text{m}$  long including 23  $\mu\text{m}$  long scale. Midtibia with 1 spur, 25  $\mu\text{m}$  long; hind tibia with 2 spurs, 29  $\mu\text{m}$  long and broken. Combs of midtibia 14  $\mu\text{m}$  long, of hind tibia 14  $\mu\text{m}$  long. Width at apex of foretibia 36  $\mu\text{m}$ , of midtibia 36  $\mu\text{m}$ , of hind tibia 36  $\mu\text{m}$ . Lengths and proportions of legs as in Table 2.

*Abdomen.* Tergites with few setae. Segment VIII long, widest medially, weakly tapered anteriorly, with rounded anterior margin.

*Hypopygium* (Figs 9–10). Tergite IX with broadly triangular posterior margin; without dorsal lobe(s), with 36–40 scattered strong setae, including those close to anal point. Anal point broadly lanceolate, 34–41  $\mu\text{m}$  long, 20–23  $\mu\text{m}$  wide medially. Laterosternite IX with 1 seta. Phalopodeme 52–55  $\mu\text{m}$  long; transverse sternapodeme indicated. Gonocoxite 84–95  $\mu\text{m}$  long. Inferior volsella 48–52  $\mu\text{m}$  long, 8  $\mu\text{m}$  wide at base, 7  $\mu\text{m}$  wide at apex, weakly curved with rounded apex, with microtrichia and 2–4 strong apical setae sitting on small tubercles, all setae simple and curved. Superior volsella (Fig. 11) weakly sinuous, 20–23  $\mu\text{m}$  long, 4–6  $\mu\text{m}$  wide at base, 4–6  $\mu\text{m}$  wide at apex, with microtrichia and 1–3 apical setae. Median volsella (Fig. 12) 9  $\mu\text{m}$  long, straight, tapering, without microtrichia and basal setae, with 2 apical setae sitting on small tubercles. Gonostylus 70–75  $\mu\text{m}$  long, widest in apical 1/3, all setae hair-like. HR 1.19–1.27, HV 3.68.

**Pupa** ( $n = 1$ ). Total length 2.72 mm. Exuviae light brown.

*Cephalothorax* (Fig. 13). Frontal apotome and frontal setae not discernable. Thoracic horn (Fig. 14) with 5 filaments, four of them single, the fifth split into two branches; main filament about 340  $\mu\text{m}$  long with 2 minute spines; basal ring oval, about 8  $\mu\text{m}$  in diameter. Scutum with field of few weak tubercles. Anteprenotals apparently 2, median about 93  $\mu\text{m}$  long, lateral 29  $\mu\text{m}$  long. Precorneals 2, subequal, about 40  $\mu\text{m}$  long. Dorsocentrals 4,  $Dc_1$  14  $\mu\text{m}$  long,  $Dc_2$  and  $Dc_4$  lost,  $Dc_3$  25  $\mu\text{m}$  long;  $Dc_1$  34  $\mu\text{m}$  in front of  $Dc_2$ ,  $Dc_2$  137  $\mu\text{m}$  in front of  $Dc_3$ ,  $Dc_3$  41  $\mu\text{m}$  in front of  $Dc_4$ .

*Abdomen* (Figs 15–16). Tergite I with few weak spinules anteriolaterally; tergites II–VI with transverse anterior band of somewhat stronger spinules, merging with median field of finer shagreen; anterior band of shagreen on tergite VI separated from posterior shagreen patch; tergite VII with single posterior shagreen patch; tergite VIII with median and posterior shagreen patches connected; tergite IX bare. Tergite II with 223  $\mu\text{m}$  long row of 55 hooks, each hook 4–9  $\mu\text{m}$  long. Conjunctives III/IV and IV/V with 4 and 6 rows of spinules, respectively. Pedes spurii B weakly developed on segment II. Anal comb 23  $\mu\text{m}$  long, consisting of 2 spurs.

*Abdominal setation.* Lateral setae on segments I–VIII as: 1, 3, 3, 3, 4, 4, 4, 4; posterior lateral seta on tergite IV and all lateral setae on tergites V–VIII taeniate, remaining setae hair-like. All tergites with 1 pair of O setae.

*Anal lobe.* With complete fringe of 22 taeniae on each side, longest about 550  $\mu\text{m}$  long. Male genital sac overreaches anal lobe by 245  $\mu\text{m}$ .

**Female and larva.** Unknown.

**Distribution.** Known from Amazonas and Mato Grosso, Brazil.

**TABLE 2.** Lengths (in  $\mu\text{m}$ ) and proportions of legs of *Nilothauma aripuanense* sp. n., male ( $n = 1$ ).

	fe	ti	ta <sub>1</sub>	ta <sub>2</sub>	ta <sub>3</sub>	ta <sub>4</sub>	ta <sub>5</sub>	LR	BV	SV	BR
p <sub>1</sub>	553	387	–	–	–	–	–	–	–	–	–
p <sub>2</sub>	507	359	221	101	83	46	37	0.61	4.07	3.92	–
p <sub>3</sub>	–	–	–	–	–	–	–	–	–	–	–

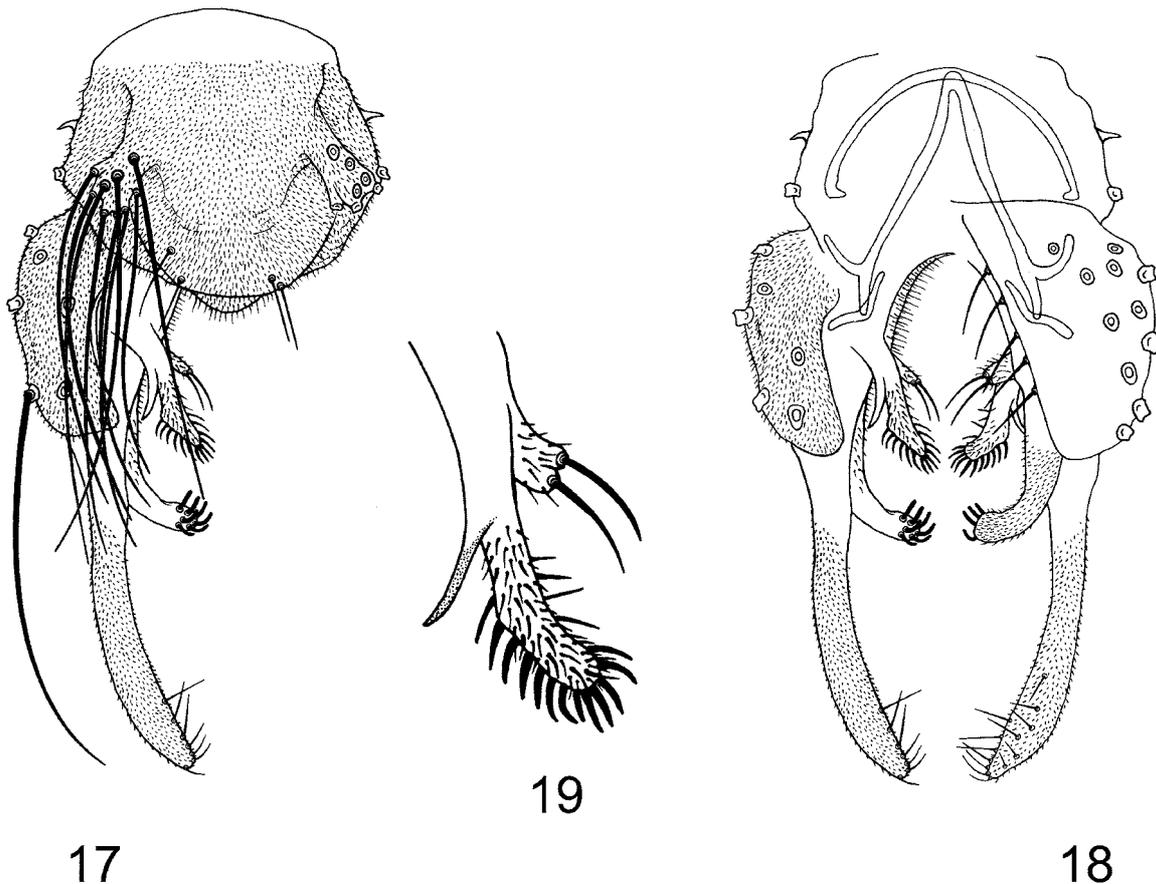
*Nilothauma calori* sp. n.

(Figs 17–19)

**Type material.** Holotype male, **BRAZIL:** Acre: Mâncio Lima, Parque Nacional do Divisor, igarapé Amor, 18.ii.2006, light trap, A. R. Calor (MZUSP). Paratype: 1 male, Acre: Mâncio Lima, Pé da Serra, Rio Moa, in front of IBAMA office, 17.ii.2006, light trap, A. R. Calor (ZMBN).

**Diagnostic characters.** The two dorsal, setose lobes on tergite IX and the presence of a lateral thorn on laterosternite IX combined with lack of anal point, inferior volsella with stout, simple setae, and superior volsella with lateral, strongly sclerotized, spine-like projection will separate the male of *N. calori* from all other *Nilothauma* species.

**Etymology.** Named after Dr. Adolfo R. Calor, who collected the specimens.



**FIGURES 17–19.** *Nilothauma calori* sp. n., male. **17**—dorsal aspect of hypopygium. **18**—hypopygium with tergite IX and anal point removed, dorsal view left, ventral view right. **19**—median and superior volsella, dorsal view.

**TABLE 3.** Lengths (in  $\mu\text{m}$ ) and proportions of legs of *Nilothauma calori* sp. n., male ( $n = 1\text{--}2$ ).

	fe	ti	ta <sub>1</sub>	ta <sub>2</sub>	ta <sub>3</sub>	ta <sub>4</sub>
P <sub>1</sub>	500–724	324–475	576	259	194	137
P <sub>2</sub>	508–641	328–407	184–266	72–115	47–54	25–47
P <sub>3</sub>	569–749	497–684	252	122	122	72
	ta <sub>5</sub>	LR	BV	SV	BR	
P <sub>1</sub>	61	1.78	2.15	1.43	3.1	
P <sub>2</sub>	22–27	0.56–0.65	4.87–5.89	3.92–4.55	3.5	
P <sub>3</sub>	43	0.51	3.66	4.23	4.5	

**Male** (n = 1–2). Total length 2.83–3.08 mm. Wing length 1.11–1.48 mm. Total length / wing length 2.08–2.54. Wing length / length of profemur 2.09–2.24.

**Coloration.** Thorax pale brown with darker scutum and postnotum; foretibia darker basally and apically, other segments and legs uniformly pale brown.

**Head.** AR 0.18–0.44. Thirteenth flagellomere 151–216  $\mu\text{m}$  long; stout subapical seta 40–54  $\mu\text{m}$  long. Temporal setae 4 in single row including 1 inner vertical and 3 postorbitals. Frontal tubercles present. Clypeus with about 12 setae. Tentorium 75  $\mu\text{m}$  long, 11  $\mu\text{m}$  wide. Stipes 93  $\mu\text{m}$  long. Palp segment lengths (in  $\mu\text{m}$ ): 23, 23–25, 54–61, 86–91, 100–109. Third palpomere with 2 sensilla clavata subapically, longest 16–20  $\mu\text{m}$  long. Fifth palpomere / third palpomere 1.79–1.85.

**Thorax.** Dorsocentrals 4–6 in single row, acrostichals 2–3, prealars 2–3. Scutellum with 2 setae.

**Wing.** VR 1.45–1.48. Brachiolum with 1 seta, R with 5–11 setae,  $R_{4+5}$  with 2 setae apically, remaining veins bare.

**Legs.** Spur of foretibia 57–64  $\mu\text{m}$  long including 27  $\mu\text{m}$  long scale. Midtibia with 1 spur, 30–32  $\mu\text{m}$  long; hind tibia with 2 spurs, 27  $\mu\text{m}$  and 32–43  $\mu\text{m}$  long. Combs of midtibia 14–19  $\mu\text{m}$  long, of hind tibia 16–20  $\mu\text{m}$  long. Width at apex of foretibia 32–40  $\mu\text{m}$ , of midtibia 36–41  $\mu\text{m}$ , of hind tibia 29–41  $\mu\text{m}$ . Lengths and proportions of legs as in Table 3.

**Abdomen.** Tergites with few setae. Segment VIII long, weakly triangularly, tapering anteriorly.

**Hypopygium** (Figs 17–18). Tergite IX with broadly rounded posterior margin; with 4–6 setae along posterior margin; with pair of dorsal, wart-like lobes submedially, each with 7–9 long setae. Anal point lacking. Laterosternite IX with 1 setae and lateral thorn. Phalopodeme 41–45  $\mu\text{m}$  long; transverse sternapodeme lacking. Gonocoxite 98–100  $\mu\text{m}$  long. Inferior volsella curved with rounded apex, 54–64  $\mu\text{m}$  long, 9  $\mu\text{m}$  wide subapically, with microtrichia and 6–9 short, stout setae subapically. Superior volsella (Fig. 19) 41–57  $\mu\text{m}$  long, 7  $\mu\text{m}$  wide at base, 6  $\mu\text{m}$  wide at apex, with microtrichia in apical 1/2, marginal microtrichia strong; with lateral strongly sclerotized, spine-like projection, 14  $\mu\text{m}$  long, 3  $\mu\text{m}$  wide at base. Median volsella (Fig. 19) parallel-sided, 8–14  $\mu\text{m}$  long, 4  $\mu\text{m}$  wide, with microtrichia and 2 strong apical setae. Gonostylus parallel-sided, weakly curved, 113–118  $\mu\text{m}$  long, all setae hair-like. HR 0.83–0.88, HV 2.49–2.61.

**Female and immatures.** Unknown.

**Distribution.** Known only from Acre, Brazil.

### ***Nilothauma complicatum* sp. n.**

(Figs 20–23)

**Type material.** Holotype male, **BRAZIL:** Espírito Santo: Linhares, Reserva Biológica Sooretama, 18°58'02.8"S, 40°07'53.6"W, 87 m a.s.l., 21–24.iii.2002, Malaise trap (Trilha 1), C. O. Azevedo *et al.* (BIOTA-FAPESP) (MZUSP).

**Diagnostic characters.** The absence of dorsal lobe(s) on tergite IX and anal point combined with inferior volsella having an additional subapical branch will separate the male of *N. complicatum* from all other *Nilothauma* species.

**Etymology.** From Latin, *complicatus*, meaning folded together referring to the shape of the superior volsella.

**Male** (n = 1). Total length 2.26 mm. Wing length 1.28 mm. Total length / wing length 1.76. Wing length / length of profemur 2.20.

**Coloration.** Thorax and antenna uniformly brown, apex of foretibia,  $ta_1$  and  $ta_2$  dark brown, other legs uniformly brown.

**Head.** AR 0.47. Thirteenth flagellomere 259  $\mu\text{m}$  long, stout subapical seta 36  $\mu\text{m}$  long. Temporal setae 5 in single row including 2 inner verticals, 2 outer verticals, and 1 postorbital. Frontal tubercles minute. Clypeus with 20 setae. Tentorium 91  $\mu\text{m}$  long, 14  $\mu\text{m}$  wide. Stipes 95  $\mu\text{m}$  long, 27  $\mu\text{m}$  wide. Palp segment lengths (in

$\mu\text{m}$ ): 16, 25, 73, 79, 116. Third palpomere with 2 sensilla clavata subapically, longest 14  $\mu\text{m}$  long. Fifth palpomere / third palpomere 1.59.

**TABLE 4.** Lengths (in  $\mu\text{m}$ ) and proportions of legs of *Nilothauma complicatum* sp. n., male (n = 1).

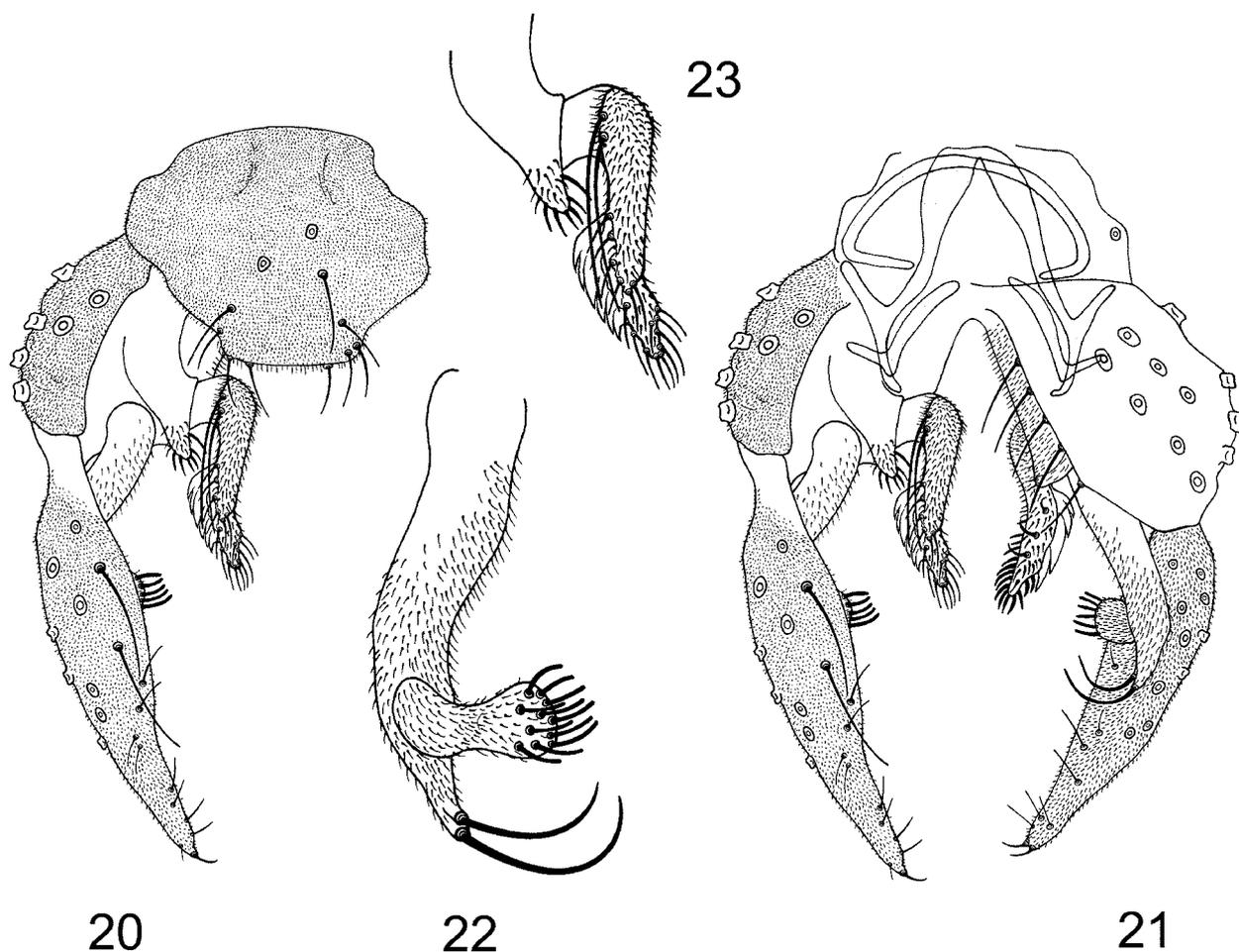
	fe	ti	ta <sub>1</sub>	ta <sub>2</sub>	ta <sub>3</sub>	ta <sub>4</sub>	ta <sub>5</sub>	LR	BV	SV	BR
p <sub>1</sub>	594	374	731	328	256	180	86	1.95	2.00	1.32	3.7
p <sub>2</sub>	569	367	234	88	54	27	18	0.64	6.25	4.00	4.1
p <sub>3</sub>	662	601	—	—	—	—	—	—	—	—	—

*Thorax.* Dorsocentrals 6 in single row, acrostichals 7, prealars 2. Scutellum with 2 setae.

*Wing.* VR 1.48. Brachiolum with 1 seta, R with 10 setae, R<sub>1</sub> with 9 setae, R<sub>4+5</sub> with 12 setae, remaining veins bare.

*Legs.* Spur of foretibia 70  $\mu\text{m}$  long including 32  $\mu\text{m}$  long scale. Midtibia with 1 spur, 34  $\mu\text{m}$  long; hind tibia with 2 spurs, 39  $\mu\text{m}$  and 27  $\mu\text{m}$  long. Combs of midtibia 14  $\mu\text{m}$  long, of hind tibia 18  $\mu\text{m}$  long. Width at apex of foretibia 43  $\mu\text{m}$ , of midtibia 40  $\mu\text{m}$ , and of hind tibia 48  $\mu\text{m}$ . Lengths and proportions of legs as in Table 4.

*Abdomen.* Tergites with few setae. Segment VIII long, weakly triangular, tapering anteriorly.



**FIGURES 20–23.** *Nilothauma complicatum* sp. n., male. **20**—dorsal aspect of hypopygium. **21**—hypopygium with tergite IX and anal point removed, dorsal view left, ventral view right. **22**—inferior volsella, dorsal view. **23**—superior volsella, dorsal view.

*Hypopygium* (Figs 20–21). Tergite IX with subrectangular posterior margin, with 11 setae. Anal point absent. Laterosternite IX with 1 seta. Phalopodeme 41  $\mu\text{m}$  long; transverse sternapodeme lacking. Gonocoxite 86  $\mu\text{m}$  long. Inferior volsella (Fig. 22) 75  $\mu\text{m}$  long, 14  $\mu\text{m}$  wide at base, 4  $\mu\text{m}$  wide at apex, slightly sinuous, tapering apically, with two strong, curved setae apically, longest 27  $\mu\text{m}$  long; with additional subapical branch, 18  $\mu\text{m}$  long, 7  $\mu\text{m}$  wide medially, 14  $\mu\text{m}$  wide subapically, bearing 12 stout setae apically. Superior volsella (Fig. 23), with triangular basal projection, with microtrichia; apical part 59  $\mu\text{m}$  long, 14  $\mu\text{m}$  wide at base, 7  $\mu\text{m}$  wide at apex, strongly curved in basal 1/4, apical 3/4 tapering, with microtrichia and weak setae, with marginal row of flattened setae, with 2 long hair-like setae in basal 1/3. Median volsella apparently fused with superior volsella. Gonostylus 125  $\mu\text{m}$  long, nearly straight, widest in basal 1/3, tapering towards apex; all setae hair-like. HR 0.69, HV 1.81.

**Female and immatures.** Unknown.

**Distribution.** Known only from the type locality in Esp rito Santo, Brazil.

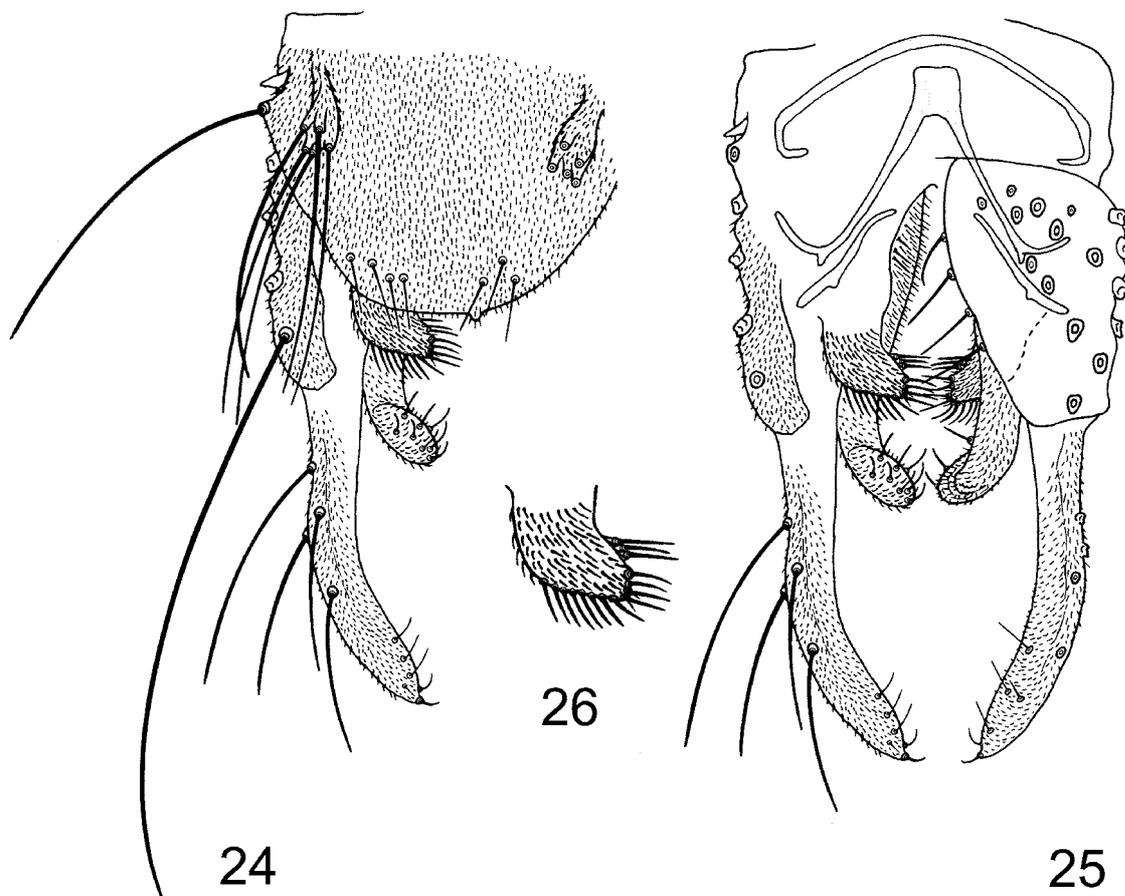
***Nilothauma fazzariense* sp. n.**

(Figs 24–26)

**Type material.** Holotype male, **BRAZIL:** S o Paulo: S o Carlos, C rrego do Fazzari, 21 57'07"S, 47 50'12"W, 17.iv–25.iv.2004, Malaise trap, F. O. Roque (MZUSP).

**Diagnostic characters.** The two dorsal, setose lobes on tergite IX and presence of a lateral thorn on laterosternite IX combined with a barely indicated anal point, pediform superior volsella apparently fused with median volsella, inferior volsella and gonostylus with simple setae, and hind  $\text{ta}_2$  and  $\text{ta}_3$  of about same length will separate the male of *N. fazzariense* from all other *Nilothauma* species.

**Etymology.** Named after C rrego do Fazzari.



**FIGURES 24–26.** *Nilothauma fazzariense* sp. n., male. 24—dorsal aspect of hypopygium. 25—hypopygium with tergite IX and anal point removed, dorsal view left, ventral view right. 26—median and superior volsella, dorsal view.

**Male** (n = 1). Total length 2.59 mm. Wing length 1.33 mm. Total length / wing length 1.95. Wing length / length of profemur 2.15.

*Coloration.* Thorax uniformly pale brown; legs and antenna yellowish brown.

*Head.* AR 0.21. Thirteenth flagellomere 148  $\mu\text{m}$  long; stout subapical setae 58  $\mu\text{m}$  long. Temporal setae 5 in single row including 1 inner vertical, 3 outer verticals, and 1 postorbital. Frontal tubercles well developed. Clypeus with 14 setae. Tentorium and stipes not measurable. Palp segment lengths (in  $\mu\text{m}$ ): 20, 68, 93, 93, 125. Third palpomere with 2 sensilla clavata subapically, longest 18  $\mu\text{m}$  long. Fifth palpomere / third palpomere 1.34.

**TABLE 5.** Lengths (in  $\mu\text{m}$ ) and proportions of legs of *Nilothauma fazzariense* sp. n., male (n = 1).

	fe	ti	ta <sub>1</sub>	ta <sub>2</sub>	ta <sub>3</sub>	ta <sub>4</sub>	ta <sub>5</sub>	LR	BV	SV	BR
P <sub>1</sub>	617	368	562	368	286	212	83	1.52	1.63	1.75	–
P <sub>2</sub>	599	562	322	157	147	92	64	0.57	3.22	3.60	–
P <sub>3</sub>	617	580	332	166	166	92	64	0.57	3.13	3.61	7.0

*Thorax.* Dorsocentrals 7 in single row, acrostichals 5, prealars 2. Scutellum with 2 setae.

*Wing.* VR 1.42. Brachiolum with 1 seta, R with 9 setae, R<sub>4+5</sub> with 2 setae apically, remaining veins bare.

*Legs.* Spur of foretibia 70  $\mu\text{m}$  long including 27  $\mu\text{m}$  long scale. Midtibia with 1 spur, 48  $\mu\text{m}$  long; hind tibia with 2 spurs, 29  $\mu\text{m}$  and 50  $\mu\text{m}$  long. Combs of midtibia 22  $\mu\text{m}$  long, of hind tibia 23  $\mu\text{m}$  long. Width at apex of foretibia 36  $\mu\text{m}$ , of midtibia 39  $\mu\text{m}$ , of hind tibia 40  $\mu\text{m}$ . Lengths and proportions of legs as in Table 5.

*Abdomen.* Tergites with few setae. Segment VIII long, weakly triangular, tapering anteriorly.

*Hypopygium* (Figs 24–25). Tergite IX with broadly rounded posterior margin; with 7 strong subapical setae; with pair of dorsal, anteriolateral lobes, each with 5 long setae. Anal point proper absent, but posterior margin of tergite IX with small hump-like structure. Laterosternite IX with 1 seta and lateral thorn. Phalopodeme 54  $\mu\text{m}$  long; transverse sternapodeme lacking. Gonocoxite 86  $\mu\text{m}$  long. Inferior volsella 50  $\mu\text{m}$  long, 10  $\mu\text{m}$  wide subapically, curved with broadly rounded apex, with microtrichia and 8 short, simple setae subapically to apically. Superior volsella (Fig. 26) pediform with broadly rounded apex, 25  $\mu\text{m}$  long, 14  $\mu\text{m}$  wide at base, 8  $\mu\text{m}$  wide subapically, densely covered with microtrichia. Median volsella completely fused with superior volsella, apparently consisting of 3 strong setae on small tubercles on inner margin of superior volsella. Gonostylus nearly parallel-sided, weakly curved, 81  $\mu\text{m}$  long, all setae hair-like. HR 1.05, HV 3.19.

**Female and immatures.** Unknown.

**Distribution.** Known only from the type locality in São Paulo, Brazil.

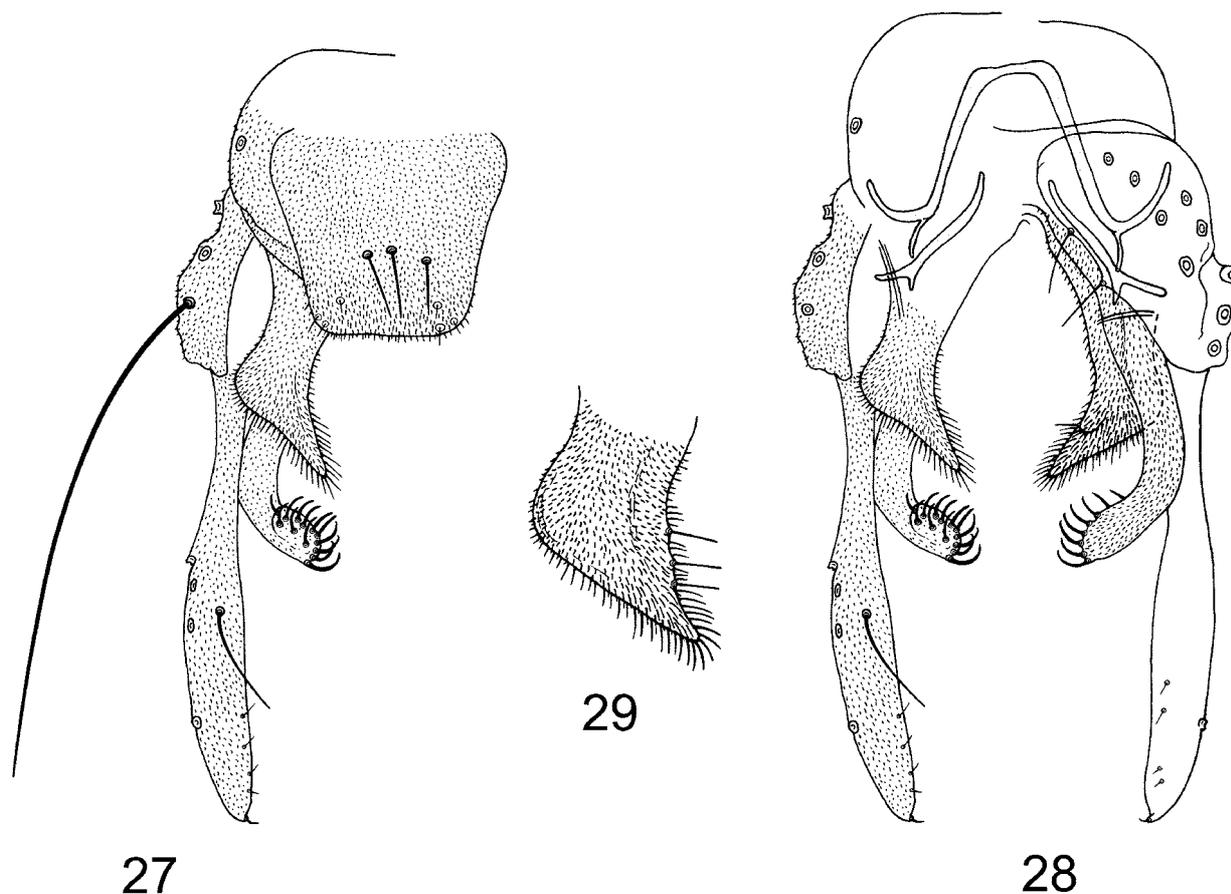
***Nilothauma fittkai* (Soponis) comb. n.**  
(Figs 27–29)

*Neelamia fittkai* Soponis, 1987: 19, Figs 12–16; Spies and Reiss (1996: 71).

*Neelamia bergeri* Soponis, 1987: 21, **syn. n.**

**Material examined. BRAZIL:** Amazonas: Rio Marauá, tributary of upper Rio Negro, near Mission Station San Antonio, 2 male paratypes of *Neelamia fittkai* Soponis, 10.i.1963, light trap, E. J. Fittkau (ZSM). **BRAZIL:** Pará: Paru de Oeste, igarapé Okueima (stream with slow current), male paratype of *Neelamia bergeri* Soponis, 18.iv.1962, light trap, E. J. Fittkau (A371–1, ZSM). **BRAZIL:** Espírito Santo: Linhares, Reserva Biológica Sooretama, 18°58'02.5"S, 40°08'11.1"W, 27 m a.s.l., 1 male, 24–27.iii.2002, Malaise trap (Trilha 6), C. O. Azevedo *et al.*; 1 male, as previous except for 18°58'03.0"S, 40°08'03.6"W, 49 m a.s.l., (Trilha 4). **BRAZIL:** Acre: Mâncio Lima, Parque Nacional do Divisor, igarapé Amor, 1male, 16.ii.2006, light trap, A. R. Calor; 1 male, as previous except for 18.iii.2006; 1 male, as previous except for igarapé da Cobra; 2 males as previous except for Rio Azul, 15.iii.2006; 1 male, as previous except for Pé da Serra, Rio Moa, in

front of IBAMA office, 17.iii.2006, A. R. Calor & D. M. Lima. **ECUADOR:** Orellana, Rio Tiputini, Estación Biológica Tiputini, 00°38.275'S, 76°08.948'W, 200 m a.s.l., 3 males, 12–24.ii.2000, light trap, F. M. Quesada.



**FIGURES 27–29.** *Nilothauma fittkai* (Soponis) comb. n., male. **27**—dorsal aspect of hypopygium. **28**—hypopygium with tergite IX and anal point removed, dorsal view left, ventral view right. **29**—superior volsella, dorsal view.

**Diagnostic characters.** The absence of dorsal lobe(s) on tergite IX and anal point combined with a pediform superior volsella and abdomen without dark bands will separate the male of *N. fittkai* from all other *Nilothauma* species.

**Male.** The male is described in detail by Soponis (1987). Hypopygium and superior volsella as in Figures 27–29.

**Female and immatures.** Unknown.

**Remarks.** The two *Neelamia* species, *N. fittkai* and *N. bergeri*, described by Soponis (1987) were mainly separated on the shape of the inferior volsella and the posterior margin of tergite IX, the latter was described as rounded in *N. fittkai* while rectangular in *N. bergeri*. Additional material shows that the shape of the inferior volsella is highly influenced by the positioning of the hypopygium on the slide during slide-mounting. The shape of the posterior margin of tergite IX also appears to vary gradually from subrectangular to rounded in the additional material. We therefore place *N. bergeri* as a junior synonym of *N. fittkai*.

**Distribution.** This species was described from the Amazonian region, Brazil; recent collections from Ecuador and southeastern Brazil indicate a wider range.

**TABLE 6.** Lengths (in  $\mu\text{m}$ ) and proportions of legs of *Nilothauma involucrum* sp. n., male (n = 1).

	fe	ti	ta <sub>1</sub>	ta <sub>2</sub>	ta <sub>3</sub>	ta <sub>4</sub>	ta <sub>5</sub>	LR	BV	SV	BR
P <sub>1</sub>	378	230	407	184	150	112	54	1.76	2.04	1.50	3.2
P <sub>2</sub>	389	248	137	58	40	20	18	0.55	5.73	4.66	3.8
P <sub>3</sub>	425	378	184	86	101	61	36	0.49	3.47	4.37	4.8

*Nilothauma involucrum* sp. n.

(Figs 30–32)

**Type material.** Holotype male, **BRAZIL:** Espírito Santo: Linhares, Reserva Biológica Sooretama, 18°58'03.0"S, 40°07'56.8"W, 33 m a.s.l., 21–24.iii.2002, Malaise trap (Bosque 2), C. O. Azevedo *et al.* (BIOTA-FAPESP) (MZUSP).

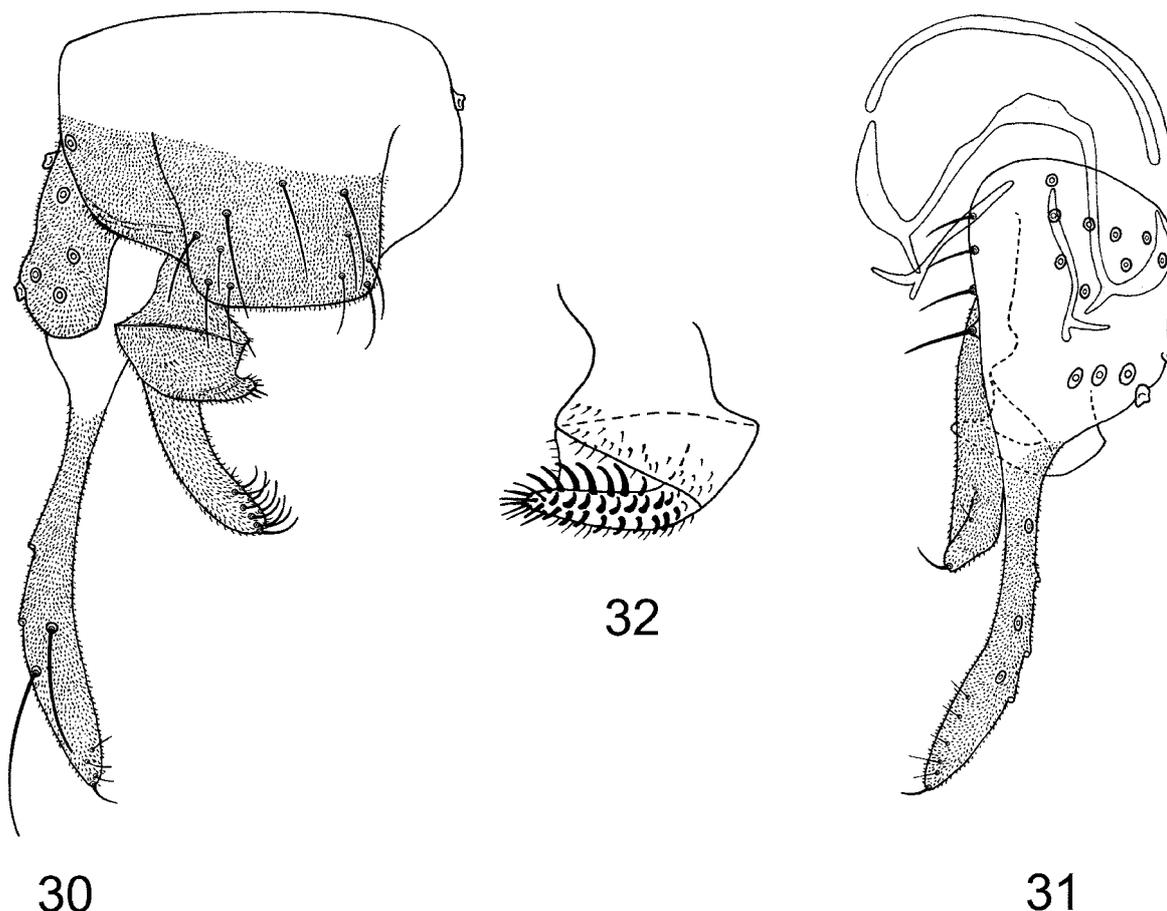
**Diagnostic characters.** The absence of dorsal lobe(s) on tergite IX and anal point combined with a superior volsella with ventral, median fold and curved posterior margin with strong microtrichia will separate the male of *N. involucrum* from all other *Nilothauma* species.

**Etymology.** From Latin, *involucrum*, meaning envelope, referring to the shape of the superior volsella.

**Male** (n = 1). Total length 1.53 mm.

**Coloration.** Thorax, legs and antenna uniformly pale brown.

**Head.** AR 0.21. Thirteenth flagellomere 83  $\mu\text{m}$  long; stout subapical seta 58  $\mu\text{m}$  long. Temporal setae 7 in single row including 2 inner verticals, 4 outer verticals, and 1 postorbital. Frontal tubercles present. Clypeus with 14 setae. Tentorium 54  $\mu\text{m}$  long, 7  $\mu\text{m}$  wide. Stipes 68  $\mu\text{m}$  long. Palp segment lengths (in  $\mu\text{m}$ ): 14, 18, 45, 70, 90. Third palpomere with 2 sensilla clavata subapically, longest 14  $\mu\text{m}$  long. Fifth palpomere / third palpomere 1.97.



**FIGURES 30–32.** *Nilothauma involucrum* sp. n., male. **30**—dorsal aspect of hypopygium. **31**—hypopygium, ventral view. **32**—superior volsella, ventral view.

*Thorax.* Anteprenotal lobe with weak dorsal notch. Dorsocentrals 5 in single row, acrostichals 8, prealars 2. Scutellum with 2 setae.

*Wing.* Lost.

*Legs.* Spur of foretibia 50 µm long including 25 µm long scale. Midtibia with 1 spur, 27 µm long; hind tibia with 2 spurs, 34 µm and 18 µm long. Combs of midtibia 14 µm long, of hind tibia 11 µm long. Width at apex of foretibia 28 µm, of midtibia 32 µm, of hind tibia 36 µm. Lengths and proportions of legs as in Table 6.

*Abdomen.* Tergites with few setae. Segment VIII long, weakly triangular, tapering anteriorly.

*Hypopygium* (Figs 30–31). Tergite IX with subrectangular posterior margin, with 11 setae. Anal point absent. Laterosternite IX with 1 seta. Phalopodeme 34 µm long; transverse sternapodeme 23 µm long. Gonocoxite 61 µm long. Inferior volsella 57 µm long, 11 µm wide at base, 8 µm wide at apex, curved with rounded apex, with microtrichia and about 10 setae subapically, all simple. Superior volsella (Fig. 32) 29 µm long, 28 µm wide medially, dorsally with median ridge, ventrally with median fold and curved posterior margin with strong microtrichia. Median volsella apparently fused with superior volsella. Gonostylus 100 µm long, weakly curved, widest in apical 1/2, all setae hair-like. HR 0.61, HV 1.53.

**Female and immatures.** Unknown.

**Distribution.** Known only from the type locality in Espírito Santo State, Brazil.

### *Nilothauma jaraguaense* sp. n.

(Figs 33–36)

**Type material.** Holotype male, **BRAZIL:** São Paulo: Parque Estadual do Jaraguá, 23°27'59"S, 46°45'58"W, 16.xii.2000, F. O. Roque (MZUSP).

**Diagnostic characters.** The two dorsal, setose lobes on tergite IX combined with a broadly lanceolate anal point, inferior volsella and gonostylus with apically split setae, and gonostylus nearly parallel-sided will separate the male of *N. jaraguaense* from all other *Nilothauma* species.

**Etymology.** Named after Parque Estadual do Jaraguá.

**Male** (n = 1). Total length 2.38 mm. Wing length 1.83 mm. Total length / wing length 2.17. Wing length / length of profemur 2.12.

*Coloration.* Pale with vittae and posterior part of postnotum pale brown; legs and antenna pale yellow.

*Head.* AR 0.18. Thirteenth flagellomere 91 µm long. Temporal setae 7 in single row including 3 inner verticals, 1 outer vertical, and 2 postorbitals. Frontal tubercles minute. Clypeus with 15 setae. Tentorium and stipes not measurable. Palp segment lengths (in µm): 16, 20, 41, 57, 82. Third palpomere with 2 sensilla clavata subapically, longest 9 µm long. Fifth palpomere / third palpomere 1.44.

*Thorax.* Dorsocentrals 8 in single row, acrostichals 4, prealars 2. Scutellum with 2 setae.

*Wing.* VR 1.38. Brachiolum with 1 seta, R with 9 setae, R<sub>1</sub> with 6 setae, R<sub>4+5</sub> with 13 setae, remaining veins bare.

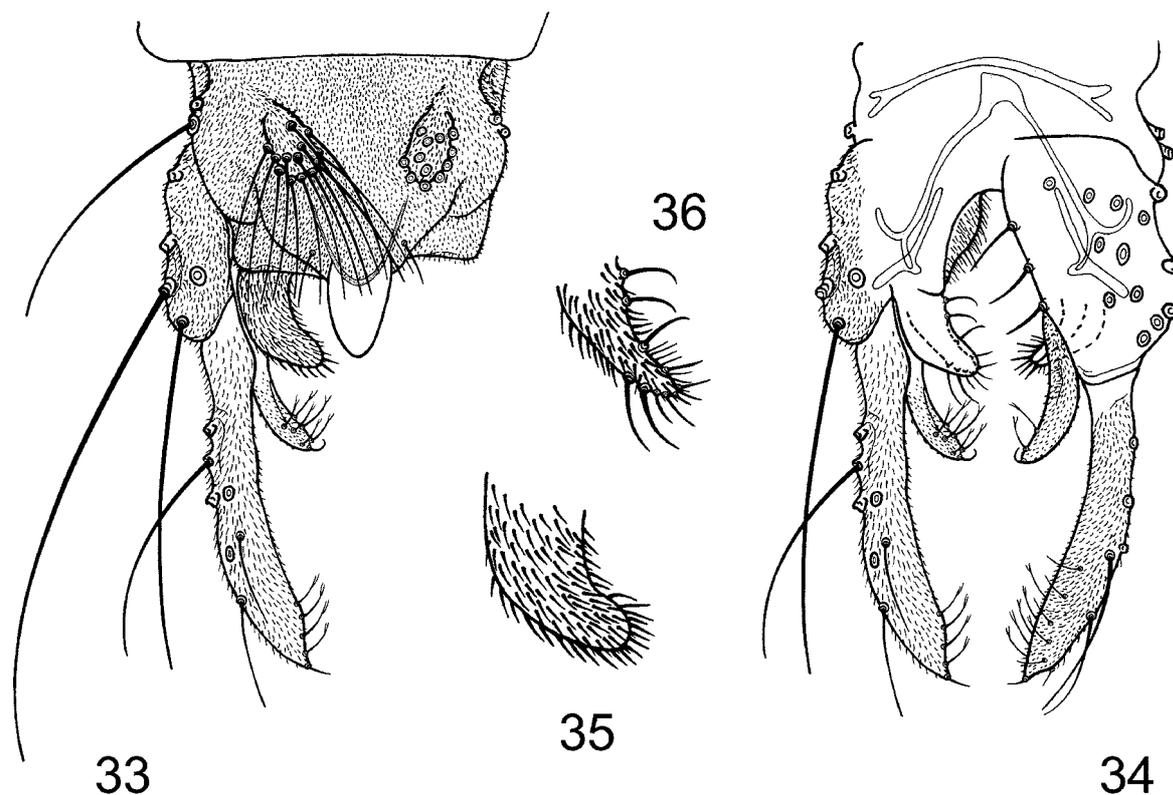
*Legs.* Spur of foretibia 50 µm long including 16 µm long scale. Midtibia with 1 spur, 25 µm long; hind tibia with 2 spurs, 23 µm and 34 µm long. Combs of midtibia 14 µm long, of hind tibia 14 µm long. Width at apex of foretibia 35 µm, of midtibia 35 µm, of hind tibia 35 µm. Lengths and proportions of legs as in Table 7.

*Abdomen.* Tergites with few setae. Segment VIII long, subrectangular, tapering anteriorly.

*Hypopygium* (Figs 33–34). Tergite IX with subrectangular posterior margin, with 1 submarginal setae to each side of base of anal point; with pair of dorsal lobes submedially, each with about 12 strong setae. Anal point broadly lanceolate, 20 µm long, 16 µm wide. Laterosternite IX with 2 setae. Phalopodeme 45 µm long; transverse sternapodeme lacking. Gonocoxite 68 µm long. Inferior volsella 52 µm long, 7 µm wide subapically, curved with rounded apex, with microtrichia and 7 setae of which all but 1 are split apically. Superior volsella (Fig. 35) 32 µm long, 11 µm wide medially, curved with broadly rounded apex, with microtrichia. Median volsella (Fig. 36) 32 µm long, curved, tapering, with microtrichia and 2 basal and 7 apical to subapical strong setae. Gonostylus 91 µm long, nearly parallel-sided, with 4 apically split setae along inner margin subapically. HR 0.75, HV 2.61.

**Female and immatures.** Unknown.

**Distribution.** Known only from the type locality in São Paulo, Brazil.



**FIGURES 33–36.** *Nilothauma jaraguaense* sp. n., male. **33**—dorsal aspect of hypopygium. **34**—hypopygium with tergite IX and anal point removed, dorsal view left, ventral view right. **35**—superior volsella, dorsal view. **36**—median volsella, dorsal view.

**TABLE 7.** Lengths (in  $\mu\text{m}$ ) and proportions of legs of *Nilothauma jaraguaense* sp. n., male ( $n = 1$ ).

	fe	ti	ta <sub>1</sub>	ta <sub>2</sub>	ta <sub>3</sub>	ta <sub>4</sub>	ta <sub>5</sub>	LR	BV	SV	BR
P <sub>1</sub>	516	332	497	221	203	147	74	1.50	2.08	1.70	2.6
P <sub>2</sub>	433	322	175	120	64	46	37	0.54	3.48	4.32	4.3
P <sub>3</sub>	525	461	267	138	120	83	46	0.58	3.24	3.69	4.1

***Nilothauma longissimum* sp. n.**

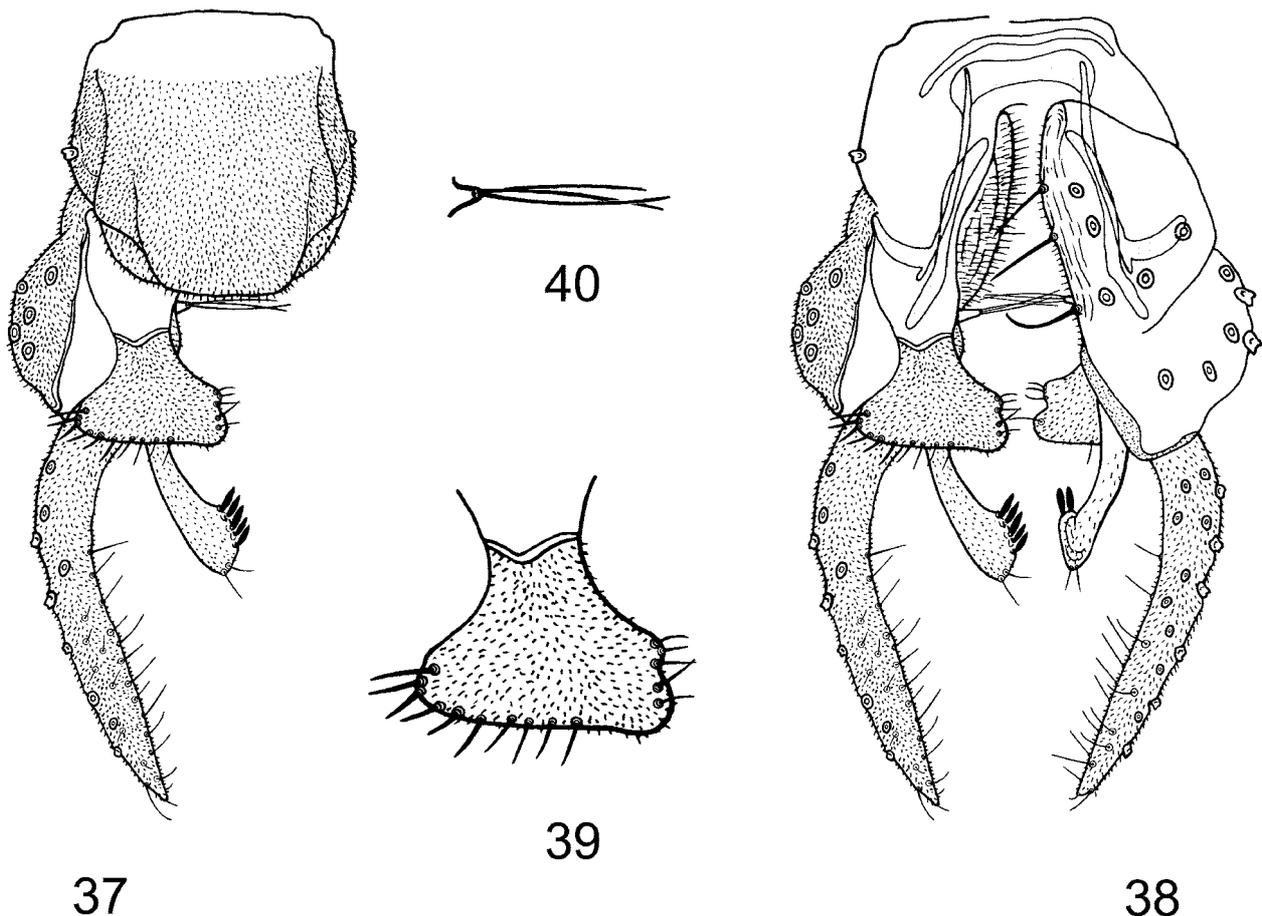
(Figs 37–40)

**Type material.** Holotype male, **BRAZIL:** São Paulo: Ubatuba, Parque Estadual Serra do Mar, Núcleo Picinguaba, afluyente Rio Fazenda, 10.ix.2006, at light, M. Spies & A. E. Siegloch (MZUSP). Paratypes: 1 male, as holotype; 1 male, as holotype except for afluyente Rio Cambori, 09.ix.2006 (MZUSP, ZMBN).

**Diagnostic characters.** The absence of dorsal lobe(s) on tergite IX and anal point combined with the high antennal ratio ( $AR > 1.00$ ) and the subrectangular superior volsella will separate the male of *N. longissimum* from all other *Nilothauma* species.

**Etymology.** From Latin, *longissimus*, meaning longest, as this is the only species of the genus with an AR higher than 1.00.

**Male** ( $n = 2-3$ , except when otherwise stated). Total length 2.04–2.67 mm. Wing length 1.21–1.34 mm. Total length / wing length 1.69–1.99. Wing length / length of profemur 1.87–1.90.



**FIGURES 37–40.** *Nilothauma longissimum* sp. n., male. **37**—dorsal aspect of hypopygium. **38**—hypopygium with tergite IX and anal point removed, dorsal view left, ventral view right. **39**—superior volsella, dorsal view. **40**—median volsella, dorsal view.

**TABLE 8.** Lengths (in  $\mu\text{m}$ ) and proportions of legs of *Nilothauma longissimum* sp. n., male (n = 2–3).

	fe	ti	ta <sub>1</sub>	ta <sub>2</sub>	ta <sub>3</sub>	ta <sub>4</sub>
P <sub>1</sub>	635–718	387–589	746–801	332–363	225–258	147–166
P <sub>2</sub>	654–728	470–516	280–451	129–184	83–111	46–74
P <sub>3</sub>	737–792	553–599	479	203	147–157	74–83
	ta <sub>5</sub>	LR	BV	SV	BR	
P <sub>1</sub>	50–64	1.26–1.93	2.31–2.49	1.37–1.69	3.6–3.9	
P <sub>2</sub>	28–37	0.60–0.87	4.18–4.62	2.75–4.00	4.3–5.7	
P <sub>3</sub>	28–37	0.80–0.87	3.69–4.14	2.69–2.90	5.3–6.0	

**Coloration.** Thorax, legs and antenna uniformly pale brown, abdominal segments with dark oral bands.

**Head.** AR 1.07–1.12. Thirteenth flagellomere 410–436  $\mu\text{m}$  long, stout subapical seta lost in all specimens. Temporal setae 8–10 in single row including 3–6 inner verticals, 2–3 outer verticals and 2 postorbitals. Frontal tubercles absent. Clypeus with 11–14 setae. Tentorium 102–109  $\mu\text{m}$  long, 15–17  $\mu\text{m}$  wide. Stipes 98–107  $\mu\text{m}$  long. Palp segment lengths (in  $\mu\text{m}$ ): 20–23, 32–34, 82–86, 95, 141 (1). Third palpomere with 4–5 sensilla clavata subapically, longest 13–16  $\mu\text{m}$  long. Fifth palpomere / third palpomere 1.72 (1).

**Thorax.** Dorsocentrals 8–12 in single row; acrostichals 7–9, biserial; prealars 2. Scutellum with 4–6 setae.

**Wing.** VR 1.25–1.34. Brachiolum with 2 setae, R with 5–8 setae, R<sub>4+5</sub> with 1–3 setae apically, remaining veins bare.

**Legs.** Spur of foretibia 48–57  $\mu\text{m}$  long including 15–20  $\mu\text{m}$  long scale. Midtibia with 1 spur, 54–59  $\mu\text{m}$  long; hind tibia with 2 spurs, 57–66  $\mu\text{m}$  and 23 (1)  $\mu\text{m}$  long. Combs of midtibia 14  $\mu\text{m}$  long, of hind tibia

14–17 µm long. Width at apex of foretibia 42–54 µm, of midtibia 54–59 µm, of hind tibia 45–50 µm. Lengths and proportions of legs as in Table 8.

*Abdomen.* Tergites with few setae. Segment VIII long, weakly triangular, tapering anteriorly.

*Hypopygium* (Figs 37–38). Tergite IX with subrectangular posterior margin, without setae. Anal point absent. Laterosternite IX with 1 seta. Phalopodeme 54–66 µm long; transverse sternapodeme without oral projections, 19–29 µm long. Gonocoxite 102–107 µm long. Inferior volsella 52–75 µm long, 9 µm wide at base, 10–18 µm wide subapically; curved with broadly rounded apex; with microtrichia; with row of 5–8 stout, almost lanceolate setae subapically and 2–3 simple weak setae apically. Superior volsella (Fig. 39) subrectangular, 27–48 µm long, 38–48 µm wide, with 15 µm wide base which appears flexible in dorsoventral direction, covered with microtrichia, with 14–18 marginal setae. Median volsella (Fig. 40) tubercle-like, 4–8 µm long, with 2–3 long, simple setae. Gonostylus 102–118 µm long, curved, tapering from base, all setae hair-like. HR 0.90–1.00, HV 2.00–2.26.

**Female and immatures.** Unknown.

**Distribution.** Known only from the type locality in São Paulo, Brazil.

### *Nilothauma matogrossense* sp. n.

(Figs 41–48)

**Type material.** Holotype male with pupal exuviae, **BRAZIL:** Mato Grosso: Serra dos Parecis, Pensão Alemã, 10–11.x.1965, drift net, E. J. Fittkau (ZSM).

**Diagnostic characters.** The single, dorsal lobe on tergite IX with strong, simple setae combined with a narrow, parallel-sided anal point and a long, narrow L-shaped superior volsella with single apical seta will separate the male of *N. matogrossense* from all other *Nilothauma* species. The pupa can be separated from other known Neotropical pupae by having a thoracic horn with 5 branches and the anterior and posterior shagreen patches on tergite VIII completely fused.

**Etymology.** Named after Mato Grosso State.

**Male** (n = 1–2). Total length 2.68 mm. Wing length 1.29 mm. Total length / wing length 2.08. Wing length / length of profemur 2.50.

*Coloration.* Thorax coloration not discernible; legs and antenna yellowish brown.

*Head.* AR 0.32–0.42. Thirteenth flagellomere 184–216 µm long. Temporal setae 3 in single row. Frontal tubercles apparently absent. Clypeus with 8–9 setae. Tentorium 95 µm long, 16 µm wide. Stipes not measurable. Palp segment lengths (in µm): 11–23, 18–25, 54–70, 95–100, 91–125. Third palpomere with 2 sensilla clavata subapically, longest 11–12 µm long. Fifth palpomere / third palpomere 1.67–1.77.

*Thorax.* Uncleared, setae not discernible.

*Wing.* VR 1.43. Brachiolum with 1 seta, R with 8 setae, R<sub>1</sub> with 4 setae, R<sub>4+5</sub> with 2 setae apically, remaining veins bare.

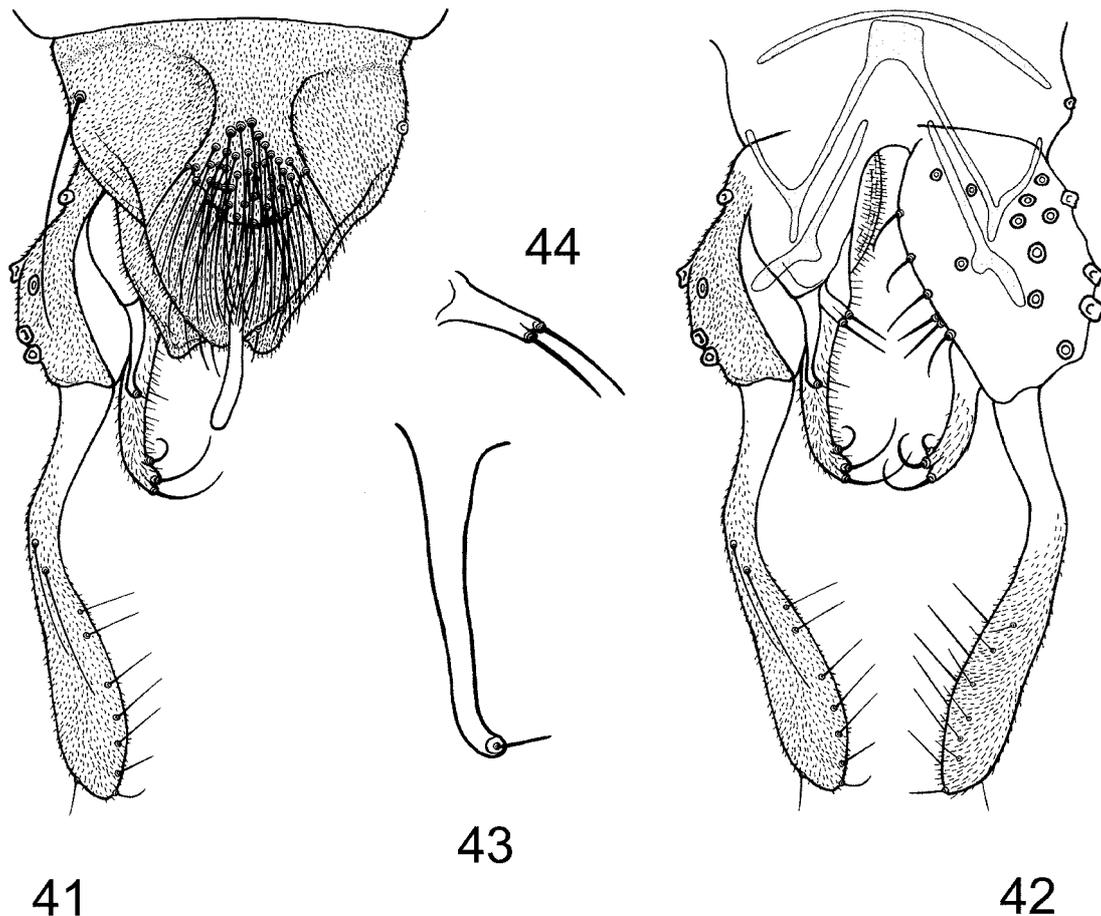
*Legs.* Spur of foretibia 37 µm long including 16 µm long scale. Midtibia with 1 spur, 27 µm long; hind tibia with 2 spurs, 36 µm and 16 µm long. Combs of midtibia 16 µm long, of hind tibia 20 µm long. Width at apex of foretibia 34 µm, of midtibia 36 µm, of hind tibia 36 µm. Lengths and proportions of legs as in Table 9.

*Abdomen.* Tergites with few setae. Segment VIII long, subtriangular, widest medially, weakly tapering anteriorly.

**TABLE 9.** Lengths (in µm) and proportions of legs of *Nilothauma matogrossense* sp. n., male (n = 1).

	fe	ti	ta <sub>1</sub>	ta <sub>2</sub>	ta <sub>3</sub>	ta <sub>4</sub>	ta <sub>5</sub>	LR	BV	SV	BR
P <sub>1</sub>	516	414	–	–	–	–	–	–	–	–	–
P <sub>2</sub>	507	378	245	101	83	59	37	0.64	4.02	3.62	4.5
P <sub>3</sub>	589	608	–	–	–	–	–	–	–	–	–

*Hypopygium* (Figs 41–42). Tergite IX with broadly triangular posterior margin, with 4 weak marginal setae to each side of base of anal point; with single, median dorsal lobe, with about 45 strong setae. Anal point parallel-sided, 41–45  $\mu\text{m}$  long, 7–9  $\mu\text{m}$  wide at base, 7  $\mu\text{m}$  wide at apex. Laterosternite IX with 1 seta. Phalopodeme 52  $\mu\text{m}$  long; transverse sternapodeme indicated. Gonocoxite 73–77  $\mu\text{m}$  long. Inferior volsella 57  $\mu\text{m}$  long, 8  $\mu\text{m}$  wide at base, 7  $\mu\text{m}$  wide at apex, weakly curved with rounded apex, with microtrichia and 3–4 strong apical setae sitting on small tubercles, all setae simple and curved. Superior volsella (Fig. 43) L-shaped, 27–36  $\mu\text{m}$  long, 4–6  $\mu\text{m}$  wide at base, 3–4  $\mu\text{m}$  wide at apex, without microtrichia, with single apical seta. Median volsella (Fig. 44) straight, tapering, 12–14  $\mu\text{m}$  long, without microtrichia and basal setae, with 2 apical setae sitting on small tubercles. Gonostylus 125–134  $\mu\text{m}$  long, widest in apical 1/3, all setae hair-like. HR 0.58, HV 2.14.



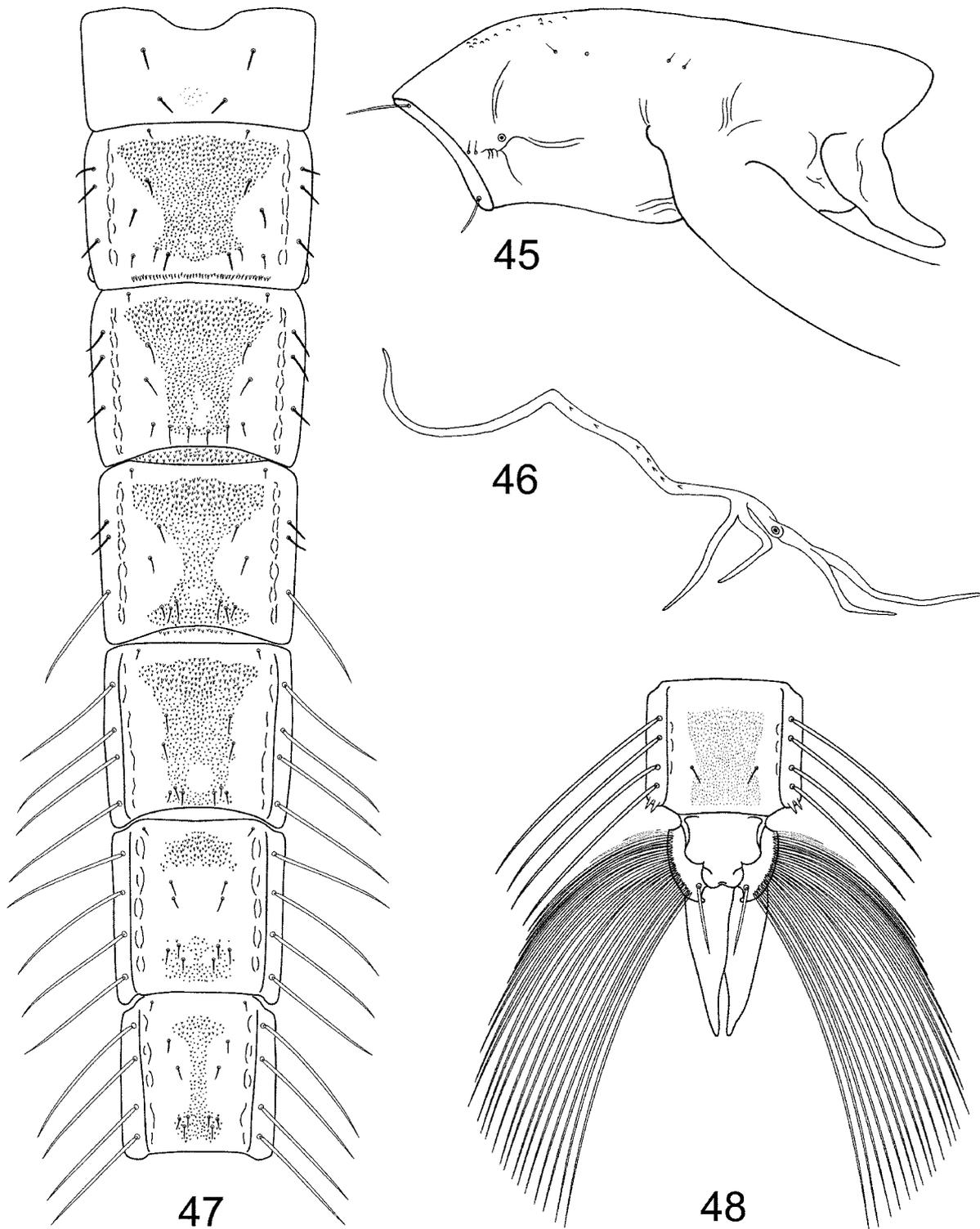
**FIGURES 41–44.** *Nilothauma matogrossense* sp. n., male. **41**—dorsal aspect of hypopygium. **42**—hypopygium with tergite IX and anal point removed, dorsal view left, ventral view right. **43**—superior volsella, dorsal view. **44**—median volsella, dorsal view.

**Pupa** (n = 1). Total length 3.03 mm. Exuviae light brown.

*Cephalothorax* (Fig. 45). Frontal apotome smooth, frontal setae 58  $\mu\text{m}$  long. Thoracic horn (Fig. 46) with 5 filaments; main filament 514  $\mu\text{m}$  long with several minute spines; basal ring oval, 7  $\mu\text{m}$  of diameter. Scutum with field of few weak tubercles. Anteprenotals apparently 2, median about 166  $\mu\text{m}$  long, lateral not measurable. Precorneals 2, subequal, about 20  $\mu\text{m}$  long. Dorsocentrals 4, Dc<sub>1</sub> 11  $\mu\text{m}$  long, Dc<sub>2</sub> lost, Dc<sub>3</sub> 16  $\mu\text{m}$  long, Dc<sub>4</sub> 7  $\mu\text{m}$  long; Dc<sub>1</sub> 43  $\mu\text{m}$  in front of Dc<sub>2</sub>, Dc<sub>2</sub> 113  $\mu\text{m}$  in front of Dc<sub>3</sub>, Dc<sub>3</sub> 27  $\mu\text{m}$  in front of Dc<sub>4</sub>.

*Abdomen* (Figs 47–48). Tergite I with few weak spinules posteriomediaally; tergites II–VI with transverse anterior band of somewhat stronger spinules, merging with median field of finer shagreen; anterior band of shagreen on tergite VI separated from posterior shagreen patch; tergite VII with anterior and posterior

shagreen patches connected by narrow band of fine shagreen; tergite VIII with median and posterior shagreen patches broadly connected; tergite IX bare. Tergite II with 188  $\mu\text{m}$  long row of 44 hooks, each hook 6–9  $\mu\text{m}$  long. Conjunctive III/IV with 4 rows of spinules; conjunctive IV/V with 1 row of weak spinules. Pedes spurii B weakly developed on segment II. Anal comb 25  $\mu\text{m}$  long, consisting of 2–3 spurs.



**FIGURES 45–48.** *Nilothauma matogrossense* sp. n., pupa. 45—thorax, lateral view. 46—thoracic horn. 47—tergites I–VII. 48—tergite VIII and anal lobe.

**Abdominal setation.** Lateral setae on segments I–VIII as: 0, 3, 3, 3, 4, 4, 4, 4; posterior lateral seta on tergite IV and all lateral setae on tergites V–VIII taeniate, remaining setae hair-like. All tergites with 1 pair of O setae.

**Anal lobe.** With complete fringe of 24 taeniae on each side, longest about 450 µm long. Male genital sac overreaches anal lobe by 210 µm.

**Female and larva.** Unknown.

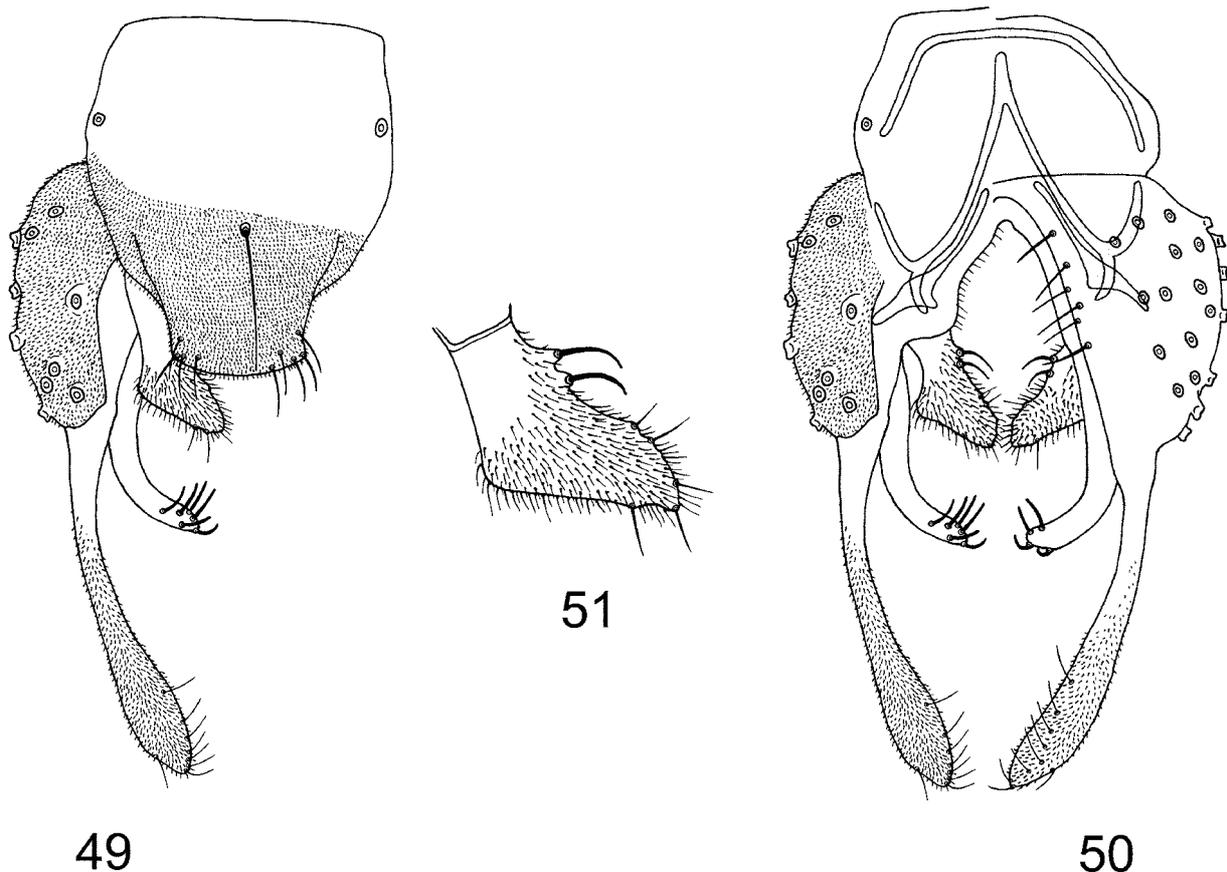
**Distribution.** Known only from the type locality in Mato Grosso, Brazil.

***Nilothauma reissi* (Soptonis) comb. n.**

(Figs 49–51)

*Paranilothauma reissi* Soptonis, 1987: 13, Figs 1–11; Spies and Reiss (1996: 71).

**Material examined. BRAZIL:** Amazonas: Rio Itu, tributary of middle Rio Negro, male paratype with pupal exuviae, 13.ii.1962, E. J. Fittkau, reared (A 348–1, ZSM); Amazonas: Lago do Calado, near Manpuru, Rio Solimões, 1 male with pupal exuviae, 12.ii.1972, F. Reiss, reared Series XIII (ZSM). **BRAZIL:** Minas Gerais: Santa Rita de Cássia, 20°51'S, 46°58'W, 2 males, 18.vi.2000, light trap, H. F. Mendes. **BRAZIL:** São Paulo: Luis Antônio, Estação Ecológica do Jataí, 21°33'–21°37'S, 47°45'–47°51'W, 1 male, 2003, M. Peláez-Rodríguez; 1 male, as previous except 17.x.2001, S. Trivinho-Strixino (ZMBN, UFSCar, MZUSP).



**FIGURES 49–51.** *Nilothauma reissi* (Soptonis) comb. n., male. **49**—dorsal aspect of hypopygium. **50**—hypopygium with tergite IX and anal point removed, dorsal view left, ventral view right. **51**—superior volsella, dorsal view.

**Diagnostic characters.** The absence of dorsal lobe(s) on tergite IX and anal point combined with a pediform superior volsella, median volsella apparently represented by two strong, curved setae on short

tubercles basally on superior volsella, and  $R_1$  without setae separate the male of *N. reissi* from all other *Nilothauma* species. The pupa can be separated from other known Neotropical pupae by having a thoracic horn with 8 branches and tergites VII–VIII with anterior shagreen patches only.

**Male and pupa.** The male and pupa are described in detail by Soponis (1987). Hypopygium and superior volsella as in Figures 49–51.

**Female and larva.** Unknown.

**Distribution.** The species was originally described from the Amazonian region; the range is now extended to include São Paulo and Minas Gerais States in southeastern Brazil.

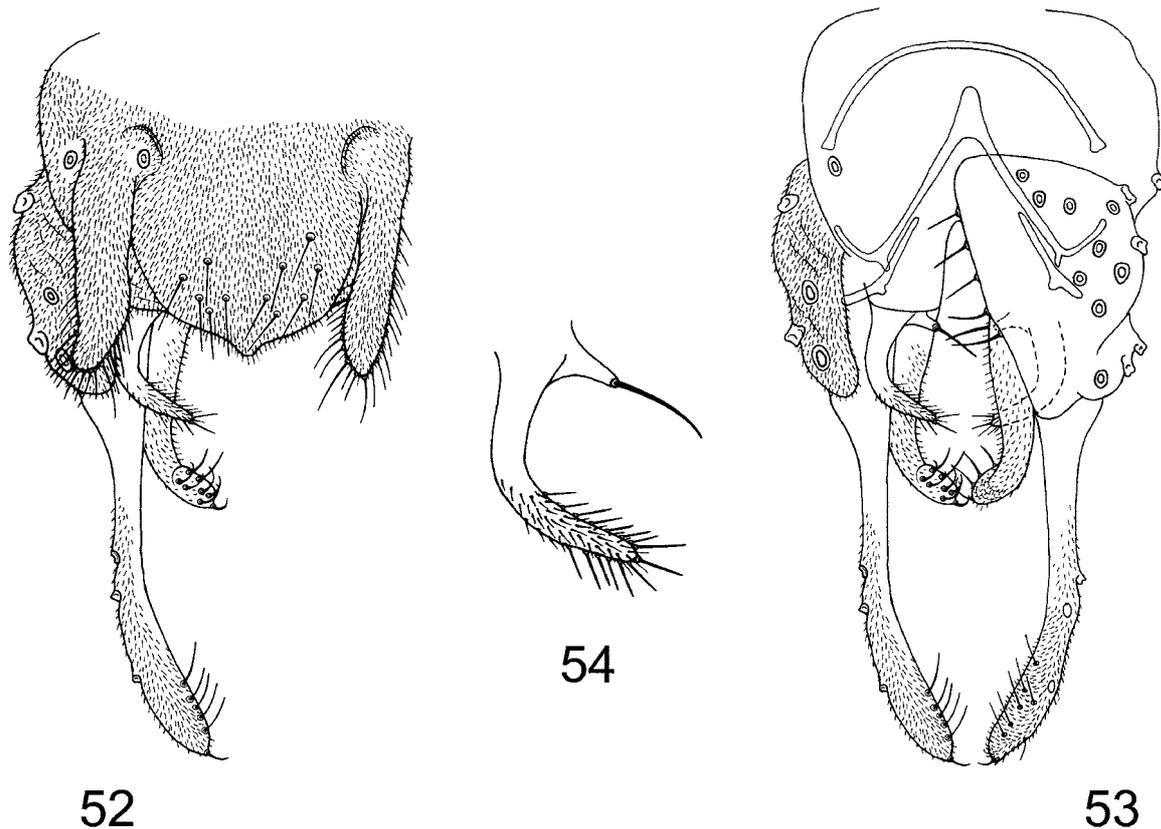
***Nilothauma roquei* sp. n.**

(Figs 52–54)

**Type material.** Holotype male, **BRAZIL:** São Paulo: Cananéia, 24°53'03"S, 47°51'22"W, ii.2003, Malaise trap, F. O. Roque (MZUSP).

**Diagnostic characters.** The two long, lateral projections of tergite IX overreaching the posterior margin of the tergite and lacking strong setae combined with a rudimentary anal point, curved superior volsella, median volsella with single apical setae, inferior volsella and gonostylus with simple setae, and hind  $ta_2$  shorter than hind  $ta_3$  will separate the male of *N. roquei* from all other *Nilothauma* species.

**Etymology.** Named after Dr. Fabio O. Roque, who collected the specimen.



**FIGURES 52–54.** *Nilothauma roquei* sp. n., male. **52**—dorsal aspect of hypopygium. **53**—hypopygium with tergite IX and anal point removed, dorsal view left, ventral view right. **54**—median and superior volsella, dorsal view.

**Male** ( $n = 1$ ). Total length 2.49 mm.

**Coloration.** Pale with brown scutum and scutellum; legs pale with distal part of femora and proximal parts of tibiae slightly darker.

**Head.** AR 0.18. Thirteenth flagellomere 115  $\mu\text{m}$  long; stout subapical seta lost. Temporal setae at least 3 including 2 outer verticals and 1 postorbital. Clypeus with 12 setae. Tentorium and stipes not measurable. Palp segment lengths (in  $\mu\text{m}$ ): 14, 23, 50, 82, 122. Third palpomere with 2 sensilla clavata subapically, longest 14  $\mu\text{m}$  long. Fifth palpomere / third palpomere 2.45.

**Thorax.** Dorsocentrals 6 in single row, acrostichals 8, prealars 2. Scutellum with 2 setae.

**Wing.** Not measurable.

**Legs.** Spur of foretibia 57  $\mu\text{m}$  long including 29  $\mu\text{m}$  long scale. Midtibia with 1 spur, 32  $\mu\text{m}$  long; hind tibia with 2 spurs, 27  $\mu\text{m}$  and 36  $\mu\text{m}$  long. Combs of midtibia 18  $\mu\text{m}$  long, of hind tibia 18  $\mu\text{m}$  long. Width at apex of foretibia 34  $\mu\text{m}$ , of midtibia 41  $\mu\text{m}$ , of hind tibia 39  $\mu\text{m}$ . Lengths and proportions of legs as in Table 10.

**Abdomen.** Tergites with few setae. Segment VIII long, triangular, strongly tapering anteriorly.

**Hypopygium** (Figs 52–53). Tergite IX with broadly rounded posterior margin; with 11 strong subapical setae; with pair of lateral lobe-like projections sitting high on tergite and extending posterior overreaching posterior margin of tergite, with few weak setae apically, left lobe with strong basal setae. Anal point lacking, but posterior margin of tergite IX with small hump-like structure. Laterosternite IX with 1 seta. Phalopodeme 50  $\mu\text{m}$  long; transverse sternapodeme lacking. Gonocoxite 86  $\mu\text{m}$  long. Inferior volsella 57  $\mu\text{m}$  long, 9  $\mu\text{m}$  wide at base, 9  $\mu\text{m}$  wide at apex, curved in apical 1/3, with rounded apex, with microtrichia and 8 simple setae subapically to apically. Superior volsella (Fig. 54) curved, 36  $\mu\text{m}$  long, 9  $\mu\text{m}$  wide at base, 3  $\mu\text{m}$  wide at apex, with microtrichia. Median volsella (Fig. 54) 9  $\mu\text{m}$  long, tapering, without microtrichia and basal setae, with 1 strong apical setae. Gonostylus 95  $\mu\text{m}$  long, weakly curved, slightly wider in apical 1/2, all setae hair-like. HR 0.90, HV 2.62.

**Female and immatures.** Unknown.

**Distribution.** Known only from the type locality in São Paulo, Brazil.

**TABLE 10.** Lengths (in  $\mu\text{m}$ ) and proportions of legs of *Nilothauma roquei* sp. n., male (n = 1).

	fe	ti	ta <sub>1</sub>	ta <sub>2</sub>	ta <sub>3</sub>	ta <sub>4</sub>	ta <sub>5</sub>	LR	BV	SV	BR
P <sub>1</sub>	507	332	–	–	–	–	–	–	–	–	–
P <sub>2</sub>	461	295	166	74	64	37	28	0.56	4.54	4.55	5.1
P <sub>3</sub>	534	571	267	129	120	83	55	0.47	3.55	4.14	6.5

### *Nilothauma sooretamense* sp. n.

(Figs 55–57)

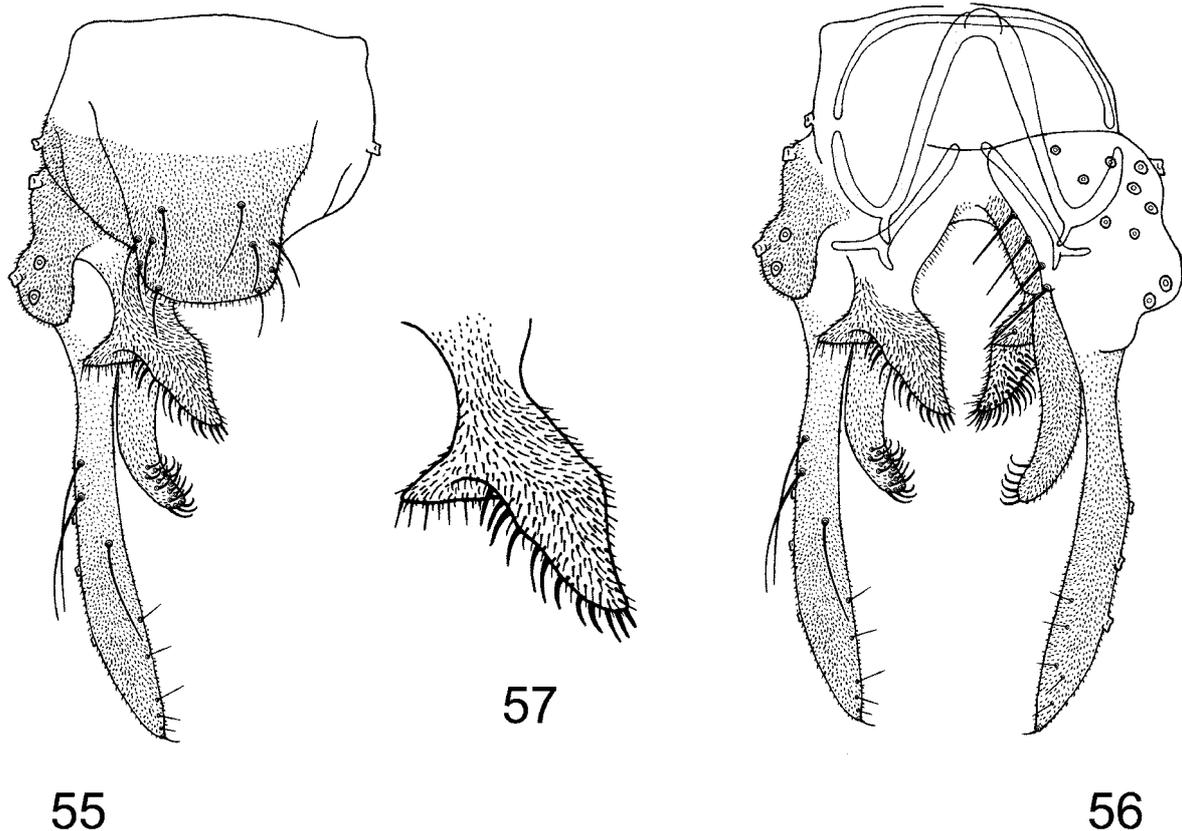
**Type material.** Holotype male, **BRAZIL:** Espírito Santo: Linhares, Reserva Biológica Sooretama, 18°58'02.8"S, 40°07'53.6"W, 87 m a.s.l., 21–24.iii.2002, Malaise trap (Trilha 1), C. O. Azevedo *et al.* (BIOTA-FAPESP). Paratypes: 1 male, as holotype; 2 males, as holotype except for 18°58'03.1"S, 40°08'00.0"W, 22 m a.s.l., (Bosque 3); 1 male, as holotype except for 18°58'03.0"S, 40°08'03.6"W, 49 m a.s.l.; 1 male, as holotype except for 24–27.iii.2002, (Trilha 5) (MZUSP, ZMBN, ZSM).

**Diagnostic characters.** The absence of dorsal lobe(s) on tergite IX and anal point combined with a superior volsella with ventral ridge, median volsella apparently fused with superior volsella, and hind ta<sub>2</sub> shorter than hind ta<sub>3</sub> will separate the male of *N. sooretamense* from all other *Nilothauma* species.

**Etymology.** Named after Reserva Biológica Sooretama.

**Male** (n = 5–6, except when otherwise stated). Total length 1.60–2.14, 1.91 mm. Wing length 0.838–1.033, 0.936 mm. Total length / wing length 1.91–2.30, 2.02. Wing length / length of profemur 2.07–2.21, 2.13.

**Coloration.** Thorax pale with darker notum; foretibia slightly darker apically, other leg segments and antenna yellowish brown.



**FIGURES 55–57.** *Nilothauma sooretamense* sp. n., male. **55**—dorsal aspect of hypopygium. **56**—hypopygium with tergite IX and anal point removed, dorsal view left, ventral view right. **57**—superior volsella, dorsal view.

*Head.* AR 0.18–0.24, 0.22. Thirteenth flagellomere 83–130, 109  $\mu$ m long. Temporal setae 5–8, 6 in single row including 2–3, 2 inner verticals, 1–4, 3 outer verticals, and 0–3, 1 postorbitals. Frontal tubercles well developed. Clypeus with 13–19, 15 setae. Tentorium 54–75, 64 (4)  $\mu$ m long, 6–9, 8 (4)  $\mu$ m wide. Stipes 61–84, 72 (4)  $\mu$ m long. Palp segment lengths (in  $\mu$ m): 14–20, 17; 18–23, 20; 41–59, 50; 57–88, 77; 98–107, 101. Third palpomere with 2 sensilla clavata subapically, longest 14–23, 18  $\mu$ m long. Fifth palpomere / third palpomere 1.69–2.39, 2.08.

*Thorax.* Dorsocentrals 5–6, 5 in single row; acrostichals 7–13, 9; prealars 2. Scutellum with 2 setae.

*Wing.* VR 1.40–1.44, 1.42. Brachiolum with 1 seta, R with 7–11, 9 setae;  $R_1$  with 5–9, 7 setae;  $R_{4+5}$  with 14–19, 17 setae; remaining veins bare.

*Legs.* Spur of foretibia 52–66, 60  $\mu$ m long including 25–29, 27  $\mu$ m long scale. Midtibia with 1 spur, 29–36, 33  $\mu$ m long; hind tibia with 2 spurs, 34–43, 39  $\mu$ m and 23–27, 24  $\mu$ m long. Combs of midtibia 14–18, 16  $\mu$ m long, of hind tibia 14–20, 17  $\mu$ m long. Width at apex of foretibia 31–36, 34  $\mu$ m, of midtibia 32–39, 35  $\mu$ m, of hind tibia 36–44, 41  $\mu$ m. Lengths and proportions of legs as in Table 11.

*Abdomen.* Tergites with few setae. Segment VIII long, weakly triangularly, tapering anteriorly.

*Hypopygium* (Figs 55–56). Tergite IX with subrectangular posterior margin, with 10–18, 13 setae. Anal point lacking. Laterosternite IX with 1 seta. Phalopodeme 36–47, 40  $\mu$ m long; transverse sternapodeme 11–23, 19  $\mu$ m long. Gonocoxite 50–66, 57  $\mu$ m long. Inferior volsella 36–57, 45  $\mu$ m long, 8–11, 10  $\mu$ m wide at base, 7–14, 10  $\mu$ m wide apically, weakly curved with broadly rounded apex, with microtrichia and 10–15, 12 simple, short setae subapically. Superior volsella (Fig. 57), 34–45, 42  $\mu$ m long, 29–44, 39  $\mu$ m wide medially, with median ridge ventrally, tapering towards apex, with microtrichia. Median volsella apparently fused with superior volsella. Gonostylus 77–113, 98  $\mu$ m long, weakly curved, nearly parallel-sided, all setae hair-like. HR 0.51–0.67, 0.59; HV 1.84–2.15, 1.96.

**Female and immatures.** Unknown.

**Distribution.** Known only from Espírito Santo, Brazil.

**TABLE 11.** Lengths (in  $\mu\text{m}$ ) and proportions of legs of *Nilothauma sooretamense* sp. n., male (n = 5–6).

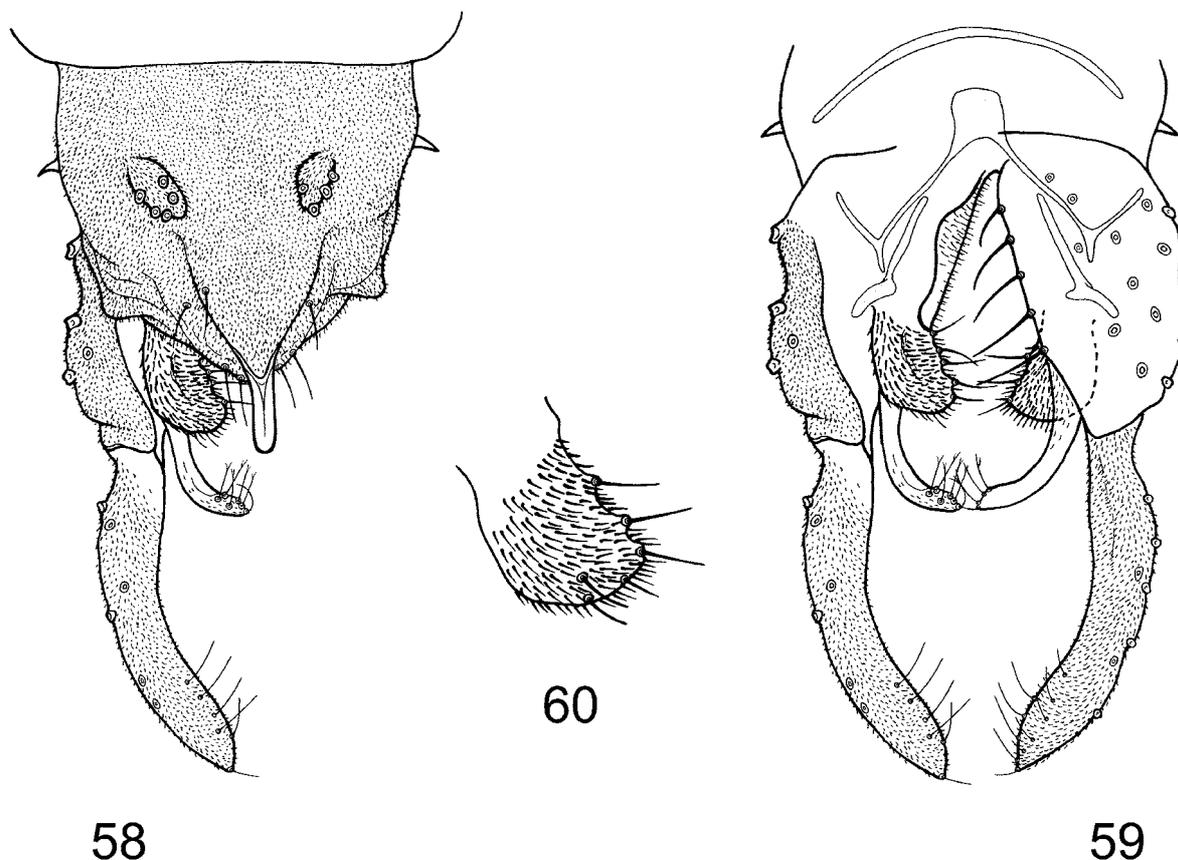
	fe	ti	ta <sub>1</sub>	ta <sub>2</sub>	ta <sub>3</sub>	ta <sub>4</sub>
P <sub>1</sub>	410–482, 448	252–306, 284	432–533, 497	194–230, 221	151–191, 176	122–151, 138
P <sub>2</sub>	407–493, 447	263–310, 290	154–184, 173	54–72, 65	38–54, 47	22–29, 26
P <sub>3</sub>	450–533, 496	414–493, 449	182–252, 220	90–115, 104	101–126, 118	65–79, 71
	ta <sub>5</sub>	LR	BV	SV	BR	
P <sub>1</sub>	54–68, 62	1.68–1.76, 1.72	2.04–2.10, 2.07	1.45–1.53, 1.49	4.1–5.5, 4.5	
P <sub>2</sub>	14–22, 18	0.51–0.61, 0.57	5.59–6.45, 5.91	4.18–4.37, 4.29	3.4–4.6, 3.9	
P <sub>3</sub>	29–43, 37	0.43–0.51, 0.49	3.39–3.65, 3.53	4.06–4.95, 4.32	3.9–5.4, 4.7	

***Nilothauma spiesi* sp. n.**

(Figs 58–60)

**Type material.** Holotype male, **CHILE:** IX Region: Cautin, Queule, Rio Pirén, 4 km from Rio Queule, 3.ii.1986, drift net, M. Spies (ZSM).

**Diagnostic characters.** The two dorsal, setose lobes on tergite IX and the presence of a lateral thorn on laterosternite IX combined with a parallel-sided anal point, inferior volsella with apically split setae, and median volsella apparently fused with superior volsella will separate the male of *N. spiesi* from all other *Nilothauma* species.



**FIGURES 58–60.** *Nilothauma spiesi* sp. n., male. **58**—dorsal aspect of hypopygium. **59**—hypopygium with tergite IX and anal point removed, dorsal view left, ventral view right. **60**—superior volsella, dorsal view.

**TABLE 12.** Lengths (in  $\mu\text{m}$ ) and proportions of legs of *Nilothauma spiesi* sp. n., male (n = 1).

	fe	ti	ta <sub>1</sub>	ta <sub>2</sub>	ta <sub>3</sub>	ta <sub>4</sub>	ta <sub>5</sub>	LR	BV	SV	BR
P <sub>1</sub>	608	433	–	–	–	–	–	–	–	–	–
P <sub>2</sub>	663	470	295	129	101	74	46	0.63	4.08	3.84	–
P <sub>3</sub>	682	672	424	221	193	120	64	0.63	2.97	3.19	–

**Etymology.** Named after Martin Spies, who collected the specimen.

**Male** (n = 1). Total length 3.08 mm.

*Coloration.* Thorax pale yellow with median anepisternum II brown; legs and antenna pale yellow.

*Head.* AR 0.18. Thirteenth flagellomere 126  $\mu\text{m}$  long; stout subapical seta 58  $\mu\text{m}$  long. Temporal setae 7 in single row including 3 inner verticals, 2 outer verticals, and 2 postorbitals. Frontal tubercles apparently absent. Clypeus with about 10 setae. Tentorium and stipes not measurable. Palp segment lengths (in  $\mu\text{m}$ ): 16, 29, 77, 116, fifth lost. Third palpomere with 2 sensilla clavata subapically, longest 15  $\mu\text{m}$  long.

*Thorax.* Dorsocentrals 8 in single row, acrostichals 11, prealars 2. Scutellum with 2 setae.

*Wing.* Not measurable. Brachiolium with 1 seta, R with 13 setae, R<sub>1</sub> with 12 setae, R<sub>4+5</sub> with 15 setae, remaining veins bare.

*Legs.* Spur of foretibia 52  $\mu\text{m}$  long including 23  $\mu\text{m}$  long scale. Midtibia with 1 spur, 32  $\mu\text{m}$  long; hind tibia with 2 spurs, 34  $\mu\text{m}$  and 37  $\mu\text{m}$  long. Combs of midtibia 18  $\mu\text{m}$  long, of hind tibia 16  $\mu\text{m}$  long. Width at apex of foretibia 43  $\mu\text{m}$ , of midtibia 45  $\mu\text{m}$ , of hind tibia 52  $\mu\text{m}$ . Lengths and proportions of legs as in Table 12.

*Abdomen.* Tergites with few setae. Segment VIII long, subrectangular, tapering anteriorly.

*Hypopygium* (Figs 58–59). Posterior margin of tergite IX with shoulders, with 3–4 submarginal to marginal setae to each side of base of anal point; with pair of dorsal, wart-like projections submedially, each with 4–5 strong setae. Anal point parallel-sided, 27  $\mu\text{m}$  long, 7  $\mu\text{m}$  wide, with rounded apex. Laterosternite IX without seta, with lateral thorn. Phalopodeme 57  $\mu\text{m}$  long; transverse sternapodeme lacking. Gonocoxite 102  $\mu\text{m}$  long. Inferior volsella curved with rounded apex, 52  $\mu\text{m}$  long, 9  $\mu\text{m}$  wide basally, 7  $\mu\text{m}$  wide subapically, with microtrichia and 6 subapical setae of which 5 are split apically. Superior volsella (Fig. 60) subrectangular with broadly rounded apex, 32  $\mu\text{m}$  long, 23  $\mu\text{m}$  wide, with microtrichia and few setae. Median volsella fused with superior volsella, apparently represented by 2 setae on small tubercles. Gonostylus parallel-sided, weakly curved, 113  $\mu\text{m}$  long, all setae hair-like. HR 0.90, HV 2.72.

**Female and immatures.** Unknown.

**Distribution.** Known only from IX Region, Chile.

***Nilothauma strebulosum* (Adam et Sæther) comb. n.**  
(Figs 61–63)

*Paranilothauma strebulosa* Adam et Sæther, 2000: 21, Fig. 1.

**Material examined.** **COSTA RICA:** La Selva, holotype male, 16.iii.1993, Malaise trap, O. A. Sæther (ZMBN Type no. 267). **COSTA RICA:** Rancho Quemado, 2 male paratypes, ix & xii, 1990, W. Riss (ZSM).

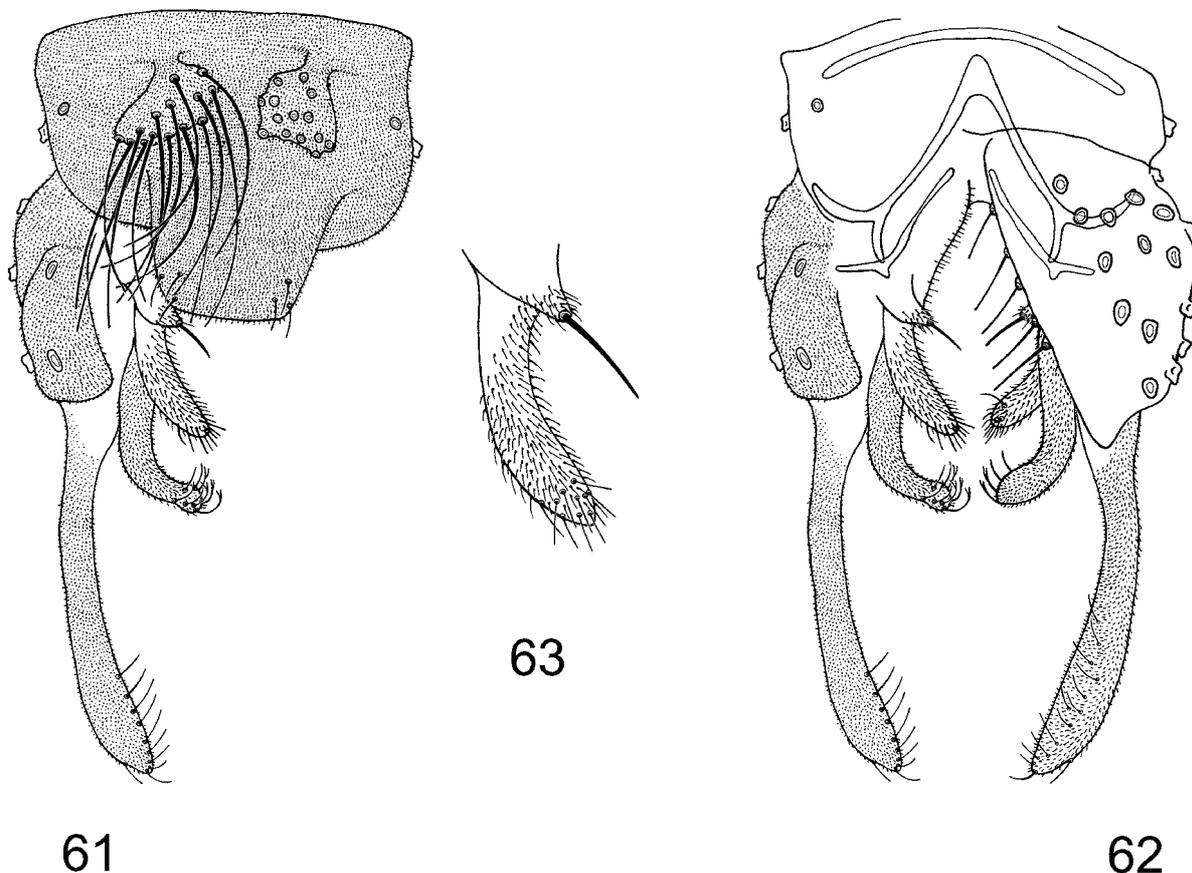
**Diagnostic characters.** The two dorsal setose lobes on tergite IX and lack of anal point combined with a strongly curved inferior volsella with some apically split setae, and median volsella with strong apical seta will separate the male of *N. strebulosum* from all other *Nilothauma* species.

**Male.** The male is described in detail by Adam and Sæther (2000). Hypopygium and superior and median volsellae as in Figures 61–63.

**Female and immatures.** Unknown.

**Remarks.** This species was originally described in *Paranilothauma* as the two dorsal setose lobes on tergite IX were regarded as belonging to laterosternite IX (Adam & Sæther 2000). The addition of several new Neotropical species with similar lobes clearly demonstrates that these lobes originate on tergite IX.

**Distribution.** This species is recorded only from Costa Rica.



**FIGURES 61–63.** *Nilothauma strebulosum* (Adam *et* Sæther) comb. n., male. **61**—dorsal aspect of hypopygium. **62**—hypopygium with tergite IX and anal point removed, dorsal view left, ventral view right. **63**—median and superior volsella, dorsal view.

*Nilothauma zitoi* sp. n.

(Figs 64–74)

**Type material.** Holotype male, **BRAZIL:** São Paulo: São Simão, Ponte Tio Zito, 19.i.2003, at light, H. F. Mendes & T. Andersen (MZUSP).

**Diagnostic characters.** The two dorsal, setose wart-like lobes on tergite IX combined with a small anal point, inferior volsella with apically split setae, and gonostylus widest in apical 1/3 will separate the male of *N. zitoi* from all other *Nilothauma* species.

**Etymology.** Named after the late João Ribeiro da Fonseca (Tio Zito), the owner of the land where the species was collected.

**Male** (n = 1). Total length 2.92 mm. Wing length 1.42 mm. Total length / wing length 2.05. Wing length / length of profemur 2.35.

**Coloration.** Pale with vittae, anterior part of preepisternum, and posterior part of postnotum brown; antenna and legs yellowish brown.

**Head** (Fig. 64). AR 0.32. Thirteenth flagellomere 203  $\mu$ m long. Temporal setae 5 in single row including 1 inner vertical and 4 postorbitals. Frontal tubercles minute. Clypeus with 9 setae. Cibarial pump, tentorium

and stipes as in Figure 65. Tentorium 71  $\mu\text{m}$  long, 18  $\mu\text{m}$  wide. Stipes 80  $\mu\text{m}$  long, 8  $\mu\text{m}$  wide. Palp segment lengths (in  $\mu\text{m}$ ): 17, 29, 63, 84, 121. Third palpomere with 2 sensilla clavata subapically, longest 19  $\mu\text{m}$  long. Fifth palpomere / third palpomere 1.98.

*Thorax* (Fig. 66). Dorsocentrals 5 in single row, acrostichals 3, prealars 2. Scutellum with 2 setae.

*Wing* (Fig. 70). VR 1.53. Brachiolum with 1 seta, R with 7 setae,  $R_1$  with 3 setae,  $R_{4+5}$  with 2 setae apically, remaining veins bare.

*Legs* (Figs 67–69). Spur of foretibia 57  $\mu\text{m}$  long including 24  $\mu\text{m}$  long scale. Midtibia with 1 spur, 29  $\mu\text{m}$  long; hind tibia with 2 spurs, 43  $\mu\text{m}$  and 28  $\mu\text{m}$  long. Combs of midtibia 12  $\mu\text{m}$  long, of hind tibia 15  $\mu\text{m}$  long. Width at apex of foretibia 39  $\mu\text{m}$ , of midtibia 41  $\mu\text{m}$ , of hind tibia 43  $\mu\text{m}$ . Lengths and proportions of legs as in Table 13.

*Abdomen*. Tergites with few setae. Segment VIII long, weakly triangular, tapering anteriorly.

*Hypopygium* (Figs 71–72). Tergite IX with broadly triangular posterior margin; with 3 submarginal to marginal setae to each side of base of anal point; with pair of dorsal, wart-like lobes medially, each with about 10 long setae. Anal point small, digitate with rounded apex, 13  $\mu\text{m}$  long, with microtrichia in basal 1/2. Laterosternite IX without setae. Phalopodeme 65  $\mu\text{m}$  long; transverse sternapodeme lacking. Gonocoxite 94  $\mu\text{m}$  long. Inferior volsella 68  $\mu\text{m}$  long, 17  $\mu\text{m}$  wide subapically, curved with broadly rounded apex, with microtrichia and 10 setae of which 4 are split apically. Superior volsella (Fig. 73) 35  $\mu\text{m}$  long, 12  $\mu\text{m}$  wide medially, weakly curved with broadly rounded apex, with microtrichia. Median volsella (Fig. 74) 25  $\mu\text{m}$  long, curved, tapering, with microtrichia and 2 basal and 3 apical to subapical setae. Gonostylus 110  $\mu\text{m}$  long, widest in apical 3/4, all setae hair-like. HR 0.85, HV 2.65.

**Female and immatures.** Unknown.

**Distribution.** Known only from the type locality in São Paulo, Brazil.

**TABLE 13.** Lengths (in  $\mu\text{m}$ ) and proportions of legs of *Nilothauma zitoi* sp. n., male ( $n = 1$ ).

	fe	ti	ta <sub>1</sub>	ta <sub>2</sub>	ta <sub>3</sub>	ta <sub>4</sub>	ta <sub>5</sub>	LR	BV	SV	BR
p <sub>1</sub>	605	433	621	376	253	221	98	1.43	1.75	1.67	2.6
p <sub>2</sub>	539	392	245	114	90	57	41	0.63	3.89	3.80	3.1
p <sub>3</sub>	629	645	392	196	180	123	65	0.61	2.96	3.25	5.2

### *Nilothauma* sp. 1 (Pupa)

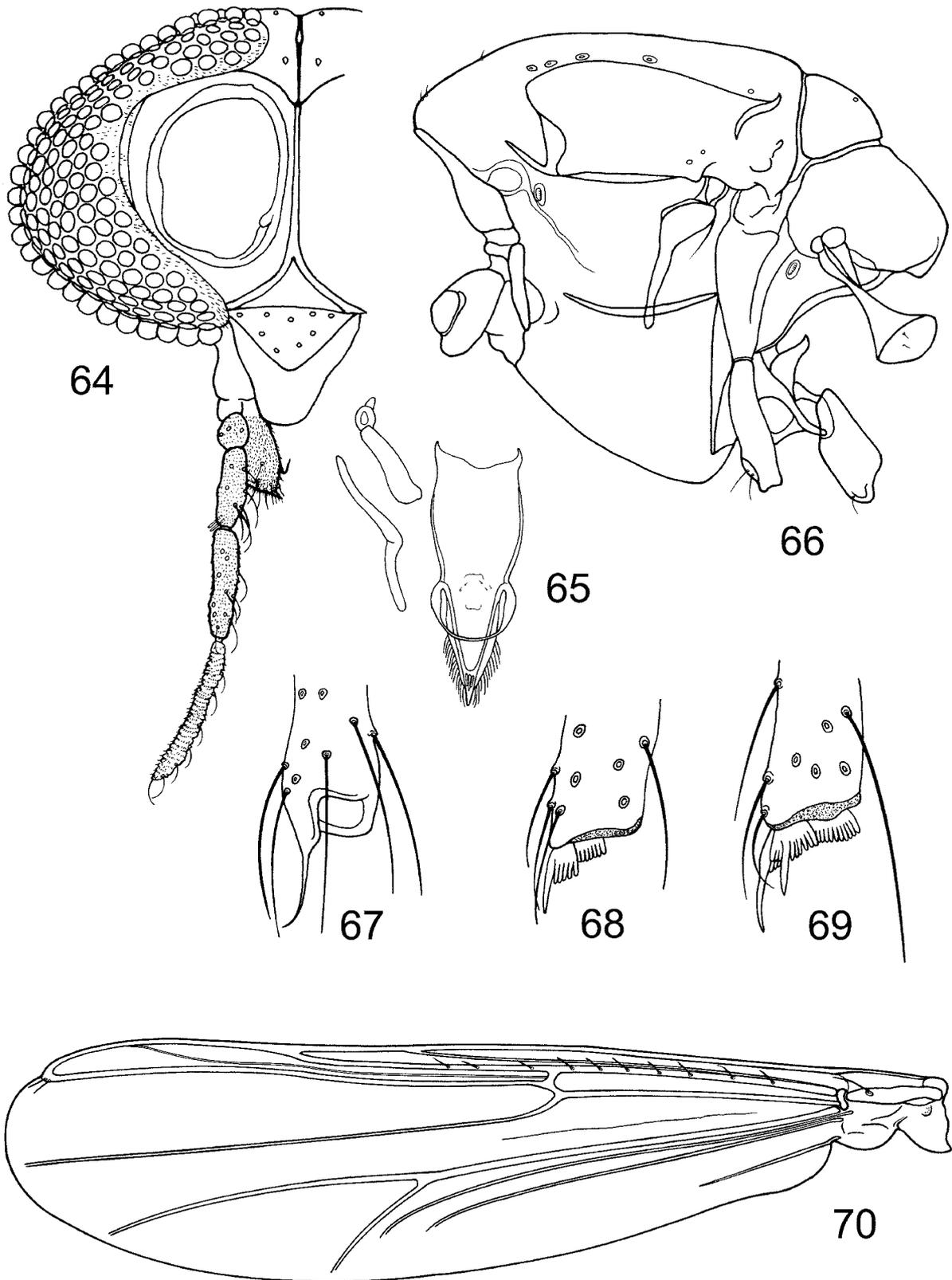
(Figs 75–79)

**Material examined. BRAZIL:** Mato Grosso: Serra dos Parecis, Pensão Alemã, 2 pupal exuviae, 10–11.x.1965, drift net, E. J. Fittkau (ZSM).

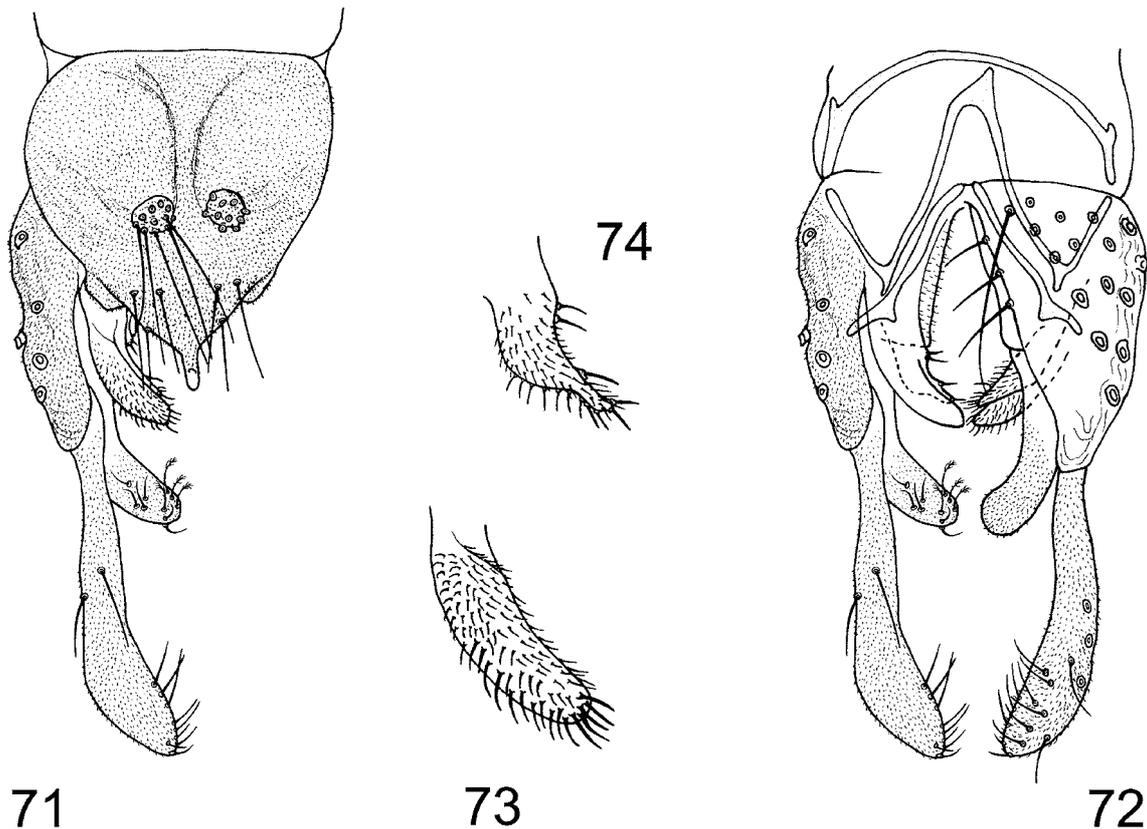
**Diagnostic characters.** The pupa can be separated from other known Neotropical pupae by having a thoracic horn with 5 branches and anterior and posterior shagreen patches on tergites VII–VIII connected by a narrow band of fine shagreen.

**Pupa** ( $n = 1-2$ ). Total length 3.40–3.47 mm. Exuviae light brown.

*Cephalothorax* (Fig. 75). Frontal apotome (Fig. 76) wrinkled, frontal setae 73–94  $\mu\text{m}$  long. Thoracic horn (Fig. 77) with 5 filaments, main filament 320  $\mu\text{m}$  long, with few weak spines; basal ring oval, 7–9  $\mu\text{m}$  of diameter. Scutum with field of few weak tubercles. Anteprenotals apparently 2, median about 50  $\mu\text{m}$  long, lateral 14  $\mu\text{m}$  long. Precorneals 2, subequal, about 15  $\mu\text{m}$  long. Dorsocentrals 4, Dc<sub>1</sub> 7–12  $\mu\text{m}$  long, Dc<sub>2</sub> 27–61  $\mu\text{m}$  long, Dc<sub>3</sub> 16–36  $\mu\text{m}$  long, Dc<sub>4</sub> 7–11  $\mu\text{m}$  long; Dc<sub>1</sub> 11–48  $\mu\text{m}$  in front of Dc<sub>2</sub>, Dc<sub>2</sub> 100–141  $\mu\text{m}$  in front of Dc<sub>3</sub>, Dc<sub>3</sub> 11  $\mu\text{m}$  in front of Dc<sub>4</sub>.



**FIGURES 64–70.** *Nilothauma zitoi* sp. n., male. **64**—head. **65**—cibarial pump, tentorium and stipes. **66**—thorax. **67**—apex of foretibia. **68**—apex of midtibia. **69**—apex of hindtibia. **70**—wing.



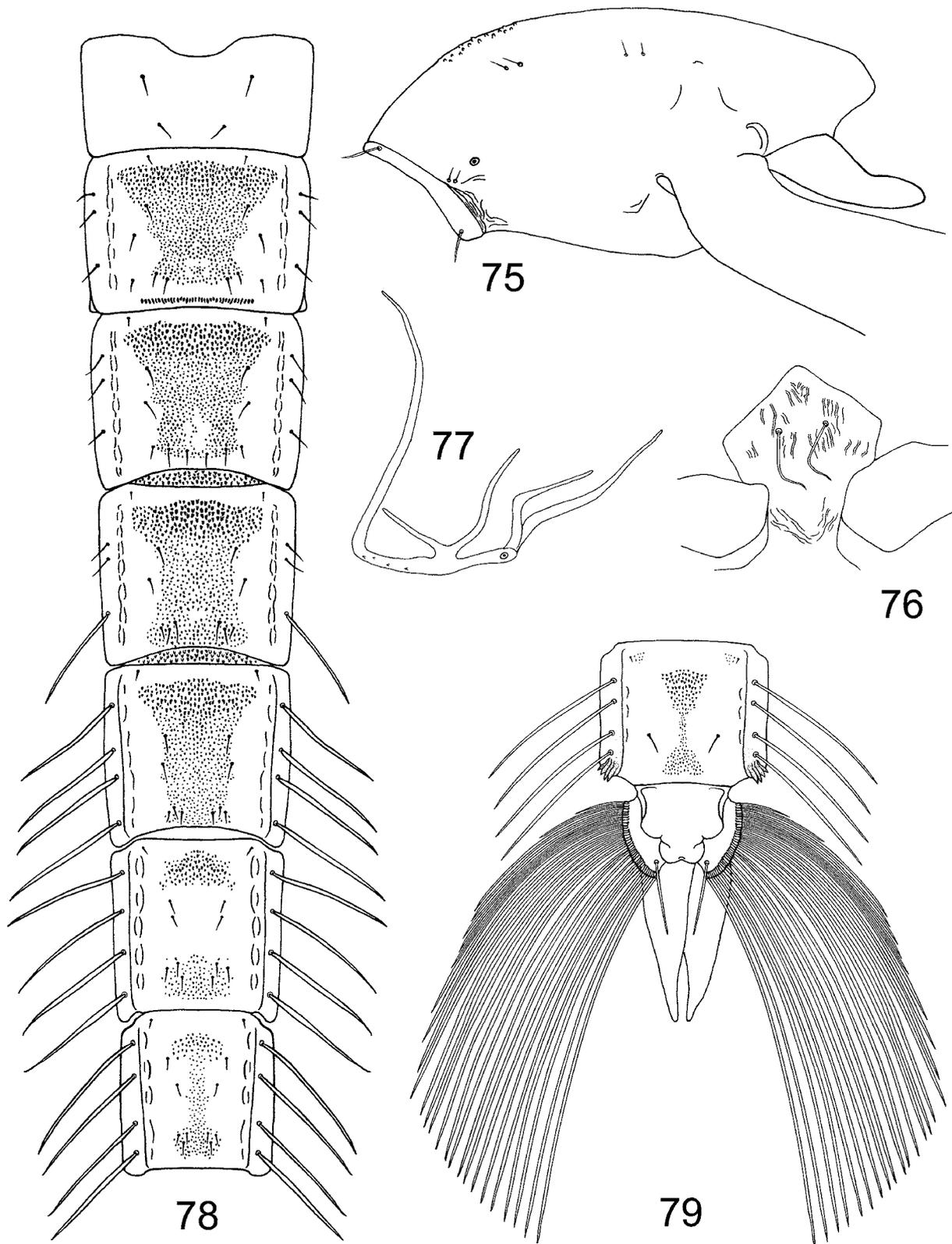
**FIGURES 71–74.** *Nilothauma zitoi* sp. n., male. **71**—dorsal aspect of hypopygium. **72**—hypopygium with tergite IX and anal point removed, dorsal view left, ventral view right. **73**—superior volsella, dorsal view. **74**—median volsella, dorsal view.

*Abdomen* (Figs 78–79). Tergite I bare; tergites II–VI with transverse anterior band of somewhat stronger spinules, merging with median field of finer shagreen; anterior band of shagreen on tergite VI separated from posterior shagreen patch; tergite VII with anterior and posterior shagreen patches connected by narrow band of fine shagreen; tergite VIII with weak anterior shagreen patches and median and posterior shagreen patches connected by narrow band of fine shagreen; tergite IX bare. Tergite II with 200–204  $\mu\text{m}$  long row of 43–46 hooks, each hook 4–9  $\mu\text{m}$  long. Conjunctives III/IV and IV/V with 4–5 rows of spinules. Pedes spurii B weakly developed on segment II. Anal comb 25  $\mu\text{m}$  long, consisting of 1–4 spurs.

*Abdominal setation.* Lateral setae on segments I–VIII as: 0, 3, 3, 3–4, 4, 4, 4, 4; posterior lateral seta on tergite IV and all lateral setae on tergites V–VIII taeniate, remaining setae hair-like. All tergites with 1 pair of O setae.

*Anal lobe.* With complete fringe of 28–31 taeniae on each side, longest 450–500  $\mu\text{m}$  long. Male genital sac overreaches anal lobe by 225–236  $\mu\text{m}$ .

**Distribution.** Only known from two pupal skins from Mato Grosso, Brazil.



**FIGURES 75–79.** *Nilothauma* sp. 1, pupa. **75**–thorax, lateral view. **76**–frontal apotome. **77**–thoracic horn. **78**–tergites I–VII. **79**–tergite VIII and anal lobe.

## Acknowledgements

We are indebted to Professor Dr. Claudio G. Froehlich, Ribeirão Preto, Brazil, Professor Ole A. Sæther, Bergen, Norway, and Martin Spies, Munich, Germany for comments and discussions on the manuscript. Thanks are also due to Dr. Carlos J. E. Lamas, Brazil for the loan of the chironomid material from the BIOTA-FAPESP project, and to Dr. Fabio O. Roque, São Carlos, Brazil and Dr. Marion Kotrba, Munich, Germany who made more *Nilothauma* material available. Gladys Ramirez and Luiz Carlos de Pinho made some of the slide preparations.

The study was partially funded through the Brazilian Research Council of São Paulo State (FAPESP 02/12180–9 and 98/05073–4) within the BIOTA-FAPESP – The Biodiversity Virtual Institute Program ([www.biota.org.br](http://www.biota.org.br)). Thanks are also due to Bergen Museum, University of Bergen and the Programa de Pós-Graduação em Entomologia da FFCLRP-USP (CAPES-PROAP) for financial support during field work in Brazil.

## References

- Adam, J.I. & Sæther, O.A. (1999) Revision of the genus *Nilothauma* Kieffer, 1921 (Diptera: Chironomidae). *Entomologica Scandinavica, Supplement*, 56, 1–107.
- Adam, J.I. & Sæther, O.A. (2000) *Paranilothauma strebulosa* sp. n. from Costa Rica (Diptera: Chironomidae). In: Hoffrichter, O. (Ed.), *Late 20th Century Research on Chironomidae: An Anthology from the 13th International Symposium on Chironomidae*. Shaker Verlag, Aachen, pp. 19–23.
- Banarescu, P. (1990) *Zoogeography of Fresh Waters. 1. General Distribution and Dispersal of Freshwater Animals*. AULA Verlag, Wiesbaden, pp. 1–511.
- Banarescu, P. (1991) *Zoogeography of Fresh Waters. 2. Distribution and Dispersal of Freshwater Animals in North America and Eurasia*. AULA Verlag, Wiesbaden, pp. 512–1091.
- Banarescu, P. (1995) *Zoogeography of Fresh Waters. 3. Distribution and Dispersal of Freshwater Animals in Africa, Pacific Areas and South America*. AULA Verlag, Wiesbaden, pp. 1092–1617.
- Brooks, D. (1990) Parsimony analysis in historical biogeography and evolution: methodological and theoretical update. *Systematic Biology*, 41, 436–445.
- Brooks, D., van Veller, M.G.P. & McLennan, D.A. (2001) How to do BPA, really. *Journal of Biogeography*, 28, 345–358.
- Brooks, D., Dowling, A.P.G., van Veller, M.G.P. & Hoberg, E.P. (2004) Ending a decade of deception: a valiant failure, a not-so-valiant failure, and a success story. *Cladistics*, 20, 32–46.
- Cranston, P.S., Dillon, M.E., Pinder, L.C.V. & Reiss, F. (1989) 10. The adult males of Chironominae (Diptera: Chironomidae) of the Holarctic region - Keys and diagnoses. In: Wiederholm, T. (Ed.), *Chironomidae of the Holarctic region. Keys and diagnoses. Part 3. Adult males*. *Entomologica Scandinavica, Supplement*, 34, 353–502.
- Ebach, M., Humphries, C.J. & Williams, D.M. (2003) Phylogenetic biogeography deconstructed. *Journal of Biogeography*, 30, 1285–1296.
- Edwards, F. (1929) British non-biting midges (Diptera, Chironomidae). *Transactions of the Royal Entomological Society of London*, 77, 279–430.
- Freeman, P. (1957) A study of the Chironomidae (Diptera) of Africa south of the Sahara. Part III. *Bulletin of the British Museum (Natural History), Entomology*, 5(9), 323–426.
- Goetghebuer, M. (1921) Chironomides de Belgique et spécialement de la zone des Flandres. *Mémoires du Musée royal d'Histoire naturelle de Belgique*, 8, Fascicule 4, Mémoire 31, 1–211.
- Goetghebuer, M. (1928) Diptères (Nématocères). Chironomidae. III. Chironomariae. *Faune du France*, 5, 1–174.
- Humphries, C.J. & Parenti, L.R. (1999) *Cladistic Biogeography: Interpreting Patterns of Plant and Animal Distributions. 2nd edition*. Oxford University Press, Oxford, 187 pp.
- ICZN (1999) *International Code of Zoological Nomenclature. Fourth Edition*. The International Trust for Zoological Nomenclature, London, xxix+306 pp.
- Kieffer, J.J. (1921a) Synopse de la tribu des Chironomariae (Diptères). *Annales de la Société scientifique de Bruxelles, Ire partie (Comptes Rendus)*, 40, 269–276.
- Kieffer, J.J. (1921b) Chironomides de l'Afrique Équatoriale (1e partie). *Annales de la Société entomologique de France*, 90, 1–56.
- McKie, B.G. & Cranston, P.S. (2005) Size matters: systematic and ecological implications of allometry in the responses of chironomid midge morphological ratios to experimental temperature manipulations. *Canadian Journal of*

*Zoology*, 83, 553–568.

- Niitsuma, H. (1985) A new species of the genus *Nilothauma* (Diptera, Chironomidae) from Japan. *Kontyu (Tokyo)*, 53(1), 229–232.
- Pinder, L.C.V. (1989) 1. The adult males of Chironomidae (Diptera) of the Holarctic region - Introduction. In: Wiederholm, T. (Ed.), Chironomidae of the Holarctic region. Keys and diagnoses. Part 3. Adult males. *Entomologica Scandinavica, Supplement*, 34, 5–9.
- Pinder, L.C.V. & Reiss, F. (1983) 10. The larvae of Chironominae (Diptera: Chironomidae) of the Holarctic region - Keys and diagnoses. In: Wiederholm, T. (Ed.), Chironomidae of the Holarctic region. Keys and diagnoses. Part 1. Larvae. *Entomologica Scandinavica, Supplement*, 19, 293–435.
- Pinder, L.C.V. & Reiss, F. (1986) 10. The pupae of Chironominae (Diptera: Chironomidae) of the Holarctic region - Keys and diagnoses. In: Wiederholm, T. (Ed.), Chironomidae of the Holarctic region. Keys and diagnoses. Part 2. Pupae. *Entomologica Scandinavica, Supplement*, 28, 299–456.
- Rempel, J.G. (1937) A new species of the subgenus *Kribioxenus* (Diptera: Chironomidae). *Canadian Entomologist*, 69, 274–275.
- Roback, S.S. (1960) Results of the Catherwood Foundation Peruvian Amazon Expedition. New species of Tendipedidae (Diptera). *Transactions of the American Entomological Society*, 86, 87–107.
- Sæther, O.A. (1969) Some Nearctic Podonominae, Diamesinae, and Orthocladiinae (Diptera: Chironomidae). *Bulletin of the Fisheries Research Board of Canada*, 170, 1–154.
- Sæther, O.A. (1977) Female genitalia in Chironomidae and other Nematocera: morphology, phylogenies, keys. *Bulletin of the Fisheries Research Board of Canada*, 197, 1–209.
- Sæther, O.A. (1980) Glossary of chironomid morphology terminology (Diptera: Chironomidae). *Entomologica Scandinavica, Supplement*, 14, 1–51.
- Sæther, O.A. (2000) Zoogeographical patterns in Chironomidae (Diptera). *Verhandlungen der Internationale Vereinigung für Theoretische und Angewandte Limnologie*, 27(1), 290–302.
- Sasa, M. (1990) Studies on the chironomid midges of Jintsu River (Diptera, Chironomidae). *Research Report from Toyama Prefectural environmental Pollution Research Centre*, 1990, 30–67.
- Sasa, M. (1991) Studies on the chironomids of the Lake Nojiri area, Nagano. *Research Report from Toyama Prefectural environmental Pollution Research Centre*, 1991, 82–92.
- Sasa, M. (1993) The chironomids collected from lakes in the Aizu district (Fukushima). *Research Report from Toyama Prefectural environmental Pollution Research Centre*, 1993, 69–95.
- Sasa, M., Suzuki, H. & Sakai, T. (1998) Studies on the chironomid midges collected on the shore of Shimanto River in April, 1998. Part 1. Description of species of the subfamily Chironominae. *Tropical Medicine*, 40, 47–89.
- Soponis, A.R. (1987) *Paranilothauma* and *Neelamia*, new genera of Chironomini (Diptera: Chironomidae) from Brazil. *Studies on Neotropical Fauna and Environment*, 22, 11–24.
- Spies, M. & Reiss, F. (1996) Catalog and bibliography of Neotropical and Mexican Chironomidae (Insecta, Diptera). *Spixiana, Supplement*, 22, 61–119.
- Swofford, D.L. (1998) PAUP\*. *Phylogenetic analysis using parsimony (\*and other methods), version 4*. Sinauer Associates, Sunderland, Massachusetts. [Computer software.]
- Swofford, D.L. & Olsen, G.L. (1990) Phylogeny reconstruction in molecular systematics. In: Hillis, D.M. & Moritz, C. (Eds), *Molecular Systematics*. Sinauer Associates, Sunderland, Massachusetts, pp. 411–501.
- Townes, H.K. (1945) The Nearctic species of Tendipedini [Diptera, Tendipedidae (= Chironomidae)]. *The American Midland Naturalist*, 34, 1–206.
- Trivinho-Strixino, S. & Strixino, G. (1995) *Larvas de Chironomidae (Diptera) do Estado de São Paulo. Guia de identificação e diagnose dos gêneros*. Universidade Federal de São Carlos, São Carlos, Brazil, 229 pp.
- van Veller, M.G.P., Zandee, M. & Kornet, D.J. (1999) Two requirements for obtaining valid common patterns under different assumptions in vicariance biogeography. *Cladistics*, 15, 393–406.
- van Veller, M.G.P., Kornet, D.J. & Zandee, M. (2001) Methods in vicariance biogeography: assessment of the implementations of assumptions 0, 1, and 2. *Cladistics*, 16, 319–345.
- Wang, X. (2000) A revised checklist of chironomids from China (Diptera). In: Hoffrichter, O. (Ed.), *Late 20th Century Research on Chironomidae: An Anthology from the 13th International Symposium on Chironomidae*. Shaker Verlag, Aachen, pp. 629–652.
- Watson, C.N. jr & Heyn, M.W. (1992) A preliminary survey of the Chironomidae (Diptera) of Costa Rica, with emphasis on the lotic fauna. *Netherlands Journal of Aquatic Ecology*, 26, 257–262.
- Wiedenbrug, S. (2000) *Studie zur Chironomidenfauna aus Bergbächen von Rio Grande do Sul, Brasilien*. Dissertation, Faculty of Biology, Ludwigs-Maximilian-Universität-München, Munich, Germany, 444 pp.
- Yan, C., Tang, H. & Wang, X. (2005). *Nilothauma* Kieffer from China (Diptera: Chironomidae). *Aquatic Insects*, 27, 213–220.

**APPENDIX 1.** Character states for characters 1–48 in *Nilothauma* Kieffer, *Neelamia* Sopenis, *Paranilotheuma* Sopenis, *Paratendipes* Kieffer, and *Pseudochironomus* Malloch. Polymorphies: A = 0&1; B = 0&1&2; C = 1&2; D = 0&1&2&3; E = 1&2&3; F = 2&3.

Character No.																	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2
	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4							
<i>Paratendipes</i> Kieffer	A	0	0	0	0	?	0	A	A	A	C	0	1	F	?	B	0	-	0	0	-	-	-	-							
<i>Pseudochironomus</i> Malloch	A	A	A	0	0	0	0	0	0	0	-	A	1	C	2	0	0	-	0	0	-	-	-	-							
<i>Neelamia fitzkau</i> Sopenis	2	1	0	0	0	1	1	1	1	0	-	1	1	1	2	1	0	-	0	0	-	-	-	-							
<i>Nilothauma acre</i> Adam et Sæther	1	0	0	1	3	0	1	1	1	0	-	0	1	0	1	1	1	0	1	1	2	0	1	1							
<i>N. adunatum</i> Adam et Sæther	1	?	0	?	?	?	1	1	0	0	-	?	?	?	?	1	C	B	1	1	1	0	1	0							
<i>N. anderseni</i> Adam et Sæther	2	0	0	1	2	0	1	1	0	1	0	0	0	1	?	1	2	1	1	1	2	0	1	0							
<i>N. ankasense</i> Adam et Sæther	2	1	0	1	2	0	1	1	1	0	-	1	1	2	?	1	2	1	1	1	1	0	1	0							
<i>N. babyi</i> (Rempel)	B	1	1	1	2	A	1	A	0	0	-	0	0	0	A	1	2	1	1	0	1	0	1	0							
<i>N. bicorne</i> (Townes)	2	1	1	1	3	1	1	1	1	0	-	0	0	2	?	2	2	1	1	1	1	0	1	1							
<i>N. brayi</i> (Goetghebuer)	1	1	1	1	2	0	1	1	0	0	-	0	A	0	1	2	2	1	1	1	1	0	1	0							
<i>N. burmeisteri</i> Adam et Sæther	C	1	0	1	3	A	1	1	1	0	-	0	0	0	A	2	2	1	1	1	1	0	1	0							
<i>N. duminola</i> Adam et Sæther	2	1	0	1	3	0	1	1	1	0	-	A	0	C	2	2	2	1	1	0	1	0	1	0							
<i>N. flabellatum</i> Adam et Sæther	2	1	0	1	2	1	1	1	1	0	A	1	2	1	2	2	2	1	1	2	0	1	1								
<i>N. fuscina</i> Adam et Sæther	2	1	0	1	3	0	1	1	1	0	-	1	1	2	2	2	2	1	0	1	0	0	0								
<i>N. harrisoni</i> Adam et Sæther	2	1	1	1	3	0	1	1	0	1	A	A	C	1	2	0	1	1	1	2	0	0	0								
<i>N. hibaraquartum</i> Sasa	2	1	1	1	2	0	1	1	1	1	?	?	?	?	0	1	0	1	1	1	2	0	1	0							
<i>N. hibarateritium</i> Sasa	1	0	1	1	2	0	1	0	0	0	-	?	?	?	1	2	2	1	1	1	2	1	1	1							
<i>N. infissum</i> Adam et Sæther	2	?	?	?	1	3	1	1	1	0	0	0	0	2	2	1	0	1	1	0	0	1	0								
<i>N. insolitum</i> Adam et Sæther	2	0	1	1	2	0	1	1	1	0	1	1	2	2	1	1	0	1	1	2	0	0	0								
<i>N. japonicum</i> Niitsuma	2	1	1	1	2	0	1	1	1	0	-	A	A	C	C	2	2	1	0	1	0	0	0	0							
<i>N. kakumense</i> Adam et Sæther	2	1	1	1	2	0	1	1	1	1	0	0	0	2	?	2	2	1	1	1	2	0	1	1							
<i>N. latocaudatum</i> Adam et Sæther	2	0	1	?	?	0	1	1	1	0	0	0	2	2	1	1	0	1	1	2	0	1	0								
<i>N. mergae</i> Adam et Sæther	2	1	1	1	2	0	1	1	0	0	-	1	1	1	2	1	1	1	1	1	0	1	1								
<i>N. mirabile</i> (Townes)	B	1	1	1	3	A	1	A	0	0	-	0	0	1	1	1	2	1	1	1	2	1	1	1							
<i>N. nojirimaculatum</i> Sasa	2	1	1	1	2	0	1	A	0	1	1	?	?	?	1	1	1	1	1	1	2	0	1	0							
<i>N. pictipenne</i> Kieffer	2	1	0	1	2	0	1	0	0	1	1	0	0	2	?	2	0	1	1	1	2	0	1	0							
<i>N. sasai</i> Adam et Sæther	2	1	1	1	2	0	1	?	0	0	-	0	0	1	1	2	2	1	1	1	0	1	1								
<i>N. verrucum</i> Adam et Sæther	0	1	1	1	1	0	1	1	0	0	-	0	0	0	1	2	0	1	1	0	1	0	1	0							
<i>Paranilothauma reissi</i> Sopenis	2	1	0	1	3	1	1	1	1	0	-	1	1	3	2	2	1	0	0	-	-	-	-								
<i>P. strebulosum</i> Adam et Sæther	C	1	1	1	3	1	1	1	1	0	-	1	1	3	2	1	2	2	1	0	2	1	0	0							
<i>Nilothauma zitoi</i> sp. n.	2	0	1	1	1	1	1	1	1	0	-	1	1	2	1	1	2	1	1	0	2	1	0	0							
<i>N. jaraguaense</i> sp. n.	1	0	1	1	3	0	1	1	1	0	-	0	0	1	1	0	2	1	1	0	2	1	0	0							
<i>N. matogrossense</i> sp. n.	2	0	?	A	A	1	1	?	?	?	0	-	0	1	2	?	?	1	1	1	0	1	-	0	0						
<i>N. aripuanense</i> sp. n.	2	0	0	?	?	1	?	1	0	0	-	0	0	1	?	1	0	-	0	0	-	-	0	-							
<i>N. amazonense</i> sp. n.	?	0	0	1	3	1	1	?	1	0	-	?	?	?	2	0	0	-	1	0	2	1	0	0							
<i>N. fazzariense</i> sp. n.	2	0	0	1	2	1	1	1	1	0	-	0	1	3	2	1	1	1	1	0	2	1	0	0							
<i>N. roquei</i> sp. n.	?	1	1	1	3	1	?	1	1	0	-	?	?	?	?	2	2	2	1	0	2	1	0	0							
<i>N. spiesi</i> sp. n.	?	0	1	1	3	0	1	1	1	0	-	0	0	0	?	0	1	1	1	0	2	1	0	0							
<i>N. calori</i> sp. n.	1	1	1	A	D	1	1	1	1	0	-	A	1	3	2	1	1	0	1	0	2	1	0	0							
<i>N. sooretamense</i> sp. n.	2	1	0	1	F	A	1	1	A	0	-	A	0	1	2	1	0	-	0	0	-	-	-	-							
<i>N. longissimum</i> sp. n.	2	0	0	0	0	0	1	A	1	0	-	0	1	3	C	1	0	-	0	0	-	-	-	-							
<i>N. complicatum</i> sp. n.	2	1	0	0	0	1	1	1	1	0	-	1	0	1	2	1	0	-	0	0	-	-	-	-							
<i>N. involucrum</i> sp. n.	?	0	0	1	1	0	1	1	1	0	-	?	?	?	2	1	0	-	0	0	-	-	-	-							

APPENDIX 1. Continued.

Character No.	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	4	4	4	
	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8					
<i>Paratendipes</i> Kieffer	-	-	-	0	0	0	0	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	A	0	0		
<i>Pseudochironomus</i> Malloch	-	-	-	1	-	-	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	A	0	0	
<i>Neelamia fitzkau</i> Sopenis	-	-	-	1	-	-	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	
<i>Nilothauma acre</i> Adam et Sæther	1	-	-	0	1	2	1	2	0	0	1	1	2	1	0	0	1	A	0	0	0	0	0	1	0	0	1	0	
<i>N. adunatum</i> Adam et Sæther	0	0	0	0	1	0	1	1	0	0	1	0	1	0	0	0	1	1	1	1	1	0	0	1	0	0	1	0	
<i>N. anderseni</i> Adam et Sæther	1	1	2	0	0	2	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0
<i>N. ankasense</i> Adam et Sæther	0	1	1	0	1	1	0	1	0	0	2	1	-	0	0	0	1	C	0	0	1	0	1	0	1	0	1	0	
<i>N. babyi</i> (Rempel)	0	-	-	0	1	0	1	1	0	0	C	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1	0	
<i>N. bicorne</i> (Townes)	0	0	1	0	1	2	1	1	0	0	1	1	-	1	0	0	1	A	A	0	0	0	0	1	0	0	1	0	
<i>N. brayi</i> (Goetghebuer)	0	1	0	0	1	2	1	C	0	0	1	0	1	0	0	0	1	0	0	0	1	0	0	1	0	1	0	1	0
<i>N. burmeisteri</i> Adam et Sæther	0	0	1	0	0	1	0	1	0	0	1	1	-	0	3	0	1	1	0	0	1	0	1	0	1	0	1	0	0
<i>N. duminola</i> Adam et Sæther	1	-	-	0	1	2	0	0	0	0	A	1	-	0	2	1	0	1	1	0	0	0	0	0	0	0	0	0	0
<i>N. flabellatum</i> Adam et Sæther	1	1	2	0	0	2	0	1	0	0	1	1	-	0	2	0	0	1	1	0	1	0	1	0	1	0	1	0	0
<i>N. fuscina</i> Adam et Sæther	0	-	-	0	1	0	0	0	0	0	1	1	-	0	1	1	0	A	0	0	0	0	0	0	0	0	0	0	0
<i>N. harrisoni</i> Adam et Sæther	1	1	1	0	0	2	0	1	0	0	A	0	1	0	0	0	0	0	1	0	1	0	1	0	0	0	1	0	0
<i>N. hibaraquartum</i> Sasa	1	0	2	0	0	2	0	C	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0
<i>N. hibaratertium</i> Sasa	2	1	0	0	1	2	0	1	0	0	1	0	1	0	0	0	1	A	1	0	0	0	1	0	0	0	1	0	0
<i>N. infissum</i> Adam et Sæther	0	0	0	0	1	2	0	1	0	0	1	0	0	0	1	0	1	1	0	1	0	1	0	1	0	0	1	0	0
<i>N. insolitum</i> Adam et Sæther	1	1	1	1	-	0	0	0	0	0	1	0	1	0	0	0	0	2	0	1	0	0	0	1	0	0	1	0	0
<i>N. japonicum</i> Niitsuma	0	0	1	0	1	0	0	1	0	0	1	1	-	1	0	0	1	A	0	0	0	0	0	0	0	0	1	0	0
<i>N. kakumense</i> Adam et Sæther	1	1	2	0	0	2	0	0	0	0	1	1	0	2	0	0	1	1	0	0	1	1	0	0	0	0	1	0	0
<i>N. latocaudatum</i> Adam et Sæther	1	1	1	0	0	2	?	?	?	?	?	0	1	0	0	0	0	1	0	1	0	1	1	0	1	0	1	0	0
<i>N. mergae</i> Adam et Sæther	0	0	1	0	1	2	0	0	0	0	1	1	2	1	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0
<i>N. mirabile</i> (Townes)	2	1	0	0	1	2	0	2	0	0	1	0	1	1	0	0	1	1	0	0	1	0	0	0	0	0	0	1	0
<i>N. nojirimaculatum</i> Sasa	1	1	2	0	0	2	0	A	0	0	A	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
<i>N. pictipenne</i> Kieffer	1	1	2	0	0	2	0	0	0	0	0	1	-	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0
<i>N. sasai</i> Adam et Sæther	2	1	0	0	1	2	0	C	0	0	1	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	1	0	0
<i>N. verrucum</i> Adam et Sæther	0	-	-	0	1	0	1	2	0	0	1	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	1	0	0
<i>Paranilothauma reissi</i> Sopenis	0	-	-	1	-	0	0	1	1	1	2	0	0	0	0	0	0	2	0	1	1	0	0	0	0	0	0	0	0
<i>P. strebulosum</i> Adam et Sæther	1	-	-	1	-	0	0	2	1	1	1	0	0	0	0	1	0	C	A	1	0	0	0	0	0	0	0	0	0
<i>Nilothauma zitoi</i> sp. n.	1	-	-	1	0	0	0	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0
<i>N. jaraguaense</i> sp. n.	1	-	-	0	1	2	1	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
<i>N. matogrossense</i> sp. n.	2	-	-	0	1	0	0	2	0	1	2	1	-	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
<i>N. aripuanense</i> sp. n.	0	-	-	0	1	2	0	1	0	1	0	0	2	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
<i>N. amazonense</i> sp. n.	1	-	-	0	1	2	0	0	0	0	0	0	2	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0
<i>N. fazzariense</i> sp. n.	0	-	-	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0
<i>N. roquei</i> sp. n.	0	-	-	1	0	0	0	2	0	1	0	0	2	0	0	1	0	2	0	0	0	0	1	0	0	1	0	0	0
<i>N. spiesi</i> sp. n.	0	-	-	0	1	0	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0
<i>N. calori</i> sp. n.	A	-	-	1	-	-	0	2	1	0	A	0	0	1	0	0	0	1	0	0	1	0	0	1	0	0	1	0	0
<i>N. sooretamense</i> sp. n.	-	-	-	1	-	-	0	?	0	0	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
<i>N. longissimum</i> sp. n.	-	-	-	1	-	-	0	2	0	0	0	0	0	0	0	0	3	0	-	0	1	0	1	0	1	0	0	0	0
<i>N. complicatum</i> sp. n.	-	-	-	1	-	-	0	?	0	0	1	0	0	0	0	0	3	0	-	0	1	0	1	0	1	0	0	0	0
<i>N. involucrum</i> sp. n.	-	-	-	1	-	-	0	?	0	0	1	0	2	0	0	3	0	-	0	1	0	0	0	0	0	0	0	0	0