

The genus *Manota* in Costa Rica (Diptera: Mycetophilidae)

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Abstract

The genus *Manota* Williston is shown for the first time to be present in Costa Rica, and is represented there by 27 species, all new to science: *acuminata*, *acutistylus*, *arenalensis*, *bihamata*, *caribica*, *corcovado*, *costaricensis*, *diversiseta*, *eximia*, *fraterna*, *incisa*, *inornata*, *intermedia*, *limonensis*, *major*, *montivaga*, *multisetosa*, *parva*, *penicillata*, *planistylus*, *rara*, *rectolobata*, *rotundistylus*, *spinosa*, *squamulata*, *tapantiensis*, and *vexillifera*. These species are described, illustrated, and keyed using characters of the male terminalia as the only tool for distinguishing closely related species. A lectotype is designated for the type species, *Manota defecta* Williston, and it is redescribed and the male terminalia illustrated.

Key words: taxonomy, morphology, Mycetophilidae, *Manota*, new species, Costa Rica

Introduction

The subfamily Manotinae (Mycetophilidae) was recently shown, by parsimony analysis, to be a monophyletic group (Hippa et al. 2005), which is in accordance with the view taken by most previous authors (Tuomikoski 1966; Zaitzev 1990; Söli 1997, 2002; Söli et al. 2000). Among the four manotine genera recognised (Papp 2004, Hippa et al. 2005), *Manota* Williston is the only genus to extend its range outside the Oriental Region. A total of 30 *Manota* species has been described to date, distributed over the biogeographic regions as follows: Palaearctic Region, 3 species; Oriental, 3; Afrotropical, 18; Neotropical, 3; and Australian, 3 (Bechev 2000, Ševčík 2002, Papp 2004). At least one unnamed species is known to occur in the Nearctic Region (Vockeroth 1981, in litt.). According to Papavero (1978), the three named Neotropical species include two from Brazil and one from St. Vincent, Lesser Antilles, the latter being the type species, *Manota defecta* Williston 1896. The presence of *Manota* in Central America has not yet been documented.

Apart from the common knowledge that species of *Manota* are forest dwellers, details of their biology remain largely obscure. Larvae of one Palaearctic species, *M. unifurcata* Lundström, were found once on the surface of very moist, rotten birch wood with a greyish coat of an unidentified fungus (Zaitzev 1990). For the same *Manota* species, a single specimen was reported as emerging from rotten beech wood bearing a myxomycete (Chandler 1978). Adults, quite inconspicuous in their habits, are usually obtained by standard entomological methods, especially Malaise traps, used in damp, shady forests.

Due to its peculiar wing venation, *Manota* is one of the most readily recognisable genera of the family Mycetophilidae. The external morphology of *Manota* species is for the most part extremely uniform, but there is a degree of morphological diversity in the male terminalia, which is of major significance for the purposes of species identification and presumably also for subgeneric classification.

In this article, we describe and key 27 new species of *Manota* from the small area of Costa Rica. This number probably represents about half the actual number of *Manota* spe-

cies occurring in Costa Rica, while there is every indication that the genus might well comprise several hundred species worldwide, most of which will be found in the tropics. To deal taxonomically with such numbers of species that resemble each other so closely necessitates a more thorough understanding and characterisation of the male terminalia than is presently the case, and an attempt to remedy this situation is one of the aims of this paper. Finally, we redescribe and illustrate the type species, *Manota defecta*. We did not attempt to come to any conclusions on the distribution of Costa Rican *Manota*, as we are still far from a data base even reasonably sufficient for making such an analysis.

Material and methods

Specimens were picked from ethanol-preserved samples, mainly from Malaise traps, in the care of the Instituto Nacional de Biodiversidad (INBio), Santo Domingo de Heredia, Costa Rica. Out of the several hundred specimens, 232 males were provisionally sorted to species under a stereomicroscope and mounted in Canada balsam on microscope slides for further study under a compound microscope. The mounting procedure included maceration in warm potassium hydroxide (10% KOH), step-wise dehydration in ethanol, and brief treatment with beechwood creosote prior to the transfer of specimens into Canada balsam. Specimens were partially dissected, with at least one of the wings and terminalia mounted under separate cover slips, and with the eighth segment removed from the terminalia. The terminalia of some species were dissected further to understand better their structure. No attempt was made to identify females, occurring in far fewer numbers than males, which were left in the sorted Malaise samples, except for a very few specimens which were placed in 70% ethanol and deposited in the INBio collection. Preimaginal stages were not available for our study. All holotypes and almost all paratypes are deposited in INBio, with a few paratypes and additional material retained in the Swedish Museum of Natural History, Stockholm (NHRS). Two syntype specimens of *Manota defecta* were obtained on loan from The Natural History Museum, London (NHM). One of these dry specimens was soaked in water and then slide-mounted following the procedure described above. The morphological terminology follows that of Söli (1997), while some additional terms are explained elsewhere in the text. Illustrations were made using a drawing tube attached to a Leitz Diaplan compound microscope.

The type species, *Manota defecta* Williston (Fig. 3A, B)

Of the six specimens of *Manota defecta* mentioned by Williston (1896), two syntypes are still preserved in The Natural History Museum, London. One of these (BMNH(E) #254366) is a pinned female lacking the head; it may or may not belong to *M. defecta*. The other specimen, a male, is designated here as the lectotype. As the original description of

Manota defecta is no longer adequate for recognising the species, we give here a redescription based on the lectotype specimen.

Redescription. Agreeing with the description given below for *Manota* species in Costa Rica, with specific characters as follows:

Small species.

Male. Head missing.

Thorax. Anepisternum, anterior basalare, laterotergites, and episternum 3 each setose. Anepisternal cleft complete. Preepisternum 2 bare. **Wing.** Length 1.6 mm. Membrane with a few setae along posterior margin. Sc distally of h bare. CuA-stem setose dorsally. Junction of CuA2 into CuA1 incomplete.

Terminalia (Fig. 3A, B). Sternite 9 large, distinct; posterior margin emarginate medially, situated beyond mid length of gonocoxites; with setae larger than those on gonocoxites. Disto-lateral lobes of gonocoxites absent. Ventro-lateral lobes of gonocoxites subrectangular. Gonocoxites in position I with some 7 short setae on lobe; in position II with some 15 short, blunt megasetae on lobe plus 1 short, flat, pointed megaseta; in position III with 2 flat megasetae, each at least two-branched with one branch whip-like and the other branch rounded; 2 large setae displaced from position IV into a more dorso-apical position. Gonostyli somewhat reduced in size, flat; ventro-apically with some 5 setae increasing in length; dorso-subbasally with 1+5 setae directed dorsally. Parastylar lobes large, situated at some distance from gonostyli; each with 2 setae apico-posteriorly. Parameral apodemes widely spread. Tegmen tapering to tip; margin of ventro-lateral lobes discernible. Cerci unusually wide, longer than hypoproct. Hypoproct almost pointed, with long setae laterally and distally and very large setae dorso-subapically.

Diagnostic characters. Compared with the Costa Rican species, *M. defecta* is exceptional in having both the disto-lateral lobes of the gonocoxites absent and the gonostyli reduced in size and vestiture. In Costa Rican species, reduced gonostyli are associated with large disto-lateral gonocoxal lobes. As is the case with all *Manota* species we have seen, the distribution of setae/megasetae dorsally on the gonocoxites is also species specific in *M. defecta*.

Lectotype designation. Male (BMNH(E) #254365), with printed original labels "Windward side / St. Vincent, W. I. / H. H. Smith.", "W. Indies. / 1907—66.", "1000 feet", plus label with red double-frame and hand-written in black ink "Manota defecta Willist.". (Formerly pinned, with posterior abdomen including terminalia in glycerol; designated and labelled as syntype by N.P. Wyatt in 2002. Mounted by us in Canada balsam on a microscope slide, and labelled as lectotype.)

General morphology. The adult morphology of Costa Rican species of *Manota* fits well into the outline given by Söli (1993), with taxonomically important characters as follows:

Species small (wing length about 1.4–1.7 mm) to large (wing length about 2.0–2.4 mm).

Head. Antenna with fourth flagellomere 1.5–2.5 times as long as wide (Fig. 1A, B). Third palpomere on apical process with large, curved sensilla, numbering 3 in most species, but 2 or 4–5 in others; fourth palpomere apically with a short, knob-like process or a distinct, small parasegment.

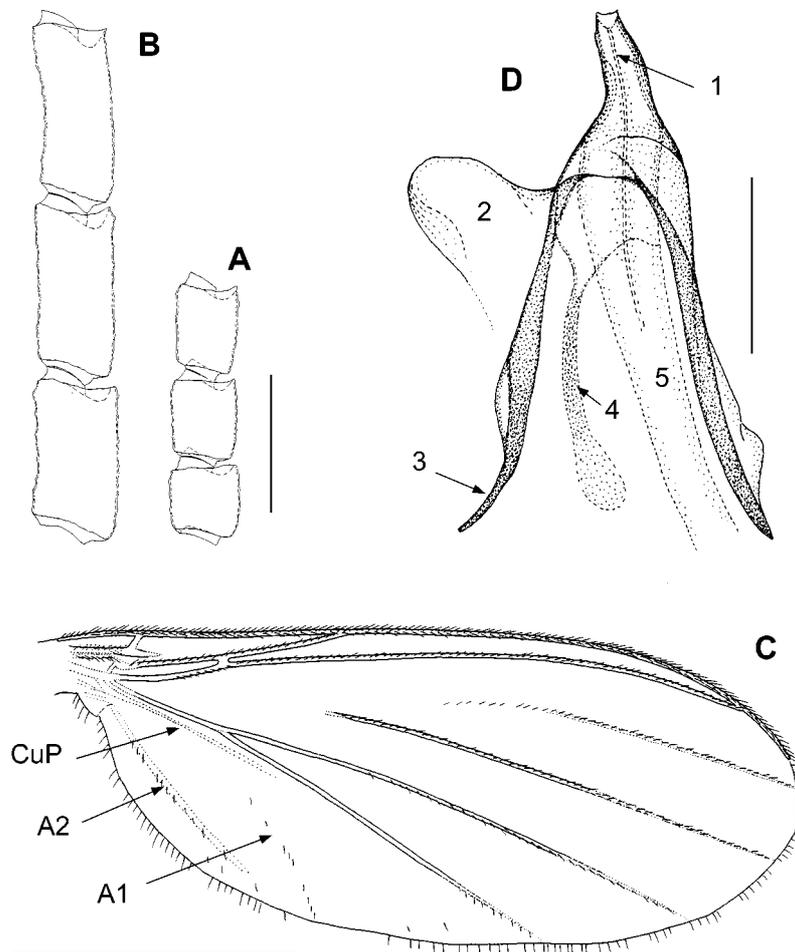


FIGURE 1. Morphology of *Manota* spp. **A:** Antennal flagellomeres 3–5, lateral view, of *M. spinosa* sp. n. (0.1 mm). **B:** Antennal flagellomeres 3–5, lateral view, of *M. rectolobata* sp. n. (0.1 mm). **C:** Wing, dorsal view, of *M. bihamata* sp. n. (1.0 mm). **D:** Tegmen, ventro-lateral view, of *M. rectolobata* sp. n. (0.05 mm). Scale in parentheses. 1 = apical process, 2 = ventro-lateral lobe, 3 = parameral apodeme, 4 = ejaculatory apodeme, 5 = ejaculatory duct.

Thorax (See Söli 1993, Fig. 1D). Anepisternum fully setose. Anepisternal cleft completely separating anepisternum and anterior basalare, or almost so. Anterior basalare setose or bare. Preepisternum 2 bare. Laterotergite setose or bare. Episternum 3 setose. **Wing** (Fig. 1C). Membrane non-setose, or with a few setae along posterior margin; microtrichia on either side arranged in rows. (The irregular impression as described by Söli (1993) results from the fact that the rows on each side of the membrane do not always coincide.) Portion of Sc basally of h setose ventrally; portion distally of h setose on both sides, on one side, or bare. CuA-fork complete, or incomplete due to fading away of most proximal portion of CuA2. CuA-stem bare. CuP present as a fold-line immediately posterior of CuA-stem. A1 absent as a distinct vein, occasionally indicated by a line of setae between CuA2 and A2. A2 present as a faint vein, usually long but never reaching wing margin, following curvature of anal lobe, setose. (In the literature on the Mycetophilidae including *Manota* (for instance, Söli 1993), the homology of the posterior veins, CuP, A1, and A2, has no unanimous interpretation. Our interpretation is based on the fact that (1) a line of setae between CuA2 and the most posterior vein indicates the presence of another vein which, if considered to be a true vein, could only be A1, and (2) the most posterior vein takes a position and curvature which one would only expect for A2.)

Male terminalia (Figs 1D, 2, 4, 14). Sternite 9 present as a separate sclerite, or more or less merged with gonocoxites. Tergite 9 in most species discernible as a weakly sclerotised, curved bar between dorsal portions of gonocoxites. Gonocoxites often with large disto-lateral lobes, particularly large in species with size-reduced gonostyli. Posterior of ventro-lateral lobes of gonocoxites with a separate rim bearing 1 or more seta(e). Gonocoxites dorso-interiorly with a species specific array of setae and/or megasetae, often situated on lobes and referable to homologous positions I–IV. Gonocoxal apodemes well developed. Gonostyli of usual size, or more or less greatly reduced in size. Parastylar lobes distinct in most species, but very faint or absent in others. Ejaculatory apodeme not discernible, or, in a very few species, visible as a very weakly sclerotised rod running into ventro-distal margin of tegmen. Parameres fused to form a tegmen. Parameral apodemes well developed, crossing or meeting gonocoxal apodemes, both apparently interlocked. Tegmen ventro-laterally with membranous lobes sometimes very large; apically with a tube-like process directed ventrally or postero-ventrally, with opening at apex and ejaculatory duct leading therein. Hypoproct large, bilobed with lobes merged posteriorly; ventro- and disto-laterally setose or setulose, distally with pairs of large setae pointing posteriorly. Tergite 10 occasionally discernible as a bare, apparently membranous plate, or a rounded rim posterior of hypoproct. Cerci large; densely setose.

Even though not studied in detail here, the females of Costa Rican species do not differ fundamentally from those previously described or known to us from elsewhere.

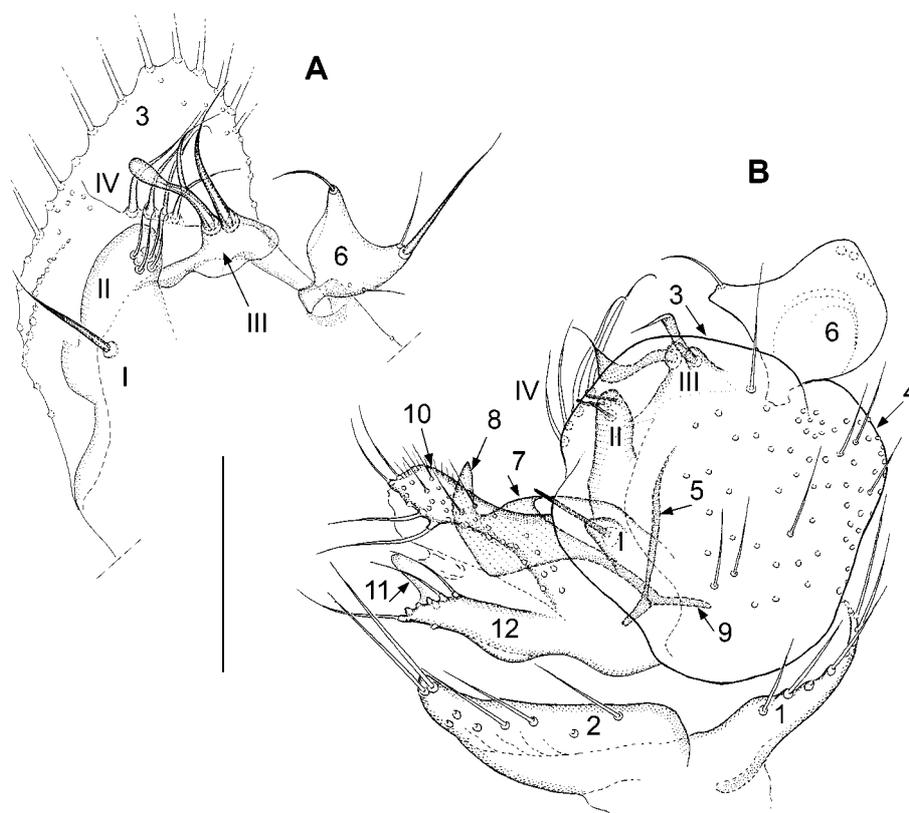


FIGURE 2. Male terminalia of *Manota* spp. **A:** Posterior portion of gonocoxites, lateral view of interior, of *M. parva* sp. n. **B:** Abdominal sclerite 8 and terminalia, lateral view, of *M. planistylus* sp. n. Scale 0.1 mm. 1 = segment 8, 2 = tergite 8, 3 = disto-lateral lobe of gonocoxites, 4 = ventro-lateral lobe of gonocoxites, 5 = gonocoxal apodeme, 6 = gonostylus, 7 = tegmen, 8 = apical tegmen process, 9 = parameral apodeme, 10 = hypoproct (sternite 10), 11 = tergite 10, 12 = cercus, I–IV = positions of setae/megasetae on gonocoxites.

Species groups. Based mainly on characters of the male terminalia, two species groups are recognisable.

(1) Terminalia with disto-lateral lobes of gonocoxites large, and gonostyli reduced in size and vestiture (= synapomorphous characters). Laterotergites bare in the majority of species, but setose in two others. The following species form a monophyletic group: *Manota acuminata*, *M. acutistylus*, *M. arenalensis*, *M. corcovado*, *M. costaricensis*, *M. diversiseta*, *M. eximia*, *M. fraterna*, *M. incisa*, *M. inornata*, *M. limonensis*, *M. montivaga*, *M. parva*, *M. rotundistylus*, *M. spinosa*, and *M. vexillifera*.

In *Manota intermedia*, *M. planistylus*, and *M. rectolobata* (= *planistylus* subgroup), the disto-lateral lobes of the gonocoxites are very small and the gonostyli very large, which are presumably reversals of the states described above. As details of the vestiture of the gonostyli correspond with the species grouped under (1), we have no doubt that the *planistylus* subgroup belongs there.

Manota bihamata and *M. penicillata*, both with little-reduced gonostyli and setose laterotergites, are also best grouped under (1).

(2) Terminalia with disto-lateral lobes of gonocoxites small or absent, and gonostyli large and strongly setose. Laterotergites setose or bare. This group, very probably not monophyletic, comprises species that lack the synapomorphous characters referred to under (1). Included here are *Manota caribica*, *M. major*, *M. multisetosa*, *M. rara*, *M. squamulata*, and *M. tapantiensis*.

Key to species (males)

1. Laterotergite setose.....2
- Laterotergite bare 12
2. Anterior basalare setose 3
- Anterior basalare bare. 4
3. Sternite 9 with non-setose area medially small or absent. Gonostyli one-lobed. Parastylar lobes with straight setae. Small species *M. squamulata* sp. n. (Fig. 7)
- Sternite 9 with non-setose area medially large. Gonostyli two-lobed. Parastylar lobes with curly or whip-like setae. Large species *M. major* sp. n. (Fig. 8)
4. Gonostyli large, flat and poorly setose. Disto-lateral lobes of gonocoxites very small ..
..... 5
- Gonostyli small; if larger, then strongly setose and not particularly flat. Disto-lateral lobes of gonocoxites usually large, but small in species with strongly setose gonostyli
..... 7
5. Gonostyli in ventral view subrectangular, not narrowed distally. Ventro-lateral lobes of gonocoxites rounded. In position III with comparatively narrow megasetae
..... *M. planistylus* sp. n. (Fig. 26)
- Gonostyli in ventral view narrowed distally. Ventro-lateral lobes of gonocoxites subrectangular. In position III with broad megasetae, one considerably broader than the other
..... 6
6. Gonostyli with setae along anterior margin. Posterior of ventro-lateral gonocoxal lobes with seta of ordinary size *M. rectolobata* sp. n. (Fig. 27)
- Gonostyli without setae along anterior margin. Posterior of ventro-lateral gonocoxal lobes with a very strong seta *M. intermedia* sp. n. (Fig. 28)
7. Disto-lateral lobes of gonocoxites with a strikingly dense brush of large setae
..... *M. penicillata* sp. n. (Fig. 9)
- Disto-lateral lobes of gonocoxites without such a brush of setae 8
8. Sternite 9 postero-medially with a small, rectangular lobe. Third palpomere with 2 curved sensilla..... *M. bihamata* sp. n. (Fig. 10)
- Sternite 9 postero-medially without a lobe. Third palpomere with 3 curved sensilla... 9
9. Gonostyli large and strongly setose. Disto-lateral lobes of gonocoxites very small... 10

- Gonostyli small and poorly setose. Disto-lateral lobes of gonocoxites large 11
- 10. Disto-lateral lobes of gonocoxites inside with numerous short, stiff, very thick setae. Ventro-lateral lobes of gonocoxites not incised *M. spinosa* sp. n. (Fig. 11)
- Disto-lateral lobes of gonocoxites without such setae. Ventro-lateral lobes of gonocoxites strikingly incised.....*M. incisa* sp. n. (Fig. 13A)
- 11. Sternite 9 with posterior margin straight. Gonostyli subbasally with a small lobe.....
..... *M. rara* sp. n. (Fig. 3C)
- Sternite 9 with posterior margin emarginate. Gonostyli without a subbasal lobe.....
..... *M. caribica* sp. n. (Fig. 4)
- 12. Disto-lateral lobes of gonocoxites absent. Gonostyli large 13
- Disto-lateral lobes of gonocoxites large. Gonostyli small 14
- 13. Sternite 9 subtrapezoid. Ventro-lateral lobes of gonocoxites without a group of setae marginally. Gonostyli ovoid..... *M. multisetosa* sp. n. (Fig. 5)
- Sternite 9 semicircular. Ventro-lateral lobes of gonocoxites with a group of some 7 setae marginally. Gonostyli elongate *M. tapantiensis* sp. n. (Fig. 6)
- 14. Gonocoxites in position I with 1 large megaseta modified at tip..... 15
- Gonocoxites in position I with 1 unmodified, large, stiff seta/megaseta, or megasetae in positions I+II not distinguishable..... 16
- 15. In position I with a flag-like megaseta *M. vexillifera* sp. n. (Fig. 15)
- In position I with a hook-like megaseta *M. montivaga* sp. n. (Fig. 14)
- 16. Megasetae in positions I+II forming a common group 17
- Megaseta in position I well separate from megasetae/setae in position II 19
- 17. In position I+II with 4 megasetae..... *M. limonensis* sp. n. (Fig. 23)
- In position I+II with 5 or more megasetae 18
- 18. In position III with 2 very large, flat megasetae, each two- or three-branched; in position IV with 1 large, flat megaseta *M. eximia* sp. n. (Fig. 13B)
- In position III with 2 rather small, flat megasetae, each simple; in position IV with 2 long megasetae *M. acuminata* sp. n. (Fig. 18)
- 19. In position IV with 1 large, pointed megaseta directed inwards
..... *M. arenalensis* sp. n. (Fig. 12)
- In position IV with more than 1 megaseta/seta 20
- 20. In position II with at least 7 short, stiff setae 21
- In position II with 3 or less megasetae/setae 24
- 21. Sternite 9 situated very far anteriorly; almost non-setose. Gonocoxites ventrally with large setae along inner margin..... *M. inornata* sp. n. (Fig. 22)
- Sternite 9 with posterior margin at or beyond mid length of gonocoxites; setose. Gonocoxites without large setae along inner margin 22
- 22. Gonostyli without setae in centre of ventral surface.....*M. parva* sp. n. (Fig. 21)
- Gonostyli with setae/setulae in centre of ventral surface 23
- 23. Gonostyli with some 3 setae ventro-centrally *M. costaricensis* sp. n. (Fig. 19)

- Gonostyli with a patch of fine, almost microtrichia-like setulae ventro-centrally
..... *M. fraterna* sp. n. (Fig. 20)
- 24. Gonocoxites in position IV with 3 two-pointed megasetae. Gonostyli antero-apically
with 1 large, straight seta directed inwards 25
- Gonocoxites in position IV with 3 simple, large setae. Gonostyli without such seta . 26
- 25. Gonocoxites with a rounded, setose lobe on dorsal margin
..... *M. diversiseta* sp. n. (Fig. 17)
- Gonocoxites without such a lobe *M. corcovado* sp. n. (Fig. 16)
- 26. Ventro-lateral lobes of gonocoxites rounded. Gonostyli pointed apically
..... *M. acutistylus* sp. n. (Fig. 24)
- Ventro-lateral lobes of gonocoxites subrectangular. Gonostyli rounded apically
..... *M. rotundistylus* sp. n. (Fig. 25)

Manota rara sp. n. (Fig. 3C)

Description. Large species.

Male. Head. Antenna with fourth flagellomere 2.4 times as long as wide. Maxillary palpus with third palpomere bearing 3 curved sensilla; fourth palpomere with a parasegment apically.

Thorax. Anterior basalare bare. Laterotergite setose. Episternum 3 with ventral portion setose. **Wing.** Length 2.2 mm. Membrane non-setose. Sc distally of h bare. Junction of CuA2 into CuA1 incomplete.

Terminalia (Fig. 3C). Sternite 9 large, with posterior and most of lateral margins distinct; posterior margin straight, situated beyond mid length of gonocoxites; with setae larger than those on gonocoxites. Ventro-lateral lobes of gonocoxites small, subrectangular. Disto-lateral lobes of gonocoxites small and only dorsally developed. Gonocoxites in position I+II with a circle of some 10–15 short setae, some setae very thick and blunt, others stiff and pointed; in position III with 2 flat megasetae, each two-branched with one branch whip-like and the other branch rounded; with 1 large, posteriorly directed seta displaced from position IV into dorso-subapical position. Gonostyli elongate, bilobed; posterior lobe large, rounded, with numerous large setae; inwardly directed lobe smaller, subtriangular in ventral view, with some 10 setae marginally, obviously with a dorsal extension bearing 2 short setae. Parastylar lobes small, largely hidden behind gonostyli; each lobe with 2–3 setae apico-posteriorly. Parameral apodemes widely spread. Tegmen constricted in distal half; margin of ventro-lateral lobes distinct. Cerci unusually wide, longer than hypoproct. Hypoproct with short setulae disto-laterally.

Diagnostic characters. Among the species with long antennae and setose laterotergites, it has terminalia with very short disto-lateral lobes of the gonocoxites; elongate, bilobed gonostyli; unusually wide cerci; and gonocoxites with a characteristic circle of 10–15 short, stiff setae in position I+II.

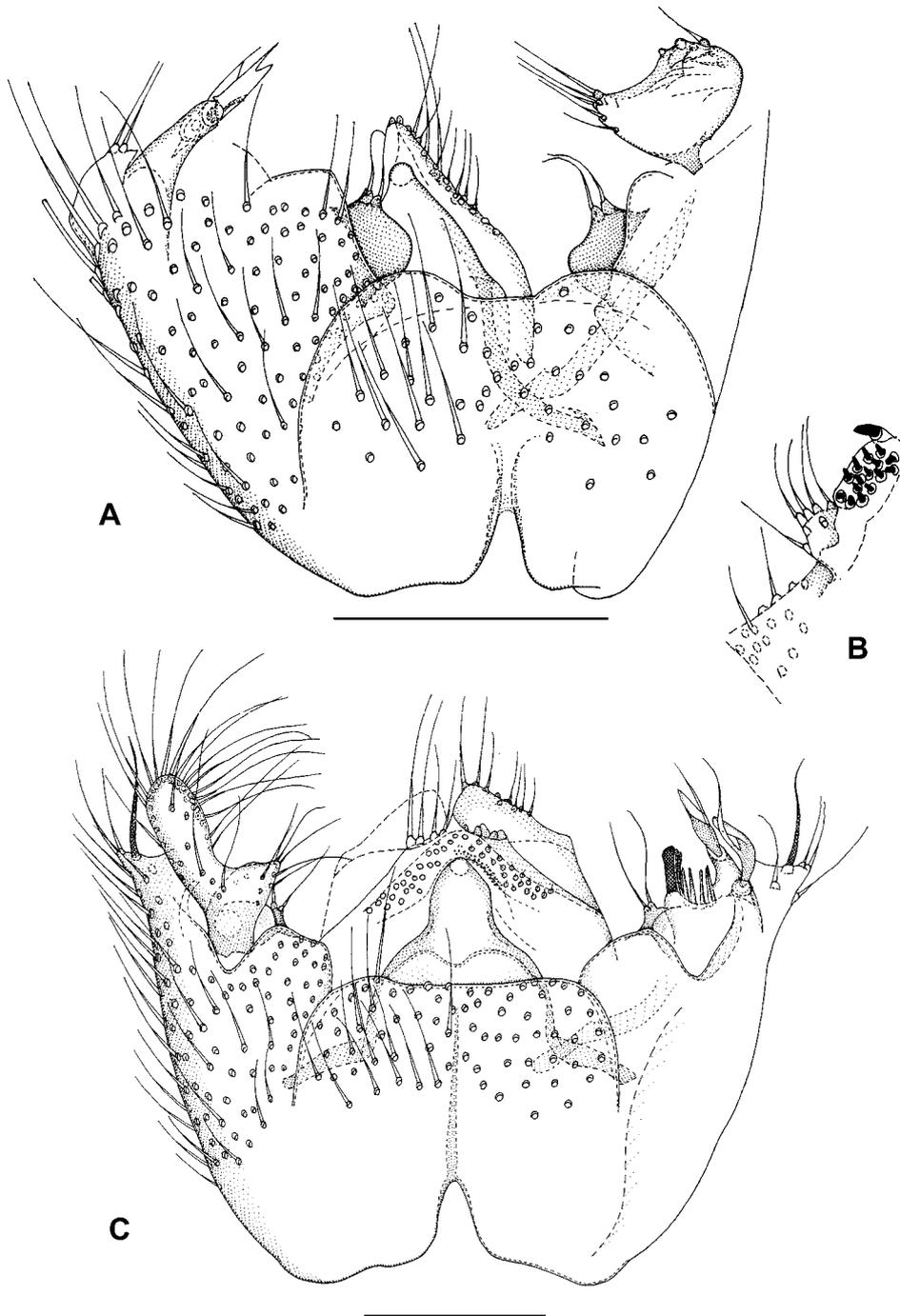


FIGURE 3. Male terminalia of *Manota* spp. **A:** *M. defecta* Will. (lectotype), ventral view. **B:** *M. defecta* Will. (lectotype), detail of gonocoxites showing vestiture in positions I and II, ventral view. **C:** *M. rara* sp. n. (holotype), ventral view. Scale = 0.1 mm.

Etymology. From Latin, *rarus*, scarce, referring to the evident scarcity of this species.

Holotype. Male, Costa Rica, Limón province, Hitoy Cerere Biological Reserve, Sendero Espavel, 560 m, in tall secondary rain-forest, 11 March–1 April 2003, by Malaise trap, E. Rojas, B. Gamboa & W. Arana (INBio sample #73628).

***Manota caribica* sp. n. (Fig. 4)**

Description. Large species.

Male. Head. Antenna with fourth flagellomere 1.6 times as long as wide. Maxillary palpus with third palpomere bearing 3 curved sensilla; fourth palpomere with a parasegment apically.

Thorax. Anterior basalare bare. Laterotergite setose. Episternum 3 with ventral portion setose. **Wing.** Length 2.0 mm. Membrane non-setose. Sc distally of h bare. Junction of CuA2 into CuA1 incomplete.

Terminalia (Fig. 4). Sternite 9 large, with posterior and most of lateral margins distinct; posterior margin emarginate, situated beyond mid length of gonocoxites; with setae larger than those on gonocoxites. Gonocoxites with a very dense covering of setae on ventro-lateral lobes and along postero-dorsal margin. Disto-lateral lobes of gonocoxites small and only dorsally developed. Gonocoxites in position I+II with some 15 short, stiff setae on lobe; in position III with 2 flat, pointed megasetae; in position IV with 1(–2) large seta(e). Gonostyli short, from some angles almost circular; on inner margin with 1 large seta directed posteriorly; on dorso-posterior margin with 6–7 large setae directed dorsally. Parastylar lobes small, stout; each with 2–3 setae apico-posteriorly. Parameral apodemes widely spread. Tegmen almost evenly tapering to tip; margin of ventro-lateral lobes distinct. Hypoproct pointed; with large setae disto-laterally.

Diagnostic characters. Among the species with setose laterotergites, it has terminalia with a distinct, large sternite 9; very short disto-lateral lobes of the gonocoxites; stout, rounded gonostyli with 1 large seta ventro-posteriorly; setose parastylar lobes; and pointed hypoproct.

Etymology. Latinized, *caribicus*, Caribbean, referring to the type locality located on the “Caribbean side” of Costa Rica.

Types. *Holotype.* Male, Costa Rica, Limón province, Hitoy Cerere Biological Reserve, Sendero Espavel, 300 m, in tall secondary rain-forest, 29 Sep.–10 Oct. 2003, by Malaise trap, M. & C. Jaschhof. *Paratype.* Male, same locality, but 550 m, 11 March–1 April 2003, by Malaise trap, E. Rojas, B. Gamboa & W. Arana (INBio sample #73627).

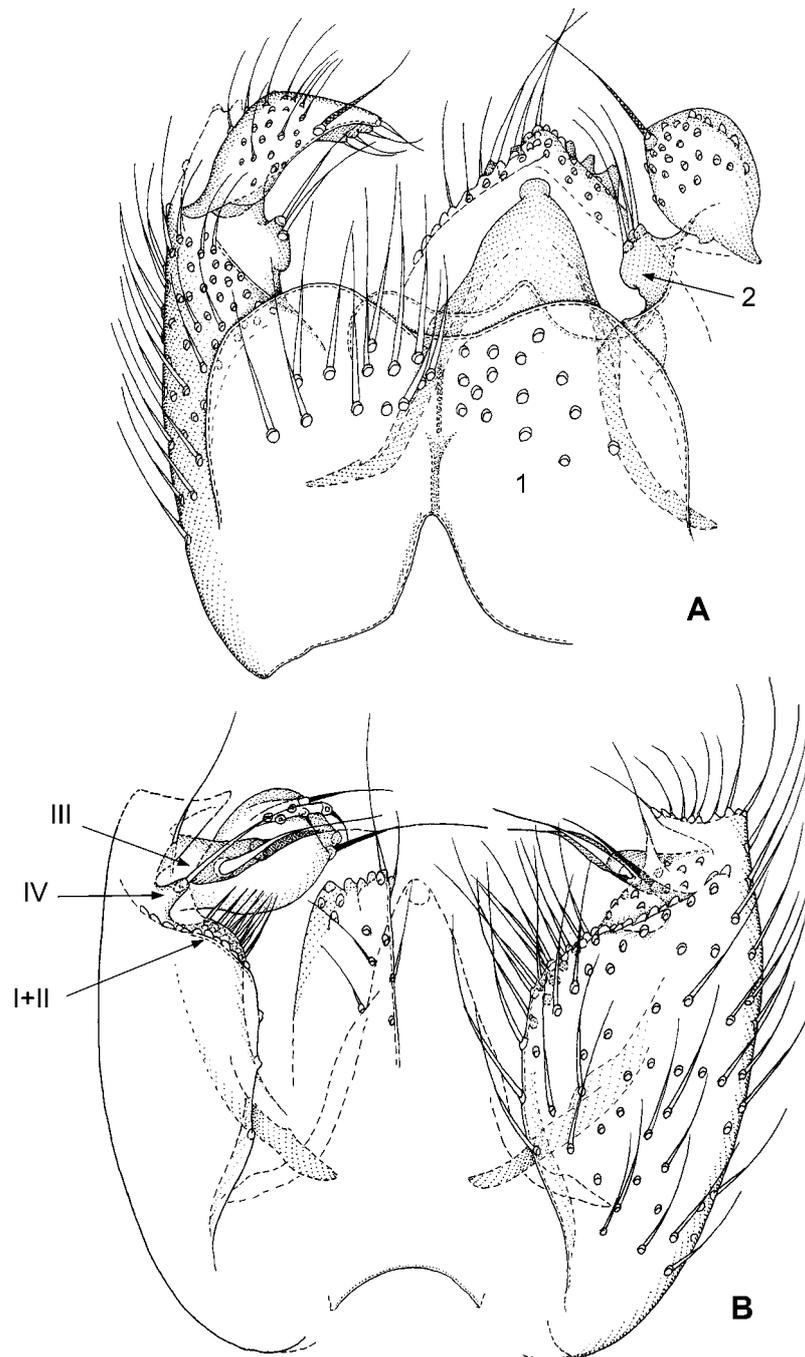


FIGURE 4. *Manota caribica* sp. n. **A:** Male terminalia, ventral view (holotype). **B:** Male terminalia, dorsal view (paratype). Scale = 0.1 mm. 1 = sternite 9, 2 = parastylar lobe, I-IV = positions of setae/megasetae on gonocoxites.

Manota multisetosa sp. n. (Fig. 5)

Description. Large species.

Male. **Head.** Antenna with fourth flagellomere 1.7 times as long as wide. Maxillary palpus with third palpomere bearing 3 curved sensilla; fourth palpomere with a parasegment apically.

Thorax. Anterior basalare and laterotergite each bare. Episternum 3 with ventral portion setose. **Wing.** Length 1.7–1.8 mm. Membrane with a few setae along posterior margin. Sc setose dorsally and ventrally. CuA2 fading away proximally.

Terminalia (Fig. 5). Sternite 9 small, trapezoid, with posterior and lateral margins distinct; posterior margin situated at mid length of gonocoxites, with a tiny notch medially. Ventro-lateral lobes of gonocoxites rounded; interiorly with up to 5 setae on a separate rim. Disto-lateral lobes of gonocoxites absent. Gonocoxites in position I+II with some 7 moderately large setae plus a dense, irregular comb of numerous shorter setae extending posteriorly; in position III+IV with 2 pointed megasetae. Gonostyli short, ovoid; with setae of moderate length, setae on dorsal side strong, directed dorsally and inwards. Parastylar lobes distinct, at some distance from gonostyli, large, bare. Tegmen almost evenly tapering to tip. Hypoproct broadly rounded, with a few long setae disto-laterally.

Diagnostic characters. Among the species with bare laterotergites, it has terminalia with disto-lateral lobes of the gonocoxites reduced; gonocoxites dorsally with a dense comb of setae; gonostyli stout and with large setae dorso-apically; and parastylar lobes very distinct, bare and situated at some distance from the gonostyli. Very similar to *M. tapantiensis*. (See next species).

Etymology. From Latin, *multus*, much, and *setosus*, setose, referring to the dense comb of setae dorsally on the gonocoxites.

Types. *Holotype.* Male, Costa Rica, Puntarenas province, Corcovado National Park, 600 m S Cerro Rincón, 745 m, 23 April–24 June 2002, by Malaise trap, J. Azofeifa (INBio sample #70842). *Paratypes.* 4 males, same data as the holotype; 1 male, same locality, but 1 Aug.–25 Sep. 2002 (INBio sample #71459); 4 males, same locality, but La Tigrilla, 600 m, 20 Dec. 2001–7 Feb. 2002, by Malaise trap, J. Azofeifa (INBio sample #67158); 1 male, same locality, but 7 Feb.–23 April 2002 (INBio sample #70848).

Other material studied. 3 males, Limón province, Hitoy Cerere Biological Reserve, Sendero Espavel, 11 March–1 April 2003, E. Rojas, B. Gamboa & W. Arana (INBio samples #73470, 73627 and 73628); 4 males, same locality, but 18 Sep.–7 Oct. 2003, E. Rojas, B. Gamboa, W. Arana, M. & C. Jaschhof; 1 male, Limón province, Pococí, Braulio Carrillo National Park, Estación Quebrada González, 23 April 2002, P. Hanson & C. Godoy (INBio sample #67599); 1 male, Puntarenas province, Cerro Puma 19 June–8 July 2003, M. Moraga, A. Azofeifa & K. Caballero (INBio sample #74508); 1 male, Puntarenas province, Gofito, Jiménez, Corcovado National Park, Cerro Mueller, 20 Dec. 2001–7 Feb. 2002, J. Azofeifa (INBio sample #67160); 1 male, same National Park, but Estación Patos, Sendero a Sirena, 5 May–8 June 2001, J. Azofeifa (INBio sample #64143); 1 male, Ala-

juela province, San Carlos, Volcán Arenal National Park, Sendero Pilon, 6–7 Nov. 2000, G. Carballo (INBio sample #60084); 1 male, Alajuela province, Estación Caribe, Sep.–Oct. 2002, W. Flowers (INBio sample #71759).

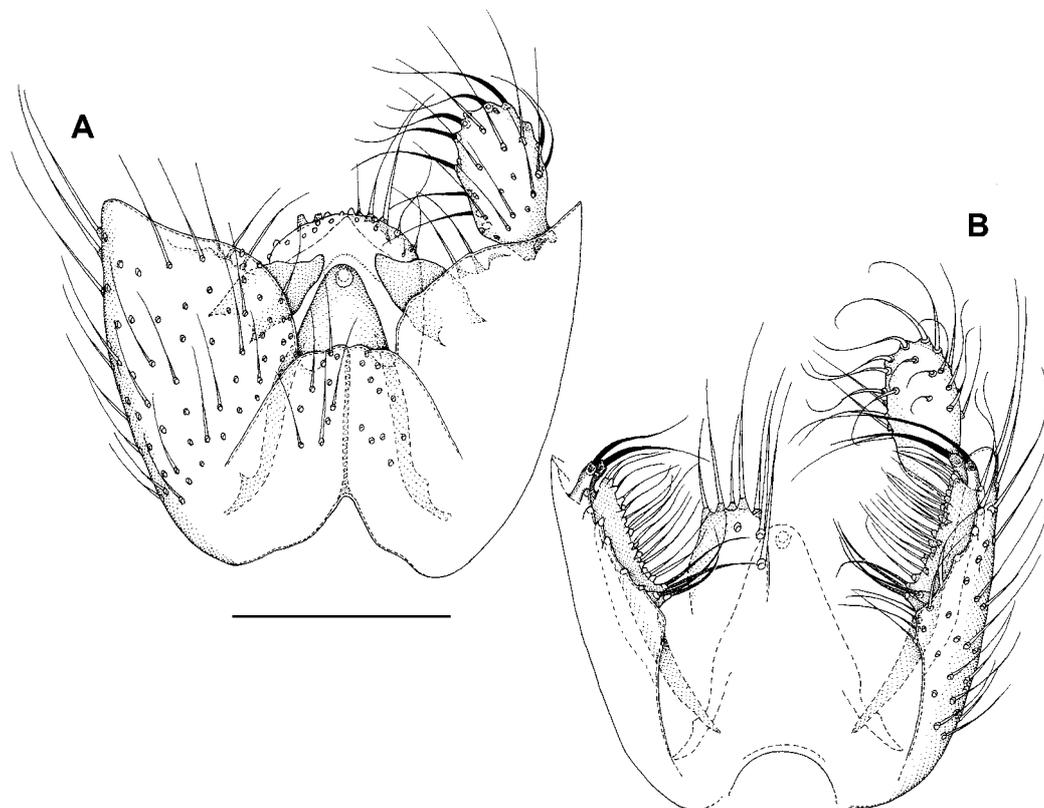


FIGURE 5. *Manota multisetosa* sp. n. **A:** Male terminalia, ventral view (holotype). **B:** Male terminalia, dorsal view (specimen from Estación Caribe). Scale = 0.1 mm.

***Manota tapantiensis* sp. n. (Fig. 6)**

Description. Large species.

Male. **Head.** Antenna with fourth flagellomere 1.6 times as long as wide. Maxillary palpus with third palpomere bearing 3 curved sensilla; fourth palpomere with a parasegment apically.

Thorax. Anterior basalare and laterotergite each bare. Episternum 3 with ventral portion setose. **Wing.** Length 2.1–2.5 mm. Membrane with a few setae along posterior margin. Sc setose dorsally. CuA2 fading away proximally.

Terminalia (Fig. 6). Very similar to *M. multisetosa*, with differences as follows. Sternite 9 with posterior margin broadly rounded. Vento-lateral lobes of gonocoxites with a group of some 7 setae marginally. Gonocoxites in position I+II with some 7 large setae on

small lobe plus a dense, irregular comb of numerous shorter setae extending posteriorly; in position III+IV with 2 megasetae, one megaseta pointed and the other flat and rounded; dorsal gonocoxal margin with a brush of setae on a small lobe, followed posteriorly by a stripe of thick setae. Gonostyli more elongate; with large setae concentrated dorso-distally.

Diagnostic characters. See under Terminalia.

Etymology. Derived from the type locality, Tapantí.

Types. Holotype. Male, Costa Rica, Cartago province, Tapantí–Macizo de la Muerte National Park, Sector la Represa, 1550 m, 26 March 2000, by Malaise trap, D. Rubí & C. Hansson (INBio sample #67894). *Paratypes.* 4 males, same data as the holotype; 3 males, same National Park, but Sendero Arboles Caídos, 1500–1600 m, 9 April 2002, by Malaise trap, D. Rubí & C. Hansson (INBio sample #67891).

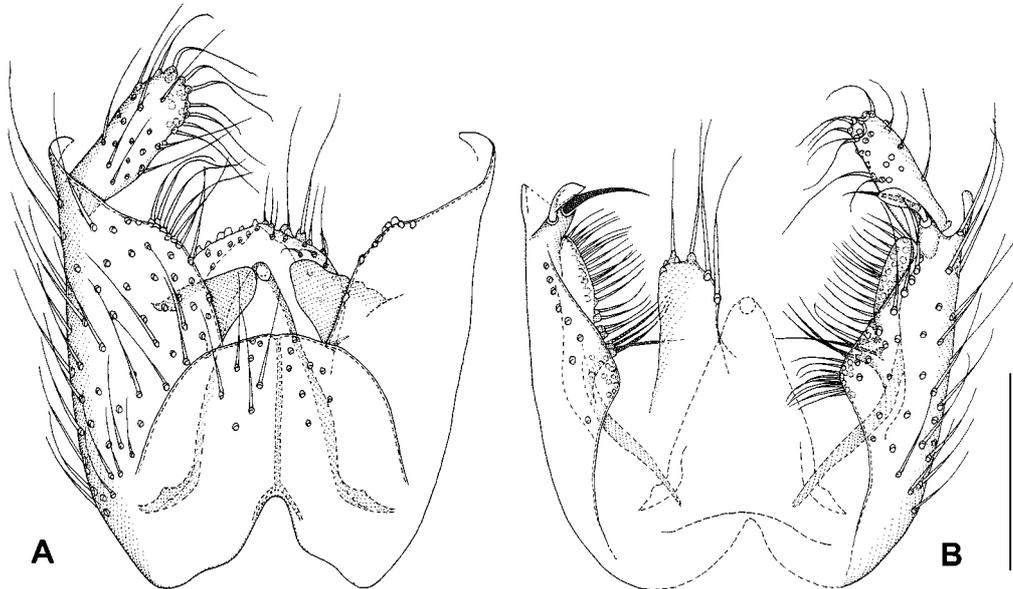


FIGURE 6. *Manota tapantiensis* sp. n. **A:** Male terminalia, ventral view (holotype). **B:** Male terminalia, dorsal view (paratype). Scale = 0.1 mm.

***Manota squamulata* sp. n. (Fig. 7)**

Description. Small species.

Male. Head. Antenna with fourth flagellomere 1.8 times as long as wide. Maxillary palpus with third palpomere bearing (3–)4(–5) curved sensilla; fourth palpomere with a small process apically.

Thorax. Anterior basalare and laterotergite each setose. Episternum 3 with ventral portion setose. **Wing.** Length 1.5 mm. Membrane with a few setae along posterior margin. Sc bare. CuA2 fading away proximally.

Terminalia (Fig. 7). Sternite 9 largely merged with gonocoxites; only posterior margin distinct, situated at almost same level as posterior gonocoxal margin, straight or very slightly emarginate; on interior surface with extensive scale-like pattern; on exterior surface densely covered with setae, sometimes with a small non-setose area medially. Disto-lateral lobes of gonocoxites absent. Gonocoxites in position I+II with 12–14 thick, blunt and pointed setae on lobe; in position III+IV with 1 pointed megaseta. Gonostyli short, slightly bilobed; ventral lobe on inner margin with some 5 large setae increasing in length posteriorly; dorsal lobe on posterior margin with some 4 large setae curved dorsally. Parastylar lobes large, rounded; each with some 5 setae posteriorly. Tegmen strongly narrowed in distal half, very wide basally with dorsal portions of tegmen extending laterally beyond width of parameral apodemes. Hypoproct tapering to tip; with long setae disto-laterally.



FIGURE 7. *Manota squamulata* sp. n. **A:** Male terminalia, ventral view (holotype). **B:** Male terminalia, dorsal view (paratype from Cerro Puma). Scale = 0.1 mm.

Diagnostic characters. Together with *M. major* (next species), this is the only species with both the anterior basalare and laterotergites setose. The terminalia with sternite 9 are largely merged with the gonocoxites and with a scale-like pattern on the interior surface;

disto-lateral lobes of the gonocoxites are absent; gonostyli are stout and with large setae apically; and the parastylar lobes are large and setose.

Etymology. From Latin, *squamulatus*, with small scales, referring to the interior surface structure on sternite 9.

Types. Holotype. Male, Costa Rica, Limón province, Hitoy Cerere Biological Reserve, Sendero Espavel, 100–550 m, in tall secondary rain-forest, 18 Sep.–7 Oct. 2003, by sweepnet and aspirator, M. Jaschhof. *Paratypes.* 1 male, same data as the holotype; 2 males, same data, but 550 m, by Malaise trap, E. Rojas, B. Gamboa, W. Arana, M. & C. Jaschhof; 1 male, Puntarenas province, Cerro Puma, 100–300 m, 19 June–8 July 2003, by flight interception trap, M. Moraga, A. Azofeifa & K. Caballero (INBio sample #74480).

Manota major sp. n. (Fig. 8)

Description. Large species.

Male. Head. Antenna with fourth flagellomere 2.1 times as long as wide. Maxillary palpus with third palpomere bearing 4(–5) curved sensilla; fourth palpomere with a small process apically.

Thorax. Anterior basalare and laterotergite each setose. Episternum 3 setose. **Wing.** Length 1.7–2.2 mm. Membrane with a few setae along posterior wing margin. Sc setose dorsally. CuA-fork complete.

Terminalia (Fig. 8). Extremely similar to *M. squamulata*, with differences as follows. Sternite 9 with a large non-setose area medially (Fig.). Gonocoxites in position I+II with 16–18 blunt megasetae; in position III+IV with 1 pointed, blade-like megaseta. Gonostyli short, not bilobed, from some angles almost circular; on inner margin with some 5 setae increasing in length posteriorly, with most posterior seta particularly large; dorso-posterior gonocoxal margin with numerous setae curved dorsally. Parastylar lobes each with some 5 curly, or whip-like setae apically. Tegmen with dorsal portions not extending laterally beyond width of parameral apodemes.

Diagnostic characters. See under Terminalia.

Etymology. From Latin, *major*, larger, referring to the larger body size compared with the closely related *M. squamulata*.

Types. Holotype. Male, Costa Rica, Limón province, Pococí, Braulio Carrillo National Park, Estación Quebrada González, 400–500 m, 15 May 2002, by Malaise trap, P. Hanson & C. Godoy (INBio sample #68654). *Paratypes.* 1 male, Puntarenas province, La Amistad International Park, Buenos Aires, Sendero a Casa Coca, 1700 m, 13 Oct.–13 Nov. 2001, by Malaise trap, D. Rubí (INBio sample #74889); 1 male, Alajuela province, San Carlos, Volcán Arenal National Park, Sendero Pilon, 650 m, 6–7 Nov. 2000, by Malaise trap, G. Carballo (INBio sample #60084).

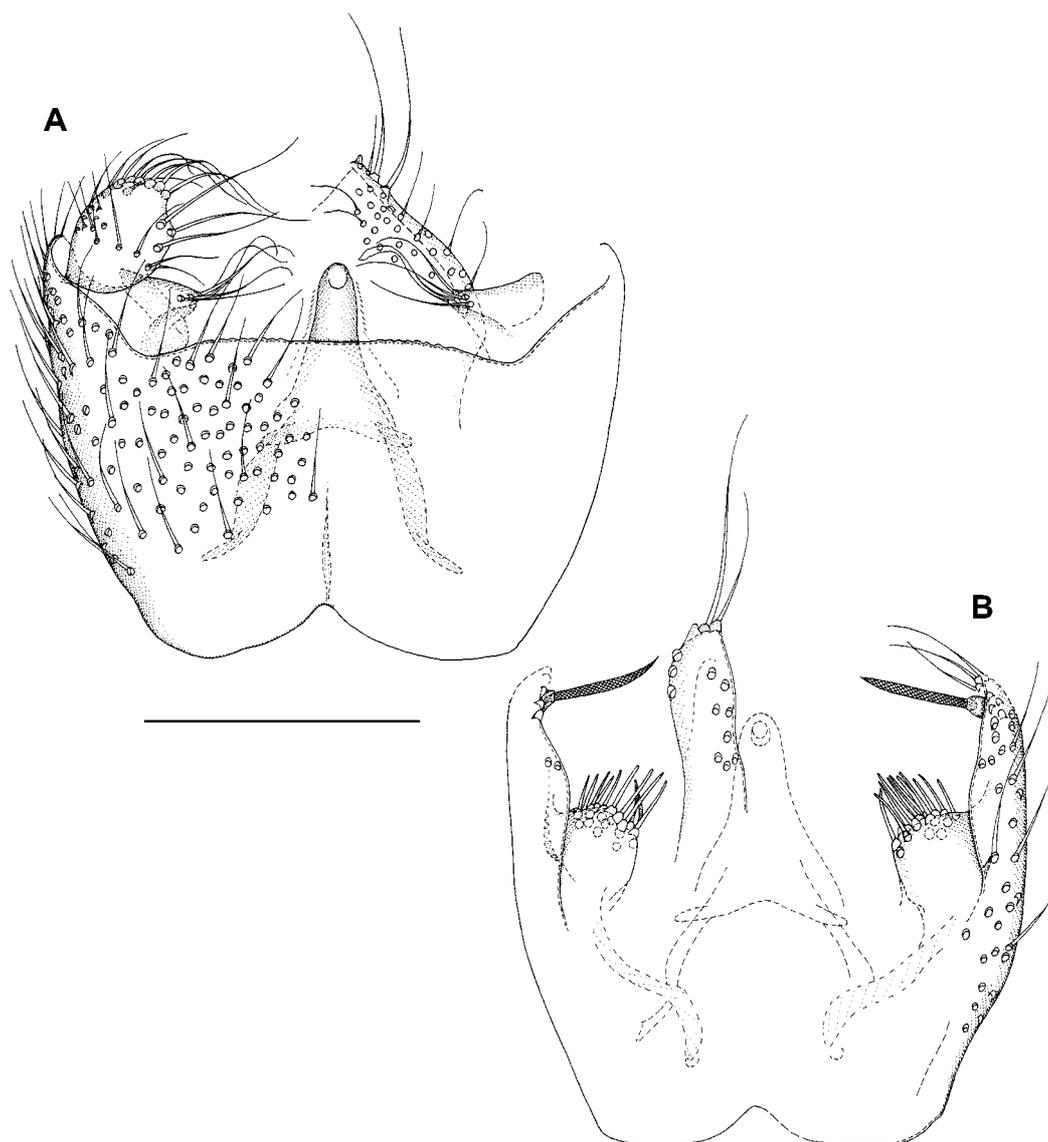


FIGURE 8. *Manota major* sp. n. **A:** Male terminalia, ventral view (holotype). **B:** Male terminalia, dorsal view (paratype from Volcán Arenal). Scale = 0.1 mm.

***Manota penicillata* sp. n. (Fig. 9)**

Description. Large species.

Male. **Head.** Antenna with fourth flagellomere 1.9 times as long as wide. Maxillary palpus with third palpomere bearing 3 curved sensilla; fourth palpomere with a parasegment apically.

Thorax. Anterior basalare bare. Laterotergite setose. Episternum 3 with ventral portion setose. **Wing.** Length 1.7–1.8 mm. Membrane occasionally with single setae along posterior margin. Sc bare. CuA2 fading away proximally.

Terminalia (Fig. 9). Sternite 9 large, with posterior and most of lateral margins distinct; posterior margin with a wide, shallow emargination and a tiny notch medially; with setae larger than those on gonocoxites. Disto-lateral lobes of gonocoxites large; each lobe with a dense brush of large, curly setae apically, inside with a dense stripe of shorter setae on ridge extending from ventral to dorsal side. Gonocoxites in position I+II with a patch of some 15–20 short, blunt setae; in position III+IV with 2 flat megasetae, each broad basally and whip-like apically. Gonostyli small, elongate; on ventral surface with setae of various lengths, dorso-apically with some 6 strong setae directed dorsally. Parastylar lobes large; each with 2–3 setae apico-posteriorly. Parameral apodemes widely spread. Tegmen evenly tapering to tip; margin of ventro-lateral lobes distinct. Hypoproct almost pointed; with long setae disto-laterally.

Diagnostic characters. Among the species with setose laterotergites, it has the terminalia quite distinct because of the striking brush of setae on the disto-lateral lobes of the gonocoxites.

Etymology. From Latin, *penicillatus*, brush-like setose, referring to the peculiar setae on the gonocoxites.

Types. *Holotype.* Male, Costa Rica, Puntarenas province, Corcovado National Park, Cerro Rincón, 745 m, 1 Aug.–25 Sep. 2002, by Malaise trap, J. Azofeifa (INBio sample #71459). *Paratypes.* 7 males, same data as the holotype.

Other material studied. 2 males, same locality as the types, but 23 April–24 June 2002 (INBio samples #70842 and 70843).

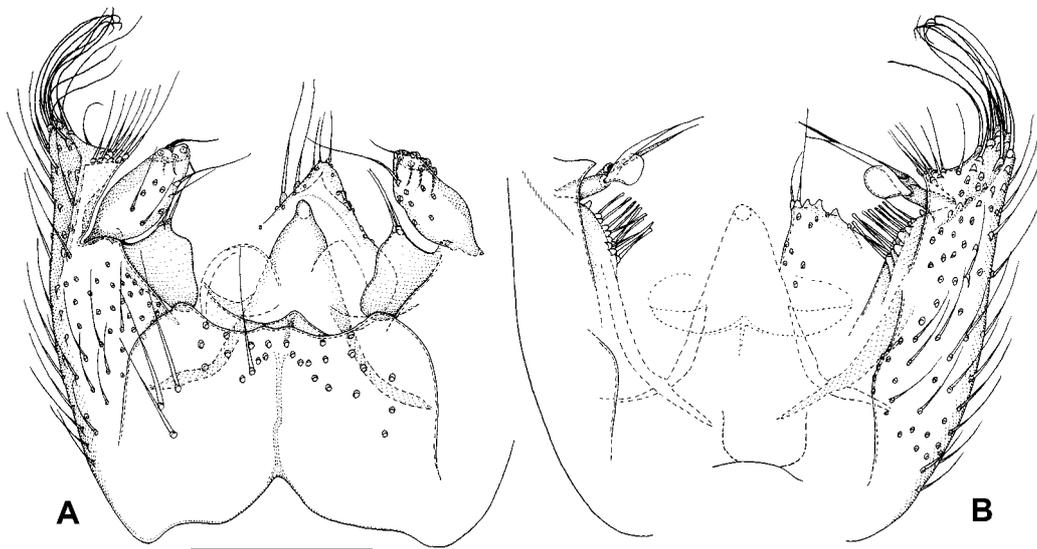


FIGURE 9. *Manota penicillata* sp. n. **A:** Male terminalia, ventral view (holotype). **B:** Male terminalia, dorsal view (paratype). Scale = 0.1 mm.

Manota bihamata sp. n. (Figs 1C, 10)

Description. Large species.

Male. **Head.** Antenna with fourth flagellomere 1.9 times as long as wide. Maxillary palpus with third palpomere bearing 2 curved sensilla; fourth palpomere with a small process apically.

Thorax. Anterior basalare bare. Laterotergite setose. Episternum 3 with ventral portion setose. **Wing** (Fig. 1C). Length 2.2–2.8 mm. Membrane with a few setae along posterior margin. Sc setose dorsally and ventrally. M1 proceeding proximally as a row of setae. CuA-fork complete. Presence of A1 indicated by a few setae in a line.

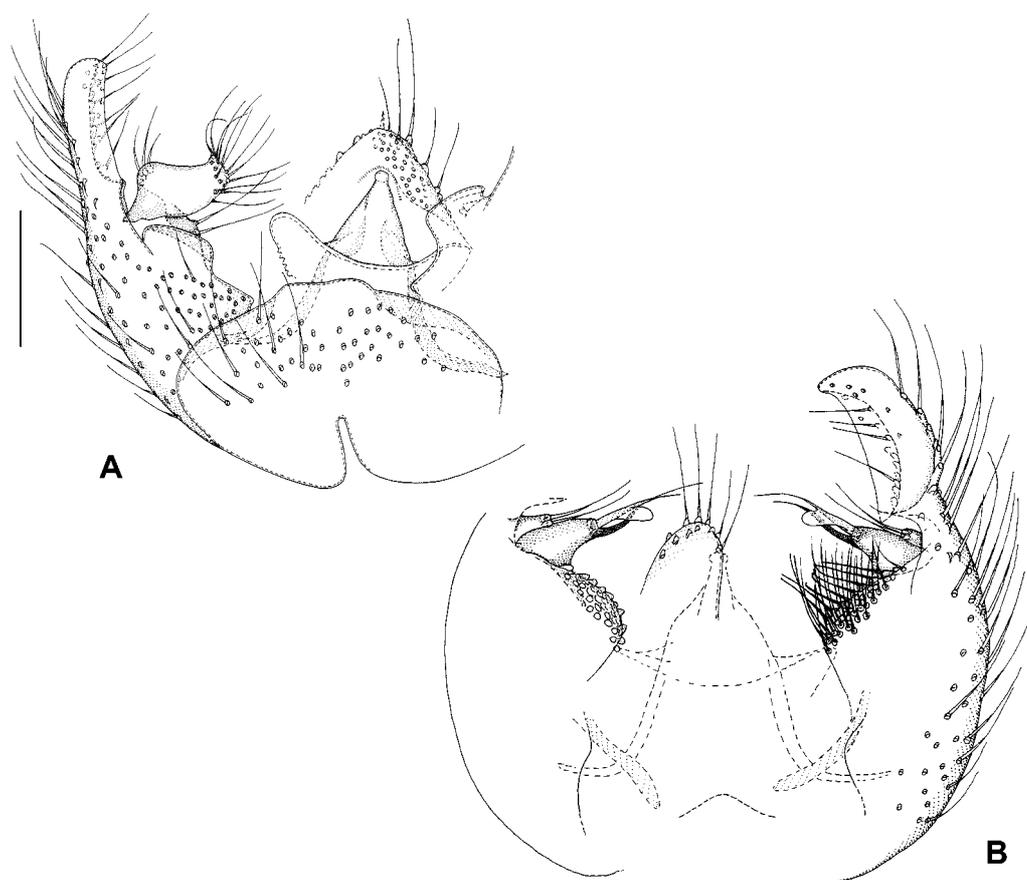


FIGURE 10. *Manota bihamata* sp. n. **A:** Male terminalia, ventral view (holotype). **B:** Male terminalia, dorsal view (paratype from Madreselva). Scale = 0.1 mm.

Terminalia (Fig. 10). Sternite 9 distinct, large, rounded laterally, on posterior margin with a small, subrectangular lobe medially; with setae larger than those on gonocoxites. Vento-lateral lobes of gonocoxites posteriorly bare and subrectangular, with very dense

setae anteriorly. Disto-lateral lobes of gonocoxites large; each lobe bare inside ventrally and apically, with setae of various lengths elsewhere. Gonocoxites in position I+II with a large, very dense patch of numerous setae on lobe; in position III with 2 flat megasetae, one megaseta simple and whip-like apically, the other two-branched with one branch rounded and the other branch whip-like; in position IV with 2 large setae directed inwards. Gonostyli small, flat; with numerous long setae apically and some 5 setae dorso-subbasally. Parastylar lobes small; each with 2–3 long setae. Parameral apodemes widely spread. Tegmen evenly tapering to tip; margin of ventro-lateral lobes very distinct. Hypoproct tapering to tip; with long setae disto-laterally.

Diagnostic characters. This is the only species with only two, instead of three or more, curved sensilla on the third palpomere. Laterotergites are setose. The terminalia are distinct because of the outline of sternite 9 and gonocoxites.

Etymology. From Latin, *bihamatus*, with two hooks, referring to the two curved sensilla on the third palpomere.

Types. Holotype. Male, Costa Rica, Puntarenas province, Buenos Aires, Potrero Grande, La Amistad International Park, Estación Altamira, Cerro Frantzius, 2134 m, 21 Sep.–21 Oct. 2002, by Malaise trap, D. Rubí & M.M. Chavarria (INBio sample #72953). *Paratypes.* 1 male, same data as holotype; 2 males, Cartago province, Finca los Lagos, Madreselva, 2600 m, 1 Sep.–23 Oct. 1994, by Malaise trap, M.M. Chavarria (INBio sample #3354); 2 males, same locality, but April–May 1994, M.M. Chavarria & A. Solano (INBio sample #5494).

Manota incisa sp. n. (Fig. 13A)

Description. Large species.

Male. **Head.** Antenna with fourth flagellomere 1.7 times as long as wide. Maxillary palpus with third palpomere bearing 3 curved sensilla; fourth palpomere with a parasegment apically.

Thorax. Anterior basalare bare. Laterotergite setose. Episternum 3 with ventral portion setose. **Wing.** Length 1.9 mm. Membrane with a few setae along posterior margin. Sc bare. CuA2 fading away proximally.

Terminalia (Fig. 13A). Sternite 9 distinct, with posterior margin straight; with setae larger than, or as large as, those on gonocoxites. Ventro-lateral lobes of gonocoxites sharply incised; interiorly with 3–4 fine setae. Disto-lateral lobes of gonocoxites short; with large, straight setae. Gonocoxites ventrally beyond insertion of gonostyli with a bare, sclerotised margin, followed posteriorly by a small, setose lobe; in position I+II with numerous short, stiff setae on lobe plus 1 small, flat, pointed megaseta (not illustrated); in position III with 2 flat, two-branched megasetae with one branch broadly rounded and the other whip-like; in position IV with 3 setae on lobe. Gonostyli small, flat; with 2 short, stiff setae plus 1 longer seta dorso-posteriorly and 1 pointed megaseta plus 1 seta antero-

apically. Parastylar lobes hidden behind gonostyli, very weak, bare. Parameral apodemes widely spread. Tegmen evenly tapering to tip; ventro-lateral lobes very distinct. Hypoproct rounded apically; disto-laterally with fine, rather long setae.

Diagnostic characters. Among the species with setose laterotergites, it has the terminalia quite distinct because of the strikingly incised ventro-lateral lobes of the gonocoxites.

Etymology. From Latin, *incisus*, incised, referring to the outline of the gonocoxites.

Holotype. Male, Costa Rica, Cartago province, Tapantí–Macizo de la Muerte National Park, Sendero Arboles Caídos, 1500–1600 m, 9 April 2002, by Malaise trap, D. Rubí & C. Hansson (INBio sample #67891).

Manota spinosa sp. n. (Figs 1A, 11)

Description. Small species.

Male. **Head.** Antenna with fourth flagellomere 1.5 times as long as wide (Fig. 1A). Maxillary palpus with third palpomere bearing 3 curved sensilla; fourth palpomere with a parasegment or small process apically.

Thorax. Anterior basalare bare. Laterotergite setose. Episternum 3 in ventral portion with up to 3 setae. **Wing.** Length 1.4–1.7 mm. Membrane without setae. Sc bare. CuA-fork complete. Setae on CuA2 and A2 absent or very few.

Terminalia (Fig. 11). Sternite 9 with posterior margin and portions of lateral margins distinct; posterior margin emarginate medially. Ventro-lateral lobes of gonocoxites with 2 small, curved setae interiorly on a separate rim. Disto-lateral lobes of gonocoxites large; inside distally with some 20–25 short, very thick setae; at base with numerous long, fine, curly trichia presumedly belonging to parastylar lobes. Gonocoxites in position I+II with some 15–20 short, stiff setae on lobe; in position III with 1 short, flat, crescent-shaped megaseta plus 2 short, pointed setae; in position IV with 2 thick, blunt megasetae. Gonostyli small, flat, subrectangular in ventral view; each ventro-anteriorly with 4 setae, dorso-posteriorly with 3 setae directed dorsally with one seta particularly strong and re-curved. Parameral apodemes widely spread. Tegmen with ventro-lateral lobes large and very distinct. Hypoproct almost pointed apically; laterally with long setae. Tergite 9 present as a very weak, bilobed plate with strongly sclerotised anterior margin; in holotype specimen even with large setae.

Diagnostic characters. Among the species with setose laterotergites, it has the terminalia quite distinct because of the presence of numerous short, thick setae inside on the disto-lateral lobes of the gonocoxites.

Etymology. From Latin, *spinus*, spiny, referring to the dense covering of thick setae on the gonocoxites.

Types. *Holotype.* Male, Costa Rica, Puntarenas province, Corcovado National Park, 600 m S Cerro Rincón, 745 m, 23 April–24 June 2002, by Malaise trap, J. Azofeifa (INBio sample #70842). *Paratypes.* 10 males, same data as the holotype.

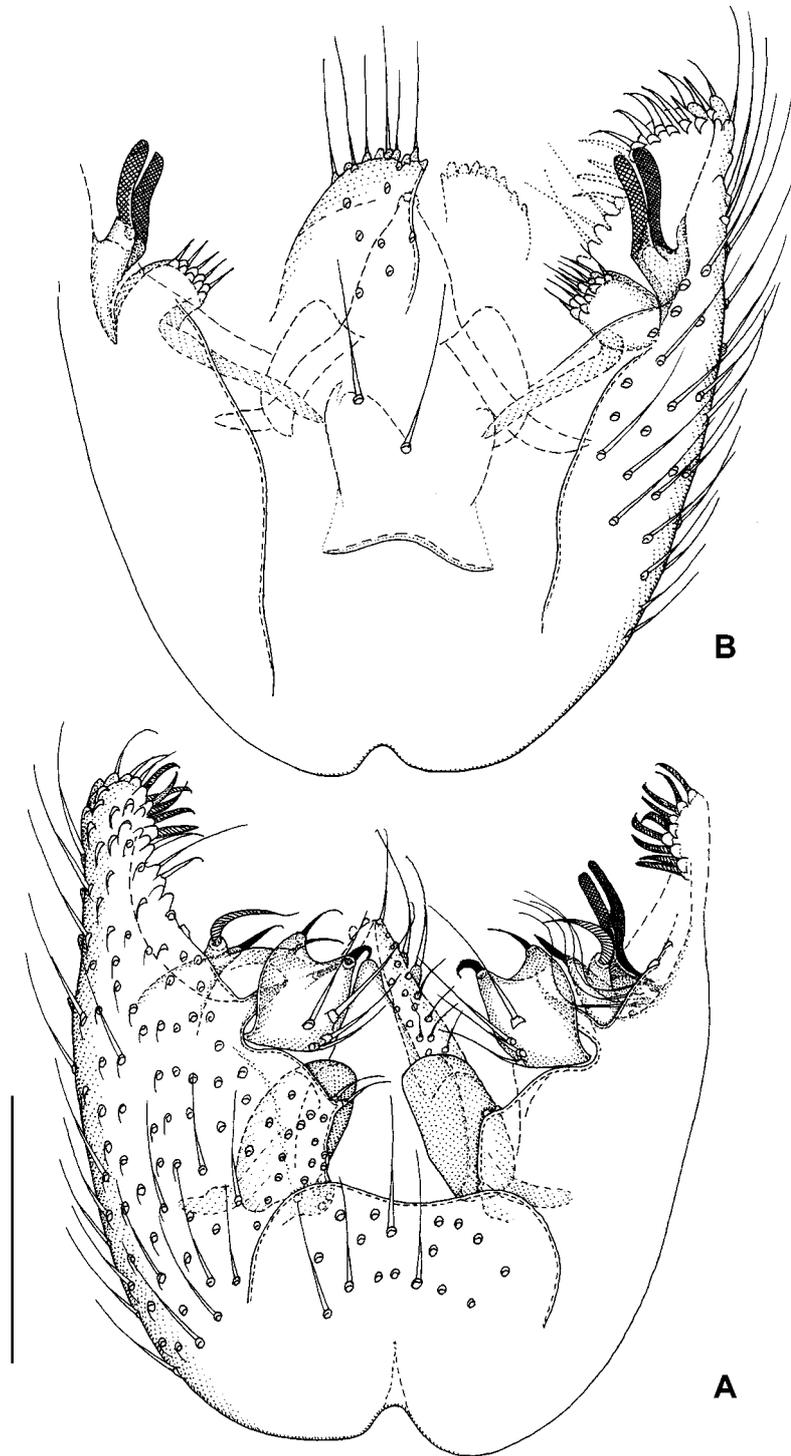


FIGURE 11. *Manota spinosa* sp. n. **A:** Male terminalia, ventral view (holotype). **B:** Male terminalia, dorsal view (paratype). Scale = 0.1 mm.

Other material studied. 3 males, same data as the types, but 800 m S Cerro Rincón (INBio sample #70843); 2 males, same National Park, but Cerro Rincón, La Tigrilla, 20 Dec. 2001–7 Feb. 2002, J. Azofeifa (INBio sample #67158); 1 male, same National Park, but Cerro Mueller, 20 Dec. 2001–7 Feb. 2002, J. Azofeifa (INBio sample #67160); 1 male, same National Park, but Estación Agujas, 800 m N Cerro Las Quebraditas, 6 Nov.–20 Dec. 2001, J. Azofeifa (INBio sample #66478).

***Manota arenalensis* sp. n. (Fig. 12)**

Description. Large species.

Male. Head. Antenna with fourth flagellomere 1.9 times as long as wide. Maxillary palpus with third palpomere bearing 3 curved sensilla; fourth palpomere with a parasegment apically.

Thorax. Anterior basalare and laterotergite each bare. Episternum 3 with ventral portion setose. **Wing.** Length 1.7–2.2 mm. Membrane with a few setae along posterior margin. Sc bare. Junction of CuA2 into CuA1 incomplete or complete.

Terminalia (Fig. 12). Sternite 9 almost completely merged with gonocoxites, with only small portions of posterior margin recognisable; margin situated beyond mid length of gonocoxites. Ventro-lateral edges of gonocoxites lobe-like and with some 5 stronger setae; interiorly with 1 curved seta on a separate rim. Disto-lateral lobes of gonocoxites large; with large, straight setae pointing posteriorly and smaller, curly setae pointing inwards. Gonocoxites in position I with 1 medium-sized, blunt megaseta; in position II with 3 short, strong, stiff setae on lobe; in position III with 2 flat megasetae, one megaseta simple and pointed, the other two-branched with one branch broadly rounded and the other branch whip-like; in position IV with 1 pointed megaseta directed inwards. Gonostyli small, slender, bilobed; ventral lobe each with 1 large and 1 smaller setae apically, dorsal lobe with 2+1 setae with one apical seta strongly re-curved. Parastylar lobes large, very weak in some specimens, but seemingly sclerotised in others. Tegmen long and narrow, almost evenly tapering to tip. Hypoproct broad apically; with long setae laterally.

Diagnostic characters. Among the species with both anterior basalare and laterotergites bare, it has the terminalia characterised by the combination of very small, slender gonostyli; gonocoxites in position IV with one large, pointed megaseta pointing strictly inwards (see also next species, *M. eximia*); and sternite 9 almost indistinguishable from the gonocoxites.

Etymology. Derived from the type locality, Arenal volcano.

Types. Holotype. Male. Costa Rica, Alajuela province, San Carlos, Volcán Arenal National Park, Sendero Pilón, 650 m, 6–7 Nov. 2000, by Malaise trap, G. Carballo (INBio sample #60084). *Paratypes.* 3 males, same data as the holotype; 3 males, Cartago province, Tapantí-Macizo de la Muerte National Park, Sector la Represa, 1550 m, 26 March 2000, by Malaise trap, D. Rubí & C. Hansson (INBio sample #67894); 2 males, same

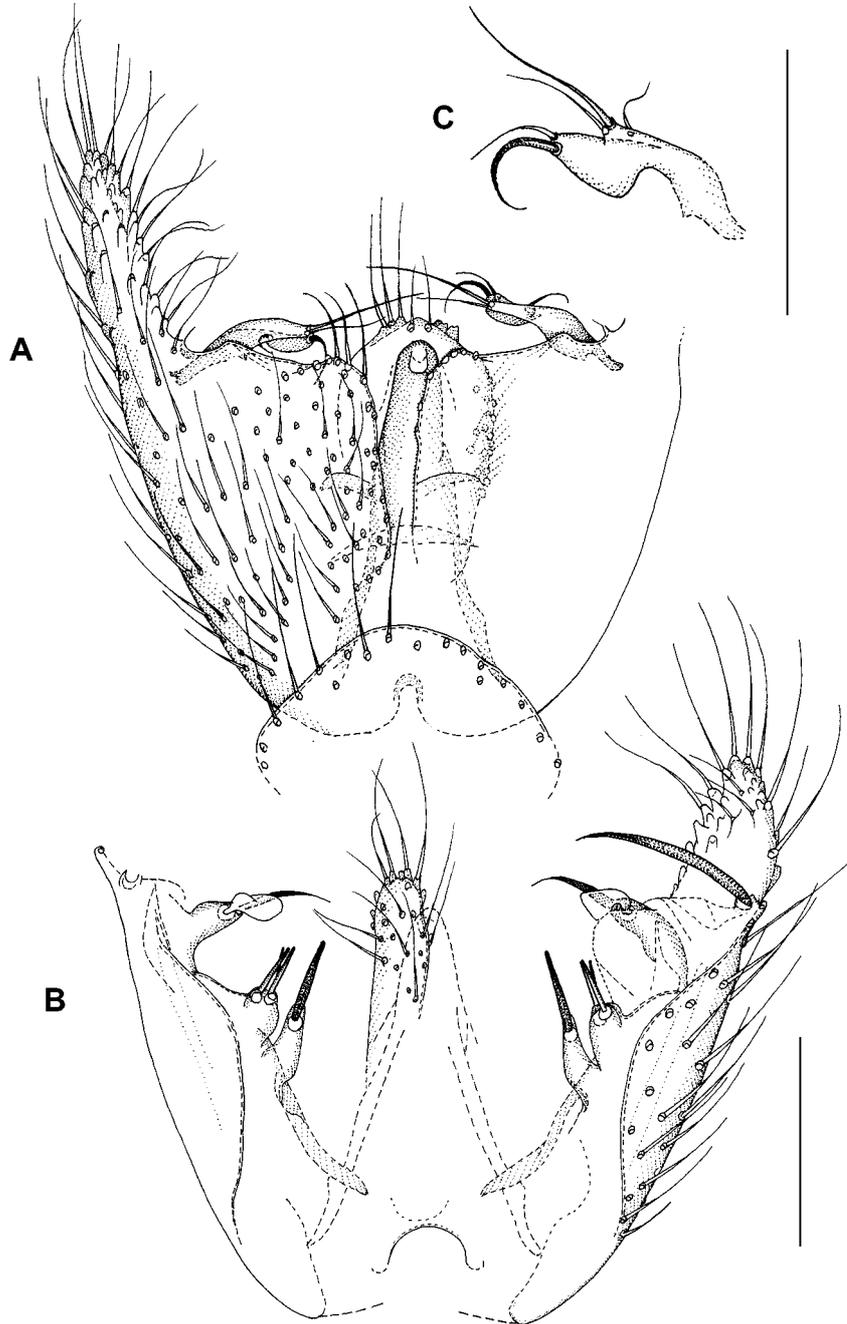


FIGURE 12. *Manota arenalensis* sp. n. **A:** Male terminalia and sternite 8, ventral view (holotype). **B:** Male terminalia, dorsal view (paratype). **C:** gonostylus, ventral view (paratype from Tapantí). Scale = 0.1 mm.

Other material studied. 1 male, Puntarenas province, La Amistad International Park, Buenos Aires, Sendero a Casa Coca, 13 Oct.–13 Nov. 2001, D. Rubí (INBio sample #74889); 3 males, Limón province, Hitoy Cerere Biological Reserve, Sendero Espavel, 18 Sep.–7 Oct. 2003, E. Rojas, B. Gamboa, W. Arana, M. & C. Jaschhof; 1 male, Limón province, Pococí, Braulio Carrillo National Park, Estación Quebrada González, 21 Aug. 2002, P. Hanson & C. Godoy (INBio sample #70777).

***Manota eximia* sp. n. (Fig. 13B)**

Description. Large species.

Male. Head. Antenna with fourth flagellomere 2.2 times as long as wide. Maxillary palpus with third palpomere bearing 3 curved sensilla; fourth palpomere with a parasegment apically.

Thorax. Anterior basalare and laterotergite each bare. Episternum 3 setose. **Wing.** Length 2.0–2.1 mm. Membrane with a few setae along posterior margin. Sc bare. CuA2 fading away proximally.

Terminalia (Fig. 13B). Similar to *M. montivaga*, with differences as follows. Sternite 9 with posterior margin situated at mid length of gonocoxites. Gonocoxites in position I+II with 2 large and 3 smaller, blunt megasetae on lobe; in position III with 2 flat megasetae, one megaseta three-branched with two branches rounded and one pointed, the other megaseta broadly rounded medially and pointed apically; in position IV with 1 flat, pointed megaseta. Gonostyli not unlike those in *M. montivaga*, and no possible differences apparent in the specimens available for study.

Diagnostic characters. Among the species with both anterior basalare and laterotergites bare, it is particularly close to *M. montivaga*. (See next species). The terminalia with gonocoxites in position III bear megasetae of a unique and remarkable shape.

Etymology. From Latin, *eximius*, extraordinary, referring to the peculiar megasetae on the gonocoxites.

Types. Holotype. Male, Costa Rica, Puntarenas province, La Amistad International Park, Buenos Aires, Sendero a Casa Coca, 1700 m, 13 Oct.–13 Nov. 2001, by Malaise trap, D. Rubí (INBio sample #74889). *Paratypes.* 1 male, same Park as the holotype, but Estación Altamira, Sendero a Casa Coca, 1700 m, 21 Sep.–21 Oct. 2002, by Malaise trap, D. Rubí & M.M. Chavarria (INBio sample #72952); 1 male, San José province, Dota, Finca Orlando Mora, 1600 m, 12–17 July 2002, by Malaise trap, A. Solis (INBio sample #70192).



FIGURE 13. Male terminalia in *Manota* spp. **A:** *M. incisa* sp. n., ventral view (holotype). **B:** *M. eximia* sp. n., dorsal view (holotype). Scale = 0.1 mm.

Manota montivaga sp. n. (Fig. 14)

Description. Large species.

Male. **Head.** Antenna with fourth flagellomere 1.9 times as long as wide. Maxillary palpus with third palpomere bearing 3 curved sensilla; fourth palpomere with a parasegment apically.

Thorax. Anterior basalare and laterotergite each bare. Episternum 3 with ventral portion setose. **Wing.** Length 2.2–2.6 mm. Membrane with a few setae along posterior margin. Sc usually bare, occasionally with 1 seta ventrally. CuA-fork complete. Presence of A1 occasionally indicated by 2 or so setae in line between CuA and A2.

Terminalia (Fig. 14). Sternite 9 with only posterior margin distinct; margin emarginate medially, situated below mid length of gonocoxites. Vento-lateral lobes of gonocoxites subrectangular; interiorly with 1 strong, curved seta on a separate rim. Disto-lateral lobes of gonocoxites large, bilobed; on dorsal lobe with large, straight setae pointing posteriorly; on ventral lobe with smaller, curly setae pointing inwards. Gonocoxites in position I with 1 large megaseta hook-like apically; in position II with 4 blunt megasetae on lobe; in position III with 2 flat megasetae with one megaseta pointed and the other blunt; in position IV with 1 flat, spoon-shaped megaseta. Gonostyli small, flat; ventro-apically with 1 large and 1 smaller setae, followed dorsally by 3 curved and 1 straight setae, most dorsally with 1 seta strongly re-curved. Parastylar lobes hidden behind gonostyli, large, very weak; each with a marginal comb of some 15 trichia (not illustrated). Tegmen long and narrow, almost evenly tapering to tip. Hypoproct rounded apically; with long setae laterally.

Diagnostic characters. Among the species with both anterior basalare and laterotergites bare, it has the terminalia with gonocoxites bearing a quite distinct set of megasetae in positions I to IV, including 1 peculiar hooked megaseta in position I.

Etymology. From Latin, *montivagus*, mountain-roaming, referring to the occurrence of this species in high-altitude mountains.

Types. *Holotype.* Male, Costa Rica, Cartago province, El Guarco, Rio Macho Forest Reserve, Estación Ojo de Agua, 2950–3000 m, 22–28 July 1999, by Malaise trap, A. Picado (INBio sample #52878). *Paratypes.* 2 males, Cartago province, Madreselva, Finca los Lagos, 2000–2600 m, April–May 1994, by Malaise trap, M.M. Chavarria & A. Solano (INBio sample #5494); 1 male, San José province, Pérez Zelodón, Chirripó National Park, Llano Bonito, 2400 m, 14 Sep.–14 Oct. 2001, by Malaise trap, M. Alfaro.

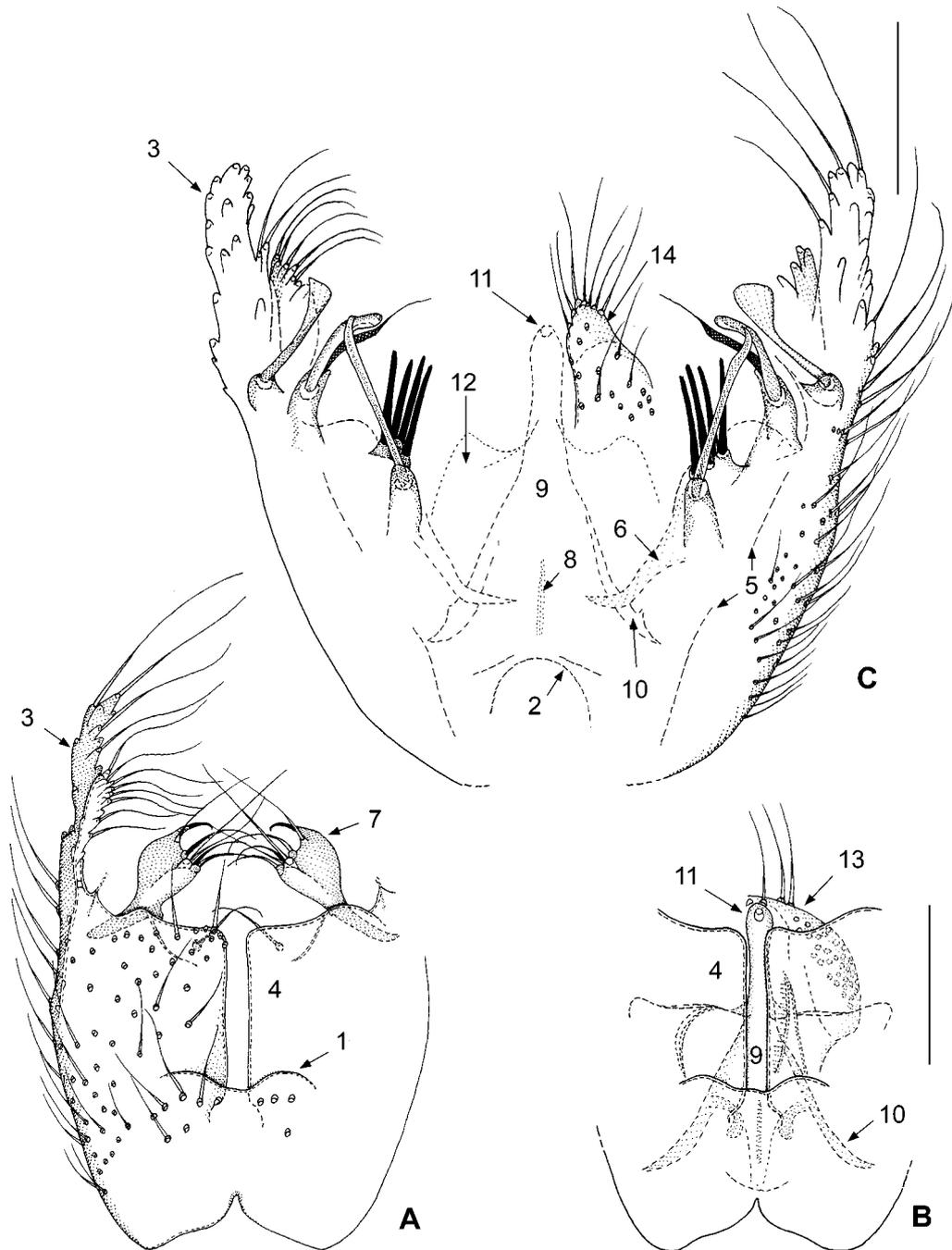


FIGURE 14. *Manota montivaga* sp. n. **A:** Male terminalia, ventral view (holotype). **B:** Male terminalia, central portion, ventral view (holotype). **C:** Male terminalia, dorsal view (paratype from Madreselva). Scale = 0.1 mm. 1 = posterior margin of sternite 9, 2 = tergite 9, 3 = disto-lateral lobe of gonocoxites, 4 = ventro-lateral lobe of gonocoxites, 5 = dorsal margin of gonocoxites, 6 = gonocoxal apodeme, 7 = gonostylus, 8 = ejaculatory apodeme, 9 = tegmen, 10 = parameral apodeme, 11 = apical process of tegmen, 12 = ventro-lateral lobe of tegmen, 13 = hypoproct (sternite 10), 14 = cercus.

***Manota vexillifera* sp. n. (Fig. 15)**

Description. Small species.

Male. Head. Antenna with fourth flagellomere 1.8 times as long as wide. Maxillary palpus with third palpomere bearing 3, occasionally 4, curved sensilla; fourth palpomere with a parasegment apically.

Thorax. Anterior basalare and laterotergite each bare. Episternum 3 with ventral portion setose. **Wing.** Length 1.4–1.7 mm. Membrane with a few setae along posterior margin. Sc bare. Junction of CuA2 into CuA1 incomplete.

Terminalia (Fig. 15). Similar to *M. montivaga*, with differences as follows. Sternite 9 with posterior margin convex medially, situated at mid length of gonocoxites. Disto-lateral lobes of gonocoxites bilobed; on dorsal lobe with large, straight setae pointing posteriorly; on ventral lobe with shorter, straight setae pointing inwards. Gonocoxites in position I with 1 large flag-like megaseta at tip; in position II with 3–4 short, blunt megasetae on lobe; in position III with 2 flat megasetae with one megaseta pointed and the other blunt; in position IV with 1 pointed megaseta, or rarely 2 large setae. Gonostyli small; ventro-apically with 1 large and 1 smaller setae, along dorsal margin with 1+5 curved setae directed dorsally plus 1 isolated seta directed posteriorly.

Diagnostic characters. Among the species with both anterior basalare and laterotergites bare, it has the terminalia with gonocoxites in position I bearing 1 megaseta of unique, flag-like shape.

Etymology. From Latin, *vexilliferus*, standard-bearing, referring to the peculiar megaseta in position I of the gonocoxites.

Types. Holotype. Male, Costa Rica, Alajuela province, San Carlos, Volcán Arenal National Park, Sendero Pilón, 650 m, 6–7 Nov. 2000, by Malaise trap, G. Carballo (INBio sample #60084). *Paratypes.* 2 males, Cartago province, Tapantí–Macizo de la Muerte National Park, Estación La Esperanza, 2200–2600 m, in cloud forest of oak, 3–22 Nov. 2003, by Malaise trap, M. & C. Jaschhof; 4 males, Limón province, Pococí, Braulio Carrillo National Park, Estación Quebrada González, 400–500 m, 15 May, 21 Aug. and 24 Sep. 2002, by Malaise trap, P. Hanson & C. Godoy (INBio samples #68654, 70777 and 71289).

Other material studied. 2 males, Limón province, Hitoy Cerere Biological Reserve, Sendero Espavel, 11 March–1 April 2003, E. Rojas, B. Gamboa & W. Arana (INBio sample #73628); 1 male, same locality, but 18 Sep.–7 Oct. 2003, E. Rojas, B. Gamboa, W. Arana, M. & C. Jaschhof.

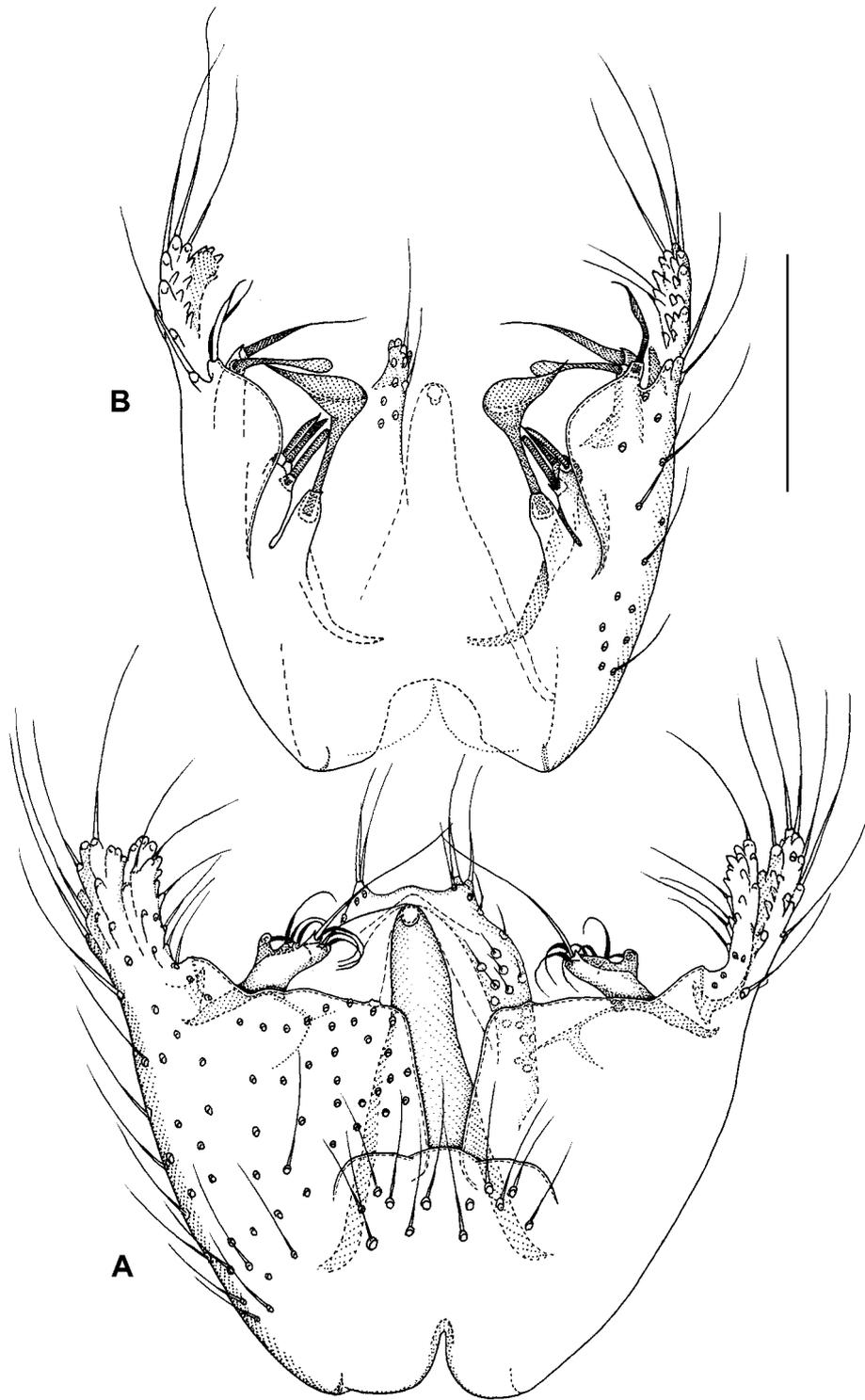


FIGURE 15. *Manota vexillifera* sp. n. **A:** Male terminalia, ventral view (holotype). **B:** Male terminalia, dorsal view (paratype from Braulio Carrillo). Scale = 0.1 mm.

***Manota corcovado* sp. n. (Fig. 16)**

Description. Small species.

Male. Head. Antenna with fourth flagellomere 2 times as long as wide. Maxillary palpus with third palpomere bearing 3 curved sensilla; fourth palpomere with a parasegment apically.

Thorax. Anterior basalare and laterotergite each bare. Episternum 3 with ventral portion setose. **Wing.** Length 1.6 mm. Membrane with a few setae along posterior margin. Sc bare. CuA2 fading away proximally.

Terminalia (Fig. 16). Sternite 9 with only a short portion of posterior margin distinct, i.e. two small lobes; margin situated beyond mid length of gonocoxites. Ventro-lateral lobes of gonocoxites densely setose; each lobe interiorly with 1 short seta on a separate rim and, more anteriorly, with an ovoid lobe bearing large microtrichia. Disto-lateral lobes of gonocoxites moderately long; each with very large setae directed posteriorly. Gonocoxites in position I with 1 moderately long, blunt megaseta; in position II with 3 short, blunt megasetae; in position III with 2 flat megasetae, each two-branched with one branch pointed, or bi-pointed, and the other branch rounded apically; in position IV with 3 two-pointed megasetae; between positions III and IV with a slender lobe bearing 6–7 setae; dorsal gonocoxal margin unmodified. Gonostyli small, flat; each posteriorly with 1 strongly re-curved, blunt seta, anteriorly with 1 large plus 2 smaller setae apically. Parastylar lobes hidden behind gonostyli, each lobe with ventral portion stout and bare, and dorsal portion with a marginal comb of some 15 trichia (not illustrated). Tegmen tapering almost evenly to tip. Hypoproct rounded or blunt apically; with fine, short setulae laterally.

Diagnostic characters. Among the species with both anterior basalare and laterotergites bare, and terminalia with sternite 9 barely discernible, it has the disto-lateral lobes of the gonocoxites large, and the gonostyli small and flat. The array of megasetae dorsally on the gonocoxites is species specific, even though very similar to *M. diversiseta*. (See next species).

Etymology. From the type locality, Corcovado [National Park], which proved to be extremely rich in *Manota* species.

Types. Holotype. Male, Costa Rica, Puntarenas province, Corcovado National Park, 600 m S Cerro Rincón, 745 m, 23 April–24 June 2002, by Malaise trap, J. Azofeifa (INBio #70842). *Paratypes.* 8 males, same data as the holotype; 1 male, same data, but 800 m S Cerro Rincón (INBio sample #70843).

Other material studied. 1 male, same National Park as types, but Cerro Rincón, La Tigrilla, 7 Feb.–23 April 2002, J. Azofeifa (INBio sample #70848); 1 male, same National Park, but Cerro Mueller, 20 Dec. 2001–7 Feb. 2002, J. Azofeifa (INBio sample #67160).

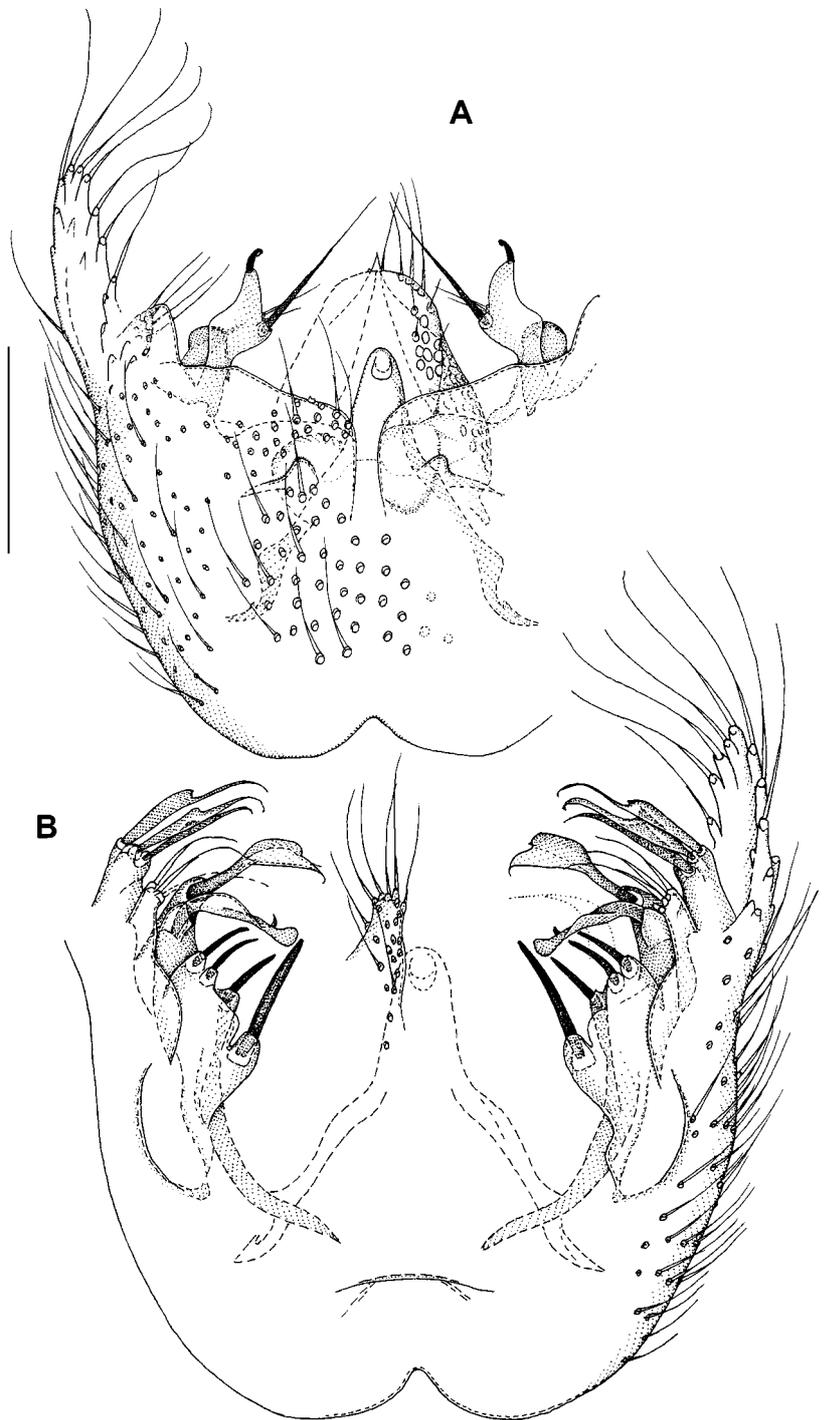


FIGURE 16. *Manota corcovado* sp. n. **A:** Male terminalia, ventral view (holotype). **B:** Male terminalia, dorsal view (paratype). Scale = 0.1 mm.

Manota diversiseta sp. n. (Fig. 17)

Description. Small species.

Male. **Head.** Antenna with fourth flagellomere 2.3 times as long as wide. Maxillary palpus with third palpomere bearing 3 curved sensilla; fourth palpomere with a parasegment apically.

Thorax. Anterior basalare and laterotergite each bare. Episternum 3 with ventral portion setose. **Wing.** Length 1.5–1.6 mm. Membrane with a few setae along posterior margin. Sc bare. CuA2 fading away proximally.

Terminalia (Fig. 17). Extremely similar to *M. corcovado*, with differences as follows. Gonocoxites in position III with 2 flat megasetae, one megaseta two-branched with one branch pointed and the other rounded apically, the other megaseta broadly rounded apically and apparently excavated like a soup spoon. Gonocoxites on dorso-distal margin with a rounded lobe bearing 5 setae.

Diagnostic characters. See under Terminalia.



FIGURE 17. *Manota diversiseta* sp. n. Male terminalia, dorsal view (holotype). Scale = 0.1 mm.

Etymology. From Latin, *diversus*, different, and *seta*, bristle, referring to the peculiar megaseta in position III of the gonocoxites.

Types. Holotype. Male, Costa Rica, Limón province, Hitoy Cerere Biological Reserve, Sendero Espavel, 550 m, in tall secondary rain-forest, 18 Sep.–7 Oct. 2003, by Malaise trap, E. Rojas, B. Gamboa, W. Arana, M. & C. Jaschhof. Paratypes. 2 males, same data as the holotype; 1 male, same locality, but 100–550 m, by sweepnet and aspirator, M. Jaschhof.

Other material studied. 2 males, same locality as the types, but 11 March–1 April 2003, E. Rojas, B. Gamboa & W. Arana (INBio samples #73470 and 73628).

Manota acuminata sp. n. (Fig. 18)

Description. Small species.

Male. **Head.** Antenna with fourth flagellomere 1.7 times as long as wide. Maxillary palpus with third palpomere bearing 3 curved sensilla; fourth palpomere with a parasegment apically.

Thorax. Anterior basalare and laterotergite each bare. Episternum 3 setose. **Wing.** Length 1.5–1.6 mm. Membrane with a few setae along posterior margin. Sc bare, or with 1 single seta dorsally. Junction of CuA2 into CuA1 incomplete.

Terminalia (Fig. 18). Sternite 9 with only posterior margin distinct; margin situated at mid length of gonocoxites, strongly emarginate. Ventro-lateral lobes of gonocoxites subrectangular; interiorly each with 1 long seta on a separate rim. Disto-lateral lobes of gonocoxites short, bilobed; outer lobe with very large, straight setae; inner lobe subcircular, with long, curly setae. Gonocoxites in position I+II with 7–9 short, blunt megasetae; in position III with 2 flat megasetae with one megaseta whip-like and the other rounded apically; in position IV with 2 long, pointed megasetae directed inwards. Gonostyli small, flat; each bilobed posteriorly, one lobe bare, the other lobe bearing 1 strongly re-curved seta apically; antero-apically with 1 large, straight seta directed inwards plus 1 short, fine seta. Parastylar lobes largely hidden behind gonostyli, large, bare, almost pointed posteriorly (not illustrated). Tegmen wide basally, strongly narrowed in distal half. Hypoproct broad apically, with posterior margin of tergite 10 behind; with a few rather long setae laterally.

Diagnostic characters. Among the species with both anterior basalare and laterotergites bare, and terminalia with sternite 9 barely discernible, it has the disto-lateral lobes of the gonocoxites large, and the gonostyli small and flat. The array of megasetae dorsally on the gonocoxites is species specific (in particular, the conspicuous megasetae in positions I+II and IV), as is the large, bare, pointed parastylar lobe.

Etymology. From Latin, *acuminatus*, pointed, referring to the outline of the parastylar lobe.

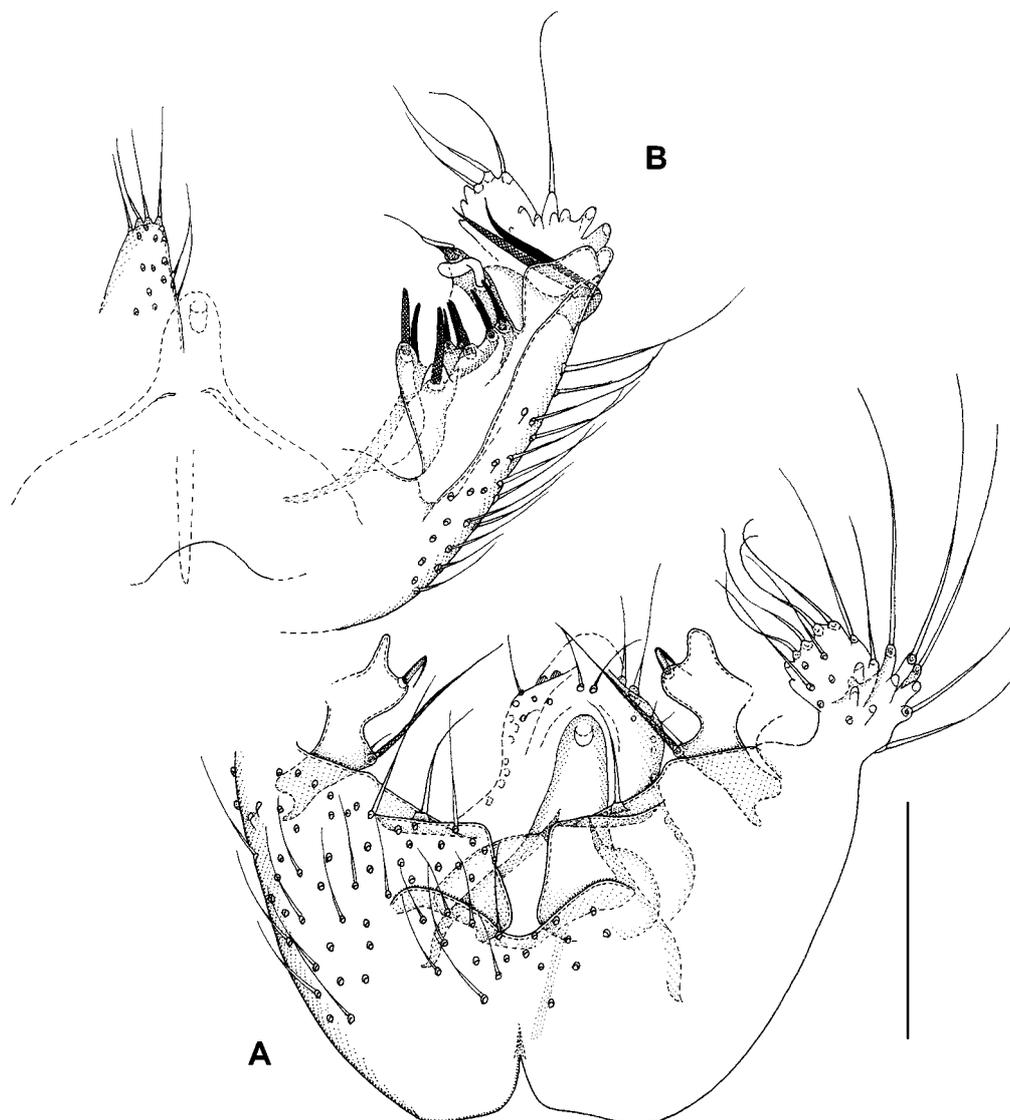


FIGURE 18. *Manota acuminata* sp. n. **A:** Male terminalia, ventral view (holotype). **B:** Male terminalia, dorsal view (paratype from Hitoy Cerere). Scale = 0.1 mm.

Types. Holotype. Male. Costa Rica, Alajuela province, San Carlos, Volcán Arenal National Park, Sendero Pilón, 650 m, 6–7 Nov. 2000, by Malaise trap, G. Carballo (INBio sample #60084). *Paratypes.* 5 males, same data as the holotype; 2 males, Limón province, Hitoy Cerere Biological Reserve, Sendero Espavel, 560 m, 11 March–1 April 2003, by Malaise trap, E. Rojas, B. Gamboa & W. Arana (INBio sample #73628).

Other material studied. 1 male, Puntarenas province, Corcovado National Park, 600 m S Cerro Rincón, 23 April–24 June 2002, J. Azofeifa (INBio sample #70842); 2 males,

same locality, but 1 Aug.–25 Sep. 2002 (INBio sample #71459); 1 male, Limón province, Pococí, Braulio Carrillo National Park, Estación Quebrada González, 21 Aug. 2002, P. Hanson & C. Godoy (INBio sample #70777); 1 male, Limón province, Hitoy Cerere Biological Reserve, Sendero Espavel, 18 Sep.–7 Oct. 2003, E. Rojas, B. Gamboa, W. Arana, M. & C. Jaschhof; 1 male, Cartago province, Tapantí–Macizo de la Muerte National Park, Estación La Esperanza, 3–22 Nov. 2003, M. & C. Jaschhof.

***Manota costaricensis* sp. n. (Fig. 19)**

Description. Small species.

Male. Head. Antenna with fourth flagellomere 1.8 times as long as wide. Maxillary palpus with third palpomere bearing 3 curved sensilla; fourth palpomere with a parasegment apically.

Thorax. Anterior basalare and laterotergite bare. Episternum 3 with ventral portion setose. **Wing.** Length 1.3–1.8 mm. Membrane with a few setae along posterior margin. Sc bare. Junction of CuA2 into CuA1 incomplete.

Terminalia (Fig. 19). Sternite 9 with only posterior margin distinct; margin situated at mid length of gonocoxites, straight or slightly emarginate. Ventro-lateral lobes of gonocoxites each rounded; interiorly with 1 short seta on a separate rim. Disto-lateral lobes of gonocoxites each moderately long; with very large, straight setae directed posteriorly and long, curly setae directed inwards. Gonocoxites in position I with 1 short, blunt megaseta; in position II with some 7 short, stiff setae; in position III with 1 pointed megaseta plus 1 flat, two-branched megaseta with one branch whip-like and the other rounded apically; in position IV with 4 moderately long setae curved inwards. Dorsal margin of gonocoxites with a row of 7–8 setae decreasing in length posteriorly, followed by a stripe of large microtrichia. Gonostyli small, flat; each bilobed, distal lobe with 1 strongly re-curved seta apically plus 1 seta centrally, proximal lobe with some 3 setae each centrally, marginally and apically, with one apical seta clearly enlarged. Parastylar lobes hidden behind gonostyli, small, almost pointed apically (not illustrated). Tegmen tapering almost evenly to tip; ventro-lateral lobes often distinct. Hypoproct rounded apically; with fine, rather short setulae laterally.

Diagnostic characters. Among the species with both anterior basalare and laterotergites bare, and terminalia with sternite 9 barely discernible, it has the disto-lateral lobes of the gonocoxites large and the gonostyli rather small and flat. The array of megasetae dorso-interiorly on the gonocoxites is almost identical with that of *M. fraterna* and *M. parva* (next species), whereas the setation along the dorsal margin of the gonocoxites is species specific, as is the vestiture of the gonostyli.

Etymology. Derived from Costa Rica, referring to the fact that this species is among the most common and typical *Manota* species in Costa Rica.

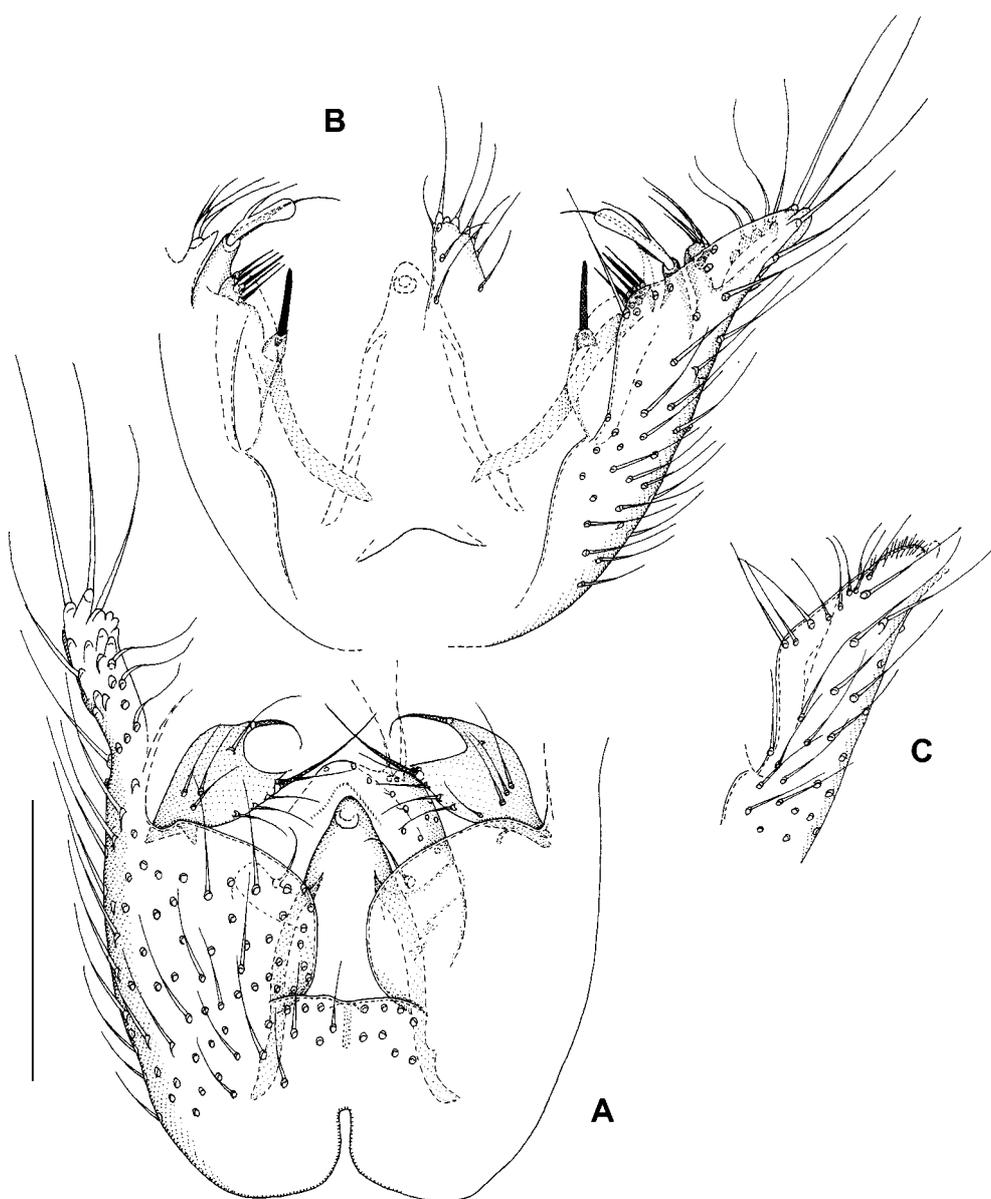


FIGURE 19. *Manota costaricensis* sp. n. **A:** Male terminalia, ventral view (holotype). **B:** Male terminalia, dorsal view (paratype from La Esperanza). **C:** Dorsal margin of gonocoxites, dorsal view (same paratype). Scale = 0.1 mm.

Types. Holotype. Male, Costa Rica, Puntarenas province, Corcovado National Park, 600 m S Cerro Rincón, 745 m, 23 April–24 June 2002, by Malaise trap, J. Azofeifa (INBio sample #70842). *Paratypes.* 1 male, same data as the holotype; 1 male, same locality, but 1 Aug.–25 Sep. 2002 (INBio sample #71459); 1 male, Puntarenas province, Golfito, Corco-

vado National Park, Estación Agujas, 800 m N Cerro Las Quebraditas, 782 m, 6 Nov.–20 Dec. 2002, by Malaise trap, J. Azofeifa (INBio sample #66478); 1 male, Cartago province, Tapantí–Macizo de la Muerte National Park, Estación La Esperanza, 2200–2600 m, in cloud forest of oak, 3–22 Nov. 2003, by Malaise trap, M. & C. Jaschhof; 2 males, same National Park, but Sector la Represa, 1550 m, 26 March 2000, by Malaise trap, D. Rubí & C. Hansson (INBio sample #67894).

Other material studied. 2 males, Alajuela province, Estación Caribe, Sep.–Oct. 2002, W. Flowers (INBio sample #71759); 3 males, Limón province, Pococí, Braulio Carrillo National Park, Estación Quebrada González, 21 Aug. 2002, P. Hanson & C. Godoy (INBio sample #70777); 1 male, Limón province, Hitoy Cerere Biological Reserve, Sendero Espavel, 18 Sep.–7 Oct. 2003, E. Rojas, B. Gamboa, W. Arana, M. & C. Jaschhof; 1 male, same locality, but 11 March–1 April 2003, E. Rojas, B. Gamboa & W. Arana (INBio sample #73628).

Manota fraterna sp. n. (Fig. 20)

Description. Large species.

Male. Head. Antenna with fourth flagellomere 2.1 times as long as wide. Maxillary palpus with third palpomere bearing 3 curved sensilla; fourth palpomere with a parasegment apically.

Thorax. Anterior basalare and laterotergite each bare. Episternum 3 with ventral portion setose. **Wing.** Length 2.1 mm. Membrane with a few setae along posterior margin. Sc bare. CuA-fork complete.

Terminalia (Fig. 20). Extremely similar to *M. costaricensis*, with differences as follows. Sternite 9 with posterior margin situated beyond mid length of gonocoxites, slightly convex medially. Disto-lateral lobes of gonocoxites each moderately long; with very large, straight setae directed posteriorly and shorter, straight setae directed inwards. Gonocoxites with setation in position I–III identical with *M. costaricensis*, with much stronger setae in position IV. Dorsal margin of gonocoxites with irregularly arranged setae of various lengths, followed posteriorly by a patch of particularly dense, fine setulae. Gonostyli each bilobed, distal lobe bearing 1 strongly re-curved seta apically, proximal lobe with 1 very large seta apically, surrounded by 2–3 ordinary setae marginally, centrally with a patch of fine, almost microtrichia-like setulae.

Diagnostic characters. See under Terminalia.

Etymology. From Latin, *fraternus*, brotherly, referring to its close relationship with *Manota costaricensis*.

Types. Holotype. Male, Costa Rica, Cartago province, Tapantí–Macizo de la Muerte National Park, Sector la Represa, 1550 m, 26 March 2000, by Malaise trap, D. Rubí & C. Hansson (INBio sample #67894). *Paratypes.* 2 males, same data as the holotype.

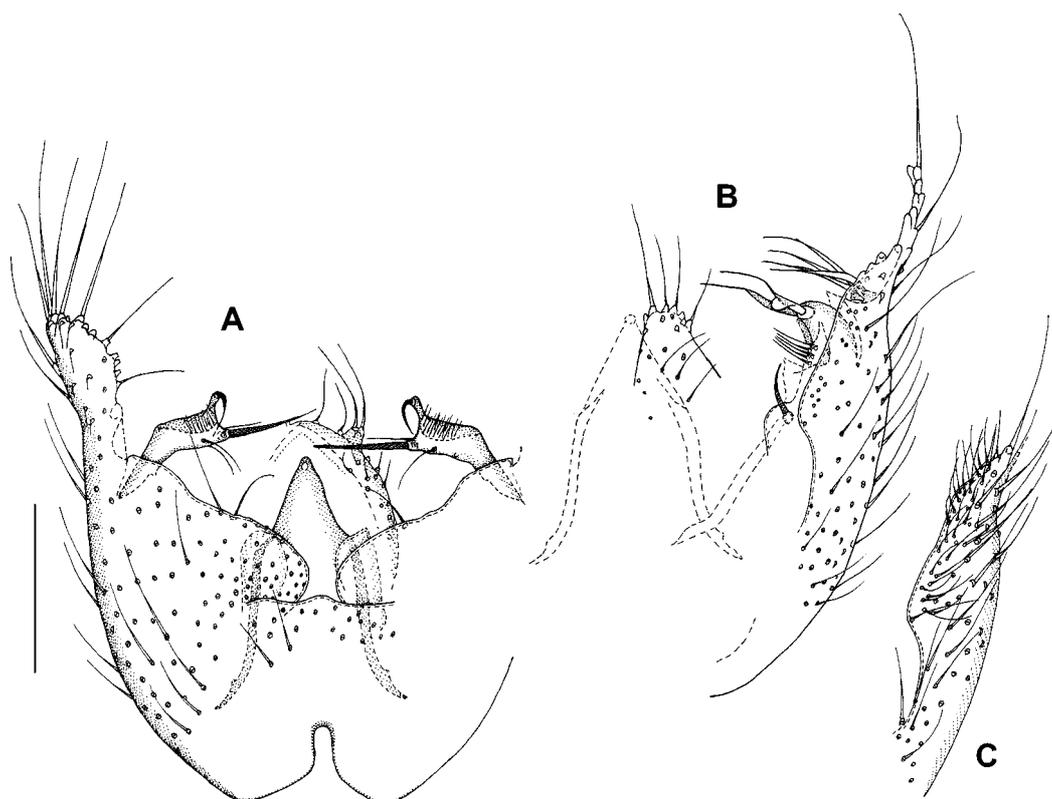


FIGURE 20. *Manota fraterna* sp. n. **A:** Male terminalia, ventral view (holotype). **B:** Male terminalia, dorsal view (paratype). **C:** Dorsal margin of gonocoxites, dorsal view (paratype).

***Manota parva* sp. n. (Figs 2A, 21)**

Description. Small species.

Male. Head. Antenna with fourth flagellomere 2.0 times as long as wide. Maxillary palpus with third palpomere bearing 3 curved sensilla; fourth palpomere with a parasegment apically.

Thorax. Anterior basalare and laterotergite each bare. Episternum 3 with ventral portion setose. **Wing.** Length 1.4–1.7 mm. Membrane with a few setae along posterior margin. Sc bare. Junction of CuA2 into CuA1 incomplete.

Terminalia (Figs 2A, 21). Sternite 9 with only posterior margin distinct; margin situated at mid length of gonocoxites, straight or slightly convex medially. Vento-lateral lobes of gonocoxites each rounded; with a rather short interior seta marginally. Disto-lateral lobes of gonocoxites each moderately long; with very large, straight setae directed posteriorly and shorter, straight setae directed inwards. Gonocoxites in position I with 1 moderately long megaseta, pointed in some specimens, blunt in others; in position II with some 7 short, stiff setae; in position III with 1 pointed megaseta plus 1 flat, two-branched megaseta.

eta with one branch whip-like and the other rounded apically; in position IV with 2–3, rarely 4 moderately long setae curved inwards. Dorsal margin of gonocoxites with a row of some 10 setae slightly decreasing in length posteriorly. Gonostyli reduced in size, flat; each bilobed, distal lobe with 1 strongly re-curved seta apically, proximal lobe with 1 megaseta plus 1 seta apically, and 2–3 setae marginally. Parastylar lobes not discernible. Tegmen almost evenly tapering to tip. Hypoproct rounded apically, each disto-laterally with large setae on small lobes, laterally with fine, rather long setae.

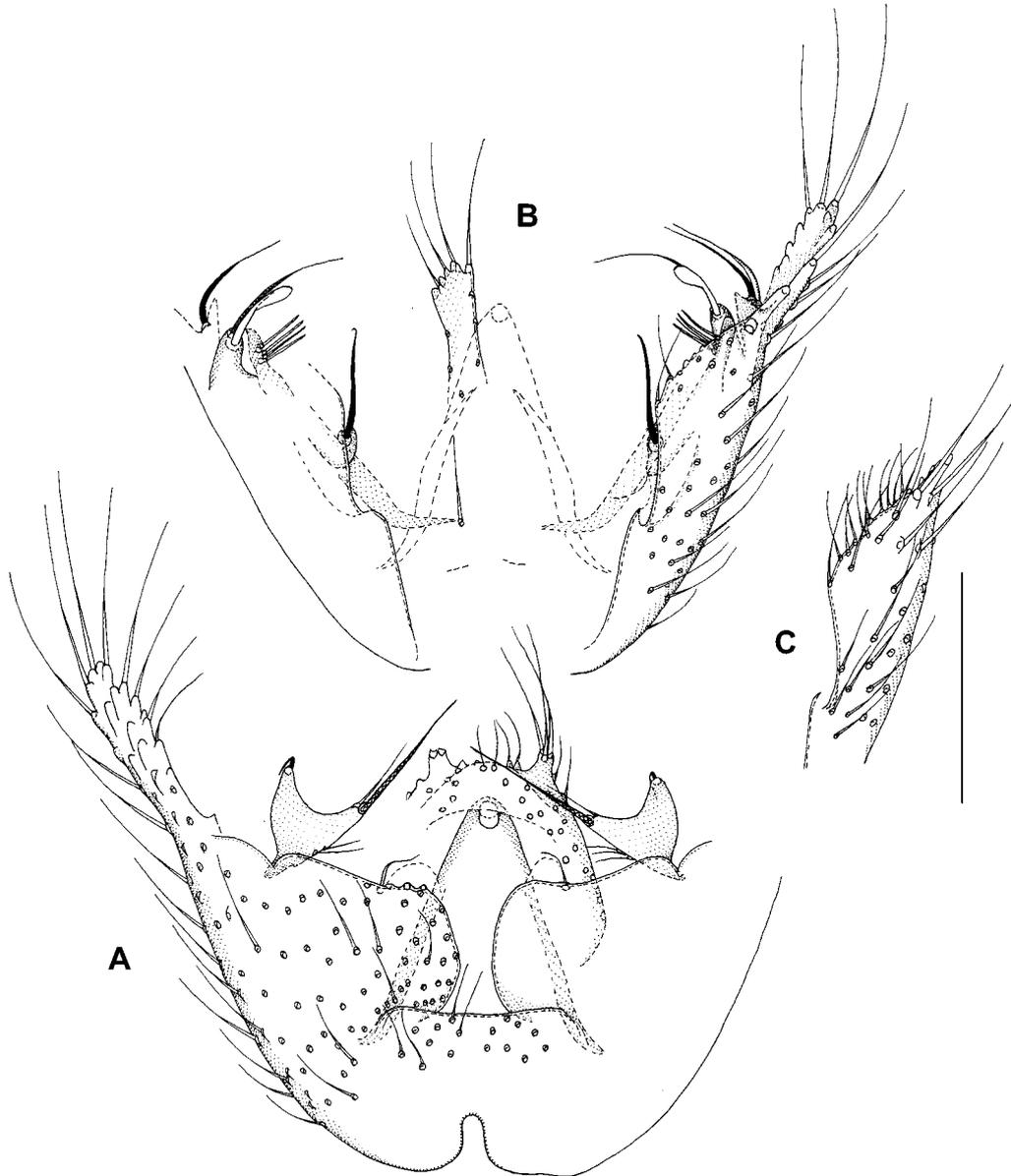


FIGURE 21. *Manota parva* sp. n. **A:** Male terminalia, ventral view (holotype). **B:** Male terminalia, dorsal view (paratype from La Esperanza). **C:** Dorsal margin of gonocoxites, dorsal view (same paratype). Scale = 0.1 mm.

Diagnostic characters. Very similar to *M. costaricensis* and *M. fraterna*. The setation along the dorsal margin of the gonocoxites is species specific, as is the vestiture of the gonostyli.

Etymology. From Latin, *parvus*, small, referring to the small size and inconspicuous morphology of this species.

Types. Holotype. Male, Costa Rica, Puntarenas province, Lepanto, Karen Mogensen Private Reserve, Sendero Quebrada Pérez, 315 m, 23 June–10 July 2003, by Malaise trap, W. Porras (INBio sample no. 74648). *Paratypes.* 3 males, same data as the holotype; 3 males, Cartago province, Tapantí–Macizo de la Muerte National Park, Estación La Esperanza, 2200–2600 m, in cloud forest of oak, 3–22 Nov. 2003, by Malaise trap, M. & C. Jaschhof; 4 males, Limón province, Pococí, Braulio Carrillo National Park, Estación Quebrada González, 400–500 m, 21 Aug. 2002, by Malaise trap, P. Hanson & C. Godoy (INBio sample #70777); 6 males, Alajuela province, San Carlos, Volcán Arenal National Park, Sendero Pilón, 650 m, 6–7 Nov. 2000, by Malaise trap, G. Carballo (INBio sample #60084).

Other material studied. 1 male, Puntarenas province, Corcovado National Park, Cerro Rincón, La Tigrilla, 20 Dec. 2001–7 Feb. 2002, J. Azofeifa (INBio sample #67158); 1 male, Puntarenas province, Cerro Puma, 19 June–8 July 2003, M. Moraga, A. Azofeifa & K. Caballero (INBio sample #74508); 2 males, Cartago province, Tapantí–Macizo de la Muerte National Park, Sendero Arboles Caídos, 9 April 2002, D. Rubí & C. Hansson (INBio sample #67891); 1 male, Alajuela province, Estación Caribe, Sep.–Oct. 2002, W. Flowers (INBio sample #71759); 1 male, Limón province, Hitoy Cerere Biological Reserve, Sendero Espavel, 18 Sep.–7 Oct. 2003, E. Rojas, B. Gamboa, W. Arana, M. & C. Jaschhof; 3 males, Limón province, Pococí, Braulio Carrillo National Park, Estación Quebrada González, 15 May 2002, P. Hanson & C. Godoy (INBio sample #68654); 1 male, same locality, but 24 Sep. 2002 (INBio sample #71289).

Manota inornata sp. n. (Fig. 22)

Description. Small species.

Male. Head. Antenna with fourth flagellomere 1.9 times as long as wide. Maxillary palpus with third palpomere bearing 3 curved sensilla; fourth palpomere with a parasegment apically.

Thorax. Anterior basalare and laterotergite each bare. Episternum 3 with ventral portion setose. **Wing.** Length 1.3–1.6 mm. Membrane with a few setae along posterior margin. Sc bare. CuA-fork complete.

Terminalia (Fig. 22). Sternite 9 with only posterior margin distinct; margin situated far below mid length of gonocoxites, with a shallow emargination and a weak lobe medially; with very few setae. Vento-lateral lobes of gonocoxites rounded; with large setae along margin. Disto-lateral lobes of gonocoxites short; with setae of moderate length.

Gonocoxites in position I with 1 medium-sized, blunt megaseta; in position II with more than 10 short, strong, stiff setae on lobe; in position III with 2 flat, pointed megasetae; in position IV with 1–3 large setae. Gonostyli very small; each with 2 large setae apically and a few short setae more anteriorly. Tegmen almost evenly tapering to tip. Hypoproct rounded apically; with long setae laterally.

Diagnostic characters. Among the species with both anterior basalare and laterotergites bare, the terminalia are distinctive in that sternite 9 is almost bare and situated far anteriorly, and the gonostyli are very small and poorly setose.

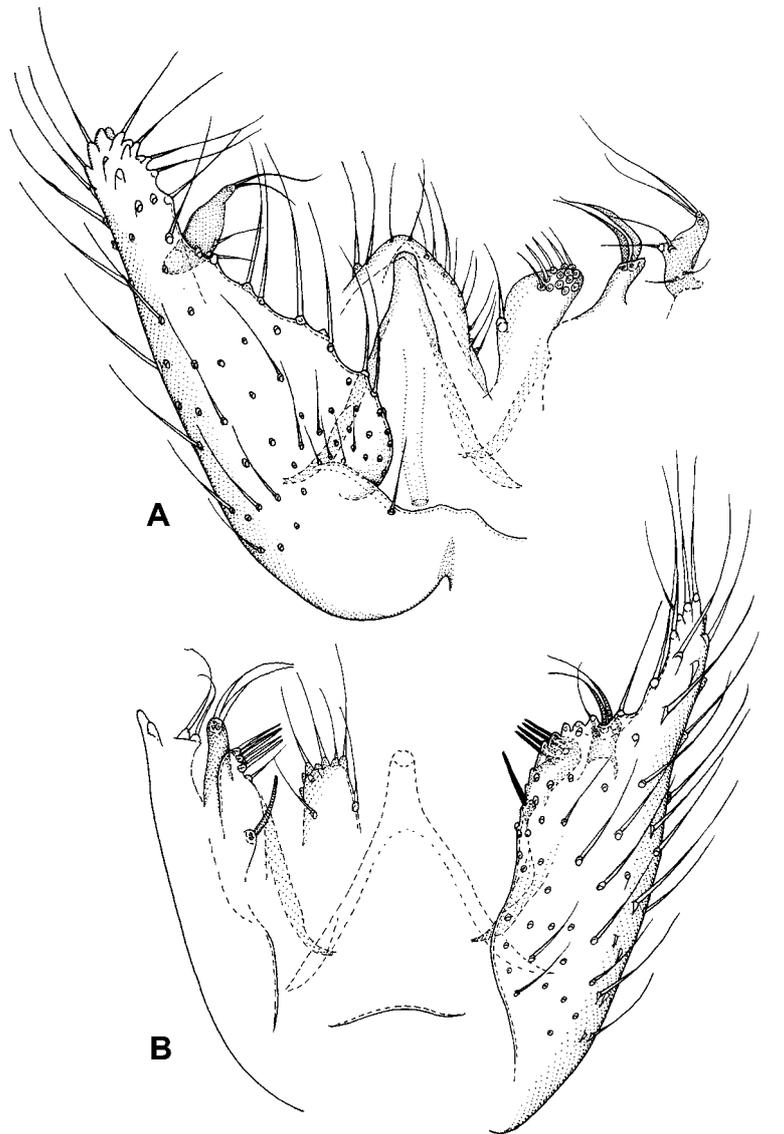


FIGURE 22. *Manota inornata* sp. n. **A:** Male terminalia, ventral view (holotype). **B:** Male terminalia, dorsal view (paratype from Cerro Rincón). Scale = 0.1 mm.

Etymology. From Latin, *inornatus*, unadorned, referring to the inconspicuous morphology of this species.

Types. Holotype. Male, Costa Rica, Limón province, Hitoy Cerere Biological Reserve, Sendero Espavel, 560 m, 11 March–1 April 2003, by Malaise trap, E. Rojas, B. Gamboa & W. Arana (INBio sample #73628). *Paratypes.* 1 male, same data as the holotype; 7 males, Puntarenas province, Corcovado National Park, 600 m S Cerro Rincón, 745 m, 23 April–24 June 2002, by Malaise trap, J. Azofeifa (INBio sample #70842).

Other material studied. 1 male, Puntarenas province, Corcovado National Park, 800 m S Cerro Rincón, 23 April–24 June 2002, J. Azofeifa (INBio sample #70843); 1 male, Puntarenas province, La Amistad International Park, Estación Altamira, Sendero a Casa Coca, 21 Sep.–21 Oct. 2002, D. Rubí & M.M. Chavarria (INBio sample #72952).

Manota limonensis sp. n. (Fig. 23)

Description. Small species.

Male. **Head.** Antenna with fourth flagellomere 2.1 times as long as wide. Maxillary palpus with third palpomere bearing 3 curved sensilla; fourth palpomere with a parasegment apically.

Thorax. Anterior basalare and laterotergite each bare. Episternum 3 with ventral portion setose. **Wing.** Length 1.3 mm. Membrane with a very few setae along posterior margin. Sc bare. Junction of CuA2 into CuA1 incomplete.

Terminalia (Fig. 23). Sternite 9 with only posterior margin distinct, even though very faint; margin situated at mid length of gonocoxites, broadly rounded to almost straight. Vento-lateral lobes of gonocoxites marginally each with 1–2(–3) larger setae; interiorly with 1 seta on a separate rim. Disto-lateral lobes of gonocoxites large; with large setae directed posteriorly and shorter setae directed inwards. Gonocoxites in position I+II with 2 medium-sized, blunt megasetae on separate lobes, and 2 short, blunt megasetae on another lobe; in position III with 2 flat megasetae, one megaseta broadly rounded apically with tiny, pointed processes, the other broad with a whip-like tip; in position IV with 3 large setae. Gonostyli very small, dorso-posteriorly with a weak lobe; each with 1 large and 1 fine setae apically and 1 strong, stiff seta directed dorsally. Parastylar lobes large, weak, bare (not illustrated). Parameral apodemes widely spread. Tegmen narrow in distal half. Hypoproct broadly rounded apically; with fine, rather short setulae laterally.

Diagnostic characters. It is in the group of species with both anterior basalare and laterotergites bare; terminalia with sternite 9 barely discernible; the disto-lateral lobes of the gonocoxites large; and the gonostyli small and flat. The array of megasetae dorsally on the gonocoxites is species specific. (Note, in particular, the megaseta on a finger-like lobe in position I).

Etymology. Derived from Limón, the name of the province where so many *Manota* species, including this one, were collected.

Types. Holotype. Male. Costa Rica, Limón province, Hitoy Cerere Biological Reserve, Sendero Espavel, 560 m, 11 March–1 April 2003, by Malaise trap, E. Rojas, B. Gamboa & W. Arana (INBio sample #73628). *Paratypes.* 1 male, same data as the holotype; 1 male, same locality, but 18 Sep.–7 Oct. 2003, by Malaise trap, E. Rojas, B. Gamboa, W. Arana, M. & C. Jaschhof; 1 male, Limón province, Pococí, Braulio Carrillo National Park, 400–500 m, 21 Aug. 2002, by Malaise trap, P. Hanson & C. Godoy (INBio sample #70777).

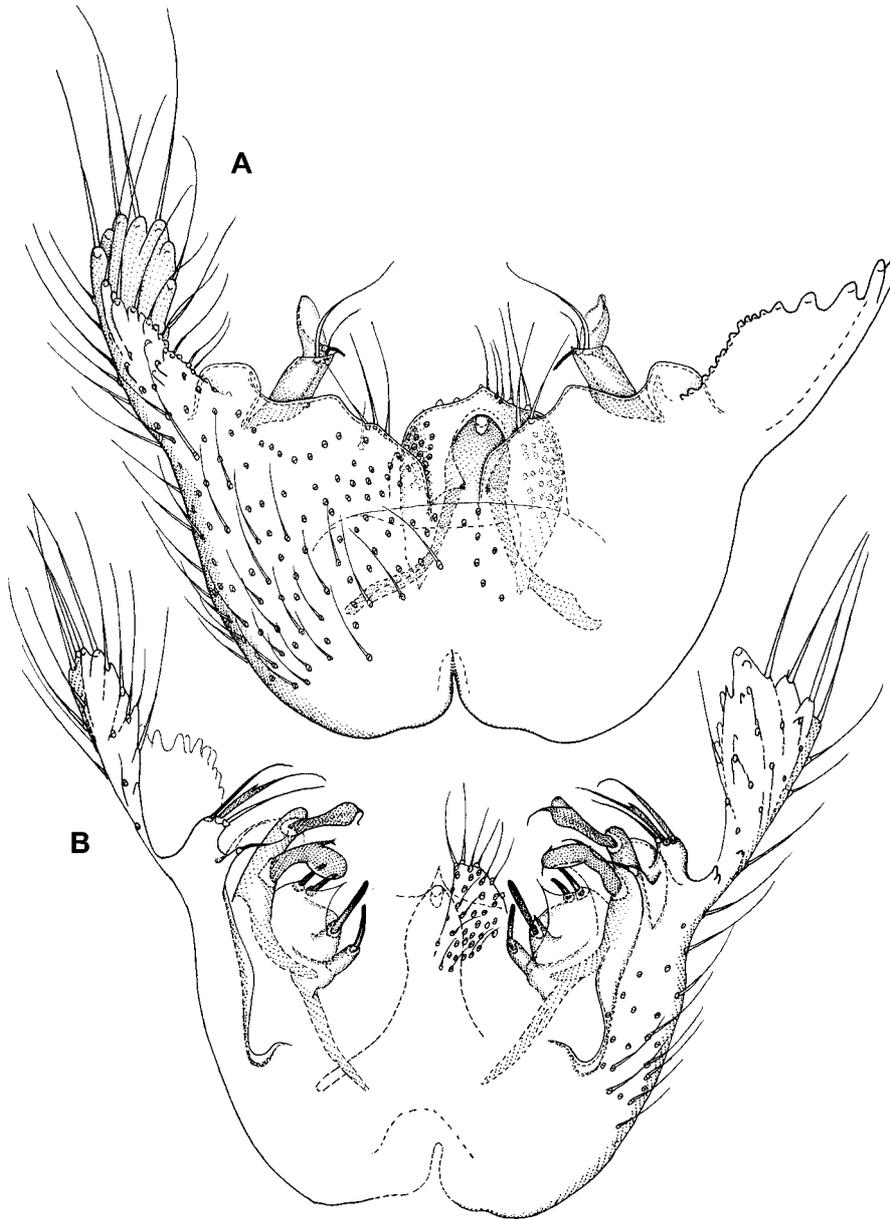


FIGURE 23. *Manota limonensis* sp. n. **A:** Male terminalia, ventral view (holotype). **B:** Male terminalia, dorsal view (paratype from Hitoy Cerere). Scale = 0.1 mm.

Manota acutistylus sp. n. (Fig. 24)

Description. Small species.

Male. **Head.** Antenna with fourth flagellomere 1.6 times as long as wide. Maxillary palpus with third palpomere bearing 3–4 curved sensilla; fourth palpomere with a parasegment apically.

Thorax. Anterior basalare and laterotergite each bare. Episternum 3 with ventral portion setose. **Wing.** Length 1.5 mm. Membrane with a few setae along posterior margin. Sc bare. Junction of CuA2 into CuA1 incomplete.

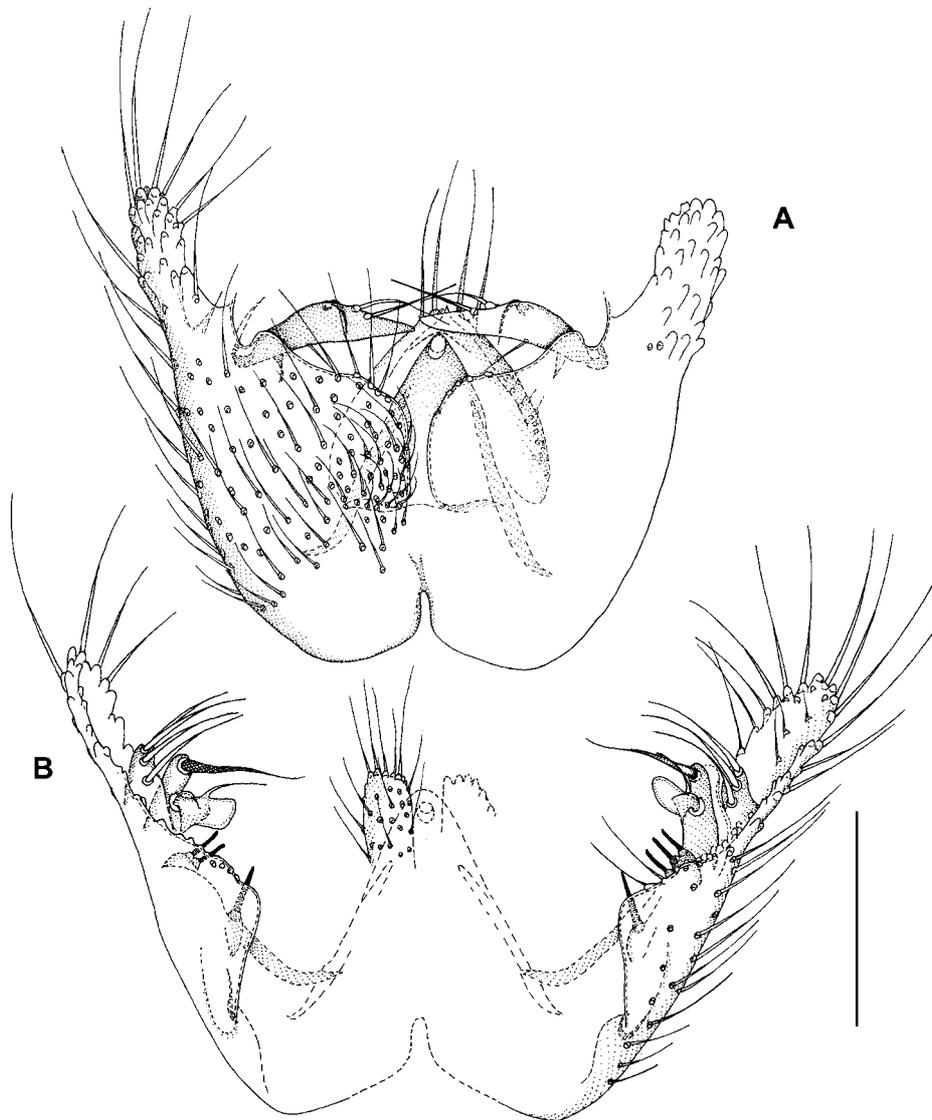


FIGURE 24. *Manota acutistylus* sp. n. **A:** Male terminalia, ventral view (holotype). **B:** Male terminalia, dorsal view (paratype). Scale = 0.1 mm.

Terminalia (Fig. 24). Sternite 9 with only posterior margin distinct; margin situated at mid length of gonocoxites, slightly convex medially. Ventro-lateral lobes of gonocoxites rounded, each marginally with 2–3 larger setae; interiorly with 1 seta on a separate rim. Disto-lateral lobes of gonocoxites comparatively short; with large setae directed posteriorly. Gonocoxites in position I with 1 medium-sized, blunt megaseta; in position II with 2–3 short, blunt megasetae; in position III with 1 pointed megaseta and 1 flat, two-branched megaseta with one branch broadly rounded and the other whip-like; in position IV with 4 large setae; on dorso-posterior gonocoxal margin with an irregular comb of numerous setae directed inwards. Gonostyli small, elongate, pointed apically; each on posterior margin with 1 long, stiff seta directed inwards, 1 long seta directed dorsally, and 1 strong, recurved seta directed dorsally; on anterior margin with 1 seta subbasally. Parastylar lobes moderately sized, weak, bare (not illustrated). Tegmen evenly tapering to tip. Hypoproct tapering to tip; with long setae laterally.

Diagnostic characters. It is in the group of species with both anterior basalare and laterotergites bare; terminalia with sternite 9 barely discernible; the disto-lateral lobes of the gonocoxites large; and the gonostyli small and flat. The array of megasetae dorsally on the gonocoxites is species specific, as are the pointed, apically bare gonostyli.

Etymology. From Latin, *acutus*, acute, and *stylus*, style, referring to the outline of the gonostyli.

Types. Holotype. Male, Costa Rica, Puntarenas province, Cerro Puma, 100–300 m, 19 June–8 July 2003, by Malaise trap, M. Moraga, A. Azofeifa & K. Caballero (INBio sample #74508). *Paratype.* 1 male, Limón province, Hitoy Cerere Biological Reserve, Sendero Espavel, 560 m, 11 March–1 April 2003, by Malaise trap, E. Rojas, B. Gamboa & W. Arana (INBio sample #73628).

***Manota rotundistylus* sp. n. (Fig. 25)**

Description. Large species.

Male. Head. Antenna with fourth flagellomere 2.0 times as long as wide. Maxillary palpus with third palpomere bearing 3 curved sensilla; fourth palpomere with a parasegment apically.

Thorax. Anterior basalare and laterotergite each bare. Episternum 3 with ventral portion setose. **Wing.** Length 2.5 mm. Membrane with a few setae along posterior margin. Sc bare. CuA-fork complete.

Terminalia (Fig. 25). Very similar to *M. acutistylus*, with differences as follows. Ventro-lateral lobes of gonocoxites subrectangular. Disto-lateral lobes of gonocoxites long. Gonocoxites on dorso-posterior margin without an irregular comb of setae directed inwards. Gonostyli small, elongate, rounded apically; each on posterior margin with 2 long setae directed inwards, and 1 long seta directed dorsally; on anterior margin with 2 setae subbasally. Parastylar lobes small (not illustrated). Tegmen narrow, evenly tapering to tip; ventro-lateral lobes distinct.

Diagnostic characters. See under Terminalia.

Etymology. From Latin, *rotundus*, rounded, and *stylus*, style, referring to the outline of the gonostyli.

Types. Holotype. Male, Costa Rica, Cartago province, Finca los Lagos, Madreselva, 2600 m, 1 Sep.–23 Oct. 1994, by Malaise trap, M.M. Chavarria (INBio sample #3354).

Paratypes. 1 male, same data as the holotype; 1 male, same locality, but Aug. 1994 (INBio sample #3250).

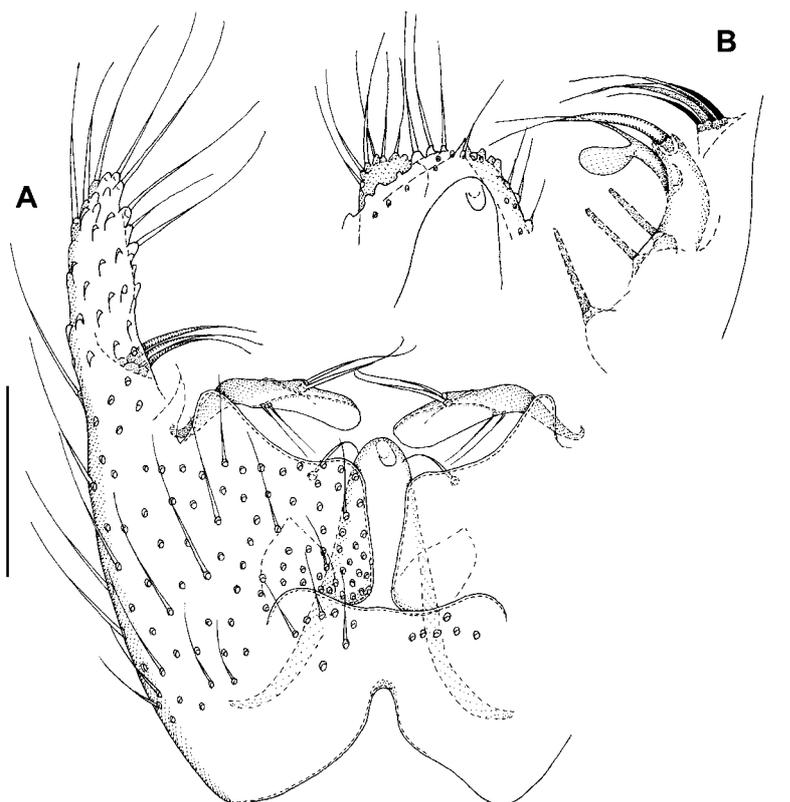


FIGURE 25. *Manota rotundistylus* sp. n. (holotype). **A:** Male terminalia, ventral view. **B:** Male terminalia, dorsal view. Scale = 0.1 mm.

***Manota planistylus* sp. n. (Figs 2B, 26)**

Description. Small species.

Male. Head. Antenna with fourth flagellomere 2.1 times as long as wide. Maxillary palpus with third palpomere bearing 3 curved sensilla; fourth palpomere with a parasegment apically.

Thorax. Anterior basalare bare. Laterotergite setose. Episternum 3 with ventral portion setose. **Wing.** Length 1.4–1.5 mm. Membrane with a few setae along posterior margin. Sc bare. CuA2 fading away proximally.

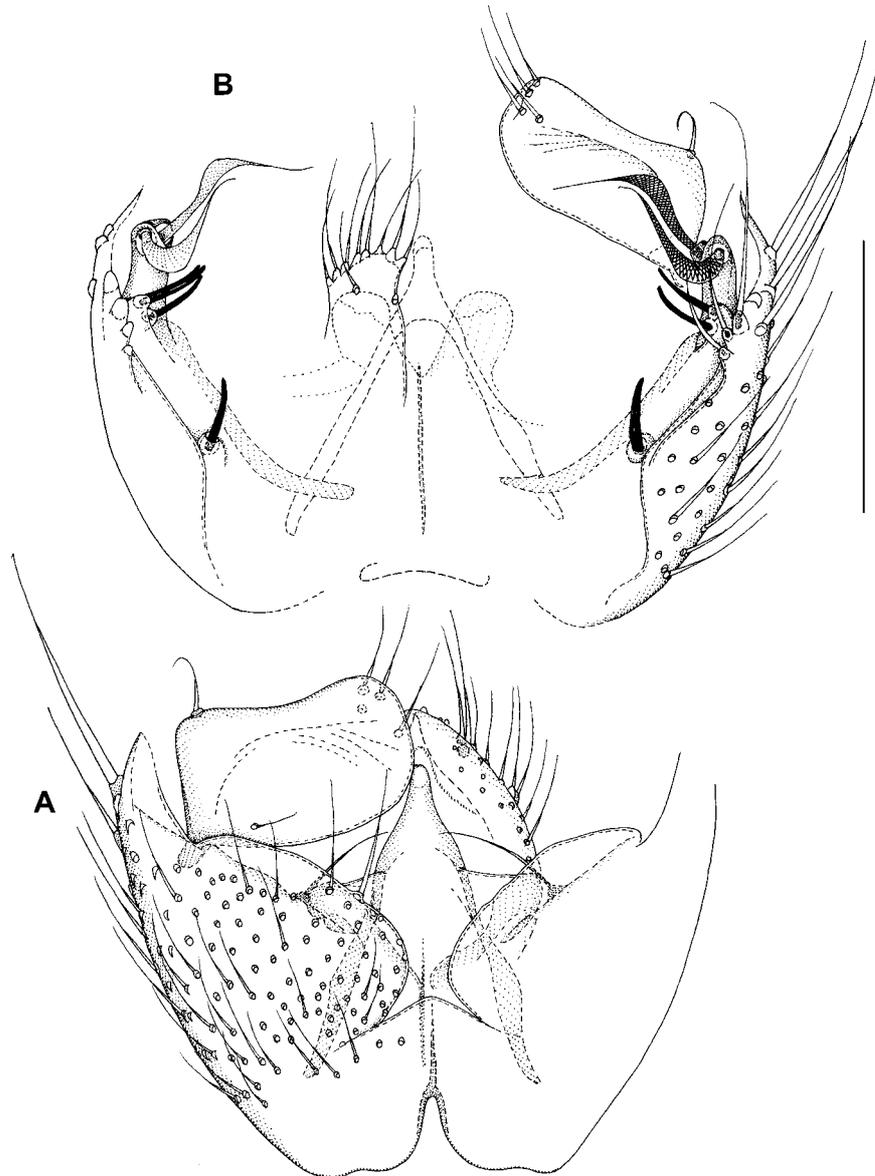


FIGURE 26. *Manota planistylus* sp. n. **A:** Male terminalia, ventral view (holotype). **B:** Male terminalia, ventral view (paratype). Scale = 0.1 mm.

Terminalia (Figs 2B, 26). Sternite 9 with only the posterior margin distinct; margin situated below mid length of gonocoxites, convex. Ventro-lateral lobes of gonocoxites rounded, marginally each with 1–2 larger setae; interiorly with 1 long seta on a separate rim. Disto-lateral lobes of gonocoxites very short; along posterior margin with some 5 very large, straight setae. Gonocoxites in position I with 1 medium-sized, blunt megaseta; in position II with 3 short, blunt megasetae; in position III with 2 flat, pointed megasetae; with 2 large and 2 smaller setae displaced from position IV to posterior margin of gonocoxites. Gonostyli very large, subrectangular in ventral view; each dorsally on posterior

edge with 4(–5) comparatively fine setae, on posterior margin with 1 re-curved seta directed dorsally; dorso-subbasally near anterior margin with 1 seta. Parastylar lobes small, weak, bare (not illustrated). Tegmen almost evenly tapering to tip; ventro-lateral lobes distinct. Hypoproct rounded apically; with long setae laterally.

Diagnostic characters. Among the species with setose laterotergites, it is very similar to *M. rectolobata* and *M. intermedia*, all three species having the disto-lateral lobes of the gonocoxites much reduced and the gonostyli very large and flat. For differences, see under the following two species.

Etymology. From Latin, *planus*, flat, and *stylus*, style, referring to the outline of the gonostyli.

Types. Holotype. Male, Costa Rica, Puntarenas province, Corcovado National Park, 600 m S Cerro Rincón, 745 m, 23 April–24 June 2002, by Malaise trap, J. Azofeifa (INBio sample #70842). *Paratypes.* 8 males, same data as the holotype.

***Manota rectolobata* sp. n. (Figs 1B, 1D, 27)**

Description. Large species.

Male. Head. Antenna with fourth flagellomere 2.5 times as long as wide (Fig. 1B). Maxillary palpus with third palpomere bearing 3 curved sensilla; fourth palpomere with a parasegment apically.

Thorax. Anterior basalare bare. Laterotergite setose. Episternum 3 with ventral portion setose. **Wing.** Length 2.4 mm. Membrane with a few setae along posterior margin. Sc bare. CuA2 fading away proximally. Presence of A1 usually indicated by a few setae in a line between CuA and A2.

Terminalia (Figs 1D, 27). Extremely similar to *M. planistylus*, with differences as follows. Sternite 9 with posterior margin rather straight. Ventro-lateral lobes of gonocoxites subrectangular; interiorly with 1 strong seta on a separate rim. Gonocoxites in position III with 2 megasetae very broad, particularly the dorsal one. Gonostyli in ventral view narrower towards apex, rounded apically; each dorsally along anterior and apical margins with row of up to 10 setae, with three apical setae rather strong; on posterior margin with 1 re-curved seta directed dorsally; next to the re-curved seta with a small lobe directed dorsally.

Diagnostic characters. See under Terminalia.

Etymology. From Latin, *rectus*, straight, and *lobatus*, lobed, referring to the outline of the ventro-lateral lobes of the gonostyli.

Types. Holotype. Male, Costa Rica, Cartago province, Tapantí–Macizo de la Muerte National Park, Sendero Arboles Caídos, 1500–1600 m, 9 April 2002, by Malaise trap, D. Rubí & C. Hansson (INBio sample #67891). *Paratypes.* 4 males, same data as the holotype.

Other material studied. 2 males, same National Park as types, but Sector la Represa, 26 March 2002, D. Rubí & C. Hansson (INBio sample #67894).

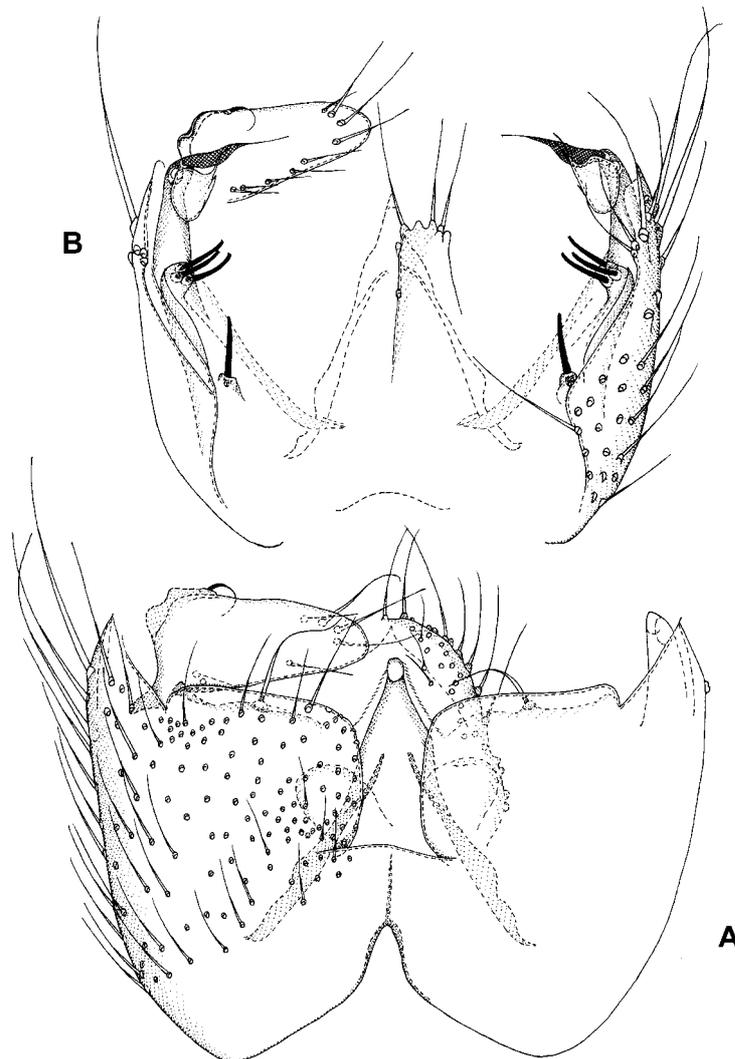


FIGURE 27. *Manota rectolobata* sp. n. **A:** Male terminalia, ventral view (holotype). **B:** Male terminalia, dorsal view (paratype). Scale = 0.1 mm.

***Manota intermedia* sp. n. (Fig. 28)**

Description. Small species.

Male. Head. Antenna with fourth flagellomere 2.0 times as long as wide. Maxillary palpus with third palpomere bearing 3 curved sensilla; fourth palpomere with a parasegment apically.

Thorax. Anterior basalare bare. Laterotergite setose. Episternum 3 with ventral portion setose. **Wing.** Length 1.5–1.7 mm. Membrane with a few setae along posterior margin. Sc bare. CuA2 fading away proximally.

Terminalia (Fig. 28). Extremely similar to *M. planistylus* and *M. rectolobatus*. Sternite 9 with posterior margin straight. Vento-lateral lobes of gonocoxites subrectangular;

interiorly with 1 very strong seta on a separate rim. Gonocoxites in position III with 2 flat, pointed megasetae, with dorsal one very broad; dorsal margin with setae particularly dense. Gonostyli similar to *M. rectolobatus* in shape, and setation similar to *M. planistylus*, with apical setae rather strong; on posterior margin with 1 re-curved seta directed dorsally, but without a lobe next to it.

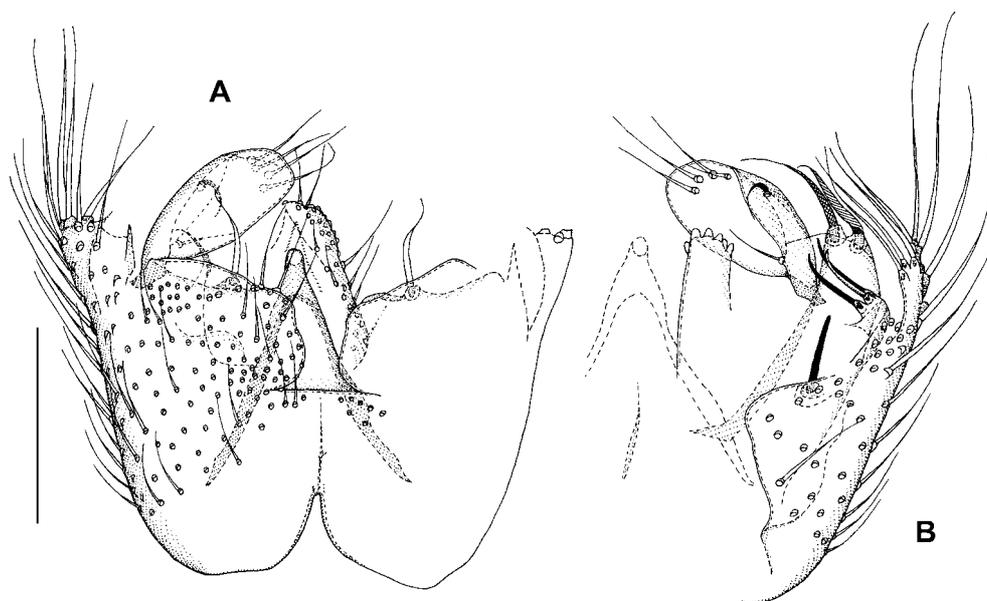


FIGURE 28. *Manota intermedia* sp. n. **A:** Male terminalia, ventral view (holotype). **B:** Male terminalia, dorsal view (specimen from Tapantí). Scale = 0.1 mm.

Diagnostic characters. See under Terminalia.

Etymology. From Latin, *intermedius*, medium, referring to the intermediate morphology between *Manota planistylus* and *M. rectolobatus*.

Types. *Holotype.* Male, Costa Rica, Limón province, Hitoy Cerere Biological Reserve, Sendero Espavel, 560 m, 11 March–1 April 2003, by Malaise trap, E. Rojas, B. Gamboa & W. Arana (INBio sample #73628). *Paratypes.* 2 males, same data as the holotype; 2 males, same locality, but 18 Sep.–7 Oct. 2003, E. Rojas, B. Gamboa, W. Arana, M. & C. Jaschhof; 1 male, Cartago province, Tapantí–Macizo de la Muerte National Park, Estación La Esperanza, 2200–2600 m, in cloud forest of oak, 3–22 Nov. 2003, by Malaise trap, M. & C. Jaschhof.

Other material studied. 1 male, Cartago province, Tapantí–Macizo de la Muerte National Park, Sendero Arboles Caídos, 9 April 2002, D. Rubí & C. Hansson (INBio sample #67891).

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