



The genus *Manota* Williston (Diptera: Mycetophilidae) in New Zealand

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Abstract

Manota spp. are quite common in all kinds of indigenous forest in New Zealand. Five species are present: *M. maorica* Edwards, *M. granvillensis* sp. n., *M. birgitae* sp. n., *M. purakaunui* sp. n., and *M. regineae* sp. n. They can be distinguished from one another by male genitalic characters, in particular those of gonostylus. New Zealand *Manota* form a monophyletic group though their relationship to *Manota* spp. outside New Zealand is unclear.

Key words: Diptera, Mycetophilidae, *Manota*, new species, New Zealand

Introduction

The genus *Manota* is a prime example of an open-ended taxon in Mycetophilidae (cf. Bickel 2009). The number of described species stands currently at 161 (Hippra & Ševčík 2010), but any Malaise sample taken in tropical rainforest is likely to contain additional species. Compared with the tropics, the genus is much less speciose in the moist temperate forests of both the southern and northern hemisphere. For instance, *Manota* has few species in the Holarctic Region and South Africa and appears to be completely lacking in Tasmania (pers. obs.). In New Zealand manotas are among the most common mycetophilids (pers. obs.). This fact, only brought to light with the widespread use of Malaise traps, is well known to contemporary New Zealand entomologists studying fungus gnats (cf. Davies 1988, Toft *et al.* 2001). Previous findings were always assigned to *Manota maorica* Edwards, the only previously described New Zealand species (Tonnoir & Edwards 1927). *Manota maorica* was described on the basis of four male specimens of which the holotype specimen was recently restudied by Hippra (2007). Here we document the occurrence in abundance of *Manota* throughout New Zealand and the presence of five species, four of them new. The new species are described and named and compared with manotas elsewhere. Further, we describe the female of *Manota maorica* and supplement the male description.

Material and methods

We studied a total of 1417 specimens, among which were only 3 females. Specimens were, for the most part, picked from unsorted ethanol samples deposited with the following New Zealand institutions: New Zealand Arthropod Collection, Tamaki, Auckland (Dr T.K. Crosby); Landcare Research, Nelson (R. Toft); Department of Conservation, St Arnaud (through mediation by R. Toft); Canterbury Museum, Christchurch (P.M. Johns, Dr R.P. Macfarlane); University of Canterbury, Christchurch (Dr R.K. Didham); and School of Forestry, Christchurch (through mediation by P.M. Johns). Another large number of specimens were collected by ourselves on various occasions during the years 2001–2003. Holotypes, most paratypes and further specimens are deposited in the New Zealand Arthropod Collection (NZAC). Some paratypes and voucher specimens are kept in the Senckenberg Naturhistorische Sammlungen, Museum für Tierkunde, Dresden, Germany (SMTD).

Type specimens are mounted on microscope slides, most of the other specimens are kept in 70% ethanol. For mounting in Canada balsam, some specimens were macerated in lactic acid following the procedure described by Cumming (1992), transferred back to 70% ethanol and then treated with beechwood creosote. The other specimens remained unmacerated, but were also treated with creosote. For light microscope study and the preparation of drawings we used an Olympus BX50 microscope in combination with the U-DA drawing unit. The morphological terminology as used here follows Sølvi (1997), Jaschhof & Hippa (2005) and Jaschhof & Kallweit (2009). In particular, we continue using “positions” for referring to certain setae on gonocoxites (cf. Jaschhof & Hippa 2005), as we regard this as a convenient and unmistakable way to specify homologous structures. Wing veins with their abbreviations as used in the text are labelled in Figure 1A. The structures of male terminalia are explained in Figure 2A.

Abbreviations for geographic names are as follows: AK, Auckland; BR, Buller; FD, Fiordland; KA, Kaikoura; MC, Mid Canterbury; NN, Nelson; NO, North Island; OL, Otago Lakes; SI, Stewart Island; SL, Southland; SO, South Island; TO, Taupo; WD, Westland. Other abbreviations used are: Cr., creek; F., forest; F. P., Forest Park; I., island, L., lake; loc., locality; N. P., National Park; R., river; Rd. road; Res., reserve; Sc. Res., Scientific Reserve; S. F., State Forest; Tr., track. Holotype data are given without abbreviations.

Common features of New Zealand *Manota*

All the species of *Manota* in New Zealand are large, usually with wing lengths of 2 mm or more, and have a largely uniform morphology. **Head.** The number of postocular bristles is 10–14 and may vary within species; the fourth antennal flagellomere is slightly longer than wide in males (Fig. 1D) and as long as wide in females (Fig. 1E); the third segment of the maxillary palpus bears 3 (occasionally only 2) curved sensilla subapically. **Thorax.** The anepisternum is usually asetose, but may bear 1 seta in some of the species; the preepisternum 2, laterotergite and episternum 3 are all setose, with the number of setae being intraspecifically quite variable (see *Manota purakaunui*). **Wing.** The wing membrane is smoky on the apical half (see Tonnoir & Edwards 1927: plt. 63, fig. 85) and is asetose except for a few setae along the posterior margin (Fig. 1A); vein R1 is longer than in most other manotas, meeting C near the wing midlength and much beyond the base of the sclerotized portion of M2 (not M1 as stated by Hippa 2007); the CuA-fork is complete; the CuA-stem is setose; presence of A1 is indicated by a few setae in line. **Legs.** The mid tibia of males bears very dense, fine setae situated on a subbasal swelling mesally (= mid tibial organ, Fig. 1B, C). The mid tibial organ is absent in females. **Terminalia.** Male genitalic structures are consistent to a common basic pattern that is clearly perceivable in all of the five species (Figs 2–6). Sternite 9 (not tergite 9 as stated by Hippa 2007) is largely separate from the gonocoxites, is reinforced by sclerotization along its midline, has a deeply notched, U-shaped anterior margin and bears 2–3 pairs of large setae subapically (Fig. 2A); the parastylar lobe is thumb-shaped and bears 2 large setae (Fig. 2A); the inside of ventromesal margin of the gonocoxa has a bare membranous lobe of various size (which may actually be a part of the parastylar lobe); the gonocoxa has numerous ordinary setae in position I, a large lobe with a few ordinary subbasal setae and several mesal and apical macrosetae in position II, a thumb-shaped lobe with 1 strong subapical seta and 1 flat apical macroseta in position III (= juxtagonostylar setae of Hippa 2007), and no special modification in position IV (Figs 2B, C, 3B, C, 4B, C, 5B, C); the gonostylus is large, composed of several lobes that bear variously modified setae (Fig. 6); the tegmen has lateral shoulders; the parameral apodemes are widely diverging; the hypoproct bears dense setae including a pair of strong setae on each side subapicodorsally; and the cerci are mesally separate. Preimaginal stages are not known for any of the species.

Manota maorica Edwards

(Figs 1, 6C)

Supplement to the redescription by Hippa (2007). Third segment of maxillary palpus with 3, rarely 2 curved sensilla. Both preepisternum 2 and episternum 3 setose. Smoky portion of wing membrane

comparatively large, even though somewhat varying in size, apicalmost and basal membrane portions rather clear. Mid tibial organ comparatively short, occupying less than one fourth of tibia length (Fig. 1B, C). The male terminalia were figured by Hippa (2007: fig. 3). Gonocoxae with some 15 setae in position I, 4 mesal and 4 apical macrosetae in position II, and the macroseta in position III broad, blunt-tipped, similar to that in *Manota purakaunui*, Fig. 4B (see below). The membranous lobe on the ventromesal margin of gonocoxa is the largest of all the species dealt with here, even larger than that in *Manota birgittae*, Fig. 3A (see below). Gonostylus with 3–4 plus 6–8 macrosetae on apical margin and 4–6 macrosetae on mesal margin, the lobes on mesal surface extremely large and prominent (Fig. 6C). Females are very similar to males. Differences concern the antenna, which is shorter in females (Fig. 1E) and the mid tibial organ, which is lacking in females. The terminalia of female *M. maorica* do not differ from that in many other *Manota* females (cf. Hippa 2007: fig. 2). Long setae with very large basal bodies present on apical margin of tergite 9. Two cercus segments, basiscercus more than 3 times the length of disticercus. Wing length in males 2.0–2.2, in females 2.2–2.7 mm.

Material. *Specimens on slide.* SO: BR: 21 males, 3 females, Ahaura, Granville S. F., Dec. 1994, J. Hutcheson. *Specimens in ethanol.* NO: AK: 1 male, Kawau I., May–June 1993, D. Williams; SO: NN: 1 male, Kahurangi N. P., Takaka R. valley, Cobb Dam Rd., 31 Aug.–7 Oct. 2001, M. & C. Jaschhof; BR: 189 males, Ahaura, Granville S. F., Dec. 1994, J. Hutcheson; 56 males, Maruia F., Shenandoah Saddle, 9 Oct.–25 Nov. 2001, M. & C. Jaschhof, U. Kallweit; 45 males, 5 km W Maruia Springs, 26 Nov.–25 Dec. 2001, M. & C. Jaschhof; 3 males, Paparoa N. P., 5 km E Punakaiki, Inland Park Tr., 30 Sep.–23 Nov. 2001, M. & C. Jaschhof; 11 males, L. Daniells Tr. 10 km NE Springs Junction, 24 Nov.–26 Dec. 2001, M. & C. Jaschhof; KA: 4 males, Waiiau, Pillona, 26 Dec. 2000–12 Jan. 2001, P.M. Jones; 1 male, Blue Duck Sc. Res., beech crown, 15 m height, 15–22 Jan. 1991, R.K. Didham; 1 male, same loc., totara crown, 12 m height, 22–29 Jan. 1991; WD: 32 males, Waitototo, 16 Oct.–20 Nov. 2001, M. & C. Jaschhof; 6 males, Westland N. P., SE Gillespies Beach, 14 Oct.–21 Nov. 2001, M. & C. Jaschhof; 1 male, Okuku Sc. Res. SE Dillmanstown, 18 Dec. 2001, M. Jaschhof; MC: 2 males, Cass, Middle Bush, 9 April and 10 Dec. 1998, P.M. Jones; OL: 3 males, Fiordland N. P., Eglinton R. valley, Deer Flat, 4–24 Jan. 2002, M & C. Jaschhof; FD: 1 male, Fiordland N. P., 4 km E Milford Sound, 7 Jan. 2002, M. Jaschhof; 45 males, Fiordland N. P., Hollyford R. valley, Moraine Cr. Tr., 5–24 Jan. 2002, M. & C. Jaschhof; SL: 138 males, Catlins Coastal Rain F. P., Catlins R. valley, 3 Jan.–5 March 2002, M. & C. Jaschhof; 171 males, Catlins, Purakaunui Scenic Res., 27 Jan.–5 March 2002, M. & C. Jaschhof; SI: 5 males, Smoky Beach, 15/16 Jan 2000, R.K. Didham; 13 males, Christmas Village Hut, 17/18 Jan. 2000, J.B. & G.M. Ward, R.K. Didham; 11 males, Murray Beach, 20 Jan. 2000, R.K. Didham; 4 males, Kaipipi Bay 3 km W Halfmoon Bay, 27 March 2002, M. Jaschhof.

***Manota granvillensis* Jaschhof & Jaschhof sp. n.**

(Figs 2, 6B)

Male. **Thorax.** Anepisternum with 0–1 seta. **Wing.** Length 2.0–2.3 mm. Membrane with small smoky portion compared with other New Zealand species. **Legs.** Mid tibial organ comparatively short, occupying little more than one fourth of tibia length. **Terminalia** (Figs 2, 6B). Apical margin of st 9 rounded. Gonocoxa with small bare lobe on ventromesal margin, about 20 setae in position I, 4–6 mesal and 2 apical macrosetae in position II, the macroseta in position III blunt-tipped. Setae on parastylar lobe long, lash-like. Gonostylus elongate, comparatively slender, its apex pointing dorsally, apical margin with 4–6 broad flat macrosetae, ventromesal margin with 2–3 long setae on short process, dorsomesal surface with some 15 setae on a prominent lobe.

Female unknown.

Etymology. From the type locality, Granville State Forest.

Types. *Holotype.* Male, New Zealand, South Island, Buller, Ahaura, Granville State Forest, in *Nothofagus truncata* forest, 170–250 m, Dec. 1994, by Malaise trap 2GUL10L, J. Hutcheson (in NZAC). *Paratypes.* 10 males, same data as the holotype; 4 males, same data but trap 2GUL8M (9 in NZAC and 5 in SMTD).

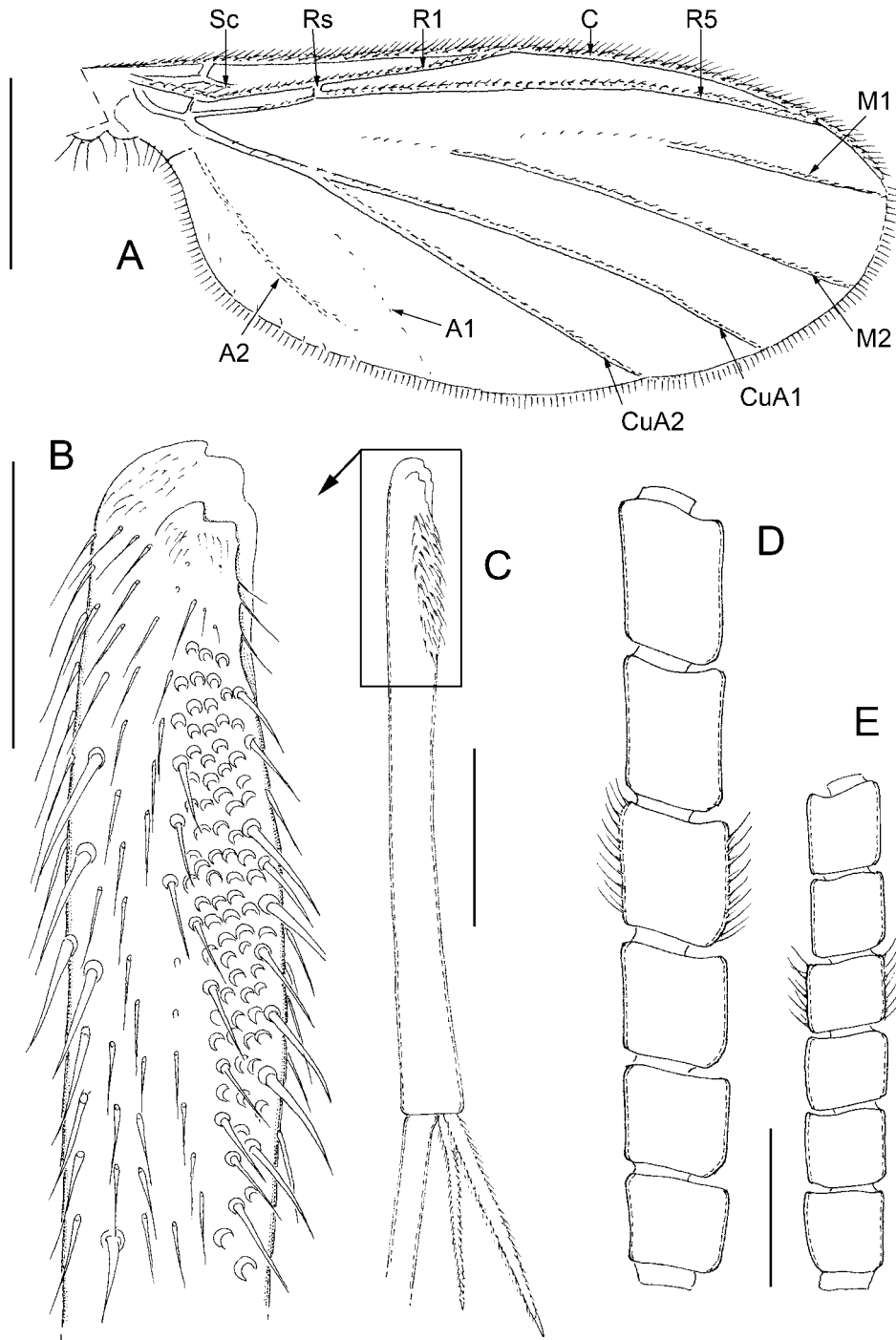


FIGURE 1. *Manota maorica* Edwards. **A:** Male wing (shading not drawn). **B:** Mid tibial organ, mesal view. **C:** Mid tibia with tibial organ indicated, mesal view. **D:** Male antennal flagellomeres 1–6. **E:** Female antennal flagellomeres 1–6. Scale for A, 0.50 mm; B, D and E, 0.10 mm; C, 0.25 mm.

Other material. *Specimens on slide.* SO: BR: 2 males, Ahaura, Granville S. F., Dec. 1994, J. Hutcheson. *Specimens in ethanol.* NO: TO: 1 male, Pureora F. P., Waipapa Res., 4/5 Feb. 2002, M. Jaschhof; SO: BR: 62 males, Ahaura, Granville S. F., Dec. 1994, J. Hutcheson; WD: 2 males, Okuku Scenic Res. SE Dillmanstown, 18 Dec. 2001, M. Jaschhof; FD: 95 males, Fiordland N. P., Hollyford R. valley, Moraine Cr. Tr., 5–24 Jan. 2002, M. & C. Jaschhof; SL: 5 males, Catlins Coastal Rain F. P., Catlins R. valley, 3 Jan.–5 March 2002, M. & C. Jaschhof; 54 males, Catlins, Purakaunui Scenic Res., 27 Jan.–5 March 2002, M. & C. Jaschhof; SI: 1 male,

Ulva I., Boulder Beach Tr., 13 Jan. 2000, J.B. & G.M. Ward; 1 male, Kaipipi Bay 3 km W Halfmoon Bay, 7 March 2002, M. Jaschhof.

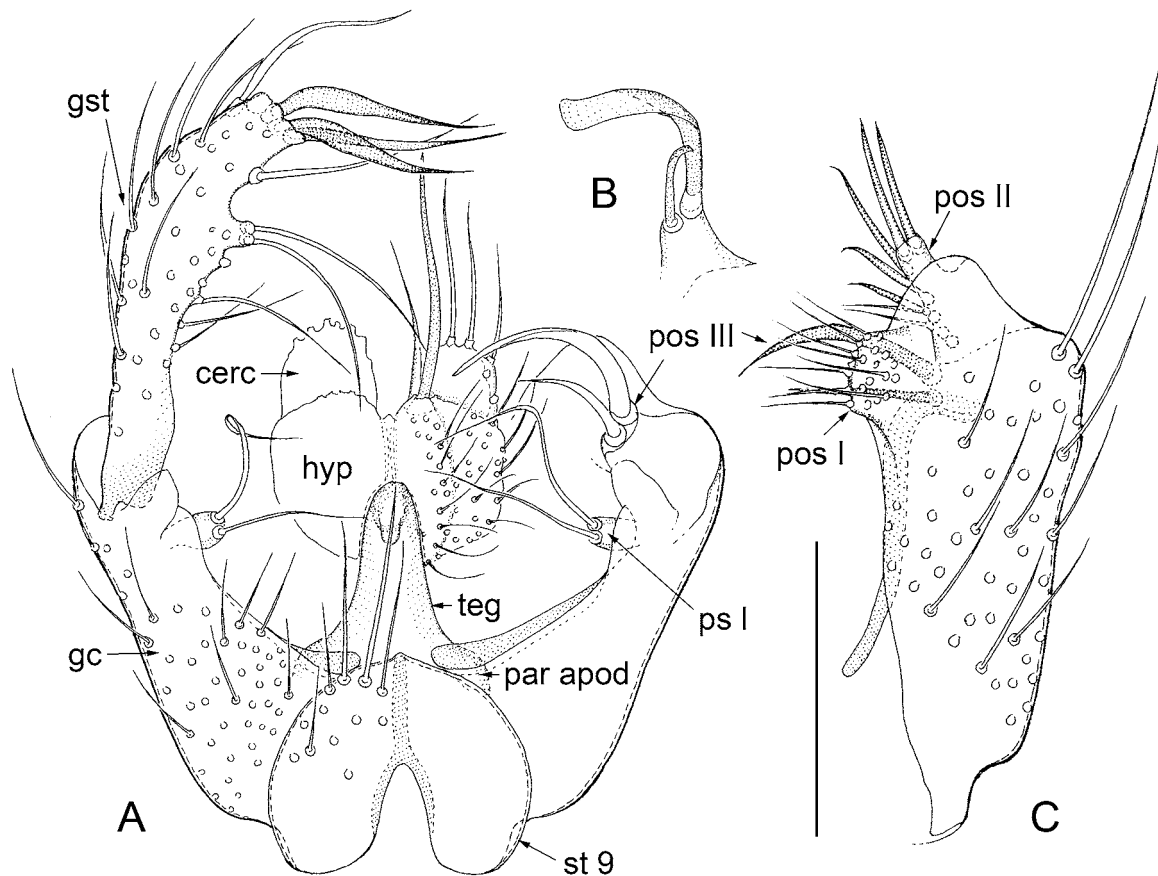


FIGURE 2. *Manota granvillensis* sp. n., male. **A:** Terminalia, ventral view (holotype). **B:** Setae on gonocoxa in position III. **C:** Right gonocoxa, dorsal view. Scale 0.10 mm. Abbreviations: cerc, cercus; gc, gonocoxa; gst, gonostylus; hyp, hypoproct; par apod, parameral apodeme; pos I–III, position I to III; ps I, parastylar lobe; st 9, sternite 9; teg, tegmen.

***Manota birgittae* Jaschhof & Jaschhof sp. n.**

(Figs 3, 6A)

Male. **Thorax.** Anepisternum with 0–1 seta. **Wing.** Length 2.0–2.3 mm. Membrane with comparatively small smoky portion. **Legs.** Mid tibial organ comparatively small. **Terminalia** (Figs 3, 6A). Apical margin of st 9 rounded. Gonocoxa with large bare lobe on ventromesal margin, about 15 setae in position I, about 10 macrosetae mesally and apically on the lobe in position II, the macroseta in position III blunt-tipped. Gonostylus on apical margin with 15–20 long setae pointing dorsomesally, on ventromesal margin some 7 long setae on a small process, on mesal surface a large, subtriangular, exposed lobe bearing marginally very dense, fine setae, a smaller lobe subbasally, bearing fewer but larger setae.

Female unknown.

Etymology. We name this species after Ms. Birgit Sievert, Berlin, for her support of our work on Diptera over many years.

Types. *Holotype.* Male, New Zealand, South Island, Buller, Ahaura, Granville State Forest, in *Nothofagus truncata* forest, 170–250 m, Dec. 1994, by Malaise trap 2GUL10L, J. Hutcheson (in NZAC). *Paratypes.* 9 males, same data as the holotype; 9 males, same data but trap 2GUL8M (12 in NZAC and 6 in SMTD).

Other material. *Specimens on slide.* SO: BR: 2 males, Ahaura, Granville S. F., Dec. 1994, J. Hutcheson. *Specimens in ethanol.* SO: BR: 72 males, Ahaura, Granville S. F., Dec. 1994, J. Hutcheson; 1 male, L. Daniells Tr. 5 km E Springs Junction, 9 Nov. 2001, M. Jaschhof; 32 males, same site but 7 km E Springs Junction, 24 Nov.–26 Dec. 2001, M. & C. Jaschhof; 2 males, L. Daniells 10 km NE Springs Junction, 26 Dec. 2001, M. Jaschhof; 2 males, Maruia F., Shenandoah Saddle, 3–25 Nov. 2001, M. & C. Jaschhof; 87 males, 5 km W Maruia Springs, 26 Nov.–25 Dec. 2001, M. & C. Jaschhof; 4 males, Lewis Pass, 26 Nov.–25 Dec. 2001, M. & C. Jaschhof; WD: 4 males, Waitoto, 16 Oct.–20 Nov. 2001, M. & C. Jaschhof; 1 male, Westland N. P., SE Gillespies Beach, 14 Oct.–21 Nov. 2001, M. & C. Jaschhof; OL: 105 males, Fiordland N. P., Eglinton R. valley, Deer Flat, 4–24 Jan. 2002, M. & C. Jaschhof; FD: 6 males, Fiordland N. P., Hollyford R. valley, Moraine Cr. Tr., 5–24 Jan. 2002, M. & C. Jaschhof; SL: 3 males, Catlins Coastal Rain F. P., Catlins R. valley, 3 Jan.–5 March 2002, M. & C. Jaschhof; 14 males, Catlins, Purakaunui Scenic Res., 27 Jan.–5 March 2002, M. & C. Jaschhof.

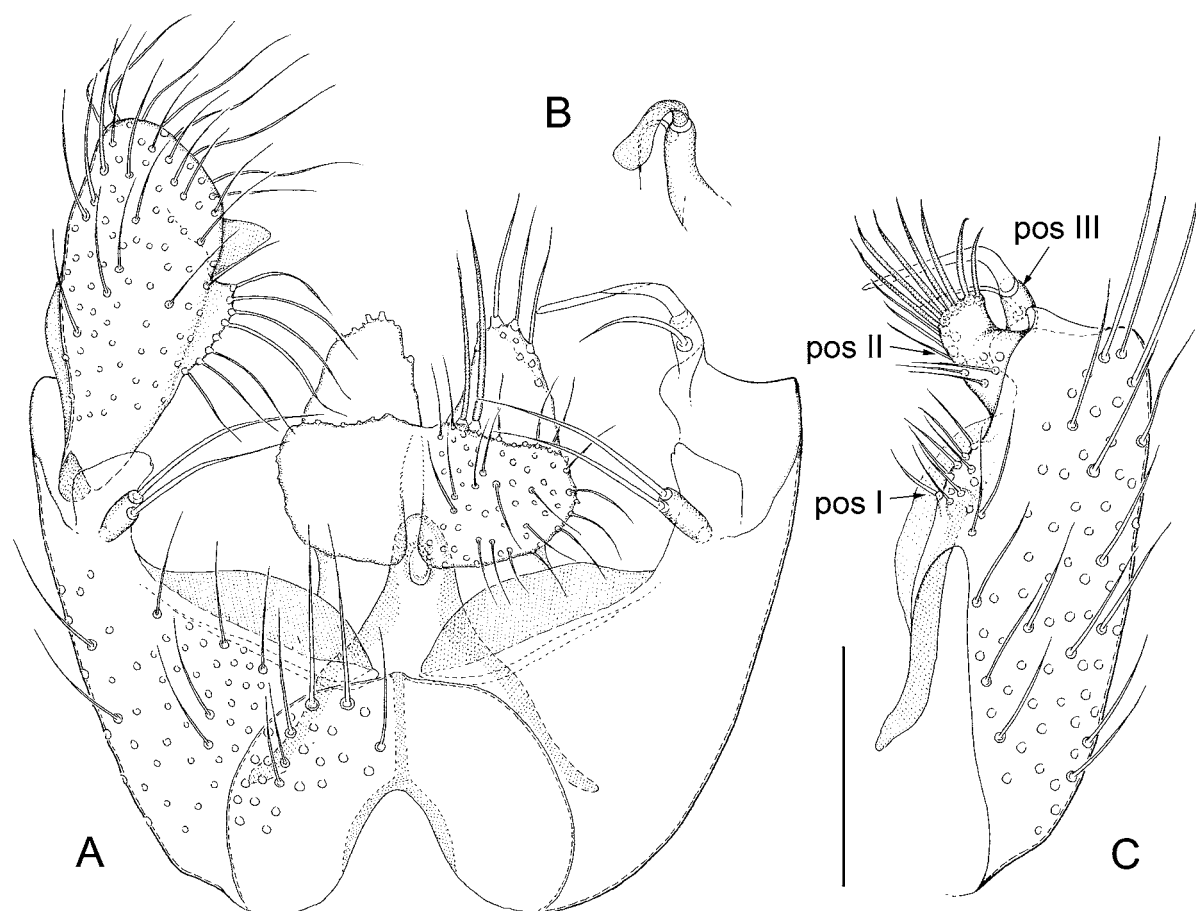


FIGURE 3. *Manota birgitae* sp. n., male. **A:** Terminalia, ventral view (holotype). **B:** Setae on gonocoxa in position III. **C:** Right gonocoxa, dorsal view. Scale 0.10 mm.

***Manota purakaunui* Jaschhof & Jaschhof sp. n.**

(Figs 4, 6D)

Male. **Thorax.** Anepisternum with 0–1 seta. **Wing.** Length 2.0–2.2 mm. Membrane with comparatively small smoky portion. **Legs.** Mid tibial organ large, occupying one third of tibia length. **Terminalia** (Figs 4, 6D). Apical margin of st 9 notched. Gonocoxa with moderately large bare lobe on ventromesal margin, about 15 setae in position I, arranged in a narrow stripe, 3 mesal and 2 stronger apical macrosetae in position II, the macroseta in position III broad rounded apically. Gonostylus with 8–9 long setae on apical margin, the

innermost seta strongest of all, 4–5 long setae on ventromesal margin, on dorsomesal surface a large lobe bearing dense, rather fine setae, a smaller, more exposed lobe subbasally, bearing larger setae.

Female unknown.

Remark. The number of pleural setae varies among specimens (n=10): 14–22 on preepisternum 2, 27–38 on laterotergite and 6–15 on episternum 3. We found variation to a similar extent also in the other species studied here.

Etymology. From the type locality, Purakaunui Scenic Reserve.

Types. *Holotype.* Male, New Zealand, South Island, Southland, Catlins, Purakaunui Scenic Reserve, in mixed podocarp/beechn forest, 27 Jan.–5 March 2002, by Malaise trap, M. & C. Jaschhof (in NZAC). *Paratypes.* 3 males, same data as the holotype; 1 male, North Island, Taupo, Pureora Forst, Waipapa Reserve, in podocarp forest, 570 m, 12 Jan. 1984, by Malaise trap, J. Hutcheson; 5 males, North Island, Wanganui, Palmerston North, Munroes Bush, March 1981, by Malaise trap, P. Watt; 5 males, Wanganui, Kakariki Rangitawa Bush, 120 m, Dec. 1997, by Malaise traps MPNRbT 1614, MPNRcNT 1542, R.J. Harris; 3 males, South Island, Buller, Ahaura, Granville State Forest, in *Nothofagus truncata* forest, 170–250 m, Dec. 1994, by Malaise traps 2GUL4K, 2GUL8M, 2GUL10M, J. Hutcheson; 1 male, Buller, 5 km W Maruia Springs, in mixed *Nothofagus* forest, 26 Nov.–25 Dec. 2001, by Malaise trap, M. & C. Jaschhof (14 in NZAC and 6 in SMTD).

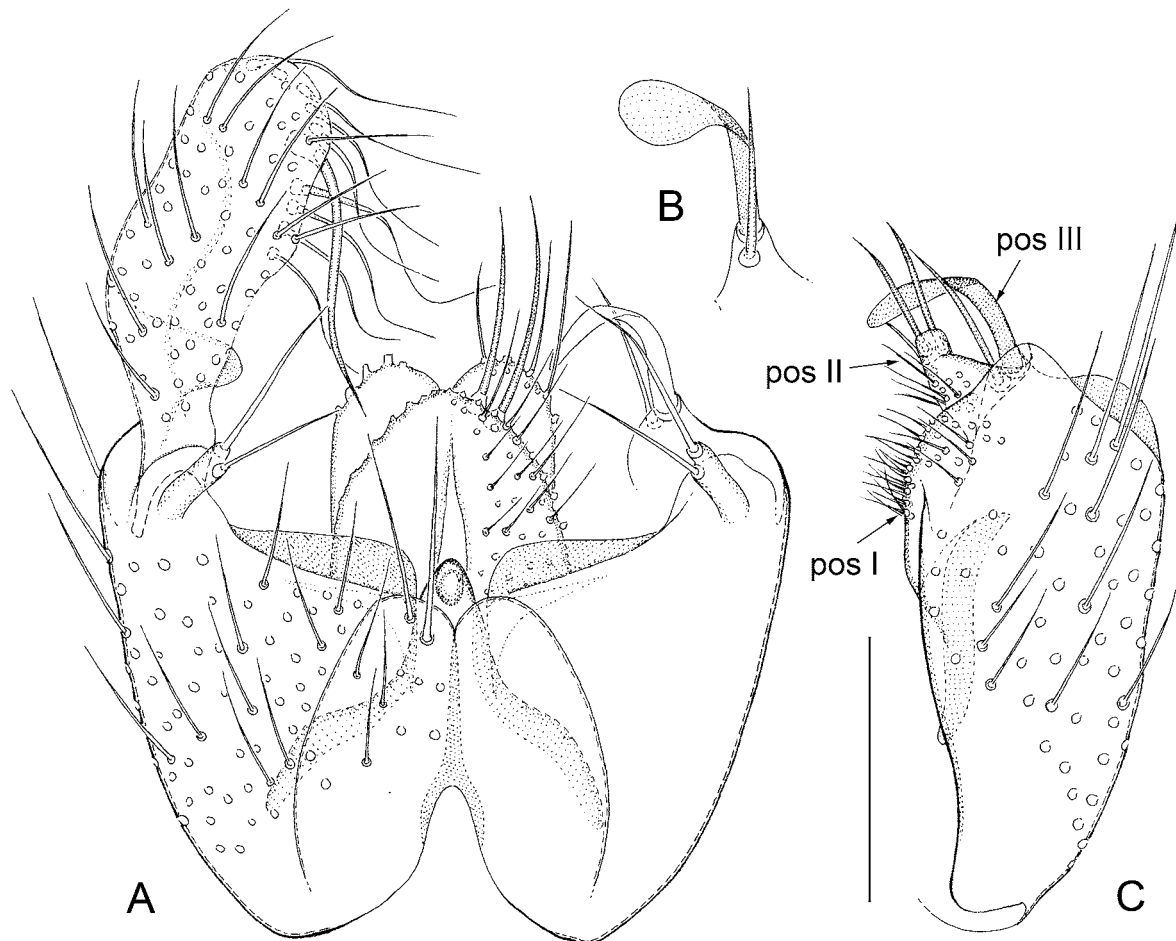


FIGURE 4. *Manota purakaunui* sp. n., male. **A:** Terminalia, ventral view (holotype). **B:** Setae on gonocoxa in position III. **C:** Right gonocoxa, dorsal view. Scale 0.10 mm.

***Manota regineae* Jaschhof & Jaschhof sp. n.**

(Figs 5, 6E)

Male. **Thorax.** Anepisternum asetose. **Wing.** Length 2.0–2.2 mm. Membrane with comparatively small smoky portion. **Legs.** Mid tibial organ large. **Terminalia** (Figs 5, 6E). Apical margin of st 9 rounded. Gonocoxa with moderately large bare lobe on ventromesal margin, about 15 setae in position I, 3–5 mesal and 4 apical macrosetae in position II, the macroseta in position III tapered towards apex. Gonostylus comparatively short and broad, with 2–3 macrosetae on the crest of apical margin, 4–5 plus 5–6 long setae on ventromesal margin, on mesal surface a large transverse lobe bearing dense fine setae, a smaller lobe more basally, bearing fewer but larger setae.

Female unknown.

Remark. In one of the specimens studied the gonostyli are mesally connate, clearly a malformation.

Etymology. We name this species after Dr Regine Dahse, Jena, for her continuing support of our studies of Diptera.

Types. *Holotype.* Male, New Zealand, North Island, Wanganui, Palmerston North, Munroes Bush, Dec. 1980–Feb. 1981, by Malaise trap, P. Watt (in NZAC). *Paratypes.* 7 males, same data as the holotype; 10 males, same site but labelled “in reserve”, Jan. 1981; 9 males, North Island, Wellington, Otaki Denton’s Bush, 40 m, Dec. 1997, by Malaise trap MPNDcT 1236, R.J. Harris (15 in NZAC and 6 in SMTD).

Other material. *Specimens in ethanol.* NO: AK: 1 male, Huia, Jan. 1981, B. Mau; TO: 1 male, Pureora F., Waipapa Res., 1 Dec. 1983, J. Hutcheson; 1 male, same locality but 1 March 1984; WI: 3 males, Palmerston North, Munroes Bush, March 1981, P. Watt.

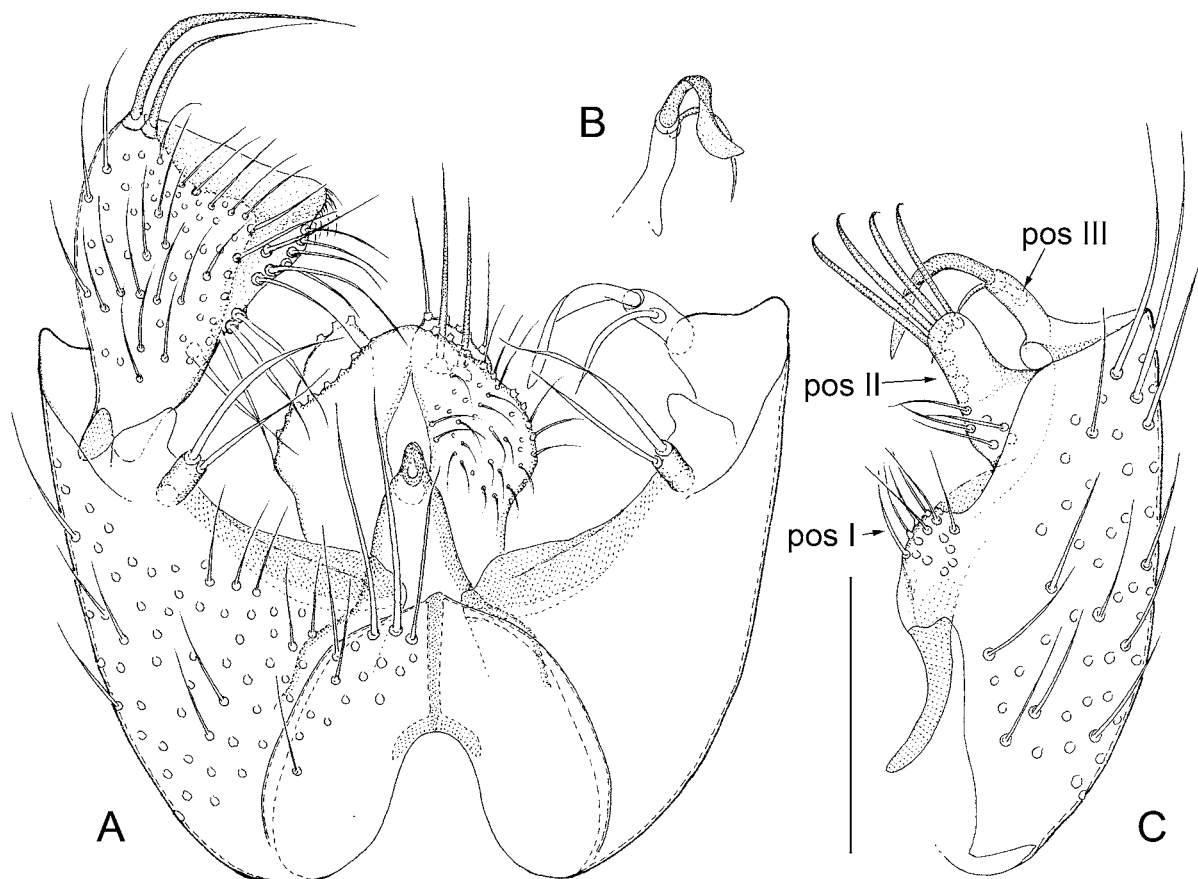


FIGURE 5. *Manota regineae* sp. n., male. **A:** Terminalia, ventral view (holotype). **B:** Setae on gonocoxa in position III. **C:** Right gonocoxa, dorsal view. Scale 0.10 mm.

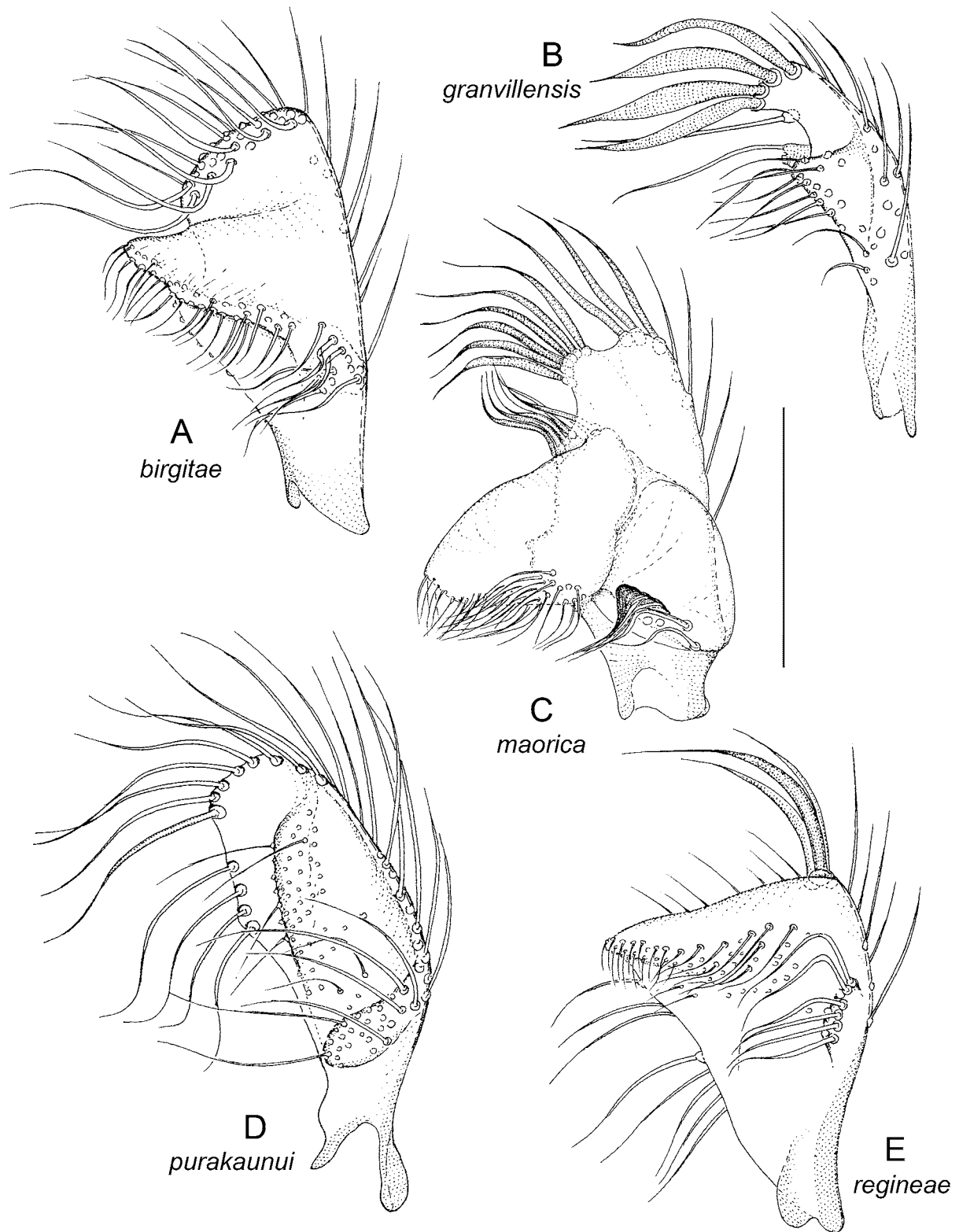


FIGURE 6. Right gonostylus of *Manota* spp., dorsomesal view. **A:** *M. birgitae* sp. n. **B:** *M. granvillensis* sp. n. **C:** *M. maorica* Edwards. **D:** *M. purakaunui* sp. n. **E:** *M. regineae* sp. n. Scale 0.10 mm.

Relationships

Adult morphology indicates that New Zealand *Manota* form a monophyletic group. Not only are the five species very similar to each other, they also share derived characters not found in other manotas, such as shaded wing tips and complex, multi-lobed gonostyli, of which the basic structure is identical in all species. The presence of the mid tibial organ is another derived character of New Zealand *Manota*, but might have been overlooked in earlier described extralimital species. We found the mid tibial organ to be present in an unnamed species from Queensland, Australia, which otherwise is greatly dissimilar to the species from New Zealand (unpubl.). The long R1 is shared with the Palearctic *Manota unifurcata* Lundström (cf. Lundström 1913: plt. 15, fig. 17), the Oriental *Manota subforceps* Hippa & Ševčík (cf. Hippa & Ševčík 2010: fig. 1B) and a few others, but might be a plesiomorphic character state. Moreover, the common possession of the long R1 in these species is not accompanied with other phylogenetically significant characters. Similarly, there are other characters that, if contemplated in isolation, might be regarded as signs of relationship (cf. Hippa 2007: 8). Taking the full set of adult characters into account, the species from New Zealand stand isolated among the World *Manota* as currently known. Their closest relatives might be expected to be found in the southern Neotropics, Australia or New Caledonia, which however are largely unstudied for manotas.

Distribution and phenology

Manota spp. occur in all of New Zealand, four species each on the North Island and the South Island, with two species on Stewart Island. *M. maorica* is the most common and abundant species of all, represented in our material by 53% of the specimens and present in 74% of all the samples studied. Its distributional range comprises practically the entire South Island including Stewart Island, the existing gaps explained by incomplete sampling. Only one of our specimens of *M. maorica* comes from the North Island, which points to a restricted distribution there and urges restudy of the specimens identified as *M. maorica* from Hawkes Bay by Davies (1988) and from Wanganui and Wellington by Toft *et al.* (2001). We examined the manotas from some of the samples taken in the course of the latter study and found *M. purakaunui* and *M. regineae*, but not *M. maorica*.

Two other species, *M. granvillensis* and *M. birgatae*, are moderately common, making up 17% and 25%, respectively, of our specimens and occurring in 28% and 42%, respectively, of our samples. *M. granvillensis* is widespread on the South Island including Stewart Island, but has only one record from the North Island. *M. birgatae* appears to be confined to the South Island, where it is widespread. *M. purakaunui* and *M. regineae* must be regarded as rare species, both represented by about 2% of our specimens and in little more than 10% of our samples. While *M. purakaunui* is present on both the North and South Islands, *M. regineae* was found to occur exclusively on the North Island.

We found manotas in all kinds of indigenous forest, from lowlands to mountains. Our data are insufficient to make a statement regarding the quality of the forests containing manotas, or regarding potential habitats other than forest. As a notable fact, up to four species may occur at one site, and even in one Malaise trap sample. The highest number of male specimens, of four species, found in a single Malaise sample was 243 (the trap was set up for 5 weeks). Manotas are much more abundant on the forest floor than in the canopy. Only two male specimens of *M. maorica* were captured in crowns of *Nothofagus* sp. and *Podocarpus totara* trees 12–15 metres above the ground (cf. Didham 1997).

It is remarkable that only 24 specimens studied here were collected by sweep net, which compares with 1391 specimens captured by Malaise trap. This underlines strikingly the advantage of Malaise trapping over hand-collecting in obtaining manotas.

Identification

Interspecific differences in male genitalic structures should be used for the identification of species. They can be observed by means of a good stereo microscope, even without dissecting and slide-mounting specimens. Gonostylus shape and vestiture alone provide most obvious species-specific characters (Fig. 6), so we see no necessity for constructing a key. In particular the outline of the gonostylus apex, including the kind and arrangement of setae, is diagnostic and well observable at relatively low magnification. However, some experience is required with observing small, three-dimensional structures. As gonostyli are complex, flexible bodies that may be distorted, their outline as perceived from different angles may change dramatically. Doubtful specimens should be slide-mounted for compound microscope study, not only of gonostyli but also of other genitalic structures, such as sternite 9 and the dorsal aspect of gonocoxites. Drawing from our experience with closely related manotas elsewhere, we consider it unlikely that females of New Zealand *Manota* can be identified to species, so the fact that our species are only known from the male sex should not be a deficit. Lastly, as we have seen hundreds of specimens of *Manota* from many parts of New Zealand, we regard the possibility as low that there are further species present in this country.

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