

***Geron* sp. (Diptera: Bombyliidae) and new distributional record for New Zealand.**

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Abstract

The Australasian subgenus *Geron* (*Plichtamyia*) Evenhuis 1979 (Diptera: Bombyliidae: Toxophorinae) is newly recorded from a single known location in New Zealand. Previously the only bombyliid species known in New Zealand was the endemic *Tillyardomyia gracilis* Tonnoir, 1927 (Diptera: Bombyliidae: Ecliminae). A brief description to distinguish the two genera is provided and detailed illustration are provided for future workers.

Introduction

Bee flies (Bombylioidea) are considered one of the larger groups of flies (Diptera) and are found almost everywhere in the world. Bee flies comprise the families Mythicomysiidae (micro bee flies) and Bombyliidae (lower bee flies). Mythicomysiidae are not known to be present in New Zealand. *Tillyardomyia gracilis* Tonnoir, 1927 is endemic and is the only species of Bombyliidae commonly known in New Zealand (Greathead 1988). *Comptosia moretonii* Macquart, 1855 (Bombyliidae: Lomatiinae) is a common species in eastern Australia and had been recorded in New Zealand once only as a wind dispersed migrant but is not established in New Zealand (Evenhuis 1986, 1987, Yeates 1991). I collected for the first time an unknown bombyliid species from Napier, Hawkes Bay, New Zealand in January 2000. The specimen was identified using Hull (1973) by Ian Andrew (pers. comm.) and myself as belonging to the genus *Geron* Meigen, 1820. MacFarlane *et al.* (2010) published this unidentified *Geron*

sp. as a New Zealand endemic species. Subsequent collection efforts in December 2004 and 2005, in January 2015, and in December 2017 resulted in additional specimens. Consultation of Evenhuis' (1979) key to subgenera of *Geron* showed that the specimens did not belong to the Nearctic subgenus *Empidigeron* Painter, 1932 nor the Afrotropical subgenus *Pseudoamictus* Bigot, 1892. Using Evenhuis (1979) and Hall & Evenhuis (2003) confirmed the specimens not to be a Nearctic species of the subgenus *Geron*. Having confirmed the New Zealand *Geron* sp. not belonging in the subgenera *Empidigeron* and *Pseudoamictus* suggests that the New Zealand species belongs to the Australasian subgenus *Plichtamyia*, Evenhuis 1979. The New Zealand *Geron* specimens could not be identified at the species level with the help of comparative material made available of some *Geron* species housed in the ANIC collection (including some paratype material).

Therefore, a brief diagnosis of the *Geron* sp. based on the specimens collected from New Zealand is given. Even though *T. gracilis* was described by Tonnoir (1927) and the description revised by Greathead (1988) and a description of *C. moretonii* was given by Yeates (1991), brief diagnosis of both, for comparison with the *Geron* sp. from New Zealand, is provided. Also included in this article are the known New Zealand locality records for *T. gracilis* and its specimen depositories.

Material and methods

Collection acronyms are as follows:

AMNZ – Auckland Museum, New Zealand; ANIC – Australian National Insect Collection, CSIRO, Canberra, Australia; CMNZ – Canterbury Museum, Christchurch, New Zealand; FSNZ – Franz-Rudolf Schnitzler Collection, New Zealand; NZAC – New Zealand Arthropod Collection, Manaaki Whenua—Landcare Research, Auckland, New Zealand.

The geographic subregions (two letter codes) of New Zealand are as defined by Crosby *et al.* (1998). Voucher specimens of the New Zealand collected *Geron* sp. are deposited at FSNZ and NZAC.

For genitalia dissections whole abdomens were placed at room temperature in potassium hydroxide (KOH 10%) for 12 h and there after heated for ten minutes to 70°C. Dissected material was neutralized in glacial acidic acid and then washed in distilled water. Dissected male material and female abdomen were stored in glycol in microvials pinned below the specimen and female genitalia slide-mounted in Euparal. Morphological terminology follows Cumming and Wood (2017).

New Zealand *Geron* specimens were collected by sweep-netting over a period of 7 years (2000-2017) in the southern hemisphere summer months of December/January on Bluff Hill, Napier, New Zealand, co-ordinates - 39.478926, 176.918226, at 101 m above sea level. Bluff Hill is a public area and a popular lookout. The area is well maintained and many of the plants cultivated are suitable nectaring hosts for adults of *Geron* (Fig.1). The lookout area (Fig. 2) is at the highest point of Bluff Hill and is bordered by a cliff facing the Napier port. *Geron* adults were only observed and collected on sunny, hot and still days.



Figure 1: Live *Geron* sp. female on Bluff Hill



Figure 2: Napier Bluff Hill gardens during summer displaying a variety of suitable nectaring hosts for *Geron* sp.adults. Photo courtesy Napier City Council.

Diagnosis

The New Zealand *Geron* sp (Fig. 3) can easily be distinguished from *Tillyardomyia gracilis* (Fig. 4) and *Comptosia moretonii* (Fig. 5) by the absence of the wing vein M_2 (Fig. 6) and having clear wings. In both *T. gracilis* and *C. moretonii* the vein M_2 is present (Figs. 4-5) and the wings

are infusate. *Tillyardomyia gracilis* has the wings infusate in the anterior half (Fig. 4), whereas in *C. moretonii* the wings are in part infusate from anterior to posterior and clear at the apex (Fig. 5).

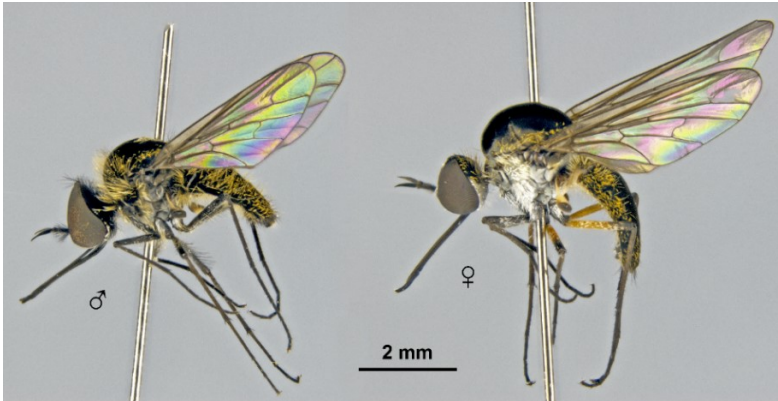


Figure 3: Lateral view of male (left) and female (right) *Geron* sp.



Figure 4: Dorsal view of *Tillyardomyia gracilis*. The wings are infusate along the anterior half and wing vein M_2 is present (arrow). Scale bar 5mm.



Figure 5: Dorsal view of *Comptosia moretonii*. The wings are in part infusate from anterior to posterior and clear at the apex. The wing vein M_2 is present (arrow). Photograph courtesy of Michael Jefferies



Figure 6: Right wing of *Geron* sp. male showing absence of wing vein M₂ (arrow).

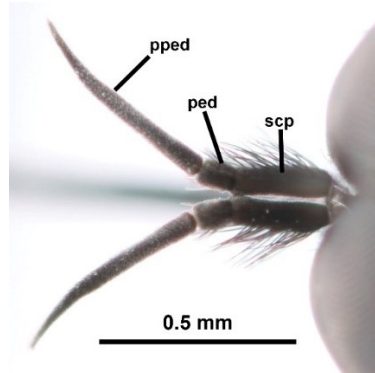


Fig. 7: Dorsal view of *Geron* sp. male antennae. Abbreviations: ped = pedicel, pped = postpedicel, scp = scape.

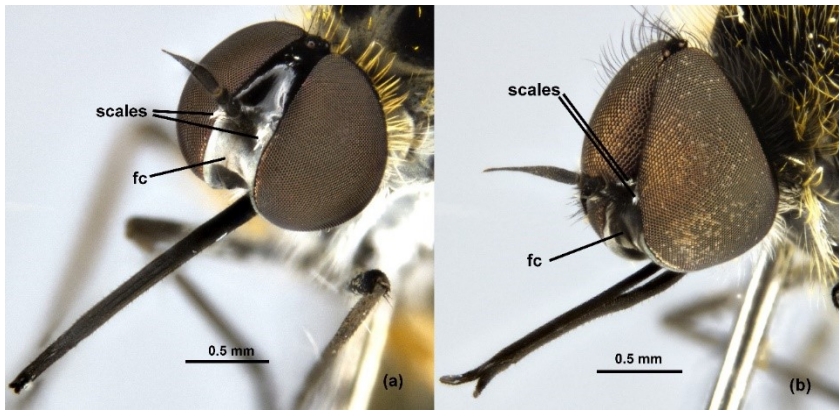


Figure 8: *Geron* sp. frontolateral view of head showing silvery scales on frons beside antennae: (a) female, eyes wide apart; (b) male, eyes meeting above antennae. Abbreviations: fc = face.

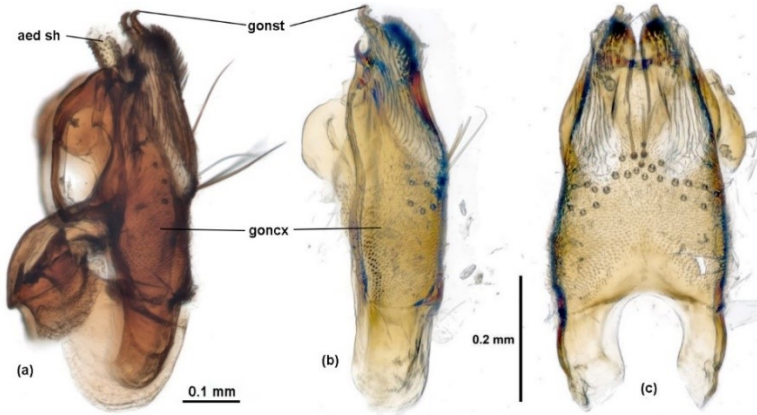


Figure 9: Comparison of *Geron* spp. (♂) genital capsules: (a) genital capsule, lateral, Australian *G. microcciput*; (b) genital capsule, lateral, (c) genital capsule, ventral, New Zealand *Geron* sp.- Abbreviations: aed sh = aedeagal sheath; goncx = gonocoxite; gonst = gonostylus. ((a) Australian specimen dissected and photographed by Xuankun Li; image courtesy and permission of David Yeates, ANIC).

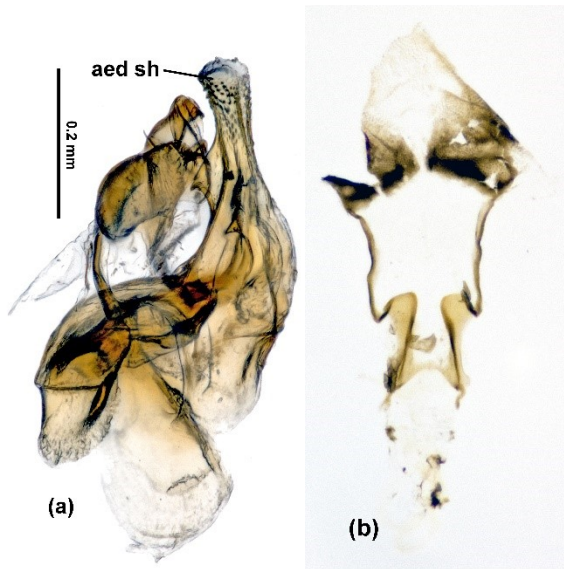


Figure 10: *Geron* sp.: (a) male, phallic structures; (b) female, sternite 9.

The New Zealand *Geron* sp. postpedicel without distinct pubescence (Fig. 7), face bare (Fig. 8); postpedicel distinct pubescent in the subgenus *Empidigeron* (couplet 1, p. 2 in Evenhuis 1979), and face predominantly hairy in *Empidigeron* (Evenhuis 1979 couplet 1, p. 2) and in Nearctic *Geron* spp. (Hall and Evenhuis 2003, couplet 1, p. 4).

The New Zealand *Geron* sp. gena narrow, eyes in male in contact above antennae (Fig. 8), thorax humped; in the subgenus *Pseudoamictus* gena broad, eyes of male not in contact above antennae for a long distance, thorax not markedly humped (Evenhuis 1979, couplet 2, p. 2). The *Geron* sp.: male antennae ratio 3:1:6 (Fig. 7); frons with silver scales (Fig. 8); overall body length 4.2-5.5 mm. Male and female genitalia as in Figs. 9-10.

Material Examined.

Geron (Plichtamyia) sp.: New Zealand **HB**, Coll.: F.R. Schnitzler, Bluff Hill, Napier, collected by sweeping: 1 ♂, *Pomaderris* sp. flowers, 09 Jan 2000 (NZAC4090131); 1 ♂, *Erigeron karvinskianus* flowers, 26 Dec 2005 (NZAC4090132); 1 ♂, 1 ♀, Daisy flowers, 31 Dec 2005 (NZAC4090133, 4090134); 1 ♂, 1 ♀, *Helichrysum petiolare* flowers, 12 Jan 2015 (NZAC4090135, 4090136); 1 ♀, 1 ♂, Daisy flowers, 26 Dec 2005 (FSNZ04000045, 04000174); 1 ♂, 1 ♀, *Helichrysum petiolare* (licorice plant) flowers, 12 Jan 2015 (FSNZ04000173, 04000172 – sternite 9 slide mount (FSNZ02000007)); 1 ♀, Daisy flower, 24 Dec 2017; 1 ♂, *Lobularia maritima* flowers, 31 Dec 2004, (this specimen has been lost).

Australia, paratypes det. N.L. Evenhuis 1978: 1 ♂, 4mils E. of Nimmitabel, 08 Mar 1963, Z. Liepa, N.S.W.; 1 ♀, Bluff Ra S-W, slopes near Biggenden Qld., 25 Feb 1976, H. Frauca.

***Tillyardomyia gracilis* Tonnoir**: New Zealand **NN**: Type, ♂ Dun Mt., 14 Feb 1926, E.S. Gourlay (NZAC04021413); paratypes, 1 ♂, Dun Mt. 2500ft. 03 Feb 1921 (NZAC04019564); 1 ♀ Dun Mt., 2000ft., 20 Dec 1925, E.S. Gourlay, (NZAC4090137), (Fig.); Cobb Ridge 3400ft, on *Hebe* flrs., 05 Feb 1966, E.S. Gourlay (NZAC04090130); 1 ♀, Lake Rotoiti, Malaise trap, 01-12 Jan 1976, A.K. Walker (NZAC04090128); 1 ♀, Canaan Saddle, 1000m, sweeping *Leptospermum scoparium*, 01 Feb 1978, A.K. Walker (NZAC04090129); **CL**: 1 ♀ Great Barrier Island, Little

Windy Hill, 100m, coastal forest, Malaise trap, 20 Jan – 25 Feb 2003 (AMNZ). **RI:** 1 ♂, Harris, Ohakune (NZAC04019562), **no data:** 1 ♀, (NZAC04019550); allotype,

Additional *T. gracilis* collecting records and sightings. **DN:** Paratype, Dunedin, 620m, 17 Jan 1921, A. Philpott (CMNZ 2007.192.4170); **KA:** Puhī Puhī Reserve, 01 Jan 1930, S. Lindsay, (CMNZ 2007.192.4171); **NC:** Okuku Pass, sweeping young *Nothofagus*, *Cyathodes*, 14 Jan 1972, P. Johns, (CMNZ 2007.192.4172).

NN: Maitai, Nelson, 16 Jan 2021, inaturalist.nz/observations/68377232;

OL: Makarora, 11 Jan 2024, inaturalist.nz/observations/213591919;
inaturalist.nz/observations/196739177 ;

NN: Tapawera, 05 Jan 2024, inaturalist.nz/observations/196073586.

Location records for *G. nigrocciput* and *T. gracilis* are summarized in Fig. 11.

Discussion

During initial attempts at identifying the NZ species, a specimen labelled as a male paratype of *G. nigrocciput* was borrowed from ANIC. This specimen was found not to be conspecific with the NZ species. However, male genitalia images supplied to me by Xuankun Li (ANIC, pers. comm.) of an Australian *G. nigrocciput* Evenhuis, 1979 specimen allowed for comparison with the male genitalia of the species from Napier. This comparison showed the New Zealand specimen to be close to the Australian endemic *G. nigrocciput*. *Geron nigrocciput* appears most similar to *G. dispar*, and within the genus the male genitalia are invaluable in separating species (Evenhuis 1979), which are otherwise difficult to separate. Sharing and comparing photographic images from New Zealand and Australia of male genitalia however was inconclusive. A full revision of the subgenus *Plichtamyia* would be required to identify the New Zealand *Geron* species as *G. nigrocciput*, or an existing or new species.

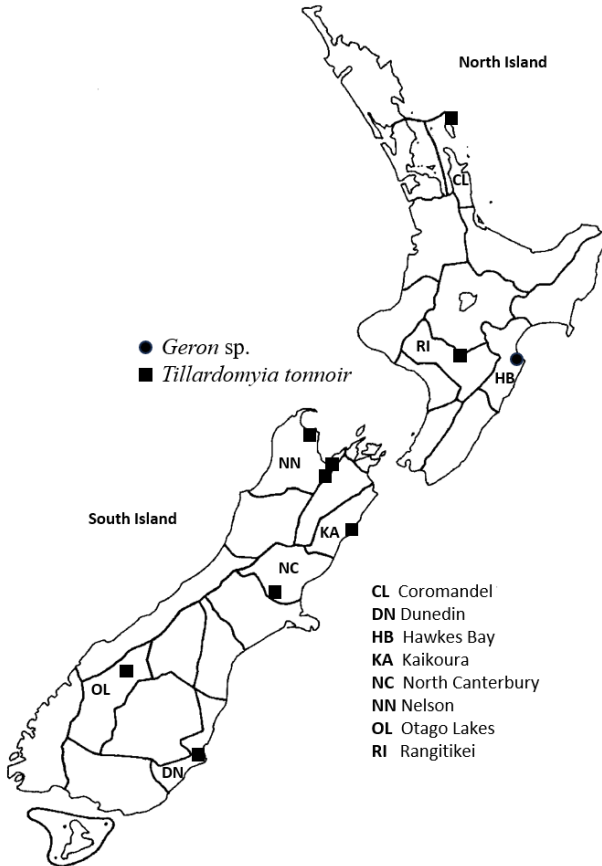


Figure 11: *Geron* sp. and *Tyllyardomyia gracilis* location records for New Zealand and the area codes after Crosby *et al.* (1998).

Geron specimens were observed and collected only on Bluff Hill in Napier from 2000 to 2017. The New Zealand distribution of the *Geron* species may not be restricted to Bluff Hill. Further collecting efforts might show a more extended range throughout Napier and/or confirm a long-term presence in New Zealand. However Bluff Hill Lookout is almost like an island with a variety of suitable nectaring plants for the adult flies.

Therefore, the long-term persistence of this population might be vulnerable to any changes, should this species be restricted to this area. Specimens are best collected by sweep-net when hovering above or sitting on their preferred food plants. However, they are difficult to see as they fly very fast and erratically similar to hoverflies. *Geron* species in general prefer composites with exposed inflorescences and small florets (Hall and Evenhuis 2003) and specimens from Bluff Hill were collected from such flowers.

Geron species are parasitic on a variety of lepidopteran larvae including larvae of the Lepidoptera families Tortricidae, Pyralidae, Psychidae, and Noctuidae (Evenhuis 1979) and Sesiidae (Purrington and Evenhuis 2001). All these families are present and relatively diverse in New Zealand (Dugdale 1988), except for Sesiidae (only a single introduced species, *Synanthedon tipuliformis* (Clerck). The hosts of *G. nigrocciput* are not known (Evenhuis, 1979; Xuankun Li, pers. comm.). Whether the *Geron* species arrived on Bluff Hill via its host or by any other means is also not known. In its native range the Australian endemic *G. nigrocciput* has been recorded from Tasmania, South Australia, Australian Capital Territory, New South Wales, and Queensland, however its host is not known.

Other material supplied by ANIC and examined were: *G. (P.) dispar* Macquart, 1850; *G. (G.) australis* Macquart, 1840; *G. (G.) chrysonotum* Evenhuis, 1979; *G. (G.) balbi* Evenhuis, 1979; *G. (G.) flavocciput* Evenhuis, 1979 and *G. (G.) karakara* Evenhuis, 1979. The New Zealand *Gero* specimen could be excluded to be any one of these afore mentioned species.

The only other exotic bombyliid species collected in New Zealand is *Comptosia moretonii* known here from a single male, collected by J. L. Gressitt from Franz Joseph Glacier on the South Island and deposited in BPBM (Yeates 1991). This species is considered a vagrant, and has almost certainly never established in New Zealand.

Until the first *Geron* specimen was collected from Bluff Hill the only bombyliid species known in New Zealand was the endemic *Tillyardomyia gracilis*. According to MacFarlane (2010) *T. gracilis* is confined to the South Island in grass and tussock habitat; however this species has also

been collected in the central North Island and on Great Barrier Island. The biology of *T. gracilis* is also unknown. Worldwide there are over 4500 species of Bombyliidae known (Evenhuis and Greathead 2003), of which two are now known to occur in New Zealand. Future studies on both the endemic *T. gracilis*, the newly recorded *Geron* species and the exotic *G. nigrocciput* would enhance our limited knowledge about the distributions and biology of these species.

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