



***Kaurimyia* gen. nov.: discovery of Apsilocephalidae (Diptera: Therevoid clade) in New Zealand**

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Abstract

A new genus (*Kaurimyia thorpei* gen. et sp. nov.) of the enigmatic fly family Apsilocephalidae (Asiloidea) is described from New Zealand. *Kaurimyia thorpei* gen. et sp. nov. is described and figured from male and female specimens, one of which was collected in Kauri forest near Auckland (North Island). While superficially similar to *Apsilocephala* Kröber, this new genus shows closer affinities to *Clesthentia* White (= *Clesthentiella* Nagatomi, Saigusa, Nagatomi et Lyneborg syn. nov.) from Tasmania based on genitalic characters such as aedeagus shape and non-articulated surstyli. Apsilocephalidae is presently known from just a few extant species in North America and Tasmania (Australia), although extinct species are recorded from the Holarctic and Oriental regions. This is the first description of the family from New Zealand.

Key words: Apsilocephalidae, New Zealand, Kauri

Introduction

The therevoid clade consists of four families of Asiloid flies (Lower Brachycera): Therevidae, Scenopinidae, Evocoidae and Apsilocephalidae. The clade has been poorly defined in a phylogenetic sense due to numerous plesiomorphies in the adults and lack of information on immatures of two of the families (Apsilocephalidae and Evocoidae). Scenopinidae and Therevidae have been long established as family groups, while Evocoidae was only recently described based on a single species from Chile (Yeates *et al.* 2003). Apsilocephalidae are an enigmatic group comprising three extant genera, one described from North America (*Apsilocephala* Kröber) and two monotypic genera described from Tasmania (Australia) (*Clesthentia* White and *Clesthentiella* Nagatomi, Saigusa, Nagatomi & Lyneborg (Nogatomi *et al.* 1991a). An extinct monotypic genus (*Burmap-silocephala* Gaimari & Mostovski) was described from Burmese amber (Gaimari & Mostovski 2000) while Hauser & Irwin (2005) recently transferred the fossil species, *Apsilocephala vagabunda* (Cockerell) described from Florissant shale, from Therevidae to Apsilocephalidae.

Apsilocephalidae are diagnosed in the context of Asiloidea by the presence of surstyli on the male epan-drium, three sclerotised spermathecae and antennal and wing venational characteristics. The presence of hind coxal knobs and a spermathecal sac in the female reproductive system of all Apsilocephalidae places this family in the Therevoid clade (Winterton *et al.* 1999b; Yeates 2002). The family status of Apsilocephalidae has remained highly contentious until recently. *Clesthentia* was originally described in Leptidae (= Rhagionidae) by White (1915) and subsequently transferred to Therevidae by Hardy (1921). Placement of both *Apsilocephala* and *Clesthentia* in Therevidae was questioned by Irwin (1976) and Irwin & Lyneborg (1981, 1989) until Nagatomi *et al.* (1991a) erected Apsilocephalidae for these genera and described *Clesthentiella*. Sinclair *et al.*

(1994) questioned the status of Apsilocephalidae due to the apparent lack of synapomorphies (many Eremoneura also possess epandrial surstyli). Nagatomi & Yang (1998) placed Apsilocephalidae as a synonym of the extant family Rhagionempididae, a decision rejected by subsequent authors (Gaimari & Mostovski 2000; Yeates *et al.* 2003; Hauser & Irwin 2005) who supported the retention of family status of Apsilocephalidae.

The highly disjunct distribution of extant species of Apsilocephalidae (North America and Tasmania), with extinct species in the Oriental and Palaearctic regions (see Gaimari & Mostovski 2000) indicate that the present distribution pattern is relictual and that this group was historically more widely distributed. Both Hauser & Irwin (2005) and Gaimari & Mostovski (2000) state that Apsilocephalidae are found in New Zealand, based on the presence of an undescribed species. Herein we describe and figure that species (*Kaurimyia thorpei* **gen. et sp. nov.**) as a new genus of Apsilocephalidae from single male and female specimens collected from both the North and South Islands of New Zealand. Based on characters given by Nagatomi *et al.* (1991) we conclude that the generic distinction between *Clesthenticia* and *Clesthentiella* is not justified and the latter is herein placed in synonymy with the former.

Material and Methods

Terminology follows McAlpine *et al.* (1981) although genitalic morphology is modified according to Winterton *et al.* (1999a). As discussed in Winterton (2006), this paper follows Hauser & Irwin (2003) in the use of the term pubescence *sensu* Nichols (1989) instead of pruinescence to describe microtrichia covering the adult body.

Genitalia were macerated in 10% KOH at room temperature for one day to remove soft tissue, then rinsed in distilled water and dilute glacial acetic acid, and dissected in 80% ethanol. Female reproductive organs were stained with a saturated solution of Chlorazol Black in 40% ethanol. Genitalia preparations were placed in glycerine in a genitalia vial mounted on the pin beneath the specimen. Types are located in the New Zealand Arthropod Collection (NZAC) in Auckland, and the Natural History Museum (NHM) in London, England. Database MEIXXXXX, numbers in MANDALA (Kampmeier *et al.* 2004).

Taxonomy

Key to extant genera of Apsilocephalidae:

1. Antennal style elongate, much longer than basal segment of flagellum; body usually dark yellow with brown markings, head with grey pubescence; male genitalia with surstyli articulated with margins of epandrium; surstyli with strong setae; distiphallus coiled (North America) *Apsilocephala* Kröber
– Antennal style equal to or shorter than basal segment of flagellum; body dark; male genitalia with surstyli at best only weakly articulated with margins of epandrium; surstyli without strong setae; distiphallus not coiled (New Zealand, Australia)2.
2. Antennal style approximately equal length of basal segment of flagellum (apical segment greatly elongate), deflexed ventrally at base (Fig. 2B); wing vein M_3 always well developed, reaching wing margin; hind leg longer and thicker than other legs; male surstyli extending posteriorly, not encircling around cerci; female with two spermathecae (New Zealand)..... *Kaurimyia* **gen. nov.**
– Antennal style less than half the length of basal segment of flagellum, not deflexed ventrally at base; wing vein M_3 sometimes reduced or absent; hind leg similar in size and shape to other legs; male surstyli extending posteromedially, encircling around cerci; female with three spermathecae (Australia: Tasmania) *Clesthenticia* White

***Kaurimya* gen. nov.**

Type species. *Kaurimya thorpei* sp. nov., present designation.

Diagnosis

Antennal style approximately equal length to base of flagellum, deflexed ventrally at base; wing vein M_3 joining CuA_1 before reaching wing margin; hind coxal knob rounded, distinct; hind legs distinctly longer and thicker than mid and fore legs; male epandrium with surstyli projecting posteriorly, not articulated with epandrium; surstyli without strong setae along margin; aedeagus with distiphallus relatively short; female with two spermathecae.

Etymology

The genus name is derived from the kauri (*Agathis australis* (D. Don) Loudon) forests from which the male specimen was collected.

***Kaurimya thorpei* sp. nov.**

(Figures 1-2)

Type material

Holotype male, NEW ZEALAND: Auckland: Waitakere Ra[nges], Cascade Park, 14-23.i.2000 [36° 53.176'S, 174° 31.111'E], wasp survey, Malaise trap 4 (NZAC) (MEI165150).

Paratype female, NEW ZEALAND: Otago: Dunedin, C.C. Fenwick; B.M. 1924-227 (NHM) (MEI031913).

Diagnosis

Body colour dark; frons wider than ocellar tubercle in both sexes; single row of dark postocular setae in male; setae pale and scattered in female; antenna shorter than head; scutum glossy with sparse pale setae; scutal macrosetae elongate, dark; hind legs distinctly longer and thicker than mid and fore legs.

Description

Head. Rounded, frons wider than ocellar tubercle in both sexes (Fig. 1A), frons slightly convex, glossy black with short pale setae; lower frons and face overlain with sparse silver pubescence; ocellar tubercle relatively flattened; occiput largely flat, convex laterally, glossy black, overlain with sparse silver pubescence; single row of dark postocular setae in male; setae pale in female with row poorly defined; gena dark with numerous short, pale setae, longer ventrally; mouthparts orange; antenna shorter than head; scape and pedicel orange-brown with short, dark setae on outer surfaces; flagellum dark brown, covered with dense, elongate pubescence; scape short and cylindrical; pedicel slightly wider distally; flagellum three segmented, longer than combined length of scape and pedicel, basal section ovate, distal section elongate, filamentous, reflexed ventrally at base of filamentous section.

Thorax. Black to brown; scutum glossy with sparse pale setae (longer in male), anterolateral corners and area immediately anterior to scutellum overlain with silver pubescence; scutal macrosetae elongate, dark; scutellum and postalar callus light brown, overlain with silver pubescence; pleuron dark, densely overlain with silver pubescence; coxae pale yellow with silver pubescence admixed with pale setae on anterior surfaces; legs pale yellow, femora darker; hind leg longer and thicker than mid and forelegs, dark brown distally; wing hyaline; venation dark; wing vein M_3 complete, meeting CuA_1 before joining wing margin; haltere light brown, club darker distally. Scutal chaetotaxy (pairs): notopleural: 2; supra-alar: 1; post-alar: 1; scutellar: 2; dorsocentral: 0.

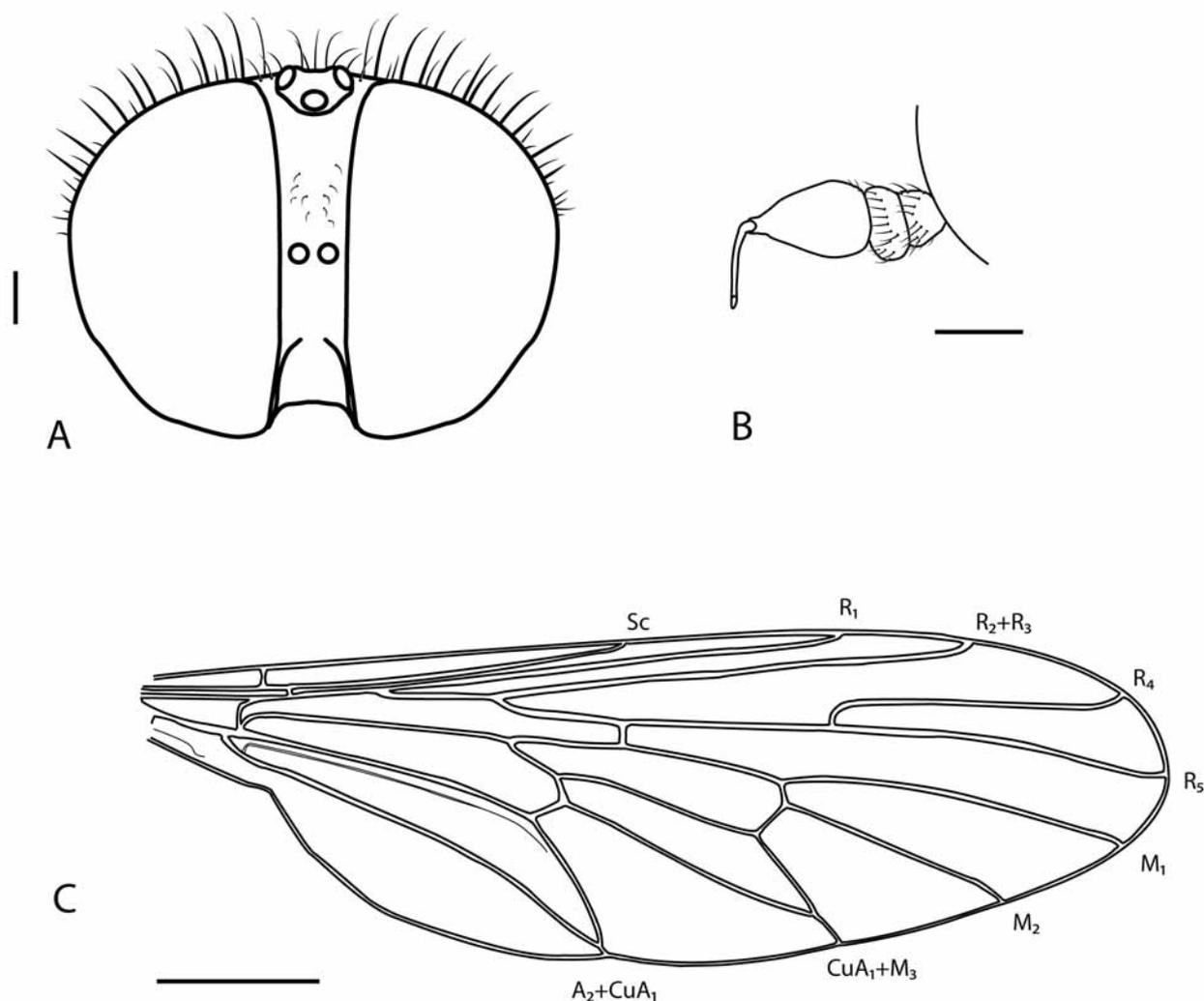


FIGURE 1. *Kaurimyia thorpei* gen. et sp. nov. A, Male head, lateral view; B, Antenna, lateral view; C, Wing. Scale = 2.0 mm.

Abdomen. Elongate; dark brown with posterolateral margins of tergites pale tan to cream; elongate pale setae sparsely distributed on all segments, longer laterally; terminalia dark, with pale setae.

Male genitalia. Epandrium (Figs 2A-B) arched over gonocoxites, tapered posteriorly with non-articulated surstyli on posterolateral corners, sclerotised ring medially around base of cerci and hypoproct; cerci ovoid; gonocoxites and hypandrium form bowl-like structure (Figs 2C, E); posterior margin of gonocoxite with hooked process (Fig. 2E); hypandrium relatively large, triangular; gonostylus triangular in profile with elongate medially directed setae; ventral lobe directed internally with elongate pale setae along medial surface; gonocoxal apodeme very small; aedeagus connected to gonocoxites by strong dorsal bridge formed from the dorsal apodeme (Figs 2D, F); lateral ejaculatory apodeme narrow with slight flange; ventral apodeme complex, 'V'-shaped in anterior view; distiphallus short, straight; ejaculatory apodeme narrow and elongate.

Female genitalia. Cerci trapezoid in dorsal view; setae short and pale except for a patch of slender, elongate posteriorly directed setae on distal margin (Fig. 2G); sternite 10 ovoid with truncated anterior margin; tergites 9 and 10 fused dorsomedially, narrow processes directed anteriorly between furca and tergite 8; tergite 8 quadrangular with sparse short setae; furca roughly 'Y'-shaped, marginal lip on anterior margin; paired accessory glands posterior to common duct of spermathecal sac and spermathecal ducts; small ovoid spermathecal sac present; two sclerotised spermathecae; spermathecal ducts narrow and joining together before joining to base of spermathecal duct.

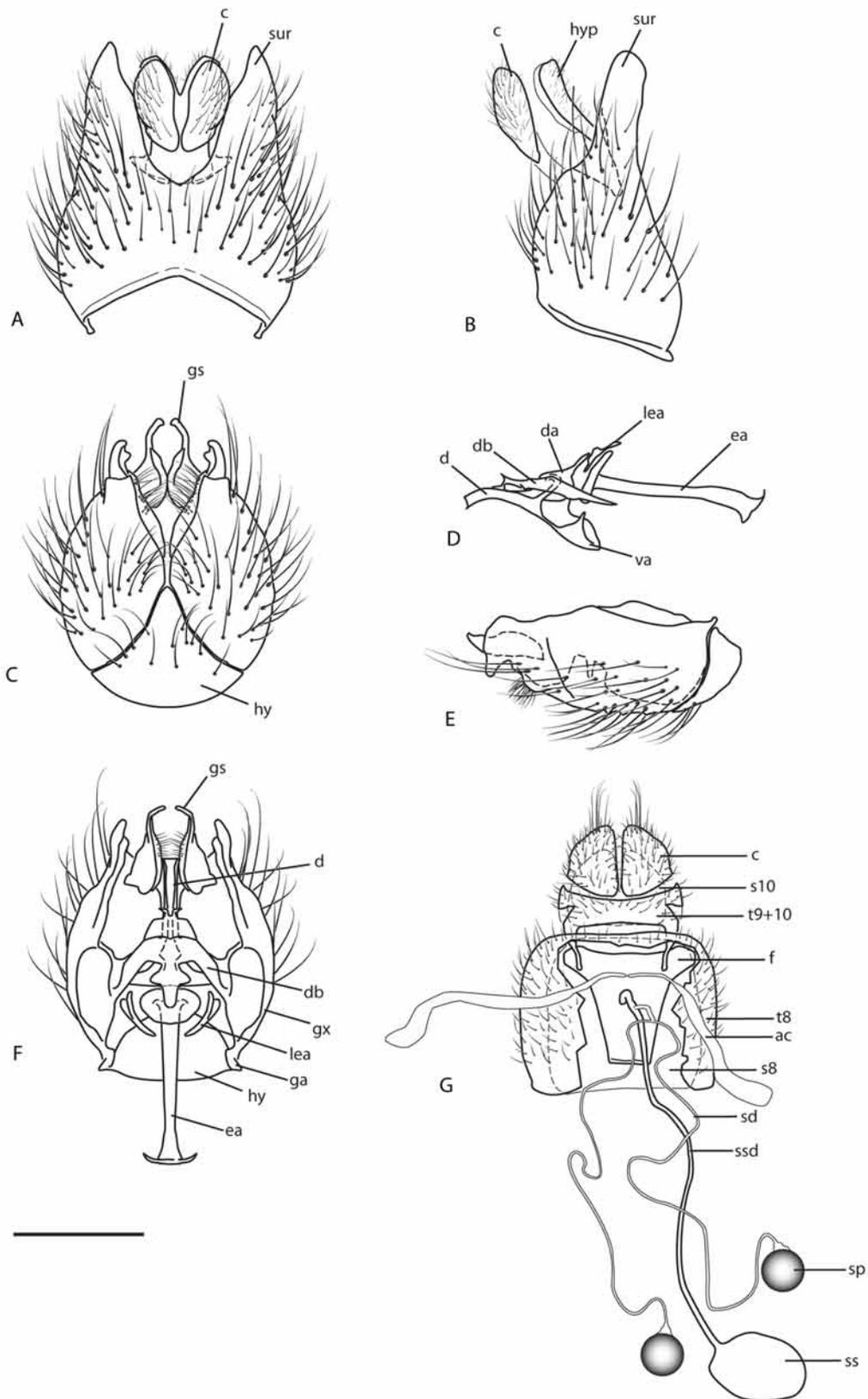


FIGURE 2. *Kaurimyia thorpei* gen. et sp. nov. Male genitalia: A, Epandrium and tergite 8, dorsal view; B, Same, lateral view; C, Gonocoxites, ventral view; D, Same, lateral view; E, Aedeagus, dorsal view; F, Same, lateral view. Female genitalia: G, Terminalia, dorsal view; H, Same, lateral view; I, Spermathecal complex, dorsal view. Abbreviations: sur = surstylus; c= cercus; d= distiphallus; da= dorsal apodeme; ea= ejaculatory apodeme; f= furca; h= hypandrium; lea; lateral ejaculatory apodeme; sp= spermatheca; ac= accessory gland; sd; spermathecal duct; sps= spermathecal sac; s8= sternite 8; t8= tergite 8; gs= gonostylus; vl= ventral lobe. Scale = 0.3 mm.

Etymology

The specific epithet is named in honour of Mr Stephen Thorpe, the collector of the male specimen.

Comments

Only a single male and female specimen is known for the taxon. The female was collected from Dunedin on the South Island, while the male was collected in a Malaise trap in Kauri forest near Auckland on the North Island.

Phylogenetic position of *Kaurimyia* gen. nov. and status of *Clesthentiella*

Kaurimyia thorpei gen. et sp. nov. exhibits characteristics of both *Clesthentia* and *Apsilocephala*. The elongate antennal flagellum of this genus is also found in *Apsilocephala* but the shape of male genitalic structures such as the non-articulating surstyli and short distiphallus suggests a closer affinity with *Clesthentia*. The presence of only two, sclerotised spermathecae is anomalous, as both *Clesthentia* and *Apsilocephala* have three, plus a spermathecal sac.

Clesthentiella was described based on a single female from Tasmania. Examining a series of *Clesthentia* specimens from Tasmania there is some variation in the completeness and sclerotisation of various wing veins (e.g. incomplete sclerotisation of base of vein R_4). A female specimen was found to have antennal characteristics of *Clesthentia* but with an incomplete M_3 wing vein, one of two genus level characters defining *Clesthentiella*. This suggests that wing venation is labile between individuals in *Clesthentia* and should not be considered a generic or species level character. Considering also, the variability in the length and number of flagellar segments at genus and species level in related Therevidae, this character by itself should not be justification for generic separation. Consequently, *Clesthentiella* is herein placed in synonymy with *Clesthentia*. *Clesthentia* thus contains two species, the type *C. aberrans* White and *C. crassioccipitis* (Nagatomi, Saigusa, Nagatomi et Lyneborg) **nov comb.**

The presence of surstyli posterolaterally on the epandrium is considered a synapomorphy of Apsilocephalidae. Surstyli are only distinctively articulated with the epandrium in *Apsilocephala*. In both *Clesthentia* and *Kaurimyia*, the surstyli are simple extensions of the epandrium and show little articulation. The non-articulating state of the surstyli in these two genera calls into question the definition of these structures as actual surstyli and thus the status of the structure as a synapomorphy for the family. Further study of the musculature of the male epandrium and surstyli in all three genera is required to confirm their structural and functional homology.

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