

# ***Minipteryx robusta*—a New Genus and Species of Micropterous Limnophilinae (Insecta: Diptera: Tipuloidea: Limoniidae) from Australia**

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**ABSTRACT.** A new genus and species of the subfamily Limnophilinae of the tipuloid family Limoniidae from Australia, *Minipteryx robusta* gen. nov. sp. nov., is described and illustrated. It is a rather large micropterous crane fly. Its affinities to existing genera remain unclear. The unique male was collected in late austral autumn at a small creek in alpine vegetation (elevation 1638 m a.s.l.) of Kosciuszko National Park, New South Wales. A review is provided on the Australian Tipuloidea with reduced wings.

THEISCHINGER, GUNTHER. 2015. *Minipteryx robusta*—a new genus and species of micropterous Limnophilinae (Insecta: Diptera: Tipuloidea: Limoniidae) from Australia. *Records of the Australian Museum* 67(6): 201–206.

## **Introduction**

The Tipuloidea (formerly Tipulidae) is the largest family group taxon of Diptera, with some 15,000 described species (Oosterbroek, 2015). Well over 1000 species are recognized from Australia. Of these, only ten species are known to have micropterous/brachypterous females, and only one Tasmanian endemic is known to be micropterous in both sexes. This makes a micropterous male recently discovered in Kosciuszko National Park, New South Wales, the first micropterous male crane fly from mainland Australia. As the systematics and identification of tipuloids at the generic level is mainly based on wing venation, the male from Mt Kosciuszko cannot be classified with confidence. Its general body and genitalic features suggest that it is a member of the family Limoniidae, subfamily Limnophilinae, but it does not fit neatly into any of the described genera. It is therefore described below as a new genus and species.

## **Material and methods**

The unique individual of the taxon described in this paper was collected by accident. It was extracted from a kick sample obtained during general aquatic macroinvertebrate sampling in riffle sections (approximately 0.5–1.0 m wide) of Pipers Creek at 1638 m a.s.l. This sampling is part of the Kosciuszko National Park Resort Water Quality Monitoring program for which OEHL (Office of Environment and Heritage) is monitoring, twice a year, the impact of ski resorts, their infrastructure and management on the waterways in their vicinity.

Morphological terminology follows Alexander & Byers (1981). The specimen was preserved in 75% ethanol. Line drawings were made using a camera lucida and are not to scale. The unique specimen (holotype of *Minipteryx robusta*) with hypopygium in glycerol is lodged in the Entomology collection of the Australian Museum, Sydney (AMS).

## Systematics

### *Minipteryx* gen. nov.

Figs 1–16

**Diagnosis.** A rather large limoniid tipuloid, the male almost completely black without any distinct markings. Head (Figs 1, 8) with rostrum almost completely atrophied, palps only 2-segmented and antennae 12-segmented. Thorax (Figs 2, 9, 10) short and narrow, without V-shaped thoracic suture developed; katapisternum small, all coxae very large, formula of tibial spurs 1/2/1, claws simple, wing greatly reduced in size and halter without distinct knob. Abdominal segments 3–6, but particularly segments 4 and 5 (Fig. 11), with distinct bump on each side just past mid-length. Terminalia (Figs 4–7, 12–16): segment 9 a simple ring that is apically not produced, lobed or indented; two pairs of gonostyli, the inner simple, the outer armed; aedeagal complex (Figs 6, 7, 14, 15) strongly sclerotized, the parameres narrow rods, the aedeagus claw-shaped, bifid (double-branched), pointing distinctly ventrad (as in Fig. 14).

**Etymology.** The generic name refers to the almost minimal size of the wings.

### *Minipteryx robusta* sp. nov.

Figs 1–16

**Type material.** Holotype. ♂ (unique, ♀ unknown): Australia, New South Wales: Kosciuszko National Park, Pipers Creek downstream from Smiggin Holes, adjacent to Summit Road (36.39829°S 148.43555°E, 1638 m a.s.l.), 6-v-2015, G. Theischinger leg. (AMS).

**Description** ♂ (♀ unknown). Large almost completely black micropterous crane fly.

**Head** (Figs 1, 8) largely black, setose. Rostrum almost atrophied. Maxillary palp 2-segmented. Antenna 12-segmented: scape cylindrical and about twice as long as wide; pedicel at least as wide as scape, oval and about 1.3 times as long as wide; first flagellar segment oval, narrow at base, widest subapically, 1.5 times as long as wide; segment 4 slightly longer than wide; segments 5–10 almost globular, in one antenna segment 11 almost twice as long as preceding segments, and segment 12 only slightly longer than wide, in the other antenna segments 5–11 similar in length and segment 12 distinctly longer than wide. Palp and antenna, but in particular antennal flagellum paler greyish brown than remainder of head.

**Thorax** (Figs 2, 9, 10) rather short and narrow, largely brownish grey to brownish black. Legs with coxae and trochanters and basal portion of femora dark brown, remainder of femora, tibiae and tarsi black and very hairy. Wing greatly reduced, pale, without interpretable venation details, narrow in basal 1/3, dilated into broad blade in distal 2/3; halter very short, pale, almost conical, without distinct knob.

**Abdomen** (Fig. 3) long and slender. Tergites black, particularly segments 4 and 5 with lateral bumps slightly past mid-length (Fig. 11), sternites slightly paler.

**Terminalia** (Figs 4–7, 12–16): Segment 9 a simple ring that is apically not produced, lobed or indented; aedeagal complex (Figs 6, 7, 14, 15) strongly sclerotized, the parameres narrow rods, widely and rather evenly curved dorsad, reaching beyond half-length of aedeagus, which is claw-shaped, bifid, apically pointed and directed distinctly

ventrad; gonocoxite simply subconical, not modified; two pairs of gonostyli, the inner an only partially sclerotized, simple, thick blade, the outer strongly sclerotized, basally very wide, tapering into bifid tip (Fig. 16).

**Dimensions.** Total length about 14.5 mm; antenna 1.4 mm; length of metafemur 11.0 mm; wing 1.2 mm.

**Etymology.** *Robustus*, -a, -um is a Latin adjective meaning robust, referring to the apparent robustness of the species.

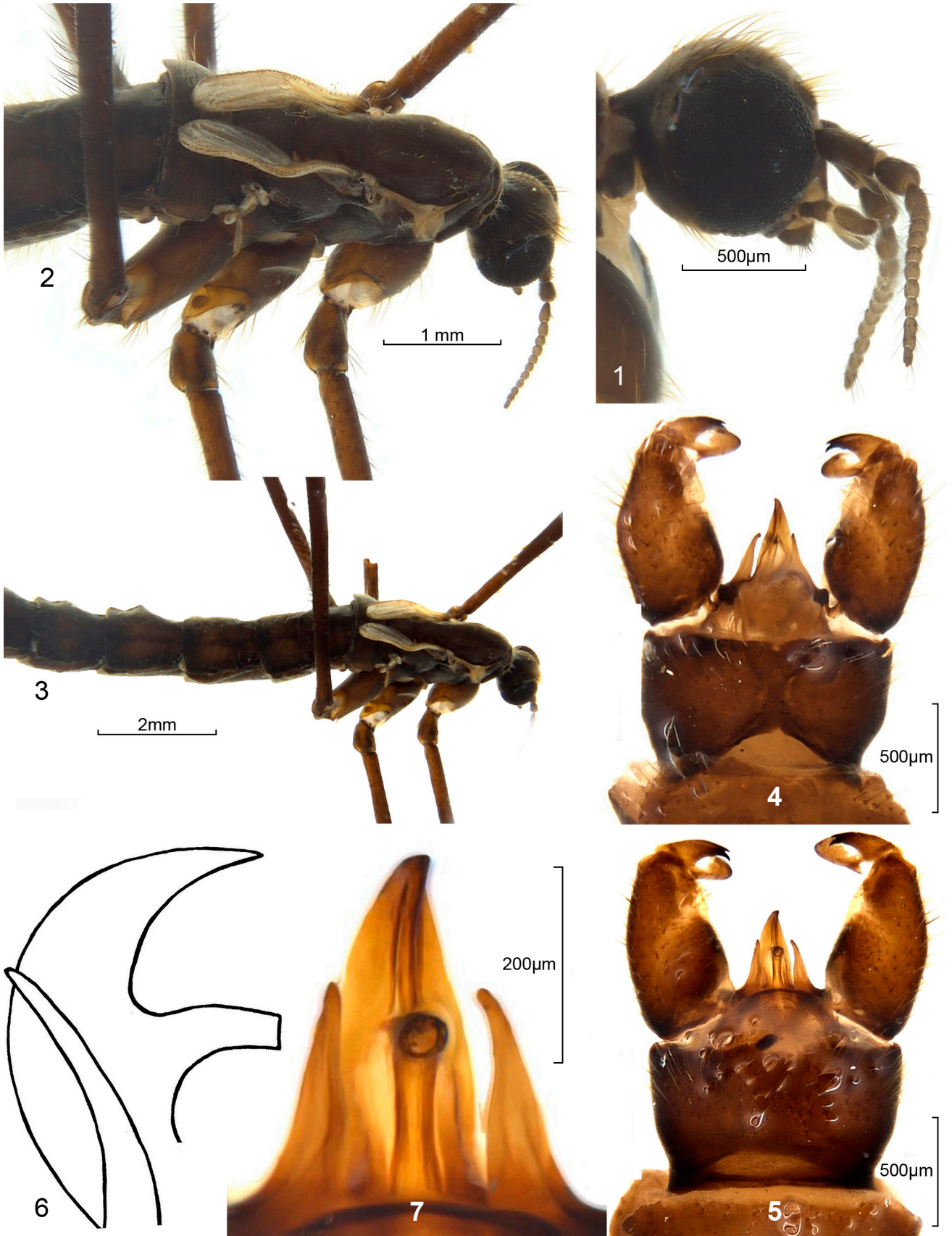
## Discussion

The size, overall appearance and ecological circumstances suggest that *Minipteryx robusta* is a limoniine tipulid. It may be close to *Limnophila* but does not fit neatly into this or any other Australian genus. Even though some of the distinctive characters can be considered as potentially the result of the micropterous condition (more robust legs for walking, atrophy of flight muscles, lack of halter knobs etc.) as elaborated by Hackman (1964), genitalic characters like the very plain abdominal segment 9 and the strongly sclerotized and elaborate, highly specialized aedeagus cannot. The last two features are also not recorded from any of the Australian species of *Limnophila*. Crane fly species with greatly reduced wings cannot be identified by using the key to the Australian genera of Limoniinae by Theischinger (1996). In a worldwide treatment Ribeiro (2008) includes “margin of tergite 9 forming no extension” as one of the character states for Limnophilinae but none of the numerous aedeagus illustrations shows a structure similar to *Minipteryx*. On the basis of size, colouration and morphological characters it cannot be assumed that *Minipteryx robusta* is the undescribed male of an Australian species known from females with reduced wings only. *Limnophila brachyptera* Alexander, 1931 is known from a single female collected at 6000 ft (1829 m) on Mt Kosciuszko. The fact that Alexander (1931) did not mention that this female had reduced mouthparts, that its antenna is 15-segmented, its femora are yellow with black tips and it was collected at the height of summer in the Australian Alps (see below) clearly indicates that *M. robusta* is not the hitherto undescribed male of *L. brachyptera*. *Limnophila subapterogyne* Alexander, 1928, also known from a unique micropterous female is a Tasmanian species much smaller than *M. robusta*. It can, however, not be excluded that *Limnophila brachyptera* and *L. subapterogyne*, or one of them, belong in *Minipteryx*. Molecular study may be required to establish the phylogenetic relationships of this striking taxon.

Loss (or, more likely, reduction) of wings is common throughout Tipuloidea. It has been supposed by Byers (1961) that reduction of wings, a common phenomenon among insects living at cold latitudes or high elevations or occurring as adults during cold seasons at temperate latitudes, has developed because wings are of little use in cold weather since the rate of vibration required for flight usually cannot be achieved. Thus natural selection would not act against mutants with reduced wings.

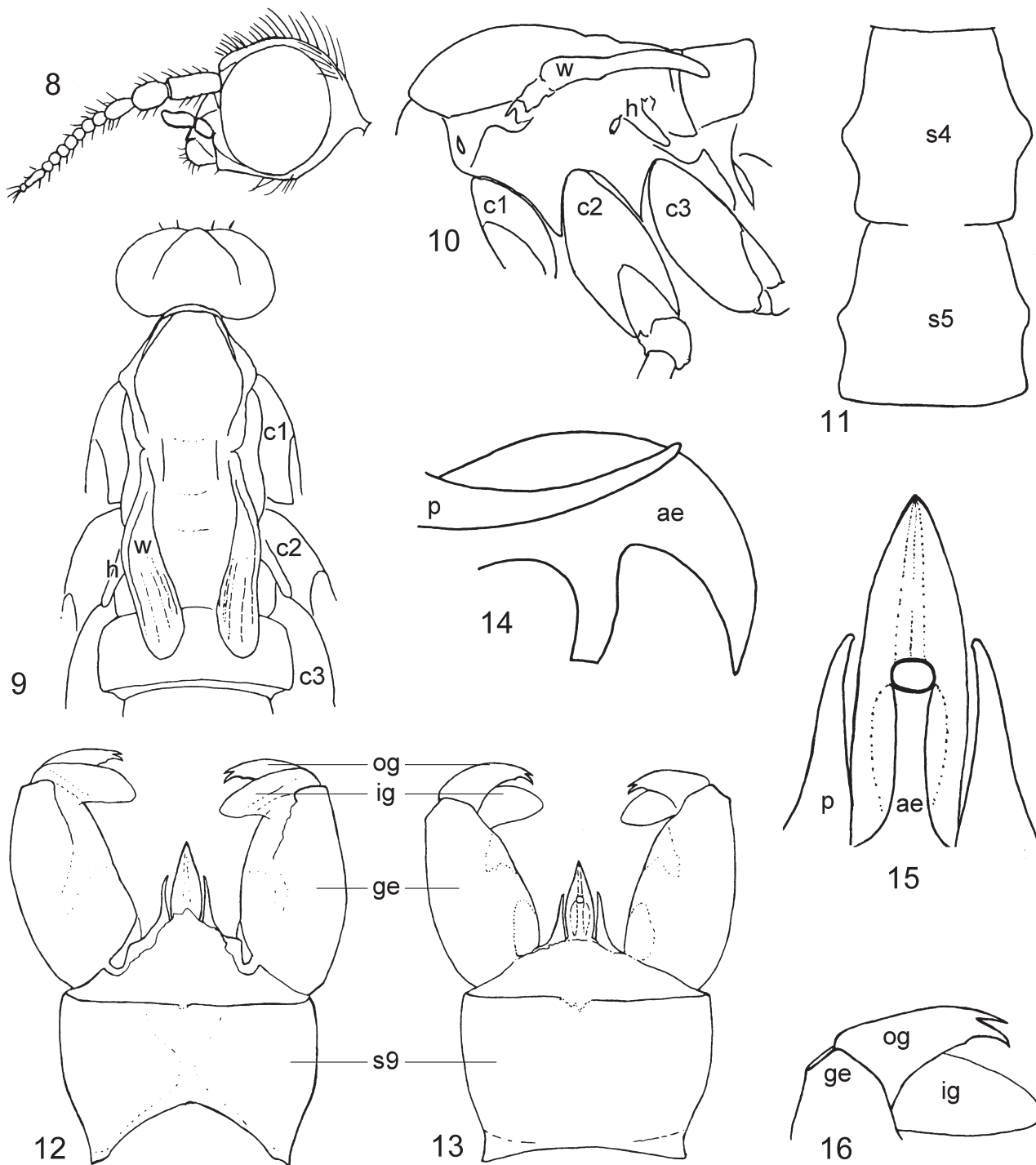
From the tundra near Point Barrow in Alaska, Tjeder (1963) elaborately described a female that shows reduction of thorax, wings, mouthparts and antennae similar to *M. robusta* but this belongs to a species of the tipuloid family Pediciidae.

Strong reduction, particularly of antennae, mouth parts and wings, also occur in the Holarctic genus *Chionea* (Limoniidae: Chioneinae). However, the species of this genus, known as Snow-flies or Snow-midges, lack tibial spurs.



Figures 1–7. *Minipteryx robusta*, male. (1) head, lateral; (2) head and thorax, dorsal; (3) head, thorax and part of abdomen, dorsal; (4, 5) terminalia: 4, dorsal; 5, ventral; (6, 7) aedeagal complex: 6, lateral; 7, ventral.





Figures 8–16. *Minipteryx robusta*, male: (8) head, lateral; (9) head and thorax, dorsal; (10) thorax, lateral; (11) abdominal segments 4 and 5, dorsal; (12, 13) terminalia: 12, dorsal; 13, ventral; (14, 15) aedeagal complex: 14, lateral with body axis horizontal; 15, ventral; (16) tip of gonocoxite and gonostyli, ventral. *ae*—aedeagus; *c1*—prococxa; *c2*—mesococxa; *c3*—metacocxa; *ge*—gonocoxite; *h*—halter; *ig*—inner gonostylus; *og*—outer gonostylus; *p*—paramere; *s4*—segment 4; *s5*—segment 5; *s9*—segment 9; *w*—wing.

*Minipteryx robusta* is a robust species. The collection date indicates it is an autumnal species, suggesting that its life history is different from montane species that emerge in summer. It was collected well after several hard frosts and light snow.

The collecting site (Fig. 17) has had a level of disturbance from the road development which is in close proximity to the site. Increased flows from upstream runoff have likely led to stream bank erosion. The vegetation reflects this disturbance with a mix of exotic grasses (*Dactylis glomerata*, *Phleum*

*pratense* and *Holcus lanatus*) interspersed with sod tussock grassland (*Poa costiniana* and *P. hiemata*) on the road side of the site. There is also alpine bog (*Carex gaudichaudiana* and *Empodisma minus*) between the riparian zone and the road side. On the opposite side of the creek the vegetation is a mix of sod tussock grassland interspersed with tall alpine heath species (*Olearia algida* and *Grevillea australis*). Up stream of this site (i.e. other side of road-bridge) the vegetation is tall alpine heath interspersed with alpine bog/sod tussock grassland.

The general aquatic macroinvertebrate sampling method used to obtain the specimen samples is certainly not the best way to collect adult tipulids. However, in spite of being rather roughly treated in a rather large sample, the specimen was in nearly perfect condition with only one leg broken off near the coxa.

*Minipteryx robusta* is a very special and interesting addition to the fauna of the Australian Alps. Its robustness and probable endemism in a national park will hopefully enable it to withstand future, particularly human-induced, environmental pressure.

### Micropterous Australian species of Tipuloidea

It must be remembered that our knowledge of Australian micropterous and brachypterous Tipuloidea/Tipulidae is incomplete (Dobrotworsky, 1968; Bugledich, 1999; Theischinger, 1996), but all known species (12 of more than 1000) are listed below, including some significant details.

#### Tipulidae

*Ptilogyne (Plusiomyia) necopina* (Alexander, 1922)

**Tasmania:** Gladstone. Collecting date not available. Female subapterous; wings reduced to narrow straps, about 5.5 mm long; body length about 24 mm. Male unknown (Dobrotworsky, 1971).

*Ptilogyne (Plusiomyia) spissigrada* (Alexander, 1922)

**Tasmania:** Frenchmans Cap. Collecting date not available. Female subapterous; wings considerably reduced in both length and breadth, about 12 mm long; body length about 33 mm. Male unknown (Dobrotworsky, 1971).

*Ptilogyne (Plusiomyia) tripectinata* (Alexander, 1922)

**Tasmania:** Magnet, Waratah, 5 miles SW of Waratah, Strahan, Milabena. Available collecting date 17 Feb. 1963. Female subapterous with wings reduced to narrow straps, 11.0 mm long; length of body, without ovipositor, 20.0 mm; male wings 24.5–26 mm, body length 25 mm (Alexander, 1922; Dobrotworsky, 1971).

*Leptotarsus (Phymatopsis) tonnoiranus* (Alexander, 1928)

**Tasmania:** Cradle Valley; Walls of Jerusalem; Forentic River; Waldheim, Cradle Mountain. Available collecting date 13–26 Jan. 1923. Male: body length 16–17 mm; wing 16.5–17 mm. Female 23 mm long, generally similar to male but differing mainly by reduced wings which are narrow, short (4.5 mm), strap-like, dark brown with distorted venation; legs shorter and stouter (Alexander, 1928b; Dobrotworsky, 1974).

*Leptotarsus (Macromastix) fergusonii* (Alexander, 1924)

**New South Wales:** Blue Mountains. **Australian Capital Territory:** Blundell's. **Victoria:** Melbourne, Heyfield, Croydon, Kinglake, Beaufort, Woodend. Available collecting date 17 Apr. 1922. Male body length 9 mm; wing 13 mm. Female subapterous; reduced wings strap-like, about 1 mm long and without venation; legs shorter than in male; abdomen extremely large; male wings of normal length (Alexander, 1924; Dobrotworsky, 1974).

### Limoniidae, Chioneinae

*Molophilus micropteryx* Alexander, 1927

**New South Wales:** Wentworth Falls, Blue Mountains, 2844 ft (867 m). Collecting date 18 Nov. 1921. Female body length about 2.8 mm; wing 0.8 mm. Male unknown. Subgeneric placement unknown as known from brachypterous female only (Alexander, 1927; Theischinger, 1992).

*Molophilus subapterogyne* Alexander, 1927

**Tasmania:** Cradle Valley. Collecting date 23 Jan. 1923. Female body length about 3 mm; wing 1.2 mm. Male unknown. Subgeneric placement unknown as known from brachypterous female only (Alexander, 1927; Theischinger, 1992).

### Limoniidae, Limnophilinae

*Gynoplistia (Gynoplistia) boomerang* Theischinger, 1993

**New South Wales:** New England National Park, 4500 ft (1372 m); New England National Park, rainforest; foot of Cathedral Rock; near Ebor. Collecting dates: 15 Oct. 1966; 4 Feb. 1968; 3 Jan. 1978; 20–21 Nov. 1990; March 1992. Wing length: male 8.1–9.8 mm, female 3.8–4.7 mm. This is the only species of *Gynoplistia* s. str. of which the female is known to be brachypterous (Theischinger, 1993).

*Gynoplistia (Xenolimnophila) zaluscodes* (Alexander, 1922)

**Tasmania:** Waratah, Hellyer Gorge, Mt Farrel. Collection date not available. Body length: male about 13.5 mm, female about 15.5–16 mm; wing length of both sexes 2 mm. The brachypterous condition (both sexes) is apparently diagnostic for this species within its genus and subgenus (Theischinger, 1993).

*Limnophila (Limnophila) brachyptera* Alexander, 1931

**New South Wales:** Club Lake, Mount Kosciusko, 6000 ft (1829 m). Collecting date 28 Jan. 1930. Female length about 11 mm; wing about 1 mm. Male unknown (Alexander, 1931).

*Limnophila (Limnophila) subapterogyne* Alexander, 1928

**Tasmania:** Hartz Mts. Collecting date 10 Dec. 1922. Female length about 4 mm; wing about 0.5 mm. Male unknown (Alexander, 1928a).

*Minipteryx robusta* gen.nov., sp.nov.

**New South Wales:** Kosciuszko National Park, Pipers Creek downstream Smiggin Holes, adjacent to Summit Road. Collecting date 6 May 2015. Male length about 14.5 mm; wing about 1.2 mm. Female unknown, but it is expected to be brachypterous and somewhat larger than the male. Subapterism in the genus *Limnophila* usually involves both sexes (Alexander, 1928).

According to Alexander (1931) larvae of limnophiline genera are found in sandy, gravelly, or loamy soil, with some humus at margins of streams or ponds, rich organic earth or mud, as at margins of rills, streams, lakes, or other bodies of water, swamps or marshes; leaf-mould or drift at stream margins; wet spots or situations beneath leaf-mould in rich, moist to saturated humus soil in woods. Microhabitats similar to some of the above occur along the streams monitored by OEH in Kosciuszko National Park giving reason to hope that the continuation of this field work and future molecular studies may provide us with more information on the phylogenetic affinities and ecology of the new taxon.

ACKNOWLEDGMENTS. The support by NSW NPWS is gratefully acknowledged. I wish to thank the members of the monitoring team of OEH (J. Miller, P. Scanes, A. Bransden, S. Jacobs and H. Peters) for their co-operation during the 2015 Autumn sampling, and M. Schroeder and A. Bransden for valuable habitat information. I am much indebted to A. Bransden and J. C. Martin (Australian Museum) for taking the photographs. D. Bickel (Australian Museum), J. Gelhaus (Philadelphia) and P. Oosterbroek (Amsterdam) and J. Miller and P. Scanes are thanked for helpful comments on the manuscript and for purposeful information.

SUMMARY. In atrocious weather conditions in the morning of 6 May 2015 a rather large-bodied (c. 15 mm), almost completely black male crane fly with very tiny wings was accidentally collected during monitoring work of the NSW OEH on riffles of high altitude streams in Kosciuszko National Park. It is the first micropterous male crane fly recorded from mainland Australia. Based on overall and genitalic features it is regarded as belonging to the tipuloid family Limoniidae, subfamily Limnophilinae. Its various massive reductions of mouth parts, thorax and wings, modifications of the abdomen and its enigmatic genitalic characters do not allow definite assignment to any of the available genera or species. It is therefore described as a new genus and species, *Minipteryx robusta* gen. et sp. nov. Some aspects of microptery are discussed, and a survey is given recording details of all Australian crane fly species with micropterous specimens recorded.

## References

- Alexander, C. P. 1922. Undescribed crane-flies (Tanyderidae and Tipulidae) in the South Australian Museum. *Records of the South Australian Museum* 2: 223–270.
- Alexander, C. P. 1924. New or little-known Tipulidae (Diptera). XX. Australasian species. *Annals and Magazine of Natural History* 9(13): 177–194.  
<http://dx.doi.org/10.1080/00222932408633024>
- Alexander, C. P. 1927. New or little-known Tipulidae (Diptera). XXXVI. Australasian species. *Annals and Magazine of Natural History* 9(20): 353–372.  
<http://dx.doi.org/10.1080/00222932708655462>
- Alexander, C. P. 1928a. New or little-known Tipulidae (Diptera). XXXVII. Australasian species. *Annals and Magazine of Natural History* 10(1): 82–108.  
<http://dx.doi.org/10.1080/00222932808672750>
- Alexander, C. P. 1928b. New or little-known Tipulidae (Diptera). XL. Australasian species. *Annals and Magazine of Natural History* 10(2): 337–362.  
<http://dx.doi.org/10.1080/00222932808672889>
- Alexander, C. P. 1931. New or little-known Tipulidae (Diptera). XLIX. Australasian species. *Annals and Magazine of Natural History* 10(8): 145–166.  
<http://dx.doi.org/10.1080/00222933108673374>
- Alexander, C. P., and G. W. Byers. 1981. Tipulidae. In *Manual of Nearctic Diptera*, volume I. Ottawa: Research Branch Agriculture Canada Monograph No. 27.
- Bugledich, E.-M. A. 1999. Diptera: Nematocera. In *Zoological Catalogue of Australia*, ed. A. Wells and W. W. K. Houston, vol. 30.1. Melbourne, Australia: CSIRO Publishing.
- Byers, G. W. 1961. Biology and classification of Chionea. XI. *Internationaler Kongress für Entomologie Wien 1960* 1: 188–191.
- Dobrotworsky, N. V. 1968. The Tipulidae (Diptera) of Australia. I. A review of the genera of the subfamily Tipulinae. *Australian Journal of Zoology* 16: 495–510.  
<http://dx.doi.org/10.1071/ZO9680495>
- Dobrotworsky, N. V. 1971. The Tipulidae (Diptera) of Australia. III. The genus *Ptilogyne* Westwood. *Australian Journal of Zoology* 19: 3–41 (*Supplementary Series* 1).  
<http://dx.doi.org/10.1071/AJZS001>
- Dobrotworsky, N. V. 1974. The Tipulidae (Diptera) of Australia. VIII–X. The genus *Leptotarsus* Guerin [etc.]. *Australian Journal of Zoology, Supplementary Series* 25: 1–14, 15–30, 31–62.  
VIII — <http://dx.doi.org/10.1071/AJZS025> IX — <http://dx.doi.org/10.1071/AJZS025b> X — <http://dx.doi.org/10.1071/AJZS025c>
- Hackman, W. 1964. On reduction and loss of wings in Diptera. *Notulae Entomologicae* 44: 73–93.
- Oosterbroek, P. 2015. *Catalogue of the Craneflies of the World*. Available at <http://ccw.naturalis.nl> (accessed 15 May 2015)
- Ribeiro, C. G. 2008. Phylogeny of the Limnophilinae (Limoniidae) and early evolution of the Tipulomorpha (Diptera). *Invertebrate Systematics* 22: 627–694.  
<http://dx.doi.org/10.1071/IS08017>
- Theischinger, G. 1992. The Limoniinae (Diptera: Tipulidae) of Australia. II. The genus *Molophilus* Curtis. *Stapfia* 27: 5–150.
- Theischinger, G. 1993. The Limoniinae (Diptera, Tipulidae) of Australia. III. The genus *Gynoplistia* Macquart. *Stapfia* 29: 1–106.
- Theischinger, G. 1996. The Limoniinae (Diptera: Tipulidae) of Australia. VIII. Preliminary key to the genus-group taxa. *Stapfia* 44: 117–144.
- Tjeder, B. 1963. Three subapterous crane-flies from Alaska (Dipt. Tipulidae). *Opuscula Entomologica* 28: 220–241.

Manuscript submitted 28 July 2015, revised 22 October 2015, and accepted 22 October 2015.



Figure 17. Collecting site and possible habitat of *Minipteryx robusta* at 1638 m a.s.l., Pipers Creek, Kosciuszko National Park.