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Synopsis of the subfamily Carventinae in New Zealand (Heteroptera: Aradidae)

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Tuataraptera unca (Kirman, 1989)

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Synopsis of the subfamily Carventinae in New Zealand (Heteroptera: Aradidae)

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Abstract. The subfamily Carventinae (Heteroptera: Aradidae) is revised for New Zealand. Eight genera and fifteen species are recognized.

One genus and six species are described as new: *Carventaptera hallae* Larivière and Larochelle **new species**, *Lissaptera heissi* Larivière and Larochelle **new species**, *Modicarventus kirmani* Larivière and Larochelle **new species**, *Neocarventus montanus* Larivière and Larochelle **new species**, *Neocarventus northlandicus* Larivière and Larochelle **new species**, *Neocarventus potterae* Larivière and Larochelle **new species**, *Tuataraptera* Larivière and Larochelle **new genus**.

One **new combination** is established: *Neocarventus uncus* Kirman, 1989 = *Tuataraptera unca* (Kirman, 1989).

One **new synonymy** is made: *Leuraptera yakasi* Heiss, 1990 = *Leuraptera zealandica* Usinger and Matsuda, 1959.

A revision of all taxa is provided. Descriptions, identification keys, illustrations of male genitalia, habitus photos, distributional data and maps are given. Extensive information on biology is included for each species.

Key words. Taxonomy, new genus and species, keys, geographic distribution, biology.

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Introduction

The subfamily Carventinae (Heteroptera: Aradidae) contains 118 genera and 364 species (C. Damken, pers. comm.). This is primarily a tropical group of mostly flightless Aradidae; only seven genera are known to be macropterous (Schuh and Weirauch 2020). In New Zealand, Carventinae are mostly found in warm-temperate rainforests with their greatest diversity in northern areas of the North Island where subtropical forests persisted the longest over geological time. Six of eight genera and all known species are endemic to the country.

Most species live on the moist, often moldy bark (with or without visible wood-decay fungi) on the underside of rotting fallen branches and logs lying on the forest floor. Species of *Carventaptera* Usinger and Matsuda can also occur under the bark of decaying branches and logs. Species of *Acaraptera* Usinger and Matsuda, and *Lissaptera* Usinger and Matsuda, mostly occur in leaf and twig litter.

All New Zealand species are apterous and have the body surface coated with incrustations, a mixture of waxy cuticular secretions, soil, and debris. Most species display various degrees of thoracic and abdominal sclerite fusion resulting in strange body shapes and protuberances that are often more pronounced in males than in females, resulting in strong sexual dimorphism (e.g., in *Clavaptera* Kirman, *Neocarventus* Usinger and Matsuda, *Tuataraptera* new genus).

The New Zealand Carventinae were most recently catalogued by Larivière and Larochelle (2004, 2014) in seven genera: *Acaraptera* Usinger and Matsuda, *Carventaptera* Usinger and Matsuda, *Clavaptera* Kirman, *Leuraptera* Usinger and Matsuda, *Lissaptera* Usinger and Matsuda, *Modicarventus* Kirman, and *Neocarventus* Usinger and Matsuda. Larivière and Larochelle (2006), in their overview of New Zealand Aradidae genera, provided

keys and descriptions to supraspecific taxa of Carventinae and a detailed discussion of faunal diversification and affinities.

Usinger and Matsuda (1959), in their seminal work on world Aradidae, described five monotypic genus-group taxa for New Zealand Carventinae. *Lissaptera* was then recognized as a subgenus of *Acaraptera* but Kormilev and Froeschner (1987), in their catalogue of world Aradidae, elevated *Lissaptera* to generic level. Kirman (1985, 1989a–b) added two monotypic genera to the fauna and provided the first identification key to New Zealand carventine genera. Finally, Heiss (1990) described two species from the far north of the country, *Acaraptera waipouensis* Heiss and *Leuraptera yakasi* Heiss. This brought the New Zealand Carventinae fauna to a total of seven genera and ten species.

The current taxonomic revision adds one genus (*Tuataraptera* new genus) and deals with 15 species, six of which are new to science.

This synopsis provides a detailed treatment of the taxonomy of New Zealand Carventinae, identification keys to all taxa, and information on species distribution and biology. The male genitalia are described and illustrated whenever possible, and habitus photos are provided for all taxa for the first time.

This revision is another step in the authors' goal of contributing to the understanding of the New Zealand Hemiptera fauna, especially Heteroptera, by providing comprehensive treatments that make large amounts of information available for practical use by a wide range of users. It follows the publication of a revision of Cydnidae, Acanthosomatidae, and Pentatomidae (Larivière 1995), a revision of the family Cixiidae (Larivière 1999), a catalogue and a checklist of New Zealand Heteroptera (Larivière and Larochelle 2004, 2014), an overview of Aradidae genera (Larivière and Larochelle 2006), a catalogue of Auchenorrhyncha (Larivière et al. 2010), a review of the family Peloridiidae (Larivière et al. 2011), revisions and a supplement to the world catalogue of Saldidae (Larivière and Larochelle 2015–2019).

Materials and Methods

This study is based on the examination of over 3,600 specimens from several hundred New Zealand localities. More than 1,300 specimens have been collected by the authors (1992–2018) and deposited in the New Zealand Arthropod Collection (NZAC), Auckland.

Other specimens were kindly provided by the following museums and collections: Auckland War Memorial Museum, Auckland, New Zealand (AMNZ); Canterbury Museum, Christchurch, New Zealand (CMNZ); Entomology Research Collection, Lincoln University, Lincoln, New Zealand (LUNZ); Museum of New Zealand Te Papa Tongarewa, Wellington, New Zealand (MONZ); The Natural History Museum, London, U.K. (BMNH). Type material has been deposited in some of the above collections. Paratypes of *Acaraptera waipouensis* are also located in the American Museum of Natural History, New York (AMNH) and the E. Heiss Collection (Innsbruck, Austria).

Terms particular to Carventinae morphology have varied considerably in the taxonomic literature. The terminology has been particularly confusing with regards to 1) the tergites dividing dorsal and ventral abdominal segments, 2) the cuticular plates and swellings on the dorsal surface of the thorax and abdominal segments, and 3) the smooth or partially granulate, spot-bearing patches or delimited areas of cuticle that serve as apodemes or points of muscular attachment to the cuticle on each side of the abdominal midline and on the connexival segments.

In this synopsis, the term 'mediotergite(s)' refers to the median part of abdominal segments III–VII and 'laterotergite(s)' to the surface of connexival segments (Fig. 4). Abbreviations are as follows: dmtg, dorsal mediotergite(s); vmtg, ventral mediotergite(s); dltg, dorsal laterotergite(s); vltg, (ventral laterotergite(s). In the female, the ventral mediotergite (vmtg) VII is split into two subtriangular plates.

The term 'plate(s)' has been adopted by the authors to designate elevated or swollen cuticular areas that are delimited by sulci or that are otherwise well-circumscribed and distinct from their surroundings. The term callosity (plural callosities) pertains to smaller cuticular elevations or swellings that are not so well-delimited and that are larger than granules (small grain-like elevations).

The appellation 'apodemal markings' (Fig. 4) is used to designate well-delimited spot-bearing cuticular areas, and 'apodemal spots' refer to the median spot they bear or apodemal spots on their own, i.e., not supported

by a delimited cuticular area. The expression 'pattern of apodemal markings' is equivalent to the 'pattern of glabrous areas' of Usinger and Matsuda (1959) and refers to the longitudinal rows of markings or spots on the abdominal mediotergites III–VI and on the connexival laterotergites III–VI. A 'pattern of apodemal markings' described by the formula 2:2:1 (dorsal; ventral) indicates two spot-bearing markings or individual spots on dorsal laterotergites, two outer markings or spots on the dorsal mediotergites next to the connexivum, and one marking or spot on mediotergites near the abdominal midline; this pattern is repeated on the ventral side.

The term 'teneral(s)' refers to newly emerged adults, i.e., individuals recently emerged from the final nymphal stage, with an exoskeleton that is yet to harden and take its final color and form. Tenerals are very common in collections and pose a significant challenge to accurate identification. They have a soft cuticle that can be deceptively pale compared to fully mature adults. Morphological characters traditionally used to diagnose Carventinae can be oddly shaped or abnormally developed, e.g., thoracic plates and other callosities, anterolateral and posterolateral angles of thoracic and connexival segments, antennal segments, antenniferous tubercles, postocular tubercles, or even genitalic structures. When collecting in the field it is difficult to judge if sampled individuals represent fully mature adults. It is therefore important to collect long series of specimens from any given population and to sample Carventinae at the height of the New Zealand summer season (December–February) when fully mature adults are more abundant.

Collecting methods (Fig. 88–94) involve examination of the underside of rotting fallen branches, brushing branches over a white sheet or tray, and collecting individual specimens using forceps. Wearing a headlamp is helpful in heavily forested or overcast situations. Leaf-litter species are collected by sifting rotting twig and leaf litter over a white sheet or tray, or by using extraction techniques, e.g., Berlese funnels.

Taxonomic descriptions are based on the same list of characters for all taxa of equivalent rank. Characters and character states apply to both sexes unless otherwise specified. The subfamily description, generic descriptions, and key to genera update those published by Larivière and Larochelle (2006). In the identification keys to genera and species, additional helpful but not necessarily exclusive characters are provided in brackets. The taxonomic arrangement of genera in the text follows their order in the identification key. Type species descriptions appear first within each genus. The sequence of habitus photos and illustrations of male genitalia follows the order of taxa in the text. Synonyms, new combinations, and type data are given for all taxa.

For detailed examination of the external morphology, it was necessary to clear the body surface of incrustations. Since the material for this study consisted mostly of pinned or card-mounted specimens, incrustation removal was done by stabilizing individual specimens on a small piece of soft foam and by scraping away the incrustation coating with a fine entomological pin attached to a pin holder. In many cases it was helpful to soften the incrustation cover by holding the specimen under a warm light source for a minute beforehand. For specimens kept in alcohol, a fine paint brush with bristles cut very short, was used to remove incrustations before examination or prior to dry-mounting specimens. For routine identification, only those incrustations obstructing diagnostic characters were removed.

Measurements, often expressed as ratios, were taken as follows: *body length*, in dorsal view, from visible apex of head to apex of fully retracted male or female terminalia; *head length*, along midline, from visible apex of head; *head width*, across middle of eyes; *antennal segment length*, from base to apex of each segment; *antenniferous tubercle length*, in front of eye; *pro-, meso-, metanotum width,* across posterolateral angles; *pro-, meso-, metanotum length,* along midline or as close as possible to midline, from anterior margin to posterior margin; *vmtg VI length*, along midline, from anterior margin to posterior margin; *vmtg VII length*, along midline (male), along inner margin of each plate (female).

The male pygophore (genital capsule) was studied and found to be diagnostic at the generic level. The male parameres, of which there are two, are symmetrical and diagnostic at the species level. Although their extraction from the pygophore is very difficult they were studied from populations across the geographic range of each species, with a few exceptions due to insufficient material. Dry-mounted specimens were warmed for 15 minutes in hot 75% ethanol (or hot soapy water); softened specimens were transferred to a watch glass containing some of the hot ethanol used for softening (e.g., a square 4 cm watch glass or equivalent). For each specimen, the genital capsule was separated from the abdomen using fine forceps and a microscalpel (e.g., needle tip from a 1.0 ml disposable hypodermic syringe or other fine needle); parameres were detached and extracted from the genital capsule using the same tools; dissected genitalia were transferred to smaller individual watch glasses (e.g., 1 dram

glass vials cut in half) containing glycerol and a thin film of 75% ethanol to facilitate the absorption of glycerol by the structures; the small watch glasses were then stored in 24-well sorting trays for further examination. At the end of the study dissected genitalia were transferred to plastic microvials containing glycerol, and subsequently mounted on the pin below relevant specimens.

The two-letter abbreviation codes of Crosby et al. (1976, 1998) for areas of New Zealand (Fig. 72) were used to record geographic distributions. Full distributional information is given for lesser known or insufficiently sampled species and geographic areas. Appendix 1 provides decimal degree coordinates for localities cited in the text. Maps summarizing species distribution are alphabetically arranged (Fig. 73–87).

Notes on biology are based on an analysis and synthesis of specimen label data and field observations by the authors. The terminology and style of presentation follow previous publications by the authors.

Systematics

Subfamily Carventinae

Description (New Zealand). **Head.** Genae large, produced anteriorly on either side of clypeus, nearly reaching or surpassing its apex to form a cleft or emarginate anterior margin of head. Rostrum short, not reaching beyond hind margin of head; bordered by bucculae at base; arising from a closed or open (*Acaraptera*, *Lissaptera*) atrium. Gula with rostral groove. Labrum fused with clypeus. Feeding stylets coiled into an anticlockwise circle. **Thorax.** Metathoracic scent gland openings inconspicuous, without well-developed evaporatory area. Tarsal claws with non-lamellate triangular (spatulate) pseudopulvilli. **Abdomen.** Dorsal mediotergites (dmtg) I–II at least partially fused, distinct from tergal disc (fused dmtg III–VI). Posterior margin of dorsal mediotergites (dmtg) III–V distinctly bent backward. Dorsal abdominal scent glands with first opening (or scar thereof) more developed than second and third. Pattern of apodemal markings 2:1:1 (dorsal, except 2:2:1 in *Acaraptera* and *Lissaptera*); 2:2:1 (ventral, except 2:1:1 in *Leuraptera*). ***Male genitalia.*** Pygophore trilobate (two dorsal lobes, one ventral lobe); parameres symmetrical; paratergites VIII strongly developed, projecting on each side of pygophore.

References. Larivière and Larochelle 2004: 51–53, 226–231, 285–289 (catalogue, biology, distribution, maps, references, type photos), 2006 (descriptions of subfamily and genera, habitus photos, key to genera, faunal diversification and affinities), 2014: 350 (updated checklist).

Alphabetical checklist of taxa

Valid genus- and species-group taxa are listed alphabetically (E = Endemic, N = Native, but not endemic to New Zealand).

Subfamily **Carventinae**

- Genus ***Acaraptera*** Usinger and Matsuda, 1959 [N]
  - ***myersi*** Usinger and Matsuda, 1959 [E]
  - ***waipouensis*** Heiss, 1990 [E]
- Genus ***Carventaptera*** Usinger and Matsuda, 1959 [E]
  - ***hallae*** Larivière and Larochelle [E], new species
  - ***spinifera*** Usinger and Matsuda, 1959 [E]
- Genus ***Clavaptera*** Kirman, 1985 [E]
  - ***ornata*** Kirman, 1985 [E]
- Genus ***Leuraptera*** Usinger and Matsuda, 1959 [E]
  - ***zealandica*** Usinger and Matsuda, 1959 [E]
- Genus ***Lissaptera*** Usinger and Matsuda, 1959 [N]
  - ***completa*** (Usinger and Matsuda, 1959) [E]
  - ***heissi*** Larivière and Larochelle [E], new species
- Genus ***Modicarventus*** Kirman, 1989 [E]
  - ***kirmani*** Larivière and Larochelle [E], new species
  - ***wisei*** Kirman, 1989 [E]

Genus ***Neocarventus*** Usinger and Matsuda, 1959 [E]
angulatus Usinger and Matsuda, 1959 [E]
montanus Larivière and Larochelle [E], new species
northlandicus Larivière and Larochelle [E], new species
potterae Larivière and Larochelle [E], new species
Genus ***Tuataraptera*** Larivière and Larochelle [E], new genus
unca (Kirman, 1989) [E], new combination

Key to genera of Carventinae (New Zealand)

1. Rostrum arising from an open atrium (Fig. 2). Pleuron of connexivum reflexed (visible from above), extending forward to posterolateral angles of pronotum (Fig. 5–6) **2**

— Rostrum arising from a closed atrium (Fig. 3). Pleuron of connexivum neither reflexed (not visible from above) nor extending forward to posterolateral angles of pronotum **3**

2(1). Mesonotum, metanotum, and dorsal mediotergites (dmtg) I–II of abdomen fused (Fig. 5) into a smooth notal plate interrupted only by a median transverse suture between dmtg I–II. Fig. 44–47. [Body length about 3.0–3.5 mm (male), 3.6–3.9 mm (female)] . . **Genus *Lissaptera* Usinger and Matsuda**

— Mesonotum, metanotum, and dorsal mediotergites (dmtg) I–II of abdomen not fused (Fig. 6) into a smooth notal plate. Fig. 48–51. [Body length about 3.0 mm (male), 3.4 mm (female); disc of mesonotum with a U-shaped backward projection (Fig. 9)] . . . . **Genus *Acaraptera* Usinger and Matsuda**

3(1). Dorsal mediotergites (dmtg) I–II of abdomen broadly fused with metanotum and mesonotum medially, produced into a forward subtriangular projection (Fig. 7) reaching anterior margin of mesonotum. Fig. 52–53. [Body length about 3.6 mm (male), 4.8 mm (female)] . . . . . **Genus *Leuraptera* Usinger and Matsuda**

— Dorsal mediotergites (dmtg) I–II of abdomen separated from metanotum by a distinct suture, not produced into a forward projection **4**

4(3). Disc of mesonotum produced into a hexagonal to subelliptical backward projection (Fig. 10) reaching anterior three quarters of metanotum. Pro-, meso-, and metanotum separated by very deep gaps. Dorsal mediotergites (dmtg) I–II of abdomen completely fused. Fig. 54–55. [Body length about 3.1 mm (male), 3.5 mm (female); posterolateral angles of metanotum (male) strongly produced into horn-shaped spines] . . . . . **Genus *Clavaptera* Kirman**

— Disc of mesonotum not produced into a hexagonal to subelliptical backward projection as above. Pro-, meso-, and metanotum not separated by very deep gaps. Dorsal mediotergites (dmtg) I–II of abdomen at least partially separated from each other **5**

5(4). Disc of mesonotum produced into a V-shaped backward projection, without anterolateral projections (Fig. 11). Vestigial wing pads present, appearing as small narrow plates fused to the thorax. Posterolateral angles of ventral laterotergites (vltg) V–VII of connexivum produced, visible from above. Fig. 56–59. [Body length about 4.1 mm (male), 4.9 mm (female)] . . . . . **Genus *Carventaptera* Usinger and Matsuda**

— Disc of mesonotum produced into a V-shaped or rounded-subquadrate to subpentagonal backward projection, with two anterolateral projections covering much of lateral portions (Fig. 12–14). Vestigial wing pads absent. Posterolateral angles of ventral laterotergites (vltg) V–VII of connexivum unproduced, not visible from above **6**

6(5). Disc of mesonotum produced into a rounded-subquadrate to subpentagonal backward projection (Fig. 13). Posterior margin of mesonotum thickened, curved to the rear and produced on each side of backward projection. Dorsal mediotergite (dmtg) III of tergal plate divided longitudinally by a median sulcus. Posterolateral angles of metanotum (male) unproduced or faintly produced, not forming acutely tipped spines. Fig. 60–63. [Body length about 2.5–2.9 mm (male), 3.1–3.5 mm (female)] . . . . . **Genus *Modicarventus* Kirman**

— Disc of mesonotum produced into a V-shaped backward projection (Fig. 12, 14). Posterior margin of mesonotum neither thickened nor curved backward as above. Dorsal mediotergite III of tergal plate undivided. Posterolateral angles of metanotum (male) moderately to strongly produced, forming short to long, acutely tipped spines **7**

7(6). V-shaped backward projection of mesonotum nearly reaching posterior margin of metanotum, apically flanked by two small, rounded metanotal callosities (Fig. 8, 12). Tergal plate (dmtg III–VI) completely fused. Posterolateral angles of metanotum, in male, slightly to moderately elevated and produced, forming regularly curved to angular, acutely tipped spines slightly surpassing anterior margin of dmtg I; in female, distinctly thickened, forming rounded-subtriangular lobes. Fig. 64–69. [Body length about 3.1–3.4 mm (male), 3.5–3.8 mm (female)] . . . . . **Genus *Neocarventus* Usinger and Matsuda**

— V-shaped backward projection of mesonotum reaching posterior margin of metanotum, apically flanked by coarse granules (Fig. 14). Tergal plate (dmtg III–VI) superficially unfused, with shallow sulci delimiting three large plates and apodemal markings. Posterolateral angles of metanotum, in male, strongly elevated and produced, forming long, sinuate, acutely tipped spines reaching anterior third to middle of first visible connexival segment; in female, slightly thickened, not forming rounded-subtriangular lobes. Fig. 70–71. [Body length about 3.2 mm (male), 3.9 mm (female)] . . . . . **Genus *Tuataraptera* Larivière and Larochelle, new genus**

Genus *Lissaptera* Usinger and Matsuda, 1959

Fig. 15, 23, 31–32, 44–47, 79–80

Acaraptera (Lissaptera) Usinger and Matsuda, 1959: 149.
Lissaptera Usinger and Matsuda, 1959. Elevated to generic status by Kormilev and Froeschner, 1987: 83.

Type species. *Acaraptera completa* Usinger and Matsuda, 1959, by original designation.

Description (incrustation removed). Apterous. Body pear-shaped; length about 3.0–3.5 mm (male), 3.6–3.9 mm (female). **Head.** Eyes rather large in relation to head, granulate. Postocular tubercles rounded-subquadrate, slightly to moderately produced laterally. Rostrum arising from an open atrium. **Thorax.** Pronotum separated from notal plate (fused mesonotum, metanotum, and dmtg I–II) by a distinct suture. ***Pronotum.*** Single-ring collar barely set off from anterior margin, without lateral tubercles or posteriorly produced subtriangular plate. Disc bearing a moderately large, smooth, slightly convex, subrectangular to hourglass-shaped plate from anterior to posterior margin. Lateral portions with a curved or slightly angular submarginal bead extending from anterior to posterior margin. ***Mesonotum, metanotum and dmtg I–II*** fused into a smooth notal plate interrupted only by a median transverse suture between dmtg I–II (fused notal plate absent in other genera). ***Legs.*** Coxal lobes rugose. Trochanters and femora demarcated from each other. Femora granulate, slightly longer than tibiae. Protibiae with fine ventral spines and apical comb. **Abdomen.** ***Tergal plate*** (dmtg III–VI) completely fused, with or without faint longitudinal carinae between inner and outer apodemal spots. Dmtg IV–V smooth on each side of reduced, posteriorly subtriangular plate carrying scent gland openings, VI smooth, with slight median elevation, without median plate. Scent gland openings (or scars thereof) three in number, first large, displaced posteriorly on dmtg IV, second very small, third evanescent or lacking. ***Connexivum*** consisting of dorsal laterotergites (dltg) and reflexed part of pleuron delimited from each other by a carina; reflexed part of pleuron extending forward to posterolateral angles of pronotum. Dorsal laterotergites (dltg) with a pair of distinct, rounded, smooth apodemal spots of similar size. Dltg II–III fused, narrowly subtriangular, extending forward to 'mesonotal area' of fused notal plate; IV–VII subrectangular (on inner side of carina). Spiracles II–VII lateral (visible from above). ***Pattern of apodemal markings*** 2:2:1 (dorsal; ventral). ***Male genitalia.*** Pygophore trilobate (Fig. 15, posterodorsal view); dorsal lobes somewhat crescent-shaped, with thickened lateral margin giving rise to curved oblique lines of coalesced granules, flat or slightly produced backward, separated by a wide depression with a faint longitudinal ridge; ventral lobe broadly rounded-subtriangular medially, slightly produced; dorsal opening wide; paramere heads nearly fully visible as large boot-shaped structures; posterior rim with very short, anteriorly directed, subtriangular projection on each side of median suture. Paratergites VIII (Fig. 23, outer lateral view) with an apically acuminate, rounded-subtriangular head; spiracle subapical.

Remarks. This genus is known from Lord Howe Island and New Zealand. *Lissaptera* is the only New Zealand genus where the mesonotum, metanotum and dmtg I–II of abdomen are fused into a mostly uninterrupted, smooth notal plate. In addition to rostral and connexival characters used by Usinger and Matsuda (1959) to group this genus with *Acaraptera*, the two genera also share a number of other unique characters among New Zealand Carventinae, e.g., a single-ring collar barely set off from anterior margin of pronotum and lacking lateral tubercles, abdominal spiracles positioned laterally and all visible from above, a 2:2:1 pattern of dorsal and ventral apodemal markings, and male parameres with boot-shaped heads nearly fully exposed in the dorsal opening of the pygophore. *Lissaptera* is easily separated from *Acaraptera* by characters of the thoracic notum listed in the key to genera. A number of other noteworthy morphological differences include a more reduced plate around abdominal scent gland openings, the first visible connexival segment extending further anteriorly, a different configuration of the male pygophore, especially the less strongly produced ventral lobe. The genus *Lissaptera* was previously known by the type species (*L. completa*) from the Three Kings Islands (TH) located 56 km off the northern tip of the North Island. A second species (*L. heissi*) is described here from the northernmost Aupouri Peninsula at the very top of the North Island, an area which was also an island at some point during the Pliocene and Pleistocene (Buckley and Leschen 2013).

Key to species of *Lissaptera*

1. Genae slightly to moderately longer than clypeus, forming a gap in front. Dorsal mediotergites (dmtg) I–II separated by a short transverse suture not reaching inner apodemal spots. Fig. 44–45. [Body length about 3.5 mm (male), 3.9 mm (female). Three Kings Islands (TH)] ..... ***Lissaptera completa* Usinger and Matsuda**

— Genae subequal to or barely longer than clypeus, not forming a gap in front. Dorsal mediotergites (dmtg) I–II separated by a long transverse suture reaching or surpassing inner apodemal spots. Fig. 46–47. [Body length about 3.0 mm (male), 3.6 mm (female). North Island: northernmost Aupouri Peninsula (ND)] ..... ***Lissaptera heissi* Larivière and Larochelle, new species**

Lissaptera completa (Usinger and Matsuda, 1959)

Fig. 31, 44–45, 79

Acaraptera (Lissaptera) completa Usinger and Matsuda 1959: 151. Holotype: male (CMNZ) labeled "S.W. [= South West] Island, Three Kings Is: Jan. 13, 1951 T.E. Woodward (hand-written) / HOLOTYPE (typed) Lissaptera completa (hand-written) Usinger-Matsuda (red label; typed)." Photo of holotype and associated labels (Larivière and Larochelle 2004: 229).

Lissaptera completa: Kormilev and Froeschner, 1987: 83.

Description (incrustation removed). Body pear-shaped (more broadly so in female); length about 3.5 mm (male), 3.9 mm (female). Dorsal color (male) dark reddish brown tinged with dark brown approaching black; yellowish brown on plates and markings of lateral margins of pronotum, fused notal plate, tergal plate of abdomen, between connexival segments, and medially on dmtg VII (male). Female darker overall. Eyes reddish brown. Antennae and legs slightly paler than main body. Ventral color mostly matching dorsal color. **Head.** About 0.8× as long as wide across eyes. Genae slightly to moderately longer than clypeus, forming a gap in front. Antenniferous tubercles broadly subtriangular (inner margin subrectilinear or slightly concave), their apices subacutely rounded and divergent. Postocular tubercles rounded-subquadrate, slightly to moderately produced laterally. ***Antennae*** about as long as or barely longer than width of head across eyes, mostly granulate. Ratio of length of antennal segments II–IV/I about 0.5: 0.6: 0.8. Segment I narrowed, smooth in basal fourth, then thickened; II slightly curved basally, gradually thickened toward apex; III pedunculate in basal fourth, gradually thickened toward apex; IV fusiform, pilose in apical fourth to third. **Thorax.** ***Pronotum*** about 3.6–4.0× wider than long medially, including collar. Anterior margin barely incised on each side of collar. Anterolateral angles rounded to subquadrate, slightly produced in front of collar (angles sometimes more strongly angular and produced in female). Disc barely produced posteriorly. Lateral portions with four rather small irregularly shaped plates and, submarginally, a finely granulate to nearly smooth, strongly curved bead extending from anterior to posterior margin. Posterolateral angles rounded-subquadrate, unproduced. ***Notal plate*** (fused mesonotum, metanotum, dmtg I–II) moderately

elevated posteromedially. Anterolateral portions, each with two large, irregularly shaped pale marks or slightly elevated plates next to a submarginal, granulate, longitudinal bead in line with that of pronotum. Midlateral portions, each with three moderately large, irregularly shaped, pale marks or slightly elevated plates. Posterolateral portions, each with two pairs of small suboval to rounded apodemal spots (a pair in line with transverse suture of dmtg I–II, a second pair more anteriorly). Dmtg I–II, each with a pair of more or less defined longitudinal plates medially (often reduced to pale marks); separated by a short transverse suture not reaching inner apodemal spots. **Abdomen** widest across tergite IV. ***Tergal plate*** (dmtg III–VI). Disc slightly to moderately elevated; dmtg IV–V with reduced or evanescent plate carrying scent gland openings, VI smooth, with slight median elevation but no plate. Lateral margins moderately convex (male), more strongly convex (female). Inner and outer rows of apodemal markings usually made of distinct, suboval to rounded, smooth spots (sometimes evanescent). Dmtg VII broadly smooth medially, very narrowly marked with small callosities and granules laterally, moderately elevated posteromedially (male); smooth throughout, unevenly surfaced, lateral margins subrectilinear, oblique (female). ***Connexivum*** carinate between dorsal laterotergites (dltg) and reflexed part of pleuron; increasingly reflexed toward apex (male), rather flat (female). Posterolateral angles of dltg III–VI rounded-subquadrate, barely produced, increasingly reflexed, VII broadly rounded-subtriangular, slightly thickened and produced, somewhat reflexed (male); III–VI rounded, barely produced, rather flat, VII rounded, slightly thickened, faintly produced, rather flat (female). ***Male genitalia.*** Right paramere (Fig. 31, outer lateral view) with broad subrectangular head and short shaft; anterior margin of head bulbous. **Ventral surface. Head.** Rostrum nearly reaching posterior margin of carinate, subovate rostral groove. **Thorax.** Pro-, meso-, and metasternum fused, flat or slightly convex (not depressed) medially; suture line between metasternum and vmtg I of abdomen distinct. **Abdomen.** Ventral mediotergites (vmtg) I–III fused; other mediotergites well demarcated from each other; IV–VI flat (not depressed) medially; VII about 2.3× longer than VI medially, without wrinkles posteriorly (male), medially split into two subquadrate plates with inner margin of each plate about 1.5× longer than VI medially, surface rugose in inner posterior angle (female). Apodemal spots (sterna IV–VI) flat or slightly elevated, paler than or nearly concolorous with remainder of sterna (sometimes evanescent); inner and outer rows made of similarly sized spots. Connexivum faintly demarcated from remainder of venter (often more distinctly demarcated in female).

Material examined. 150 specimens (CMNZ, LUNZ, NZAC).

Geographic distribution (Fig. 79). Offshore Islands: TH–Great Island (NZAC) (Baylis Stream (LUNZ); Castaway Camp (LUNZ, NZAC); South East Bay (LUNZ); Tasman Stream, NW side (LUNZ); Tasman Valley (NZAC)). North East Island (LUNZ, NZAC). South West Island (NZAC). Three Kings Island [= Great Island], Summit (NZAC). West Island, south east end (NZAC).

Biology. Altitudinal range. Lowland to lower montane (up to 300 m). **Habitat.** Occurs in broadleaf forests and shrublands. Collected mostly in leaf litter; also in decaying wood debris. **Seasonality.** Adults and tenerals: November–December. Nymphs: November, December (mostly). Mating probably occurs in December.

Remarks. *Lissaptera completa* is endemic to the Three Kings Islands (TH). Larivière and Larochelle (2004)'s North Island records from Northland (ND) were based on misidentified specimens.

Lissaptera heissi Larivière and Larochelle, new species

Fig. 32, 46–47, 80

Lissaptera heissi Larivière and Larochelle, new species. Holotype: male (AMNZ) labeled "NEW ZEALAND ND Te Paki, 122m Taputaputa Res [= Tapotupotu Reserve] 7.xii.1967 KAJ Wise (typed) / Puriri leaf litter. Berlese extraction P/S 409. L5093 (typed) / AMNZ72454 AUCKLAND MUSEUM NEW ZEALAND (green label; typed) / HOLOTYPE [male symbol] *Lissaptera heissi* Larivière & Larochelle, 2022 (red label; typed)." Paratypes: 1 female (AMNZ) with same data as holotype, 1 male (AMNZ) from the same locality, 9.iii.1967, bearing blue paratype labels.

Description (incrustation removed). Body pear-shaped (more broadly so in female); length about 3.0 mm (male), 3.6 mm (female). Dorsal color (male) reddish brown tinged with dark brown approaching black; reddish yellow on plates and markings of lateral margins of pronotum, fused notal plate, tergal plate of abdomen; yellowish between segments of connexivum. Female dark reddish black with more distinct pale markings and plates than in male; overall color resembling *L. completa*. Eyes reddish brown. Antennae and legs slightly paler than main body. Ventral color mostly matching dorsal color. **Head.** Genae subequal to or barely longer than clypeus, not forming a

gap in front. Antenniferous tubercles narrowly subtriangular (inner margin slightly concave), their apices acutely rounded and subparallel. **Thorax.** ***Pronotum.*** Disc slightly produced posteriorly. Lateral portions with a slightly angular submarginal bead extending from anterior to posterior margin. ***Notal plate*** (fused mesonotum, metanotum, dmtg I–II) moderately to strongly elevated posteromedially. Midlateral portions, each with two or three moderately large, irregularly shaped, pale marks or slightly elevated plates. Posterolateral portions, each with two pairs of small suboval to rounded apodemal spots (a pair in line with transverse suture of dmtg I–II, a second pair more anteriorly); apodemal spots more obscure in male. Dmtg I–II separated by a long transverse suture reaching or surpassing inner apodemal spots (suture sometimes curving backward, nearly delimiting dmtg II medially). **Abdomen.** ***Tergal plate*** (dmtg III–VI). Disc moderately to strongly elevated. Lateral margins slightly convex (male), moderately convex (female). Inner and outer rows of apodemal spots obscure in male. ***Connexivum*** flat or barely reflexed throughout (male), rather flat (female). Posterolateral angles of dltg III–VI rounded-subquadrate, barely produced, rather flat (not reflexed), VII narrowly rounded-subtriangular, slightly thickened and produced, barely reflexed (male); III–VI rounded, unproduced, rather flat, VII subquadrate, barely thickened, unproduced, rather flat (female). ***Male genitalia.*** Right paramere (Fig. 32, outer lateral view) with broad subrectangular head and short shaft; anterior margin of head slightly rounded, with subtriangular projection.

Other characters as in *L. completa.*

Material examined. 8 specimens (AMNZ).

Geographic distribution (Fig. 80). North Island: ND–Northernmost Aupouri Peninsula (Pandora, West Spirits Bay (AMNZ); Taputaputa [= Tapotupotu] Reserve (AMNZ); Te Paki Trig (AMNZ); Unuwhao (AMNZ)).

Biology. Altitudinal range. Lowland. **Habitat.** Occurs in broadleaf forests and shrublands. Collected mostly in leaf litter (e.g., *Dysoxylum*, *Leptospermum* or *Vitex* leaf litter); also in decaying wood debris. **Seasonality.** Adults and tenerals: November–December, March. Mating probably occurs in December–January.

Remarks. This species is named after Ernst Heiss (Tiroler Landesmuseum, Innsbruck, Austria) for his exceptional body of work on world Aradidae and for his precious help and encouragement in our Hemiptera research over the last three decades and through the course of this study. In addition to characters of the male parameres, *Lissaptera heissi* is mostly distinguished from *L. completa* by the following features: genae subequal to or barely longer than clypeus; antenniferous tubercles subparallel apically; dmtg I–II separated by a long transverse suture; male much smaller and more uniformly colored than female. *Lissaptera heissi* is only known from the Te Paki area (northernmost Aupouri Peninsula, ND). Specimens from Tapotupotu Reserve and Unuwhao are teneral.

Genus *Acaraptera* Usinger and Matsuda, 1959

Fig. 16, 24, 33–34, 48–51, 73–74

Acaraptera Usinger and Matsuda, 1959: 148.

Type species. *Acaraptera myersi* Usinger and Matsuda, 1959, by original designation.

Description (incrustation removed). Apterous. Body subovate (male) to broadly pear-shaped (female); length about 3.0 mm (male), 3.4 mm (female). **Head.** Eyes rather large in relation to head, granulate. Postocular tubercles rounded-subquadrate, moderately to strongly produced laterally. Rostrum arising from an open atrium. **Thorax.** Pro-, meso-, and metanotum separated by distinct sutures. ***Pronotum.*** Single-ring collar barely set off from anterior margin, without lateral tubercles or posteriorly produced subtriangular plate. Disc bearing a moderately large, smooth, slightly convex, hourglass-shaped plate from anterior to posterior margin. Lateral portions with a curved submarginal bead extending from anterior to posterior margin or ending before posterior margin. ***Mesonotum.*** Disc bearing a large irregularly shaped plate with a U-shaped backward projection reaching anterior one-third of metanotum and two subquadrate anterolateral projections covering about half of lateral portions and topped with a curved plate or two to three nearly coalesced callosities. ***Metanotum*** fused with dmtg I (*A. myersi*) or distinctly separated from it (*A. waipouensis*). Disc of metanotum, dmtg I, and dmtg II moderately to strongly elevated, each with a pair of well-defined, small longitudinal plates. Posterolateral angles flat, unproduced. ***Legs.*** Coxal lobes rugose. Trochanters and femora demarcated from each other. Femora granulate, slightly longer than tibiae. Protibiae with fine ventral spines and apical comb. **Abdomen.** Dmtg I–II separated from each other over their entire width (*A. myersi*) or separated medially, fused laterally (*A. waipouensis*); disc

(see metanotum); lateral portions of each segment with two, often faint, small, rounded callosities or spots, one adjacent to median elevation and the other near lateral margin, both in line with the rows of apodemal spots on dmtg III–VI. ***Tergal plate*** (dmtg III–VI) completely fused, with distinct carinae between inner and outer apodemal spots. Dmtg IV–VI smooth on each side of a distinct, posteriorly subtriangular plate carrying scent gland openings. Scent gland openings (or scars thereof) three in number, first large, displaced posteriorly on dmtg IV, second smaller, third evanescent. ***Connexivum*** consisting of dorsal laterotergites (dltg) and reflexed part of pleuron delimited from each other by a carina; reflexed part of pleuron extending forward to posterolateral angles of pronotum. Dorsal laterotergites (dltg) with a pair of distinct, rounded, smooth apodemal spots of similar size. Dltg II–III superficially unfused, II narrowly subtriangular, extending forward to middle of metanotum; III–VII subrectangular (on inner side of carina). Spiracles II–VII lateral (visible from above). ***Pattern of apodemal markings*** 2:2:1 (dorsal; ventral). ***Male genitalia.*** Pygophore trilobate (Fig. 16, posterodorsal view); dorsal lobes somewhat crescent-shaped, carinate along lateral margin, subdepressed medially, separated by a moderately wide depression with a strong longitudinal ridge; ventral lobe narrowly rounded-subtriangular medially, strongly produced (lobe forming a keel-like structure underneath pygophore); dorsal opening wide; paramere heads nearly fully visible as large boot-shaped structures; posterior rim with very short, anteriorly directed, subtriangular projection on each side of median suture. Paratergites VIII (Fig. 24, outer lateral view) with an apically acuminate, rounded-subtriangular head; spiracle subapical.

Remarks. This genus is known from Lord Howe Island, New Zealand and the Solomon Islands. In addition, there could be two undescribed species, one from Norfolk Island and one from New Caledonia (G.F. Monteith pers. comm. in Larivière and Larochelle 2006). The genus *Acaraptera* shares some morphological similarities with *Lissaptera* (see the Remarks under that genus) but can easily be diagnosed from it by characters of the thoracic notum listed in the key to genera. Some other important morphological differences include a more developed plate around abdominal scent gland openings, the first visible connexival segment not extending as far anteriorly, and a different configuration of the lobes of the male pygophore, especially the more strongly produced ventral lobe forming a keel-like structure underneath the genital capsule. The genus *Acaraptera* includes two North Island species. These leaf-litter inhabitants can be collected in very large numbers using manual sifting methods or extraction systems such as Berlese funnels. Species of *Acaraptera* are easily collected and account for the vast majority of Carventinae deposited in New Zealand Collections.

Key to species of *Acaraptera*

1. Metanotum fused with dorsal mediotergite (dmtg) I of abdomen. Dmtg I–II separated from each other for their entire width. Genae about as long as or slightly shorter than clypeus. Fig. 48–49. [North Island and nearby offshore islands] . . . . . ***Acaraptera myersi* Usinger and Matsuda**

— Metanotum distinctly separated from dorsal mediotergite (dmtg) I of abdomen. Dmtg I–II separated medially, fused laterally. Genae slightly longer than clypeus. Fig. 50–51. [North Island: ND, mostly in the west] . . . . . ***Acaraptera waipouensis* Heiss**

Acaraptera myersi Usinger and Matsuda, 1959

Fig. 33, 48–49, 73

Acaraptera (*Acaraptera*) *myersi* Usinger and Matsuda, 1959: 149. Holotype: female (BMNH) labeled "Ohakune [TO] NZ. 8.IV.23 JG Myers (hand-written) / J.G. Myers Coll. B.M. 1937-789. (typed) / spec. Figured Acaraptera myersi Usinger (hand-written) det. RLUsinger'49 (typed) / HOLOTYPE Acaraptera myersi Usinger-Matsuda (red label; typed except for taxon name)." Paratypes: 2 males with same data as holotype (Usinger and Matsuda 1959).

Acaraptera myersi: Kormilev and Froeschner, 1987: 65.

Description (incrustation removed). Body length about 3.0 mm (male), 3.4 mm (female). Dorsal color (male) yellowish brown; dark brown approaching black medially on pronotum and mesonotum, laterally on metanotum and dmtg I–II, basally on tergal plate of abdomen; yellowish laterally on thorax, on plates and markings of metanotum, dmtg I–II, tergal plate of abdomen; alternate yellowish and dark brown on connexivum. Female overall darker brownish black. Eyes reddish. Antennae and legs slightly paler than main body. Ventral color mostly matching dorsal color. **Head.** About 0.7× as long as wide across eyes. Genae about as long as or slightly

shorter than clypeus. Antenniferous tubercles narrowly subtriangular (inner margin sinuate), their apices subacutely rounded and subparallel. Postocular tubercles rounded-subquadrate, moderately to strongly produced laterally. ***Antennae*** about as long as or barely longer than width of head across eyes, mostly granulate. Ratio of length of antennal segments II–IV/I about 0.5: 0.8: 1.0. Segment I narrowed, smooth in basal fourth to third, then thickened; II slightly curved basally, gradually thickened toward apex; III pedunculate in basal fifth to fourth, gradually thickened toward apex; IV fusiform, pilose in apical fourth. **Thorax.** ***Pronotum*** about 2.8× wider than long medially, including collar (male), 3.1× (female). Anterior margin barely incised on each side of collar; sinuate medially. Anterolateral angles rounded-subtriangular, slightly to moderately (mostly) produced in front of collar, extending along part of anterior margin but not reaching close to sides of collar. Lateral portions with four rather small, irregularly shaped plates and, submarginally, a finely granulate to nearly smooth, curved bead extending from anterior to posterior margin. Posterolateral angles rounded-subquadrate, unproduced. ***Mesonotum*** about 3.0× wider than long medially including backward projection (male), 3.2× (female). Lateral portions with a deep sulcus near anterior margin and, submarginally, one or two irregularly shaped plates and some granules. Lateral margins slightly convex. ***Metanotum*** fused with dmtg I of abdomen. Disc strongly elevated, bearing two pairs of small longitudinal plates. Lateral portions with one or two longitudinal sulci near anterior margin and three to four irregularly shaped plates (sometimes barely elevated), and one small, rounded callosity or spot near posterior margin of dmtg I, in line with similar spots on dmtg II and tergal plate of abdomen. **Abdomen** widest across tergite III (male), tergite IV (female). Dmtg I–II separated from each other for their entire width. Disc of dmtg II strongly elevated, bearing a pair of small longitudinal plates flanked by two small, rounded callosities or spots, each adjacent to a short carina and in line with inner apodemal spots on dltg III–VI, and submarginally, a small, often faint, rounded callosity or spot in line with outer apodemal spots on dltg III–VI. ***Tergal plate*** (dmtg III–VI). Disc slightly to moderately elevated. Lateral margins slightly convex (male), moderately convex (female). Surface with distinct longitudinal carinae between inner and outer apodemal markings, with or without faint carinae around outer markings; inner and outer rows of markings made of distinct, suboval to rounded, smooth spots. Dmtg VII broadly smooth medially, narrowly marked with small callosities and granules laterally, moderately to strongly elevated posteromedially (male); smooth throughout, unevenly surfaced, lateral margins subrectilinear (female). ***Connexivum*** moderately reflexed toward apex (male), flat or slightly reflexed (female). Posterolateral angles of dltg III–IV rounded-subtriangular, slightly produced, V–VI slightly reflexed, distinctly more rounded and produced, VII rounded-subtriangular, strongly thickened, moderately produced and reflexed (male); III–VI rounded, unproduced or barely produced, VII rounded, not distinctly thickened, unproduced or faintly so, flat (female). ***Male genitalia.*** Right paramere (Fig. 33, outer lateral view) with broad subrectangular head and short shaft; anterior margin of head slightly rounded, with acutely subtriangular projection. **Ventral surface. Head.** Rostrum reaching or slightly surpassing posterior margin of subovate, carinate rostral groove. **Thorax.** Pro-, meso-, and metasternum fused, flat (not depressed) medially; suture line between metasternum and vmtg I of abdomen distinct. **Abdomen.** Ventral mediotergites (vmtg) I–III fused; other mediotergites well demarcated from each other; IV–VI flat (not depressed) medially; VII about 3.0× longer than VI medially, without wrinkles posteriorly (male), medially split into two subquadrate plates with inner margin of each plate about 1.6× longer than VI medially, surface rugose in inner posterior angle (female). Apodemal spots (vmtg IV–VI) flat or slightly elevated, paler than or nearly concolorous with remainder of venter; outer rows often more distinct or with larger spots. Connexivum faintly demarcated from remainder of venter (more distinctly demarcated in female).

Material examined. Nearly 2,000 specimens (AMNZ, BMNH, MONZ, NZAC (mostly)).

Geographic distribution (Fig. 73). North Island: AK, BP, CL, GB, HB, ND, RI, TK, TO, WA, WO.

Biology. Altitudinal range. Lowland to montane (up to 950 m). **Habitat.** Occurs in broadleaf-podocarp forests and, in the lower North Island, southern beech forests (*Nothofagus* sensu lato) or *Weinmannia* forests; can be locally abundant in forests where *Beilschmiedia* is predominant. Collected in large numbers in leaf litter, leaf and twig litter, or decaying wood litter along or under fallen rotting branches, dead fallen trees, and decaying logs; found in small numbers on the moist, moldy bark from the underside of fallen rotting branches. **Seasonality.** Adults: throughout most of the year (abundant in November to January). Tenerals: September–January (abundant in November–December), April–June. Nymphs: September–January (abundant in January), May–June. Mating probably occurs in December–January.

Remarks. *Acaraptera myersi* is a morphologically highly variable species. It is by far the most wide-ranging and locally abundant carventine species in New Zealand. Some morphological characters vary considerably within and between populations, e.g., the length and shape of antenniferous tubercles, degree of development of anterolateral angles of pronotum, and shape of mesonotal plate. *Acaraptera myersi* is, however, easily distinguished from *A. waipouensis* by features of the male genitalia and characters given in the key to species.

Acaraptera waipouensis Heiss, 1990

Fig. 34, 50–51, 74

Acaraptera waipouensis Heiss, 1990: 393. Holotype: male (NZAC) labeled "NEW ZEALAND, ND: Waipoua State For. [= Forest], c. 150 m., Toronui Track, April 13, 1980 A. Newton & M. Thayer (typed) / kauri, podocarp, broadleaf, nikau palm forest leaf & log litter ---------- See NZJZ 1976 v.3, p. 69 for Code letters (typed) / If designated as holotype specimen must be returned to New Zealand. (green label; typed) / HOLOTYPUS (typed) Acaraptera waipouensis n. sp. (hand-written) E. Heiss 1989 (typed except 89) (red label)." Photo of holotype and associated labels (Larivière and Larochelle 2004: 226). Paratypes: 10 males, 15 females (AMNH, NZAC, E. Heiss Collection) from ND–Waipoua Forest (Kauri Rickers Track; Toronui Track; Wairau Summit; Waikohatu [Stream] Bridge; Yakas Tree Track); Intamoe [= Tutamoe] Range, North Dargaville.

Description (incrustation removed). Body length about 3.0 mm (male), 3.4 mm (female). Dorsal color (male, female) similar to *A. myersi*. Eyes reddish. Antennae and legs slightly paler than main body. Ventral color mostly matching dorsal color. **Head.** Genae slightly longer than clypeus. Antenniferous tubercles broadly subtriangular (inner margin subrectilinear to slightly concave), their apices bluntly rounded and subparallel. ***Antennae.*** Segment I narrowed, smooth in basal third, then thickened; II slightly curved basally, gradually thickened toward apex; III pedunculate in basal third, gradually thickened toward apex; IV fusiform, pilose in apical fourth. **Thorax.** ***Pronotum*** about 3.0× wider than long medially, including collar (male), 3.5× (female). Anterior margin subrectilinear or slightly concave medially. Anterolateral angles rounded-subquadrate (often strongly angular in female), barely produced in front of collar, extending along entire anterior margin and reaching close to sides of collar. Lateral portions with four rather small irregularly shaped plates and, submarginally, a finely granulate to nearly smooth, curved to slightly angular bead extending from anterior margin and ending some distance before posterior margin. ***Mesonotum.*** Lateral margins subrectilinear. ***Metanotum*** distinctly separated from dmtg I of abdomen. Disc moderately to strongly elevated, bearing a pair of small longitudinal plates. Lateral portions with one or two longitudinal sulci near anterior margin and three to four irregularly shaped plates (sometimes barely elevated). **Abdomen.** Dmtg I–II separated medially, fused to each other laterally. Disc of each segment strongly elevated, bearing a pair of small longitudinal plates flanked by two faint, small, rounded callosities or spots, each adjacent to a short, longitudinal suture and in line with inner apodemal spots on dltg III–VI. Fused lateral portions with a pair of small, rounded callosities or spots in line with outer row of apodemal spots on dltg III–VI. ***Tergal plate*** (dmtg III–VI). Surface with or without faint longitudinal carinae between inner and outer apodemal markings, without faint carinae around outer apodemal markings; inner and outer rows of markings made of distinct, suboval to rounded, smooth spots. Dmtg VII moderately elevated posteromedially (male); lateral margins convex (female). ***Connexivum*** slightly reflexed toward apex (male), flat or slightly reflexed (female). Posterolateral angles of dltg III–IV rounded-subquadrate, unproduced or faintly produced, V–VI slightly more rounded and produced (VI slightly reflexed), VII rounded-subtriangular, slightly thickened, slightly produced and reflexed (male); III–VI rounded, unproduced or faintly so, VII rounded, not distinctly thickened, unproduced or faintly so, flat (female). ***Male genitalia.*** Right paramere (Fig. 34, outer lateral view) with broad subrectangular head and short shaft; anterior margin of head slightly subrectilinear, with rounded-subtriangular projection.

Other characters as in *A. myersi*.

Material examined. 158 specimens (AMNZ, NZAC).

Geographic distribution (Fig. 74). North Island: ND–Mangamuka Gorge (AMNZ). Mangamuka Gorge Walkway (NZAC). Mangamuka Hills (AMNZ), summit (AMNZ). Mangamuka [Summit] Walkway (NZAC). Mitimiti (NZAC). Mount Whakaangi, East side (AMNZ). Puketi Forest (NZAC) ([Upper] Waipapa [River] Track, 1 km West of Headquarters (NZAC); Waitahere Stream Track, near Waiare Road (NZAC)). Tutamoe Range (E.

Heiss Collection, NZAC). Waipoua Forest (NZAC), 1 km E of Headquarters (NZAC); Headquarters road beside river (NZAC); Kauri Rickers Track (NZAC); Te Matua Ngahere (NZAC); Toatoa Track (NZAC); Toronui Track (NZAC); Wairau Summit (AMNH, NZAC); Waikohatu [Stream] Bridge (AMNH); Yakas Tree Track (AMNH). Warawara State Forest (NZAC).

Biology. Altitudinal range. Lowland to lower montane (up to 700 m). **Habitat.** Occurs in broadleaf-podocarp forests with relatively abundant podocarps (e.g., *Agathis*, *Dacrydium*) or good *Beilschmiedia* cover. Collected in large numbers in leaf litter, leaf and twig litter, or decaying wood litter along or under fallen rotting branches, dead fallen trees, and decaying logs; found in small numbers on the moist, moldy bark from the underside of fallen rotting branches. **Seasonality.** Adults: throughout most of the year (abundant in December–January). Tenerals: September–January (abundant in January), May–July. Nymphs: September, January, probably also May–June. Mating probably occurs in December–January.

Remarks. The holotype is a slightly teneral individual, paler than reddish brown to brownish black color characteristic of *A. waipouensis*. *Acaraptera waipouensis* is easily distinguished from *A. myersi* by features of the male parameres and characters given in the key to species. This species is widespread in the western rainforests of Northland (ND). It had previously been recorded only from the Waipoua Forest and the Tutamoe Range.

Genus *Leuraptera* Usinger and Matsuda, 1959

Fig. 17, 25, 35, 52–53, 78

Leuraptera Usinger and Matsuda, 1959: 158.

Type species. *Leuraptera zealandica* Usinger and Matsuda, 1959, by original designation.

Description (incrustation removed). Apterous. Body subrectangular (male) to ovate (female); length about 3.6 mm (male), 4.8 mm (female). **Head.** Eyes moderately large in relation to head, granulate. Postocular tubercles subtriangular, slightly reflexed, moderately produced laterally. Rostrum arising from a closed atrium. **Thorax.** Pro-, meso-, and metanotum separated by distinct sutures (deeper between pro- and mesonotum). ***Pronotum*** deeply and broadly incised on each side of collar (more shallowly and narrowly incised in other genera). Double-ring collar distinctly set off from anterior margin, with lateral tubercles and posteriorly produced subtriangular plate. Disc bearing two moderately large, rounded to subtriangular plates, one on each side of a broad median sulcus extending from subtriangular plate behind collar to a small, rounded callosity at posterior margin. ***Mesonotum and metanotum.*** Disc of both segments covered by forward projection of dmtg I–II. Posterolateral angles of metanotum unproduced. ***Legs.*** Coxal lobes rugose. Trochanters and femora demarcated from each other. Femora granulate, slightly shorter than tibiae. Protibiae with fine ventral spines and apical comb. **Abdomen.** Dmtg I–II broadly fused with metanotum and mesonotum medially, separated from metanotum and from each other by a distinct suture laterally; disc strongly produced into a forward subtriangular projection reaching anterior margin of mesonotum (disc without a forward projection in other genera); lateral portions smooth in front and behind lateral suture. ***Tergal plate*** (dmtg III–VI) completely fused, without sulci or carinae around apodemal markings. Dmtg IV–VI without a plate around scent gland openings. The latter (or scars thereof) three in number; first opening moderately developed, displaced posteriorly on dmtg IV, second very small, third evanescent. ***Connexivum.*** Dorsal and ventral surface coarsely and uniformly granulate (more finely and irregularly granulate and rugose in other genera). Dorsal laterotergites (dltg) with a pair of distinct, rounded, smooth apodemal spots, posterior one larger. Dltg II–III fused, subtriangular, extending forward to posterolateral angles of metanotum; IV–VI subquadrate (male), subrectangular (female). Spiracles II–IV ventral (not visible from above), V–VII lateral (visible from above). ***Pattern of apodemal markings*** 2:1:1 (dorsal; ventral). ***Male genitalia.*** Pygophore trilobate (Fig. 17, posterodorsal view); dorsal lobes ear-shaped dorsolaterally, carinate along lateral margin, depressed medially, with an oblique carina between dorsal margin and swollen ventral portion of inner margin, the latter meeting swollen portion of opposite lobe to form a bulbous backward projection; ventral lobe with rounded-subquadrate convexity medially, moderately produced; dorsal opening moderately wide; paramere heads slightly visible as rounded setose structures; posterior rim with a large, anteriorly directed, sinuate-subrectangular projection on each side of median suture. Paratergites VIII (Fig. 25, outer lateral view) with a narrowly rounded head bearing a short ventral flange; spiracle apical.

Remarks. The genus *Leuraptera* is unique among New Zealand genera in having a forward subtriangular projection stemming from the fused discs of the mesonotum, metanotum, and dorsal mediotergites (dmtg) I–II of abdomen, and a 2:1:1 pattern of dorsal and ventral apodemal markings on the abdomen. The male pygophore is also highly characteristic especially with regards to the shape of the dorsal lobes and the large forward projections from the dorsal rim. The male paratergites show similarities with those of *Carventaptera*. Two species were previously known in *Leuraptera*, *L. zealandica* and the more recently described *L. yakasi* which is synonymized below, returning the genus to its original monotypic status. No additional *Leuraptera* species could be identified despite the relatively rich material seen for this study. *Leuraptera* is found in northernmost areas of the North Island from Northland (ND) south to the Auckland region (AK), and then further south along the east coast in the Coromandel (CL) and northern Bay of Plenty (BP) regions.

Leuraptera zealandica Usinger and Matsuda, 1959

Fig. 35, 52–53, 78

Leuraptera zealandica Usinger and Matsuda, 1959: 160. Holotype: male (CMNZ) labeled "x Fungus Titirangi [AK] 30 March 1946 J.M. Dingley. (hand-written) / HOLOTYPE (typed) Leuraptera zealandica Using. & Mats. (pink-red label; hand-written)." Photo of holotype and associated labels (Larivière and Larochelle 2004: 228). Paratypes: 3 females with same data as holotype (Usinger and Matsuda 1959).

Leuraptera yakasi Heiss, 1990: 399. Holotype: male (NZAC) labeled "NEW ZEALAND, ND: Waipoua State Forest, Yakas Tree Track, 350 m., April 11, 1980 A. Newton & M. Thayer (typed) / mixed broadleaf, podo- carp forest, leaf & log litter ---------- See NZJZ 1976 v.3, p. 69 for Code Letters (typed) / If designated as a holotype specimen must be returned to New Zealand (green label; typed) / HOLOTYPUS (typed) Leuraptera yakasi n. sp. (hand-written) E. HEISS 1989 (typed, except for '89') (red label)." Photo of holotype and associated labels (Larivière and Larochelle 2004: 228). Paratypes: 2 males, 3 females (AMNH, E. Heiss Collection) from ND–Waipoua Forest, Yakas Tree Track; Intamoe [= Tutamoe] Range, North Dargaville. **New synonym.**

Description (incrustation removed). Body length about 3.6 mm (male), 4.8 mm (female). Dorsal color (male, female) reddish brown with varying degrees of darker brown to nearly black on head and thorax, tergal disc of abdomen, connexivum, and dmtg VII. Eyes reddish. Antennae and legs concolorous or slightly paler than main body. Ventral color generally darker than main dorsal color. **Head.** About 0.8× as long as wide across eyes. Genae distinctly longer than clypeus, nearly touching or touching in front. Antenniferous tubercles subconical, their apices subacutely to bluntly rounded, divergent. ***Antennae*** about 1.4× longer than width of head across eyes, mostly granulate. Ratio of length of antennal segments II–IV/I about 0.7: 1.1: 1.1. Segment I narrowed, smooth in basal fourth to third, then thickened; II slightly curved basally, gradually thickened toward apex; III pedunculate in basal fifth, gradually thickened toward apex; IV fusiform, pilose in apical third. **Thorax.** ***Pronotum*** about 3.5× wider than long medially, including collar. Anterolateral angles broadly rounded-subtriangular, slightly to moderately produced in front of collar; inner portion strongly projecting toward collar. Lateral portions with two irregularly shaped plates (anterior plate larger, often semi-circular or hook-shaped) and, submarginally, a slightly elevated area with several irregular rows of fine to moderately coarse granules (finer and more closely set together near lateral margin). Lateral margins subrectilinear to slightly sinuate or concave, strongly oblique. Posterolateral angles subquadrate or rounded-subtriangular, slightly to moderately produced. ***Mesonotum*** about 6.0× wider than long medially (next to dmtg I–II forward projection). Lateral portions bearing a large, subquadrate plate with a lateral hook-shaped extension in front of a small, subovate plate (sometimes evanescent) and, submarginally on a slightly elevated area, fine to moderately coarse granules (finer, darker, thickened together closer to margin). Lateral margins reflexed or not, slightly to strongly convex. Posterolateral angles subquadrate or subtriangular, slightly to moderately produced (more produced in male). ***Metanotum***. Lateral portions with a large subovate plate, a smaller, posterolateral rounded plate and, submarginally, fine to moderately coarse granules (finer, darker, thickened together near margin). Lateral margins slightly convex, unproduced, rather flat. Posterolateral angles subquadrate. **Abdomen** widest across tergite IV (male), tergites III–IV (female). Dmtg I–II rather flat (not declivent from front to back). ***Tergal plate*** (dmtg III–VI). Disc barely elevated. Lateral margins slightly to moderately convex. Inner rows of apodemal markings made of rather obscure, rounded to suboval, smooth spots; outer rows made of slightly smaller, rounded spots. Dmtg VII broadly smooth medially, narrowly marked with small callosities and granules laterally, moderately elevated posteromedially (male); broadly smooth medially,

broadly marked with small callosities and granules laterally, with more or less distinct transverse sulcus posteriorly (female). ***Connexivum*** moderately to strongly reflexed. Posterolateral angles of dltg III–IV subquadrate, unproduced, V rounded, barely produced, VI rounded, slightly more produced, VII broadly rounded-subtriangular, unproduced, slightly reflexed (male); III–IV subquadrate, unproduced, V–VI rounded, barely produced, VII rounded, slightly thickened, unproduced, rather flat (female). ***Male genitalia.*** Right paramere (Fig. 35, outer lateral view) broad and flat, shaft straight for most of its length posteriorly, head strongly sinuate apically, with anterior margin rounded, curved inward into a rounded-subtriangular 'lip'. **Ventral surface. Head.** Rostrum nearly reaching posterior margin of subovate, carinate rostral groove. **Thorax.** Pro-, meso-, and metasternum separated from each other; meso- and metasternum slightly depressed medially; suture line between metasternum and vmtg I of abdomen distinct medially, segments separated by deep depressions laterally. **Abdomen.** Ventral mediotergites (vmtg) I–II fused, distinctly separated from III at least laterally; other mediotergites well demarcated from each other; III–VI barely depressed medially; VII about 3.0× longer than VI, smooth medially along posterior margin (male); VII medially split into two triangular plates with inner margin of each plate about 2.7× longer than VI medially; surface obliquely rugose (female). Apodemal spots (vmtg IV–VI) flat or slightly elevated, slightly paler than or concolorous with remainder of venter; inner rows sometimes evanescent; outer rows sometimes made of larger, more elevated spots. Connexivum distinctly demarcated from remainder of venter.

Material examined. 540 specimens (AMNZ, CMNZ, NZAC).

Geographic distribution (Fig. 78). North Island: AK, BP, CL, ND.

Biology. Altitudinal range. Lowland to lower montane (up to 650 m). **Habitat.** Occurs in broadleaf–podocarp forests; can be locally abundant in forests where *Beilschmiedia* is predominant; also found in southern beech (*Nothofagus* sensu lato)-*Agathis*-*Phyllocladus* forests. Collected in groups on the moist, often moldy bark from the underside of fallen rotting branches about 3–10 cm in diameter (e.g., *Beilschmiedia*, *Dysoxylum*, *Pittosporum*, *Weinmannia*, *Phyllocladus*, *Podocarpus totara* branches); found in smaller numbers in leaf litter. **Seasonality.** Adults: throughout most of the year (abundant in November–December). Tenerals: October to December (abundant in November), April. Nymphs: October–December (abundant in November–December), April–June. Mating observed in December.

References. Larivière and Larochelle 2004: 52 (catalogue; *L. zealandica, L. yakasi*), 228 (photos of type and labels; *L. zealandica, L. yakasi*), 2014: 350 (checklist; *L. zealandica, L. yakasi*).

Remarks. *Leuraptera zealandica* was previously known from about 20 specimens collected in a handful of localities from the Auckland (AK), Coromandel (CL), and Northland (ND) regions. It is now known from long series of specimens sampled in over 30 localities across these regions and the Bay of Plenty (BP). The male holotypes of *L. yakasi* and *L. zealandica* represent teneral individuals. Their body color is paler than in fully mature adults, thoracic elevations or markings and overall granulation are less developed, and other morphological features appear slightly distorted due to incomplete hardening of the cuticle. The authors have checked the male holotype of both species and found the two taxa to be conspecific. Further support for this new synonymy is based on the examination of hundreds of specimens of *L. zealandica* and long series of *Leuraptera* specimens from western Northland in forests geographically proximate and ecologically similar to Waipoua Forest (type locality of *L. yakasi*) and Tutamoe Range (paratype locality). Morphological variation within and between populations in the putative geographic range of *L. yakasi* is consistent with that observed for *L. zealandica* across its distribution range.

Genus *Clavaptera* Kirman, 1985

Fig. 18, 54–55, 77

Clavaptera Kirman, 1985: 125.

Type species. *Clavaptera ornata* Kirman, 1985, by original designation.

Description (incrustation removed). Apterous. Body subovate to subrectangular, slightly narrowed anteriorly; length about 3.1 mm (male), 3.5 mm (female). **Head.** Eyes rather small in relation to head, granulate. Postocular tubercles rounded-subtriangular to acutely triangular, slightly to moderately produced laterally. Rostrum arising from a closed atrium. **Thorax.** Pro-, meso-, and metanotum separated by very deep gaps (as opposed to

moderately deep sutures in *Neocarventus, Tuataraptera*). ***Pronotum.*** Double-ring collar distinctly set off from anterior margin, with lateral tubercles and posteriorly produced subtriangular plate (sometimes ill-defined). Disc with a moderately large, somewhat swollen, posteriorly produced, subtriangular plate split for part of its length by a subparallel median sulcus and bearing an apical tubercle. Lateral portions with a curved submarginal ridge close to lateral margin. ***Mesonotum.*** Disc bearing a hexagonal to subelliptical plate with a backward projection reaching anterior three-quarters of metanotum; apex of projection flanked by two moderately large, irregularly shaped, nearly coalesced metanotal callosities. ***Metanotum***. Disc largely covered by mesonotal projection. Posterolateral angles strongly elevated, strongly produced into short, subacutely tipped, horn-shaped spines reaching anterolateral angle of first visible connexival segment (male), slightly elevated, forming short, subtriangular projections (female). ***Legs.*** Coxal lobes rugose. Trochanters and femora demarcated from each other. Femora granulate, about as long as tibiae. Protibiae with fine ventral spines and apical comb. **Abdomen.** Dmtg I–II separated from metanotum by a distinct suture; completely fused to each other, with a longitudinal carina medially; lateral portions with a curved, laterally attenuate, transverse plate along anterior margin in front of a subquadrate plate thinly connected posteriorly to a long, medially concave, submarginal plate next to a large, coarsely granulate pit. ***Tergal plate*** (dmtg III–VI) mostly fused, with carinae around inner apodemal markings and sulci around outer markings. Dmtg III with a longitudinal carina medially, flanked by granules and two apodemal spots near anterior margin; dmtg IV–VI with large granulate areas on each side of a distinct elongate plate carrying scent gland openings. The latter (or scars thereof) three in number, first moderately developed, displaced posteriorly on dmtg IV, second very small, third evanescent. ***Connexivum.*** Dorsal latero-tergites (dltg) with a pair of rather faint, rounded, smooth apodemal spots, posterior one usually larger. Dltg II–III fused, subtriangular, extending forward to or slightly beyond posterolateral angles of metanotum; IV–VI subquadrate, VII subrectangular (male); IV subquadrate, V–VII subrectangular (female). Spiracles II–III ventral (not visible from above), IV sublateral, V–VII lateral (visible from above). ***Pattern of apodemal markings*** 2:1:1 (dorsal); 2:2:1 (ventral). ***Male genitalia.*** Pygophore trilobate (Fig. 18, posterodorsal view); dorsal lobes nearly elliptical in shape, carinate along margins, depressed medially, touching each other along their thickened inner margin; ventral lobe broadly rounded-subtriangular and convex medially, moderately produced; dorsal opening narrow; paramere heads partially visible as lamellate setose structures; posterior rim with a moderately long, anteriorly directed, truncate-subtriangular projection on each side of median suture. Paratergites VIII (Fig. 18, posterodorsal view) with a very large, apically rounded-subtriangular, sickle-shaped head; spiracle distant from apex.

Remarks. To the untrained eye the genus *Clavaptera* may resemble *Tuataraptera* in body shape, size, and color. Four major characters set *Clavaptera* apart from *Tuataraptera* and all other New Zealand genera: the elongate hexagonal to subelliptical mesonotal projection; very deep gaps between pro-, meso-, and metanotum; completely fused dorsal mediotergites (dmtg) I–II of abdomen; the very large sickle-shaped head of the male paratergites VIII. The horn-shaped metanotal spines, although similarly positioned, bear little resemblance to those seen in *Neocarventus* or *Tuataraptera*. The configuration of the male pygophore only superficially resembles that of *Tuataraptera*. The genus *Clavaptera* is known from a single species, *Clavaptera ornata*, which occurs in the far north of the North Island, on the Aupouri Peninsula (ND) in the Te Paki-Cape Reinga area.

Clavaptera ornata Kirman, 1985

Fig. 54–55, 77

Clavaptera ornata Kirman, 1985: 126. Holotype: male (AMNZ) labeled "Leaf litter Serpentine Access Rd. 4 miles from Spirits Bay Rd. [ND] 30.IV.1968 J. Bertrand. (hand-written) / Mangonui Co. North Island NEW ZEALAND AUCKLAND MUSEUM (typed) / Auckland Museum PLANT [forward slash] SOIL SAMPLE (typed) 526 (hand-written) / Clavaptera ornata KIRMAN [male symbol] HOLOTYPE. (red label; hand-written) / AMNZ 21723 AUCKLAND MUSEUM NEW ZEALAND (green label; typed)." Photo of holotype and associated labels (Larivière and Larochelle 2004: 227). Paratype: 1 female (NZAC) from Tapotupotu Stream, at base of Cape Reinga (ND).

Description (incrustation removed). Body length about 3.1 mm (male), 3.5 mm (female). Dorsal color (male) pale to moderately dark reddish brown tinged with yellow; nearly black laterally on pro-, meso-, and metanotum, posteromedially on pronotum, anteriorly on mesonotal projection, around inner apodemal spots on

tergal plate of abdomen; paler reddish brown to nearly yellowish on mesonotal projection, anterior plates of dmtg I, middle of tergal plate, apodemal spots, and outer connexivum. Female similarly colored. Eyes reddish. Antennae and legs nearly concolorous with main body. Ventral color mostly matching main dorsal color medially, darker midlaterally and medially on segment VIII (male), VII (female). **Head.** About as long as wide across eyes. Genae distinctly longer than clypeus, forming a gap in front. Antenniferous tubercles broadly subtriangular, their apices bluntly rounded and divergent. ***Antennae*** about 1.6× longer than width of head across eyes, mostly granulate. Ratio of length of antennal segments II–IV/I about 0.6: 0.9: 0.9. Segment I narrowed, smooth in basal third, then thickened; II slightly curved basally, gradually thickened toward apex; III pedunculate in basal fifth, gradually thickened toward apex; IV fusiform, pilose in apical half. **Thorax.** ***Pronotum*** about 2.6× wider than long medially, including collar (male), 2.9× (female). Anterior margin deeply and narrowly incised on each side of collar. Anterolateral angles broadly rounded-subtriangular, slightly to moderately produced in front of collar. Lateral portions with small callosities and coarse granules coalesced into a slightly to moderately elevated, broad, strongly oblique, curved submarginal ridge nearly reaching lateral margin. Lateral margins subrectilinear to slightly concave, slightly oblique. Posterolateral angles rounded-subquadrate, unproduced. ***Mesonotum*** about 2.6× wider than long medially, including backward projection (male), 3.2× (female). Lateral portions with a moderately large, sometimes ill-defined, vermiculate plate (or nearly merged callosities), small callosities, and coarse granules. Lateral margins strongly convex and oblique. Posterolateral angles broadly rounded, moderately to strongly produced (reflexed in male). ***Metanotum***. Disc slightly elevated near apex of mesonotal projection. Lateral portions with a moderately large, sometimes ill-defined, curved plate. Lateral margins strongly convex (male), subrectilinear (female). **Abdomen** widest across tergite V. Dmtg I–II strongly declivent from front to back (male), moderately declivent (female). ***Tergal plate*** (dmtg III–VI). Disc moderately elevated. Lateral margins faintly convex. Inner rows of apodemal markings made of transverse, subovate to subquadrate plates bearing a distinct, oval, smooth median spot; outer rows made of longitudinal, rounded-subovate plates with a more rounded spot (outer markings smaller than inner markings). Dmtg VII narrowly smooth and unevenly surfaced anteromedially, broadly marked with small callosities and granules laterally, strongly elevated posteromedially (male); broadly smooth medially, broadly marked with small callosities and granules laterally, slightly elevated and unevenly surfaced medially, with a faint transverse sulcus posteriorly (female). ***Connexivum*** strongly reflexed (male), slightly reflexed (female). Posterolateral angles of dltg III–IV rounded, unproduced, V–VI rounded-subtriangular, increasingly reflexed and produced, VII narrowly rounded-subtriangular, rather strongly produced and reflexed (male); III–IV unproduced, V–VI rounded, slightly produced, VII rounded, slightly more produced, rather flat (female). ***Male genitalia.*** Right paramere not dissected. **Ventral surface. Head.** Rostrum nearly reaching posterior margin of subrectangular, carinate rostral groove. **Thorax.** Pro-, meso-, and metasternum fused; meso- and metasternum barely depressed medially; suture line between metasternum and vmtg I of abdomen absent. **Abdomen.** Ventral mediotergites (vmtg) I–III fused; other mediotergites well demarcated from each other; IV–VI barely depressed medially; VII 3.0× longer than VI medially, with moderately strong transverse wrinkles in apical fifth (male), medially split into two triangular plates, with inner margin of each plate about 3.0× longer than VI medially, surface obliquely wrinkled (female). Apodemal spots (vmtg IV–VI) flat or slightly elevated, paler than remainder of venter; outer and inner rows made of similarly sized spots. Connexivum faintly demarcated from remainder of venter.

Material examined. 4 specimens (AMNZ, NZAC).

Geographic distribution (Fig. 77). North Island: ND–Cape Reinga, Tapotupotu Stream (NZAC). North Cape, Serpentine Access Road, 4 miles [= 6.4 km] from Spirits Bay Road (AMNZ). Te Paki, Kohuronaki (NZAC).

Biology. Altitudinal range. Lowland. **Habitat.** Found in coastal shrublands and scrublands. Collected in leaf litter (*Dysoxylum–Vitex–Brachyglottis–Sophora–Phormium* bush). **Seasonality.** Adults: November, April.

Remarks. This species was previously known only from the holotype and allotype. Two additional NZAC specimens from a new locality (Te Paki, ND) are recorded here. *Clavaptera ornata* appears to have a restricted distribution range around Te Paki and Cape Reinga, at the northernmost tip of the North Island.

Genus *Carventaptera* Usinger and Matsuda, 1959

Fig. 19, 26–27, 36–37, 56–59, 75–76

Carventaptera Usinger and Matsuda, 1959: 161.

Type species. *Carventaptera spinifera* Usinger and Matsuda, 1959, by original designation.

Description (incrustation removed). Apterous. Body subrectangular; length about 4.1 mm (male), 4.9 mm (female). **Head.** Eyes rather small in relation to head, granulate. Postocular tubercles acutely subtriangular, slightly to strongly produced laterally. Rostrum arising from a closed atrium. **Thorax.** Pro-, meso-, and metanotum separated by distinct sutures. Vestigial wing pads present, appearing as small narrow plates fused to the thorax, extending backward along anterior fifth of fused dltg II–III of connexivum (vestigial wing pads absent in other genera). ***Pronotum.*** Double-ring collar distinctly set off from anterior margin, with lateral tubercles and posteriorly produced subtriangular plate (sometimes ill-defined). Disc bearing two moderately large rounded-subtriangular plates, one on each side of a broad median sulcus. Lateral portions with a moderately to strongly elevated submarginal area of fine to coarse granules (finer, more closely set together along lateral margin). ***Mesonotum.*** Disc bearing a moderately large V-shaped plate with a backward projection reaching anterior three-quarters of metanotum; apex of backward projection flanked by two small, rounded-subtriangular metanotal callosities. ***Metanotum***. Disc largely covered by mesonotal projection. Posterolateral angles unproduced. ***Legs.*** Coxal lobes rugose. Trochanters and femora demarcated from each other. Femora granulate, about as long as tibiae. Protibiae with fine ventral spines and apical comb. **Abdomen.** Dmtg I–II separated from metanotum by a distinct suture; fused medially, with an ill-defined longitudinal carina, separated from each other submarginally; lateral portions with a moderately large, oblong transverse plate along anterior margin in front of a small, rounded callosity next to a submarginal slit and coarse granules (in part coalesced into oblique wrinkles). ***Tergal plate*** (dmtg III–VI) completely fused, with low carinae around apodemal markings. Dmtg IV–VI with an ill-defined plate around scent gland openings. The latter (or scars thereof) three in number, first moderately developed, displaced posteriorly on dmtg IV, second very small, third lacking. ***Connexivum.*** Dorsal laterotergites (dltg) with a pair of obscure or distinct, rounded, smooth apodemal spots, posterior one larger. Dltg II–III fused, subtriangular, extending forward to anterolateral angles of metanotum; IV–VII subrectangular. Spiracles II–IV ventral (not visible from above), V–VII lateral (visible from above). Posterolateral angles of vltg V–VII produced, visible from above (unproduced, not visible from above in other genera). ***Pattern of apodemal markings*** 2:1:1 (dorsal); 2:2:1 (ventral). ***Male genitalia.*** Pygophore trilobate (Fig. 19, posterodorsal view); dorsal lobes ear-shaped, strongly carinate along margins, depressed medially, swollen ventral portion of inner margin nearly touching swollen margin of opposite lobe; ventral lobe with narrowly rounded median convexity flanked by two carinae, moderately produced; dorsal opening narrow; paramere heads partially visible as rounded setose structures; posterior rim with short, anteriorly concave, angular projection on each side of median suture. Paratergites VIII (Fig. 26–27, dorsolateral view) with a broadly rounded head bearing a long ventral flange; spiracle apical.

Remarks. The genus *Carventaptera* is unique among New Zealand genera in possessing the following two morphological characters: presence of vestigial wing pads, appearing as small narrow plates fused to the thorax; posterolateral angles of ventral laterotergites (vltg) V–VII of connexivum produced and visible from above. Furthermore, the simple V-shaped backward projection of the mesonotal disc of *Carventaptera* lacks the anterolateral projections present in *Neocarventus* and *Tuataraptera*. Finally, the overall appearance of the male paratergites VIII is reminiscent of the situation seen in *Leuraptera*. The genus *Carventaptera* was previously known only from the type species (*C. spinifera*) which occurs on the South Island and in southernmost areas of the North Island. A new species from the North Island, *C. hallae*, is described here.

Key to species of *Carventaptera*

1. Dorsal color pale to moderately dark reddish brown with paler pronotum and mesonotum, and distinct yellowish plates, callosities, and other markings on thorax and abdomen. Lateral margins of head strongly reflexed; postocular tubercles acutely subtriangular, strongly produced laterally, strongly reflexed. Anterolateral angles of pronotum broadly rounded-subtriangular, rather strongly produced in front of collar; posterolateral angles produced into an upper and a lower tubercle of subequal

length. Fig. 56–57. [Dorsal shape broad; forethorax slightly narrowed. South Island, southernmost North Island] . . . . . ***Carventaptera spinifera*** **Usinger and Matsuda**

— Dorsal color dark reddish brown except for paler backward projection of mesonotum and adjacent metanotum-dmtg I area (other thoracic and abdominal callosities and markings obscure). Lateral margins of head flat to slightly reflexed; postocular tubercles rounded-subtriangular, slightly produced laterally, not strongly reflexed. Anterolateral angles of pronotum more narrowly rounded-subtriangular, less strongly produced in front of collar; posterolateral angles produced into a short upper tubercle and a longer lower tubercle. Fig. 58–59. [Dorsal shape narrower; forethorax more strongly narrowed. North Island] . . . ***Carventaptera hallae*** **Larivière and Larochelle, new species**

Carventaptera spinifera Usinger and Matsuda, 1959

Fig. 36, 56–57, 76

Carventaptera spinifera Usinger and Matsuda, 1959: 162. Holotype: female (BMNH) labeled "New Zealand. Oct. 1901-Nov. 1902. J.J. Walker. 1910–384. (typed) / Port Chalmers [DN], N.Z. J.J. Walker. (typed) / Carventaptera spinifera n.g. + sp. (hand-written) det. RL Usinger' 48 (typed) / HOLOTYPE (typed) Carventaptera spinifera (hand-written) Usinger-Matsuda (red label; typed)." Paratypes: 1 male and 2 other specimens (probably females) with same data as holotype (Usinger and Matsuda 1959).

Description (incrustation removed). Body length about 4.1 mm (male), 4.9 mm (female). Dorsal color (male) pale to moderately dark reddish brown with paler pronotum and mesonotum, and distinct yellowish plates, callosities, and other markings on thorax and abdomen; darker brown to black on collar and to varying degrees on metanotum and abdomen. Female similarly colored. Eyes reddish. Antennae and legs concolorous with or slightly paler than main body (apices of femora and entire tibiae, often paler). Ventral color mostly matching main dorsal color; thoracic sterna markedly paler medially, vmtg III–VI with dark median foveae. **Head.** Slightly shorter than wide across eyes. Genae distinctly longer than clypeus, touching or forming a gap in front. Antenniferous tubercles broadly subconical, their apices divergent and strongly reflexed. Postocular tubercles acutely subtriangular, strongly produced laterally, strongly reflexed. Lateral margins of head strongly reflexed. ***Antennae*** about 1.3× longer than width of head across eyes, mostly granulate. Ratio of length of antennal segments II–IV/I about 0.6: 0.8: 0.9. Segment I narrowed, smooth in basal third, then thickened; II slightly curved basally, gradually thickened toward apex; III pedunculate in basal fifth to fourth, gradually thickened toward apex; IV fusiform, pilose in apical third to half. **Thorax.** ***Pronotum*** about 2.9× wider than long medially, including collar (male), 3.1× (female); slightly though distinctly wider than mesonotum. Anterior margin deeply and narrowly incised on each side of collar, inner side nearly touching collar. Anterolateral angles broadly rounded-subtriangular (often appearing swollen), rather strongly produced in front of collar, moderately to strongly reflexed. Lateral portions with a narrow, semicircular or vermiculate plate, coarse granules and, submarginally, a moderately to strongly elevated area of fine to coarse granules (finer and more closely set together along lateral margin). Lateral margins moderately to strongly sinuate, moderately oblique, strongly reflexed. Posterolateral angles bluntly rounded-subtriangular, moderately to strongly produced into an upper and a lower tubercle of subequal length, moderately reflexed. ***Mesonotum*** about 2.9× wider than long medially, including backward projection. Lateral portions with one or two small, rounded callosities, coarse granules and, submarginally, closely set finer granules forming a thickened border. Lateral margins subrectilinear to slightly convex and oblique. Posterolateral angles rounded-subquadrate, unproduced. ***Metanotum***. Disc moderately elevated posteriorly. Lateral portions with a distinct, moderately large, narrow semicircular or vermiculate plate, coarse granules coalesced into oblique wrinkles, and submarginally, a small, rounded callosity, coarse granules and closely set finer granules forming a thickened border anteriorly. Lateral margins angular, thickened and slightly convex anteriorly. Posterolateral angles subquadrate. **Abdomen** widest across tergite IV. Dmtg I–II slightly to moderately declivent from front to back (less declivent in female). ***Tergal plate*** (dmtg III–VI). Disc slightly to moderately elevated (male), slightly elevated (female). Lateral margins slightly to moderately convex. Inner rows of apodemal markings made of distinct, suboval, smooth spots; outer rows made of distinct, more rounded, smaller spots. Dmtg VII broadly smooth anteromedially, with a longitudinal slit on a moderate to strong elevation, narrowly marked with a rounded depression and small callosities laterally (male); broadly marked with small callosities and coarse granules medially, narrowly marked with a rounded depression and small callosities laterally, slightly but flatly elevated anteromedially, with

a transverse sulcus followed by a narrow bead posteromedially (female). ***Connexivum*** moderately to strongly reflexed (more reflexed in male). Dorsal laterotergites (dltg) with a pair of distinct apodemal spots. Posterolateral angles of dltg III–VI rounded-subquadrate, unproduced or barely produced (V–VI thickened), VII broadly rounded-subtriangular, barely produced, moderately to strongly reflexed (male); III–VI rounded-subquadrate, unproduced, VII broadly rounded-subtriangular, slightly produced and reflexed (female). ***Male genitalia.*** Right paramere (Fig. 36, inner lateral view) broad and flat; head broadly rounded-subtriangular, posterior margin thickened from apex to about midlength of paramere, ending in a broadly subtriangular flange (appearing as a broad, subtriangular projection in dorsolateral view, Fig. 26). **Ventral surface. Head.** Rostrum reaching posterior margin of subovate, carinate rostral groove. **Thorax.** Pro-, meso-, and metasternum clearly separated from each other; meso- and metasternum with deep, paired foveae medially; suture line between metasternum and vmtg I of abdomen distinct, deep. **Abdomen.** Ventral mediotergite (vmtg) I clearly separated from fused vmtg II–III; other mediotergites well demarcated from each other; III–VI depressed (foveate) medially; VII about 2.2× longer than VI medially, with strong wrinkles in apical third (male); medially split into two subtriangular plates with inner margin of each plate about 2.0× longer than VI medially, surface obliquely wrinkled with coarse coalesced punctures in outer posterior corner (female). Apodemal spots (vmtg III–VI) flat or slightly elevated, usually paler than remainder of venter (sometimes nearly concolorous); inner rows usually made of larger spots. Connexivum distinctly demarcated from remainder of venter; posterolateral angles of vltg V–VII rounded, moderately to strongly produced (V slightly, VI strongly, VII moderately; as opposed to other genera).

Material examined. 56 specimens (BMNH, LUNZ, NZAC).

Geographic distribution (Fig. 76). North Island: WA–Tararua FP [= Forest Park/Range], Kiriwhakapapa Road end, Te Mara Track (NZAC). WN–East Tararua Range, Mount Holdsworth (NZAC). Levin, Kimberley Reserve (NZAC). Manawatu Gorge, Ballance Bridge Reserve (NZAC). Orongorongo Valley (NZAC). South Island: BR–Fletcher Creek, West Inangahua (NZAC). Lewis Pass (NZAC). Shenandoah Saddle (NZAC). DN–Port Chalmers (BMNH). KA–Half Moon Bay, Ohau Stream Walk (NZAC). Blue Duck Valley (NZAC). MB–Avon [River] Valley (LUNZ). MC–Banks Peninsula, Peraki Scenic Reserve (LUNZ). Christchurch, Riccarton Bush (NZAC). NN–Canaan (NZAC). Hardwoods Hole (NZAC). Cobb Valley (LUNZ). Collingwood, Kaituna [River/Track] (NZAC). Dun Mountain/Track (NZAC). SC–Peel Forest (LUNZ). SD–Chetwode Islands, Nukuwaiata [Island] (LUNZ). Picton, Shakespeare Bay (NZAC). Stephens Island (NZAC). Tunakino Valley (NZAC).

Biology. Altitudinal range. Lowland to montane. **Habitat.** Found in broadleaf–podocarp forests, southern beech (*Nothofagus* sensu lato) forests or mixed forests. Collected in leaf litter, under the bark of fallen rotting branches and trees, or on the moist undersurface of fallen rotting branches. **Seasonality.** Adults and tenerals: September–April, July–August (mostly January–March). Nymphs: October, April, July. Mating probably occurs around January.

Remarks. This species mostly occurs on the South Island although five teneral specimens (NZAC) from WA and WN appear to also belong to this taxon. Consequently, Larivière and Larochelle (2004)'s North Island records of *C. spinifera*, except for WN, are referred to the new species *C. hallae*. *Carventaptera spinifera* is recorded for the first time from the Buller (BR), Kaikoura (KA), and Marlborough Sounds (MB) regions. *Carventaptera spinifera* is poorly represented in New Zealand collections. In most instances, only one or two specimens have been found together; over half of available material is composed of tenerals and nymphs. Specimens collected on islands can appear atypical, probably due to their geographic isolation and restricted gene flow.

Carventaptera hallae Larivière and Larochelle, new species

Fig. 37, 58–59, 75

Carventaptera hallae Larivière and Larochelle. Holotype: female (NZAC) labeled "NEW ZEALAND RI Ruahine Ra. [= Range] Colenso Trig Tk [= Track] 600m 3946S 17602E [= 39°46'S 176°02'E] 10.XII.2010 Larivière, Larochelle (typed) / Mixed forest (beech-broadleaf-podocarp). Underside of 5 cm diam. rotten fallen branch #4; [at] base of Blechnum-ferns. (typed) / HOLOTYPE [female symbol] *Carventaptera hallae* Larivière & Larochelle, 2022 (red label; typed)." Paratypes: 2 males (LUNZ, NZAC) and 2 females (NZAC) from the same locality as the holotype, 1 female (NZAC) from Ruahine Range, Limestone Road end Track, 1 female (NZAC) from Ruahine Range, Rangiwahia Hut Track, and 1 female (LUNZ) from Ruahine Range, start of Daphne Hut Track, bearing blue paratype labels.

Description (incrustation removed). Body length about 4.1 mm (male), 4.9 mm (female). Dorsal color (male) dark reddish brown except for paler backward projection of mesonotum and adjacent metanotum-dmtg I area (other thoracic and abdominal callosities and markings obscure); darker brown to black on collar and to varying degrees thorax and abdomen. Female similarly colored. Eyes reddish. Antennae and legs concolorous with or slightly paler than main body (apices of femora and entire tibiae, often paler). Ventral color mostly matching main dorsal color; thoracic sterna sometimes slightly paler, vmtg III–VI with dark median foveae. **Head.** Antenniferous tubercles narrowly subconical, their apices divergent and slightly reflexed. Postocular tubercles rounded-subtriangular, slightly produced laterally, flat to slightly reflexed. Lateral margins of head flat to slightly reflexed. **Thorax.** ***Pronotum*** about 3.0× wider than long medially, including collar (male), 3.2× (female); about as wide as or barely wider than mesonotum. Anterolateral angles narrowly rounded-subtriangular (not appearing swollen), slightly to moderately produced in front of collar, slightly to moderately reflexed. Lateral margins slightly to moderately sinuate, moderately oblique, slightly to moderately reflexed. Posterolateral angles bluntly rounded-subtriangular, moderately to strongly produced into a short upper tubercle and a longer lower tubercle, slightly reflexed. ***Mesonotum*** about 3.2× wider than long medially, including backward projection. Lateral portions with one or two small, rounded callosities, coarse granules mostly coalesced into oblique wrinkles and, submarginally, closely set finer granules forming a thickened border. ***Metanotum.*** Lateral portions with an obscure, moderately large, narrow semicircular or vermiculate plate, coarse granules coalesced into oblique wrinkles, and submarginally, a small, rounded callosity, coarse granules and closely set finer granules forming a thickened border anteriorly. **Abdomen.** ***Tergal plate*** (dmtg III–VI). Lateral margins subrectilinear to slightly convex. Inner rows of apodemal markings made of obscure, suboval, smooth spots; outer rows made of obscure, more rounded, smaller spots. Dmtg VII with a longitudinal slit on a moderate elevation medially (male); with a transverse sulcus followed by a wide bead posteromedially (female). ***Connexivum*** slightly to moderately reflexed (more reflexed in male). Dorsal laterotergites (dltg) with a pair of obscure apodemal spots. Posterolateral angles of dltg III–VI rounded-subquadrate, unproduced (V–VI thickened), VII narrowly rounded-subtriangular, barely produced, moderately reflexed (male); III–VI rounded-subquadrate, unproduced (V–VI thickened), VII broadly rounded-subquadrate, unproduced, barely reflexed (female). ***Male genitalia.*** Right paramere (Fig. 37, inner lateral view) broad and flat; head broadly rounded-subtriangular, posterior margin thickened from apex to about midlength of paramere, ending in a narrowly sinuate-subtriangular flange (appearing as a narrow, subtriangular projection in dorsolateral view, Fig. 27). **Ventral surface. Abdomen.** Apodemal spots (vmtg III–VI) flat or slightly elevated, nearly concolorous with remainder of venter; inner rows usually made of larger, more obscure spots.

Other characters as in *C. spinifera*.

Material examined. 235 specimens (AMNZ, LUNZ, NZAC).

Geographic distribution (Fig. 75). North Island: AK, BP, CL, GB, ND, RI, TK, WO.

Biology. Altitudinal range. Lowland to montane (up to 800 m). **Habitat.** Found in broadleaf–podocarp forests, southern beech (*Nothofagus* sensu lato) forests or mixed forests. Collected in large numbers under the loose bark, in wood interstices or on the moist, often moldy, undersurface of fallen rotting branches (5–10 cm diameter) and logs; more rarely collected in leaf or leaf and twig litter. **Seasonality.** Adults: throughout most of the year (mostly December–January). Tenerals and nymphs: December. Mating observed in December (fully mature adults and tenerals).

Remarks. This species is named after Grace Hall (Landcare Research, Auckland), a longtime friend and colleague, for her special help and encouragement in our Hemiptera research over the last three decades, and for her unwavering commitment to the New Zealand Arthropod Collection, its staff, and the New Zealand entomological community. In addition to characters of the male parameres, *Carventaptera hallae* is distinguished from *C. spinifera* by the following features: narrower shape; darker color, with obscure plates, callosities and other markings; lateral margins of head flat to slightly reflexed; antenniferous tubercles narrowly subconical, not strongly reflexed; postocular tubercles rounded-subtriangular, slightly produced laterally, not strongly reflexed; pronotum with anterolateral angles more narrowly rounded-subtriangular, less strongly produced in front of collar, lateral margins less sinuate, and posterolateral angles produced into two tubercles of unequal length. *Carventaptera hallae* is broadly distributed on the North Island, north of the Wairarapa (WA) and Wellington (WN) regions. The Northland (ND) record is based on a single teneral female from Whangarei (NZAC).

Genus *Modicarventus* Kirman, 1989

Fig. 20, 28, 38, 60–63, 81–82

Modicarventus Kirman, 1989a: 26.

Type species. *Modicarventus wisei* Kirman, 1989, by original designation.

Description (incrustation removed). Apterous. Body subovate to pear-shaped; length about 2.5–2.9 mm (male), 3.1–3.5 mm (female). **Head.** Eyes moderately large in relation to head, granulate. Postocular tubercles evanescent or at most forming short swellings. Rostrum arising from a closed atrium. **Thorax.** Pro-, meso-, and metanotum separated by distinct sutures. ***Pronotum.*** Double-ring collar distinctly set off from anterior margin, with lateral tubercles and posteriorly produced subtriangular plate. Disc bearing two moderately large subtriangular to subquadrate plates, one on each side of a narrow to moderately wide sulcus. Lateral portions with rows of coarse granules submarginally. ***Mesonotum.*** Disc bearing a large laterally winged plate (stouter than in *Neocarventus, Tuataraptera*) with a broadly rounded-subquadrate to subpentagonal backward projection reaching posterior margin of metanotum and two anterolateral projections divided into two anteriorly fused plates covering much of lateral portions; apex of backward projection flanked by two small transverse subtriangular to subovate metanotal plates. Posterior margin thickened, curved to the rear and produced on each side of backward projection (margin not thickened and curved to the rear in other genera). ***Metanotum***. Disc largely covered by mesonotal projection. Posterolateral angles unproduced or faintly produced. ***Legs.*** Coxal lobes rugose. Trochanters and femora demarcated from each other. Femora granulate, about as long as tibiae. Protibiae with fine ventral spines and apical comb. **Abdomen.** Dmtg I–II separated from metanotum by a distinct suture; nearly separated medially by a longitudinal sulcus extending from anterior margin to posterior margin and bearing a small posterior callosity, separated from each other submarginally; lateral portions with a large subrectangular plate next to two subrectangular to subtriangular plates separated by a deep slit (as opposed to a pit in *Clavaptera, Neocarventus, Tuataraptera*). ***Tergal plate*** (dmtg III–VI) superficially unfused, with shallow sulci delimiting two moderately large subtriangular plates, a narrow, longitudinal plate, and apodemal markings. Dmtg III divided longitudinally by a median sulcus, each subtriangular half bearing an apodemal spot near anterior margin (dmtg III not divided by a sulcus in other genera). Dmtg IV–VI with a distinct, nearly diamond-shaped plate carrying scent gland openings (without granulate areas beside plate). Scent gland openings (or scars thereof) three in number, first large, displaced posteriorly on dmtg IV, second very small, third evanescent. ***Connexivum.*** Dorsal laterotergites (dltg) with a pair of distinct, rounded, smooth apodemal spots, posterior one larger. Dltg II–III fused, subtriangular, extending forward to posterolateral angles of metanotum; IV–VI subquadrate; VII subrectangular. Spiracles II–IV ventral (not visible from above), V–VII lateral (visible from above). ***Pattern of apodemal markings*** 2:1:1 (dorsal); 2:2:1 (ventral). ***Male genitalia.*** Pygophore trilobate (Fig. 20, posterodorsal view); dorsal lobes below carinate margin, nearly elliptical in shape, slightly convex, slightly produced backward, barely touching each other ventrally along their inner margin; ventral lobe narrowly bulbous medially, slightly produced; dorsal opening narrow; paramere heads partially visible as lamellate setose structures; posterior rim with a long, anteriorly directed, digitate projection on each side of median suture. Paratergites VIII (Fig. 28, outer lateral view) with an apically acuminate, sinuate-subtriangular head; spiracle distant from apex.

Remarks. The genus *Modicarventus* is unique among New Zealand genera in having the posterior margin of the mesonotum thickened, curved to the rear and produced on each side of the backward projection, and the dorsal mediotergite (dmtg) III of the tergal plate divided longitudinally by a median sulcus. Other chief morphological features distinguishing this genus from *Clavaptera*, *Neocarventus,* and *Tuataraptera* are highlighted in the generic description. The configuration of the male pygophore is akin to that of *Tuataraptera*. The shape of the paratergites VIII is somewhat reminiscent of *Neocarventus*. *Modicarventus* was previously known from a single species, *M. wisei*. A second species, *M. kirmani*, is described here. The genus is mostly confined to Northland, the northernmost region of the North Island.

Key to species of *Modicarventus*

1. Head shorter than wide across eyes. Thorax moderately narrowed anteriorly. Lateral margins of pronotum, mesonotum, and metanotum broadly and contiguously granulate; rows of granules well

defined. Fig. 60–61. [Body length about 2.5 mm (male), 3.1 mm (female). North Island: Northland (ND), northernmost Aupouri Peninsula] ..... ***Modicarventus wisei* Kirman**

— Head about as long as wide across eyes. Thorax distinctly narrowed anteriorly. Lateral margins of pronotum narrowly granulate, margins of mesonotum and metanotum barely granulate; rows of granules well defined on pronotum only. Fig. 62–63. [Body length about 2.9 mm (male), 3.5 mm (female). North Island: Northland (ND), south of Aupouri Peninsula to Auckland (AK)] .... ***Modicarventus kirmani* Larivière and Larochelle, new species**

Modicarventus wisei Kirman, 1989

Fig. 60–61, 82

Modicarventus wisei Kirman, 1989a: 27. Holotype: female (AMNZ) labeled "Forest remnant Unuwhao [ND] 610m North Cape area 22.II.1967 K.A.J. Wise (typed) / Mangonui Co. North Island NEW ZEALAND AUCKLAND MUSEUM (typed) / Auckland Museum PLANT "/" SOIL SAMPLE (typed) 218 (hand-written) / Sample 218 Mangonui Co "22/ II/67" (hand-written) / Modicarventus wisei HOLOTYPE [female symbol] M. KIRMAN 1989 (hand-written) / Modicarventus wisei HOLOTYPE M. KIRMAN 1989. (red label; hand-written) / AMNZ 6328 AUCKLAND MUSEUM NEW ZEALAND (green label; typed)." Photo of holotype and associated labels (Larivière and Larochelle 2004: 229). Paratypes: 2 males (AMNZ) from Whareana, North Cape Area (ND).

Description (incrustation removed). Body broadly subovate, nearly subrectangular (male), broadly pear-shaped (female); thorax moderately narrowed anteriorly; length about 2.5 mm (male), 3.1 mm (female). Dorsal color (male) moderately dark reddish brown; darker brown to black on collar, margins of main thoracic and abdominal plates; yellowish on anterior part of head and posterolateral angles of connexival segments. Female more uniformly colored. Eyes yellowish brown to reddish brown. Antennae paler than main body (male), nearly concolorous with main body (female). Legs paler than main body. Ventral color mostly matching dorsal color. **Head.** Shorter than wide across eyes. Genae subequal to or slightly longer than clypeus (forming a very short gap in front). Antenniferous tubercles subtriangular to broadly subconical, their apices obtusely rounded and subparallel. ***Antennae*** about 1.5× longer than width of head across eyes, mostly granulate. Ratio of length of antennal segments II–IV/I about 0.6: 0.8: 1.0. Segment I narrowed, smooth in basal third, then thickened; II slightly curved basally, gradually thickened toward apex; III pedunculate in basal fifth to fourth, gradually thickened toward apex; IV fusiform, pilose in apical half. **Thorax.** ***Pronotum*** about 2.8× wider than long medially, including collar (male), 3.0× (female). Anterior margin shallowly incised on each side of collar. Anterolateral angles rounded-subquadrate, unproduced. Lateral portions with a small subrectangular plate or one or two small callosities behind a larger curved or sinuate plate and, submarginally, a few small callosities and three rows of coarse granules along entire length of lateral margin. Lateral margins subrectilinear, slightly oblique (more strongly oblique in female). Posterolateral angles rounded-subquadrate (more angular in female), unproduced. ***Mesonotum*** about 2.8× wider than long medially, including backward projection. Disc bearing a rounded-subquadrate backward median projection with two anterolateral projections, each divided into a subquadrate plate anteriorly fused to a narrow, hook-shaped plate (Fig. 13b). Lateral portions with two or three rows of submarginal granules along entire length of lateral margin, contiguous with those of pronotum. Lateral margins slightly convex and oblique (male), subrectilinear, moderately oblique (female). Posterolateral angles rounded-subquadrate, unproduced (male), more angular (female). ***Metanotum***. Disc moderately to strongly elevated near apex of mesonotal projection. Lateral portions with a moderately large subtriangular-oblong to subquadrate plate and, submarginally, two or three rows of coarse granules contiguous with those of mesonotum. Lateral margins faintly convex, slightly oblique (male), subrectilinear, moderately oblique (female). Posterolateral angles rounded-subquadrate, unproduced, rather flat (not elevated; male); subquadrate, barely produced (female). **Abdomen** widest across tergite IV. Dmtg I–II moderately declivent from front to back (male), slightly to moderately declivent (female). ***Tergal plate*** (dmtg III–VI). Disc moderately elevated (male), slightly elevated (female). Lateral margins slightly to moderately convex. Inner rows of apodemal markings made of transverse subrectangular to subtriangular plates bearing an obscure, suboval, smooth spot; outer rows of apodemal markings made of longitudinal rounded-subquadrate to subrectangular plates with a similar spot. Dmtg VII smooth anteromedially, marked with callosities and granules laterally, strongly elevated posteromedially (male); smooth medially, marked with callosities and granules laterally, wrinkled along posterior margin (female). ***Connexivum*** rather flat to slightly reflexed. Posterolateral angles

of dltg III subtriangular, barely produced, IV–V subtriangular, strongly produced and reflexed, VI rounded-subquadrate, unproduced, VII broadly rounded-subtriangular, moderately produced, slightly reflexed (male); III–VI rounded-subquadrate, unproduced or faintly produced, VII rounded-subquadrate, thickened, unproduced (female). ***Male genitalia.*** Right paramere not dissected. **Ventral surface. Head.** Rostrum about 0.8× as long as subrectangular, carinate rostral groove. **Thorax.** Pro-, meso-, and metasternum fused, not depressed medially; suture line between metasternum and vmtg I of abdomen faint, superficial. **Abdomen.** Ventral mediotergites (vmtg) I–III fused; other mediotergites well demarcated from each other; IV–VI barely depressed medially; VII about 4.5× longer than VI medially (male), medially split into two triangular plates with inner margin of each plate about 3.5× longer than VI medially, surface obliquely wrinkled (female). Apodemal spots (vmtg IV–VI) flat or slightly elevated, paler than or nearly concolorous with remainder of venter. Connexivum distinctly demarcated from remainder of venter.

Material examined. 4 specimens (AMNZ, NZAC).

Geographic distribution (Fig. 82). North Island: ND–North Cape area (North Cape (NZAC); Unuwhao (AMNZ); Whareana (AMNZ)).

Biology. Altitudinal range. Lowland. **Habitat.** Found in native forest remnants. Collected in leaf litter. **Seasonality.** Adults: December–February.

Remarks. *Modicarventus wisei* is only known from the type series (AMNZ) and a non-type female specimen (NZAC). Its geographic distribution appears to be restricted to the far north of the North Island, around Cape Reinga and North Cape (ND). The species has so far been accidentally collected in soil and pitfall trap samples. Its ecological preferences are unclear and may resemble those of *M. kirmani*.

Modicarventus kirmani Larivière and Larochelle, new species

Fig. 38, 62–63, 81

Modicarventus kirmani Larivière and Larochelle, new species. Holotype: female (NZAC) labeled "NEW ZEALAND ND Pukenui Forest Loop Tk [= Track] 240m -35.70 174.26 17.XI.2017 Larivière, Larochelle (typed) / HOLOTYPE [male symbol] *Modicarventus kirmani* Larivière & Larochelle, 2022 (red label; typed)." Paratypes: 4 males (1 AMNZ, 3 NZAC,) and 3 females (1 AMNZ, 2 NZAC) from the same locality as the holotype, bearing blue paratype labels.

Description (incrustation removed). Body narrowly subovate (male) to more broadly subovate, nearly pear-shaped (female); thorax strongly narrowed anteriorly; length about 2.9 mm (male), 3.5 mm (female). Dorsal color (male) dark reddish brown (overall darker than *M. wisei*); darker brown to black on collar, margins of main thoracic and abdominal plates, dmtg I–II and VII; yellowish on anterior part of head and posterolateral angles of connexival segments. Female similarly colored. Eyes reddish. Antennae concolorous with main body. Legs, especially tibiae, slightly paler than main body. Ventral color mostly matching dorsal color. **Head.** About as long as wide across eyes. Antenniferous tubercles subtriangular to narrowly subconical, their apices acutely to obtusely rounded, subparallel. **Thorax.** ***Pronotum*** about 2.6× wider than long medially, including collar (male), 2.8× (female). Anterolateral angles rounded-subquadrate, unproduced or faintly produced. Lateral portions with a large curved plate (sometimes split into inner subrectangular and outer curved plates) and, submarginally, a few small callosities and usually one or two rows of coarse granules along anterior half to three quarters of lateral margin. Lateral margins subrectilinear to faintly convex, subparallel to slightly oblique. Posterolateral angles rounded-subquadrate, unproduced or faintly produced (sometimes more rounded and more produced in female). ***Mesonotum*** about 2.5× wider than long medially, including backward projection. Disc bearing a rounded-subquadrate to subpentagonal backward median projection with two anterolateral projections, each divided into a subquadrate plate anteriorly fused to a larger, sinuate-subrectangular plate (Fig. 13a). Lateral portions with one or two small, irregularly shaped submarginal plates next to some small callosities or granules (without well-defined rows of granules). Lateral margins subrectilinear to slightly convex, moderately oblique. Posterolateral angles rounded-subtriangular to rounded-subquadrate, unproduced or faintly produced. ***Metanotum***. Disc slightly elevated near apex of mesonotal projection. Lateral portions with a moderately large subtriangular-oblong to subquadrate plate and, submarginally, one or two smaller, irregularly shaped plates next to some coarse granules (without well-defined rows of granules or granules missing). Lateral margins subrectilinear to slightly convex, oblique (male, female). Posterolateral angles narrowly subtriangular, slightly produced,

rather flat (not elevated; male), broadly rounded-subtriangular, unproduced (female). **Abdomen.** ***Tergal plate*** (dmtg III–VI). Lateral margins slightly convex. Dmtg VII moderately elevated posteromedially (male). ***Connexivum.*** Posterolateral angles of dltg III subtriangular, barely produced, IV–V subtriangular, moderately produced and slightly reflexed, VI rounded-subquadrate, unproduced, VII narrowly subtriangular, moderately produced, slightly reflexed (male); III–VI rounded-subquadrate, unproduced, VII rounded-subquadrate, thickened, unproduced (female). ***Male genitalia.*** Right paramere (Fig. 38, inner lateral view) elongate, shaft moderately wide, slightly sinuate posteriorly, head rounded-subtriangular apically, with anterior margin thickened and notched at base of thinly surfaced subtriangular projection.

Other characters as in *M. wisei*.

Material examined. 68 specimens (AMNZ, NZAC).

Geographic distribution (Fig. 81). North Island: AK–Mount William (NZAC). ND–Herekino Forest, Kaitaia Walkway (NZAC). Ngaiotonga Reserve Walkway (NZAC). Pukenui Forest Loop Track (AMNZ, NZAC). Puketi Forest, Upper Waipapa River Track, first 1.5 km (NZAC). Ranfurly [Bay] Scenic Reserve (NZAC). Russell Forest, Punaruku Stream, about 1 km SW Russell Road (NZAC).

Biology. Altitudinal range. Lowland (up to 300 m). **Habitat.** Occurs in broadleaf-podocarp forests and shrublands; can be locally abundant in forests where *Beilschmiedia* or *Beilschmiedia-Dacrydium-Pittosporum* are predominant. Collected in groups on the moist, often moldy bark from the underside of fallen rotting branches 3–5 cm in diameter; found in small numbers in leaf litter. **Seasonality.** Adults: November (abundant), July. Tenerals: November (abundant), April.

Reference. Larivière and Larochelle 2006: 200 (photo; as *M. wisei*, in error).

Remarks. This species is named after Maurice Kirman (New Zealand) who described two genera and three species of New Zealand Carventinae and provided the first identification key to genera (Kirman 1985, 1989a–b). The main morphological features distinguishing *Modicarventus kirmani* from *M. wisei* are as follows: male and female subovate, with thorax strongly narrowed anteriorly; head about as long as wide across eyes; antenniferous tubercles narrower and more acutely rounded apically; lateral margins of pronotum narrowly granulate, margins of mesonotum and metanotum barely granulate (rows of granules well defined on pronotum only); posterolateral angles of dltg IV–V of connexivum less strongly produced (male). *Modicarventus kirmani* is mostly known from Northland (ND). The record of its occurrence in the Auckland (AK) region, nearly 200 km to the south, is based on two specimens (one male, one female) collected from Mount William (NZAC). This apparent gap in distribution coincides with a generally under collected area for Carventinae. Although the male specimen has a somewhat more rectangular forebody and both specimens show other subtle morphological differences from the Northland populations, they generally conform to *M. kirmani*.

Genus *Neocarventus* Usinger and Matsuda, 1959

Fig. 21, 29, 39–42, 64–69, 83–86

Neocarventus Usinger and Matsuda, 1959: 164.

Type species. *Neocarventus angulatus* Usinger and Matsuda, 1959, by original designation.

Description (incrustation removed). Apterous. Body subovate, moderately to strongly narrowed anteriorly; length about 3.1–3.4 mm (male), 3.5–3.8 mm (female). **Head.** Eyes rather small in relation to head, granulate. Postocular tubercles evanescent or at most forming short swellings. Rostrum arising from a closed atrium. **Thorax.** Pro-, meso-, and metanotum separated by moderately deep sutures. ***Pronotum.*** Double-ring collar distinctly set off from anterior margin, with lateral tubercles and posteriorly produced subtriangular plate. Disc with a moderately large, somewhat swollen, posteriorly produced, subtriangular plate split for part of its length by a narrowly subtriangular to somewhat rounded median sulcus. Lateral portions with a curved submarginal ridge close to lateral margin. ***Mesonotum.*** Disc bearing a large laterally winged plate with a V-shaped backward projection nearly reaching posterior margin of metanotum and two oblique, slightly curved, subrectangular anterolateral projections covering much of lateral portions; apex of V-shaped projection flanked by two small, rounded metanotal callosities. ***Metanotum***. Disc largely covered by mesonotal projection. Posterolateral angles slightly to moderately elevated and produced, forming regularly curved to angular, acutely tipped spines slightly

surpassing anterior margin of dmtg I (male), distinctly thickened, forming short, narrowly to broadly rounded-subtriangular lobes (female). ***Legs.*** Coxal lobes rugose. Trochanters and femora demarcated from each other. Femora granulate, about as long as tibiae. Protibiae with fine ventral spines and apical comb. **Abdomen.** Dmtg I–II separated from metanotum by a distinct suture; narrowly fused medially, with each side of a longitudinal carina, separated from each other laterally for most of their width; lateral portions with a thin, elongate, laterally enlarged, transverse plate along anterior margin in front of a larger, subrectangular plate that is laterally attenuate and anteriorly curved behind a submarginal pit. ***Tergal plate*** (dmtg III–VI) completely fused, without sulci or carinae around apodemal markings although pale color bands may be visible. Dmtg IV–VI with small granulate areas on each side of a distinct subrectangular plate carrying scent gland openings. The latter (or scars thereof) three in number, first moderately developed, displaced posteriorly on dmtg IV, second very small, third evanescent. ***Connexivum.*** Dorsal laterotergites (dltg) with a pair of more or less distinct, rounded, smooth apodemal spots, posterior one larger. Dltg II–III fused, subtriangular, extending forward to or slightly beyond posterolateral angles of metanotum; IV–VI subquadrate; VII subrectangular (male), subquadrate (female). Spiracles II–IV ventral (not visible from above), V–VII lateral (visible from above). ***Pattern of apodemal markings*** 2:1:1 (dorsal); 2:2:1 (ventral). ***Male genitalia.*** Pygophore trilobate (Fig. 21, posterodorsal view); dorsal lobes below carinate margin, nearly rounded in shape, strongly convex and produced backward, separated from each other by a deep furrow; ventral lobe narrowly rounded, strongly produced; dorsal opening narrow; paramere heads partially visible as lamellate setose structures; posterior rim with a long, anteriorly directed, subtriangular projection on each side of median suture. Paratergites VIII (Fig. 29, outer lateral view) with an apically digitate, narrowly hook-shaped head; spiracle distant from apex.

Remarks. The genus *Neocarventus* is morphologically close to *Tuataraptera* which in turn bears a superficial resemblance to *Clavaptera* and *Modicarventus* (see Remarks under each genus). *Neocarventus* was previously known from two species, *N. angulatus* (type species) and *N. uncus.* Three new species of *Neocarventus* are described here and *Neocarventus uncus* is transferred to the newly erected genus *Tuataraptera*. The four species currently recognized in *Neocarventus* have an allopatric distribution on the North Island and a few nearby offshore islands.

Key to species of *Neocarventus*

Females of *N. angulatus, N. potterae* and *N. montanus* are morphologically close and therefore more easily identified when associated with males.

1. Thorax gradually increasing in width from pronotum to metanotum, appearing subtriangular. Lateral margins of metanotum slightly sinuate (male, female); posterolateral angles slightly produced, forming narrowly subtriangular spines (male). Fig. 67, 69. [Forebody contrastingly dark, especially in female. North Island: Northland (ND)] . . . . . ***Neocarventus northlandicus*** **Larivière and Larochelle, new species**

— Thorax with pronotum and mesonotum distinctly narrower than metanotum, appearing strongly narrowed anteriorly. Lateral margins of metanotum more strongly sinuate (male, female); posterolateral angles more strongly produced, forming more broadly curved or angular spines (male) **2**

2(1). Species rather large and dark; body length about 3.4 mm (male), 3.8 mm (female). Lateral margins of mesonotum subrectilinear (male). Tergal plate of abdomen (female) dull yellowish brown, moderately contrasting against darker thorax. Fig. 66 (male). [North Island: Ruahine Range (RI)] . . . . . ***Neocarventus montanus*** **Larivière and Larochelle, new species**

— Species smaller and overall paler; body length about 3.1 mm (male), 3.5 mm (female). Lateral margins of mesonotum slightly concave or convex (male). Tergal plate of abdomen (female) bright whitish yellow to yellowish brown, strongly contrasting against darker thorax **3**

3(2). Lateral margins of mesonotum slightly to moderately convex (male), subrectilinear-sinuate to very slightly convex (female); posterolateral angles rather flat. Metanotum (male) with posterolateral angles moderately produced, forming curved to slightly sinuate or slightly angular spines. Fig. 64, 68. [North Island: BP (eastern), CL, GB, HB, WN] . . . . . ***Neocarventus angulatus*** **Usinger and Matsuda**

— Lateral margins of mesonotum slightly to moderately concave (male), subrectilinear-sinuate to very slightly concave (female); posterolateral angles upturned. Metanotum (male) with posterolateral angles strongly produced, forming distinctly angular spines. Fig. 65 (male). [North Island: AK, BP (western), TK, TO, WO] . . . . . ***Neocarventus potterae*** **Larivière and Larochelle, new species**

Neocarventus angulatus Usinger and Matsuda, 1959

Fig. 39, 64, 68, 83

Neocarventus angulatus Usinger and Matsuda, 1959: 166. Holotype: male (CMNZ) labeled "Wallingford S. Hawkes Bay [HB] ex. Leaf mould "12/2/48" G. Ramsay (hand-written) / HOLOTYPE (typed) Neocarventus angulatus (hand-written) Usinger-Matsuda (red label; typed)." Photo of holotype and associated labels (Larivière and Larochelle 2004: 231). Paratype: see under **Remarks.**

Description (incrustation removed). Body strongly narrowed anteriorly; length about 3.1 mm (male), 3.5 mm (female). Dorsal color (male) pale to moderately dark reddish brown; nearly black medially on pronotum and mesonotum, laterally on metanotum, on dmtg I–II, on base and sides of tergal plate; pale yellowish to yellowish brown medially on tergal plate, on and around apodemal spots, on part of connexivum. Female similarly colored except for bright whitish yellow to yellowish brown tergal plate, strongly contrasting against darker thorax, less distinct apodemal spots on abdomen and mostly pale connexivum. Eyes reddish. Antennae and legs (especially tibiae) somewhat paler than main body. Ventral color mostly matching main dorsal color; underside of abdomen darker than dorsal tergal plate in female. **Head.** About as long as wide across eyes. Genae distinctly longer than clypeus, forming a gap in front. Antenniferous tubercles narrowly subtriangular (inner margin often sinuate), their apices acutely rounded and divergent. ***Antennae*** about 1.6× longer than width of head across eyes, mostly granulate. Ratio of length of antennal segments II–IV/I about 0.7: 0.8: 0.9. Segment I narrowed, smooth in basal third, then thickened; II slightly curved basally, gradually thickened toward apex; III pedunculate in basal fifth to fourth, gradually thickened toward apex; IV fusiform, pilose in apical third to half. **Thorax.** ***Pronotum*** about 2.4× wider than long medially, including collar. Anterior margin shallowly incised on each side of collar. Anterolateral angles rounded-subquadrate to rounded-subtriangular, slightly to moderately produced, not reaching in front of collar. Lateral portions with a vermiculate or semi-circular plate (sometimes reduced to two or three nearly coalesced callosities) next to small callosities and coarse granules coalesced into a moderately elevated, broad, slightly oblique, curved submarginal ridge nearly reaching lateral margin for most of its length. Lateral margins subrectilinear, subparallel or slightly oblique. Posterolateral angles rounded-subquadrate, unproduced or faintly produced. ***Mesonotum*** about 2.8× wider than long medially, including backward projection (male), 3.4× (female). Lateral portions with small callosities and granules submarginally. Lateral margins slightly to moderately convex (male), subrectilinear-sinuate to very slightly convex (female), moderately to strongly oblique. Posterolateral angles broadly subtriangular, barely produced, rather flat (male); rounded-subtriangular to rounded-subquadrate, barely produced, rather flat (female). ***Metanotum***. Disc moderately to strongly elevated near apex of mesonotal projection. Lateral portions with a moderately large, longitudinal, subrectangular plate next to an irregular area of coarse submarginal granules. Lateral margins moderately sinuate, rather shallowly concave basally (male). Posterolateral angles slightly elevated, moderately produced, forming curved to slightly sinuate or slightly angular, acutely tipped spines (male); thickened, forming short, broadly rounded-subtriangular lobes (female). **Abdomen** widest across tergite III. Dmtg I–II strongly declivent from front to back (male), slightly to moderately declivent (female). ***Tergal plate*** (dmtg III–VI). Disc slightly to moderately elevated (male), slightly elevated (female). Lateral margins slightly convex (male), slightly to moderately convex (female). Inner rows of apodemal markings usually made of distinct, suboval, smooth spots (often less distinct in female); outer rows made of faint, more rounded spots (often rather small in male). Dmtg VII broadly smooth anteromedially, narrowly marked with small callosities and granules laterally, moderately elevated posteromedially (male); broadly smooth medially, narrowly marked with callosities and granules laterally, slightly but flatly elevated anteromedially, with a distinct transverse sulcus posteriorly (female). ***Connexivum*** moderately reflexed (sometimes slightly reflexed in female). Posterolateral angles of dltg III–V rounded-subtriangular, slightly produced (V usually more so), VI rounded, barely produced, VII narrowly rounded-subtriangular, slightly to moderately produced, flat or somewhat reflexed (male); posterolateral angles more rounded, III–IV unproduced (IV sometimes faintly so), V–VI slightly produced, VII usually somewhat more produced than V–VI, rather flat (female). ***Male genitalia.*** Right

paramere (Fig. 39, inner lateral view) elongate, shaft slightly concave posteriorly, head narrowly rounded, with margin of subrectangular projection thickened, unnotched. **Ventral surface. Head.** Rostrum nearly reaching posterior margin of carinate, subovate rostral groove. **Thorax.** Pro-, meso-, and metasternum fused; meso- and metasternum usually somewhat depressed medially; suture line between metasternum and vmtg I of abdomen absent (sometimes faintly visible next to coxal cavities). **Abdomen.** Ventral mediotergites (vmtg) I–III fused; other mediotergites well demarcated from each other; IV–VI barely depressed or flat medially; VII about 3.3× longer than VI medially, with a few moderately developed wrinkles in apical fifth to fourth (male); medially split into two triangular plates with inner margin of each plate about 3.0× longer than VI medially, surface obliquely wrinkled (female). Apodemal spots (vmtg IV–VI) flat or slightly elevated, paler than or nearly concolorous with remainder of venter; outer rows made of larger, more elevated spots. Connexivum distinctly demarcated from remainder of venter.

Material examined. 84 specimens (AMNZ, CMNZ, LUNZ, NZAC).

Geographic distribution (Fig. 83). North Island: BP (eastern), CL, GB, HB, WN.

Biology. Altitudinal range. Lowland to lower montane (up to 800 m). **Habitat.** Occurs in broadleaf forests, broadleaf-podocarp forests, and shrublands. Collected on the moist, often moldy bark from the underside of fallen rotting branches and in leaf litter. **Seasonality.** Adults: September–April (abundant in January), July. Tenerals: September–November (abundant in October), March. Mating probably occurs in December–January.

Remarks. *Neocarventus angulatus* and *N. potterae* are morphologically close. In addition to diagnostic characters of the male parameres, *N. angulatus* has the following main distinguishing features: mesonotum (male) with lateral margins slightly to moderately convex and posterolateral angles unproduced, rather flat; metanotum (male) with lateral margins moderately sinuate, rather shallowly concave basally, and posterolateral angles moderately produced, forming curved to slightly sinuate or slightly angular spines. The holotype of *N. angulatus* appears to be a slightly teneral individual with irregularly shaped antenniferous tubercles and left metanotal spine. The male paratype from Awakino [River] Valley (WO) was not seen; it probably belongs to the new species *N. potterae*. *Neocarventus angulatus* is primarily an eastern North Island species. Its known distribution follows the eastern coastal forests stretching from the Wellington (WN) area in the south to the Coromandel (CL) region in the north. Specimens from islands off the Coromandel Peninsula (CL) display a variable and somewhat unbalanced phenotype probably due to geographic isolation and restricted gene pool. Larivière and Larochelle (2004)'s records of *N. angulatus* for the Auckland (AK), Northland (ND), Taranaki (TK) and Waikato (WO) regions are referred to other species described below. Their South Island record of *N. angulatus* (Puhipuhi Reserve, KA) appears to be based on mislabeled teneral specimens.

Neocarventus potterae Larivière and Larochelle, new species

Fig. 40, 65, 86

Neocarventus potterae Larivière and Larochelle, new species. Holotype: male (NZAC) labeled "NEW ZEALAND WO Te Tapui Sce Res [= Scenic Reserve], Maungakawa 200m 6.XII.2000 Larivière, Larochelle (typed) / 375030S 1753930E [= -37°50'30"S 175°39'30"E] Wet broadleaf for. [= forest], tawa & kohekohe: underside [of] small-med. [= medium] fallen branches (typed) / HOLOTYPE [male symbol] *Neocarventus potterae* Larivière & Larochelle, 2022 (red label; typed)." Paratypes: 3 males (AMNZ, MONZ, NZAC) and 4 females (1 MONZ, 3 NZAC) from the same locality as the holotype, bearing blue paratype labels.

Description (incrustation removed). Body strongly narrowed anteriorly; length about 3.1 mm (male), 3.5 mm (female). Color similar to *N. angulatus*. **Head.** Antenniferous tubercles narrowly subtriangular (inner margin often sinuate), their apices acutely rounded and divergent. ***Antennae.*** Segment I narrowed, smooth in basal third, then thickened; II slightly curved basally, gradually thickened toward apex; III pedunculate in basal fifth to fourth, gradually thickened toward apex; IV fusiform, pilose in apical third to half. **Thorax.** ***Pronotum*** about 2.4× wider than long medially, including collar. Anterolateral angles rounded-subquadrate to rounded-subtriangular, slightly to moderately produced, not reaching in front of collar (often less strongly produced than in *N. angulatus*). Lateral margins subrectilinear, subparallel or slightly oblique. ***Mesonotum*** about 2.8× wider than long medially, including backward projection (male), 3.2× (female). Lateral margins slightly to moderately concave (male), subrectilinear-sinuate to very slightly concave (female), moderately to strongly oblique.

Posterolateral angles narrowly rounded-subtriangular, slightly to moderately produced, upturned (male); narrowly rounded, slightly produced and upturned (female). ***Metanotum***. Disc moderately to strongly elevated near apex of mesonotal projection. Lateral margins strongly sinuate, rather deeply concave basally (male). Posterolateral angles moderately elevated, rather strongly produced, forming distinctly angular, acutely tipped spines (male); thickened, forming short, broadly rounded-subtriangular lobes (female). **Abdomen** widest across tergite III. ***Tergal plate*** (dmtg III–VI). Disc slightly to moderately elevated (male), slightly elevated (female). Lateral margins slightly convex (male), slightly to moderately convex (female). Dmtg VII moderately to strongly elevated posteromedially (male). ***Connexivum*** moderately reflexed (sometimes slightly reflexed in female). Posterolateral angles of dltg III–V rounded-subtriangular, slightly produced (IV–V usually more so), VI rounded, barely produced, VII narrowly rounded-subtriangular, slightly to moderately produced, flat or somewhat reflexed (male); posterolateral angles more rounded, III–IV unproduced (IV sometimes faintly so), V–VI slightly produced, VII usually slightly more produced than V–VI, rather flat (female). ***Male genitalia.*** Right paramere (Fig. 40, inner lateral view) elongate, shaft moderately concave posteriorly, head broadly rounded apically, with margin of subrectangular projection thickened, faintly notched. **Ventral surface. Abdomen.** Ventral mediotergite (vmtg) VII about 3.3× longer than VI medially (male); VII with several moderately developed transverse wrinkles in apical third (male).

Other characters as in *N. angulatus*.

Material examined. 106 specimens (AMNZ, LUNZ, MONZ, NZAC)

Geographic distribution (Fig. 86). North Island: AK, BP (western), TK, TO, WO.

Biology. Altitudinal range. Lowland to lower montane (up to 800 m). **Habitat.** Occurs in broadleaf forests, broadleaf-podocarp forests, and shrublands. Collected in groups on the moist, often moldy bark from the underside of fallen rotting branches about 3–5 cm in diameter; found in small numbers in leaf litter, e.g., under rotting twigs and branches or at the base of tree ferns. **Seasonality.** Adults: September–May (abundant in December–January), July. Tenerals: September–February (abundant in October–December). Nymphs: September–November. Mating probably occurs in December–January.

Remarks. This species is named after Sophie Potter (Collections technician 2018–2020, Auckland War Memorial Museum) who kindly pinned and labeled hundreds of aradid specimens for this study. *Neocarventus potterae* and *N. angulatus* are morphologically close. In addition to diagnostic characters of the male parameres, *N. potterae* has the following main distinguishing features: mesonotum with slightly to moderately concave lateral margins (male) and upturned posterolateral angles (male, female); metanotum (male) with lateral margins strongly sinuate, rather deeply concave basally and posterolateral angles strongly produced, forming distinctly angular, acutely tipped spines. *Neocarventus potterae* is primarily a western North Island species.

Neocarventus montanus Larivière and Larochelle, new species

Fig. 41, 66, 84

Neocarventus montanus Larivière and Larochelle, new species. Holotype: male (NZAC) labeled "NEW ZEALAND RI Ruahine Ra [= Range], start of Daphne Hut Tk [= Track] 650m 3956S 17610E [= 39°56'S 176°10'E] 18.XII.2010 Larivière, Larochelle (typed) / Red beech-Horopito forest. Sifting leaf litter under rotten twigs & branches. (typed) / HOLOTYPE [male symbol] *Neocarventus montanus* Larivière & Larochelle, 2022 (red label; typed)." Paratypes: 3 males (1 LUNZ, 2 NZAC) and 4 females (1 LUNZ, 3 NZAC) from the same locality as the holotype, bearing blue paratype labels.

Description (incrustation removed). Body strongly narrowed anteriorly; length about 3.4 mm (male), 3.8 mm (female). Dorsal color (male) dark reddish brown; nearly black medially on pronotum and mesonotum, laterally on metanotum, on dmtg I–II, on most of tergal plate; pale yellowish to yellowish brown medially on tergal plate, apodemal spots, posterolaterally on connexival segments. Female paler overall, with dull yellowish brown tergal plate, moderately contrasting against darker thorax, less distinct apodemal spots on abdomen and moderately pale connexivum. Eyes reddish. Antennae and legs somewhat paler than main body (not as contrastingly pale as in other species). Ventral color mostly matching main dorsal color; underside of abdomen darker than dorsal tergal plate in female. **Head.** Antenniferous tubercles rather broadly subtriangular (inner margin sometimes sinuate), their apices acutely rounded and divergent. ***Antennae.*** Segment I narrowed, smooth in basal fourth to third, then thickened; II slightly curved basally, gradually thickened toward apex; III pedunculate in basal

fifth, gradually thickened toward apex; IV fusiform, pilose in apical third to half. **Thorax.** ***Pronotum*** about 2.2× wider than long medially, including collar (male), 2.4× (female). Anterolateral angles narrowly rounded-subtriangular, slightly to moderately produced, sometimes reaching in front of collar. Lateral margins subrectilinear, subparallel or slightly oblique. ***Mesonotum*** about 2.4× wider than long medially, including backward projection (male), 3.0× (female). Lateral margins subrectilinear to very slightly concave, moderately to strongly oblique. Posterolateral angles narrowly subtriangular, slightly to moderately produced, rather flat (sometimes upturned; male); more broadly rounded-subtriangular to rounded-subquadrate, slightly produced, rather flat (female). ***Metanotum***. Disc moderately to strongly elevated near apex of mesonotal projection. Lateral margins moderately sinuate, rather shallowly concave basally (male). Posterolateral angles moderately elevated, moderately produced, forming curved to slightly angular, acutely tipped spines (usually more regularly curved than in *N. angulatus*; male); thickened, forming short, broadly rounded-subtriangular lobes (female). **Abdomen** widest across tergite III (male), tergites III–IV (female). ***Tergal plate*** (dmtg III–VI). Disc moderately elevated (male), slightly elevated (female). Lateral margins slightly convex (male), slightly to moderately convex (female). Dmtg VII strongly elevated posteromedially (male). ***Connexivum*** moderately to strongly reflexed (sometimes slightly reflexed in female). Posterolateral angles of dltg III–VI narrowly rounded-subtriangular, slightly to moderately produced (IV–V usually more so), VII narrowly rounded-subtriangular, moderately produced, rather flat (male); posterolateral angles more rounded, III–IV unproduced (IV sometimes faintly so), V–VI moderately produced, VII slightly more produced than V–VI, rather flat (female). ***Male genitalia.*** Right paramere (Fig. 41, inner lateral view) elongate, shaft slightly concave posteriorly, head narrowly rounded apically, with margin of subrectangular projection thickened, distinctly notched. **Ventral surface. Abdomen.** Ventral mediotergites (vmtg) IV–VI slightly depressed medially (male, female); VII with moderately developed transverse wrinkles in apical fourth (male).

Other characters as in *N. angulatus*.

Material examined. 30 specimens (LUNZ, NZAC).

Geographic distribution (Fig. 84). North Island: RI–Ruahine Range: Rokaiwhenua [= Rokaiwhana] Stream (NZAC); start of Daphne Hut Track (LUNZ, NZAC).

Biology. Altitudinal range. Lower montane (up to 700 m). **Habitat.** Occurs in southern beech (*Nothofagus* sensu lato) and mixed southern beech-broadleaf forests. Collected in groups on the moist, often moldy bark from the underside of fallen rotting branches about 3–5 cm in diameter; also found in leaf litter, e.g., under rotting twigs and branches or at the base of *Blechnum*-ferns. **Seasonality.** Adults: October–January (abundant in December). Tenerals: December. Nymphs: October. Mating probably occurs in December–January.

Remarks. The species name is based on the Latin adjective *montanus* which means 'pertaining to mountains'. *Neocarventus montanus* superficially resembles *N. angulatus* and *N. potterae*. It is, however, a distinctly larger, more darkly colored species with generally straighter lateral margins of mesonotum, more regularly curved posterolateral angles of metanotum in the male, a darker, less contrastingly pale tergal plate in the female, and differently shaped male parameres. This species has so far been recorded from the Ruahine Range (RI). The authors have also seen a handful of female specimens (NZAC) that may belong to this taxon. They were collected from Lake Waikaremoana in the Ureweras (GB), Balls Clearing in the foothills of the Kaweka Range (HB), and the Otaki Gorge and Kiriwhakapapa Road areas in the Tararua Range (WN). Male specimens are needed to confirm the presence of *N. montanus* in these areas.

Neocarventus northlandicus Larivière and Larochelle, new species

Fig. 42, 67, 69, 85

Neocarventus northlandicus Larivière and Larochelle, new species. Holotype: male (NZAC) labeled "NEW ZEALAND ND Abbey Caves [Reserve] 19 Nov 1997 G. Hall, W. Kuschel, R. Leschen #14 (typed) / under rotting logs (typed) / HOLOTYPE [male symbol] *Neocarventus northlandicus* Larivière & Larochelle, 2022 (red label; typed)." Paratypes: 3 males (1 AMNZ, 2 NZAC) and 4 females (1 AMNZ, 3 NZAC) from the same locality as the holotype, bearing blue paratype labels.

Description (incrustation removed). Body moderately narrowed anteriorly; length about 3.1 mm (male), 3.5 mm (female). Dorsal color (male) pale to moderately dark reddish brown; nearly black medially on pronotum

and mesonotum, laterally on metanotum, on dmtg I–II, on base and sublateral portions of tergal plate; pale yellowish to yellowish brown on most of tergal plate and connexivum (tergal plate sometimes broadly margined with dark brown). Female similarly colored except for usually darker forebody, bright whitish yellow to yellowish brown tergal plate, strongly contrasting against dark thorax, less distinct apodemal spots on abdomen, and mostly pale connexivum. Eyes reddish tinged with brown. Antennae and legs (especially tibiae) somewhat paler than main body. Ventral color mostly matching main dorsal color; underside of abdomen darker than tergal plate in female. **Head.** Antenniferous tubercles broadly subtriangular (inner margin subrectilinear to slightly convex), their apices bluntly rounded and divergent. ***Antennae.*** Segment I narrowed, smooth in basal fourth to third, then thickened; II slightly curved basally, gradually thickened toward apex; III pedunculate in basal fifth, gradually thickened toward apex; IV fusiform, pilose in apical third to half. **Thorax** gradually increasing in width from pronotum to metanotum (subtriangular, less strongly narrowed anteriorly than in other *Neocarventus* species). ***Pronotum*** about 2.5× wider than long medially, including collar. Anterolateral angles rounded-subquadrate to rounded-subtriangular, slightly produced, not reaching in front of collar. Lateral margins subrectilinear, slightly oblique. Posterolateral angles rounded-subquadrate, unproduced. ***Mesonotum*** about 3.2× wider than long medially, including backward projection (male), 3.4× (female). Lateral margins subrectilinear to very slightly concave, moderately oblique. Posterolateral angles rounded-subtriangular (often more acutely subtriangular in male), slightly to moderately produced, rather flat (often upturned in male). ***Metanotum***. Disc moderately elevated near apex of mesonotal projection. Lateral margins slightly sinuate, straight or slightly convex basally. Posterolateral angles moderately elevated, slightly produced, forming narrowly subtriangular, acutely tipped spines (male); slightly thickened, forming very short, narrowly rounded lobes (female). **Abdomen** widest across tergite III (male), tergites III–IV (female). ***Tergal plate*** (dmtg III–VI). Disc slightly to moderately elevated (male), slightly elevated (female). Lateral margins slightly convex (male), slightly to moderately convex (female). Dmtg VII moderately elevated posteromedially (male). ***Connexivum.*** Posterolateral angles of dltg III–V rounded, slightly produced (IV–V usually more so), VI rounded, barely produced, VII broadly rounded-subtriangular, slightly to moderately produced, flat or somewhat reflexed (male); posterolateral angles more rounded, III–IV unproduced, V–VI barely produced, VII slightly more produced than V–VI, rather flat (female). ***Male genitalia.*** Right paramere (Fig. 42, inner lateral view) elongate, shaft strongly concave posteriorly, head broadly rounded apically, with margin of subrectangular projection thickened, distinctly notched. **Ventral surface. Abdomen.** Ventral mediotergites (vmtg) IV–VI barely depressed medially (male, female); VII with strong transverse wrinkles in apical fourth (male).

Other characters as in *N. angulatus*.

Material examined. 44 specimens (AMNZ, NZAC).

Geographic distribution (Fig. 85). North Island: ND–Abbey Caves Reserve (AMNZ, NZAC). Mount Manaia (NZAC). North Cape (NZAC). Paihia (NZAC). Parakahi [= Parihaka] Park [Whangarei] (NZAC). Poor Knights Islands, Aorangi [Island], Puweto Valley (NZAC). Russell Forest Track, 0–1 km S, Russell-Whakapara Road (NZAC).

Biology. Altitudinal range. Lowland (up to 400 m). **Habitat.** Occurs in broadleaf forest and shrublands. Collected in groups on the moist, often moldy bark from the underside of fallen rotting branches about 3–5 cm in diameter; found in small numbers in leaf litter. **Seasonality.** Adults and tenerals: November–December. Nymphs: November. Mating probably occurs in November–December.

Remarks. The name of this species is derived from Northland, the region where it is found, and the suffix *-icus* (Greek, *-ikos*) which means 'belonging or pertaining to'. *Neocarventus northlandicus* is easily recognized as follows: subtriangular thorax, less strongly narrowed anteriorly than in other *Neocarventus* species; posterolateral angles of metanotum (male) slightly produced, forming narrowly subtriangular spines; forebody contrastingly dark, especially in female; the shape of male parameres. *Neocarventus northlandicus* is known from Northland (ND), mostly in the east and the north. A series of undetermined females taken from Waipoua Forest (NZAC), in the west of Northland, may belong to *N. northlandicus*; male specimens are needed to confirm this identification.

Genus *Tuataraptera* Larivière and Larochelle, new genus

Fig. 22, 30, 43, 70–71, 87

Type species. *Neocarventus uncus* Kirman, 1989, by present designation.

Description (incrustation removed). Apterous. Body subovate to subrectangular, moderately narrowed anteriorly; length about 3.2 mm (male), 3.9 mm (female). **Head.** Eyes rather small in relation to head, granulate. Postocular tubercles rounded-subquadrate to rounded-subtriangular, slightly produced laterally. Rostrum arising from a closed atrium. **Thorax.** Pro-, meso-, and metanotum separated by moderately deep sutures. ***Pronotum.*** Double-ring collar distinctly set off from anterior margin, with lateral tubercles and posteriorly produced subtriangular plate. Disc bearing two moderately large, rather flat, subtriangular plates, one on each side of a narrow subparallel sulcus. Lateral portions with a curved submarginal ridge distant from lateral margin (close to lateral margin in *Neocarventus*). ***Mesonotum.*** Disc bearing a large laterally winged plate (larger and slenderer than in *Neocarventus*) with a V-shaped backward projection reaching posterior margin of metanotum and two curved, nearly hook-shaped anterolateral projections covering much of lateral portions; apex of V-shaped projection flanked by coarse granules. ***Metanotum***. Disc largely covered by mesonotal projection. Posterolateral angles strongly elevated and produced, forming long, sinuate, acutely tipped spines reaching anterior third to middle of first visible connexival segment (male), slightly thickened, unproduced (not forming subtriangular lobes as in *Neocarventus*; female). ***Legs.*** Coxal lobes rugose. Trochanters and femora demarcated from each other. Femora granulate, about as long as tibiae. Protibiae with fine ventral spines and apical comb. **Abdomen.** Dmtg I–II separated from metanotum by a distinct suture; narrowly fused medially, with a longitudinal carina; separated from each other laterally for most of their width; lateral portions with a large, oblong-subrectangular, laterally attenuate, transverse plate along anterior margin in front of a similarly sized subrectangular plate next to a smaller, anteriorly curved, subquadrate to subtriangular plate behind a submarginal pit. ***Tergal plate*** (dmtg III–VI) superficially unfused, with shallow sulci delimiting three large subtriangular plates and apodemal markings (tergal plate completely fused in *Neocarventus*). Dmtg III with a pair of short longitudinal sulci near middle of anterior margin, flanked by two apodemal spots (anterior longitudinal sulci absent in *Neocarventus*). Dmtg IV–VI with a few granules on each side of a distinct, irregularly shaped plate carrying scent gland openings; plate made of two subtriangular areas with long anterolateral projections (larger granulate areas present on each side of a subrectangular plate in *Neocarventus*). Scent gland openings (or scars thereof) three in number, first moderately developed, displaced posteriorly on dmtg IV, second very small, third evanescent. ***Connexivum.*** Dorsal laterotergites (dltg) with a pair of more or less distinct, rounded, smooth apodemal spots, posterior one larger. Dltg II–III fused, subtriangular, extending forward to or slightly beyond posterolateral angles of metanotum; IV–VI subquadrate; VII subrectangular. Spiracles II–IV ventral (not visible from above), V–VII lateral (visible from above). ***Pattern of apodemal markings*** 2:1:1 (dorsal); 2:2:1 (ventral). ***Male genitalia.*** Pygophore trilobate (Fig. 22, posterodorsal view); dorsal lobes below carinate margin, nearly elliptical in shape, moderately convex and produced backward, briefly touching each other ventrally along their inner margin; ventral lobe slightly convex medially, slightly produced; dorsal opening narrow; paramere heads partially visible as lamellate setose structures; posterior rim with a long, anteriorly directed, subtriangular projection on each side of median suture. Paratergites VIII (Fig. 30, outer lateral view) with an apically subtriangular, broadly explanate, hook-shaped head; spiracle nearly apical.

Remarks. The name of this new genus is derived from the Maori noun *tuatara*, the New Zealand endemic spiny back reptile with an ancient lineage going back to the dinosaurs, and *aptera*, from the Greek apteros, wingless. *Tuataraptera* is a highly distinctive monotypic genus restricted to Northland (ND), the northernmost region of the North Island. The genus *Tuataraptera* is uniquely characterized among New Zealand genera by the presence of two very long, robust metanotal spines in the male. Other noticeable differences from *Neocarventus*, its closest morphological relative, are highlighted in the generic description. The configuration of the male pygophore and shape of paratergites VIII offer some similarities with *Neocarventus* and to a lesser extent with *Modicarventus*. The flatness of the thoracic plates and divisions of the tergal plates resemble the situation in *Modicarventus*.

Tuataraptera unca (Kirman, 1989), new combination

Fig. 43, 70–71, 87

Neocarventus uncus Kirman, 1989b: 35. Holotype: male (NZAC) labeled "NEW ZEALAND (typed) ND, Warawara SF [= State Forest] 10 Oct 1974 J. C. Watt ex rotten log (hand-written) / Duplicate specimens in alcohol (typed) / Entomology Division D.S.I.R. New Zealand (gold label; typed) / Neocarventus Det. G.B. Monteith, 1979 (typed) / (blank red label) / HOLOTYPE NEOCARVENTUS UNCUS (white label; hand-written)." Photo of holotype and associated labels (Larivière and Larochelle 2004: 231). Paratypes: 2 females, 5 males (NZAC) with same data as holotype; another 3 males should be in NZAC (Kirman 1989b) but could not be located. Other paratypes (Kirman 1989b): 3 males, 2 females (AMNZ, NZAC) from Puketi Forest (ND), Waipoua State Forest (ND), Mount Camel Peninsula (ND).

Description (incrustation removed). Body length about 3.2 mm (male), 3.9 mm (female). Dorsal color (male) dark reddish brown tinged with yellow; often darker brown to black posterolaterally on metanotum, on dmtg II, medially on tergal plate, on dmtg VII; usually paler yellowish brown on mesonotal projection, dmtg I, and connexivum. Female often with paler abdomen. Eyes reddish brown. Antennae and legs somewhat paler than main body. Ventral color mostly matching or slightly darker than main dorsal color. **Head.** About as long as wide across eyes. Genae distinctly longer than clypeus, nearly touching or forming a gap in front. Antenniferous tubercles broadly subtriangular, their apices bluntly rounded and divergent. ***Antennae*** about 1.5× longer than width of head across eyes, mostly granulate. Ratio of length of antennal segments II–IV/I about 0.6: 0.9: 0.9. Segment I narrowed, smooth in basal third, then thickened; II slightly curved basally, gradually thickened toward apex; III pedunculate in basal fifth, gradually thickened toward apex; IV fusiform, pilose in apical half. **Thorax.** ***Pronotum*** about 2.5× wider than long medially, including collar. Anterior margin shallowly incised on each side of collar. Anterolateral angles rounded-subquadrate, not usually produced in front of collar. Lateral portions with small callosities and coarse granules coalesced into a strongly elevated, narrow, slightly oblique, curved submarginal ridge distant from lateral margin (ridge sometimes nearly smooth). Lateral margins subrectilinear to slightly concave, slightly oblique. Posterolateral angles rounded-subtriangular, slightly to moderately produced. ***Mesonotum*** about 3.0× wider than long medially, including backward projection (male), 3.5× (female). Lateral portions with small callosities and coarse granules submarginally. Lateral margins subrectilinear to sinuate, moderately to strongly oblique. Posterolateral angles narrowly subtriangular, moderately to strongly produced. ***Metanotum***. Disc slightly elevated near apex of mesonotal projection. Lateral portions with a moderately large hook-shaped plate. Lateral margins moderately to strongly sinuate (male), slightly convex (female). **Abdomen** widest across tergite IV. Dmtg I–II strongly declivent from front to back (male), slightly to moderately declivent (female). ***Tergal plate*** (dmtg III–VI). Disc slightly to moderately elevated (male), slightly elevated (female). Lateral margins subrectilinear (male), faintly convex (female). Dmtg III with a subtriangular plate medially and a pair of apodemal spots near anterior margin. Inner rows of apodemal markings (dmtg IV–VI) made of transverse, subovate to subtriangular plates bearing a usually distinct, oval, smooth median spot; outer rows (dmtg III–VI) made of longitudinal, rounded-subquadrate to subtriangular plates with a more rounded spot. Dmtg VII narrowly smooth and unevenly surfaced anteromedially, broadly marked with small callosities and granules laterally, strongly elevated posteromedially (male); broadly smooth medially, broadly marked with small callosities and granules laterally, slightly but flatly elevated medially, with a faint transverse sulcus posteriorly (female). ***Connexivum*** moderately to strongly reflexed (sometimes slightly reflexed in female). Posterolateral angles of dltg III–V acutely triangular, rather strongly produced, VI rounded, slightly produced, VII broadly rounded-subtriangular, strongly produced and reflexed (male); III–IV unproduced, V–VI rounded, slightly produced, VII rounded-subtriangular, more strongly produced than V–VI, rather flat (female). ***Male genitalia.*** Right paramere (Fig. 43, inner lateral view) elongate, shaft narrow, barely concave posteriorly, head rounded-subquadrate apically, with anterior margin obliquely subrectilinear, slightly thickened. **Ventral surface. Head.** Rostrum only about 0.75× as long as subrectangular, carinate rostral groove. **Thorax.** Pro-, meso-, and metasternum fused, barely depressed or flat medially; suture line between metasternum and vmtg I of abdomen faint, superficial. **Abdomen.** Ventral mediotergites (vmtg) I–III fused; other mediotergites well demarcated from each other; IV–VI barely depressed or flat medially; VII 3.5× longer than VI medially, with faint transverse wrinkles in apical fifth (male), medially split into two triangular plates with inner margin of each plate about 2.5× longer than VI medially, surface obliquely wrinkled (female). Apodemal spots (vmtg IV–VI) flat or slightly elevated, nearly concolorous with remainder of venter; outer rows made of larger, more elevated spots. Connexivum faintly demarcated from remainder of venter.

Material examined. 149 specimens (AMNZ, NZAC).

Geographic distribution (Fig. 87). North Island: ND–Herekino Forest: Herekino Forest Track, 0.5–2 km E Gorge summit (NZAC); Kaitaia Walkway, first 3–4 km (NZAC). Mangamuka Gorge Summit Walkway, first 1.5 km (NZAC). Mount Camel Peninsula, valley [on] West side (AMNZ). Omahuta Forest, Kauri Sanctuary Road, Pukekohe Stream (NZAC). Pukekaroro Scenic Reserve (NZAC). Puketi Forest (NZAC), Upper Waipapa River Track, first 1.5 km (NZAC). Waipoua Forest: 1 km E [of] Headquarters (NZAC); Kauri Rickers Track (NZAC); SH [= State Highway] 12 (NZAC). Warawara Forest (NZAC).

Biology. Altitudinal range. Lowland to lower montane (up to 700 m). **Habitat.** Occurs in broadleaf–podocarp forests; can be locally abundant in forests where *Beilschmiedia-Dacrydium*, *Beilschmiedia-Knightia-Leptospermum*, *Beilschmiedia-Rhopalostylis* or *Beilschmiedia-Agathis-Knightia* are predominant; also found once in a mesic *Weinmannia* forest. Collected in groups on the moist, often moldy bark from the underside of fallen rotting branches about 3–5 cm in diameter or slightly larger; found in small numbers in leaf litter. **Seasonality.** Adults: September–January (abundant in December), April. Tenerals: October–December (abundant in December). Nymphs: December, probably also May–June. Mating observed in December.

References. Larivière and Larochelle 2004: 53 (catalogue; *Neocarventus uncus*), 231 (photos of type and labels; *N. uncus*), 2014: 350 (checklist; *N. uncus*).

Remarks. *Tuataraptera unca* mostly occurs in the rainforests of western Northland (ND). Larivière and Larochelle (2004)'s record of this species from Mount Moehau (CL) is referred to *Neocarventus angulatus*.

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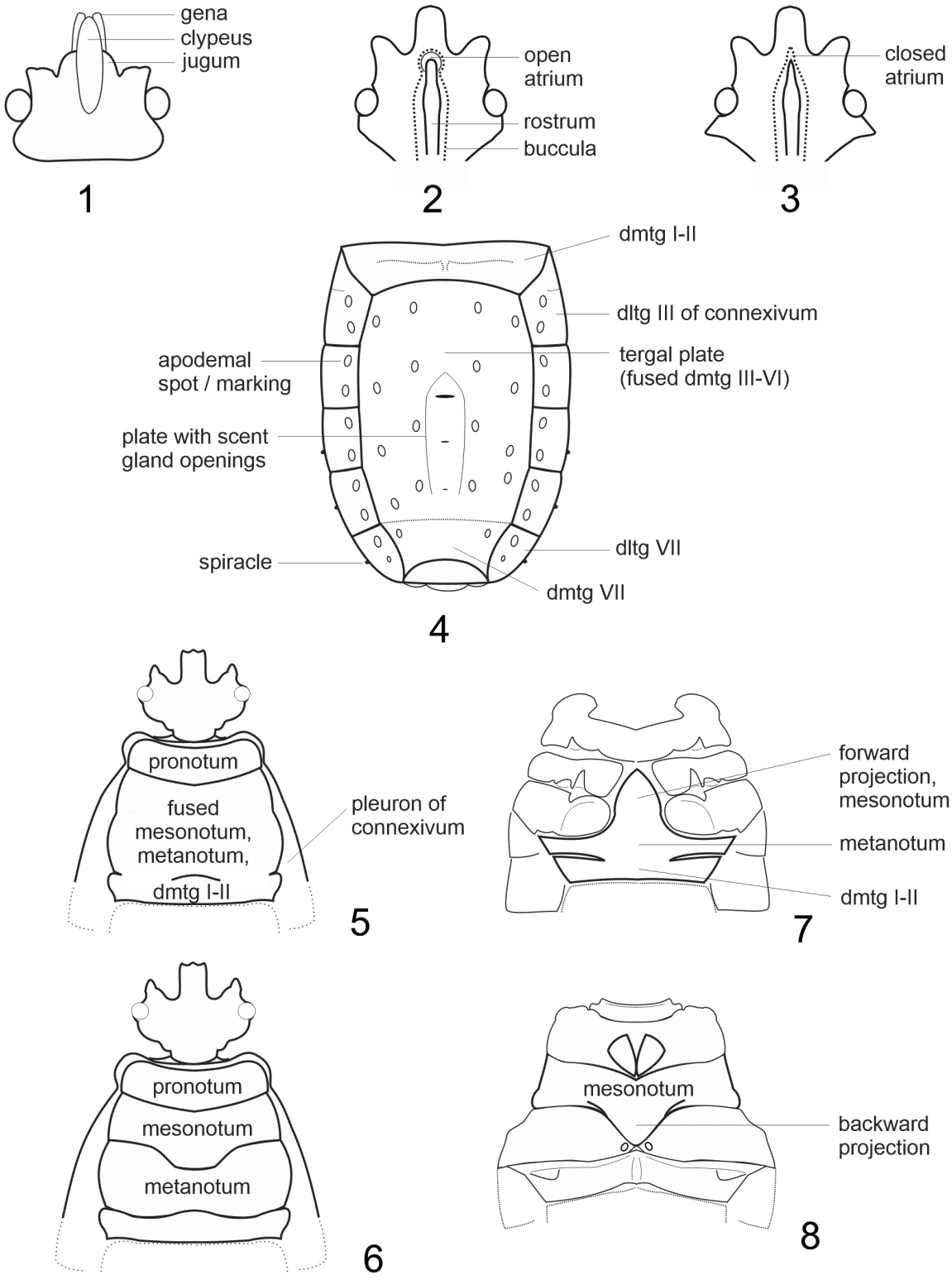
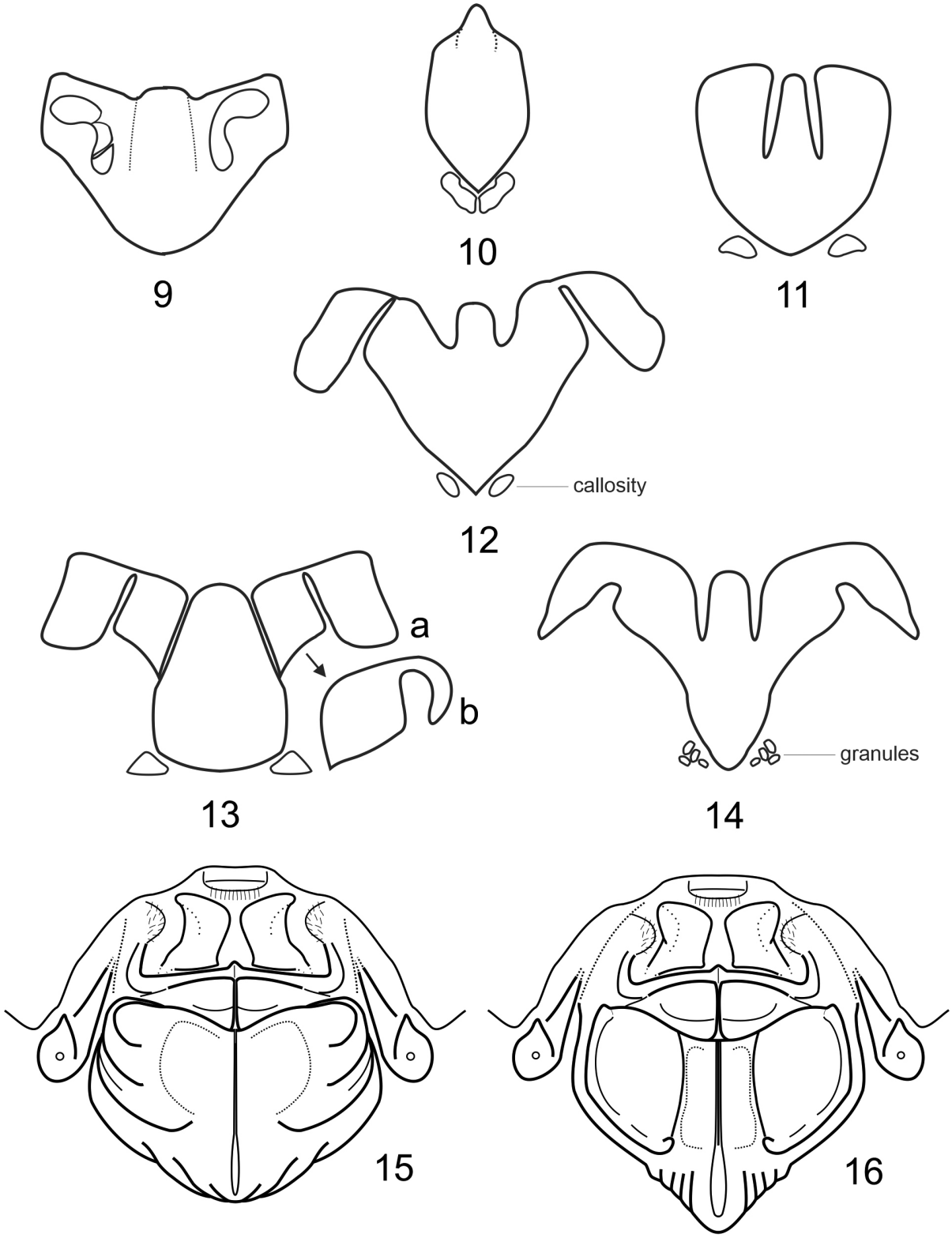
Appendix 1. Geographic coordinates of localities in decimal degrees.

Locality	Area code	Latitude	Longitude
Abbey Caves Reserve	ND	−35.7094	174.3573
Aorangi Island, Poor Knights Islands	ND	−35.4814	174.7409
Aupouri Peninsula	ND	−34.7000	173.0000
Avon River Valley	MB	−41.7859	173.5442
Awakino River Valley	WO	−38.4931	174.8027
Ballance Bridge Reserve, Manawatu Gorge	WN	−40.3387	175.8181
Balls Clearing, foothills of Kaweka Range	HB	−39.2700	176.5008
Baylis Stream, Great Island	TH	−34.1620	172.1432
Blue Duck Valley	KA	−42.2833	173.7666
Canaan	NN	−40.9416	172.8919
Cape Reinga	ND	−34.4279	172.6815
Castaway Camp, Great Island	TH	−34.1534	172.1413
Cobb Valley	NN	−41.0847	172.5575
Colenso Trig, Ruahine Range	RI	−39.7581	176.0428
Coromandel Peninsula	CL	−36.9345	175.6192
Daphne Hut Track, Ruahine Range	RI	−39.9393	176.1634
Dun Mountain	NN	−41.3186	173.3148
Fletcher Creek	BR	−41.9840	171.8487
Great Island	TH	−34.1666	172.1333
Hardwoods Hole	NN	−40.9496	172.8705
Herekino Forest Track	ND	−35.2091	173.1981
Kaitaia Walkway, Herekino Forest	ND	−35.1835	173.2731
Kaituna River/Track, Collingwood	NN	−40.7120	172.5702
Kauri Rickers Track, Waipoua Forest	ND	−35.6522	173.5708
Kimberley Reserve, Levin	WN	−40.6669	175.3133
Kiriwhakapapa Road, Tararua Range	WN	−40.8090	175.5441
Kohuronaki, Te Paki	ND	−34.5137	172.8973
Lake Waikaremoana	GB	−38.7842	176.9945
Lewis Pass	BR	−42.3786	172.3991
Limestone Road end Track, Ruahine Range	RI	−39.9847	176.0161
Mangamuka Gorge	ND	−35.2067	173.5072
Mangamuka Hills/Summit	ND	−35.1896	173.4554
Mitimiti	ND	−35.4290	173.2709
Mount Camel Peninsula	ND	−34.8206	173.1594
Mount Holdsworth, Tararua Range	WN	−40.8734	175.4168
Mount Manaia	ND	−35.8181	174.5171
Mount Moehau	CL	−36.5500	175.4000
Mount Whakaangi	ND	−34.9602	173.5609
Mount William	AK	−37.2078	175.0234
Ngaiotonga Reserve	ND	−35.3160	174.2602
North Cape	ND	−34.4158	173.0516
North East Island	TH	−34.1375	172.1654
Nukuwaiata Island, Chetwode Islands	SD	−40.9004	174.0677
Ohakune	TO	−39.4177	175.3995
Ohau Stream Walk, Half Moon Bay	KA	−42.2449	173.8298
Orongorongo Valley	WN	−41.3530	174.9617
Otaki Gorge, Tararua Range	WN	−40.8333	175.2500
Paihia	ND	−35.2832	174.0920
Pandora	ND	−34.4528	172.7786

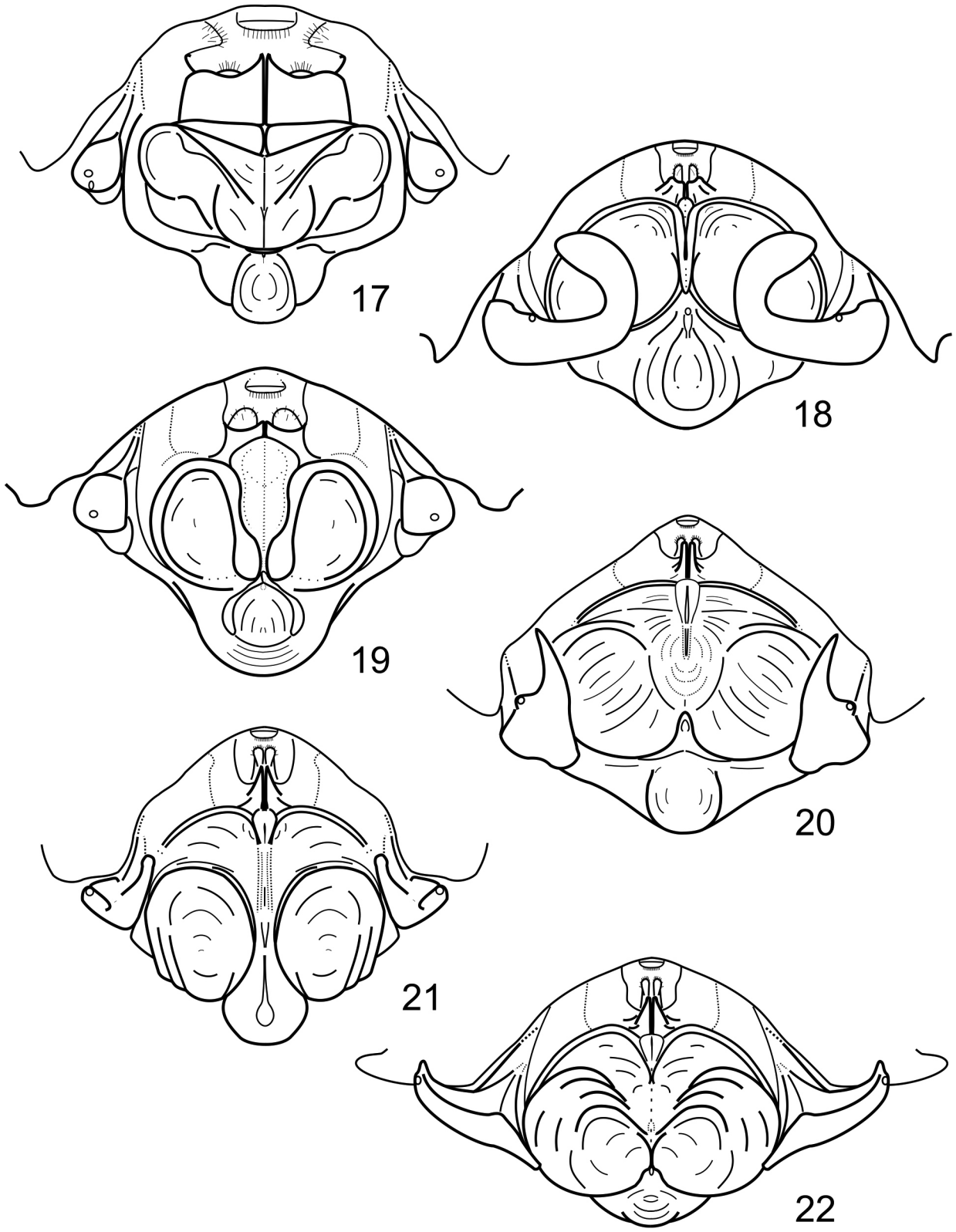
Locality	Area code	Latitude	Longitude
Parihaka Park, Whangarei	ND	−35.7126	174.3395
Peel Forest	SC	−43.9000	171.2500
Peraki Scenic Reserve, Banks Peninsula	MC	−43.8200	172.8600
Port Chalmers	DN	−45.8205	170.6223
Puhipuhi Reserve	KA	−42.2708	173.7379
Pukekaroro Scenic Reserve	ND	−36.1385	174.4390
Pukekohe Stream, Omahuta Forest	ND	−35.2355	173.6201
Pukenui Forest Loop Track	ND	−35.7063	174.2574
Puketi Forest	ND	−35.2211	173.7307
Punaruku Stream, Russell Forest	ND	−35.3953	174.3117
Ranfurly Bay Scenic Reserve	ND	−35.0040	173.7518
Rangiwahia Hut Track, Ruahine Range	RI	−39.8936	176.0001
Riccarton Bush, Christchurch	MC	−43.5269	172.5987
Rokaiwhana Stream, Ruahine Range	RI	−40.1372	176.0113
Ruahine Ranges	RI	−40.0666	176.0500
Russell Forest Track	ND	−35.3251	174.2633
Shakespeare Bay, Picton	SD	−41.2839	173.9924
Shenandoah Saddle	BR	−42.0267	172.2432
South East Bay, Great Island	TH	−34.1530	172.1436
South West Island	TH	−34.1843	172.0747
Spirits Bay	ND	−34.4588	172.8056
Stephens Island	SD	−40.6706	173.9983
Tapotupotu Reserve/Stream	ND	−34.4423	172.7193
Tararua Forest/Range	WN	−40.9000	175.3300
Tasman Stream/Valley, Great Island	TH	−34.1608	172.1372
Te Mara Track, Tararua Forest	WA	−40.8015	175.5319
Te Matua Ngahere, Waipoua Forest	ND	−35.6071	173.5288
Te Paki	ND	−34.5039	172.7991
Te Paki Trig	ND	−34.4666	172.7716
Te Tapui Scenic Reserve, Maungakawa	WO	−37.8157	175.6276
Three Kings Islands	TH	−34.1500	172.1300
Titirangi	AK	−36.9384	174.6569
Toatoa Track, Waipoua Forest	ND	−35.6734	173.5626
Toronui Track, Waipoua Forest	ND	−35.6300	173.5800
Tunakino Valley	SD	−41.2125	173.6238
Tutamoe Range	ND	−35.7600	173.8017
Unuwhao	ND	−34.4321	172.8882
Upper Waipapa River Track, Puketi Forest	ND	−35.2024	173.7835
Waikohatu Stream Bridge, Waipoua Forest	ND	−35.6514	173.5570
Waipoua Forest	ND	−35.6528	173.5556
Waipoua Forest, Headquarters	ND	−35.6518	173.5549
Wairau Summit, Waipoua Forest	ND	−35.5827	173.5394
Waitahere Stream Track, Puketi Forest	ND	−35.1963	173.7920
Wallingford	HB	−40.2087	176.5881
Warawara Forest	ND	−35.3828	173.2985
West Island	TH	−34.1856	172.0341
Whangarei	ND	−35.7244	174.3202
Whareana, North Cape Area	ND	−34.4612	173.0028
Yakas Tree Track, Waipoua Forest	ND	−35.6190	173.5301



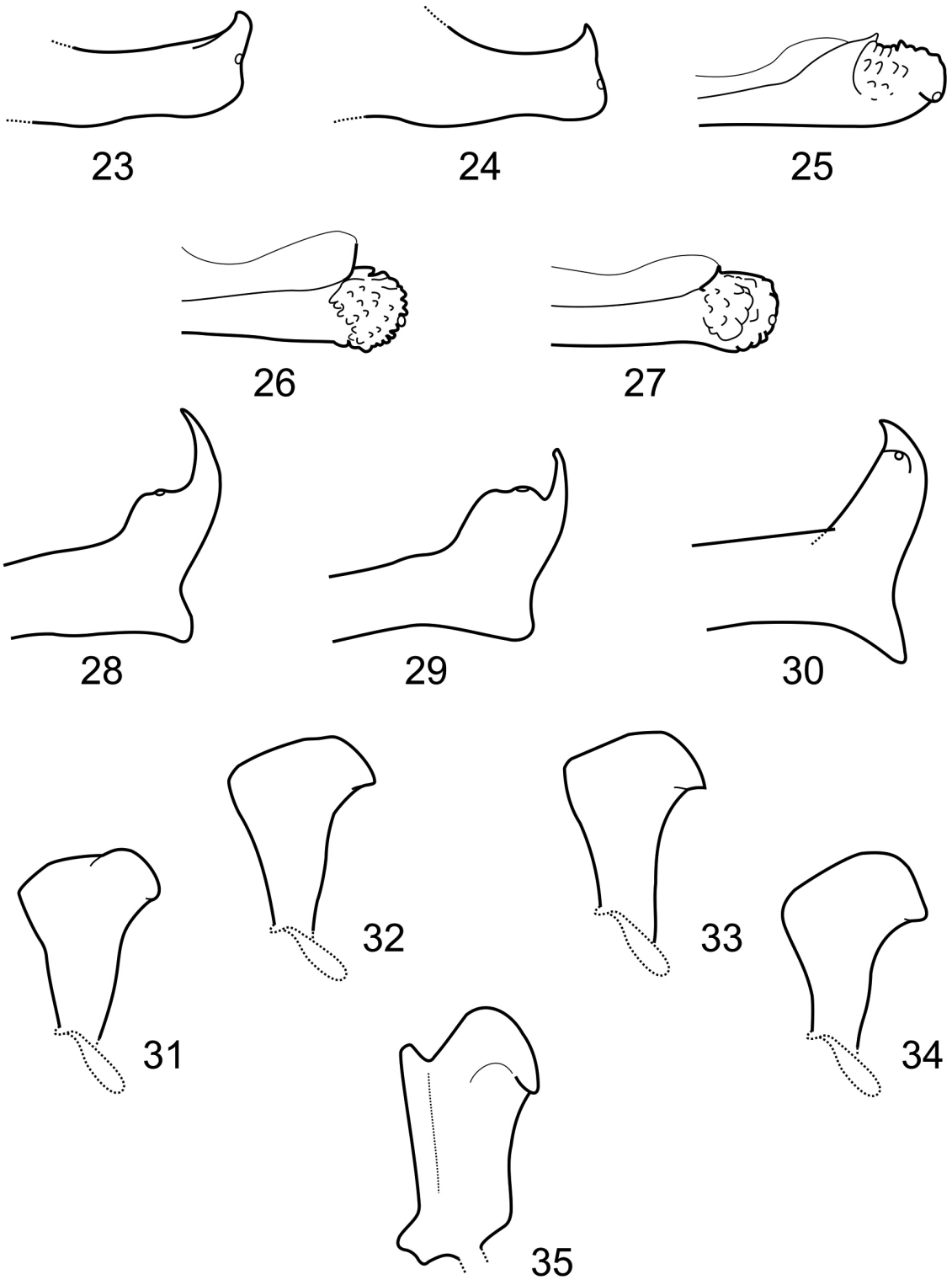
Figures 1–8. Generalized drawings of Carventinae morphology. **1)** Head, dorsal. **2–3)** Head, ventral. **4)** Abdomen, dorsal. **5)** Thorax and connexivum of *Lissaptera*, dorsal. **6)** Thorax of *Acaraptera*, dorsal. **7)** Thorax of *Leuraptera*, with forward projection, dorsal. **8)** *Neocarventus*, with backward projection. Abbreviations: dltg, dorsal laterotergite(s); dmtg, dorsal mediotergite(s).



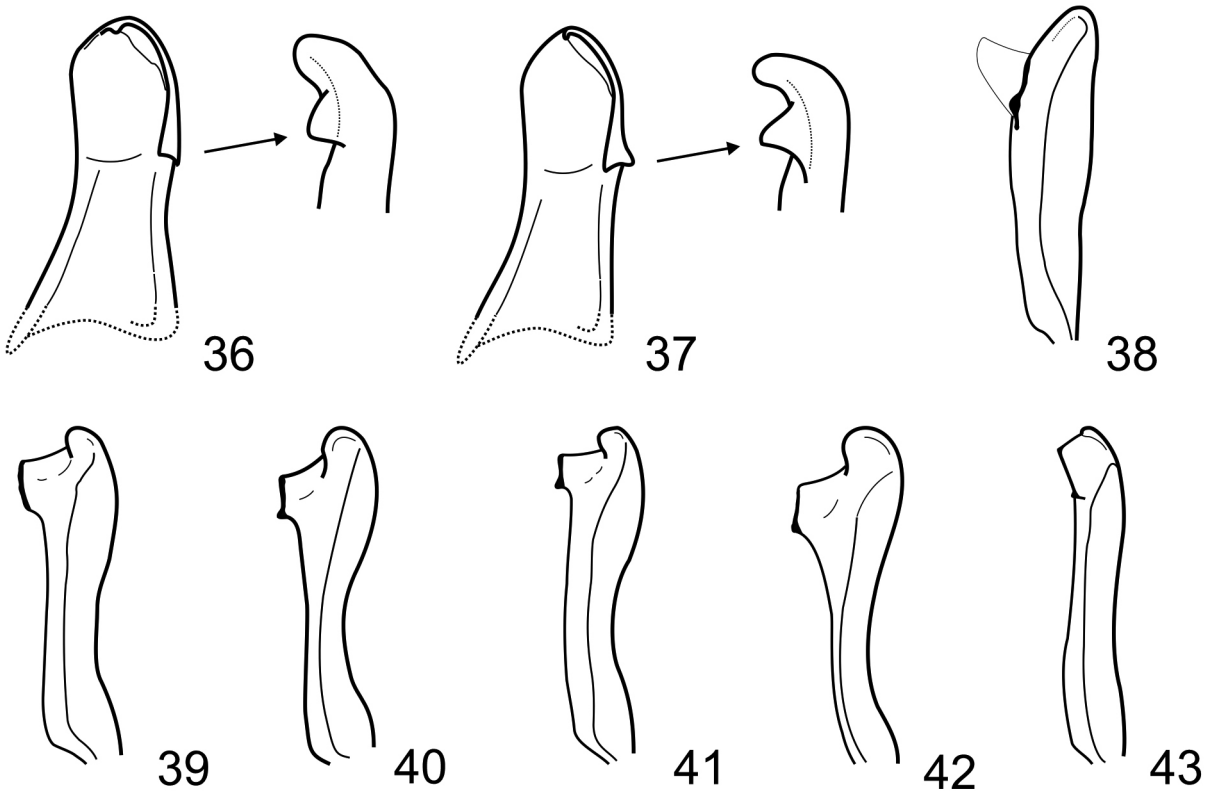
Figures 9–16. Mesonotal plate, with or without metanotal callosities or coarse granules apically. **9)** *Acaraptera*. **10)** *Clavaptera*. **11)** *Carventaptera*. **12)** *Neocarventus*. **13) a** *Modicarventus kirmani* new species, **b** *M. wisei*. **14)** *Tuataraptera*. Male pygophore and paratergites VIII, posterodorsal. **15)** *Lissaptera*. **16)** *Acaraptera*.



Figures 17–22. Male pygophore and paratergites VIII, posterodorsal. **17)** *Leuraptera*. **18)** *Clavaptera*. **19)** *Carventaptera*. **20)** *Modicarventus*. **21)** *Neocarventus*. **22)** *Tuataraptera*.

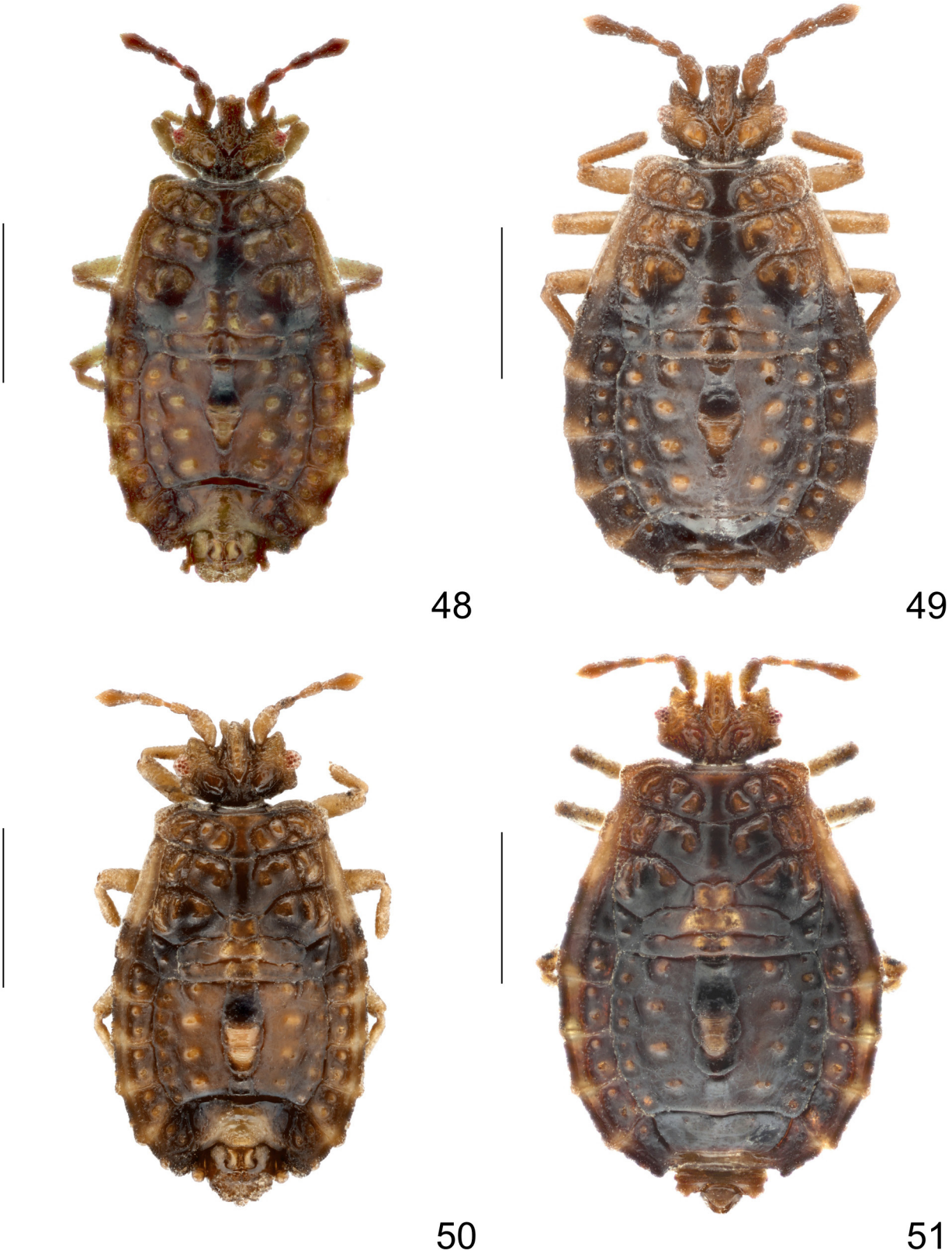


Figures 23–35. Male left paratergite VIII. **23)** *Lissaptera*, outer lateral. **24)** *Acaraptera*, outer lateral. **25)** *Leuraptera*, outer lateral. **26)** *Carventaptera spinifera*, dorsolateral. **27)** *C. hallae* new species, dorsolateral. **28)** *Modicarventus*, outer lateral. **29)** *Neocarventus*, outer lateral. **30)** *Tuataraptera*, outer lateral. Right paramere, outer lateral. **31)** *Lissaptera completa*. **32)** *L. heissi* new species. **33)** *Acaraptera myersi*. **34)** *A. waipouensis*. **35)** *Leuraptera zealandica*.

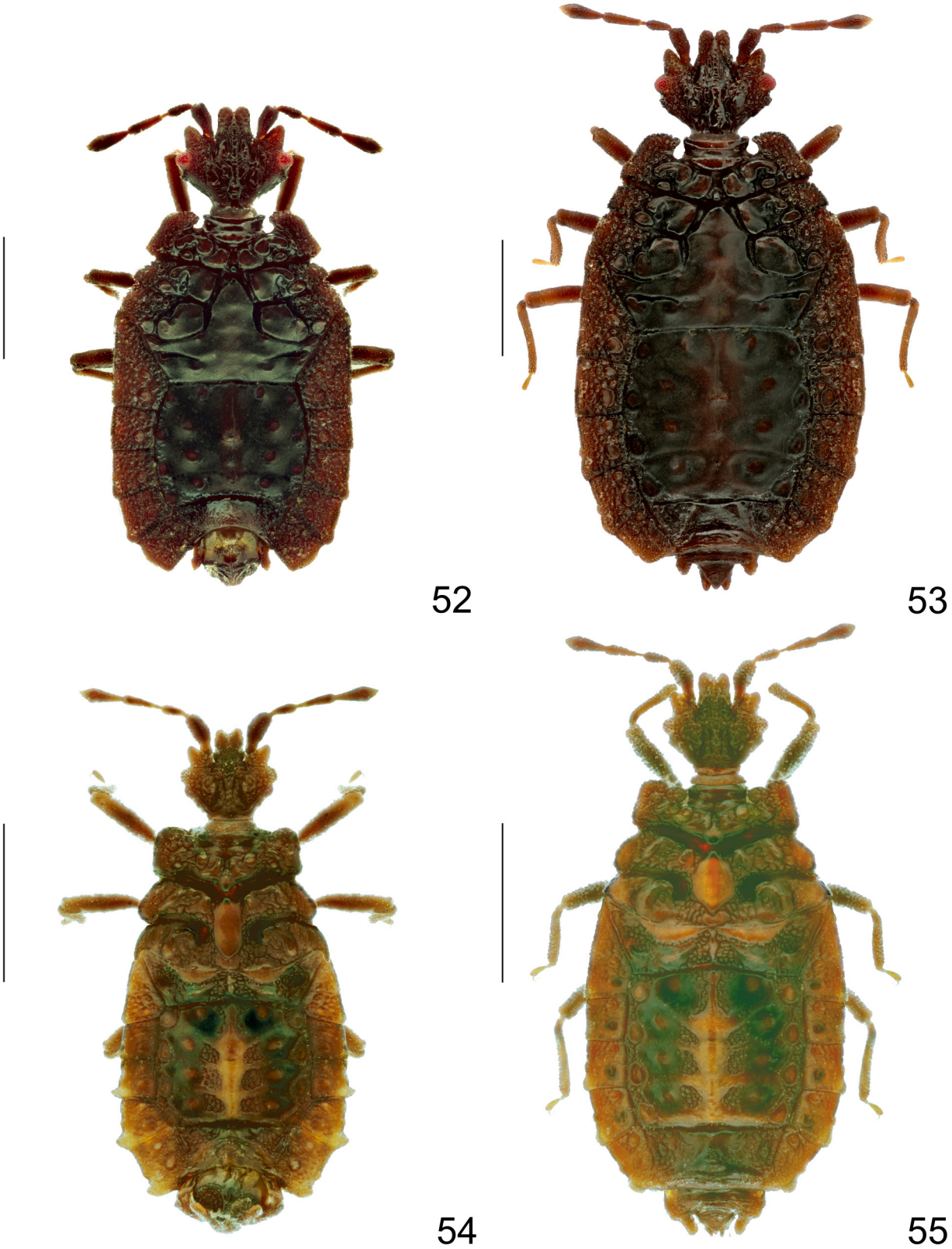


Figures 36–43. Male right paramere, inner lateral. **36)** *Carventaptera spinifera*. **37)** *C. hallae* new species. **38)** *Modicarventus kirmani* new species. **39)** *Neocarventus angulatus*. **40)** *N. potterae* new species. **41)** *N. montanus* new species. **42)** *N. northlandicus* new species. **43)** *Tuataraptera unca*.

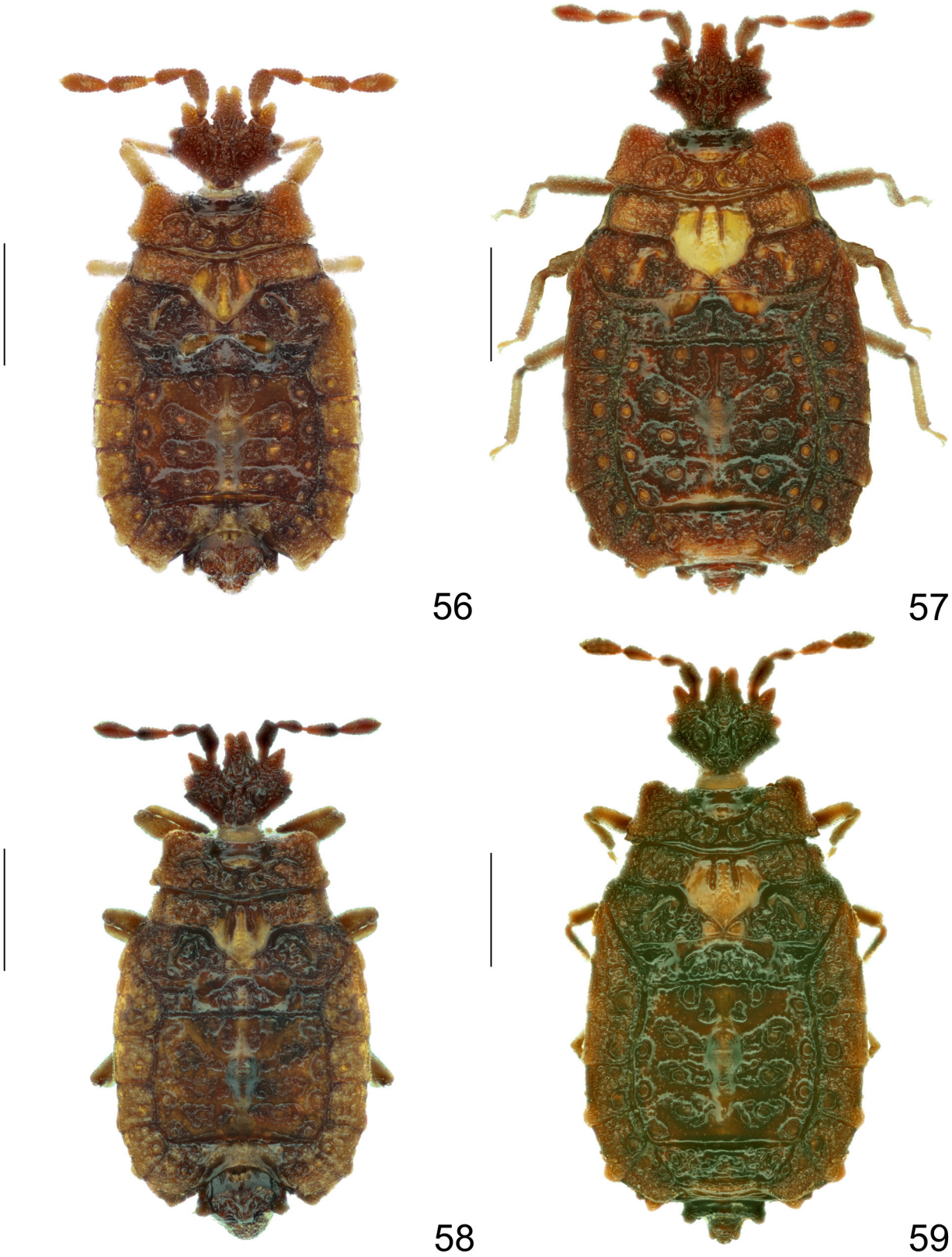
Figures 44–47. Dorsal habitus. **44)** *Lissaptera completa*, male. **45)** *L. completa*, female. **46)** *L. heissi* new species, male. **47)** *L. heissi* new species, female. Scale line = 1 mm.



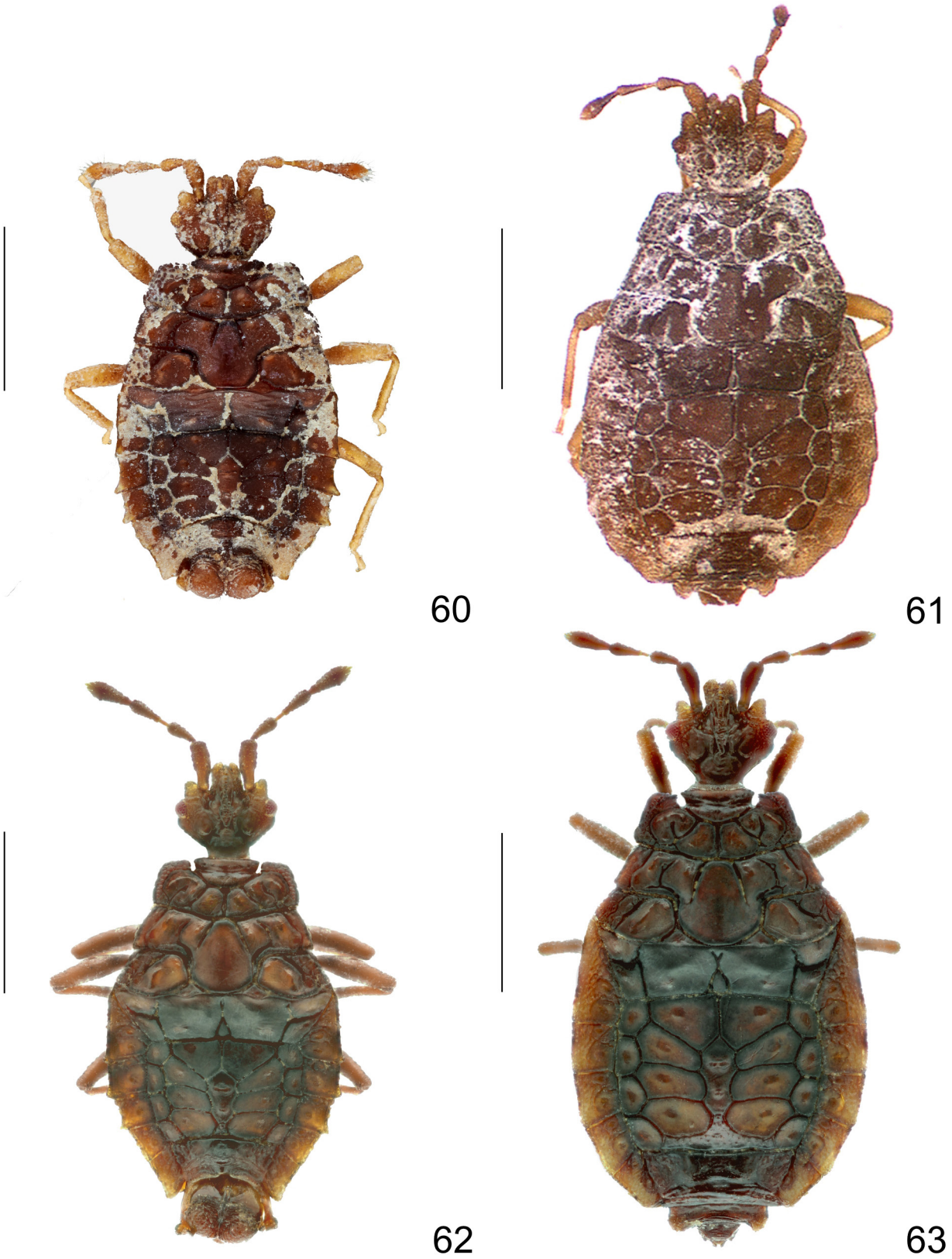
Figures 48–51. Dorsal habitus. **48)** *Acaraptera myersi*, male. **49)** *A. myersi*, female. **50)** *A. waipouensis*, male. **51)** *A. waipouensis*, female. Scale line = 1 mm.



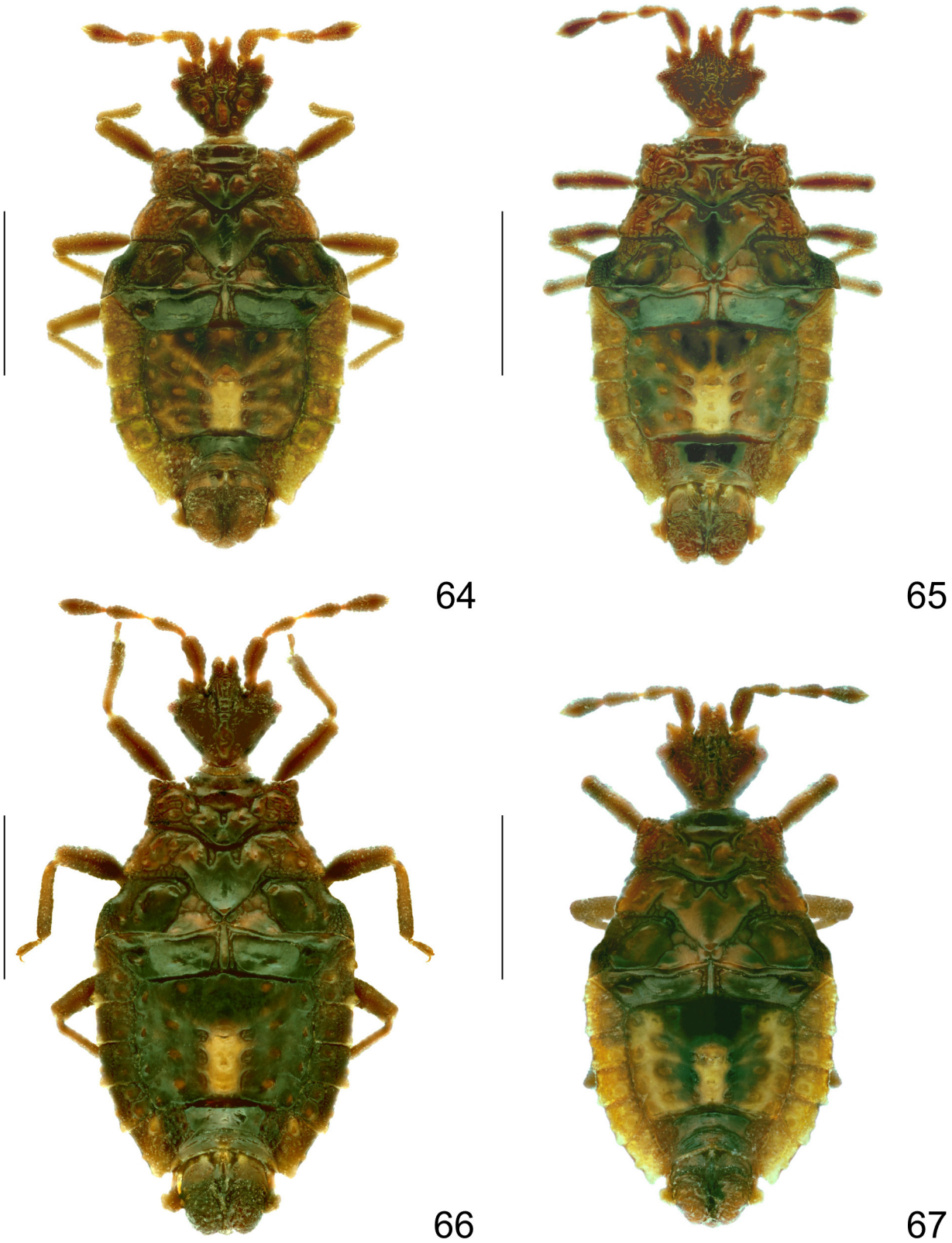
Figures 52–55. Dorsal habitus. **52)** *Leuraptera zealandica*, male. **53)** *L. zealandica*, female. **54)** *Clavaptera ornata*, male. **55)** *C. ornata*, female. Scale line = 1 mm.



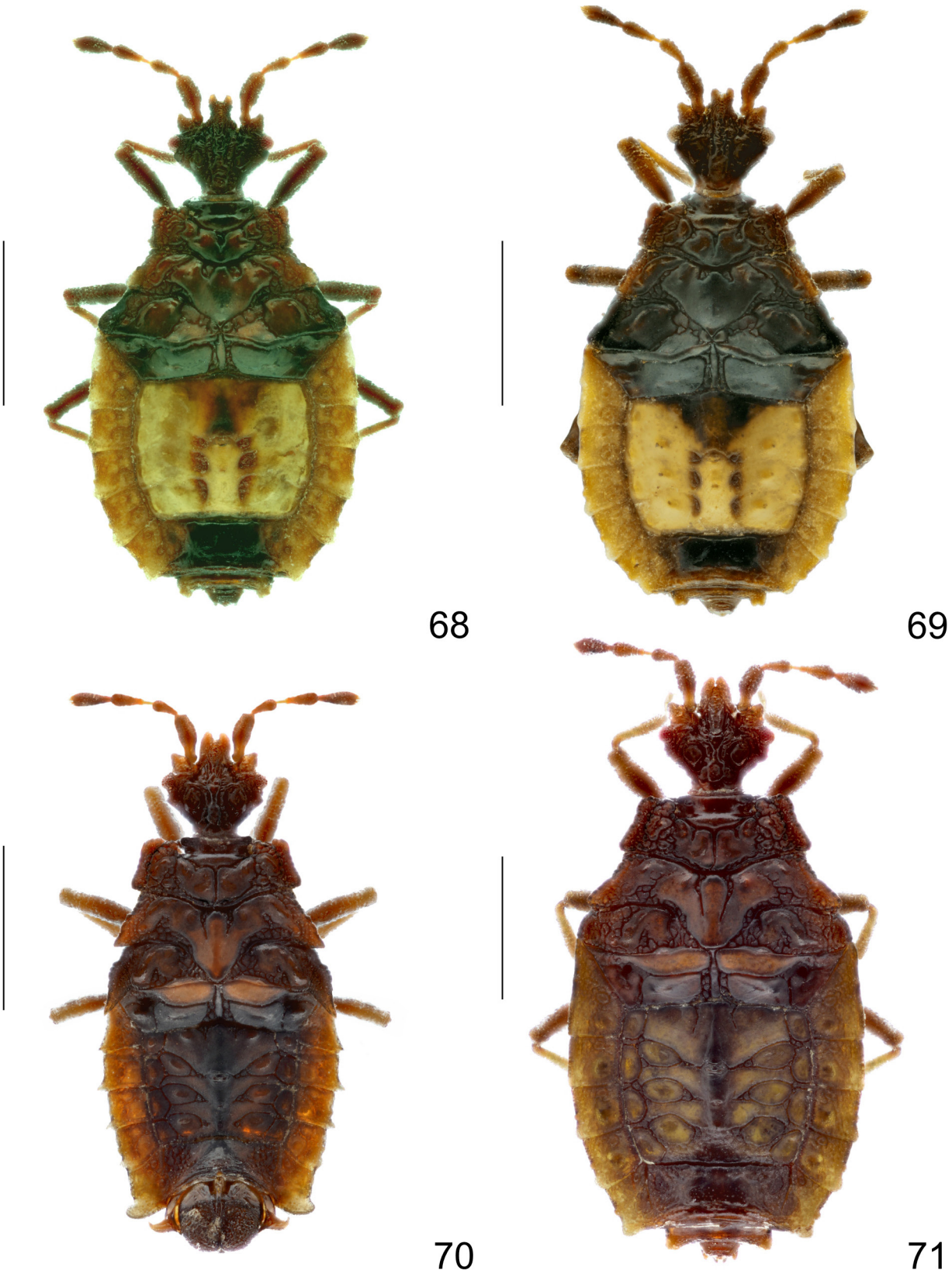
Figures 56–59. Dorsal habitus. **56)** *Carventaptera spinifera*, male. **57)** *C. spinifera*, female. **58)** *C. hallae* new species, male. **59)** *C. hallae* new species, female. Scale line = 1 mm.



Figures 60–63. Dorsal habitus. **60)** *Modicarventus wisei*, male paratype (photo D. Hoffman). **61)** *M. wisei*, female holotype (photo Larivière and Larochelle 2004). **62)** *M. kirmani* new species, male. **63)** *M. kirmani* new species, female. Scale line = 1 mm.



Figures 64–67. Dorsal habitus. **64)** *Neocarventus angulatus*, male. **65)** *N. potterae* new species, male. **66)** *N. montanus* new species, male. **67)** *N. northlandicus* new species, male. Scale line = 1 mm.



Figures 68–71. Dorsal habitus. **68)** *Neocarventus angulatus*, female. **69)** *N. northlandicus* new species, female. **70)** *Tuataraptera unca*, male. **71)** *T. unca*, female. Scale line = 1 mm.

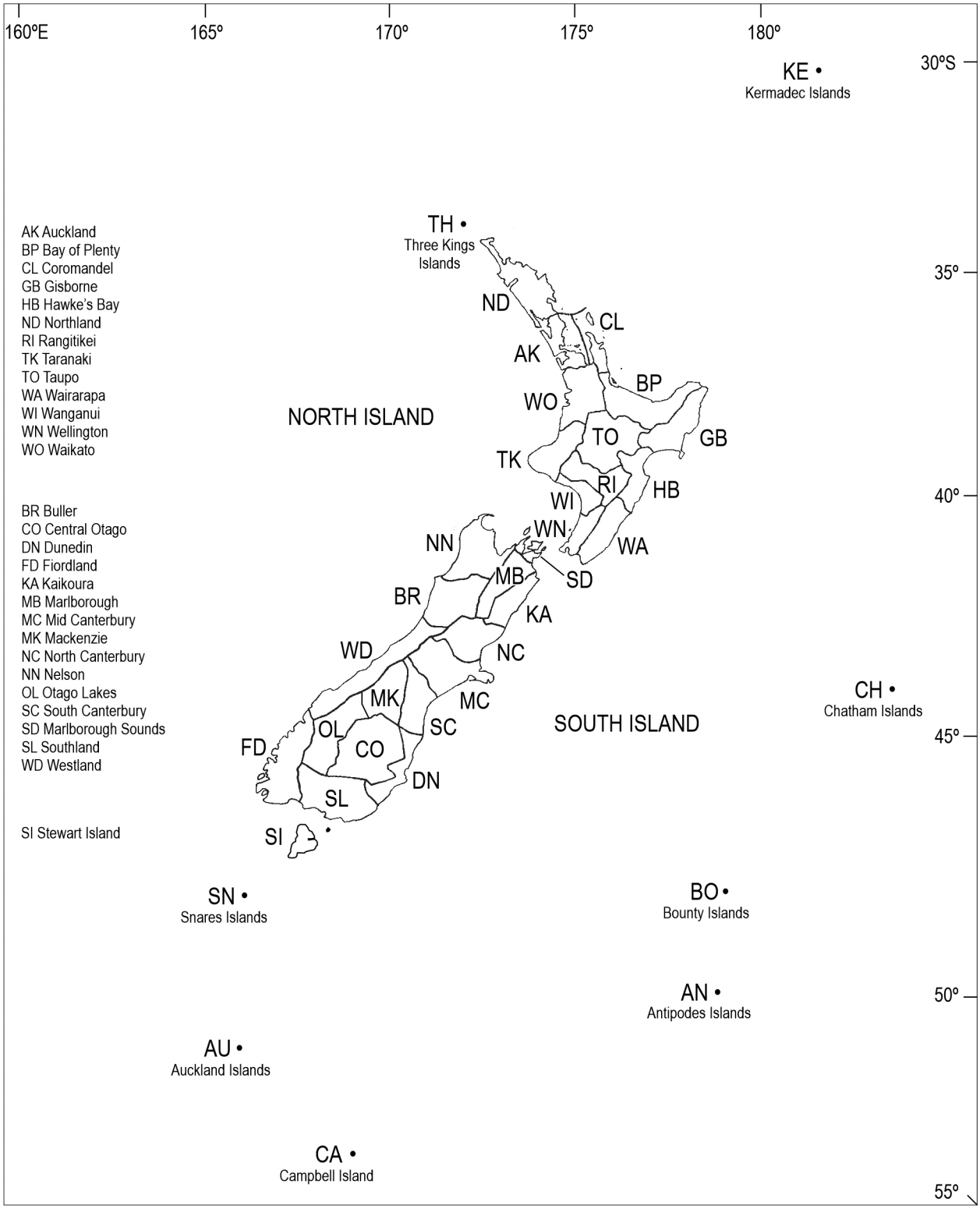
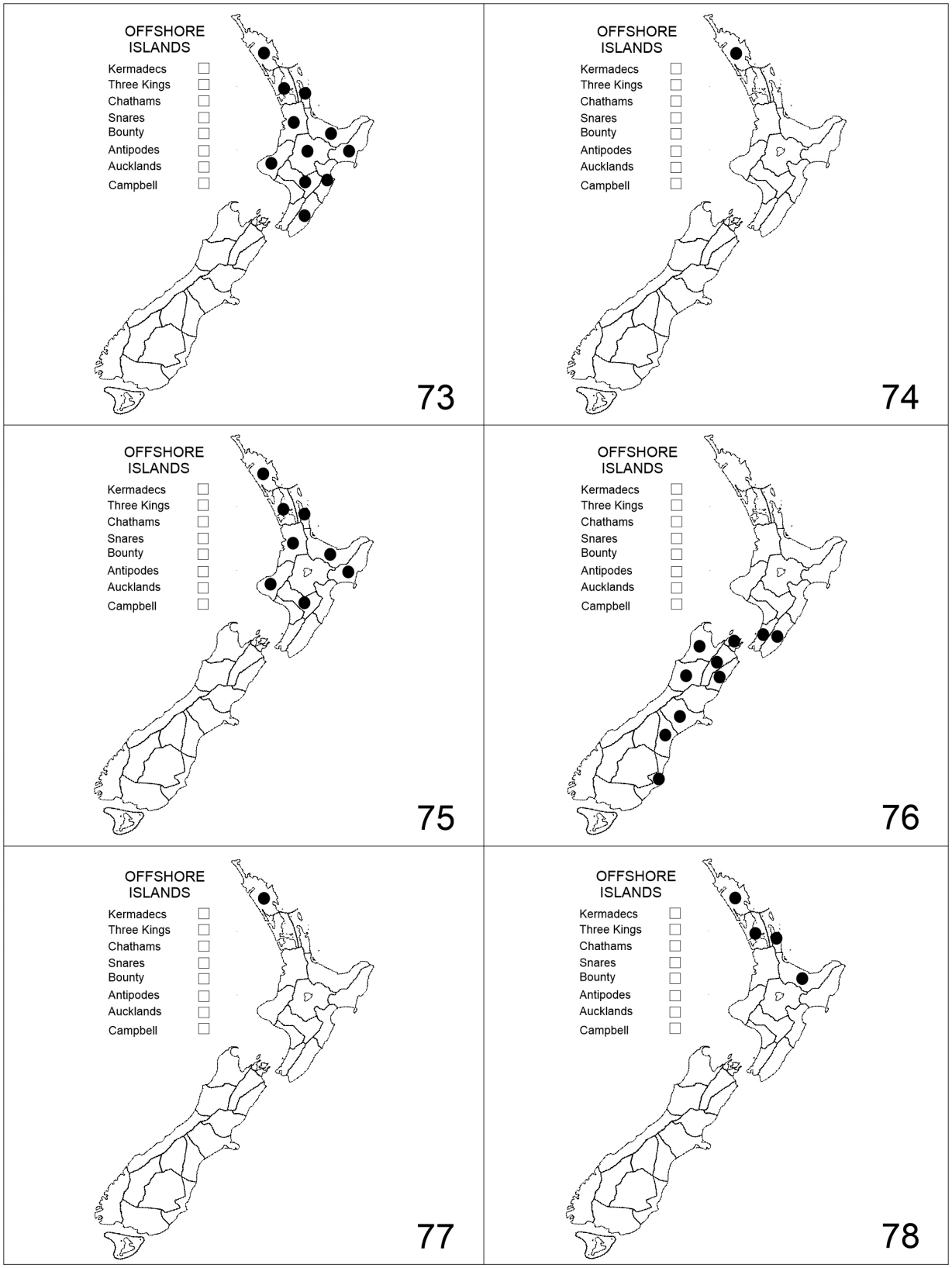
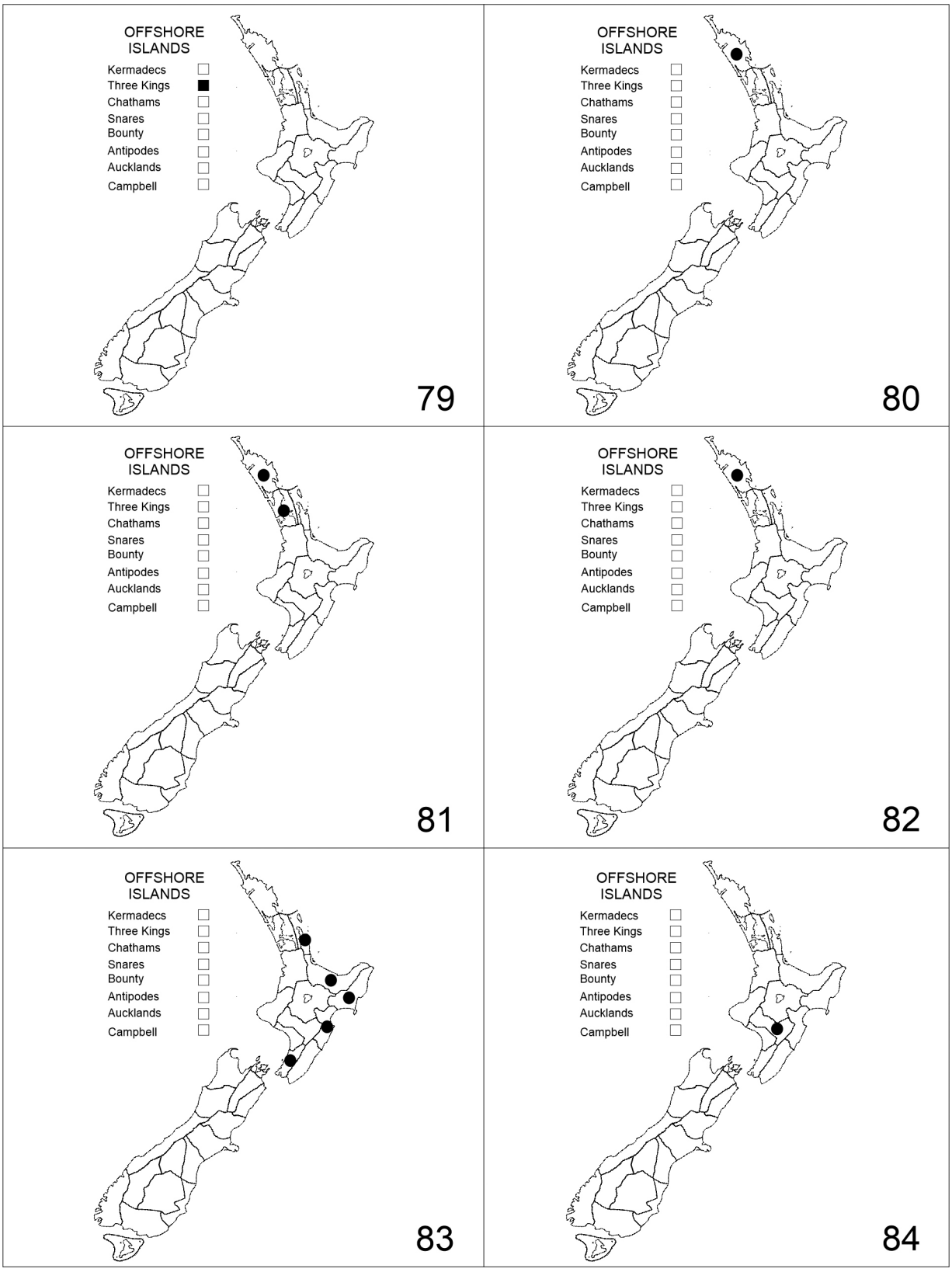


Figure 72. Map of New Zealand, outlying islands, areas and area codes.



Figures 73–78. Species distribution maps. **73)** *Acaraptera myersi*. **74)** *A. waipouensis*. **75)** *Carventaptera hallae* new species. **76)** *C. spinifera*. **77)** *Clavaptera ornata*. **78)** *Leuraptera zealandica*.



Figures 79–84. Species distribution maps. **79)** *Lissaptera completa*. **80)** *L. heissi* new species. **81)** *Modicarventus kirmani* new species. **82)** *M. wisei*. **83)** *Neocarventus angulatus*. **84)** *N. montanus* new species.

Figures 85–87. Species distribution maps. **85)** *Neocarventus northlandicus* new species. **86)** *N. potterae* new species. **87)** *Tuataraptera unca*.

Figures 88–94. Field photos. **88)** M.-C. Larivière examining the underside of a rotting branch. **89)** Brushing a branch over a white sheet. **90)** Collecting specimens with forceps. **91-92)** *Leuraptera zealandica* aggregation, underside of broadleaf branch. **93)** *Carventaptera hallae* aggregation, underside and under bark of southern beech branch. **94)** *Neocarventus* female and nymphs, underside of *Leptospermum* branch.