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A REVISION OF THE *DUCALE* AND *LATERALE* SPECIES GROUPS OF THE GENUS *MECODEMA* BLANCHARD 1853 (COLEOPTERA: CARABIDAE: NOTHOBROSCINA) FROM THE SOUTH ISLAND, AOTEAROA NEW ZEALAND

Hatch M. Fong and David S. Seldon

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A revision of the *ducale* and *laterale* species groups of the genus *Mecodema* Blanchard 1853 (Coleoptera: Carabidae: Nothobroscina) from the South Island, Aotearoa New Zealand

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Hatch M. Fong[1,2] and David S. Seldon[1,2]

[1] School of Biological Sciences, University of Auckland, New Zealand.
[2] New Zealand Arthropod Collection, Landcare Research, Bioeconomy Science Institute, Auckland, New Zealand.
Corresponding author: d.seldon@auckland.ac.nz; https://orcid.org/0000-0002-6525-6459

ABSTRACT

The New Zealand (Aotearoa) endemic ground beetle genus *Mecodema* Blanchard 1853 (Carabidae: Broscini: Nothobroscina) is hyper-diverse with a total of a 103 described species and subspecies, that are divided into seven species groups. Of the four Aotearoa nothobroscine genera, *Mecodema* is the most geographically widespread with species found throughout the North and South Islands and several offshore islands, including Three Kings (Manawatāwhi), Poor Knights (Tawhiti Rahi), Little Barrier (Hauturu), and Great Barrier (Aotea), Chatham's (Wharekauri), Stewart (Rakiura) and the Snares (Tini Heke) Islands. In this study we synonymise *M. crenaticolle* Redtenbacher, 1868 under *M. crenicolle* Castelnau, 1867, with all North Island specimens now recognised as *M. crenicolle*. We reinstate *M. venator* Broun 1883, and all South Island specimens formally known as *M. crenicolle* are now recognised as *M. venator*. Contrary to Britton, we discuss the synonym *M. variolosum* Broun 1903 collected in 'Rotorua' as the only North Island specimen of *M. venator*. Species descriptions were formed using 126 morphological external and internal (both male and female genitalia) characters. This study identified three new South Island species: *M. kahurangi* **sp. n.** (*ducale* group), *M. tititea* **sp. n.** and *M. altum* **sp. n.** (*laterale* group). Redescriptions of three previously known South Island *Mecodema* species (*M. ducale*, *M. allani*, *M. laterale*) and one North Island only (*M. crenicolle*) are included.

Key words Broscini, ground beetles, Haast Pass, Kahurangi National Park, new species, nothobrocines, Southern Alps

INTRODUCTION

The endemic New Zealand genus *Mecodema* Blanchard 1853 (Carabidae: Broscini: Nothobroscina) is hyper diverse (103 described species and subspecies) in comparison to all other nothobrosine genera (Seldon & Holwell 2019). The genus *Mecodema* is geographically widespread, found throughout mainland Aotearoa and several offshore islands including: the Three Kings—Manawatāwhi, Poor Knights—Tawhiti Rahi/Aorangi, Little Barrier—Hauturu, and Great Barrier—Aotea, Chatham—Wharekauri, Stewart—Rakiura and the Snares—Tini Heke (Britton 1949, 1964; Townsend 1971; Larochelle & Larivière 2001; Liebherr *et al.* 2011; Seldon & Leschen 2011; Seldon & Buckley 2019). In addition, *Mecodema* species are ecologically diverse and can be found occupying an array of habitats ranging from alpine zones (above the 10°C timberline) to coastal zones (down to the mean high-water), tussock grasslands and braided river systems (South Island), with majority of the species inhabiting both native and exotic forest ecosystems (Larochelle &

Larivière 2001; Berndt *et al.* 2008; Pawson *et al.* 2008, 2009; Ball *et al.* 2013; Goldberg *et al.* 2014).

In his revision of New Zealand's Broscini, Britton (1949) divided the *Mecodema* genus into eight informal species groups based on their distributional range and morphological characters (including the aedeagus). These eight species groups include: *alternans* group, *costellum* group, *curvidens* group, *ducale* group, *infimate* group, *laterale* group, *spiniferum* group and *sulcatum* group (Britton 1949, 1964; Townsend 1965; Seldon & Leschen 2011; Seldon & Buckley 2019). Seldon and Leschen (2011) synonymised the *sulcatum* group (three species) under the monophyletic *curvidens* species group. Amongst the remaining seven groups, only the *costellum*, *infimate* and *laterale* groups are restricted to the South Island.

The *ducale* group is comprised of three species, two of which (*M. crenicolle* Castelnau 1867 and *M. ducale* Sharp 1886) are found in the northern regions of the South Island, i.e., Buller (BR), Marlborough (MB), Marlborough Sounds (SD) and Nelson (NN) (Fig. 1) (Britton 1949; Larochelle & Larivière 2007). The third species, *M. crenaticolle* Redtenbacher 1868, is widespread in the North Island, ranging from the northern regions, i.e., Auckland (AK), Waikato (WO), to the eastern regions, i.e., Bay of Plenty (BP), Taupo (TO) and the western regions of Rangitikei (RI), Taranaki (TK) and Whanganui (WI) (Seldon & Buckley 2019). *Mecodema crenaticolle* is relatively similar in external morphology to its South Island sister species *M. crenicolle*; however, both species are geographically separated by the Cook Strait. Although, the *ducale* group species are mainly associated with lowland podocarp/broadleaved and montane mixed beech/podocarp–broadleaved forests, *M. ducale* has a broader range from lowland coastal/semi-coastal to subalpine habitats (Larochelle & Larivière 2001).

The *laterale* group consists of two described species, *M. allani* Fairburn 1945 *and M. laterale* Broun 1917. These two species are widely distributed throughout the South Island (Fig. 1), with populations found in Buller (BR), Westland (WD), Mid Canterbury (MC), Otago Lakes (OL) and Fiordland (FD) (Britton 1949; Larochelle & Larivière 2001). Both species can be found occupying a range of different habitats including indigenous and exotic forest, tussock grassland, lowland, montane, subalpine, and alpine ecosystems (Larochelle & Larivière 2001). The distribution of *M. allani* is from Cass Valley, between Mt. Horrible and Mt. Misery, Mid Canterbury continuing inland towards the Buller and Westland regions (Larochelle & Larivière 2001). The second species, *M. laterale*, shares a similar range with *M. allani* but can be also found at alpine ranges (500–1000 m) within Fiordland, Otago Lakes, and Westland (Britton 1949; Larochelle & Larivière 2001). Fairburn (1945) emphasised that he considered *M. allani* and *M. laterale* were closely related due to their shared geographic ranges.

METHODS AND MATERIALS

Adult pinned material of *Mecodema* species groups, *ducale* and *laterale* (both described and undescribed species), and the types were borrowed from:

- NZAC: New Zealand Arthropod Collection, Manaaki Whenua–Landcare Research, Auckland, New Zealand.
- CMNZ: Canterbury Museum, Christchurch, New Zealand.
- LUNZ: Lincoln University Collection, Lincoln, New Zealand.
- BNHM: Natural History Museum, London, United Kingdom.
- MCNG: Museo Civico di Naturale, Genova, Italy.
- VNHM: Naturhistorisches Museum Wien / Museum of Natural History, Vienna, Austria.

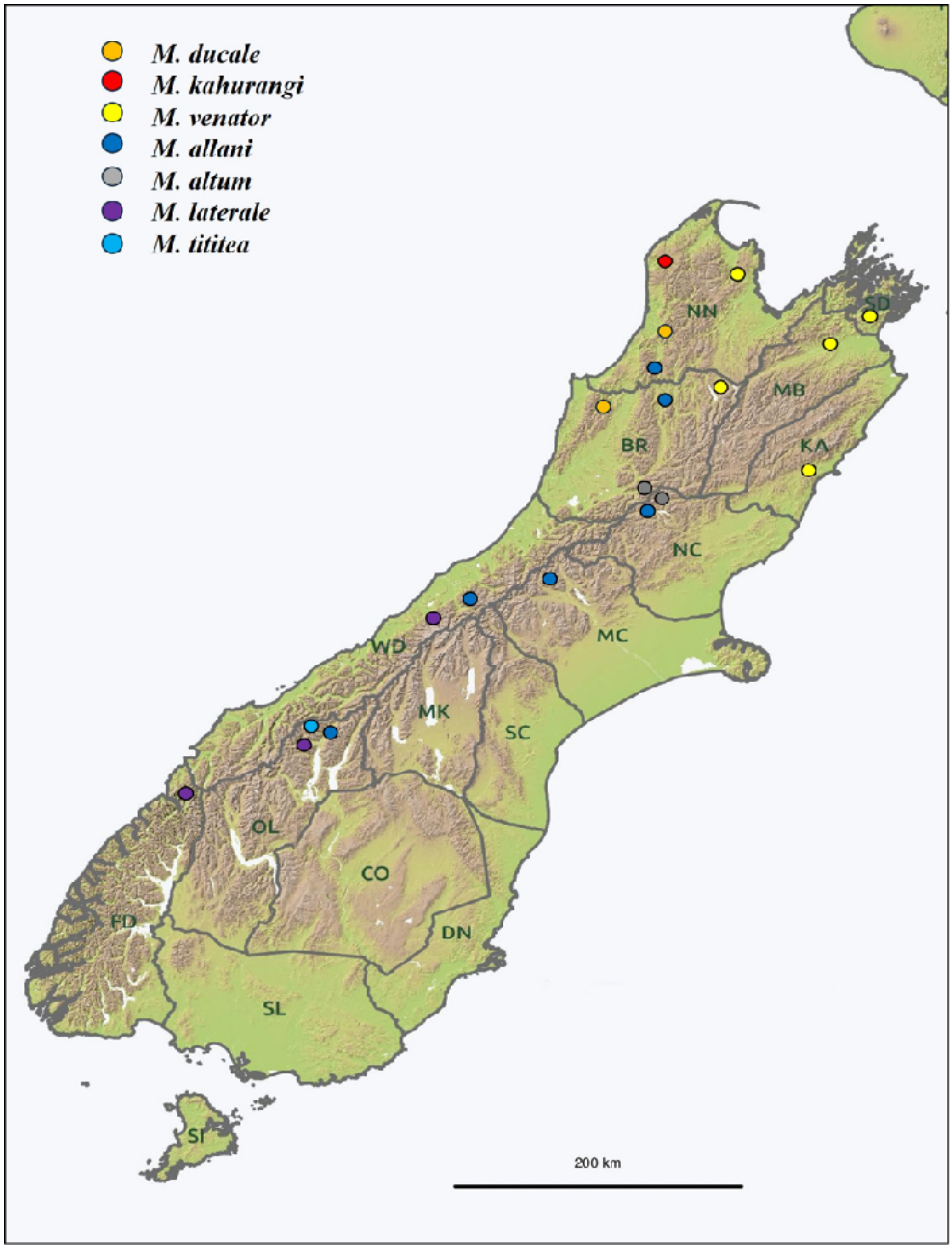

Figure 1. Distribution of the South Island, New Zealand, *Mecodema ducale* group species: *M. ducale*, *M. kahurangi* **n. sp.**, *M. venator*, and the *laterale* group species: *M. allani*, *M. altum* **n. sp.**, *M. laterale*, *M. tititea* **n. sp.**, within the entomological regions, i.e., NN (as per Crosby et al., 1998). For the distribution of *M. crenicolle* (*M. crenaticolle*), North Island only, see Seldon and Buckley (2019).

Loaned specimens were labelled and assigned with an acronym of the lending arthropod collections. Specimens were first categorised into known species group, then these groups were further sorted by geographical entomological regions within the South Island using the two-letter codes designated by Crosby *et al.* (1998), to evaluate variation amongst populations.

At least eight adult male and female specimens (where possible) were selected from each population within the South Island, Aotearoa. Dry specimens were relaxed in 50% ETOH for 24 hours, then the male and female genitalia structures were extracted using a Dumont #5 straight

stainless-steel dissecting forceps to clench the beetle in one hand, using the other hand, a straight micro hook needle or a Dumont #3 straight stainless-steel dissecting forceps was inserted under the elytral margin, then applying a small amount of pressure to gently nudge the genitalia out of the abdomen. If exposed, the genitalia were snipped from specimens using Noyes curved Micro-dissecting scissors (Bioquip ©). The extracted genitalia were macerated in 10% KOH for 24 hours for softening. The relaxed tissues were then rinsed off using distilled water to remove KOH residue. Excess tissues and membrane remnants were removed using a Dumont #3 straight stainless-steel dissecting forceps to expose male genitalia (i.e., parameres, aedeagus, and penis lobe) and female genitalic structures (1st and 2nd gonocoxites and ramus).

All male and female genitalia images were photographed using a binocular dissecting microscope (Leica EZ4W). A Visionary Digital Passport II System that had a mounted canon digital camera with a Canon EF 100 mm f/2.8L Macro IS USM was used to photograph the habitus (dorsal and ventral) views for each of the species. All photography and drawings were completed by the first author as otherwise stated. Furthermore, external and internal morphological descriptions were accomplished using a binocular dissecting microscope (Leica EZ4W). Body length and widths of pronotum and elytra were documented using Whitworth 0–150 mm digital calipers.

All specimens under the headings: ‘Holotype’, ‘Paratype(s)’ and ‘Other material examined’ in this study have label data recorded verbatim. A forward slash ‘/’ represents the beginning of a label.

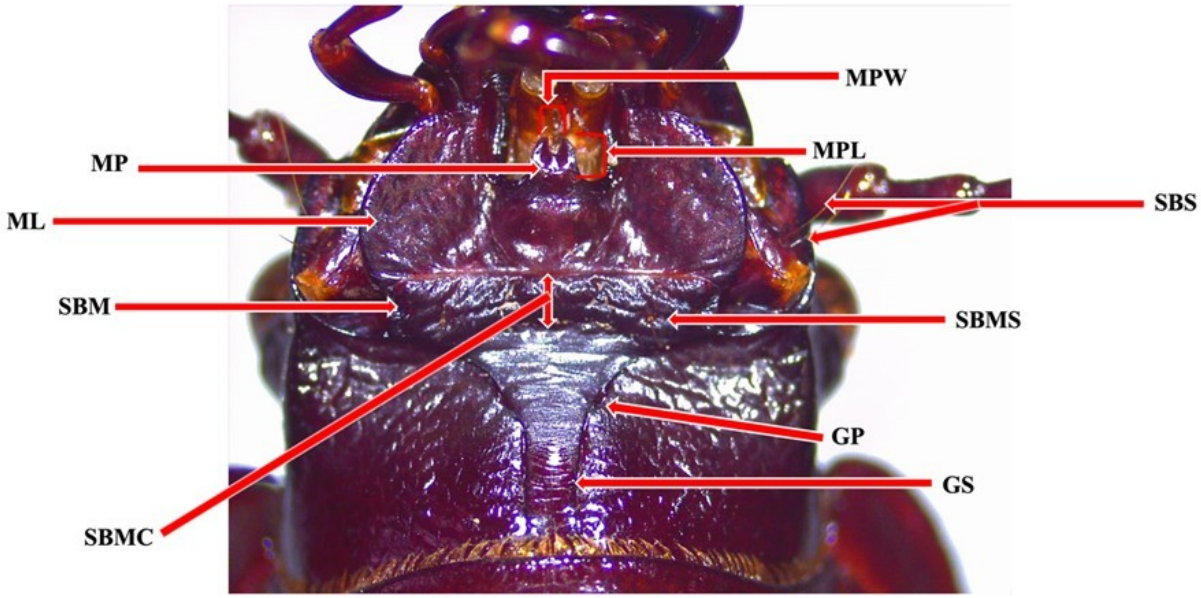

Figure 2. Ventral head detail with structures used in species descriptions. (MP) mentum process (with indentation); (MPW) mentum process width; (MPL) mentum process length; (ML) mentum lobe; (SBS) stipes basal setae; (SBM) submentum sclerite; (SBMC) submentum sclerite constriction; (SBMS) submentum setae; (GP) gula pits; (GS) gula suture. [Adapted from Seldon & Buckley, 2019].

TAXONOMY

For the genus description see Seldon & Buckley (2019).

Historical account of the species in the *ducale* group

In Britton's revision (1949) he placed three species in the *ducale* group based on the presence of stellate punctures that are found laterally on the elytra. These species included *M. ducale* Sharp 1886, *M. crenaticolle* Redtenbacher 1867 (synonyms *M. rugicolle* (Broun 1882), *M. lineatum* (Broun 1894) and *M. crenicolle* Castelnau 1867 (synonyms *M. venator* (Broun 1882), *M. variolosum* (Broun 1903), *M. attenuatum* (Broun 1908), *M. ventriculum* (Broun 1923).

Both *M. crenicolle* and *M. crenaticolle* were described by two different people in the 1860s, from specimens collected within the same locality, the Hunua Ranges, southeast Auckland. Britton confirms that these species were both described in 1867, as this is the year of publication on the title page for Redtenbacher's paper. However, all other publications (including Seldon & Buckley 2019) conform to Larochelle & Larivière's (2001) citation (and others) as Redtenbacher 1868 for the description of *M. crenaticolle*.

Bousquet (2016) determined that 1868 is the true date of Redtenbacher's publication, even though the title page states 1867, he concluded that there is no evidence this work was published in 1867. Therefore, Britton (1949) was incorrect in his citation of Redtenbacher, and in this case *M. crenicolle* gets priority, replacing *M. crenaticolle* as the name of the only North Island endemic species within the *ducale* group.

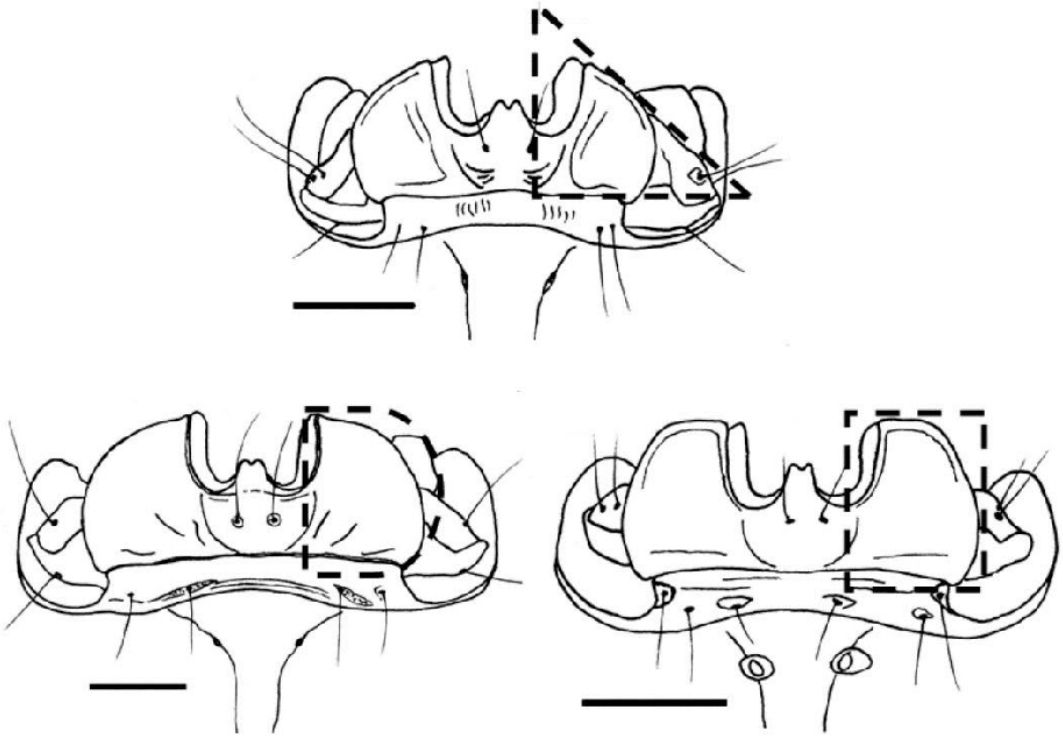

Figure 3. The three general forms of the mentum (ventral and posterior to the mouthparts) that are found in species of *Mecodema*. Top = triangular, bottom left = rounded, bottom right = squared.

Further adding to the confusion of these species' ranges across both North and South Islands is the specimen of *M. variolosum* that was synonymised under *M. crenicolle* by Britton (1949). The

locality of this specimen is 'Rotorua' and therefore, Britton assumed this was in the central North Island, and states the rarity of *M. crenicolle* in the North Island warrants investigation. Because the male genitalia match that of the South Island specimens, we have considered that this generic label is either a misspelling of Lake Rotoroa, Nelson Lakes District or Lake Rotorua, inland of Kaikoura, South Island.

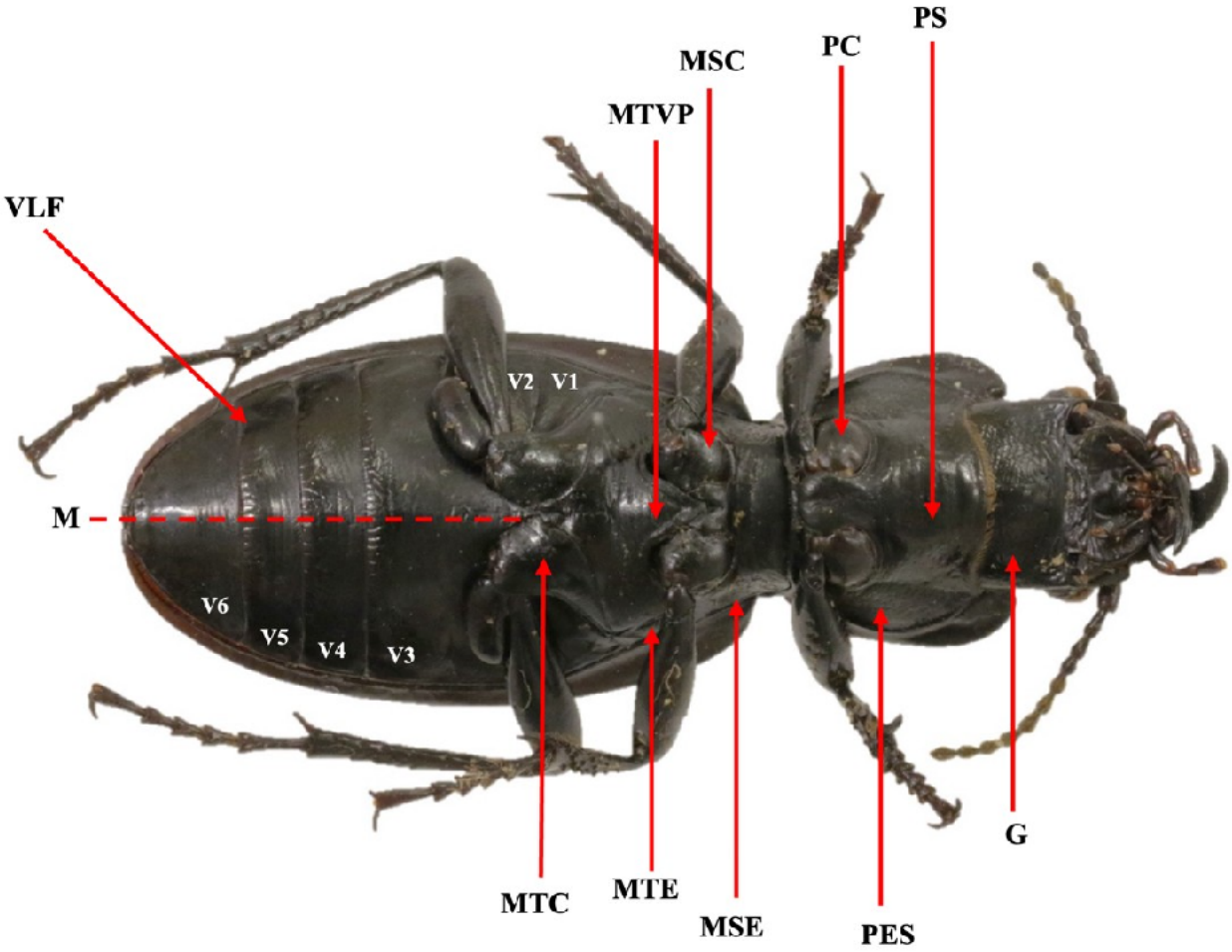

Figure 4. Ventral view of *M. laterale* depicting the taxonomic structures used in the species descriptions. (G) gena, (PS) prosternum, (PES) proepisternum, (PC) Procoxa, (MSE) mesepisternum, (MSC) mesocoxa, (MTE) metepisternum, (MTVP) metaventrite process, (MTC) metacoxa, (M) midline (dashed line not a taxonomic structure), (VLF) ventrite laterale foveae; V1–V6 = ventrites 1–6. [Adapted from Seldon & Buckley, 2019].

Key to *M. ducale* and *laterale* species groups

1. Mentum squared, with setose punctures (Figs 2, 3); elytra striae with asetose punctures stellate and pockmark-like ..... 2 *ducale* group
- Mentum rounded, without setose punctures (Figs 2, 3); elytral striae with regular asetose punctures indistinctly present .....5 *laterale* group

2. Medial region of elytra without asetose punctures and glabrous (7th interval setose punctures present), with deep pockmark-like punctures clustered laterally (Fig. 6DV) ... *M. ducale* Sharp
- Medial region of elytra with a few scattered or completely covered with asetose punctures, either regular, stellate and/or pockmark-like (Figs 5DV, 7DV, 8DV) 3

3. Asetose punctures on elytra forming irregularly stria medial region with scattered obsolescent stellate punctures to pockmark-like punctures laterally (Fig. 7DV) .....*M. kahurangi* **sp. n.**
- Random or striate distribution of asetose punctures, both regular and stellate, on elytra entire 4

4. Proepisternum (Fig. 4) rugose and pitted; asetose punctures on elytra randomly distributed entire; North Island only (Figs 5DV, 5VV) ..... *M. crenicolle* Castelnau
- Proepisternum (Fig. 4) with numerous punctures, rugosity absent; asetose stellate punctures on elytra more discernible, evenly spaced medially to irregularly striate and randomly distributed laterally (Figs 8DV. 8VV); South Island only ..... *M. venator* Broun

5. Submentum sclerite bearing 4 setae 6
- Submentum sclerite bearing 6 setae 7

6. Vertex groove with obsolescent scattered punctures (sometimes clustered medially); gena with fine isodiametric microsculpture (Figs 10DV, 10VV) ..... *M. altum* **sp. n.**
- Vertex groove strongly rugose entire, sometimes with sparse punctures; gena strongly rugose forming isodiametric microsculpture (Figs 12DV, 12VV) ..... *M. tititea* **sp. n.**

7. Mentum process broad, long and distinctly indentate; submentum sclerite narrow medially broadens laterally bearing 6 setae; elytra striae 1–4 with micro stellate asetose punctures, intervals with stellate microsculpture (distinctive look to eyes, confused) (Fig. 9DV) .... *M. allani* Fairburn
- Mentum process broad, short and moderately indentate; submentum sclerite broad entire bearing 6 setae; elytra striae 1–4 with indistinct regular asetose punctures evenly spaced, intervals 1–5 with stellate microsculpture (Fig. 11DV) ..... *M. laterale* Broun

Descriptions *M. ducale* group species (alphabetical order)

Mecodema crenicolle Castelnau, 1867.

Figures 5, 5(i).

Mecodema crenaticolle Redtenbacher, 1868 (Clevedon, AK, North Is.), **new synonym**.
Mecodema rugicolle Broun, 1882 (nr Taranaki, TK, North Is.), synonymised by Britton 1949.
Mecodema variolosum Broun, 1903 (Rotorua, BP, North Is.), synonymised by Britton 1949.
Mecodema lineatum Broun, 1894 (Ligar's Bush, AK, North Is.), synonymised by Lewis 1902.
Type locality: Auckland (AK), Hunua Ranges, Clevedon.

Diagnosis: Distinguishable from other *ducale* group species by having: **1**, the pronotum carina strongly crenulated; **2**, elytral striae 1–4 with large stellate asetose punctures in an irregular pattern, striae 5–7 with regular asetose punctures, irregularly spaced; **3**, an elytral setose puncture basad scutellum; **4**, North Island only.

Description: Length 21–27.9 mm, pronotal width 5.8–7.3 mm, elytral width 6.7–8.6 mm. Entire body reddish brown to black in colour.

Head: Broad and convex. Vertex with coarse transverse rugosity laterally, forming an isodiametric pattern toward pronotum; vertexal groove defined by punctures and coarse rugosity entire length

(Fig. 5DV); small supraorbital puncture bearing 3–4 setae, 3 ± well-defined supraorbital grooves anterad eyes, extended onto frontoclypeal area; frons with a few scattered punctures between supraorbital punctures, cuticle raised medially, a shallow depression each side of midline (anteriorly); frontoclypeal suture absent, tentorial pits indistinct within grooves; anterior area of clypeus with shallow grooves, 1 small setose puncture on each side bearing 2 setae (sometimes a medial puncture bearing 1 seta present) (Fig. 5DV). Labrum rounded laterally, anterior edge outwardly curved with 2 proximate central setae, 2 setae each side evenly spaced.

Head ventral (Fig. 2): Mentum lobes squared (Fig. 3), median process broad and short, apex slightly angled upward (15°), distinctly indentate; mentum setae present. Submentum sclerite constriction narrow medially, broadened laterally with 6 regularly spaced setae (Fig. 5VV). Stipes with 2 basal setae. Gula pits small, suture well-defined, gula flat with strong transverse lines. Gena convex and entirely covered with transverse, tightly spaced, fine rugose microsculpture that forms an isodiametric pattern laterally.

Prothorax: Prothoracic carina very narrow the entire length, distinctly crenulated with 6–10 relatively evenly spaced setae along each side (Fig. 5DV), extended to anterior angle; posterior lateral sinuation evidently carinate, parallel or slightly angled outward (very distinctive as it is formed by foveae groove); pronotum laterally deflected, disc with deep transverse grooves laterally (less impressed proximate the midline), overall shape cordate, medial impressions absent; pronotal foveae broad and deep (Fig. 5DV), partially formed by convexity of pronotal lateral margin; anterior edge distinctly inwardly curved, convexity forming ridge that is grooved perpendicular to anterior edge, posterior edge distinctly emarginated medially. Prosternum flat with a shallow depression each side of midline (Fig. 5VV); proepisternum moderately rugose and pitted.

Elytra: Narrow and deflected laterally, posterior end of elytra steep to apex; humeral angle anteriorly convergent; basal margin angled perpendicular to humeral angle and beveled to base; lateral carina very narrow from apex to humerus (may be broadened in posterior third) (Fig. 5DV), distinctly crenulated in anterior third to slightly crenulated in posterior third, extended to humeral angle, carina with a distinctive curve inwardly posterad humerus; humerus with 3 deep setose punctures; suture well-defined; stria 1 anterior area with small, asetose punctures in a row, medial punctures increased in size, apical punctures stellate; stria 2 defined by evenly distributed stellate punctures (Fig. 5DV), striae 3–5 obliterated by large stellate punctures in confused distribution, striae 6–8 more discernible as irregularly sized and spaced, asetose punctures (Fig. 5DV); intervals 1–2 visible, extended to scutellum but not defined by striae, interval 3 convex in posterior third, intervals 4–8 undefined; 7th stria with 4 setose punctures in anterior half, 4–6 setose punctures in posterior half, setose punctures large; a single seta each side near base end of stria 2.

Abdomen ventral: Mesepisternum (Fig. 5VV) with corrugose wrinkles; metepisternum moderately punctured, punctures continue to lateral area of ventrites 1–2; setose punctures present on mesocoxae (2) and metacoxae (3). Abdominal ventrites 1–2 finely lineate and finely micropunctate extended to coxa; ventrites 3–5 with 1 deep, setose puncture each side of midline, ventrites foveate laterally; ventrite 6 setae present: ♂ with a pair of setae each side, posterior edge straight; ♀ with 1 pair each side, 1 proximate apex, posterior edge a rounded point. Anterior metaventrite process is a short triangle with a very well-defined and broad carina the entire length (Fig. 5VV).

Male genitalia: Apical portion of penis lobe asymmetrically hooked (Fig. 5(i)PL) with a moderate deflection to right of vertical axis (ventral view); dorsal process a narrow and bluntly rounded hook,

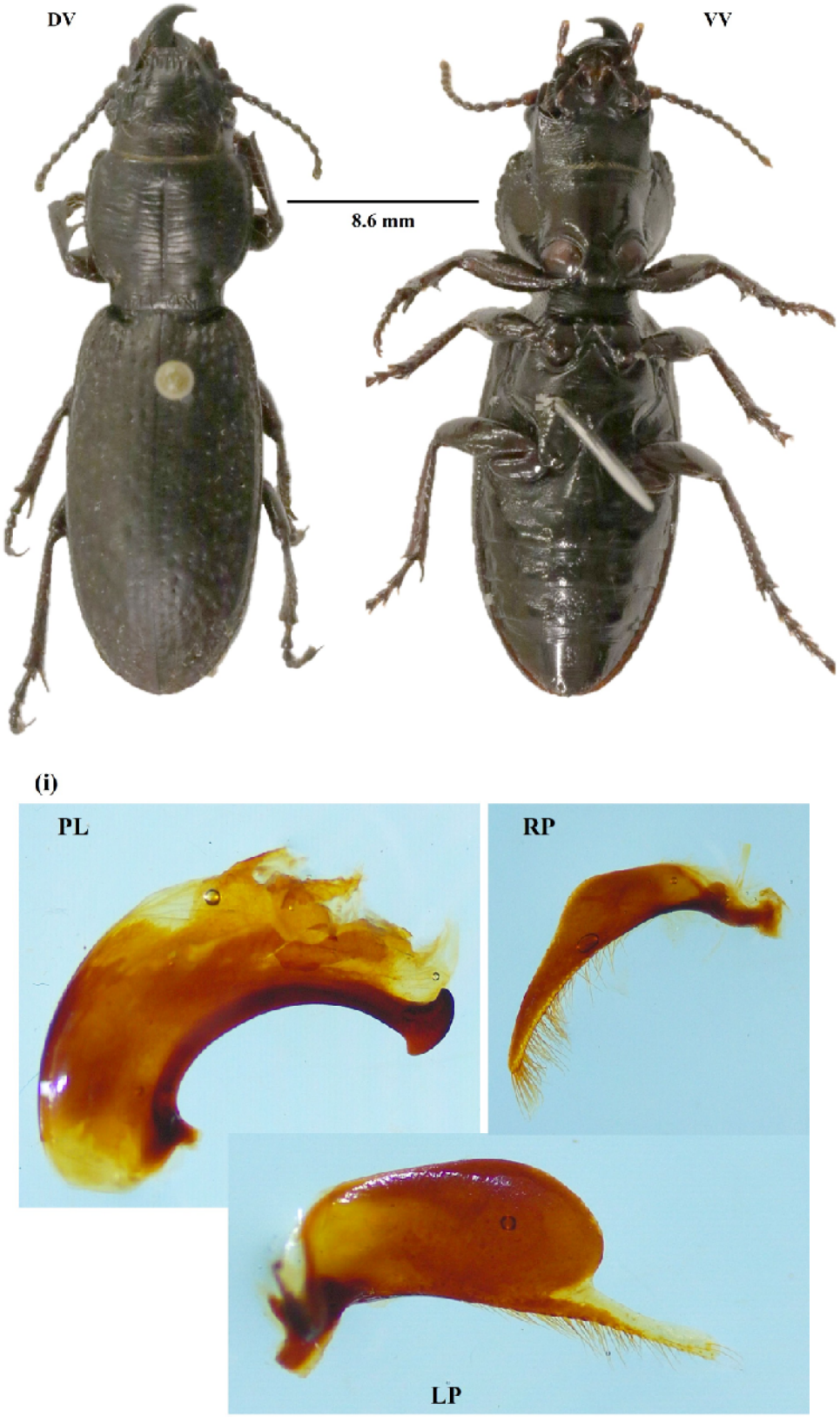

Figure 5. *Mecodema crenicolle* plate with habitus: dorsal view (DV) and ventral view (VV). Scale bar equals the widest point of the elytra of the specimen used for this habitus. **(i)** The three (detached) structures of the male aedeagus: the penis lobe (PL), the right paramere (RP) and left paramere (LP). No scale required.

slightly pushed forward of perpendicular, apex with an asymmetrical curve downward to form the ventral process (Fig. 5(i)PL), which is a very bluntly rounded point, half the size of the dorsal process; penis lobe shaft width equally narrow the entire length, apical portion straight (ventral view); overall length of penis lobe slightly curved ventrally (lateral view).

Structures of the endophallus: Lateral form of the apex of the central spicule pointed; dorsal form of the apex of the central spicule long and narrow; relative scales coverage of the apical plate moderate (26–75%); size of left setose flange large; size of right setose flange very large (long).

Parameres: Left paramere basal lobe rectangular with a very pronounced dorso-anterior hump (70–80°) angle sloping to arm; arm very narrow and continued to terminal lobe; terminal lobe short and broad, apical tuft with medium setae, sparsely scattered setae along apical third of ventral edge (Fig. 5(i)LP); ventral edge of basal lobe straight. Right paramere triangular with a pronounced anterio-dorsal hump (Fig. 5(i)RP), arm longer than basal lobe, a double row of long setae reducing in number along apical two-thirds of ventral edge.

Female genitalia: Basal gonocoxite 1 long and broad with ventral surface smooth, internal dorso-lateral carina with 4 short setae. Gonocoxite 2 a rounded triangle, paddle-like, ventral surface with numerous sensilla. Rami long and narrow.

Comments: There is some variation in pronotal and elytral characters among North Island populations, but the umbilitical setose punctures of humerus are stable. *Mecodema crenicolle* is widespread from the Wellington Region to the Hunua Ranges, Auckland, with the western populations of Whanganui and Mt. Taranaki showing the most external morphological variation.

Geographical distribution: New Zealand, North Island, Auckland (AK), Bay of Plenty (BP), Coromandel (CL), Waikato (WO), Taupo (TO), Taranaki (TK), Rangitikei (RI), Whanganui (WI), Wellington (WN) (see Seldon & Buckley, 2019).

Holotype. Type in the Museum of Natural History, Vienna (*Not viewed by authors, but viewed by Britton (1949), who stated that the paratypes match the holotype*).

Paratypes. (*viewed by DSSeldon*): BMNH, male labelled. 2594. ♂ [hw] / Type [round label with red border] / New Zealand [red underline] Broun Coll. Brit Mus. 1922—482 / Ligar's Bush. Papakura [hw] / *Mecodema lineatum* [hw] / *Mecodema crenaticolle* Redt. [hw] Compared to type E.B.B.; BMNH. Type [round label with red border] / 1322 / New Zealand [red underline] Broun Coll. Brit Mus. 1922—482 / Taranaki / card-mounted male genitalia / *Mecodema rugicolle* [hw].

Syntype. MCNG (*viewed by DSSeldon*), male labelled. Auckland Coll. Castelnau [hw, black border] / genitalia card mounted / TYPUS [red font, reb border] / *crenicolle* Cast. [hw, black border] / *crenicolle* Cast. [hw, black border] / SYNTYPUS *Mecodema crenicolle* Castelnau 1867 [red label].

Other material examined. 1♀, New Zealand, AK, Hunua Range, 16.IX.1997, Larochelle, Larivière / walking in pasture, near tree / NZAC04166434; 1♂, New Zealand, CL, Maumaupaki Track, 6.XII.1993–2.I.1994, Larivière, Larochelle / Moist for., (tawa-supplejack-*Coprosma*): rich litter, Pit traps / NZAC04165154; 1, New Zealand, BP, Mt. Te Aroha, Tui Mine area, regen forest, pitfalls, 1–19.OCT.2010, D.S. Seldon / DNA CAR96 / CARABIDAE, Broscini, *Mecodema crenaticolle,* Det. D.S. Seldon 2019 / NZAC04254842; 1♀, New Zealand, TO, Tongariro NP, Mangawhero Forest Walk, 700 m, 14.III.1998, Larivière, Larochelle / Wet podocarp-broadleaf

forest, under logs / NZAC04165205; 1♀, New Zealand, TK, Mt. Messenger For., Mokau Rd–Whitecliffs tk, 250 m, -38.5345 S 174.3550 E, 6.XII.1999, Larivière, Larochelle / wet broadleaf forest: under fallen nikau palm sheaths / NZAC04162810; 1♂ (specimen and genitalia), New Zealand, TK, Mt. Messenger For., Mokau Rd-Whitecliffs Tk, 250 m, -38.5345 S 174.3550 E, 6.XII.1999, Larivière, Larochelle / Wet broadleaf forest: under fallen epiphyte crowns / NZAC04165813; 1♂, New Zealand, TK, Pouakai Ra., 9–13.Jan.1978, J.C. Watt, Pit trap / *Mecodema crenaticolle* Redt. Det. J.C. Watt 1978 / NZAC04166636 [genitalia in tube]; 1♂ (specimen and genitalia), New Zealand, WO, Pirongia FP., Ruapane Tk, (Grey Rd end), 400 m, 18.X.1996, Larochelle, Larivière / Wet broadleaf forest, under logs / NZAC04166842 [genitalia stored in tube]; 1♀ (specimen and genitalia), New Zealand, WO, Te Tapui Sce. Res., Maungakawa, 200 m, -37.5030 S 175.3930 E, 6.XII.2000–4.I.2001, Larochelle, Larivière / Wet broadleaf forest, along gully stream, pit traps / NZAC04169611 [genitalia in tube].

Mecodema ducale Sharp, 1886

Figures 6, 6(i).

Type locality: Buller (BR), Ahaura nr. Greymouth.

Diagnosis: *Mecodema ducale* is distinguishable from other species within the *ducale* group by having the following characteristics: **1,** clypeus with medial setose puncture; **2,** medial region of elytra without asetose punctures and smooth; **3,** termination point of elytral interval 1 absent; **4,** elytral striae laterally defined; **5,** striae 1–5 absent; **6,** shape of apical portion of penis lobe flabellate.

Description: Length 24.5–31 mm, pronotal width 5.9–8.1 mm, elytral width 6.9–9.8 mm. Colour of entire body matte black, except for coxae and tarsi, which are deep reddish-brown to black.

Head: Narrow and flat. Vertex rugosity entire; vertexal groove defined by medial punctures (Fig. 6DV), faint transverse rugosity laterally present; small supraorbital punctures bearing 4–5 setae; supraorbital grooves well-defined and deep, anterad eyes extended onto frontoclypeal area; frons with strong rugosity, cuticle raised medially, 2 large shallow depression each side of midline (anteriorly) (Fig. 6DV); frontoclypeal suture well-defined, tentorial pits large; anterior area of clypeus narrowly grooved, 1 small setose puncture on each side bearing 2 setae (a medial puncture bearing 1 pair of seta may be present). Labrum rectangular, anterior edge outwardly curved with 2 proximate central setae, 2 evenly spaced setae on each side.

Head ventral (Fig. 2): Mentum lobes squared, median process broad and short, apex slightly angled upward (15°), moderately indentate; mentum setae present (bearing 2 setae). Submentum sclerite constriction narrow (Fig. 6VV), broadened laterally with 6 setae (sometimes only 4 setae). Stipes with 2 basal setae (occasionally 3 setae present). Gula pits small, suture well-defined; gula flat with transverse rugosity. Gena convex, fine rugosity entire forming an isodiametric pattern laterally.

Prothorax: Prothoracic carina, narrow the entire length (Fig. 6DV), distinctly crenulated with 11–14 evenly spaced setae along each side, extended to anterior angle; posterior lateral sinuation distinctly sinuate and outwardly angled. Pronotum broadly convex, pronotal disc with transverse rugosity (faintly impressed proximate midline), pronotal punctures absent, midline well-defined; medial impressions present (outer regions of pronotum faintly bulged); pronotal foveae deep and broad

(Fig. 6DV); anterior edge distinctly curved inwards; pronotum posterior edge sinuate. Prosternum flat bearing faint transverse lines (Fig. 6VV); proepisternum sparsely punctate.

Elytra: Narrow and laterally convex, humeral angle anteriorly convergent; basal margin distinctly curved and steep to base; elytral setose puncture present basad scutellum; interval 1 termination point absent; lateral carina broad the entire length (Fig. 6DV), extended to humeral angle; humerus bearing 3 deep setose punctures; suture well-defined; striae 1–5 absent, medial region of elytra without asetose punctures and smooth (Fig. 6DV); striae 6–8 irregular sized asetose punctures with a confused distribution, and laterally defined; 7th stria with 4 setose punctures in both anterior and posterior halves; setose punctures small. Elytral intervals 1–9 slightly convex. Posterior end of elytra with 2 setae each side of stria 2.

Abdomen ventral: Mesepisternum densely punctate; metepisternum finely lineate. Setose punctures present on mesocoxa (2) and metacoxae (2). Abdominal ventrites 1–2 with lineate microsculpture and punctures that extend to coxa; ventrites 3–5 with 1 deep setose puncture on each side of midline (faint punctures present on lateral edge of ventrite 3); ventrites with lateral foveae. Ventrite 6 ambulatory setae present (Fig. 6VV): ♂ with 1 pair of setae, posterior edge straight; ♀ with 3 pairs of setae, posterior edge rounded and blunt. Anterior metaventrite process triangular with a broad carina apically, that narrows laterally (Fig. 6VV).

Male genitalia: Apical portion of penis lobe asymmetrically hooked and moderately deflected to right of vertical axis (ventral view); overall shape of apical portion of penis flabellate (semi-circular or fan-like) (Fig. 6(i)PL). Dorsal process with a very blunt rounded hook, narrow the entire length, apex distinctly curved upwards. Ventral process curved downwards forming a smooth rounded point, half the size of dorsal process; penis shaft equally narrow entire length; ventral edge straight (ventral view), overall length of the penis lobe distinctly curved ventrally (lateral view).

Structures of the endophallus: lateral form of the apex of central spicule bluntly pointed; dorsal form of the apex of the central spicule narrow and long; relative scales coverage of the apical plate extensive (76–100%); size of left setose flange large; right setose flange very large (broad laterally).

Parameres: Left paramere basal lobe rectangular with a very pronounced dorso-anterior hump forming an 80–90° angle to a long and narrow arm (Fig. 6(i)LP); terminal lobe short and narrow with an apical tuft of sparse short setae. Ventral edge of basal lobe straight with sparse setation along the entire length. Right paramere narrow and triangular, with a double row of long contiguous setae along apical two-thirds (Fig. 6(i)RP).

Female genitalia: Basal gonocoxite 1 short and broad with a slight rugose ventral surface, internal dorso-lateral carina with 2 short setae. Gonocoxite 2 a rounded triangle (apical edge recurved), ventral surface bearing numerous sensillar pits. Helminthoid sclerite broadly long. Spermatheca long and narrow. Rami short and broad.

Comments: The range of *M. ducale* overlaps with its sister species, *M. venator*, and other *Mecodema* species, but is easily identifiable by the absence of asetose punctures along the medial region of the elytra and the shape of penis lobe.

Geographical distribution: New Zealand, South Island, Buller (BR) and Nelson (NN) (Fig. 1).

Holotype. BNHM female specimen labelled. Card-mounted sternites, Type H.T. [round glued label, red border surrounding white, typed] / Greymouth [underlined red], New Zealand. Helms. [typed] /

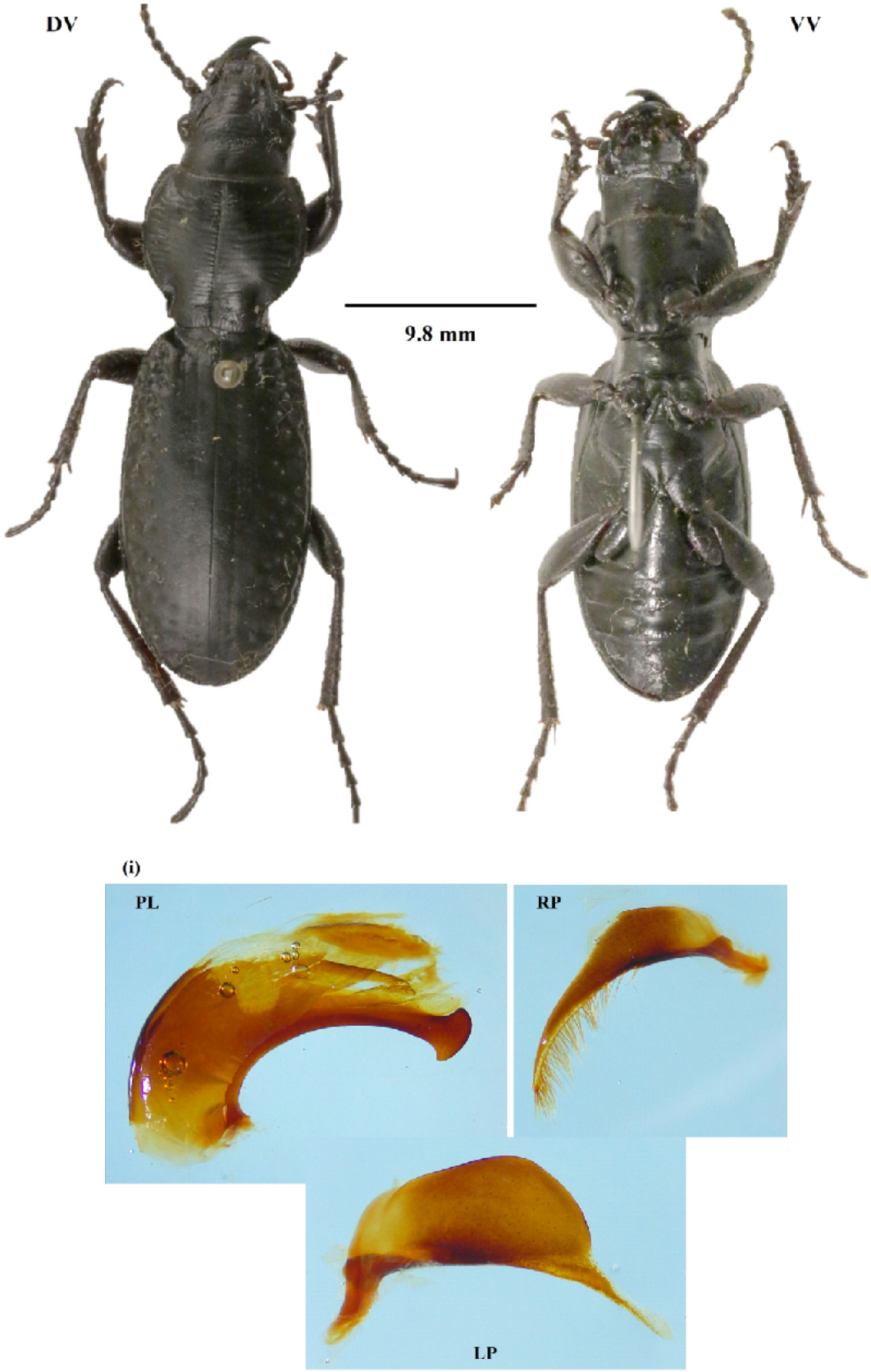

Figure 6. *Mecodema ducale* plate with habitus (left): dorsal view (DV) and ventral view (VV). Scale bar equals the widest point of the elytra of the specimen used for this habitus. **(i)** The three (detached) structures of the male aedeagus: the penis lobe (PL), the right paramere (RP) and left paramere (LP). No scale required.

Mecodema ducale n. sp., ♀, Type D.S. Ohoura, Greymouth, NZ. Helms.1884 [all hw] / HOLOTYPE *Mecodema ducale*, Sharp 1886 [hw], det. R.G. Booth 2005 [typed] / Sharp Coll. 1905-313 [typed] / VI [typed] / NMHUK 015666086 [typed].

Other material examined. 1, New Zealand, NN, Orowaiti River Res., Westport, 11.02.1986, J.I. Townsend / J.I. Townsend Collection / NZAC04168900; 1, New Zealand, NN, Denniston, W. Coast, 2000', 1.11.1965, A.C. Eyles / *Mecodema ducale* Sharp, 1886, Det. A. Larochelle / NZAC04005115; 1♀, New Zealand, BR, Maruia Bridge nr. Springs Junction, 4.2.1978, J.I. Townsend / *Mecodema ducale* Det. J.I. Townsend / NZAC04168740; 1, New Zealand, BR, Charleston, 18.Jan.1969, J.I. Townsend / *Mecodema ducale* Sharp, 1886, Det. A. Larochelle / NZAC04005112; 1♂, New Zealand, BR, Lake Daniells, Maruia, 6.Jan.1968, J.I. Townsend / J.I. Townsend Collection / NZAC04166092; 1♂ (specimen and genitalia), New Zealand, NN, Oparara Basin, Moria, 13–19.11.1957, E.S. Gourlay / NZAC04005132 [genitalia in tube]; 1♀ (specimen and genitalia), New Zealand, BR, Carter's Beach Bush, Westport, 09.X.1969, J.I. Townsend / NZAC04005119 [genitalia in tube].

***Mecodema kahurangi* sp. n.**

Figures 7, 7(i).

Type locality: Nelson (NN), West Coast Heaphy Track nr. Nettle Beach.

zoobank.org:act:6D6566B4-68CD-4CA6-BC73-84340A725BA0

Diagnosis: *Mecodema kahurangi* is distinguishable from other species within the *ducale* group by having the following characteristics: **1,** prosternum with few micro punctures and transverse lines; **2,** elytral interval 1 faintly extended to scutellum; **3,** elytral medial regions bearing faint stellate asetose punctures; **4,** elytral intervals 1–4 with faint stellate asetose punctures (sometimes indistinct); **5,** apical portion of the penis lobe resembling a curved hook (Fig. 7(i)PL).

Description: Length 21.5–27.5 mm, pronotal width 5.7–7.5 mm, elytral width 7.0–8.6 mm. Entire body matte black, coxae and tarsi with a deep reddish-brown colour.

Head: Narrow and flat. Vertex with transverse rugosity, laterally; vertexal groove defined by punctures the entire length (clustered medially, more sparse laterally) (Fig. 7DV); small supraorbital puncture bearing 3–4 setae, 2–3 well-defined and deep supraorbital grooves anterad eyes, extended to frontoclypeal area; frons with fine transverse rugosity between supraorbital punctures; cuticle faintly raised medially, a large shallow depression each side of midline (Fig. 7DV); frontoclypeal suture well–defined, tentorial pits small; anterior area of clypeus narrowly grooved, 1 small setose puncture each side bearing 2 setae. Labrum rectangular laterally; anterior edge straight with 2 proximate central setae, 2 evenly spaced either side of the midline.

Head ventral (Fig. 2): Mentum lobes squared (Fig. 3), median process broad and short, apex slightly angled upward (15°), moderately indentate; mentum bearing 2 setae (sometimes 3 setae present) (Fig. 7VV). Submentum sclerite constriction narrow, broadened laterally with 6 regularly spaced setae (Fig. 7VV). Stipes with 2 basal setae. Gula pits small, suture well-defined; gula flat with fine transverse rugosity. Gena convex, rugosity entire forming an isodiametric pattern laterally.

Prothorax: Prothoracic carina narrow entire length, distinctly crenulated with 11–14 evenly spaced setae along each side (Fig. 7DV), extended to anterior angle; posterior lateral sinuation slightly

sinuate and parallel. Pronotum broadly convex, pronotal disc with fine transverse rugosity (punctures absent), overall shape cordate (Fig. 7DV); midline well-defined; medial impressions absent; pronotal foveae deep and broad; anterior edge slightly curved inwards; pronotum posterior edge sinuate. Prosternum flat with few micro punctures and transverse lines (Fig. 7VV). Proepisternum with numerous punctures.

Elytra: Narrow and laterally convex; humeral angle anteriorly convergent; basal margin distinctly curved and steep to base; setose puncture present basad scutellum; interval 1 extended to scutellum, but indistinct; lateral carina broad in anterior and posterior thirds, medially narrow (Fig. 7DV), and extended to humeral angle; humerus with 3 deep setose punctures; suture well-defined; asetose punctures along the elytral striae obsolescent to well-defined, striae 1–4 with faint stellate asetose punctures, striae 5–8 defined by unevenly sized non-stellate asetose punctures confusedly distributed (Fig. 7DV); 7th stria with 5 setose punctures in anterior half, and 4 setose punctures in posterior half; setose punctures small. Elytral intervals with stellate micro punctures (specifically on medial region), with intervals 1–4 flat to slightly convex; intervals 5–9 slightly convex. Posterior end of elytra with two setae on each side of stria 2.

Abdomen ventral: Mesepisternum densely punctate; metepisternum with lateral rugosity. Setose punctures present on mesocoxa (2) and metacoxae (2). Abdominal ventrites 1–2 with a combination of lineate micro-sculptures and punctures extended to coxa, ventrites 3–5 with a single deep setose puncture on each side of midline, lineate micro-sculptures and faint punctures, laterally; ventrites with lateral foveae present (Fig. 7VV). Ventrite 6 ambulatory setae present: ♂ with 1 pair of setae posterior edge straight; ♀ with 3 pairs of setae, posterior edge a bluntly rounded. Anterior metaventrite process triangular with an apically broadened carina, that narrows laterally (Fig. 7VV).

Male genitalia: Apical portion of penis lobe asymmetrically hooked (Fig. 7(i)PL) with a slight deflection to right of vertical axis (ventral view); overall shape of apical portion of penis resembling a curved hook (Fig. 7(i)PL). Apex slightly curved upwards and flattened to smoothly rounded forming a slightly broad dorsal process; apical ventral edge of shaft curved downwards forming a bluntly rounded and narrow ventral process that is pushed forward of vertical axis (Fig. 7(i)PL). Penis shaft is narrow the entire length, ventral edge straight (ventral view), overall length of the penis lobe with a straight to slight curve (lateral view) (Fig. 7(i)PL).

Structures of the endophallus: Lateral form of the apex of central spicule pointed; dorsal form of the apex of the central spicule expanded; relative scales coverage of the apical plate with moderate (26–75%); size of left setose flange large; right setose flange very broad.

Parameres: Left paramere basal lobe rectangular (Fig. 7(i)LP) with a pronounced dorso-anterior hump forming a 90° angle to a long and broad arm; terminal lobe short and narrow without setae. Ventral edge of basal lobe straight and without setae. Right paramere narrow and triangular, with ventral edge bearing a double row of contiguous setae along apical two-thirds (Fig. 7(i)RP).

Female genitalia: Basal gonocoxite 1 long and broad, ventral surface covered with a few rugose wrinkles, internal dorso-lateral carina bearing 2 short setae. Gonocoxite 2 a rounded triangle (paddle-like) with a recurved apical edge and without subapical setae, ventral surface bearing numerous sensilla. Helminthoid sclerite broad and long. Spermatheca long and narrow. Rami long and broad.

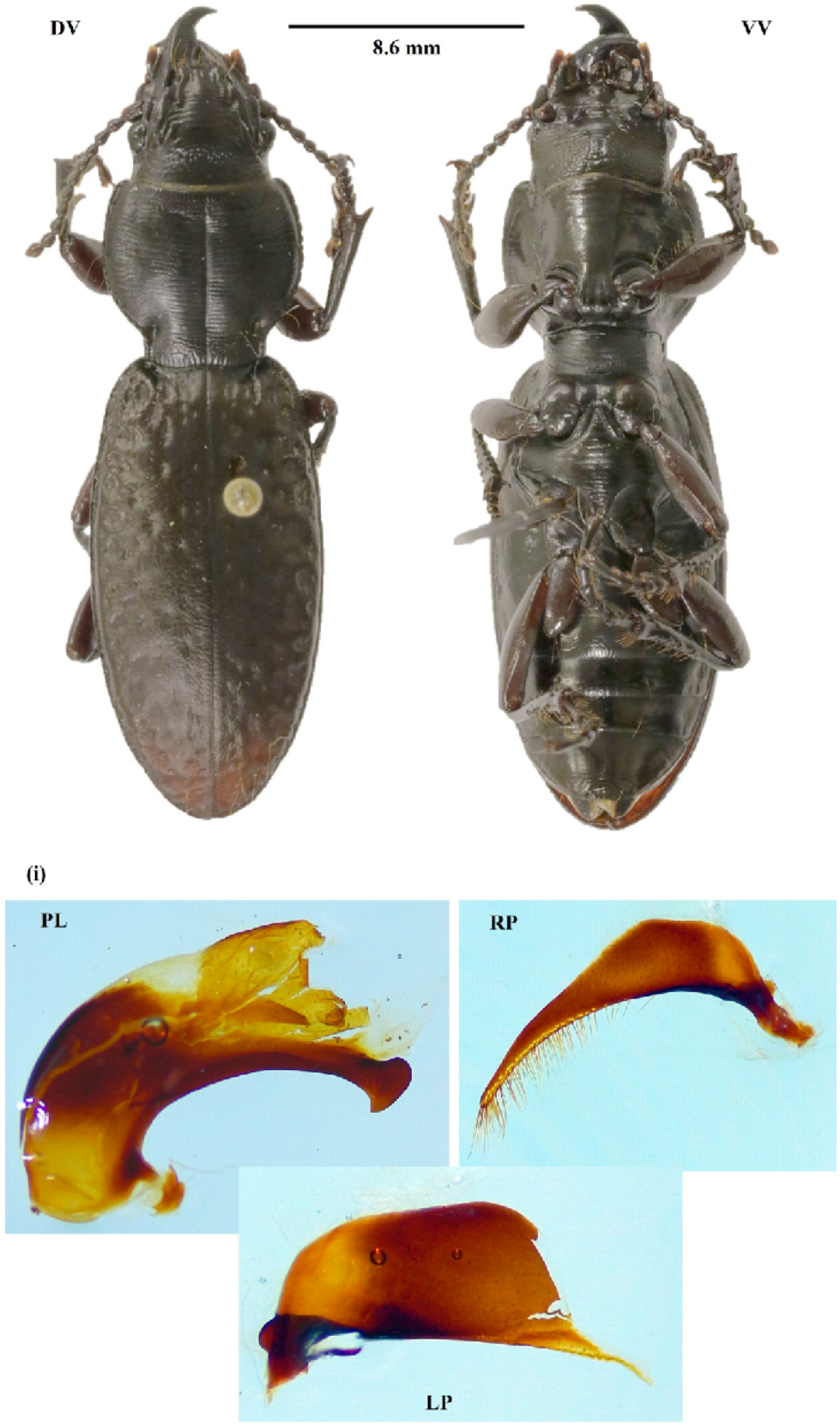

Figure 7. *Mecodema kahurangi* plate with habitus (left): dorsal view (DV) and ventral view (VV). Scale bar equals the widest point of the elytra of the specimen used for this habitus. **(i)** The three (detached) structures of the male aedeagus: the penis lobe (PL), the right paramere (RP) and left paramere (LP). No scale required.

Comments: All specimens are found west and south of the Heaphy River, which seems to be a natural barrier between *M. kahurangi* and *M. ducale*. Range extends south to the northern bank of Kōhaihai River (western end of Heaphy Track).

Geographical distribution: New Zealand, South Island, Nelson (NN), Kahurangi National Park, Heaphy Track (Fig. 1).

Holotype male labelled. NZAC. New Zealand, NN, Heaphy Tk, nr. Nettle Bch, 12.Nov.1998, G. Hall, coastal forest / broadleaf forest, walking on moist sand / HOLOTYPE *Mecodema kahurangi* n. sp. design. HM Fong 2024 [red label] / NZAC04168901 [genitalia in tube].

Paratypes. 1♀, New Zealand, NN, Heaphy Tk, nr. Nettle Bch, 12.Nov.1998, G. Hall, coastal forest / broadleaf forest, walking on moist sand / PARATYPE *Mecodema kahurangi* n. sp. design. HM Fong 2024 [blue label] / NZAC04263650 [genitalia in tube]; 1♀, New Zealand, NN, Heaphy Track – Lewis Hut, 07.Nov.1998, G. Hall, R. Leschen, under logs / PARATYPE *Mecodema kahurangi* n. sp. design. HM Fong 2024 [blue label] / NZAC04263649; 1♂, New Zealand, NN, Heaphy Tk, nr. Nettle Bch, coastal forest, 12.Nov.1998, G. Hall, coastal forest / broadleaf forest, walking on moist sand / PARATYPE *Mecodema kahurangi*, Det. HM Fong 2024 [blue label] / NZAC04263651; 1, New Zealand, NN, just S. of Swan Burn, Heaphy Track, 16.05.1978, J.I. Townsend / J.I. Townsend Collection / PARATYPE *Mecodema kahurangi*, Det. HM Fong 2024 [blue label] / NZAC04162816; 1♀, New Zealand, NN, Heaphy Track – Lewis Hut, 07.Nov.1998, G. Hall, R. Leschen, under logs / PARATYPE *Mecodema kahurangi*, Det. HM Fong 2024 [blue label] / NZAC04263649.

Other material examined. 1♀, New Zealand, NN, Kōhaihai campsite, Heaphy Track, Nikau Walk / nikau forest, under large rock, 29.Mar.2025, DS Seldon, J Vince / CARABIDAE, Broscini, *Mecodema kahurangi*, Det. DS Seldon, 2025 / NZAC04260230; 1, NN, mouth of Heaphy River / N.W. Nelson, 25.Feb.1971, B.W. Ramsay / CARABIDAE, Broscini, *Mecodema kahurangi*, Det. DS Seldon, 2025 / NZAC04005089; 1, NN, Heaphy River mouth, Aug.1963, M. Sinclair / CARABIDAE, Broscini, *Mecodema kahurangi*, Det. DS Seldon, 2025 / NZAC04162450; 1♂, Heaphy Hut-Lewis Hut, Heaphy River, Nelson, P.M. Johns, 24.XI.1974 / *Mecodema crenicolle* Castelnau 1867, det. P.M. Johns / CARABIDAE, Broscini, *Mecodema kahurangi*, Det. DS Seldon, 2025 / CMNZ 2007.163.2932; 1♀, Heaphy Hut-Lewis Hut, Heaphy River, Nelson, P.M. Johns, 24.XI.1974 / *Mecodema crenicolle* Castelnau 1867, det. P.M. Johns / CARABIDAE, Broscini, *Mecodema kahurangi*, Det. DS Seldon, 2025 / CMNZ 2007.163.2931; 1, NEW ZEALAND, NN, Heaphy Track, between Lewis & Heaphy Huts, 14.I.1995 R.R. Scott on track / *Mecodema kahurangi* Det. DS Seldon, 2025 / LUNZ00002358; 1, Nikau Grove, Scot's Beach, Nth of Kohaihai R., Heaphy Track. 30.IX.1975, R.P. Pottinger. / *Mecodema kahurangi* Det. DS Seldon, 2025 / LUNZ00002348.

Etymology. *Mecodema kahurangi* is named after Kahurangi National Park, which is the location of the Heaphy Track and type locality where the species is collected. Kahurangi is the second largest national park in Aotearoa and holds a great diversity of flora and fauna.

Mecodema venator Broun, 1883, revised status

Figures 8, 8(i).

Mecodema variolosum Broun, 1903 (Type Locality: Lake Rotorua, KA, South Is.), **new synonym.**

Mecodema attenuatum Broun, 1908 (Type locality: Tapawera, NN), synonymised by Britton 1949.

Mecodema ventriculum Broun, 1923 (Type locality: Nelson, NN), synonymised by Britton 1949.

Diagnosis: *Mecodema venator* is distinguishable from other species within the *ducale* group by having the following characteristics: **1,** vertexal groove punctured entire length; **2,** pronotal disc with anterior and posterior medial impressions; **3,** prothoracic carina distinctly crenulated; **4,** elytral striae 1–4 with fine stellate asetose punctures in an irregular pattern; **5,** striae 5–7 with large non-stellate asetose punctures; **6,** stria 8 with unevenly sized asetose punctures in a confused pattern; **7,** apical portion of penis lobe almost reniform (Fig. 8(i)PL).

Description: Length 21–27.9 mm, pronotal width 5.8–8.5 mm, elytral width 7.5–10 mm. Colour of entire body reddish-brown to black with legs showing most of the characteristic reddish-brown colour.

Head: Broad and convex. Vertex with transverse rugosity laterally; vertexal groove punctured the entire length (Fig. 8DV); small supraorbital puncture bearing 3–4 setae, 3 well-defined supraorbital grooves anterad eyes, extended onto frontoclypeal area (Fig. 8DV); frons with fine rugosity scattered between supraorbital punctures; a shallow depression each side of midline; frontoclypeal suture indistinct, tentorial pits small; anterior area of clypeus narrowly grooved, a single setose puncture present each side bearing 2 setae (occasionally with a medial puncture bearing 1–2 setae) (Fig. 8DV). Labrum rounded laterally, anterior edge slightly emarginated with 2 proximate central setae, 2 setae evenly spaced laterally.

Head ventral (Fig. 2): Mentum lobes squared (Fig. 3), median process broad and short, apex angled upward (30°), distinctly indentate; mentum setae present. Submentum sclerite constriction narrow, broadened laterally with 6 setae regularly spaced (Fig 8VV). Stipes with 2 basal setae. Gula pits small, suture well-defined; gula flat with transverse rugosity. Gena convex, fine rugosity entire forming an isodiametric pattern laterally.

Prothorax: Prothoracic carina narrow the entire length, distinctly crenulated with 7–10 evenly spaced setae along each side (Fig. 8DV), extended to anterior angle; posterior lateral sinuation distinctly sinuate and parallel; pronotum broadly convex, pronotal disc with transverse rugosity (strongly impressed proximate midline), overall shape cordate; midline well-defined; anterior (1 indentation) and medial impressions (2 indentations each side) present; pronotal foveae deep and broad (Fig. 8DV); anterior edge slightly curved inwards; pronotum posterior edge sinuate. Prosternum surface flat with fine transverse lines (Fig. 8VV); proepisternum with numerous punctures.

Elytra: Broad and laterally convex; humeral angle anteriorly convergent; basal margin moderately curved and beveled to base; setose puncture present basad scutellum; interval 1 extended to scutellum; lateral carina broad in posterior third (Fig. 8DV), extended to humeral angle; humerus with 3 deep setose punctures; suture well-defined; striae 1–4 with a row of fine stellate asetose punctures (Fig. 8DV), distributed in an irregularly striate pattern; striae 5–7 concealed by large non-stellate punctures with a confused distribution; stria 8 defined by asetose punctures that are unevenly sized and scattered (Fig. 8DV); 7th stria with 4 setose punctures in both anterior and posterior halves; setose punctures small. Elytral intervals stellate in appearance, with intervals 1–6 having an indistinct convexity, intervals 7–9 are moderately convex. Posterior end of elytra with

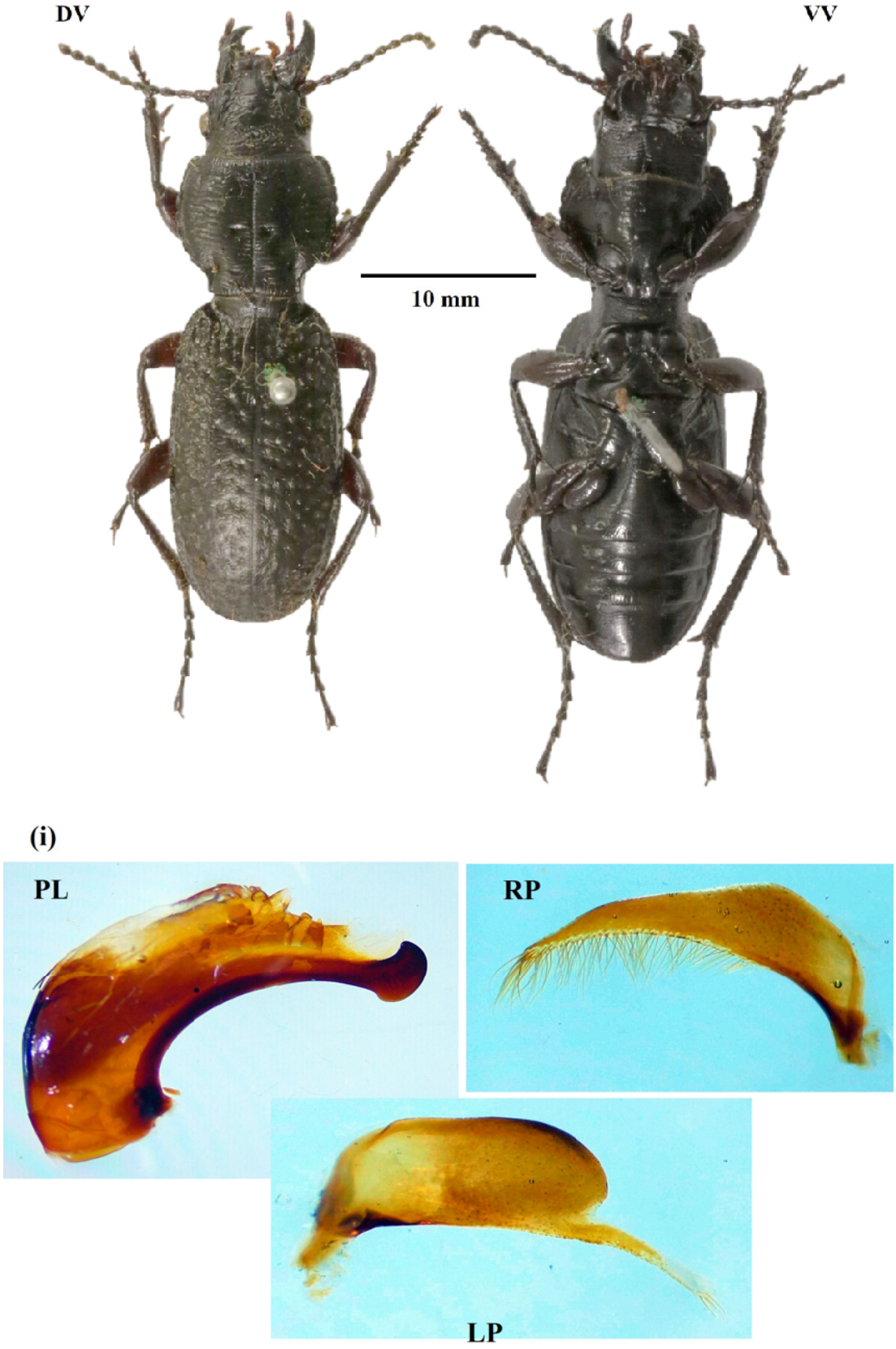

Figure 8. *Mecodema venator* plate with habitus (left): dorsal view (DV) and ventral view (VV). Scale bar equals the widest point of the elytra of the specimen used for this habitus. **(i)** The three (detached) structures of the male aedeagus: the penis lobe (PL), the right paramere (RP) and left paramere (LP). No scale required.

two setae each side of stria 2.

Abdomen ventral: Mesepisternum and metepisternum densely punctuate. Setose punctures present on mesocoxae (2) and metacoxae (3). Abdominal ventrites 1–2 with micro-punctures extending to coxa; ventrites 3–5 with 1 deep setose puncture each side of midline; ventrites with lateral foveae (Fig. 8VV). Ventrite 6 with ambulatory setae: ♂ with 1 pair of setae, posterior edge straight; ♀ with 1–3 pairs of setae, posterior edge roundly pointed (sometimes indistinctly emarginated medially). Anterior metaventrite process a short triangle with a distinctive and broad carina the entire length (Fig. 8VV).

Male genitalia: Apical portion of penis lobe asymmetrically hooked with a moderate deflection to right of vertical axis (ventral view) (Fig. 8(i)PL); overall shape of apical portion of penis almost reniform (Fig. 8(i)PL). Dorsal process with a broad, blunt rounded hook that is faintly pushed upright; apex with an asymmetrical curve downward to form the ventral process. Ventral process narrow, with a smooth rounded point, half the size of dorsal process; penis shaft equally narrow the entire length; ventral edge straight (ventral view), overall length of the penis lobe straight with a slight curved (lateral view) and slightly arched (Fig. 8(i)PL).

Structures of the endophallus: Lateral form of the apex of the central spicule sharply pointed and ensiform (sword-like); dorsal form of the apex of the central spicule long and narrow; relative scales coverage of the apical plate moderate (26–75%); size of left setose flange small; size of right setose flange large.

Parameres: Left paramere basal lobe rectangular with a small dorso-anterior hump forming a 60° angle to a very narrow and elongated arm (Fig. 8(i)LP); terminal lobe short and broad with an apical tuft of a few short setae. Ventral edge of basal lobe slightly curved**,** setae absent. Right paramere narrow and triangular, with ventral edge bearing a double row of contiguous setae along apical two-thirds (Fig. 8(i)RP).

Female genitalia: Basal gonocoxite1 short and broad with a rugose ventral surface, internal dorso-lateral carina bearing 3 long setae. Gonocoxite 2 a rounded triangle (resembles a paddle), without subapical setae, ventral surface bearing numerous sensillar pits with faint crenulations on the internal edge. Helminthoid sclerite broadly long with its apical portion projecting; Spermatheca long and narrow. Rami short and narrow.

Comments: *Mecodema venator* is the most widely distributed South Island species within the *ducale* group. All South Island specimens previously assigned to *M.crenicolle* are here referred to as *M. venator*, with *M. crenicolle* now restricted to the North Island.

Geographical distribution: New Zealand, South Island, Buller (BR), Kaikoura (KA), Marlborough (MB), Marlborough Sounds (SD) and Nelson (NN) (Fig. 1).

Holotype male labelled. BMNH specimen labelled. Type [round label with red border] / 1452 [hw] / New Zeal. Broun Coll. Brit. Mus. 1922-482 / Wangapeka / *Mecodema venator* [hw] / NHMUK015666085.

Other material examined. 1♂, New Zealand, BR, Buller Valley Lake Station, 21.Sep.1994, J. Klimaszewski / in forest on terrace / *Mecodema venator* Det. DS Seldon 2025 / NZAC004164501; 1♂, New Zealand, MB, Tunakino Vly, nr. Rai, 20.4.1972, R.J.B. Power / Pitfall in bush / *Mecodema venator* Det. DS Seldon 2025 / NZAC041652215; 1, New Zealand, MB, Cave Stream, Leatham

River, 22.09.1973, J.I. Townsend / *Mecodema venator* Det. DS Seldon 2025 / NZAC04005078; 1♂, New Zealand, MB, Tunakino Vly, nr. Rai, 8.XI.1986, R.J.B. Power / under log in open bush / *Mecodema venator* Det. DS Seldon 2025 / NZAC04169020; 1♀, New Zealand, NN, W of Tadmor Riv., Nr. Tui, 5.8.1969, J.I. Townsend / *Mecodema venator* Det. DS Seldon 2025 / NZAC04005091 [genitalia in tube]; 1♀, New Zealand, NN, Harwoods Hole, 24.II.1993, A Larochelle / wet *Nothofagus* for., Pit traps / *Mecodema venator* Det. DS Seldon 2025 / [genitalia in tube]; 1, New Zealand, NN, Canaan Track, 5.12.1956, B.B. Given / *Mecodema venator* Det. DS Seldon 2025 / NZAC04162549; 1♂, New Zealand, BR, Lake Rotoiti, 26.Dec.1979–04.Jan.1980, A.K. Walker / 609 m, pan traps in beech forest / *Mecodema venator* Det. DS Seldon 2025 / NZAC04165900; 1♂, New Zealand, SD, Tunakino Valley, 1.X.1971, R.J.B. Power / from depth of 6" in hard soil, riverside paddock with many porina / *Mecodema venator* Det. DS Seldon 2025 / NZAC04164381; 1♀, New Zealand, SD, Tunakino Valley, 10.12.1972, R.J.B. Power / pitfall traps in bush / *Mecodema venator* Det. DS Seldon 2025 / NZAC04168995; 1♀, New Zealand, MB, Upper Tinline Valley, 18.01.1973, J.I. Townsend / *Mecodema venator* Det. DS Seldon 2025 / NZAC04164956; 1♀, New Zealand, NN, Tākaka Hill Saddle, 21.Nov.1977, E. Schlinger / *Mecodema venator* Det. DS Seldon 2025 / NZAC04169625; 1♂ (specimen and genitalia), New Zealand, NN, Kahurangi NP, Heaphy Tk (E end), 600 m, 24.XII.1998, Larivière, Larochelle / wet beech forest, under logs / *Mecodema venator* Det. DS Seldon 2025 / NZAC04168756 [genitalia card mounted]; 1♂ (specimen and genitalia), New Zealand, NN, Harwoods Hole, 23.II.1993, A Larochelle / *Nothofagus* for., wet soil, Pit traps / *Mecodema venator* Det. DS Seldon 2025 / NZAC04165907 [genitalia in tube].

Descriptions *M. laterale* group species (in alphabetical order)

Mecodema allani Fairburn, 1945

Figures 9, 9(i).

Type locality: Mid Canterbury (MC), Mt. Misery and Mt. Horrible nr. Cass.

Diagnosis: *Mecodema allani* is distinguishable from other species within the *laterale* group by having the following characteristics: **1,** unipunctate supraorbital puncture (sometimes bipunctate); **2,** anterior area of clypeus with 2 lateral setose punctures each side bearing 1 seta; **3,** median process broad/long and distinctly indentate; **4,** pronotal disc without punctures; **5,** humeral angle with 4 deep setose punctures; **6,** mesocoxa and metacoxa each with 2 setose punctures; **7,** apical portion of penis lobe truncate in shape (Fig. 9(i)PL); **8,** gonocoxite 1 bearing 4 setae on dorsal internal edge.

Description: Length 28–36 mm, pronotal width 7.0–9.8 mm, elytral width 9.0–14 mm. Colour of the entire body slightly glossy black to deep brown. Head and pronotum uniformly black and elytral surface along with legs reddish deep brown in colour. The ventral surface glossy black and reddish deep brown at the legs.

Head: Very broad and flat. Vertex with transverse lateral rugosity; vertexal groove strongly rugose entire length (Fig. 9DV); large single supraorbital puncture bearing 6–7 setae (sometimes bipunctate with a small puncture bearing 1 seta), 3–4 well-defined supraorbital grooves anterad eyes, extended onto frontoclypeal area (Fig. 9DV); frons with weak transverse rugosity scattered between supraorbital punctures, a large shallow depression each side of midline; frontoclypeal suture narrow groove; tentorial pits large; anterior area of clypeus narrowly grooved (may appear indistinct) (Fig. 9DV); 2 setose punctures present each side bearing 1 seta (occasionally a single

puncture bearing 1 seta may be present). Labrum rectangular, anterior edge slightly emarginated with 2 proximate central setae, 2 setae evenly spaced laterally.

Head ventral (Fig. 2): Mentum lobes rounded (Fig. 3), median process broad and long, apex moderately angled upward (45°), distinctly indentate; mentum setae absent (Fig. 9VV). Submentum sclerite constriction medially narrow, broadened laterally with 6 setae regularly spaced (Fig. 9VV). Stipes with 2–3 basal setae. Gula pits small, suture well-defined with fine transverse rugosity; gula convex and smooth. Gena entirely covered in strong rugosity forming an isodiametric pattern laterally.

Prothorax: Prothoracic carina broad the entire length, indistinctly crenulated (crenulations may appear absent at times) with 7–10 evenly spaced setae each side (Fig. 9DV), extended to anterior angle; posterior lateral sinuation slightly sinuate and parallel; pronotum broadly flat, pronotal disc with fine transverse rugosity entire (rugosity weakens proximate midline), without punctures, overall shape cordate; midline slightly defined, but contiguous; anterior (2 indentations each side) and medial impressions (1 indentation along midline on posterior half) present; pronotal foveae broad and deep (creating a compressed appearance along posterior end of midline) (Fig. 9DV); anterior edge weakly curved (sometimes may appear straight); pronotum posterior edge of pronotum weakly curved. Prosternum surface slightly convex with a combination of few punctures and transverse lines (Fig. 9VV); proepisternum with numerous punctures.

Elytra: Broad and moderately convex laterally; humeral angle evenly convex; basal margin slightly curved and gently sloped towards base; elytral setose punctures absent basad scutellum; interval 1 termination point extended to scutellum; lateral carina broad the entire length (Fig. 9DV), extended to humeral angle; humerus with 4 deep setose punctures; suture well-defined; elytral striae with asetose punctures, medially obsolescent to well defined laterally (Fig. 9DV); striae 1–4 with a row of fine minute stellate asetose punctures (distinctive to eyes) evenly distributed (Fig. 9DV); striae 5–8 with irregular-sized asetose punctures; 7th stria with 4 setose punctures in both anterior and posterior halves; setose punctures small. Elytral intervals stellate (slightly raised) with intervals 1–4 slightly convex, intervals 5–9 slightly convex (Fig. 9DV). Posterior end of elytra with two setae on each side of stria 2.

Abdomen ventral: Mesepisternum densely punctate on both sides; metepisternum with strong rugosity. Setose punctures present on mesocoxa (2) and metacoxa (2). Abdominal ventrites 1–2 with a combination of lineate and punctate micro sculptures extended to coxa (Fig. 9VV); ventrites 3–5 with 1 deep setose puncture each side of midline; ventrites with lateral foveae. Ventrite 6 with ambulatory setae: ♂ with 2 pairs of setae, posterior edge straight (sometimes slightly convex medially); ♀ with 3 pairs of setae, posterior edge a blunt rounded point. Anterior metaventrite process carina triangular and distinctly broad the entire length (Fig. 9VV).

Male genitalia: Apical portion of penis lobe asymmetrically hooked (Fig. 9(i)PL) and moderately deflected to right of vertical axis (ventral view); overall shape of the apical portion of the penis lobe almost truncate (specifically at the apex, which has a squared-off end) (Fig. 9(i)PL); apex slightly curved upwards forming a flat dorsal process (Fig. 9(i)PL). Ventral process a short smooth rounded point, penis shaft broad entire in length (Fig. 9(i)PL); ventral edge moderately curved (ventral view), overall length of the penis lobe moderately curved ventrally (lateral view).

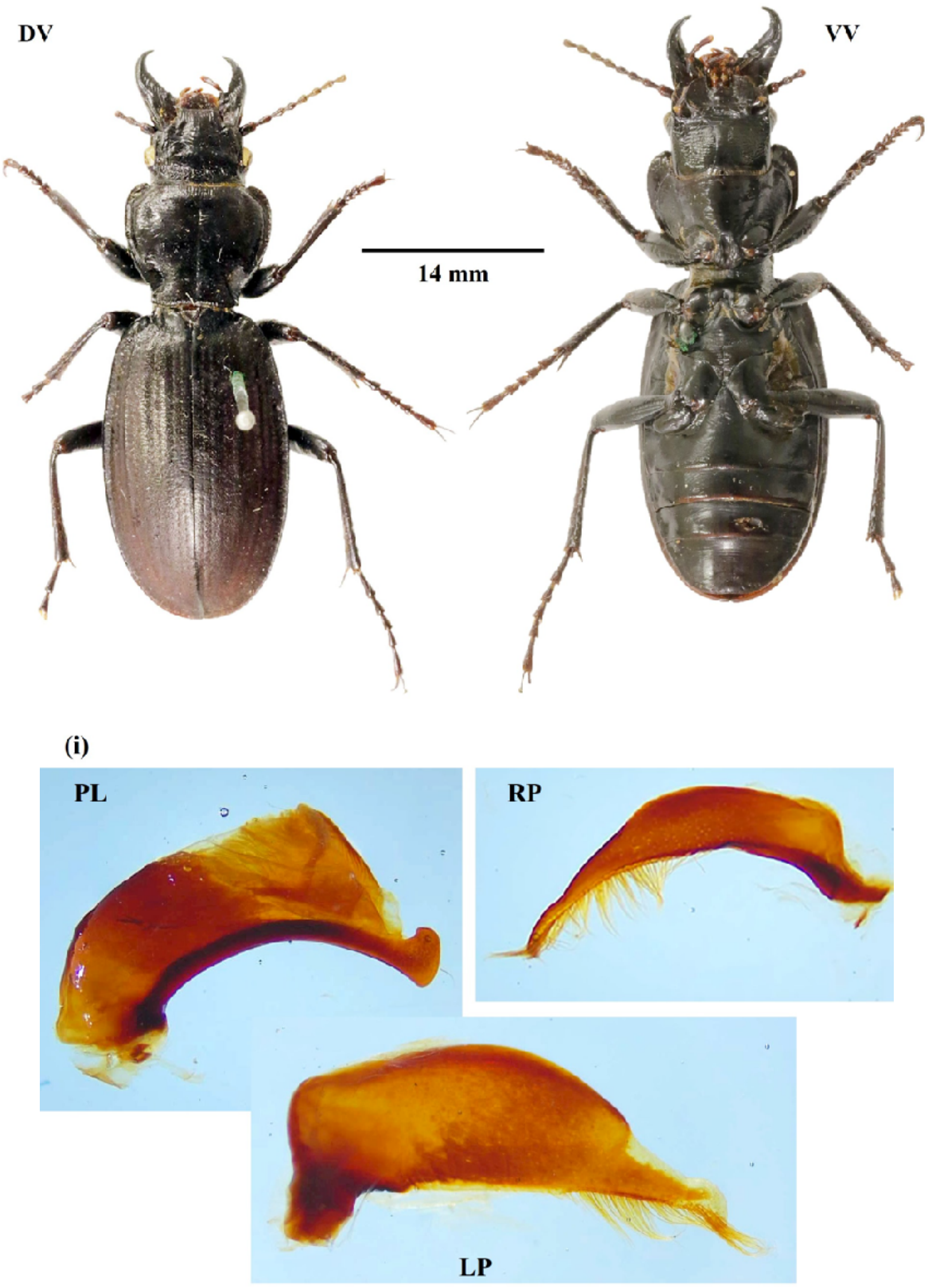

Figure 9. *Mecodema allani* plate with habitus (left): dorsal view (DV) and ventral view (VV). Scale bar equals the widest point of the elytra of the specimen used for this habitus. **(i)** The three (detached) structures of the male aedeagus: the penis lobe (PL), the right paramere (RP) and left paramere (LP). No scale required.

Structures of the endophallus: lateral form of apex of the central spicule flattened and apically curved (ribbon–like); dorsal form of the apex of the central spicule greatly expanded with projections absent; relative scales coverage of the apical plate extensive (76–100%); size of left setose flange small; size of right setose flange large.

Parameres: Left paramere basal lobe rectangular with a dorso-anterior hump forming a 45° angle gradually sloping to a very short and broad arm (Fig. 9(i)LP); terminal lobe not defined, with long tuft of setae. Ventral edge of basal lobe slightly curved towards arm; long setae along three-quarters of ventral edge. Right paramere narrow and rectangular with a double row of long setae contiguous along apical half of ventral edge (Fig. 9(i)RP).

Female genitalia: Basal gonocoxite 1 long and broad, ventral surface with few strong rugosity, internal dorso-carina bearing 4 long setae. Gonocoxite 2 a short, broadly rounded triangle and without subapical setae; ventral surface bearing numerous sensilla. Helminthoid sclerite broad and long with a projecting apical portion. Spermatheca long and narrow. Rami long and broad.

Comments: Despite *Mecodema allani* having an extensive range, the morphological characters remain consistent across examined specimens from different populations.

Geographical distribution: New Zealand, South Island, Buller (BR), Mid Canterbury (MC), North Canterbury (NC), (NN) Nelson, Westland (WD) and Otago Lakes (OL) (Fig. 1).

Holotype. (Viewed), CMNZ specimen labelled. Type, Mt. Misery & Mt. Horrible, Cass, 19.1.1938, Dr. R. Allen [hw] / Holotype [red label] *Mecodema allani* [hw] / photo [hw] / genitalia on slide / CMNZ 2007.163.2942.

Paratype. (Viewed). Specimen labelled. Cass, Mt. Misery & Mt. Horrible, 19.1.1938, R.A. Allen [hw] / Paratype [blue label] *Mecodema allani* [hw] / CMNZ 2007.163.2943.

Other material examined. 1♂, New Zealand NN, Maitland Creek, 1000 m, 12.Aug.2020, M.R. Anderson / *Mecodema allani* Fairburn 1945, ♂ gen. removed; 1♂, New Zealand BR, Travers Fall, *Mecodema sp.*, 2.12.1943, under logs, no. 1030 / J.I. Townsend Collection; 1 ♂, Leaf litter, New Zealand WD, Haast Pass, 20.March.1968, R.A. Cumber / *Mecodema allani* Fairburn, 1945, Det. A. Larochelle / NZAC04003804; 1♀ (specimen and genitalia), beech scrub 4300', New Zealand BR, Travers Valley, Lake Rotoiti, 1.2.1962, A.H. Christhe / *Mecodema allani* Fairburn, 1945, Det. A. Larochelle / NZAC04003693 [genitalia in tube]; 1♂, New Zealand MC, Lower Moa Stm., Wilberforce R., Crow, D.M. 4.12.1983–11.1.1984, pitfall in wind thrown beech / *Mecodema allani*, Det. P.M. Johns / 2007.163.2828 (CMNZ); 1♂, New Zealand BR, Lewis Pass, 14.10.1962, P.M. Johns / *Mecodema allani*, Det. P.M. Johns / 2007.163.2827 (CMNZ); 1♀, New Zealand NC, Upper Poulter Vall., Arthurs Pass Nt. Pk, P. M. Johns, 13.II.1962, *Nothofagus* / *Mecodema allani*, Det. P.M. Johns / 2007.163.2826 (CMNZ); 1♀, New Zealand BR, Boyle Strm, Lewis Pass, P.M. Johns, 16.IX.1962, *Nothofagus* / *Mecodema allani*, Det. P.M. Johns / 2007.163.2824 (CMNZ).

Mecodema altum sp. n.

Figures 10, 10(i).

Type locality: Buller (BR), Lewis Pass.

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Diagnosis: *Mecodema altum* is distinguishable from other species within the *laterale* group by having the following characteristics: **1**, vertex groove defined and medially punctate ; **2**, clypeus with 3 setose punctures bearing 2 setae each; **3,** prothoracic carina crenulations indistinct or absent; **4**, proepisternum smooth and without micro-sculptures; **5**, elytral intervals distinctly convex; **6**, elytral suture raised and distinctly impressed; **7,** elytra covered in minute striate punctures; **8,** apical portion of penis lobe spatulate (Fig. 10(i)PL).

Description: Length 34–38.5 mm, pronotal width 8.5–10.5 mm, elytral width 11–13.5 mm. Colour of entire body dark reddish-brown to dark maroon dorsally. The ventral surface entirely matte dark reddish-brown to dark maroon, and legs a reddish-brown colour.

Head: Very broad and flat; vertex with sparse scattered punctures (mostly medially); vertexal groove defined by obsolescent punctures entire, occasional clustered medially (Fig. 10DV); large supraorbital puncture bearing 6–7 setae, 3 well-defined shallow supraorbital grooves anterad eyes, extended onto frontoclypeal area; frons finely rugose; a large shallow depression each side of midline (Fig. 10DV); frontoclypeal suture indistinct, tentorial pits indistinct; anterior area of clypeus with indistinct grooves; a single setose puncture present laterally bearing 2 setae, medial setose puncture present with 2 setae (occasionally only 1 seta) (Fig. 10DV). Labrum rectangular laterally, anterior edge distinctly emarginated with 2 proximate central setae, 2 setae evenly spaced laterally.

Head ventral (Fig. 2): Mentum lobes rounded (Fig. 3), median process broad (specifically around the base) and short; apex straight and slightly indentate; mentum setae absent. Submentum sclerite constriction narrow, broadened laterally with 4 setae evenly spaced (Fig. 10VV). Stipes with 2 basal setae. Gula pits small, suture well-defined; gula convex with fine transverse lines. Gena with fine isodiametric pattern entire.

Prothorax: Prothoracic carina broad the entire length, crenulations indistinct to absent with 7–10 relatively evenly spaced setae along each side (Fig. 10DV), extended beyond anterior angle; posterior lateral sinuation slightly sinuate and parallel; pronotum broadly flat, pronotal disc with fine transverse rugosity, pronotal punctures absent, overall shape cordate; midline indistinct, but contiguous (not extending to anterior and posterior edges) (Fig. 10DV); anterior (2 indentations on each side and 1 along midline) and posterior medial impressions (1 shallow indentation along midline) present; pronotal foveae broad and deep (Fig. 10DV), anterior edge straight; pronotum posterior edge straight. Prosternum surface slightly convex with faint transverse lines (Fig. 10VV); proepisternum sparsely punctate.

Elytra: Broad and moderately convex laterally; humeral angle evenly convex; basal margin slightly curved and gently sloped to base; setose punctures basad scutellum absent; interval 1 extended to scutellum; lateral carina broad the entire length (Fig. 10DV**),** extended to humeral angle; humerus with 3 deep setose punctures; suture well-defined and raised; elytral striae with asetose punctures, medially obsolescent to well-defined laterally (Fig. 10DV); striae 1–4 with a row of fine minutely striate, evenly distributed asetose punctures; striae 5–8 with irregular-sized and spaced asetose punctures; 7th stria with 4 setose punctures in the anterior half, and 3 setose punctures in the posterior half; setose punctures small. Elytral intervals distinctly raised with minute transverse lineate microsculpture, intervals 1–4 strongly convex and intervals 5–9 strongly convex (Fig. 10DV). Posterior end of elytral with two setae each side of stria 2.

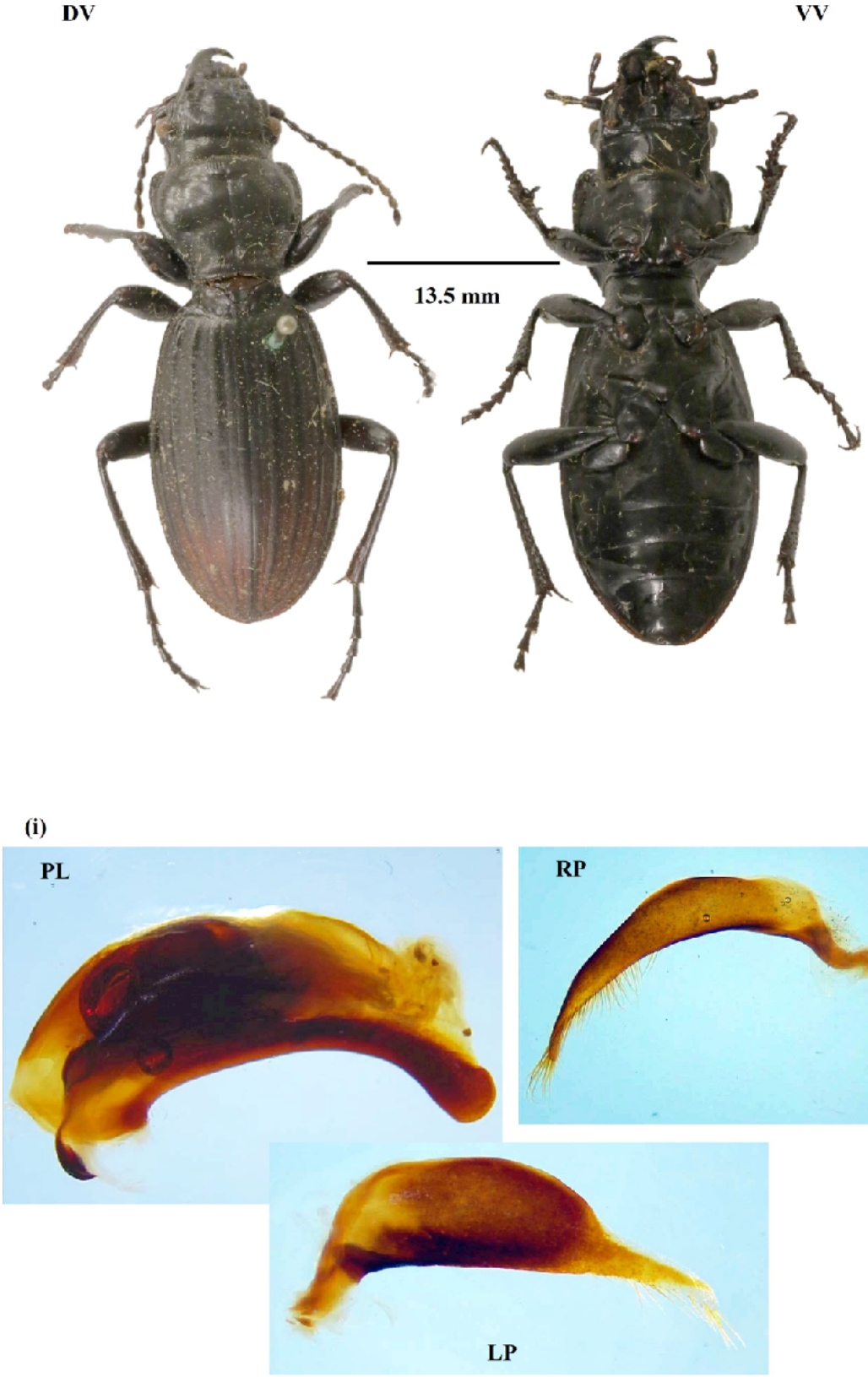

Figure 10. *Mecodema altum* plate with habitus (left): dorsal view (DV) and ventral view (VV). Scale bar equals the widest point of the elytra of the specimen used for this habitus. **(i)** The three (detached) structures of the male aedeagus: the penis lobe (PL), the right paramere (RP) and left paramere (LP). No scale required.

Abdomen ventral: Mesepisternum densely punctate; metepisternum with strong rugosity. Setose punctures present on mesocoxa (2–3) and metacoxae (2). Abdominal ventrites 1–2 with a combination of lineate and punctate microsculpture (punctures appear indistinct at times); ventrites 3–5 with 1 deep setose puncture each side of midline (Fig. 10VV); ventrites with lateral foveae. Ventrite 6 with ambulatory setae: ♂ with 1 pair of setae, posterior edge straight; ♀ with 3 pairs of setae, posterior edge roundly pointed. Anterior metaventrite process a short triangle with a distinctive and broad carina the entire length (Fig. 10VV).

Male genitalia: Apical portion of penis lobe asymmetrically rounded (Fig. 10(i)PL), distinctly deflected to right of vertical axis (ventral view); overall shape of the apical portion of the penis lobe spatulate (apical portion broadly flattened at the end and with faintly tapered towards ventral edge) (Fig. 10(i)PL), dorsal process gently curved downwards to form a smooth rounded ventral process; penis shaft equally broad the entire length; ventral edge distinctly curved (ventral view), overall length of the penis lobe slightly curved (lateral view) and straight towards apical portion (Fig. 10(i)PL).

Structures of the endophallus: lateral form of the apex of the central spicule pointed; dorsal form of the apex of the central spicule greatly expanded without projections; relative scales coverage on apical plate extensive (76–100%); size of left setose flange small; size of right setose flange large.

Parameres: Left paramere basal lobe rectangular with a small dorso-anterior hump forming a 45° angle to a broad and long arm (Fig. 10(i)LP); terminal lobe short and broad with medium length tuft of apical setae. Ventral edge of basal lobe slightly curved; setae contiguous along apical third (Fig. 10(i)LP). Right paramere narrowly rectangular with a double row of long setae, contiguous along apical half of ventral edge (Fig. 10(i)RP).

Female genitalia: Basal gonocoxite 1 long and broad with ventral surface covered with few rugosity, internal dorso-lateral carina with 2 long setae. Gonocoxite 2 oval and broad; subapical setae absent; ventral surface with numerous sensilla. Helminthoid sclerite broad and long with apical portion projecting. Spermatheca narrow and long. Rami long and narrow.

Comments: *Mecodema altum* was collected by E.S. Gourlay in December 1957 from Lewis Pass, North Canterbury. Gourlay set aside specimens of this new species in the DSIR collection, Nelson, which was eventually relocated to DSIR Auckland. We encountered these specimens in the NZAC, Landcare Research, Auckland, where Gourlay had nominated a holotype and paratypes, and designated that these were from Canterbury Museum (CMNZ). However, CMNZ has no records of these specimens, or it seems, neither do any of the other institutional collections throughout Aotearoa. We have placed this species into the *laterale* species group because *M. altum* exhibits similar morphological characters to the other species in this group. However, further research and surveys are required to determine the range of this species, and if it persists.

Geographical distribution: New Zealand, South Island, Buller (BR) and North Canterbury (NC) (Fig. 1).

Holotype male labelled. [card-mounted] NZAC specimen labelled. New Zealand, BR, Lewis Pass, 3500', 8-12.12.57, E.S. Gourlay / *Mecodema alta*, Gourlay [hw], Holotype ♂ / HOLOTYPE *Mecodema altum* n. sp. design. HM Fong 2024 [red label] / NZAC04263877.

Paratypes. 1, Ada Pass., found dead in Snowgrass, 11.11.67, M. Sinclair [hw] / PARATYPE *Mecodema altum* n. sp. design. HM Fong [blue label] / NZAC04263878; 1♀, 2 [card-mounted],

Lewis Pass (NC), 8-12.12.1957, E.S. Gourlay / PARATYPE *Mecodema altum* n. sp. design. HM Fong [blue label] / NZAC04263879; NZAC04263880; NZAC04263884; 2♂ [card-mounted], Andrew's Stream, Waimakariri River, Arthur's Pass, 22.11.61, M. Williams / J.I. Townsend Collection / PARATYPE *Mecodema altum* n. sp. design. HM Fong 2024 [blue label] / NZAC04263882; NZAC04263883; 1♂ [card-mounted], Bealey River (NC), 9.12.58, J.I. Townsend / PARATYPE *Mecodema altum* n. sp. design. HM Fong 2024 [blue label] NZAC04263885; 1♂ [card-mounted], Lewis Pass, 2950', 30.11.1965, E.S. Gourlay [hw] / E.S. Gourlay, Acc. 1970, Ent. Div. / PARATYPE *Mecodema altum* n. sp. design. HM Fong 2024 [blue label] / NZAC04263881.

Other material examined. 1♂, Lewis Pass, 2950', 30.11.1965, E.S. Gourlay [hw] / E.S. Gourlay, Acc. 1970, Ent. Div. / *Mecodema altum* n. sp. Det. DS Seldon 2025 / NZAC04263984; 1 [card-mounted, ventral], Lewis Pass (NC), 8-12.12.1957, E.S. Gourlay / *Mecodema altum* n. sp. Det. DS Seldon 2025 / NZAC04263985; 2♂, Bealey River (NC), 9.12.1958, J.I. Townsend / *Mecodema altum* n. sp. Det. DS Seldon 2025 / NZAC04263986; NZAC04263987; 1, Kiwi hut, Lewis Pass, 15.11.49, R.R. Forster / *Mecodema altum* n. sp. Det. D.S. Seldon / NZAC04263988; 3 [card-mounted], Andrew's Stream, Waimakariri River, Arthur's Pass, 22.11.61, M. Williams / J.I. Townsend Collection / *Mecodema altum* n. sp. Det. D.S. Seldon / NZAC04263990; NZAC04263991; NZAC04263992; 1♂, Mathias River, Sth Branch, I.N. 7.XI.1986, 565.627 004 2700', riverbed / *Mecodema altum* n. sp. Det. DS Seldon 2025 / 2007.163.2830 CMNZ.

Etymology. Altum means 'heaven' and therefore relates to the lofty heights (800+ m) at which these specimens have been collected.

Mecodema laterale Broun, 1917

Figures 4, 11, 11(i).

Type locality: Otago Lakes (OL), Hollyford.

Diagnosis: *Mecodema laterale* is distinguishable from other species within the *laterale* group by having the following characteristics: **1**, vertex with strong rugose isodiametric patterns; **2,** mentum process moderately indentate; **3**, pronotal disc sparsely punctured; **4**, 7th stria setae pattern with 3 setose punctures in anterior half and 4 setose punctures in posterior half; **5,** ventrites 3–5 with 2 pairs of setose punctures; **6,** apical portion of penis lobe falcate (Fig. 11(i)PL).

Description: Length 31–37 mm, pronotal width 7.0–10 mm, elytral width 9.0–13 mm. Slightly glossy black to reddish dark brown colour entire. Head and pronotum glossy black. Antennae reddish brown with the elytra and legs displaying a shade of reddish dark brown colour specifically around the legs. The ventral surface is entirely glossy black with legs dark reddish brown.

Head: Very broad and flat. Vertex with strong rugosity forming isodiametric patterns that extend towards the pronotum; vertexal groove with punctures and strong rugosity the entire length (Fig. 11DV); large supraorbital punctures bearing 6–8 setae (occasionally two punctures may be present each bearing setae); 4 well-defined supraorbital grooves anterad eyes, extended onto frontoclypeal area (Fig. 11DV); frons laterally grooved, cuticle raised medially, a large shallow depression each side of midline; frontoclypeal suture indistinct; tentorial pits small (indistinct at times); anterior area of clypeus narrowly grooved, 1 large setose puncture on each side bearing 2 setae. Labrum

rectangular laterally; anterior edge slightly emarginated with 2 proximate central setae, 2 setae evenly spaced laterally.

Head ventral (Fig. 2): Mentum lobes rounded (Fig. 3), median process broad and short, apex angled upward (30°), moderately indentate; mentum setae absent (Fig. 11VV). Submentum sclerite constriction broad, broadens laterally and with 6 evenly spaced setae (Fig. 11VV). Stipes with 2 basal setae. Gula pits small, sutures well-defined. Gula convex with fine transverse rugosity. Gena covered in strong rugosity forming isodiametric pattern laterally.

Prothorax: Prothoracic carina broad the entire length, indistinctly crenulated (crenulation may appear absent) with 7–10 evenly spaced setae along each side (Fig. 11DV), extended beyond anterior angle; posterior lateral sinuation indistinctly sinuate and parallel; pronotum broad and flat; pronotal disc with transverse rugosity and sparse punctures (transverse rugosity impressed proximate midline); overall shape cordate; midline indistinct, but contiguous (i.e., not extending to anterior and posterior edges); anterior (2 indentations either side) and medial impressions present (2 indentations on midline along anterior and posterior halves); pronotal foveae broad and deep (Fig. 11DV); anterior edge slightly curved inwards; pronotum posterior edge straight. Prosternum surface slightly convex, with a few transverse lines and punctures (Fig. 11VV); proepisternum with numerous punctures.

Elytra: Broad and moderately convex laterally*;* humeral angle evenly convex; basal margin slightly curved and gently sloped to base; elytral setose punctures basad scutellum, absent; interval 1 extended to scutellum; lateral carina broad the entire length (Fig. 11DV), extended to humeral angle; humerus with 3 deep setose punctures; suture well-defined; elytral asetose punctures medially obsolescent to well defined laterally, evenly distributed; distribution of asetose punctures striate; 7th stria with 3 setose punctures in anterior half, and 4 setose punctures in posterior half (Fig. 11DV), setose punctures small. Elytral intervals slightly raised with intervals 1–4 slightly convex with stellate microsculpture, intervals 5–9 moderately convex. Posterior end of elytra with two setae on each side of stria 2.

Abdomen ventral: Mesepisternum densely punctuate; metepisternum with strong rugosity. Setose punctures present on mesocoxae (2–3) and metacoxae (2). Abdominal ventrites 1–2 with lineate and punctate micro-sculptures, ventrites 3–5 each with 2 deep setose punctures each side of midline with lineate micro-sculptures present laterally; ventrites with lateral foveae (Fig. 11VV). Ventrite 6 with ambulatory setae: ♂ with 1 pair of setae, posterior edge straight; ♀ with 2 pairs of setae, posterior edge a blunt rounded point. Anterior metaventrite process a triangle with a broad carina the entire length (Fig. 11VV).

Male genitalia: Apical portion of penis lobe asymmetrically hooked with slight deflection to right of vertical axis (ventral view); overall shape of the apical portion of the penis lobe falcate (sickle-shaped) (Fig. 11(i)PL); apex faintly curved upwards and extended forming a short flat curved dorsal process (dorsal process slightly angled straight to penis shaft) (Fig. 11(i)PL). Ventral process a narrow and sharp, blunted point, pushed forward of vertical axis (Fig. 9(i)PL); penis shaft broad entire (Fig. 11(i)PL); ventral edge slightly curved (ventral view), overall length of the penis lobe moderately curved ventrally (lateral view).

Structures of the endophallus: lateral form of the apex of the central spicule flattened (central spicule ribbon–like apically); dorsal form of the apex of the central spicule greatly expanded

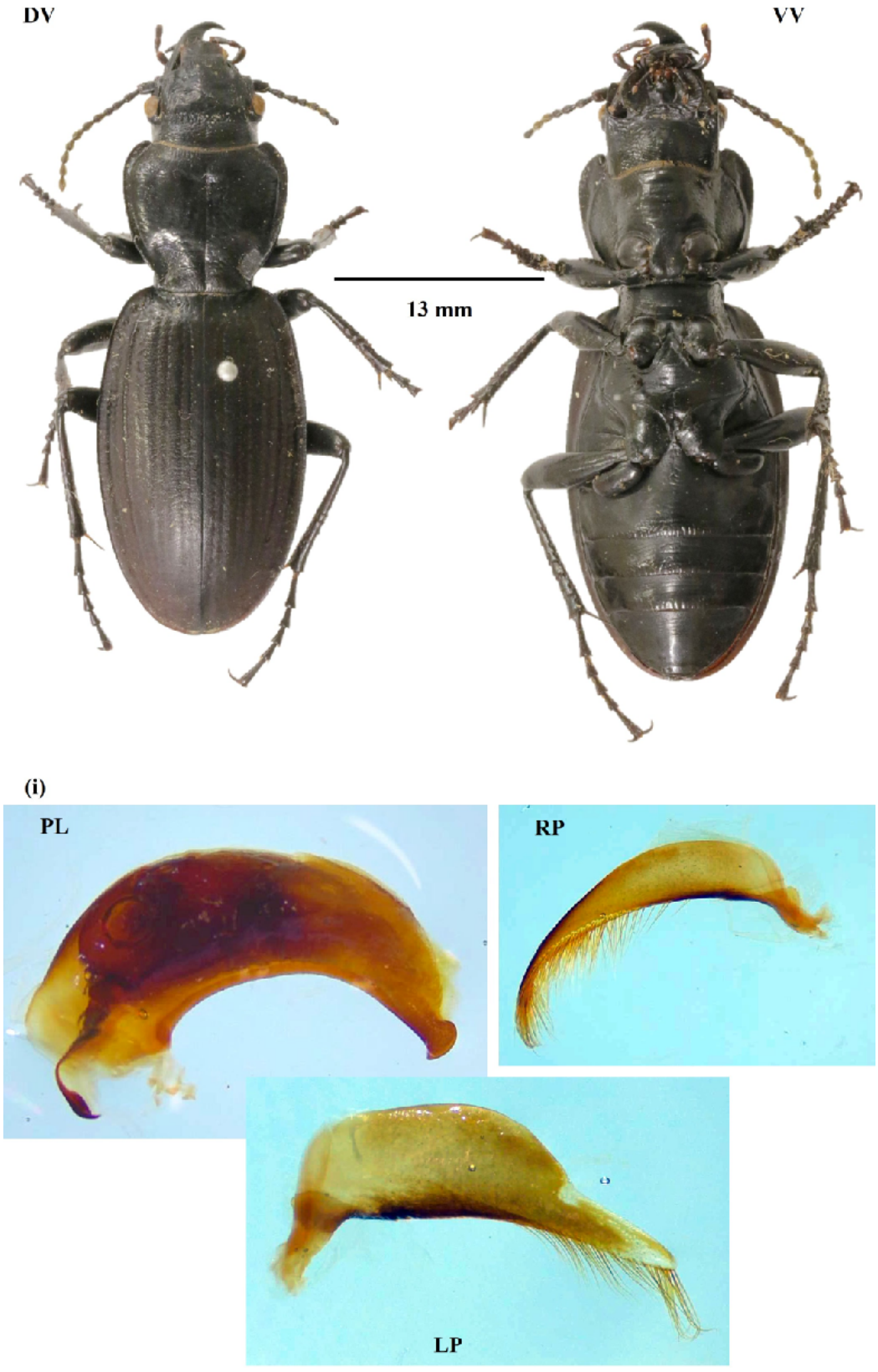

Figure 11. *Mecodema laterale* plate with habitus (left): dorsal view (DV) and ventral view (VV). Scale bar equals the widest point of the elytra of the specimen used for this habitus. **(i)** The three (detached) structures of the male aedeagus: the penis lobe (PL), the right paramere (RP) and left paramere (LP). No scale required.

without projections; relative scales coverage of the apical plate extensive (76–100%); size of left setose flange small; size of right setose flange large.

Parameres: Left paramere basal lobe rectangular with a gradual slope at 45° to short and broad arm (Fig. 11(i)LP); terminal lobe short and broad with long tuft of setae. Ventral edge of basal lobe slightly curved with a row of long setae contiguous along apical three-quarters (Fig. 11(i)LP). Right paramere narrow and rectangular with ventral edge bearing a double row of long contiguous setae along apical half (Fig. 11(i)RP).

Female genitalia: Basal gonocoxite 1 long and broad with ventral surface covered in strong rugosity, internal dorso-lateral carina bearing 2 short setae. Gonocoxite 2 a short broadly rounded triangle (paddle–like); subapical setae absent; ventral surface of gonocoxite 2 bearing numerous sensilla. Helminthoid sclerite broad and long with a projecting apical portion. Spermatheca long in length and narrow in width. Rami long and broad.

Comments: Britton's (1949) external morphological descriptions (i.e., submentum sclerite bearing two setae on each side, 4–6 setae along the sides of pronotum) do not fit *M. laterale* specimens, but more aligned to *M. tititea* sp. n. The similarity in both morphological and internal characters for *M. laterale* and *M. tititea* suggests that these two species are closely related.

Geographical distribution: New Zealand, South Island, Marlborough (MB), Fiordland (FD), Otago Lakes (OL) and Westland (WD) (Fig. 1).

Holotype. (Viewed). BMNH male specimen labelled. Type [round label with red border] / Hollyford, 19.2.1914 [hw] / *Mecodema laterale* [hw] / 3784 [hw] / New Zealand [red underline], Broun Coll., Brit. Mus., 1922-483 / NHMUK 015666090 [very damaged genitalia card-mounted].

Other material examined. 1, New Zealand WD, Haast Pass, 560 m, 22.Jan.1978, G. Kuschel / *Mecodema laterale* Broun, 1917, Det. A. Larochelle / *Mecodema laterale* det. DS Seldon 2025 / NZAC04005008; 1♀, New Zealand FD, Hollyford Tk, 22.Jan.1998, G. Hall & D.M. Gleeson / Under logs / *Mecodema laterale* det. DS Seldon 2025 / NZAC04162705; 1, New Zealand, FD, Tutoko Bench, Wildlife Camp, 9.Jan.1977, 914 m, R. Morris / *Mecodema laterale* Broun, 1917, Det. J.S. Dugdale, 1977 / *Mecodema laterale* Det. DS Seldon 2025 / NZAC04166744; 1, Hollyford Val, 12.I.1967, A.K. Walker / Under logs / Key Summit 2600' / *Mecodema laterale* Broun, 1917, Det. A. Larochelle / *Mecodema laterale* Det. DS Seldon 2025 / NZAC04005053; 1♀ (specimen and genitalia), New Zealand OL, Makarora, 330 m, 21-24.Jan.1978, S. & J. Peck / S. & J. Peck Collection / *Mecodema laterale* Broun. 1917, Det. A. Larochelle / *Mecodema laterale* Det. DS Seldon 2025 / NZAC04166665 [genitalia in tube]; 1♂ (specimen and genitalia), Lake Howden Tr., Fiordland, 2000', 14.Dec.1966 / *Mecodema laterale* Broun, 1997, Det. A. Larochelle / *Mecodema laterale* Det. DS Seldon 2025 / NZAC04005024 [genitalia in tube]; 1, Sylivia Flats, Lewis Pass Rd, 10.12.1974, M.G. Effend / J.I. Townsend Collection / *Mecodema laterale* Det. DS Seldon 2025 / NZAC04007773.

Mecodema tititea sp. n.

Figures 12, 12(i).

Type locality: Otago Lakes (OL), Mt. Aspiring National Park, Cameron Flat.

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Diagnosis: *Mecodema tititea* is distinguishable from other species within the *laterale* group by having the following characteristics: **1,** frons rugosely wrinkled; **2,** submentum sclerite constriction bearing 4 setose punctures; **3,** stipes with 3 basal setae; **4,** pronotal disc bearing 4–6 setae, sparsely punctate; **5,** ovate shape of the apical portion of the penis lobe (Fig 12(i)PL).

Description: Length 25–37 mm, pronotal width 7.0–10 mm, elytral width 8.0–13 mm. Colour of the entire body when viewed dorsally, matte black to dark brown. Head and pronotum uniformly black, elytral surface along with legs dark brown in colour. The ventral surface glossy and reddish dark brown, specifically at the legs.

Head: Very broad and flat. Vertex with strongly rugose forming isodiametric pattern towards pronotum; vertexal groove defined by strong rugosity entire (occasionally sparse punctures may be present) (Fig. 12DV); large supraorbital punctures bearing 6–7 setae, 3 ± well-defined supraorbital grooves anterad eyes, extended to frontoclypeal area (Fig. 12DV); frons with strong rugosity scattered between supraorbital punctures; cuticle medially raised, a large shallow depression each side of midline (anteriorly); frontoclypeal suture narrowly grooved; tentorial pits small; anterior area of clypeus narrowly grooved (Fig. 12DV); 1 large setose puncture on each side bearing 2 setae. Labrum rectangular laterally, anterior edge slightly emarginated with 2 proximate central setae, 2 setae each side evenly spaced.

Head ventral (Fig. 2): Mentum lobes rounded (Fig. 3), median process broad (specifically at the base) and short, apex angled upward (30°), slightly indentate; mentum process setae absent (Fig. 12VV). Submentum sclerite constriction very broad with 4 setae evenly distributed. Stipes with 3 basal setae (sometimes 2 setae). Gula pits small, but distinctive, suture well-defined; gula convex with fine transverse rugosity. Gena with strong rugosity entire forming isodiametric pattern laterally.

Prothorax: Prothoracic carina broad the entire length, indistinctly crenulated (crenulations may appear absent at times) bearing 4–6 setae relatively spaced along each side (Fig. 12DV), extended beyond anterior angle; posterior lateral sinuation slightly sinuate and parallel; pronotum broadly flatten, pronotal disc with strong transverse rugosity and sparsely punctured (rugosity strongly impressed proximate midline), overall shape cordate (Fig. 12DV); midline indistinctly defined, but contiguous (not extending to anterior and posterior edges); anterior (2 indentations each side) and medial impressions (1 indentation along midline) present; pronotal foveae broad and deep (Fig. 12DV); anterior edge slightly curved inwards; pronotum posterior edge straight. Prosternum slightly convex with a combination of few punctures and fine transverse lines (Fig. 12VV); proepisternum sparsely punctate.

Elytra: Broad and moderately convex laterally; humeral angle evenly convex; basal margin slightly curved and gently sloped to base (Fig. 12DV); elytral setose punctures basad scutellum absent; interval 1 extended to scutellum; lateral carina broad the entire length, extended to humeral angle; humerus with 3 deep setose punctures; suture well-defined; elytral asetose punctures medially obsolescent to well defined laterally; elytral striae with distribution of asetose punctures striate (Fig. 12DV); striae 1–4 a row of fine minute asetose stellate punctures (distinctive to eyes) evenly distributed; striae 5–8 with irregular-sized faint stellate asetose punctures; 7th stria with 4 setose punctures in anterior half, and 3 setose punctures in posterior half; setose punctures small. Elytral

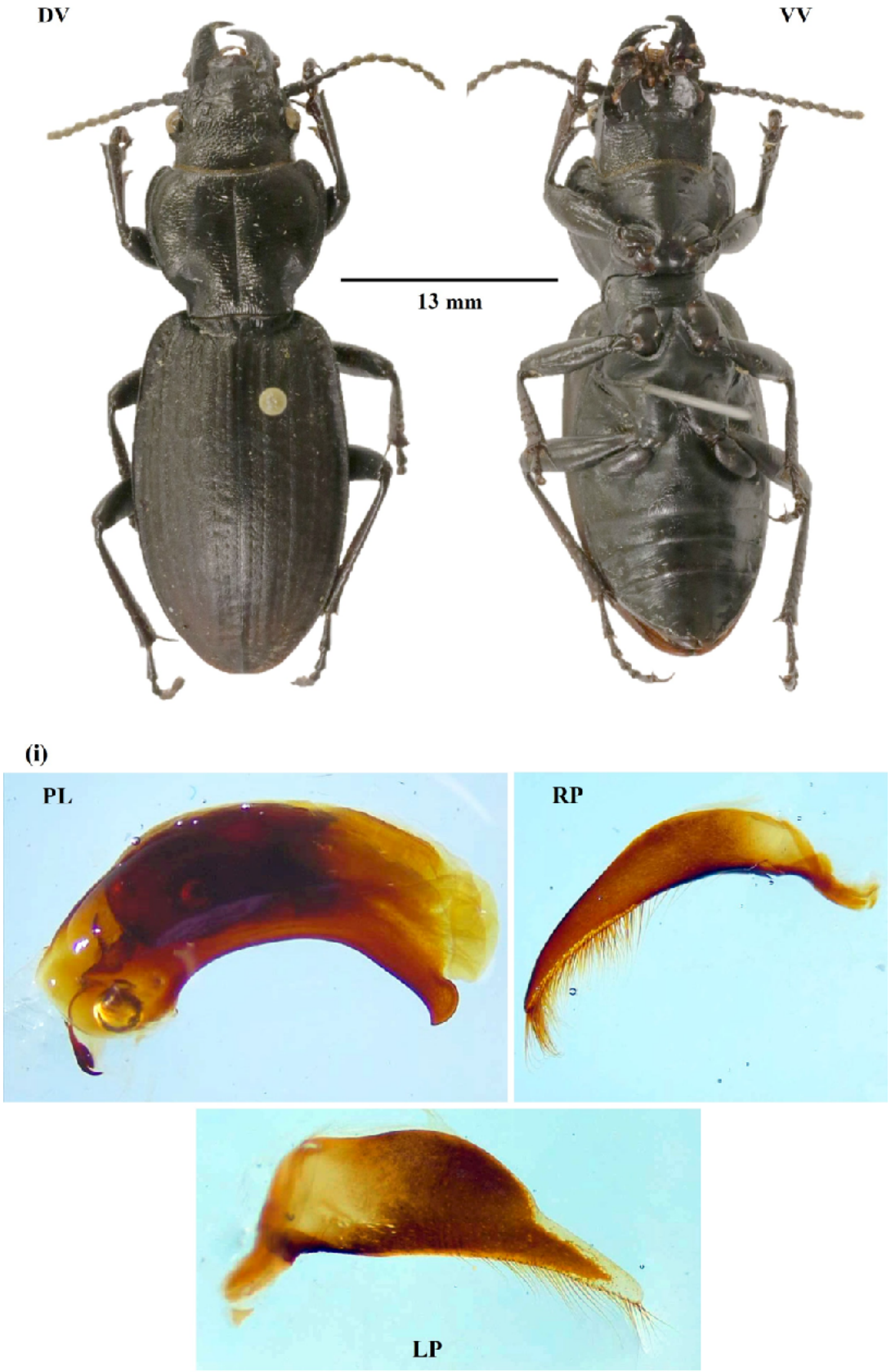

Figure 12. *Mecodema tititea* plate with habitus (left): dorsal view (DV) and ventral view (VV). Scale bar equals the widest point of the elytra of the specimen used for this habitus. **(i)** The three (detached) structures of the male aedeagus: the penis lobe (PL), the right paramere (RP) and left paramere (LP). No scale required.

intervals stellate (slightly raised) with intervals 1–4 slightly convex, intervals 5–9 slightly convex. Posterior end of elytra with two setae each side of stria 2.

Abdomen ventral: Mesepisternum densely punctuate; metepisternum with strong rugosity. Setose punctures present on mesocoxae (2–3) and metacoxae (2). Abdominal ventrites 1–2 finely lineate and punctate (Fig. 12VV); ventrites 3–5 with 1 deep setose puncture each side of midline; ventrites with lateral foveae. Ventrite 6 with ambulatory setae: ♂ with 2 pairs of setae, posterior edge straight (at times slightly convex medially); ♀ with 3 pairs of setae, posterior edge a blunt rounded point. Anterior metaventrite process is a short triangle with a distinctive and broad carina the entire length (Fig. 12VV).

Male genitalia: Apical portion of penis lobe asymmetrically hooked with a slight deflection to right of vertical axis (ventral view) (Fig. 12(i)PL); overall shape of the apical portion of the penis lobe almost ovate (sometimes indistinctly falcate). Apex gently sloped forming a short dorsal process that is smoothly curved to ventral process (Fig. 12(i)PL). Ventral process a short bluntly rounded tapering point (slightly taller than dorsal process); penis shaft broad the entire length; ventral edge slightly curved (ventral view), overall length of the penis lobe slightly curved ventrally (lateral view).

Structures of the endophallus: lateral form of the apex of the central spicule flattened (central spicule tapered apically); dorsal form of the apex of central spicule greatly expanded with projections absent; relative scale coverage of the apical plate moderate (26–75%); size of left setose flange small; size of right setose flange large.

Parameres: Left paramere basal lobe rectangular with a dorsal hump forming a 45° angle to a short and broad arm; terminal lobe not defined with an apical tuft of long length setae (Fig. 12(i)LP). Ventral edge of basal lobe slightly curved with a row of long setae contiguous along apical three-quarters. Right paramere narrow and rectangular with double row of long setae contiguous along apical half (Fig. 12(i)RP).

Female genitalia: Basal gonocoxite 1 long and broad, ventral surface with few strong rugosity, internal dorso-lateral carina bearing 2 long setae. Gonocoxite 2 short and slightly ovate, subapical setae absent, ventral surface entirely covered in sensilla. Helminthoid sclerite broad and long with its apical portion projecting. Spermatheca long and narrow. Ramus long and broad.

Comments: The distributional range of *Mecodema tititea* is not known as all the specimens have been collected in *Nothofagus* forest on the flats of Mt. Aspiring National Park by Larochelle in 1993. However, because *M. tititea* is sympatric with *M. laterale* and *M. allani*, it may be a cryptic species within this species complex.

Geographical distribution: New Zealand, South Island, Otago Lakes (OL) (Fig. 1).

Holotype male labelled. NZAC. New Zealand OL, Mt. Aspiring NP, Cameron Flat, 4.III.1993, A. Larochelle / wet *Nothofagus* for., under logs / HOLOTYPE *Mecodema tititea* n. sp. design. HM Fong 2024 / NZAC04263549 [red label].

Paratypes. 3**MS**, New Zealand OL, Mt. Aspiring NP, Cameron Flat, 4.III.1993, A. Larochelle / Wet *Nothofagus* for., under logs / PARATYPE *Mecodema tititea* n. sp. design. HM Fong 2024 [blue label] / NZAC04263620; NZAC04263553; NZAC04263570; 1, 4♂, 1♀, New Zealand OL, Mt. Aspiring NP, Cameron Flat, 5.III.1993, A. Larochelle / humid *Nothofagus* forest, Pit traps /

PARATYPE *Mecodema tititea* n. sp. design. HM Fong 2024 [blue label] / NAZC04263540; NZAC04263568; NZAC04263571; NZAC04263572; NZAC04263573; NZAC04263576; 1♂, New Zealand OL, Mt. Aspiring NP, Davis Flat, 5.III.1993, A. Larochelle / *Nothofagus* for., under logs / *Mecodema tititea* Det. HM Fong 2024 / NZAC04263608.

Other material examined. 1♂, New Zealand OL, Mt. Aspiring NP, Cameron Flat, 5.III.1993, A. Larochelle / humid *Nothofagus* for., under logs / *Mecodema tititea* Det. HM Fong 2024 / NZAC04263528; 1♂,1♀, New Zealand OL, Mt. Aspiring NP, Cameron Flat, 4.III.1993, A. Larochelle / wet *Nothofagus* for., under logs / *Mecodema tititea* Det. HM Fong 2024 / NZAC04263550; NZAC04263557.

Etymology. The species name, tititea, is derived from the Te Reo Māori name for Mt. Aspiring National Park, which is the type locality of all the specimens used in this research.

DISCUSSION

Since Britton's (1949) revision of *Mecodema* there has been a significant amount of confusion regarding the differences and similarities, plus the distribution between *M. crenicolle* and *M. crenaticolle*. Both these species were described independently by Castlenau (*M. crenicolle*) in 1867 and Redtenbacher (*M. crenaticolle*) in 1868 from specimens collected in the same locality, Hunua Ranges, southeast Auckland. Furthermore, *M. variolosum* (synonymised under *M. crenicolle*) was erroneously considered by Britton (1949) to be collected in Rotorua, North Island due to the label only stating the collection locality as 'Rotorua', assuming that this was Lake Rotorua (or Rotorua township), Bay of Plenty. Almost all specimens of *M. crenicolle* were collected on the South Island, except the type and *M. variolosum*, considering this Britton (1949) implied that *M. crenicolle* was possibly only found on the South Island, but he was unable to obtain access to the holotype.

However, on examination of the male genitalia of the type specimen, and comparing it to *M. variolosum*, we can confirm that this specimen is indeed collected in the South Island. However, we are less sure of the exact locality, which could be Lake Rotorua, Kaikoura, or a misspelling of Lake Rotoroa, Nelson Lakes District. This seems more feasible as the male genitalia of *M. variolosum* matches closely to specimens from this area, and there are no other specimens collected from the Kaikoura region.

We synonymise *M. crenaticolle* under *M. crenicolle* Castelnau and all North Island specimens are now recognised as *M. crenicolle*. Furthermore, all South Island specimens, once determined as *M. crenicolle* are now recognised as the reinstated *M. venator* Broun 1883. We corroborate Seldon & Buckley (2019) statements that these species are endemic to either the North Island (*M. crenicolle*) or the northern regions of the South Island (*M. venator*) and are not found on both islands as previously thought.

A combination of external and internal morphological characters, which included robust characters detailed in Seldon and Buckley (2019), were analysed, resulting in the description of three new species, *M. kahurangi* (*ducale* species group), *M. tititea*, and *M. altum* (*laterale* species group). Unlike the rest of the ducale group species, *M. kahurangi* is restricted to the wet podocarp/broadleaf forests bounded by the Lewis River (northern boundary), Heaphy River (eastern boundary) and Kōhaihai River (southern boundary), with the widespread sister species *M. ducale* found in the Ōpārara Valley (south) and *M. venator* in the eastern areas of the Heaphy Track, Kahurangi

National Park. It is most likely that *M. kahurangi* survived periods of glaciation in small coastal forest fragments (McGlone *et al.* 2010), i.e., glacial refugia, like other Aotearoa insect orders (see Marske *et al.* 2009; Buckley *et al.* 2015; Marske & Boyer 2024) and isolated now by large river systems.

The *laterale* group species are generally associated with subalpine beeches (*Nothofagus* spp.) forests in the western areas of the Southern Alps (Fig. 1). *Mecodema allani* has the greatest longitudinal range from the southern reaches of the Kahurangi National Park (NN) to the Otago Lakes District (OL), which overlaps with its sister taxon *M. laterale* that range from central Westland (WD) to the northern Fiordland (FD) regions (Fig. 1). The two new species in comparison are range restricted, *M. altum* is found in the Lewis Pass area and the upper reaches of the Mathais River (western mid-Canterbury (MC)). Whereas, *M. tititea* is found in small areas along the Makarora River, which include the Cameron and Davis Flats, between Makarora and Haast Pass, Otago Lakes region (OL). Three species, *M. allani*, *M. laterale* and *M. tititea* live sympatrically in this small area of the river valley. Even though these are closely related species, they are readily identifiable from one another using the diagnostic characters in the descriptions. Especially the absence and presence of punctures and rugosity on the pronotum.

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