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Aoteasalda and *Kiwisaldula*, two new genera of Saldidae (Hemiptera: Heteroptera), with a key to New Zealand genera and a new synonymy in *Zemacrosaldula*

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Abstract

Aoteasalda new genus, is described with *Saldula maculipennis* Cobben, 1961, as type species, resulting in the following new combination *Aoteasalda maculipennis* (Cobben, 1961). *Kiwisaldula* new genus, is described with *Saldula parvula* Cobben, 1961, as type species. The following new combinations are made: *Kiwisaldula parvula* (Cobben, 1961); *Kiwisaldula butleri* (White, 1878); *Kiwisaldula laelaps* (White, 1878); *Kiwisaldula stoneri* (Drake & Hoberlandt, 1950). Two species are described as new: *Kiwisaldula manawatawhi* new species, *Kiwisaldula porangahau* new species. A lectotype is designated for *Salda laelaps* White, 1878. The holotype of *Salda butleri* White, 1878, and the type series of *Saldula trivialis* Cobben, 1961, and *Saldula maculipennis* Cobben, 1961, are documented. A new synonymy is established in the genus *Zemacrosaldula* (valid name listed after equal sign): *Saldula trivialis* Cobben, 1961 = *Zemacrosaldula australis* (White, 1876). A revision of the taxonomy of *Aoteasalda* and *Kiwisaldula* species occurring on New Zealand's North Island and nearby offshore islands, is presented. Morphological descriptions are provided, with illustrations emphasising the most significant diagnostic features of the external morphology and male genitalia. Information is given on synonymy, type data, material examined, geographic distribution, and biology. Species of *Kiwisaldula* and genera of Saldidae recognised for New Zealand, are keyed.

Key words: shorebugs, revision, systematics, biodiversity, biology

Introduction

Little was known about the shore bugs (Hemiptera: Saldidae) of New Zealand until recently. Larivière & Larochelle (2004; 2014) recorded seven endemic species assigned by White (1876; 1878), Drake & Hoberlandt (1950), and Cobben (1961) to the large, nearly worldwide genus *Saldula* Van Duzee, 1914.

The genus *Zemacrosaldula* was erected by Larivière & Larochelle (2015) to accommodate *Saldula australis* (White, 1876) and three new species. A key to *Zemacrosaldula* species was provided as well as detailed information on geographic distribution and biology. This brought the number of known saldids for New Zealand to two genera and ten species.

The present study revises the taxonomy of New Zealand saldids that remained assigned to the genus *Saldula* following the description and revision of *Zemacrosaldula.* This revision is based primarily on specimens from North Island populations of *Saldula maculipennis* Cobben, 1961, *S. parvula* Cobben, 1961, *S. stoneri* Drake & Hoberlandt, 1950, and *S. trivialis* Cobben, 1961. The type specimens of *S. butleri* (White, 1878) and *S. laelaps* (White, 1878)—two South Island species—were also studied in order to complete the generic re-assignment of New Zealand shorebug species described so far.

Similarly to *Zemacrosaldula* species, the taxa under study do not fit Lindskog & Polhemus's (1992) monophyletic concept for *Saldula* (*sensu stricto*) or the taxonomic definition of other Saldidae genera.

As a result, two new genera are described: *Aoteasalda* new genus, with *S. maculipennis* as type species and *Kiwisaldula* new genus, with *S. parvula* as type species. The genus *Aoteasalda* is monotypic although additional species may be discovered once the South Island saldid fauna is revised. The genus *Kiwisaldula* contains four

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species previously placed in *Saldula* (*S. butleri*, *S. laelaps, S. parvula*, *S. stoneri*) as well as two new species (*K. manawatawhi* new species; *K. porangahau* new species).

Three genera and 11 species of Saldidae (Saldinae: Saldoidini) are now recognised from New Zealand:

Aoteasalda Larivière & Larochelle new genus
- *A. maculipennis* (Cobben, 1961) new combination

Kiwisaldula Larivière & Larochelle new genus
- *K. butleri* (White, 1878) new combination
- *K. laelaps* (White, 1878) new combination
- *K. manawatawhi* Larivière & Larochelle new species
- *K. porangahau* Larivière & Larochelle new species
- *K. parvula* (Cobben, 1961) new combination
- *K. stoneri* (Drake & Hoberlandt, 1950) new combination

Zemacrosaldula Larivière & Larochelle, 2015
- *Z. australis* (White, 1876)
  - *Saldula trivialis* Cobben, 1961 new synonym
- *Z. kapekape* Larivière & Larochelle, 2015
- *Z. pangare* Larivière & Larochelle, 2015
- *Z. whakarunga* Larivière & Larochelle, 2015

The Southern Hemisphere Saldidae remain largely unrevised. Of the genera and species known from this region of the world, none could be matched to New Zealand taxa. Therefore, the New Zealand fauna is currently considered to be endemic to this country.

The authors hope that their efforts to clarify the alpha-taxonomy of *Aoteasalda* and *Kiwisaldula* species, and to publish detailed information on their distribution and biology, may address some of the limitations to advancing knowledge on New Zealand and Southern Hemisphere saldids as well as provide a foundation for more detailed systematics and evolutionary studies.

Materials and methods

This study is based on the examination of over 1,000 specimens (mostly adults) collected in 112 localities on the North Island of New Zealand and nearby offshore islands. Most of this material (about 90%) was collected by the authors from 1992 to 2014 and is deposited in the New Zealand Arthropod Collection (NZAC), Auckland.

Other specimens were kindly provided by the following institutions: Auckland War Memorial Museum, Auckland (AMNZ); Canterbury Museum, Christchurch—P.M. Johns specimens (CMNZ); Entomology Research Museum, Lincoln University, Lincoln (LUNZ); Museum of New Zealand Te Papa Tongarewa, Wellington (MONZ); The Natural History Museum, London, U.K. (BMNH; formerly British Museum of Natural History).

The NZAC specimens used in this study received unique barcode labels and were databased. Once this paper is published, specimen records will be made available through Landcare Research's Systematics Collections Database portal (http://scd.landcareresearch.co.nz/).

Terms particular to Saldidae morphology mostly follow Schuh & Polhemus (2009), except as noted by Larivière & Larochelle (2015).

The terminology used to describe the degree of wing development also generally follows Schuh & Polhemus (2009), with some modifications: *macropterous*, both pairs of wings fully developed, of approximately equal length, reaching or surpassing apex of abdomen (presumed to be capable of flight); *submacropterous*, hemelytra slightly shortened but without strong modification or loss of cell in the membrane, hindwings of variable length but not significantly reduced (presumed to be capable of flight); *brachypterous*, both pairs of wings significantly shortened, hemelytra with strong modification or loss of cells in the membrane (presumed to be incapable of flight). In addition, the term *subbrachypterous* is used to designate specimens that have hemelytra slightly shortened with slight modification but no loss of cell in the membrane and hindwings that are significantly reduced.

In their description of the genus *Zemacrosaldula*, Larivière & Larochelle (2015) incorrectly referred to the

'gynandrial gland' with respect to the 'gynatrial ring gland' situated in the internal membranous pouch (vagina or gynatrium) at the base of the female ovipositor. They also erroneously described the hemelytral eyespot, when present, as being located on the exocorium rather than the endocorium; they, however, correctly stated that the eyespot is lacking in *Zemacrosaldula*. Finally, the wording used to describe the costal fracture of the hemelytra, was slightly different in Larivière & Larochelle (2015) than it is in the current paper; the state of this character in *Zemacrosaldula*, however, is the same as in *Aoteasalda*.

For the current revision the male genitalia of representatives of as many populations as possible were dissected and examined in the manner described by Larivière & Larochelle (2015).

Descriptions are based on adults. Measurements included in the descriptions, were taken as follows: *body length*, in dorsal view, from visible apex of head to apex of hemelytron or abdomen (in species with hemelytron shorter than abdomen); *antennal segment length*, from base to apex of segment; *leg segment length*, from base to apex of segment; *pronotum* or *scutellum length*, along midline, from base to apex. Cells in the membrane of the hemelytron are numbered from 1 to 4, from most anterior cell (near costal margin) to most posterior cell (near apex of clavus).

The eunomy or eunomic series—the range of variation in hemelytral pigmentation arranged in a sequence from light to dark according to a more or less stable gradation pattern for a given species—is an important taxonomic character used in saldid taxonomy. The eunomic series illustrated in this revision represent the general pattern that best fits variations observed among populations of a species.

Type data, when provided, are listed in this order: type status followed by sex, acronym of entomological collection or museum serving as repository, and original label data with a forward slash (/) separating data from different labels.

Genera are treated alphabetically in the text. The arrangement of *Kiwisaldula* species follows their order in the identification key. Illustrations are arranged according to the sequence of taxa in the text.

Photographs, other illustrations, and the distribution maps were prepared in the manner described by Larivière & Larochelle (2015).

The two-letter abbreviation codes of Crosby *et al*. (1976; 1998) for areas of New Zealand, were used to record localities. North Island: AK, Auckland; BP, Bay of Plenty; CL, Coromandel; GB, Gisborne; HB, Hawke's Bay; ND, Northland; RI, Rangitikei; TK, Taranaki; TO, Taupo; WA, Wairarapa; WI, Wanganui; WN, Wellington; WO, Waikato. South Island: BR, Buller; CO, Central Otago; DN, Dunedin; FD, Fiordland; KA, Kaikoura; MB, Marlborough; MC, Mid Canterbury; MK, Mackenzie; NC, North Canterbury; NN, Nelson; OL, Otago Lakes; SC, South Canterbury; SD, Marlborough Sounds; SL, Southland; WD, Westland. Stewart Island: SI. For each species areas codes are listed from north to south and west to east. Table 1 provides decimal degrees geographical coordinates for collecting localities.

Biological notes are based on an analysis and synthesis of specimen label data and field observations by the authors.

Taxonomy, geographic distribution, and biology

Key to New Zealand Saldidae genera

Remark. Additional helpful but not necessarily exclusive characters are provided between square brackets.

1 Hemelytra (Figs 9–12) marbled in colour, with a distinct eyespot subbasally on endocorium, without a line of three to four pale spots along R vein. Antennal segment II largely paler than segments III–IV, clothed over entire length with short setae, with some longer setae in apical half. Lateral margins of pronotum (Figs 9–12) broadly pale (rarely narrowly pale), explanate, separated from disc by a longitudinal furrow. [Rather small in size, 2.75–4.34 (3.44) mm long; subbrachypterous to macropterous.] . . . . . ***Kiwisaldula*** new genus

- Hemelytra (Fig. 1) speckled in colour, without a distinct eyespot subbasally on endocorium, with a line of three to four pale spots along R vein. Antennal segment II dark, not distinctly paler than segments III–IV (often pale in apical fourth or sometimes from base to apex along one side only), clothed over entire length with short setae, without longer setae in apical half. Lateral margins of pronotum very narrowly pale or completely dark, not explanate, not separated from disc by a longitudinal furrow. [Larger in size, 3.77–6.28 (4.72) mm long; macropterous.] 2

2 Hemelytral pubescence short, mostly semi-erect and whitish. Xyphus 2 of thorax underside as long as or longer than wide, subtriangular. Abdominal venter largely dark in both sexes. Inner membrane of male parandria present along basal quarter to basal third of inner margins. Processus hamatus of male paramere at right angle with corpus paramerus. [Larger species, on average 5.15 mm long.] . . . . . ***Zemacrosaldula*** Larivière & Larochelle, 2015

- Hemelytral pubescence longer, mostly reclined and whitish yellow to golden brown. Xyphus 2 of thorax underside much wider than long, obtusely rounded. Abdominal venter largely dark in male, broadly pale laterally in female. Inner membrane of male parandria shorter, present at very base of inner margins only. Processus hamatus of male paramere at an obtuse angle with corpus paramerus. [Smaller species, on average 4.28 mm long.] . . . . . ***Aoteasalda*** new genus

Aoteasalda new genus

Type species. *Saldula maculipennis* Cobben, 1961, by present designation.

Description. Body length 3.77–5.06 (4.28) mm; elongate-ovate (Fig. 1). Dorsal colour somewhat speckled; largely dark, with narrowly pale lateral margins of pronotum and well-developed, mostly individual (not coalesced) pale markings on hemelytra, including a line of four spots along R vein. Macropterous. **Head** not closely appressed to thorax (eyes distinctly separated from thorax), with three pairs of long trichobothrium-like setae (two dorsally on mandibular plates, two near preocellar furrows, two near preocellar spots). Frons with barely distinct to well-developed longitudinal furrow medially. Ocelli slightly elevated from surface of vertex, separated by the diameter of one ocellus or less, closer to each other than to eyes. Preocellar spots distinct, usually paler than surrounding area, subtriangular to crescent-shaped, narrowly to broadly touching eyes (by one ocellus width or more), slightly to strongly extending in front of ocelli. Preocellar furrows present, deeper than longitudinal frontal furrow. Preocular spots indistinct, of same colour as surrounding area. Transverse swelling (postclypeus of Cobben) rather flat, slightly to moderately developed; lateral portions separated by a gap (mostly) or almost contiguous near facial midline. Mandibular plates rather flat, barely to moderately developed. Maxillary plates slightly to moderately developed. ***Antennae*** largely dark; segment II 2.2–2.3x longer than I, clothed over entire length with very short setae (shorter than or subequal to segment width), without longer setae in apical half; segments III–IV not wider than apex of segment II, with short setae and a number of longer setae (subequal to or slightly longer than segment width). **Thorax**. Pronotum 0.6x as long as scutellum medially; subtrapezoidal; lateral margins (Fig. 1) subrectilinear to slightly sinuate-concave, narrowly pale (pale area narrower than or about as wide as antennal segment II), rarely completely dark, not explanate and not separated from disc by a longitudinal furrow; collar present, continuous (not interrupted medially), delimited posteriorly by a row of punctures; calli not strongly raised although well differentiated from disc, contiguous, forming a transverse elevation with a median pit, delimited posteriorly by a row of punctures curving forward laterally and reaching lateral margins of pronotum. Thoracic underside: xyphus 2 short (much wider than long), obtusely rounded. ***Legs***: hind tibiae with subapical comb; hind tarsal segment II 0.9–1.0x as long as segment III. ***Hemelytra*** without a distinct eyespot subbasally on endocorium; pubescence short to moderately long, mostly reclined, whitish yellow to golden brown, rather evenly distributed; clavus and corium largely pruinose; costal margin slightly convex along entire length; costal fracture straight, nearly reaching apex of R vein, barely extending towards clavus from membrane; embolar modification of female moderately developed; subapical pale spot of clavus present; membrane with four well-formed cells, cell 2 about as long as cell 3, cell 4 distinctly longer than cell 3; hypocostal ridge simple; secondary hypocostal ridge absent. **Abdomen**. Venter: male, dark, with or without posterior margin of segments narrowly pale; female, dark medially, broadly pale laterally and along posterior margin of segments. Paired eversible glands present; when externally visible, one gland located on each side near posterior margin of segment VII. ***Male parandria*** (Fig. 4) elongate, narrowly subtriangular; tip acuminate; inner membrane present near very base of inner margins only. ***Male paramere*** (Fig. 3) without distinct processus sensualis; processus hamatus at an obtuse angle with corpus paramerus (as opposed to a right angle in *Zemacrosaldula*); corpus paramerus generally more pubescent than in *Zemacrosaldula* and *Kiwisaldula*, dorsal margin bearing short to long setae. ***Male aedeagus*** containing four pairs of sclerites (Fig. 6), two basally joined, larger, branched median sclerites, their outer branch hooked apically, and six individual, smaller, simple anterolateral sclerites. ***Male filum gonopori*** coiled 1.5 times (Fig. 7). Female subgenital plate (segment VII, ventrally) with posterior margin produced caudally, truncate medially. Ovipositor with gonapophyse 1 distinctly serrate. Spermathecal pump flange present. Gynatrial ring gland sclerotised.

Remarks. The generic name *Aoteasalda* is derived from *Aotea-* (Aotearoa, Maori name for New Zealand) and *Salda* (nominate genus of the family Saldidae).

The main morphological characters of *Aoteasalda* are listed here, with generic level apomorphies from Polhemus (1985) in *italics*: size moderate (3.77–5.06 mm); dorsal colour speckled, largely dark, with narrowly pale lateral margins of pronotum and well-developed, mostly individual (not coalesced) pale markings on hemelytra, including a line of four pale spots along R vein; hemelytra lacking a distinct eyespot subbasally on endocorium; *antennal segment II long, clothed over entire length with very short setae, without long setae in apical half; frons* with barely distinct to *well-developed longitudinal furrow medially;* lateral margins of pronotum not explanate, not separated from disc by a longitudinal furrow; *calli of pronotum* forming a transverse elevation *with a distinct median pit and delimited posteriorly by a row of punctures reaching lateral margins;* hemelytra and hindwings fully developed; membrane with four well-formed cells; *embolar modification of female hemelytra developed*; *hind tibiae with subapical comb*; *male aedeagus with anterolateral sclerites*; processus sensualis of male paramere indistinct; *filum gonopori of male coiled 1.5 times*; *female abdominal venter not concolorous with underside of thorax,* broadly pale laterally and along posterior margin of segments.

The male abdominal grasping plate was not studied in detail; preliminary observations in *A. maculipennis* indicate that it bears around 16 spines, an outer row of three to four and an inner group of roughly 12 moderately long spines.

A single species of this genus could be identified on the North Island of New Zealand. South Island specimens that superficially resemble *A. maculipennis* were also noticed but confirmation of their identity awaits further study of South Island collections.

Aoteasalda maculipennis (Cobben, 1961) new combination

Saldula maculipennis Cobben, 1961: 104. Holotype: male (BMNH) labelled "Holo- type (circular red-bordered label; typed in 2 lines) / S. Karori 13.I.24 Hamilton (handwritten) / Holotypus Saldula maculipennis R.H. Cobben MS 1961 (pale green label; handwritten) / J.G. Myers Coll. B.M. 1937-789. (upside down label; typed). Fair condition; right hemelytron missing; left hind leg missing; abdomen removed and dissected, placed on round permanent slide mount on same pin as main body.

Description. Body length 3.77–5.06 (4.28) mm; elongate-ovate (Fig. 1). Dorsal colour largely dark, with narrowly pale lateral margins of pronotum and well-developed, mostly individual (not coalesced) pale markings on hemelytra, including a line of four spots along R vein and a sinuate mark near middle of costa. Facial colour (Fig. 2) slightly to moderately contrasted. Head, pronotum and scutellum slightly shiny, contrasting slightly against mostly dull hemelytra. Dorsal pubescence short to moderately long, reclined to semi-erect, whitish yellow to golden brown, rather evenly distributed. Hemelytra fully developed; hindwings reaching between apex of abdomen and apex of hemelytral membrane. **Head** (Fig. 2, facial view). Transverse swelling whitish yellow to yellowish brown. Mandibular plates, maxillary plates, anteclypeus and labrum concolorous with transverse swelling; maxillary plates often darker brown; anteclypeus often marked with brown basally. Rostrum yellowish brown to dark brown, extending to hind coxae. ***Antennae*** 4.7–4.9x longer than pronotum + collar medially; segment I whitish yellow to yellowish brown, with ventral and dorsal sides brown to nearly black (often striped), sometimes nearly entirely black; segment II brown to nearly black, usually pale in apical fourth, sometimes pale from base to apex along one side only; segments III–IV dark brown to nearly black. **Thorax**. Lateral margins of pronotum subrectilinear to slightly sinuate-concave, usually narrowly whitish yellow to yellowish brown (pale area narrower than or about as wide as antennal segment II) or, very rarely, completely dark. Scutellum 1.6–1.7x longer than pronotum + collar medially. Thoracic underside black, with strongly contrasting broadly to narrowly pale acetabula (acetabula I–II broadly pale, acetabulum III broadly or narrowly pale), and broadly pale lateral margins; pubescence rather dense, silvery, and appressed (except for glabrous lateral margins). ***Legs*** largely pale; whitish yellow to yellowish brown, with dark brown to black coxae; femora with more or less defined brown spots on anterior and posterior faces; fore and mid femora striped with dark brown to nearly black on ventral side over basal half or most of length; tibiae pale at base, dark at apex; fore tibiae with dark brown dorsal stripe over most of length; hind tibiae 2.6–2.7x longer than tarsal segments II+III combined; hind tarsal segment II slightly darkened apically, segment III dark apically or, more rarely, completely dark. ***Hemelytra***: corium (Figs 1, 8) largely black,

with numerous, mostly individual (not coalesced), irregular pale markings; exocorium with distinctive, single or divided, sinuate mark stemming from costa at about midlength; colour pattern in female consistent with that of male but often paler overall with broader more coalesced markings; basal pruinose area of clavus broad and long, covering more than one-third of clavus length; basal pale spot of clavus present or absent; subapical pale spot of clavus present; membrane dark brown to black basally with a pale mark near tip of clavus, brown medially within cells, pale elsewhere, and with dark brown to black veins; cell 1 of membrane, the shortest, subtriangular; cells 2 to 4 subrectangular, roughly subequal in width; cells 2 and 3 roughly subequal in length; cell 4 the longest, prolonged basally beyond other cells, ending apically in line with tip of cell 3. **Abdomen**. Venter: pubescence rather dense, silvery, and appressed. ***Male parandria*** (Fig. 4): inner margins regularly concave; basal margin sinuate, obtusely convex medially. ***Male paramere*** (Fig. 3) without distinct processus sensualis, instead with rather smooth and unsculptured cuticular surface bearing less than ten setae; processus hamatus obtusely rounded at tip, distinctly upturned. Apical half of ***male aedeagus*** (Fig. 5), in lateral view, with four main visible sclerites (elongate, slightly curved median sclerite; small, subtriangular anterolateral sclerite; elongate-sinuate Y-shaped sclerite; medium-sized, nearly pear-shaped sclerite). ***Female subgenital plate*** (segment VII ventrally) dark brown to black with apical half pale. *Other characters as in generic description*.

Geographic distribution (Fig. 32). North Island, general.

Material examined. A total of 229 specimens including holotype, from the following localities. **North Island**. **AK**–Hill NE of Leigh (AMNZ); Waitakere Ranges (Vicinity of Goldie Bush Reserve, Mokoroa Stream (NZAC); Swanson Creek, Cascade Park (NZAC); Upper Nihotupu Reservoir (NZAC)); Whangateau, Coxhead Creek (AMNZ). **BP**–Waioeka Gorge, Little Manganuku Track (NZAC). **CL**–Forest E of Kirikiri saddle (NZAC); Te Hope-Mount Moehau Track, half way to summit (NZAC); Whiritoa Valley, S side (AMNZ). **GB**–Awatere (near Awatere River) (NZAC); Morere (AMNZ); Otoko Scenic Reserve (NZAC); Waimata Valley, Kaharoa Station (NZAC). **HB**–Cape Kidnappers (NZAC). **ND**–Mokohinau Islands, Burgess Island (NZAC); Mount Camel (NZAC); Waipoua Forest (Waipoua River, near Headquarter) (NZAC). **RI**–Ruahine [Ranges], Junction of Lagoon Road & Wairaki Creek (NZAC); Te Huia, Mangoira Stream (NZAC). **TK**–[New Plymouth] East end, mouth of Te Henui Stream (AMNZ); Te Henui Stream, 1–2 km from coast (AMNZ); Egmont National Park (Ihaia Track (NZAC); Puniho Track (NZAC)); Pukearuhe (AMNZ); Tangarakau Gorge, Route 43, 7.5 km N Tahora (NZAC); Whitecliffs Walkway, Waipunga [=Wai Pingao] Stream (NZAC). **TO**–Kaimanawa Forest Park (Clements Road end, Hinemalaia Track (NZAC); Clements Road, 1.5 km E Waiharuru Stream (NZAC)); Lake Taupo, [Taupo] shore (AMNZ); Taumarunui (MONZ); Tongariro River, Admirals Pool (AMNZ). **WA**–Makaretu River, 2 km N Takapau (NZAC); Mangatewainui River, Junction Gundry Road (NZAC). **WN**–Tararua Forest Park, Otaki Forks (NZAC); Wellington (South Karori (BMNH, MONZ); York Bay (BMNH). **WO**–Tawarau Forest Conservation Area, Route 37 (NZAC). Vicinity of Karamu Walkway (7 km W Whatawhata) (NZAC).

Biology. **Altitudinal range**. Lowland to montane. Not usually coastal; may be present in predominantly freshwater habitats located near the mouth of rivers that also harbour inland populations. **Habitat**. Occurs mostly inland, in open or shaded (e.g., forests) environments, mostly along or near the banks of rivers, streams, rivulets, their side-channels or temporary backwaters; on sandy (including pumice sand), muddy or clayey, bare or nearly bare ground, between gravelly or stony areas, or along nearby bare to nearly bare mud or sand flats; not strictly saxicolous, often found on partly mossy or bare large stones and boulders near the water's edge (sometimes on stones and boulder emerging from water) or at a certain distance from water (2–4 m); commonly found along slightly mossy or bare seepages on horizontal to vertical rock faces near streams or waterfalls; also found on moist sand, clay or mud, sometimes mixed with stones, in modified environments (e.g., around temporary roadside pools, water puddles in nearly dried-up streambeds, waterholes in or near pastures); rarely found on uniformly gravelled or pebbled ground. Nymphs live in the same habitat as adults, on the ground surface between and under stones or debris. **Seasonality**. Adults collected from October to March; newly emerged adults (tenerals) collected mostly in December and March; nymphs found in December and from February to March—suggesting overwintering in the egg stage, nymphal development in spring, adult emergence in early summer, summer breeding, and emergence of a new generation that will breed before the winter, from about January onwards, possibly with a two to four weeks delay in southern parts of the distribution range or at higher altitudes. **Food**. Predator or scavenger. **Behaviour**. Jumps or flies short distances (usually less than 1 m) or dashes between stones or under debris when disturbed. Moderately heliophilous; more active in full sunshine, also active in the shade.

Remarks. The type series of *S. maculipennis* obtained from the Natural History Museum, in London (BMNH) contains a mixture of taxa.

The following specimens belong to *S. maculipennis*: Holotype male, allotype female, 4 paratypes (2 males, 1 fully mature female, 1 teneral female), S. Karori (North Island, WN); paratypes, 1 male, 1 teneral female, York Bay (North Island, WN).

The following paratypes belong to other taxa. *Zemacrosaldula australis*: 1 female, S. Karori (North Island, WN); 1 male + 1 female on same pin, Pakuratahi (North Island, WN). Undetermined taxon: 1 teneral female, Waitati (South Island, DN).

One female paratype labelled "New Zealand. Pascoe Coll." belongs to *Zemacrosaldula* sp.; this specimen was not listed in Cobben's (1961) original material.

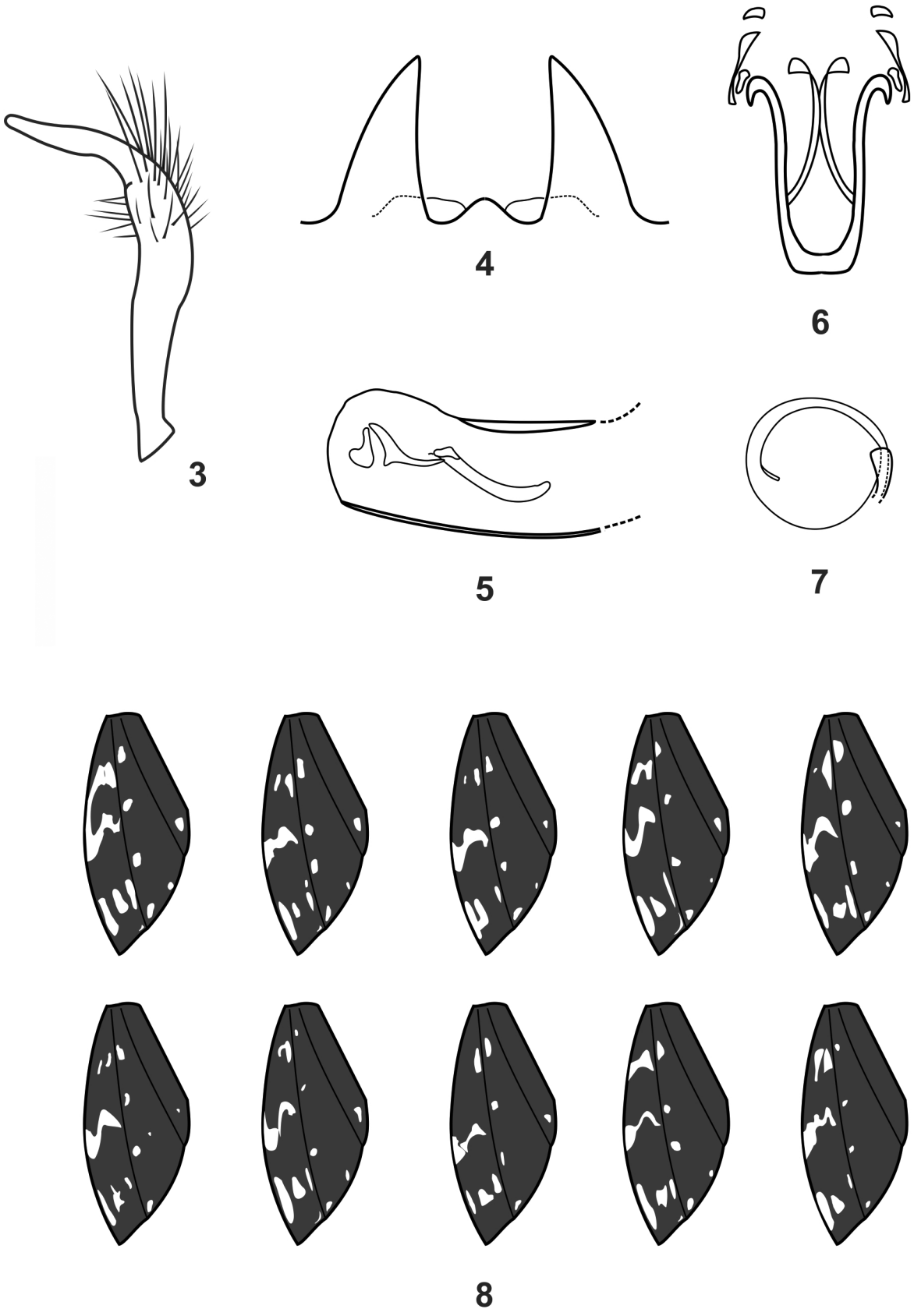
Finally, the DSIR (Nelson) [= NZAC] paratypes mentioned by Cobben (1961), could not be located.

Aoteasalda maculipennis superficially resembles *Zemacrosaldula australis* but it is smaller in size and can be primarily distinguished from this species by characters indicated in the key to genera. Other highly distinctive characters of *A. maculipennis* include the sinuate pale hemelytral mark near the middle of the costa, the narrow, acutely tipped, closely set parandria—somewhat reminiscent of a 'pair of horns'— with reduced inner membrane, and the bicoloured female abdominal venter. The eunomy is also quite distinctive for this species.

Generally speaking, however, it is important to have sufficiently long series of specimens at hand in order to study the range of variations in colour and morphology and to avoid character misinterpretations that may be caused by local environmental factors or the level of maturity of adult specimens. See also **Remarks** under *Kiwisaldula*.

Aoteasalda maculipennis is not strictly saxicolous and it is less strongly heliophilous than *Z. australis*. It will, however, occur in stony-gravelly habitats resembling those occupied by *Z. australis* although *A. maculipennis* seems to prefer muddier, more clayey, or siltier habitats and appears to tolerate better the proximity of slower-running waters, less well-oxygenated water conditions, and generally more eutrophic waterways. This is mostly an inland species that can be found near the sea coast but not typically in estuarine habitats.

FIGURES 1–2. *Aoteasalda maculipennis*. Scale bar = 1 mm. (1) Dorsal view (legs and antennae omitted). (2) Facial view.



FIGURES 3–8. *Aoteasalda maculipennis*. (3–7) Schematic view of male genitalia. (3) Paramere, ventral view, (4) parandria, posterior view, (5) anterior half of aedeagus, lateral view, (6) sclerites of aedeagus, ventral view, (7) filum gonopori, lateral view. (8) Eunomy (left corium), most frequently observed pigmentation patterns.

Kiwisaldula new genus

Type species. *Saldula parvula* Cobben, 1961, by present designation.

Description. Body length 2.75–4.34 (3.44) mm; short-ovate, short-pyriform or elongate-ovate. Dorsal colour somewhat marbled; largely dark, with broadly pale or, more rarely, narrowly pale lateral margins of pronotum, mostly well-developed coalesced or individual pale markings on hemelytra, including a distinct eyespot subbasally on endocorium next to a large apostrophe-shaped mark on exocorium. Subbrachypterous to macropterous. **Head** not closely appressed to thorax (eyes distinctly separated from thorax), with three pairs of long trichobothrium-like setae (two dorsally on mandibular plates, two near preocellar furrows, two near preocellar spots). Frons with barely distinct to moderately developed longitudinal furrow medially. Ocelli slightly elevated from surface of vertex, separated by the diameter of one ocellus or less, closer to each other than to eyes. Preocellar spots distinct, paler than surrounding area, subtriangular to crescent-shaped, narrowly to broadly touching eyes (by one ocellus width or more), slightly extending or not in front of ocelli. Preocellar furrows present, about as deep as or slightly deeper than longitudinal frontal furrow. Preocular spots usually distinct, paler than surrounding area. Transverse swelling (postclypeus of Cobben) variously swollen, slightly to strongly developed; lateral portions contiguous near facial midline or, more rarely, separated by a very narrow gap (narrower than in *Zemacrosaldula* or *Aoteasalda*). Mandibular plates barely to strongly developed. Maxillary plates slightly to strongly developed. ***Antennae*** nearly bicoloured, with segments I–II largely pale compared to segments III–IV; segment II usually 2.0–2.3x longer than I (1.1–1.3x in *K. stoneri*), clothed over entire length with short setae (slightly shorter than or subequal to segment width), with some longer setae in apical half; segments III–IV not wider than apex of segment II, with short setae and a number of longer setae (subequal to or longer than segment width). **Thorax**. Pronotum 0.5–0.8x as long as scutellum medially; subtrapezoidal; lateral margins (Figs 9–12) subrectilinear to moderately convex, rarely slightly sinuate-concave, usually broadly pale (pale area 1.5–2x as wide as antennal segment II), rarely narrowly pale to almost completely dark (*K. stoneri*), variously explanate, and separated from disc by a longitudinal furrow; collar present, continuous (not interrupted medially), delimited posteriorly by a row of punctures; calli somewhat strongly raised (more so than in *Aoteasalda* or *Zemacrosaldula*), well differentiated from disc, contiguous, forming a transverse elevation with a median pit, delimited posteriorly by a row of punctures not reaching lateral margins of pronotum. Thoracic underside: xyphus 2 short (much wider than long), subtriangular. ***Legs***: hind tibiae with subapical comb; hind tarsal segment II 0.7–1.1x as long as segment III. ***Hemelytra*** without a line of four spots along R vein; pubescence short to moderately long, reclined (mostly) to semi-erect, mostly golden brown (sometimes silvery in places), usually thicker, longer and more densely distributed on hemelytra (especially clavus and endocorium); clavus and corium moderately pruinose (pruinosity often reduced on exocorium); costal margin slightly convex along entire length; costal fracture straight or slightly curved, very short or nearly reaching apex of R vein, barely extending towards clavus from membrane; embolar modification of female indistinct or barely developed; subapical pale spot of clavus usually present; membrane with four, sometimes three, reduced to well-formed cells, cell 2 about as long as cell 3, cell 4, when present, subequal in length, longer, or shorter than cell 3; hypocostal ridge simple; secondary hypocostal ridge absent. **Abdomen**. Venter: male, dark, with or without posterior margin of segments narrowly pale; female, dark medially, broadly (mostly) or narrowly pale laterally. Paired eversible glands present; when externally visible, one gland located on each side near posterior margin of segment VII. ***Male parandria*** (Figs 25–28) elongate, narrowly or broadly subtriangular; tip acutely rounded; inner membrane present along basal half of inner margins. ***Male paramere*** (Figs 21–24) with or without barely distinct processus sensualis; processus hamatus at an obtuse angle with corpus paramerus (as opposed to a right angle in *Zemacrosaldula*); dorsal margin bearing short to moderately long setae. ***Male aedeagus*** containing four pairs of sclerites (Fig. 30, *K. parvula*), two basally joined, larger, branched median sclerites, their outer branch slightly curved but not hooked apically, and six individual, smaller, simple anterolateral sclerites. ***Male filum gonopori*** coiled 1.5 times (Fig. 31). Female subgenital plate (segment VII, ventrally) with posterior margin produced caudally, truncate medially. Ovipositor with gonapophyse 1 distinctly serrate. Spermathecal pump flange present. Gynatrial ring gland unsclerotised.

Remarks. The generic name *Kiwisaldula* is derived from *Kiwi-* (vernacular name of flightless bird native to New Zealand or nickname of a native or resident of this country) and *Saldula* (name of a similar-looking genus).

The main morphological characters unifying the species of *Kiwisaldula* are listed here, with generic level

apomorphies from Polhemus (1985) in *italics*: size *small* to moderate (2.75–4.34 mm); dorsal colour marbled, largely dark, with broadly pale or, more rarely, narrowly pale lateral margins of pronotum and mostly well-developed coalesced or individual pale markings on hemelytra, lacking a line of four pale spots along R vein; *hemelytra with a distinct eyespot subbasally on endocorium* next to an apostrophe-shaped mark on exocorium; *antennal segment II* rather short, clothed over entire length with very short setae, with some longer setae in apical half; *frons* with barely distinct to *well-developed longitudinal furrow medially; lateral margins of pronotum explanate, separated from disc by longitudinal furrow*; *calli of pronotum* forming a transverse elevation *with a distinct median pit* and delimited posteriorly by a row of punctures not reaching lateral margins; *mostly subbrachypterous or brachypterous;* membrane with four, sometimes three, reduced to well-formed cells; embolar modification of female indistinct or barely developed; *hind tibiae with subapical comb*; *male aedeagus with anterolateral sclerites*; processus sensualis of male paramere indistinct or barely developed (not tumid); *filum gonopori of male coiled 1.5 times*; *female abdominal venter not concolorous with underside of thorax,* broadly or sometimes narrowly pale laterally.

The male abdominal grasping plate was not studied in detail; preliminary observations in *K. parvula* indicate that it bears around 15 spines, an outer row of five to seven rather short, blunt spines and an inner group of roughly ten longer, sharper spines.

Limited quality material was available to study the gynatrial ring gland situated near the base of the female ovipositor but an obvious sclerotised ring, as in *Aoteasalda* or *Zemacrosaldula*, could not be seen in the half dozen specimens dissected.

Kiwisaldula species exhibit a high level of eunomic variability. Divergence from the standard eunomy is common even within populations. Tenerals or recently molted adults with a soft cuticle can be deceptively pale compared to fully mature adults; they may also have distorted male genitalia. Environmental factors also seem to be at play, cooler temperatures and/or higher humidity generally shifting the eunomic series towards the dark side of the sequence while the reverse produces lighter forms. These trends were also noted and briefly discussed by Larivière & Larochelle (2015) for species of the genus *Zemacrosaldula*. All species and most populations of *Kiwisaldula* will harbour a few very dark individuals with reduced hemelytral markings and very narrowly pale to almost completely dark lateral margins of pronotum.

When collecting in the field it is rather difficult to judge whether individuals sampled represent the standard eunomy or are mature enough so that their cuticle is hardened and body parts have taken their final shape and colour. Consequently, it is critical to collect enough individuals from a given population to have 'good quality' material to work from. In the authors' experience at least 25 mature specimens are required and collections of 35–50 specimens are ideal.

Nevertheless, there is sufficient overlap between the eunomic series of species treated in this paper to render this character nearly useless for species diagnosis, except in the case of *K. stoneri* and to some extent also *K. parvula*. In all cases, the ultimate criteria for species recognition are characters of the male genitalia.

While *K. stoneri* occurs inland only, other *Kiwisaldula* species are common in saline or brackish water environments around the coast of the North Island as well as along the margins of freshwater habitats. *Kiwisaldula parvula* and *K. porangahau* appear especially common in estuarine habitats but large populations can also be found inland. *Kiwisaldula* species are slightly to moderately heliophilous; they are often found in the shade and they remain active under cloudy or rainy conditions. Species of this genus favour sandy, muddy or silty substrates with little or no stone or gravel and at least some vegetation. In inland situations, *Kiwisaldula* species will often be found along the banks of sandy, silty or muddy side channels, pools or seepages away from the main water channel of rivers and streams with rather stony or gravelly banks where *Zemacrosaldula* or *Aoteasalda* species occur.

Key to *Kiwisaldula* species (North Island and nearby offshore islands)

Remark. Additional helpful but not necessarily exclusive characters are provided between square brackets.

1 Antennal segment II short, less than 1.5x longer than segment I. Lateral margins of pronotum narrowly pale or almost completely dark. Hemelytra (Figs 9, 17) velvety dark brown to bluish black in appearance with extensive steely blue-grey pruinose areas and reduced pale markings, without a nearly uninterrupted pale band along the costal margin. Hind femora darkly pigmented; ventral and dorsal sides dark brown to black, often coalesced into a broad annulus. Male paramere (Fig. 21) without

distinct processus sensualis; processus hamatus rather short, distinctly upturned at tip. [Small, 2.80–3.32 mm. Brachypterous, with three or four distinctly reduced cells in hemelytral membrane. Distribution: North Island, Central Volcanic Plateau and vicinity.] . . . . . ***K. stoneri*** (Drake & Hoberlandt)

- Antennal segment II longer, at least 2x longer than segment I. Lateral margins of pronotum broadly pale. Hemelytra (Figs 10–12, 18–20) not velvety dark brown to bluish black in appearance, lacking extensive steely blue-grey pruinose areas, with moderately to well developed pale markings and a nearly uninterrupted pale band along the costal margin. Hind femora paler; with or without ventral side partly dark, without a broad annulus. Male paramere (Figs 22–24) with or without processus sensualis; processus hamatus longer, not distinctly upturned at tip 2

2 Elongate-ovate species (Fig. 10). Mostly macropterous, cell 4 of hemelytral membrane ending more or less in line with cell 3. Head, pronotum and scutellum slightly shiny, not or barely contrasting against mostly dull hemelytra. Male paramere (Fig. 22) with barely distinct processus sensualis; processus hamatus moderately long and rather broad. Female venter narrowly margined with pale (pale margin often reduced to individual patches laterally on segments). [Larger, about 4 mm long on average. Fore and mid femora often with ventral dark stripe over most of length. Distribution: North Island, central eastern and southern areas.] . . . . . ***K. porangahau*** new species

- Short-ovate species (Figs 11–12). Mostly subbrachypterous, cell 4 of hemelytral membrane ending apically before tip of cell 3. Head, pronotum and scutellum strongly shiny, contrasting against mostly dull hemelytra. Male paramere (Figs 23–24) with or without barely distinct processus sensualis; processus hamatus long or short, narrower than above. Female venter moderately to broadly margined with pale, at least basally. [Smaller, under 3.4 mm long on average.] 3

3 Corium (Fig. 19): costal margin lined with rather wide pale band; basal pale spot of clavus usually absent. Inner margins of male parandria (Fig. 27) almost straight subbasally, slightly concave subapically. Male paramere (Fig. 23) without trace of a processus sensualis; processus hamatus rather long, its tip moderately broad. [Distribution: North Island, northern half and southwestern areas.] . . . . . ***K. parvula*** (Cobben)

- Corium (Fig. 20): costal margin lined with rather narrow pale band; basal pale spot of clavus usually present. Inner margins of male parandria (Fig. 28) more sinuate. Male paramere (Fig. 24) with barely distinct processus sensualis; processus hamatus rather short, its tip narrow. [Distribution: Three Kings Islands.] . . . . . ***K. manawatawhi*** new species

Kiwisaldula stoneri (Drake & Hoberlandt, 1950) new combination

Saldula stoneri Drake & Hoberlandt, 1950: 1. Holotype female, brachypterous (USNM): BP, Rotorua (not seen).

Description (Brachypterous adult). Body length 2.80–3.32 (3.06) mm; short, pear-shaped (Fig. 9). Dorsal colour largely dark, with bluish tinge and velvety appearance, narrowly pale lateral margins of pronotum, and reduced pale markings on hemelytra. Facial colour (Fig. 13) slightly to strongly contrasted. Head, pronotum and scutellum slightly shiny, not or barely contrasting against mostly dull hemelytra. Dorsal pubescence short to moderately long, reclined to semi-erect, mostly golden brown, usually thicker, longer and more densely distributed on hemelytra (especially clavus and endocorium); also with more erect dark brown setae near lateral margins of pronotum and costal margin of hemelytra. Hemelytra with reduced cells in membrane (cell 4 often extremely reduced or absent); hindwings highly reduced (not fully developed), reaching about half to two-thirds of corium length. **Head** (Fig. 13, facial view). Frons with slightly (shallowly) to moderately developed longitudinal furrow medially. Preocellar spots yellowish. Preocellar furrows moderately deep, usually deeper than longitudinal frontal furrow. Preocular spots yellowish. Transverse swelling slightly to moderately developed; lateral portions contiguous or separated by a narrow gap; whitish yellow to yellowish brown, darker at facial midline. Mandibular and maxillary plates slightly (sometimes rather flat) to strongly developed, whitish yellow or pale yellowish brown. Anteclypeus whitish yellow, marked with brown along margins or largely brownish. Rostrum brownish, extending to hind coxae. ***Antennae*** 4.5–4.8x longer than pronotum + collar medially; segment I whitish yellow to yellowish brown, often more darkly pigmented in females, ventral side usually dark (sometimes striped); segment II whitish yellow to pale brown, often darker on one side (especially in males), 1.1–1.3x longer than segment I, clothed over entire length with setae shorter than or about as long as segment width, usually with some longer setae in apical half; segments III–IV dark brown to black. **Thorax**. Lateral margins of pronotum subrectilinear, less explanate than in other *Kiwisaldula* species, narrowly pale yellowish (pale area at midlength 1–1.5x the width of antennal segment II) or, in very dark individuals, lateral margins narrowly brown to almost completely black. Scutellum 1.2–1.4x longer than pronotum + collar medially. Thoracic underside dark brown to black, with moderately contrasting, broadly or narrowly pale acetabula (acetabulum I broadly pale, acetabulum II narrowly pale, acetabulum III completely dark), and broadly pale lateral margins; pubescence rather dense, silvery, and appressed (except for glabrous lateral margins). ***Legs*** largely pale, whitish yellow, with dark brown to black coxae; femora with more or less defined brown spots on

anterior and posterior faces; fore and mid femora with ventral side dark brown to nearly black subapically or over most of length (often distinctly striped); hind femora with ventral and dorsal sides dark brown to black, often coalesced into a broad annulus (as opposed to other *Kiwisaldula* species); tibiae pale or dark at base, dark at apex; fore tibiae dark dorsally (often distinctly striped throughout); hind tibiae 2.1–2.3x longer than tarsal segments II+III combined; hind tarsal segments dark apically, segment II about as long as segment III. ***Hemelytra***: corium (Figs 9, 17) largely dark brown to bluish black, velvety in appearance, with very few if any pale markings on endocorium and reduced pale markings (whitish yellow to pale brown) on exocorium; endocorium with distinct brown to nearly black eyespot subbasally near R vein, nearly immaculate otherwise; costal margin dark, not lined with uninterrupted pale band; colour pattern in female consistent with that in male; pruinose areas well developed, bearing a distinctive steely blue tinge, distributed on base and apex of clavus, most of endocorium, subapex of exocorium, and on membrane near apex of clavus; basal pruinose area of clavus broad and long, covering about one-third of clavus length; basal pale spot of clavus absent; subapical pale spot of clavus present; membrane whitish yellow, often mixed with brown, with pale to dark brown apical margin, veins (often heavily pigmented) and patch medially in each of three to four reduced cells; cell 1 the shortest, distinctly shorter than cells 2 and 3, oval to subtriangular; cells 2 and 3 subrectangular, subequal in length and width; cell 4, if present, the narrowest, slender, distinctly shorter than cell 3. **Abdomen**. Venter: male, dark brown to black, sometimes with posterior margin of some or most segments very narrowly pale brown; female, usually with first two or three visible segments narrowly margined with yellowish brown (often only faint pale patches), darker medially, sometimes with posterior margin of some or most segments very narrowly pale brown (segments entirely dark brown to black in very dark specimens). Pubescence dense, silvery, and appressed in both sexes. ***Male parandria*** (Fig. 25) elongate, narrowly subtriangular, acutely rounded at tip; inner margins almost straight; medial membrane with angular inward projection on each side; basal margin sinuate, roundly convex medially. ***Male paramere*** (Fig. 21) without distinct processus sensualis, instead with slightly uneven cuticular surface bearing less than ten setae; processus hamatus rather short, its tip moderately broad, acutely rounded, and distinctly upturned. Apical half of ***male aedeagus***, in lateral view, with visible sclerites configuration similar to *K. parvula*. ***Subgenital plate of female*** (segment VII ventrally) dark brown to black with apical half or third pale. *Other characters as in generic description*.

Geographic distribution (Fig. 33). North Island, central Volcanic Plateau and vicinity.

Material examined. A total of 30 non-type specimens from the following localities. **North Island**. **BP**–Rotorua (not seen; type label checked by TJ Henry, USNM). **TO**–Access Road 3, 1.3 km off Highway 47 (NZAC); Desert Road, Te Piripiri Stream (NZAC); Erua, Junction of Waimarino Stream & Erua Road (NZAC); Junction Mangahuia Stream & Highway 47 (NZAC); Pureora Forest Park, Waihora Road end (NZAC); Tongariro National Park, Taranaki Falls Track (NZAC).

Biology. **Altitudinal range**. Lower montane to subalpine; collected from 400 m to 1,100 m. Inland. **Habitat**. Occurs mostly near seepages on moist to wet, sparsely vegetated (e.g., moss patches, short rushes), sandy, including pumice sand, or muddy ground located near or away from streams (e.g., roadside ditches, vacant lots, sand or mud flats and banks in tussock grasslands, alpine scrublands or open regenerating forest). **Seasonality**. Adults collected in December (mostly) and March; newly emerged adults (tenerals) collected in December. **Food**. Predator or scavenger. **Behaviour**. Jumps very short distances (less than 0.25 m) or dashes into the base of plant tufts or under debris when disturbed. Slightly heliophilous; slightly more active in full sunshine, also very active under cloudy or rainy conditions.

Remarks. This species was previously known from the female holotype only. It is mostly brachypterous although some marginally larger, more slender looking, submacropterous individuals can sometimes be seen.

Specimens examined so far conform in all respects to the description and illustration of the brachypterous female holotype of *Saldula stoneri* provided by Drake & Hoberlandt (1950). The velvety black dorsal appearance with rather narrowly pale lateral margins of pronotum, the extensive steely blue-grey pruinose areas on hemelytra, the shortness of antennal segment II, and the darkly pigmented hemelytra and hind femora, are quite distinctive for this species.

The type locality 'Rotorua' probably refers to the greater Rotorua area rather than the actual town. Based on *K. stoneri*'s known distribution and biology, it is likely that the holotype was collected somewhere south of Rotorua perhaps in the vicinity of the Orakei Korako geothermal fields or beyond where the terrain gains in altitude as it nears the Taupo Volcanic Plateau.

See also remarks under *K. parvula*.

FIGURES 9–12. Dorsal view of *Kiwisaldula* species (males; legs and antennae omitted). Scale bar = 1 mm. (9) *K. stoneri*, (10) *K. porangahau*, (11) *K. parvula*, (12) *K. manawatawhi*.

FIGURES 13–16. Facial view of *Kiwisaldula* species. (13) *K. stoneri*, (14) *K. porangahau*, (15) *K. parvula*, (16) *K. manawatawhi*.

Kiwisaldula porangahau new species

Kiwisaldula porangahau Larivière & Larochelle, new species. Holotype: Male (NZAC) labelled "NEW ZEALAND HB Porangahau Beach 4018S 17639E [= 40°18'S 176°39'E] 9.XII. 2003 Larivière, Larochelle / Sandy sides of lagoon with bare sand and drift algae. / HOLOTYPE [male symbol] *Kiwisaldula porangahau* Larivière & Larochelle, 2016 (red label)." Paratypes: 2 males (1 NZAC, 1 AMNZ), 4 females (2 NZAC, 1 AMNZ, 1 MONZ) with same data as holotype, bearing blue paratype labels.

Description (Macropterous adult). Body length 3.76–4.34 (4.09 mm); elongate-ovate (Fig. 10). Dorsal colour largely dark, with moderately to broadly pale lateral margins of pronotum and moderately to well-developed, often coalesced pale markings on hemelytra. Facial colour (Fig. 14) slightly to moderately contrasted. Head, pronotum, and scutellum slightly shiny, not or barely contrasting against mostly dull hemelytra. Dorsal pubescence short to moderately long, reclined to semi-erect, mostly golden brown or silvery, more or less evenly distributed on pronotum, scutellum and hemelytra (sometimes more densely distributed on clavus and endocorium); also with more erect dark brown setae near lateral margins of pronotum and costal margin of hemelytra. Hemelytra fully developed; hindwings reaching from base to apex of hemelytral membrane. **Head** (Fig. 14, facial view). Frons with

barely distinct to slightly (shallowly) developed longitudinal furrow medially. Preocellar spots whitish. Preocellar furrows shallow to moderately deep, about as deep as or slightly deeper than longitudinal frontal furrow. Preocular spots yellowish to brown (nearly indistinct in some darker individuals). Transverse swelling very slightly to moderately developed (often thin and flat); lateral portions contiguous (often seemingly separated by a gap if broadly dark near facial midline); whitish yellow to yellowish brown (sometimes pale brown), narrowly to broadly darker at facial midline. Mandibular plates slightly to moderately developed, concolorous with or slightly darker than transverse swelling. Maxillary plates moderately developed, concolorous with or slightly paler than transverse swelling, sometimes margined with brown. Anteclypeus whitish yellow to yellowish brown or pale brown, often marked with brown basally and along margins. Rostrum yellowish brown to dark brown, extending to hind coxae. ***Antennae*** 3.5–3.9x longer than pronotum + collar medially; segment I whitish yellow to yellowish brown, ventral and dorsal sides dark (usually striped); segment II yellowish brown to dark brown, often darker on one side, sometimes dark near base and apex, 2.2–2.3x longer than segment I, clothed over entire length with setae about as long as segment width, with some longer setae in apical half; segments III–IV brown to nearly black. **Thorax**. Lateral margins of pronotum subrectilinear (sometimes slightly sinuate-concave) to moderately convex, distinctly explanate, moderately broadly pale whitish yellow (pale area at midlength about 1.5–2x the width of antennal segment II), often tinged with brown or often thickly dark along outer edges (in rare cases obscuring the pale area). Scutellum 1.7–1.8x longer than pronotum + collar medially. Thoracic underside black, with slightly to strongly contrasting, broadly to very narrowly pale acetabula (acetabulum I very broadly pale in male, narrowly to moderately broadly pale in female; acetabulum II narrowly to moderately broadly pale, usually more broadly pale in male; acetabulum III very narrowly pale to almost completely dark), and broadly pale lateral margins; pubescence rather dense, silvery, and appressed (except for glabrous lateral margins). ***Legs*** largely pale, whitish yellow to yellowish brown, with dark brown to black coxae; femora with more or less defined brown spots on anterior and posterior faces; fore and mid femora often with ventral side dark brown to nearly black over most of length (often distinctly striped); tibiae pale or dark at base and apex; fore tibiae slightly to strongly infumate dorsally (not darkly striped throughout); hind tibiae 2.3–2.4x longer than tarsal segments II+III combined; hind tarsal segments usually dark apically, segment II often pale throughout, about as long as segment III. ***Hemelytra***: corium (Figs 10, 18) largely blackish, with reduced pale markings on endocorium and more extensive pale markings (whitish yellow to yellowish brown) on exocorium; endocorium with distinct dark brown to black eyespot subbasally near R vein, seldom with a pale mark next to midportion of clavus; costal margin lined with narrow to moderately wide, mostly uninterrupted pale band (sometimes evanescent in apical half or third); colour pattern in female consistent with that in male; pruinose areas well developed, distributed on base and apex of clavus, most of endocorium and exocorium, and usually on membrane near apex of clavus; basal pruinose area of clavus broad and short, covering less than one-third of clavus length; basal pale spot of clavus absent; subapical pale spot of clavus usually present; membrane whitish yellow, usually mixed with brown, with pale apical margin, dark brown to blackish veins and patch medially in each of four usually well-formed cells (cells 1 and 4 sometimes slightly reduced); cell 1 barely shorter than cells 2 and 3, subtriangular; cells 2 and 3 subrectangular, subequal in length and width (cell 3 sometimes narrower); cell 4 the narrowest, slender, subequal in length to slightly or much longer than cell 3, ending apically more or less in line with tip of cell 3. **Abdomen**. Venter: male, black, rarely with posterior margin of segments very narrowly pale brown; female, narrowly margined with yellowish ivory to yellowish brown (pale margin often reduced to individual patches laterally on segments), darker medially. Pubescence dense, silvery, and appressed in both sexes. ***Male parandria*** (Fig. 26) elongate, broadly subtriangular, acutely rounded at tip; inner margins sinuate; medial membrane with blunt inward projection on each side; basal margin almost straight. ***Male paramere*** (Fig. 22) with barely distinct processus sensualis bearing less than ten setae; processus hamatus moderately long, its tip rather broad and acutely rounded. Apical half of ***male aedeagus***, in lateral view, with visible sclerites configuration similar to *K. parvula*. ***Female subgenital plate*** (segment VII ventrally) dark brown to black with apical half pale. *Other characters as in generic description.*

Geographic distribution (Fig. 33). North Island, central eastern and southern areas.

Material examined. A total of 471 specimens including types, from the following localities. **North Island**. **BP**–Hicks Bay (NZAC); Otamaroa (2.3 km W Whangaparaoa) (NZAC); Papatea Bay (NZAC). **GB**–Kaiaua Beach (NZAC); Pouawa Beach (NZAC); Rangiata (NZAC); Urewera National Park (Aniwaniwa (NZAC); Mokau Landing (NZAC)); Wherowhero Lagoon (NZAC). **HB**–Blackhead Beach (NZAC); Kereru (8 km E) (NZAC); Napier [Ahuriri] Estuary (NZAC); Ocean Beach, N end of beach (NZAC); Porangahau Beach (AMNZ, MONZ,

NZAC); Whangaehu Beach (NZAC). **RI**–Horopito Stream ([Junction] Pohangina Valley Road & Tunipo Road) (NZAC); Junction Scanlyn Creek & Main South Road (NZAC); Mount Richards, Pohangina River (NZAC); Ruahine Forest Park, Rangitane Road end, Colenso Trig area (NZAC); Ruahine Ranges, Armstrong Saddle (NZAC). **TK**–Kai Iwi Beach (NZAC). **WA**–Flat Point Beach, 1.5 km N Arawhata Stream (NZAC); Herbertville, Wainui River mouth (NZAC); Nireaha, Mangatainoka River (NZAC); Okau Stream, N of Whakataki (NZAC); Otahome Stream (NZAC); Uruti Point, Waioronu Stream (NZAC). **WI**–Koitiata (NZAC); Santoft Forest (Koitiata stream mouth (NZAC); Lake Koitiata stream mouth (NZAC); Waimahora Stream mouth (NZAC)); Tangimoana (NZAC); Whangaehu River, 2 km S Mangawhero Road (NZAC).

Biology. **Altitudinal range**. Lowland to subalpine; collected from sea level to 1,400 m. Coastal or inland. **Habitat**. Occurs in open coastal habitats on moist to wet, bare, sparsely to densely vegetated (e.g., rushes and sedges), often silty, sand or mud along or near the banks of estuarine streams, the edge of lagoons and small ponds, on tidal flats in open terrain or in salt marshes; as opposed to *K. parvula*, apparently prefers more eutrophic environments, more silty terrains, and habitats with longer or denser vegetation covers (e.g., mat vegetation, carpets of flatten dead grass or of semi-dried drift algae, marshy edges of lagoons and ponds). Also lives inland, in open or lightly forested native or modified environments (e.g., pastures), on moist to wet, bare, sparsely to densely vegetated (e.g., mat vegetation, rushes, sedges), often silty or loamy, sand or mud along or near streambanks, riverbanks, lakeshores, as well as flats or terraces at some distance from body of waters; in alpine environments, collected on floating Sphagnum moss on the side of a Sphagnum moss bog surrounded by Snow tussock, also in mat vegetation at the edge of an alpine pond. Nymphs live in the same habitat as adults, on the ground on bare areas, at the base of plant or under debris (e.g., dead algae). **Seasonality**. Adults collected from September to March; mating pairs observed in November (coastal area) and February (alpine zone); newly emerged adults (tenerals) collected in September and from December to March, but most abundantly in December and January; nymphs found in January and March—suggesting overwintering in the egg stage or nymphal stage, nymphal development in late winter to early spring, adult emergence in spring, early summer breeding, and emergence of a new generation that will breed before winter, from December onwards, possibly with a two to four weeks delay inland or at higher altitudes. **Food**. Predator or scavenger. **Behaviour**. Jumps or flies moderate distances (usually less than 1 m) or dashes into the base of plant tufts or under debris (e.g., dead algae) when disturbed. Moderately heliophilous; more active in full sunshine, also active under cloudy or slightly rainy conditions.

Remarks. This species is named after its type locality, Porangahau Beach (HB).

Kiwisaldula porangahau is mostly macropterous; submacropterous individuals (hemelytral membrane slightly reduced) and some subbrachypterous individuals can sometimes be seen.

At first glance this species may superficially resemble *K. parvula* but it is larger in size, with more fully developed wings, less shiny head, pronotum and scutellum, and a largely dark, or more narrowly pale, abdominal venter in female.

Kiwisaldula parvula (Cobben, 1961) new combination

Saldula parvula Cobben, 1961: 101. Holotype: male (BMNH) labelled: "Holo- type (circular red-bordered label; typed in 2 lines) / S. Karori 13.I.24 T. Cockcroft (handwritten) / Holotypus Saldula parvula R.H. Cobben 1961(pale green label; handwritten) / J.G. Myers Coll. B.M. 1937-789. (upside down label; typed). Good condition; left hemelytron missing; abdomen removed and dissected, placed on round permanent slide mount on same pin as main body.

Description (Subbrachypterous adult). Body length 2.75–3.83 (3.16 mm); short-ovate (Fig. 11). Dorsal colour largely dark, with broadly pale lateral margins of pronotum and well-developed, often coalesced pale markings on hemelytra. Facial colour (Fig. 15) moderately to strongly contrasted. Head, pronotum, and scutellum strongly shiny, contrasting strongly against mostly dull hemelytra. Dorsal pubescence short to moderately long, reclined to semi-erect, mostly golden brown (sometimes silvery on head), usually thicker, longer and more densely distributed on hemelytra (especially clavus and endocorium); also with more erect dark brown setae near lateral margins of pronotum and costal margin of hemelytra. Hemelytra with somewhat reduced cells in membrane; hindwings distinctly reduced, reaching tip of corium to middle of hemelytral membrane. **Head** (Fig. 15, facial view). Frons with barely distinct to slightly (shallowly) developed longitudinal furrow medially. Preocellar spots yellow to yellowish brown. Preocellar furrows shallow, about as deep as longitudinal frontal furrow. Preocular spots

yellowish or brown. Transverse swelling moderately to strongly developed (sometimes prominent); lateral portions contiguous; whitish yellow to yellowish brown (often bright yellow), darker at facial midline. Mandibular plates moderately to strongly developed, concolorous with or paler than transverse swelling. Maxillary plates strongly developed, concolorous with transverse swelling, margined with brown. Anteclypeus yellowish, usually marked with brown basally and sometimes along margins. Rostrum yellowish brown to dark brown, extending to hind coxae. ***Antennae*** 3.9–4.5x longer than pronotum + collar medially; segment I whitish yellow to yellowish brown, ventral and dorsal sides often dark (sometimes striped); segment II yellowish brown, often darker in apical fourth, 1.9–2.0x longer than segment I, clothed over entire length with setae about as long as segment width, with some longer setae in apical half; segments III–IV pale to dark brown. **Thorax**. Lateral margins of pronotum subrectilinear to slightly convex, distinctly explanate, broadly pale yellow to yellowish brown (pale area at midlength at least 2x the width of antennal segment II). Scutellum 1.4–1.7x longer than pronotum + collar medially. Thoracic underside black, with moderately to strongly contrasting, broadly or narrowly pale acetabula (acetabulum I broadly pale, acetabulum II broadly or narrowly pale, acetabulum III narrowly pale or completely dark), and broadly pale lateral margins; pubescence rather dense, silvery, and appressed (except for glabrous lateral margins). ***Legs*** largely pale, whitish yellow to yellowish brown, with dark brown to black coxae; femora with more or less defined brown spots on anterior and posterior faces; fore and mid femora often with ventral side brown to nearly black subapically (not usually distinctly striped); tibiae pale or dark at base and apex; fore tibiae pale or slightly infumate dorsally (not darkly striped throughout); hind tibiae 2.3–2.7x longer than tarsal segments II+III combined; hind tarsal segments usually dark apically, segment II about as long as segment III. ***Hemelytra***: corium (Figs 11, 19) largely dark brown to nearly black, with reduced to moderately developed pale markings on endocorium and more extensive pale markings (whitish yellow to brownish) on exocorium; endocorium with distinct brown eyespot subbasally near R vein, often with a rather large irregular or subtriangular pale mark next to middle of clavus; costal margin lined with moderately to rather wide, mostly uninterrupted pale band (usually thicker-looking than in other *Kiwisaldula* species; sometimes evanescent in apical quarter or half); colour pattern in female consistent with that in male; pruinose areas well developed, distributed on base and apex of clavus, most of endocorium, often on basal third of exocorium, and sometimes on membrane near apex of clavus; basal pruinose area of clavus narrow and short, covering less than one-third of clavus length; basal pale spot of clavus usually absent; subapical pale spot of clavus present (often very small) or absent; membrane whitish yellow, often mixed with brown, with pale to moderately dark brown apical margin, veins and patch medially in each of four somewhat reduced or sometimes mostly well-formed cells; cell 1 the shortest, distinctly shorter than cells 2 and 3, oval to subtriangular; cells 2 and 3 subrectangular, subequal in length and width; cell 4 the narrowest, slender, subequal in length to or slightly longer than cell 3, ending apically before tip of cell 3. **Abdomen**. Venter: male, black, with or without posterior margin of segments very narrowly pale brown; female, moderately to broadly margined with yellowish ivory to yellowish brown (sometimes very narrowly pale), darker medially. Pubescence dense, silvery, and appressed in both sexes. ***Male parandria*** (Fig. 27) elongate, broadly subtriangular, acutely rounded at tip; inner margins almost straight (barely concave subapically); medial membrane with blunt inward projection on each side; basal margin almost straight. ***Male paramere*** (Fig. 23) without distinct processus sensualis, instead with slightly uneven cuticular surface bearing less than ten setae; processus hamatus rather long, not constricted basally, its tip moderately broad and acutely rounded. Apical half of ***male aedeagus*** (Fig. 29), in lateral view, with four main visible sclerites (elongate, moderately curved median sclerite; small, subquadrate anterolateral sclerite; elongate-sinuate V-shaped sclerite; medium-sized, nearly pear-shaped sclerite). ***Female subgenital plate*** (segment VII ventrally) dark brown to black with apical half pale. *Other characters as in generic description.*

Geographic distribution (Fig. 33). North Island, northern half and southwestern areas.

Material examined. A total of 289 specimens including holotype, from the following localities. **North Island**. **AK**—Waitakere Ranges (Swanson [Creek], Cascade Park (NZAC); Te Henga (NZAC); Whatipu, Windy Point (AMNZ)). Hunua Ranges, Vicinity of Vining Track (NZAC); Manukau Peninsula, Pollok (NZAC); **BP**—Haune Stream, W of Pikowai, above beach (AMNZ); Kaimai Range, Okauia (Old Te Aroha Road, 1 km S Till Road) (NZAC); Tokata (NZAC); Waiotahi Beach (NZAC); Whaka St. Forest Rotorua [=Rotorua, Whakarewarewa Forest] (MONZ; doubtful record, see remarks below). **CL**—Golden Cross (10 km N Waikino) (NZAC); Hotwater Beach (NZAC); Mercury Islands, Korapuki Island (NZAC); Te Kouma (AMNZ); Te Kouma Road, 5 km S Coromandel (NZAC); Whitianga (NZAC). **ND**—Doel Road, E of Kawakawa (AMNZ); Hukatere, Ninety Mile Beach (AMNZ); Karikari Peninsula (AMNZ); Lake Waiparera (AMNZ); Lake Taharoa (10 km from Kaihu)

(NZAC); Te Paki Stream (MONZ); Te Werahi Swamp S of Cape Reinga (AMNZ); Tokerau Beach (3 km SW) (NZAC); Twilight Beach Track, Werahi Stream (NZAC). **TO**—Rotorua, Orakei Korako. **WI**—Foxton Beach (NZAC); Koitiata (NZAC). **WN**—Stokes Valley (MONZ); Waitarere Beach (AMNZ); [Wellington] South Karori (BMNH). **WO**—Bryant Memorial Park, NW side of Karioi (NZAC); Lake Karapiro, Horahora Domain (NZAC); Lake Whangape (N shore) (NZAC); Owharoa Falls, E [=W] of Waikino (AMNZ).

Biology. **Altitudinal range**. Lowland (mostly) to lower montane. Coastal or inland. **Habitat**. Occurs in open coastal habitats, on moist to wet, bare or sparsely vegetated sand (e.g., *Sarcocornia*, *Juncus*, *Carex*, *Cotula*) along or near the banks of estuarine streams, the edge of lagoons, and on tidal flats. Also lives inland in open, native or modified environments (e.g., pastures), on moist to wet, bare or sparsely vegetated, sandy, silty or muddy ground along or near streambanks, riverbanks, lakeshores, or the edges of small pools and water puddles. Nymphs live in the same habitat as adults, on the ground on bare areas, at the base of plant or under debris (e.g., dead algae). **Seasonality**. Adults collected from October to April; mating pairs observed in November; newly emerged adults (tenerals) collected from October to April, but most abundantly in December to February; nymphs found in October and from December to January—suggesting overwintering in the egg stage or nymphal stage, nymphal development in late winter to early spring, adult emergence in spring, late spring to early summer breeding, and emergence of a new generation that will breed before winter, from about December onwards, possibly with a two to four weeks delay inland or at higher altitudes. **Food**. Predator or scavenger. **Behaviour**. Jumps for short distances (usually less than 0.5 m) or dashes into the base of plant tufts or under debris (e.g., dead algae) when disturbed. Moderately heliophilous; more active in full sunshine, also active under cloudy or slightly rainy conditions.

Remarks. The identity of the female allotype (MONZ) is uncertain; the specimen is damaged and discoloured. It appears morphologically closer to *K. stoneri* than to *K. parvula*.

This species is mostly known from subbrachypterous specimens. The authors noted in some population of *K. parvula*, the occasional submacropterous or macropterous specimens that were marginally larger and more slender looking than the standard subbrachypterous form.

In *K. parvula* the transverse swelling and mandibular plates are generally more strongly developed and more brightly coloured than in other *Kiwisaldula* species, except *K. manawatawhi* new species. The presence of a rather large, irregular or subtriangular pale mark next to the middle of the clavus, is not unique to this taxon but this character seems more prevalent in *K. parvula*.

Some populations in the far north of New Zealand are more lightly coloured overall. Likewise, teneral individuals can be deceptively pale, with an almost reversed colour pattern, e.g., largely ivory-yellow hemelytra with extensive yellowish brown to dark brown or nearly black markings. Individuals from populations occurring in colder areas or at higher altitudes can be smaller in size and more darkly coloured. For example, this has been observed around Rotorua and the Central Volcanic Plateau in general where *K. parvula* could at first glance easily be confused with *K. stoneri*, if not for the wide and nearly continuous pale band along the costa in *K. parvula*.

The main characters of the male genitalia that set *K. parvula* apart from its closest geographical and morphological relative *K. manawatawhi* new species, are: inner margins of parandria almost straight basally, slightly concave subapically; inward projections of medial membrane of parandria blunt; processus hamatus of paramere rather long, its tip moderately broad. In general, *K. parvula* has hemelytra with a wider pale band along the costal margin and lacks a basal pale spot on the clavus.

The distribution gap in the greater Mount Taranaki area may indicate a lack of suitable habitat for this species. This region is characterised by volcanic soil, forested hills with deeply cut streams and rivers, and rugged, unstable coastal environments.

Kiwisaldula manawatawhi new species

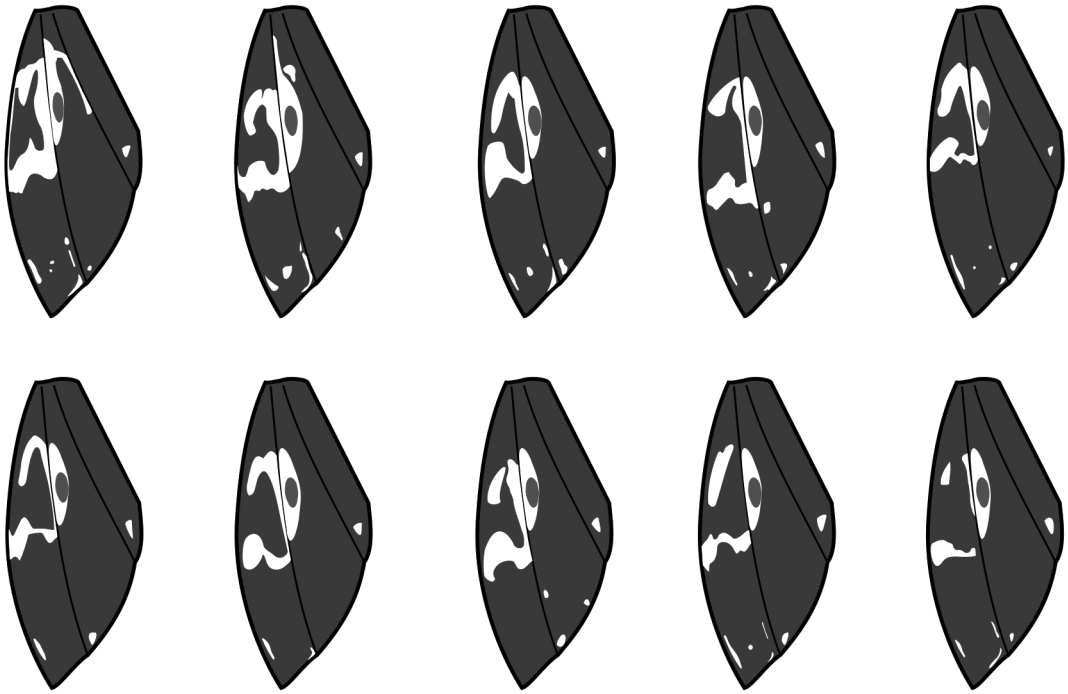
Kiwisaldula manawatawhi Larivière & Larochelle, new species. Holotype: Male (NZAC) labelled "Tasman Valley / Three Kings Is Great I. Nov 70 NZ. Ent. Div. Exp. / HOLOTYPE [male symbol] *Kiwisaldula manawatawhi* Larivière & Larochelle, 2016 (red label)." Paratypes: 3 males (1 AMNZ, 2 NZAC), 4 females (1 AMNZ, 1 MONZ, 2 NZAC) with same data as holotype, bearing blue paratype labels.

Description (Subbrachypterous adult). Body length 2.90–3.97 (3.43) mm; short-ovate (Fig. 12). Dorsal colour largely dark, with broadly pale lateral margins of pronotum and well-developed, often coalesced pale markings on

hemelytra. Facial colour (Fig. 16) slightly to moderately contrasted. Head, pronotum, and scutellum strongly shiny, contrasting against mostly dull hemelytra. Dorsal pubescence short to moderately long, reclined to semi-erect, mostly golden brown (sometimes silvery on head), usually thicker, longer and more densely distributed on hemelytra (especially clavus and endocorium); also with more erect, dark brown setae near lateral margins of pronotum and costal margin of hemelytra. Hemelytra with somewhat reduced cells in membrane; hindwings distinctly reduced, reaching subapex of corium to middle of hemelytral membrane. **Head** (Fig. 16, facial view). Frons with barely distinct to slightly (shallowly) developed longitudinal furrow medially. Preocellar spots whitish yellow or yellowish brown to pale brown. Preocellar furrows shallow to moderately deep, about as deep as or slightly deeper than longitudinal frontal furrow. Preocular spots yellowish or pale brown. Transverse swelling moderately to strongly developed (sometimes rather flat on each side of facial midline); lateral portions contiguous; whitish yellow to yellowish brown or pale brown, (sometimes bright yellow), darker at facial midline. Mandibular plates evanescent to moderately developed, concolorous with or darker than transverse swelling. Maxillary plates slightly to moderately developed, whitish yellow, yellowish brown or pale brown, sometimes bright yellow. Anteclypeus yellowish brown to pale brown, usually marked with darker brown basally and along margins. Rostrum yellowish brown to dark brown, extending to hind coxae. ***Antennae*** 3.1–4.1x longer than pronotum + collar medially; segment I whitish yellow or yellowish brown to pure brown, ventral and dorsal sides often dark (usually striped at least on dorsal side); segment II yellowish brown to pale brown, often darker along one side and sometimes in apical fourth, 2.0–2.1x longer than segment I, clothed over entire length with setae about as long as segment width, with some longer setae in apical half; segments III–IV dark brown. **Thorax**. Lateral margins of pronotum subrectilinear to slightly convex, distinctly explanate, broadly pale yellow to yellowish brown (pale area at midlength at least 2x the width of antennal segment II). Scutellum 1.4–1.6x longer than pronotum + collar medially. Thoracic underside black, with slightly to moderately contrasting, broadly or very narrowly pale acetabula (acetabulum I broadly or narrowly pale, acetabulum II broadly or narrowly pale, sometimes completely dark, acetabulum III very narrowly pale, almost completely dark) and broadly pale lateral margins; pubescence rather dense, silvery, and appressed (except for glabrous lateral margins). ***Legs*** largely pale, whitish yellow to yellowish brown, with dark brown to black coxae; femora with more or less defined brown spots on anterior and posterior faces; fore and mid femora often with ventral side brown subapically (not distinctly striped); tibiae pale or dark at base and apex; fore tibiae pale or slightly infumate dorsally (sometimes darkly striped throughout); hind tibiae 2.6–2.8x longer than tarsal segments II+III combined; hind tarsal segments usually dark apically, segment II slightly shorter than or about as long as segment III. ***Hemelytra***: corium (Figs 12, 20) largely dark brown to nearly black, with reduced pale markings on endocorium and more extensive pale markings (whitish yellow to brownish) on exocorium; endocorium with distinct brown eyespot subbasally near R vein, without irregular or subtriangular pale mark next to midportion of clavus; costal margin lined with rather narrow, mostly uninterrupted pale band (sometimes evanescent in apical third); colour pattern in female consistent with that in male; pruinose areas well developed, distributed on base of clavus, seldom on apex, on most of endocorium, often on apical third or inner half of exocorium, and sometimes on membrane near apex of clavus; basal pruinose area of clavus narrow and short, covering less than one-third of clavus length; basal pale spot of clavus usually present; subapical pale spot of clavus present; membrane whitish yellow, often mixed with brown, with pale to moderately dark brown apical margin, veins and patch medially in each of four somewhat reduced or well-formed cells; cell 1 the shortest, distinctly shorter than cells 2 and 3, oval to subtriangular; cells 2 subrectangular, narrowed or not apically; cell 3 subrectangular, subequal or slightly longer than cell 2; cell 4 the narrowest, slender, subequal in length to slightly longer than cell 3, ending apically before tip of cell 3. **Abdomen**. Venter: male, black, with or without very posterior margin of segments narrowly pale brown; female, moderately to broadly margined with yellowish ivory to yellowish brown, darker medially. Pubescence dense, silvery, and appressed in both sexes. ***Male parandria*** (Fig. 28) elongate, rather broadly subtriangular, acutely rounded at tip; inner margins sinuate; medial membrane with angular inward projection on each side; basal margin almost straight. ***Male paramere*** (Fig. 24) with barely distinct processus sensualis bearing less than ten setae; processus hamatus rather short and moderately constricted basally, its tip moderately narrow and acutely rounded. Apical half of ***male aedeagus***, in lateral view, with visible sclerites configuration similar to *K. parvula*. ***Female subgenital plate*** (segment VII ventrally) dark brown to nearly black with apical half pale. *Other characters as in generic description.*

Geographic distribution (Fig. 33). Three Kings Islands.

Material examined. A total of 13 specimens including types, from the following localities. **Offshore Islands**. **TH**–Three Kings [Islands] (Great Island, Castaway Camp (NZAC); Tasman Valley (AMNZ, MONZ, NZAC)).



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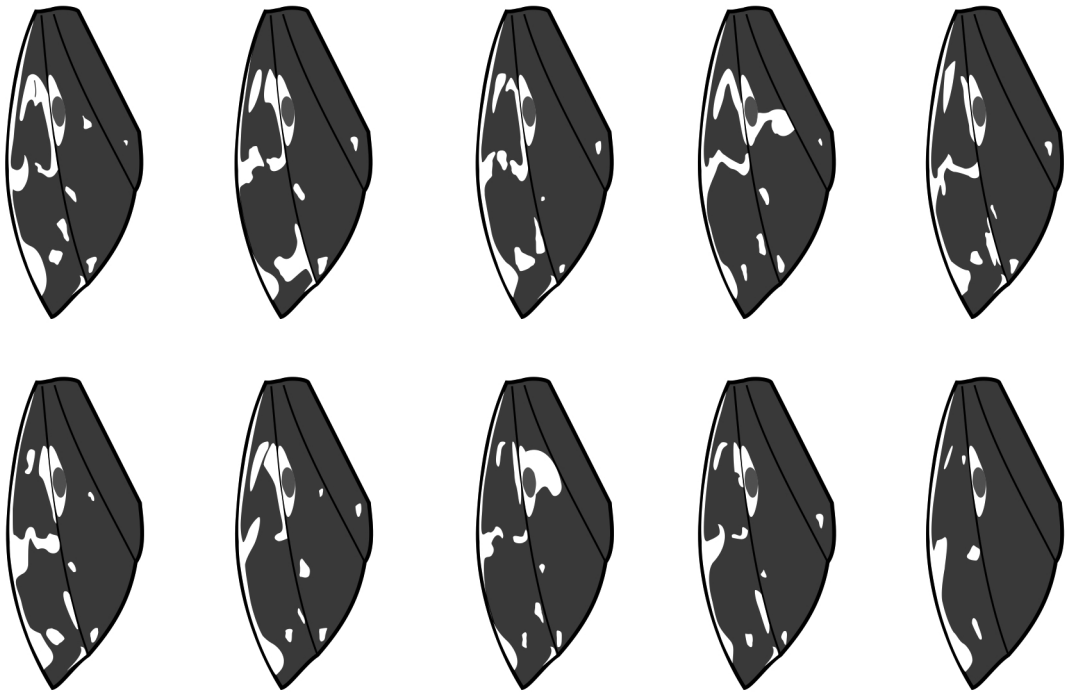

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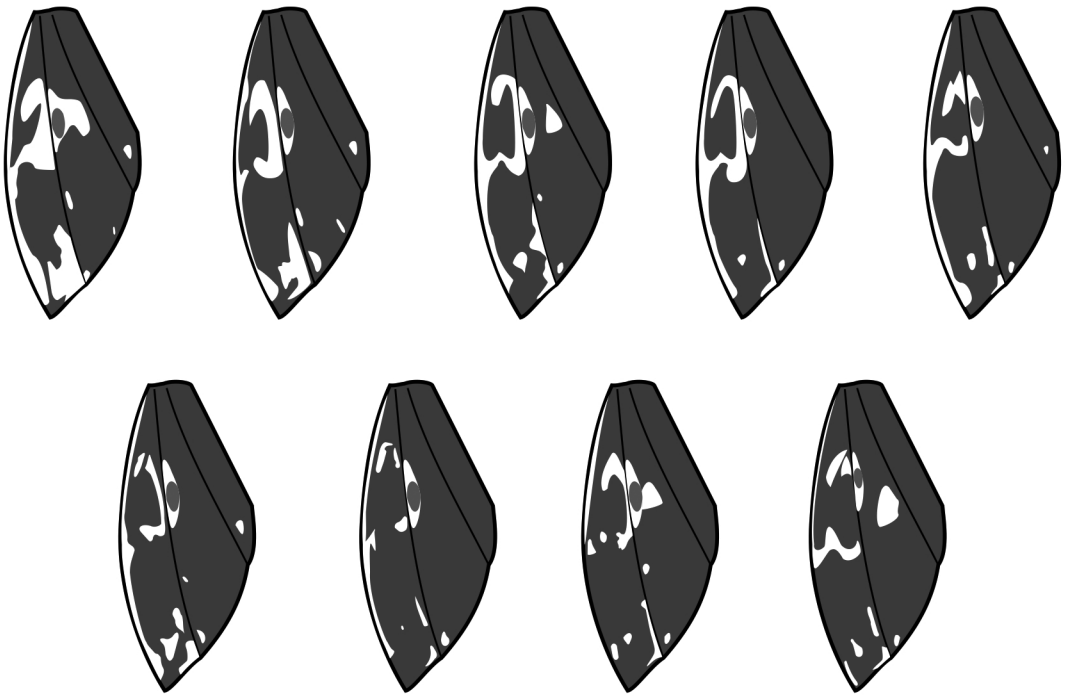
FIGURES 17–18. Eunomy (left corium) of *Kiwisaldula* species; most frequently observed pigmentation patterns. (17) *K. stoneri*, (18) *K. porangahau.*



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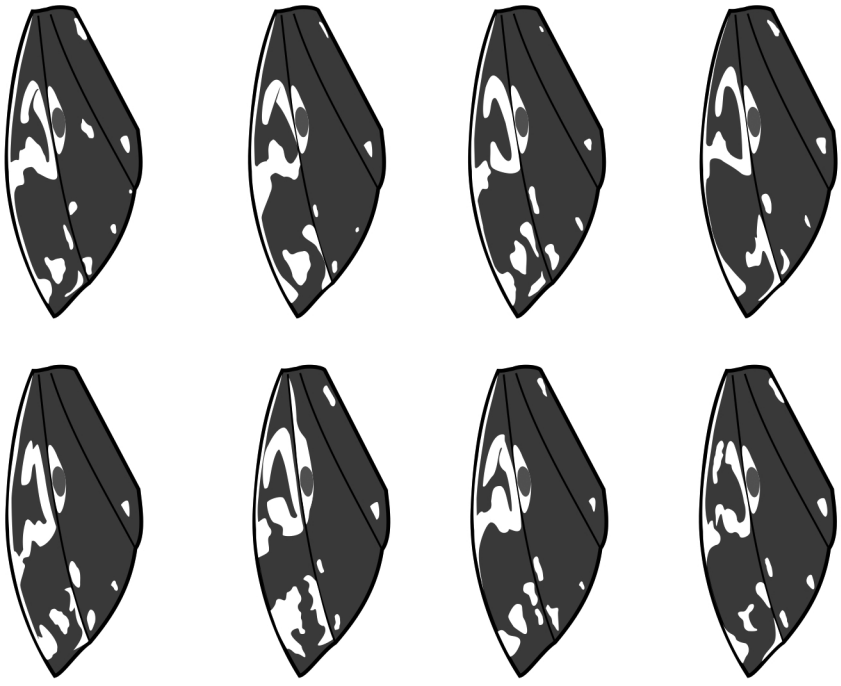

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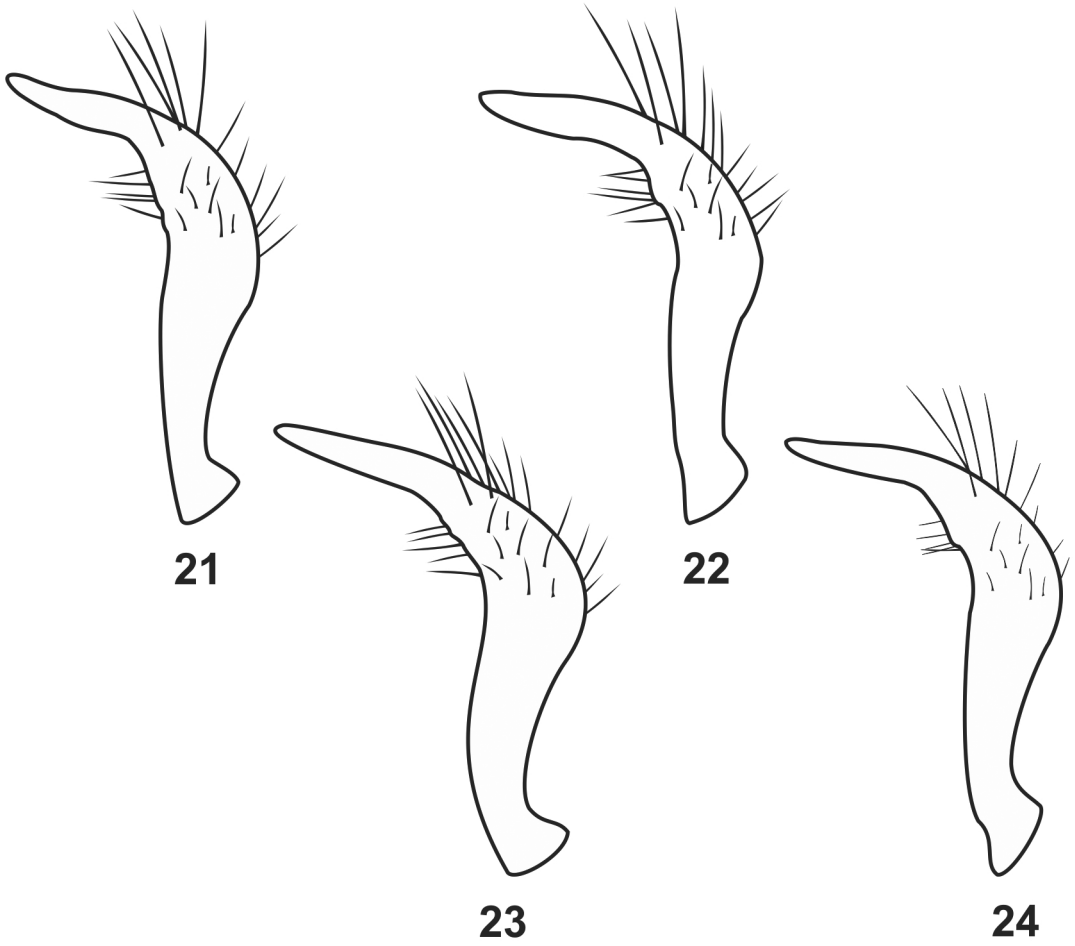
FIGURES 19–20. Eunomy (left corium) of *Kiwisaldula* species; most frequently observed pigmentation patterns. (19) *K. parvula*, (20) *K. manawatawhi*.



FIGURES 21–24. Schematic view of *Kiwisaldula* species male genitalia: paramere, ventral. (21) *K. stoneri*, (22) *K. porangahau*, (23) *K. parvula*, (24) *K. manawatawhi*.

Biology. **Altitudinal range**. Lowland. Coastal or inland (near to the coast). **Habitat**. [Probably similar to *K. parvula*.] **Seasonality**. Adults, including newly emerged adults (tenerals), collected in November. [Reproduction and life cycle probably similar to *K. parvula*.] **Food**. Predator or scavenger. **Behaviour**. [Probably similar to *K. parvula*.]

Remarks. This species is named after its type locality, Manawatawhi also known as the Three Kings Islands, a small archipelago located about 55 km northwest of the northernmost tip of the North Island of New Zealand.

Kiwisaldula manawatawhi is known from subbrachypterous specimens only. Females tend to have slightly more developed wings than males.

The main characters of the male genitalia that set this species apart from its closest geographical and morphological relative *K. parvula*, are: inner margins of parandria sinuate; inward projections of medial membrane of parandria angular; processus hamatus of paramere rather short, its tip moderately narrow. In general, *K. manawatawhi* has hemelytra with a narrower pale band along the costal margin and bears a basal pale spot on the clavus.

Kiwisaldula butleri (White, 1878) new combination

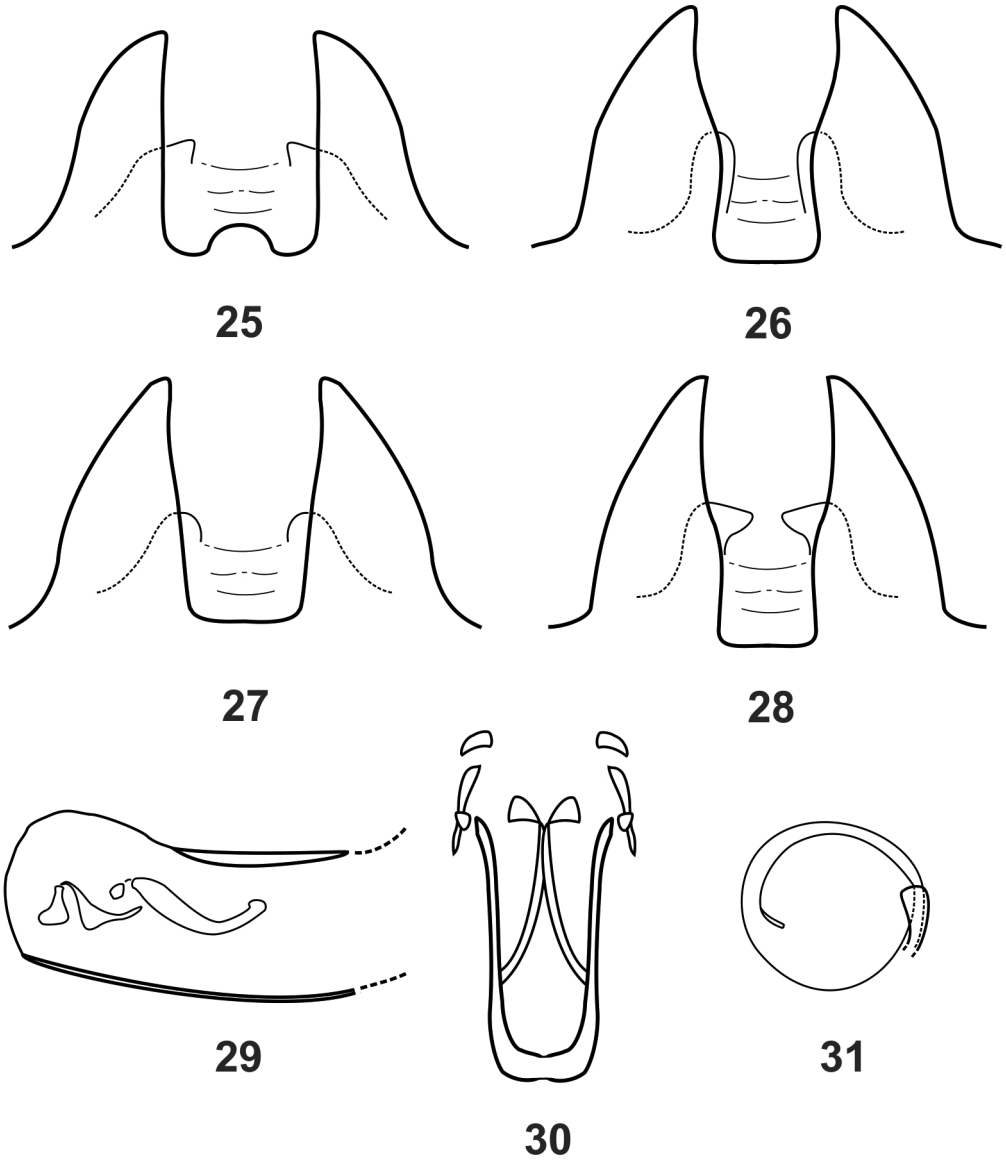
Salda butleri White, 1878: 160. Holotype female (BMNH) labelled: "LECTO- TYPE (circular purple-bordered label; typed in 2 lines) / Type (circular red-bordered label; typed) / LECTOTYPE S. butleri B. White R. Cobben 1961 (red label; first word typed, remainder text handwritten) / New Zealand (handwritten) / Salda butleri B.W (handwritten) / Salda butleri BW. (long folded label; handwritten) / Pres. by Perth Museum. B.M. 1953-629. (typed) / BMNH(E) #1005935 (typed)." Fair condition; antennae missing; left clavus damaged; left mid and hindlegs missing; right foreleg missing; right mid and hindlegs missing tibia and tarsi; mounted on card next to two nymphs.

Salda bulteri [*sic*]: Hutton, 1904: 223.
Acanthia butleri: Kirkaldy, 1909: 27.
Saldula butleri: Drake & Hoberlandt, 1950: 7.

Remarks. The female holotype of *Salda butleri* was borrowed from the Natural History Museum, London (BMNH). It is mounted on a rectangular card with two nymphs next to it. White's (1878) description under the heading "49. *S. Butleri, n. sp.*", was based on a single adult specimen provided by Hutton. This clearly excludes the two nymphs from the type series despite Cobben's lectotype label associated with this material, which suggests that in 1961 he considered the three specimens to be syntypes. Fortunately, a lectotype designation was never published by Cobben; the BMNH and Cobben's lectotype labels associated with the holotype should be ignored.

The two nymphs, and apparently several others collected by Hutton, may have been dealt with separately by White (1878) under the heading "50. *Salda sp*", with the comment "Too immature to determine, but evidently allied to the last [*S. butleri*]."

Larivière & Larochelle (2004) erroneously listed the holotype of *Salda butleri* as being a male although White's description of the "sides of abdomen below, and last segment, broadly pale" was evidently based on a female specimen.



FIGURES 25–31. Schematic view of *Kiwisaldula* species male genitalia. (25–28) Parandria, posterior view. (25) *K. stoneri*, (26) *K. porangahau*, (27) *K. parvula*, (28) *K. manawatawhi*. (29–30) *K. parvula*. (29) Anterior half of aedeagus, lateral view, (30) sclerites of aedeagus, ventral view. (31) *Kiwisaldula* species. Filum gonopori, lateral view.

The holotype specimen was collected by "Professor Hutton" [= FW Hutton]. It is labelled as having originated from "New Zealand". Between 1874 and 1880 Hutton was provincial geologist of Otago [Province], lectured both in geology and zoology at the University of Otago, occupied the position of curator of the Otago Museum and, for a brief period (1877–1880), was appointed professor of natural science at the university (Parton 2013). Although the precise type locality is not known for this species, Hutton's collecting grounds around the year of its description were on the South Island, and most likely in the Otago Province (most of the southern third of South Island from the Waitaki River in the north). However, if the specimen was collected slightly earlier it could also be from the Canterbury Province (north of the Waitaki River); Watt (1977) reported that around 1865–1970 Hutton sent beetles to London from Otago and Canterbury, with types from this material nearly all ending up in the Natural History Museum, London. The above information and the fact that no North Island taxon could be matched to the holotype, suggest that *S. butleri* is a South Island species.

Salda butleri bears the hallmarks of *Kiwisaldula* species. It is hereby transferred to this genus; the new combination *Kiwisaldula butleri* is thus established.

Kiwisaldula laelaps (White, 1878) new combination

Salda laelaps White, 1878: 160. Lectotype (hereby designated): male (BMNH) labelled: "LECTO- TYPE (circular purple-bordered label; typed in 2 lines) / Type (circular red-bordered label; typed) / LECTOTYPE S. Loelaps B. White R. Cobben 1961. (red label; first word typed, remainder text handwritten) / New Zealand (handwritten) / Salda laelaps B.W [partly legible] (handwritten) / Pres. by Perth Museum. B.M. 1953-629. (typed) / LECTOTYPE [male symbol] *Salda laelaps* White, 1878 desig. M-C Larivière & A Larochelle 2016 (red label; typed) / BMNH(E) #1005937 (typed)." Good condition; right antenna missing segments III–IV; right foreleg missing tarsal segments; mounted on two cards (top card with specimen, bottom card with dissected abdomen).

Paralectotype: female (BMNH) labelled: "PARA- LECTO- TYPE (circular pale blue-bordered label; typed in 3 lines) / Co-type (circular yellow-bordered label; typed in 2 lines) / New Zealand (handwritten) / Salda laelaps B.W (handwritten) / Salda laelaps BW. (long folded label; handwritten) / Pres. by Perth Museum. B.M. 1953-629. (typed) / PALECTOTYPE [female symbol] *Salda laelaps* White, 1878 desig. M-C Larivière & A Larochelle 2016 (blue label; typed).

Acanthia laelaps: Kirkaldy, 1909: 27.
Saldula laelaps: Drake & Hoberlandt, 1950: 8.

Remarks. Larivière & Larochelle (2004) incorrectly listed three syntypes for this species. White's (1878) description of *Salda laelaps* was based on two syntypes (1 male, 1 female; BMNH).

Lectotype labels are associated with the male syntype. Cobben's red lectotype label dated 1961, suggests that he intended to use this specimen as lectotype; such designation was never published. The male syntype is hereby designated as lectotype, in the interest of nomenclatorial stability, fixing the status of this specimen as the sole name-bearing type of *Salda laelaps*.

Larivière & Larochelle's (2004) record of this species from the Black Birch Range (South Island, MB), based on NZAC specimens identified by J.T. Polhemus, should be ignored. The specimens in question look nothing like the lectotype of *Salda laelaps* and may belong to an undescribed South Island species.

The lectotype of *Salda laelaps* is labelled as having originated from "New Zealand". No precise type locality information is known for this specimen. Wakefield [= CM Wakefield], who collected the specimen, was based in Christchurch, around the year of description of this species. The New Zealand literature (e.g., Watt 1977) indicates that Wakefield was an active insect collector in Canterbury—then a province—and that he regularly provided overseas taxonomists with study material from various insect orders. The Province of Canterbury (1853–1876) was bound by the Hurunui River in the north and the Waitaki River in the south, and initially extended from east to west until the creation of the County of Westland (1868) established the crest-line of the Southern Alps as Canterbury's western boundary (McLintock 1966). Therefore, it seems reasonable to believe, in terms of the geographic areas used in the current paper, that the lectotype of *Salda laelaps* may have been collected in North Canterbury (NC), Mid Canterbury (MC), South Canterbury (SC) or eastern Mackenzie (MK).The above information and the fact that no North Island taxon could be matched to the lectotype, suggest that *Salda laelaps* is a South Island species.

Salda laelaps bears most characteristics associated with *Kiwisaldula* species. It is hereby transferred to this genus; the new combination *Kiwisaldula laelaps* is thus established.

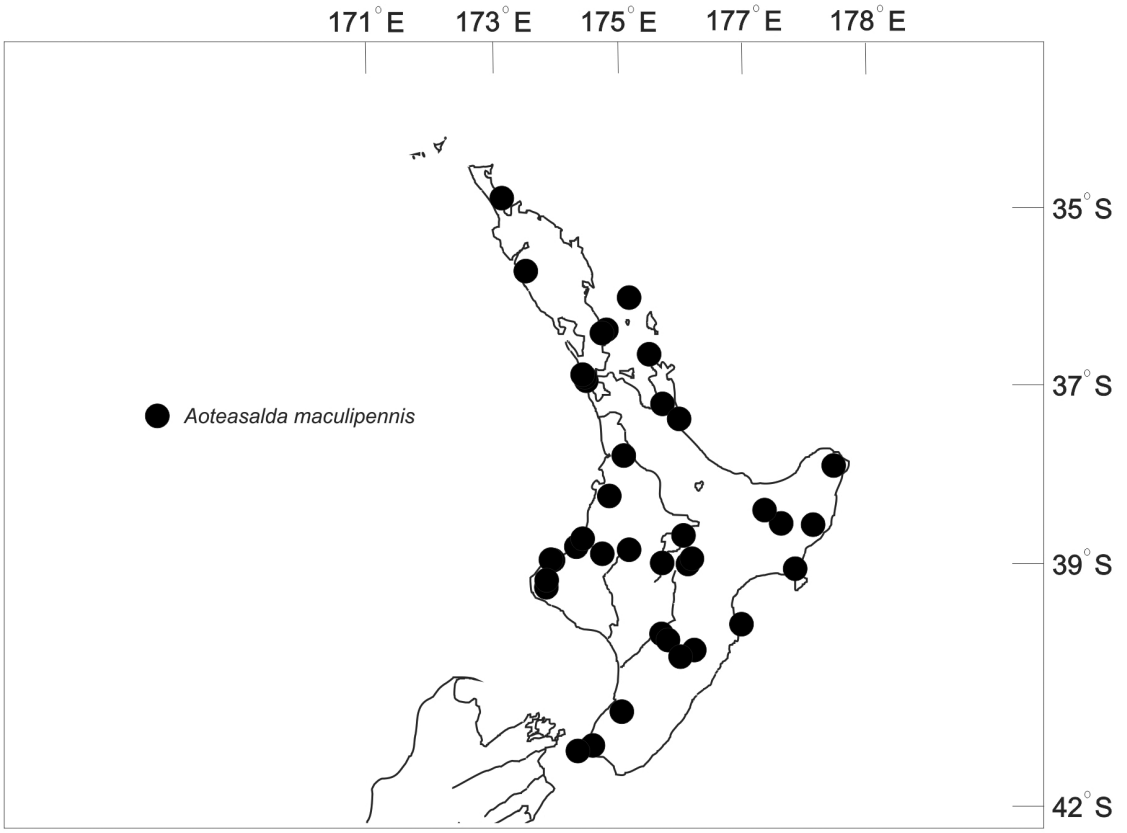


FIGURE 32. Collecting localities of *Aoteasalda maculipennis*, New Zealand's North Island and nearby offshore islands.

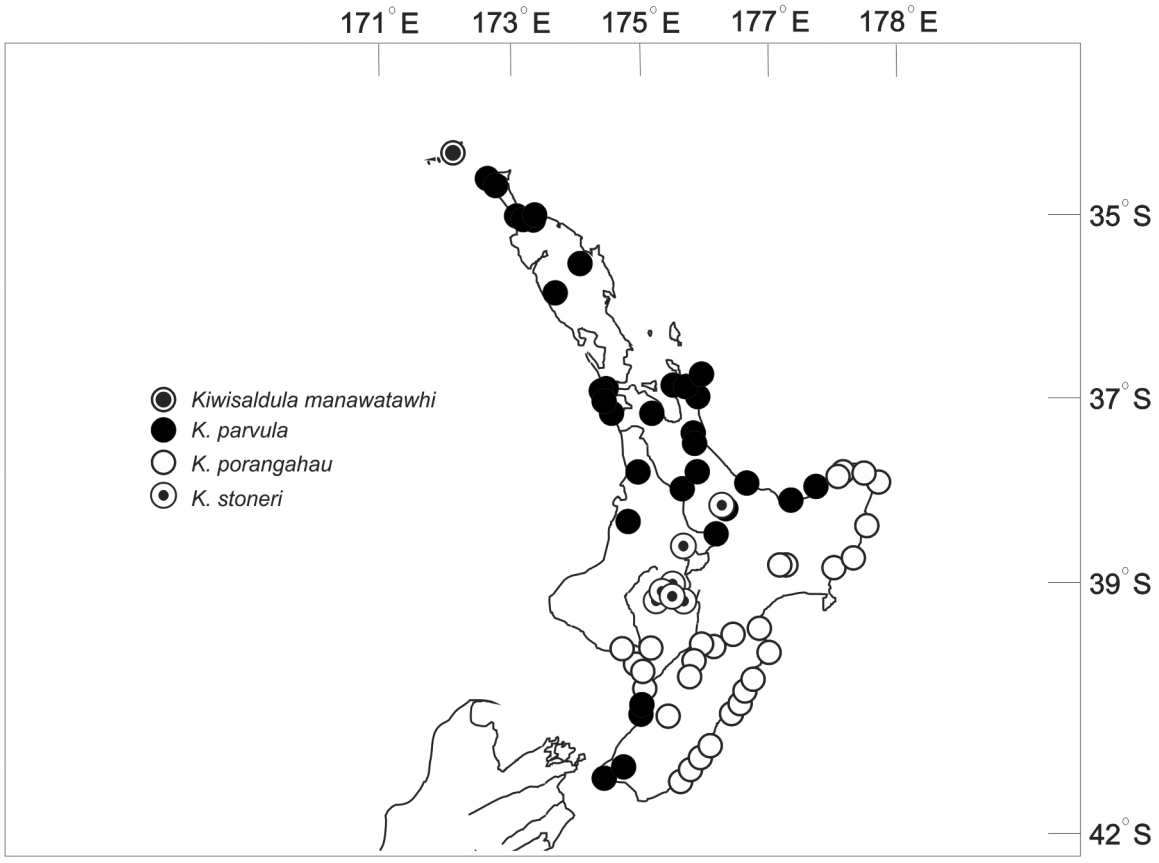


FIGURE 33. Collecting localities of *Kiwisaldula* species, New Zealand's North Island and nearby offshore islands.

TABLE 1. Geographical coordinates of localities in decimal degrees.

Locality	Area code	Latitude	Longitude
Access Road 3, 1.3 km off Highway 47	TO	-39.0500	175.5667
Awatere (near Awatere River)	GB	-37.6833	178.3500
Blackhead Beach	HB	-40.1667	176.8167
Bryant Memorial Park, NW side of Karioi	WO	-37.8254	174.8250
Cape Kidnappers	HB	-39.6450	177.0890
Desert Road, Te Piripiri Stream	TO	-39.2333	175.7333
Doel Road, E of Kawakawa	ND	-35.3695	174.0926
Egmont National Park, Ihaia Track	TK	-39.3333	173.9806
Egmont National Park, Puniho Track	TK	-39.2667	173.9833
Erua, Junction of Waimarino Stream & Erua Road	TO	-39.2167	175.3667
Flat Point Beach, 1.5 km N Arawhata Stream	WA	-41.2500	175.9167
Foxton Beach	WI	-40.4667	175.2167
Golden Cross, 10 km N Waikino	CL	-37.3392	175.7803
Haune Stream, W of Pikowai, above beach	BP	-37.8455	176.6339
Herbertville, Wainui River mouth	WA	-40.4833	176.5500
Hicks Bay	BP	-37.5914	178.2911
Horopito Stream, Junction Pohangina Valley Road & Tunipo Road	RI	-39.9167	175.9500
Hotwater Beach	CL	-36.8894	175.8256
Hukatere, Ninety Mile Beach	ND	-34.8977	173.0854
Hunua Ranges, Vicinity of Vining Track	AK	-37.1500	175.2500
Junction Mangahuia Stream & Highway 47	TO	-39.1667	175.4667
Junction Scanlyn Creek & Main South Road	RI	-39.9167	175.9333
Kai Iwi Beach	TK	-39.8833	174.9000
Kaiaua Beach	GB	-38.2985	178.3338
Kaimai Range, Okauia (Old Te Aroha Road, 1 km S Till Road)	BP	-37.7597	175.8519
Kaimanawa Forest Park, Clements Road end, Hinemalaia Track	TO	-38.9911	176.1431
Kaimanawa Forest Park, Clements Road, 1.5 km E Waiharuru Stream	TO	-38.9552	176.1751
Karamu Walkway (vicinity), 7 km W Whatawhata	WO	-37.7984	175.0987
Karikari Peninsula	ND	-34.8500	173.3700
Kereru, 8 km E	HB	-39.6333	176.4500
Kirikiri Saddle, Forest E of	CL	-37.1594	175.6403
Koitiata	WI	-40.0667	175.1333
Lake Karapiro, Horahora Domain	WO	-37.9583	175.6500
Lake Taharoa (10 km from Kaihu)	ND	-35.8063	173.6589
Lake Taupo, [Taupo] shore	TO	-38.6918	176.0723
Lake Waiparera	ND	-34.9422	173.1845
Lake Whangape, N shore	WO	-38.3569	174.8653
Leigh, Hill NE of	AK	-36.2850	174.8040
Makaretu River, 2 km N Takapau	WA	-40.0000	176.3500
Mangatewainui River, Junction Gundry Road	WA	-40.0667	176.1667
Manukau Peninsula, Pollok	AK	-37.1562	174.5981
Mercury Islands, Korapuki Island	CL	-36.6586	175.8489

.....continued on the next page

TABLE 1. (Continued)

Locality	Area code	Latitude	Longitude
Mokohinau Islands, Burgess Island	ND	-35.9042	175.1150
Morere	GB	-38.9850	177.7910
Mount Camel	ND	-34.8206	173.1594
Mount Richards, Pohangina River	RI	-40.1167	175.8500
Napier [Ahuriri] Estuary	HB	-39.4878	176.8796
New Plymouth, East End, mouth of Te Henui Stream	TK	-39.0500	174.0890
New Plymouth, Te Henui Stream, 1-2 km from coast	TK	-39.0630	174.0930
Nireaha, Mangatainoka River	WA	-40.6000	175.6167
Ocean Beach, N end of beach	HB	-39.7167	177.0167
Okau Stream, N of Whakataki	WA	-40.8333	176.2333
Otahome Stream	WA	-40.9333	176.1500
Otamaroa, 2.3 km W Whangaparaoa	BP	-37.5963	177.9750
Otoko Scenic Reserve	GB	-38.4750	177.6444
Owharoa Falls, W of Waikino	WO	-37.4196	175.7638
Papatea Bay	BP	-37.6589	177.8536
Porangahau Beach	HB	-40.3000	176.6667
Pouawa Beach	GB	-38.6083	178.1778
Pukearuhe	TK	-38.8980	174.5061
Pureora Forest Park, Waihora Road end	TO	-38.6420	175.6910
Rangiata	GB	-37.6842	178.5378
Rotorua	BP	-38.1375	176.2523
Rotorua, Orakei Korako	TO	-38.4747	176.1436
Ruahine Forest Park, Rangitane Road end, Colenso Trig area	RI	-39.7581	176.0428
Ruahine Ranges, Armstrong Saddle	RI	-39.7825	176.1653
Ruahine Ranges, Junction of Lagoon Road & Wairaki Creek	RI	-39.8333	175.8833
Santoft Forest, Koitiata stream mouth	WI	-40.1000	175.1500
Santoft Forest, Lake Koitiata stream mouth	WI	-40.1167	175.1667
Santoft Forest, Waimahora Stream mouth	WI	-40.1333	175.1833
Stokes Valley	WN	-41.1830	174.9860
Tangarakau Gorge, Route 43, 7.5 km N Tahora	TK	-38.9469	174.8112
Tangimoana	WI	-40.2833	175.2167
Tararua Forest Park, Otaki Forks	WN	-40.8333	175.2500
Taumarunui	TO	-38.8790	175.2670
Tawarau Forest Conservation Area, Route 37	WO	-38.2792	174.9333
Te Hope-Mount Moehau Track, half way to summit	CL	-36.5565	175.4023
Te Huia, Mangoira Stream	RI	-39.9000	175.9667
Te Kouma	CL	-36.8102	175.4718
Te Kouma Road, 5 km S Coromandel	CL	-36.8077	175.4934
Te Paki Stream	ND	-34.5303	172.7721
Te Werahi Swamp, S Cape Reinga	ND	-34.4645	172.6809
Three Kings Islands, Great Island, Castaway Camp	TH	-34.1534	172.1413
Three Kings Islands, Great Island, Tasman Valley	TH	-34.1608	172.1372

.....continued on the next page

TABLE 1. (Continued)

Locality	Area code	Latitude	Longitude
Tokata	BP	-37.8442	177.5858
Tokerau Beach, 3 km SW	ND	-34.9441	173.3648
Tongariro National Park, Taranaki Falls Track	TO	-39.2083	175.5639
Tongariro River, Admirals Pool	TO	-39.0101	175.8151
Twilight Beach Track, Werahi Stream	ND	-34.4738	172.6995
Urewera National Park, Aniwaniwa	GB	-38.7453	177.1633
Urewera National Park, Mokau Landing	GB	-38.7336	177.0894
Uruti Point, Waioronu Stream	WA	-41.1333	176.0500
Waimata Valley, Kaharoa Station	GB	-38.4883	178.0581
Waioeka Gorge, Little Manganuku Track	BP	-38.2917	177.3875
Waiotahi Beach	BP	-37.9908	177.2333
Waipoua Forest, Waipoua River, near Headquarter	ND	-35.6500	173.5500
Waitakere Ranges, Swanson Creek, Cascade Park	AK	-36.8869	174.5200
Waitakere Ranges, Te Henga	AK	-36.9000	174.4500
Waitakere Ranges, Upper Nihotupu Reservoir	AK	-36.9333	174.5500
Waitakere Ranges, Vicinity of Goldie Bush Reserve, Mokoroa Stream	AK	-36.8472	174.4558
Waitakere Ranges, Whatipu, Windy Point	AK	-37.0370	174.4958
Waitarere Beach	WN	-40.5700	175.1900
Wellington, South Karori	WN	-41.3060	174.7070
Wellington, York Bay	WN	-41.2648	174.9097
Whakarewarewa Forest, Rotorua	BP	-38.1700	176.2710
Whangaehu Beach	HB	-40.4000	176.6333
Whangaehu River, 2 km S Mangawhero Road	WI	-39.8667	175.2833
Whangateau, Coxhead Creek	AK	-36.3048	174.7784
Wherowhero Lagoon	GB	-38.7500	177.9250
Whiritoa Valley, S side	CL	-37.3050	175.8900
Whitecliffs Walkway, Wai Pingao Stream	TK	-38.8810	174.5450
Whitianga	CL	-36.8333	175.6667

New synonymy in the genus *Zemacrosaldula* Larivière & Larochelle, 2015

Type specimens were obtained from the Natural History Museum (London), following the description and revision of the genus *Zemacrosaldula*. Examination of this material led to the establishment of a new synonymy.

***Saldula trivialis* Cobben, 1961 = *Zemacrosaldula australis* (White, 1876)**. *Zemacrosaldula australis* is the most widely distributed and, morphologically speaking, the most highly variable species of *Zemacrosaldula*. The male holotypes of the above species, although superficially different, fall within the morphological variation in male genitalia and external characters described for *Z. australis* by Larivière & Larochelle (2015). Both specimens represent rather dark forms in terms of hemelytral eunomy. The male holotype of *Z. australis* (described as *Salda australis*; type locality unknown) is at the lower end of the range in terms of body size while the male holotype of *Saldula trivialis* (type locality S. Karori, WN, North Island) is a larger specimen.

Larivière & Larochelle (2015) cautioned not to confuse *Z. australis* with *S. trivialis* or *S. maculipennis* Cobben, 1961. They suggested that these two taxa may be conspecific or part of an unresolved species-complex, and that they resemble *Z. australis* albeit in a diminutive version with highly distinctive male parandria and broadly pale sides of the female abdominal venter. This comment was made based on the authors' interpretation of the

literature, before seeing the type of *S. trivialis*; the caution still stands for *S. maculipennis* (= *Aoteasalda maculipennis*).

Type specimens of *S. trivialis* were borrowed from the Natural History Museum in London (BMNH). They include specimens from all localities listed by Cobben (1961) and represent a mixture of taxa.

The following specimens belong to *S. trivialis*: Holotype male, allotype female, 5 paratypes (2 males, 2 females, 1 unsexed specimen with abdomen missing), S. Karori (North Island, WN); paratype, 1 male, Island Bay (North Island, WN); paratype, 1 female from E. L. Tampo [= East Lake Taupo] (North Island, TO).

The following paratypes belong to other taxa. *Zemacrosaldula kapekape*: 2 males, Orepukie [= Orepuke] (South Island, SL). *Z. whakarunga*: 1 female, Westport (South Island, NN); 1 female, Lake Rotoroa (South Island, BR). *Saldula maculipennis* (now *Aoteasalda maculipennis*): 1 male, 1 female (teneral), S. Karori (North Island, WN).

Finally, a male paratype labelled "New Zealand. Pascoe Coll." belongs to *Zemacrosaldula* sp.; this specimen was not listed in Cobben's (1961) original material.

Notes on Cobben's (1961) descriptions of *Saldula trivialis* and *S. maculipennis*

As demonstrated above and in the **Remarks** section under *A. maculipennis*, the type series of these species include a mixture of taxa. Cobben's descriptions, measurements, and illustrations need to be viewed in that context. In particular, Cobben's figures 26 to 37 can be especially misleading as they do not necessarily apply to the species listed in the captions.

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