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# *Kiwisaldula waiho* and *K. hurunui,* two new species of Saldidae (Hemiptera: Heteroptera) from the South Island of New Zealand, with redescriptions of *K. butleri* (White) and *K. laelaps* (White)

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## Abstract

*Kiwisaldula waiho* new species and *K. hurunui* new species, are described from the South Island of New Zealand. *Kiwisaldula butleri* (White, 1878) and *K. laelaps* (White, 1878), two taxonomically little-known taxa, are redescribed. Morphological descriptions are provided together with illustrations emphasising the most important diagnostic features of external morphology and male genitalia. Information is given on synonymy, type specimens, material examined, geographic distribution and biology.

**Key words:** shore bugs, revision, systematics, biodiversity

## Introduction

This is the third in a series of papers aiming to revise the taxonomy of New Zealand Saldidae (Hemiptera: Heteroptera) and to provide comprehensive information on their geographic distribution and biology.

Larivière & Larochelle (2015) erected the genus *Zemacrosaldula* which occurs on both main islands of New Zealand and contains four species. Subsequently, these workers (Larivière & Larochelle 2016) studied the North Island and nearby offshore islands saldids, and the type series of two South Island species. This resulted in the establishment of two new genera (*Aoteasalda*, one species; *Kiwisaldula,* six species) and completed the generic reassignment of all New Zealand shore bug species previously assigned to the genus *Saldula* Van Duzee, 1914 (*sensu lato*).

The revision of the South Island Saldidae is ongoing and more work is required in order to reach a basic overall understanding of this fauna. However, two very distinctive new species have already come to light and the opportunity to clarify the identity of two poorly known species also presents itself. Therefore, it seems appropriate to make this knowledge available without delay.

In this paper, *Kiwisaldula waiho* and *K. hurunui* are described as new and *K. butleri* (White, 1878) and *K. laelaps* (White, 1878) are redescribed in the interest of taxonomic stability. These four species will be keyed at a later date in the context of a more comprehensive taxonomic treatment of South Island Saldidae.

Three genera and 13 species of Saldidae (Saldinae: Saldoidini) are now recognised from New Zealand:

***Aoteasalda*** Larivière & Larochelle, 2016
*A. maculipennis* (Cobben, 1961)
***Kiwisaldula*** Larivière & Larochelle, 2016
*K. butleri* (White, 1878)
*K. hurunui* new species
*K. laelaps* (White, 1878)
*K. manawatawhi* Larivière & Larochelle, 2016

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*K. parvula* (Cobben, 1961)
*K. porangahau* Larivière & Larochelle, 2016
*K. stoneri* (Drake & Hoberlandt, 1950)
*K. waiho* new species
***Zemacrosaldula*** Larivière & Larochelle, 2015
*Z. australis* (White, 1876)
*Z. kapekape* Larivière & Larochelle, 2015
*Z. pangare* Larivière & Larochelle, 2015
*Z. whakarunga* Larivière & Larochelle, 2015

The authors hope that their efforts to clarify the alpha-taxonomy of South Island Saldidae species and to publish detailed information on their distribution and biology, 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 560 specimens (mostly adults) collected in 33 localities on the South Island of New Zealand. Most of this material was collected by the authors and is deposited in the New Zealand Arthropod Collection (NZAC), Auckland.

Other specimens were provided by or are deposited in the following institutions: Canterbury Museum, Christchurch (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, including the terminology used to describe the degree of wing development, mostly follow Schuh & Polhemus (2009) except as noted by Larivière & Larochelle (2015, 2016).

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 paper represent the general pattern that best fits the most common variations observed among populations of a species. Larivière & Larochelle (2016: 460) briefly discussed eunomic variability in New Zealand Saldidae and the relative usefulness of this character to diagnose *Kiwisaldula* species.

Facial colour and degree of mouthpart development are characters also commonly used in saldid taxonomy but their diagnostic value may have been overestimated; these characters seem to be rather variable within species. Furthermore, the authors have observed that in New Zealand shore bugs, facial colour is generally more contrasted and the degree of mouthpart development greater in males than in females who tend to have darker, less developed transverse swelling, mandibular plates, and maxillary plates that are less strikingly pale in colour compared to the dark frons. Although clear-cut differences exist between certain saldid species in general, facial colour and degree of mouthpart development are not perceived to be characters of high diagnostic value when it comes to most New Zealand 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.

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 South Island localities: 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. 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.

**TABLE 1**. Geographical coordinates of localities in decimal degrees.

| Locality | Area code | Latitude | Longitude |
|---|---|---|---|
| Amberley Beach, Mimimoto Lagoon | NC | -43.1667 | 172.7833 |
| Bluecliffs Beach, Waiau River lagoon | FD | -46.1854 | 167.5960 |
| Bobbys Head, South beach | DN | -45.5318 | 170.7575 |
| Carrick Range, Watts Rock | CO | -45.1639 | 169.0767 |
| Clarence River, 12 km inland via Clarence Valley Road | KA | -42.1104 | 173.8412 |
| Franz Josef, Waiho River | WD | -43.3933 | 170.1812 |
| Hakataramea, Hakataramea River | SC | -44.7167 | 170.4833 |
| Hakataramea River, Wrights Crossing | SC | -44.6500 | 170.6000 |
| Havelock Creek and Highway 6, junction | WD | -43.5167 | 169.8500 |
| Hundalee, Conway River | KA | -42.5833 | 173.4167 |
| Hurunui, Hurunui River | NC | -42.8715 | 172.7687 |
| Kahutara River and Highway 70 junction | KA | -42.3833 | 173.4333 |
| Kahutara River mouth | KA | -42.4333 | 173.5833 |
| Katiki | SC | -45.3904 | 170.8564 |
| Kowhai River mouth | KA | -42.4166 | 173.6331 |
| Lake Pearson | MC | -43.0966 | 171.7786 |
| Leithfield Beach | NC | -43.2333 | 172.7333 |
| Lincoln College | MC | -43.6422 | 172.4708 |
| Longwood Forest, Bald Hill | SL | -46.1833 | 167.8333 |
| Maerewhenua River, 8 km South of Duntroon | DN | -44.9000 | 170.6167 |
| Murdering Beach | DN | -45.7631 | 170.6714 |
| Ocean View | DN | -45.9394 | 170.3456 |
| Oreti Beach | SL | -46.4107 | 168.2142 |
| Orire Point | DN | -45.2000 | 170.8833 |
| Porters Pass, Lake Lyndon | MC | -43.2955 | 171.7111 |
| The Catlins, Long Beach | SL | -46.6275 | 169.2627 |
| Waiau, Waiau River | NC | -42.6500 | 173.0333 |
| Waiau River, 6.2 km West of Highways 7 and 7A junction | NC | -42.5667 | 172.7167 |
| Waimatuku River mouth | SL | -46.3568 | 168.1518 |
| Waipara River mouth | NC | -43.1500 | 172.8000 |
| Waitangitaona River and Highway 6, junction | WD | -43.2667 | 170.3000 |
| Wanganui River and Highway 6, junction | WD | -43.1500 | 170.6167 |
| Winton, Oreti River | SL | -46.1333 | 168.2833 |

## Taxonomy, geographic distribution, and biology

### *Kiwisaldula waiho* new species

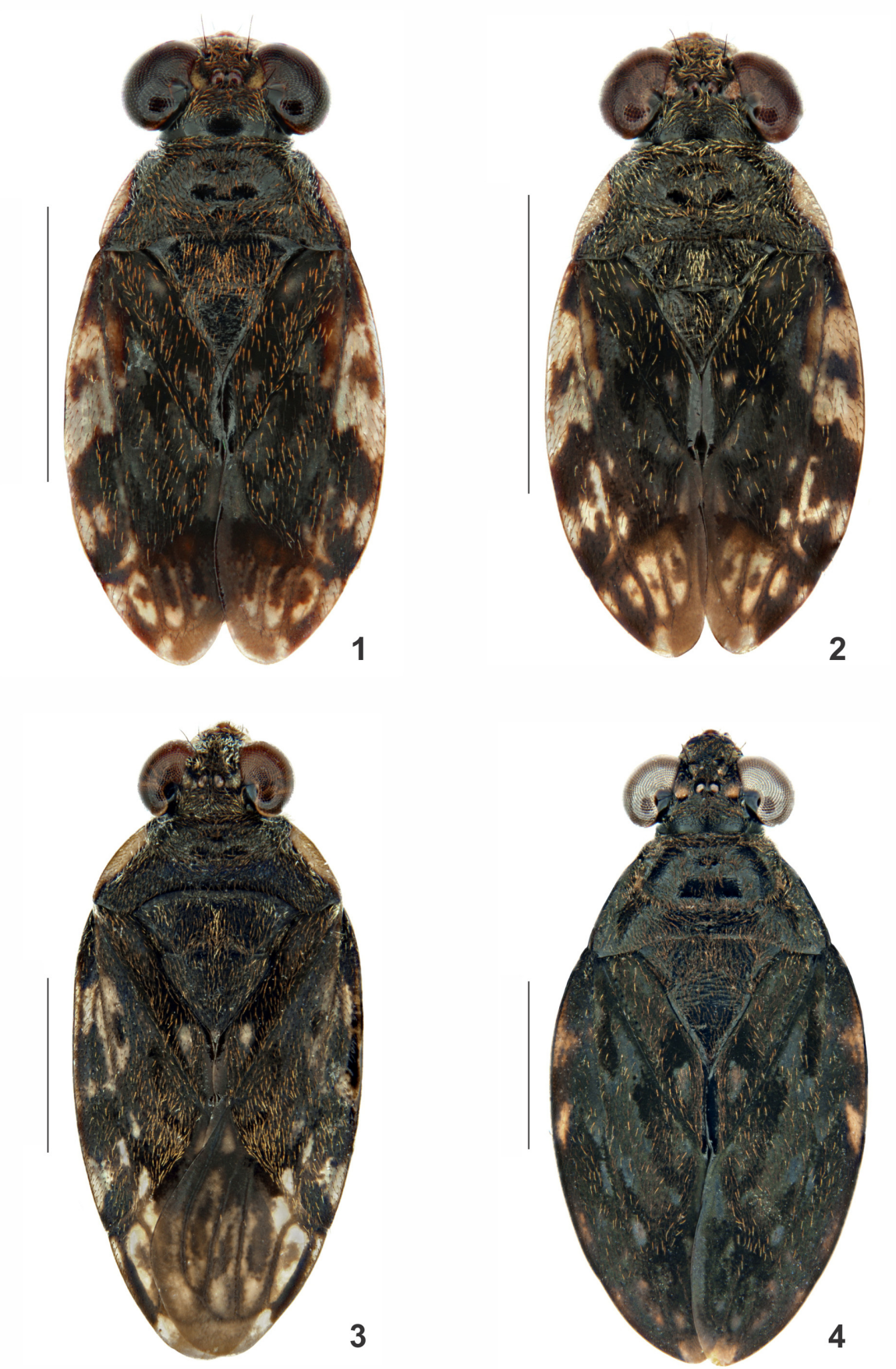
*Kiwisaldula waiho* Larivière and Larochelle, new species. Holotype: Male (NZAC) labelled "NEW ZEALAND WD Franz

Josef, Waiho Riv [=River] 100m 4323S 17010E [= 43º23'S 170º10'E] 11.III.2007 Larivière, Larochelle / Sandy glacial river moraine: scattered stones + gravel; among cushion plants; far from permanent water / HOLOTYPE [male symbol] *Kiwisaldula waiho* Larivière & Larochelle, 2017 (red label)." Paratypes: 9 males (1 CMNZ, 2 LUNZ, 2 MONZ, 4 NZAC,), 4 females ( 1 LUNZ, 1 MONZ, 2 NZAC) with same data as holotype, bearing blue paratype labels.

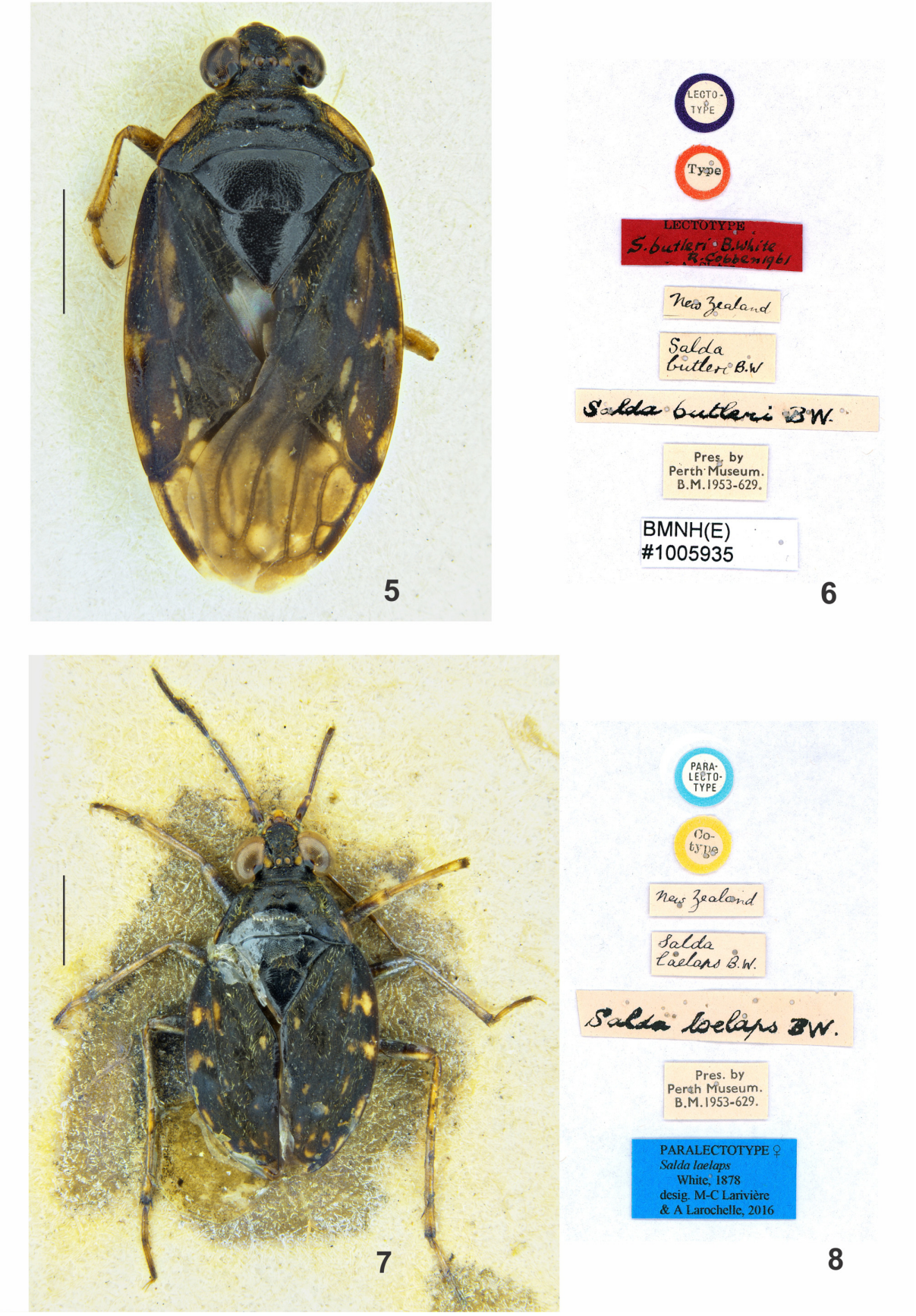
**Description** (Brachypterous adult). Body length 2.25–2.81 (2.50 mm); short-ovate, somewhat pear-shaped (Fig. 1). Dorsal colour largely dark with contrastingly pale exocorium of hemelytra and narrowly pale lateral margins of pronotum. Facial colour (Fig. 9) slightly to strongly contrasted. Head, pronotum, and scutellum moderately shiny against mostly dull hemelytra. Dorsal pubescence short to moderately long, mostly reclined, usually more densely distributed, thicker and more golden brown on pronotum, clavus, and endocorium (as in *K. hurunui*); endocorium with thicker, golden brown setae. Hemelytra with reduced cells in membrane; hindwings highly reduced (not fully formed), reaching about half to two-thirds of corium length. **Head** (Fig. 9, facial view). Preocellar spots whitish yellow (more distinct than in *K. hurunui*). Preocular spots whitish yellow to yellowish brown (more distinct than in *K. hurunui*). Transverse swelling slightly to strongly developed; lateral portions contiguous (mostly) or separated by a narrow gap; whitish yellow to dark yellowish brown, darker near facial midline. Mandibular plates slightly to strongly developed, concolorous with transverse swelling. Maxillary plates slightly to strongly developed, concolorous with or paler than transverse swelling. Rostrum brown, reaching hind coxae. ***Antennae*** about 4.1x longer than pronotum + collar medially; segment I whitish yellow to yellowish brown or brown, with ventral side at least partially dark (sometimes striped), dorsal side usually pale; segment II whitish yellow to yellowish brown or brown, about 2.2x longer than segment I; segments III–IV dark brown to nearly black. **Thorax**. Lateral margins of pronotum subrectilinear, narrowly explanate (less explanate than in *K. hurunui*), narrowly pale whitish yellow (mostly) to yellowish brown or brown (pale area at midlength about as wide or narrower than the width of antennal segment II), sometimes almost completely dark. Scutellum about 1.35x longer than pronotum + collar medially. Thoracic underside black, with moderately contrasting acetabula (acetabulum I broadly pale, acetabulum II moderately or narrowly pale, acetabulum III narrowly pale or completely dark), and broadly pale lateral margins. ***Legs*** largely pale; fore and mid femora often with ventral side brown to nearly black subapically or over most of length (often distinctly striped); hind femora rarely with ventral and dorsal sides dark brown to black, coalesced into an annulus; fore tibiae pale or slightly infumate dorsally (not darkly striped throughout), usually paler than in *K. hurunui* and at most with very faint pale subapical annulus; hind tibiae about 2.2x longer than tarsal segments II+III combined. ***Hemelytra***: corium (Figs 1, 13) largely dark brown to nearly black, with reduced pale markings on endocorium and more extensive pale markings (whitish) on exocorium (larger and more coalesced from basal quarter to basal half); endocorium with distinct, sometimes reduced, brown eyespot subbasally near R vein; costal margin lined with moderately to rather wide, pale band for most or part of length; colour pattern in female consistent with that in male; pruinose areas well developed, distributed on most of clavus and corium, and on membrane near apex of clavus (sometimes patchy on clavus and subapex of endocorium); basal pruinose area of clavus broad and long, covering more than one-third of clavus length (usually most of length, sometimes only half); basal pale spot of clavus present (sometimes very small); subapical pale spot of clavus present (often very small) or absent (rarely); membrane with 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 the narrowest, slender, subequal in length or slightly shorter than cell 3, ending apically well before tip of cell 3. **Abdomen**. Venter: male, dark brown to nearly black, with or without hind margin of segments very narrowly pale; female, dark to nearly black medially, narrowly to moderately margined with yellowish ivory to yellowish brown or pale brown (pale margin sometimes highly reduced). ***Male parandria*** (Fig. 20) elongate, narrowly subtriangular, acutely rounded and narrowed at tip; inner margins sinuate; medial membrane with truncate inward projection on each side; basal margin sinuate, broadly convex medially. ***Male paramere*** (Fig. 16) without distinct processus sensualis, instead with broadly convex cuticular surface bearing less than ten setae; processus hamatus rather short, slightly constricted basally, its tip rather broad, acutely rounded; main body bulbous (as opposed to *K. hurunui*). *Other characters as in generic description (Larivière & Larochelle, 2016: 459).*

**Geographic distribution** (Fig. 24). South Island, central west coast (WD).

**Material examined**. A total of 40 specimens including types, from the following localities. **South Island**. **WD**–Franz Josef, Waiho River (CMNZ, LUNZ, MONZ, NZAC); Havelock Creek and Highway 6, junction (NZAC); Waitangitaona River and Highway 6, junction (NZAC); Wanganui River and Highway 6, junction (NZAC).




**FIGURES 1–4.** Dorsal views of *Kiwisaldula* species (males; legs and antennae omitted). Scale bar = 1 mm. (1) *K. waiho*, (2) *K. hurunui*, (3) *K. butleri*, (4) *K. laelaps*.



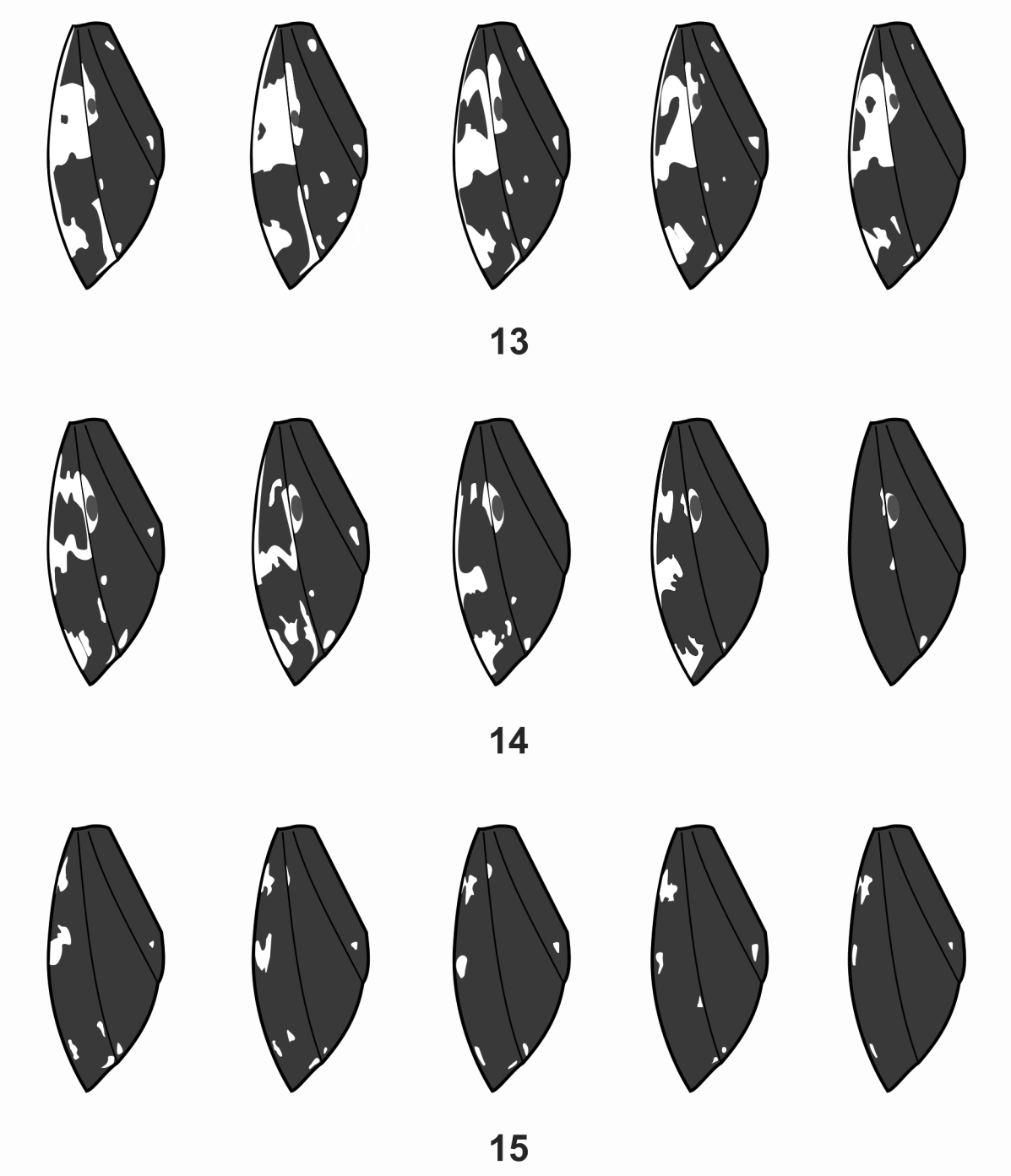

**FIGURES 5–8.** Dorsal views of type specimens with labels. Scale bar = 1 mm. (5–6) *Kiwisaldula butleri*, female holotype and labels, (7–8) *K. laelaps*, male lectotype and labels.


**FIGURES 9–12.** Facial views of *Kiwisaldula* species; males. (9) *K. waiho*, (10) *K. hurunui*, (11) *K. butleri*, (12) *K. laelaps*.

**Biology**. **Altitudinal range**. Lowland; collected around 100–200 m above sea level. Inland. **Habitat**. Sandy glacial moraines, river terraces, and river banks with or without scattered stones or gravel; above the flood line, on moist sandy patches between cushion plants and other sparse vegetation; at a certain distance from water (on average up to 10 m away from the water line); also in intermittently inundated terrains far away from permanent water. **Seasonality**. Adults and tenerals (newly emerged adults) collected in March when they appeared equally abundant in the field, suggesting summer breeding and overwintering in the egg stage. **Food**. Predator or scavenger. **Behaviour**. Undocumented.

**Remarks**. This species is named after its type locality the Waiho River (WD).

At first glance *K. waiho* may superficially resemble *K. hurunui*. In addition to differences in male paramere and parandria, *K. waiho* has paler, more distinct preocellar and preocular spots on the head, darker, less strongly developed mandibular plates, more narrowly pale and less explanate lateral margins of pronotum. The two species are allopatric in distribution.




**FIGURES 13–15.** Eunomy (left corium), most frequently observed pigmentation patterns. (13) *Kiwisaldula waiho*, (14) *K. butleri*, (15) *K. laelaps*.

### *Kiwisaldula hurunui* new species

*Kiwisaldula hurunui* Larivière and Larochelle, new species. Holotype: Male (NZAC) labelled "NEW ZEALAND NC Hurunui, Hurunui River 4252S 17246E [= 42º52'S 172º46'E] 11.III.2005 Larivière, Larochelle / Sand bar in gravelly riverbank: wet; sparse veg. (Juncus); 0.5-1 m from water / HOLOTYPE [male symbol] *Kiwisaldula hurunui* Larivière & Larochelle, 2017 (red label)." Paratypes: 2 males (1 LUNZ, 1 NZAC), 3 females (1 LUNZ, 2 NZAC) with same data as holotype, bearing blue paratype labels.

**Description** (Brachypterous adult). Body length 2.28–2.82 (2.57 mm); short-ovate, somewhat pear-shaped (Fig.

2). Dorsal colour largely dark with contrastingly pale exocorium of hemelytra and moderately to broadly pale lateral margins of pronotum. Facial colour (Fig. 10) slightly to moderately contrasted. Head, pronotum, and scutellum moderately shiny against mostly dull hemelytra. Dorsal pubescence short to moderately long, mostly reclined, usually more densely distributed, thicker and more golden brown on pronotum, clavus, and endocorium (as in *K. waiho*). Hemelytra with reduced cells in membrane; hindwings highly reduced (not fully formed), reaching about half to two-thirds of corium length. **Head** (Fig. 10, facial view). Preocellar spots whitish yellow tinged with brown (more obscured than in *K. waiho*). Preocular spots whitish yellow tinged with brown or brownish (more obscured than in *K. waiho*). Transverse swelling slightly to moderately developed; lateral portions contiguous (mostly) or separated by a narrow gap; whitish yellow to dark yellowish brown, darker near facial midline. Mandibular plates moderately developed, concolorous with transverse swelling. Maxillary plates strongly developed, concolorous with or paler than transverse swelling; contrastingly more bulbous and more brightly pale than transverse swelling or mandibular plates (as opposed to *K. waiho*). Rostrum brown, reaching hind coxae. ***Antennae*** about 4.0x longer than pronotum + collar medially; segment I whitish yellow, with ventral side at least partially dark (often striped, usually more darkly so than in *K. waiho*); segment II whitish yellow to pale brown, about 2.3x longer than segment I; segments III–IV dark brown to nearly black. **Thorax**. Lateral margins of pronotum subrectilinear, moderately explanate (usually more so than in *K. waiho*), narrowly to moderately pale whitish yellow (more broadly pale than in *K. waiho*; pale area at midlength about 1.5x the width of antennal segment II), never completely dark. Scutellum about 1.4x longer than pronotum + collar medially. Thoracic underside black, with slightly to moderately contrasting acetabula (acetabulum I broadly pale, acetabulum II moderately or narrowly pale, acetabulum III very narrowly pale or completely dark), and broadly pale lateral margins. ***Legs*** largely pale; fore and mid femora with ventral side dark brown to nearly black over most of length (usually distinctly striped); hind femora sometimes with ventral and dorsal sides dark brown to black, coalesced into an annulus; fore tibiae pale or strongly infumate dorsally (rarely darkly striped over most of length), generally darker brown than in *K. waiho* and with distinct pale subapical annulus; hind tibiae about 2.3x longer than tarsal segments II+III combined. ***Hemelytra***: eunomy similar to *K. waiho* (Fig. 13); pruinose areas moderately developed, distributed on base of clavus, rarely on apex of clavus, on endocorium, and sometimes on membrane near apex of clavus; basal pruinose area of clavus broad and long, covering more than one-third of clavus length (usually half of length); basal pale spot of clavus present or absent; subapical pale spot of clavus present; membrane with four reduced cells; cell 1 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, shorter than other cells or only slightly longer than cell 1, ending apically well before tip of cell 3. **Abdomen**. Venter: male, completely dark brown to nearly black; female, dark brown to nearly black medially, narrowly to moderately margined with yellowish ivory to yellowish brown. ***Male parandria*** (Fig. 21) elongate, broadly subtriangular, acutely rounded and moderately broad at tip; inner margins almost straight (only sinuate subapically); medial membrane with acute inward projection on each side; basal margin sinuate, narrowly convex (roundly subtriangular) medially. ***Male paramere*** (Fig. 17) without distinct processus sensualis, instead with rather flat cuticular surface bearing less than ten setae; processus hamatus moderately long, not constricted basally, its tip narrow, acutely rounded. *Other characters as in generic description (Larivière & Larochelle, 2016: 459).*

**Geographic distribution** (Fig. 24). South Island, northeastern areas (NC, KA).

**Material examined**. A total of 80 specimens including types, from the following localities. **South Island**. **KA**–Clarence River, 12 km inland via Clarence Valley Road (NZAC). **NC**–Hurunui, Hurunui River (NZAC); Waiau, Waiau River (NZAC); Waiau River, near Leslie Hills Road (NZAC); Waiau River, 6.2 km West of Highways 7 and 7A junction (NZAC).

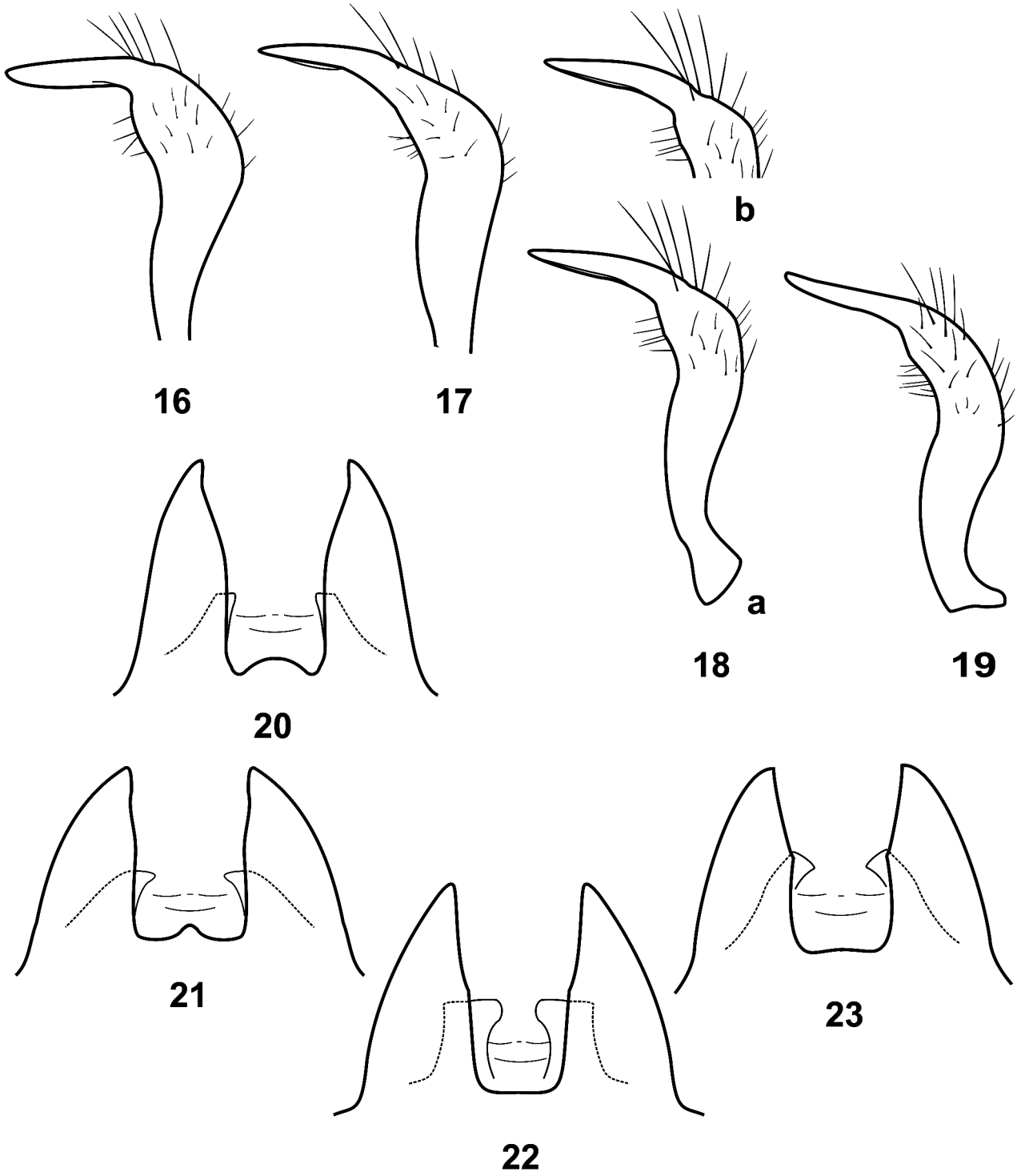
**Biology**. **Altitudinal range**. Lowland; collected between 75 and 400 m above sea level. Inland. **Habitat**. Sandy terraces, sandy bars, sandy side-channels and other sandy areas with sparse vegetation (e.g., rushes) along gravelly rivers; on wet sand between rushes and other sparse vegetation; usually at a certain distance from water (up to 30 m away from the waterline); also in intermittently inundated terrains far away from permanent water. **Seasonality**. Adults and tenerals (newly emerged adults) collected in March when they appeared equally abundant in the field, suggesting summer breeding and overwintering in the egg stage. **Food**. Predator or scavenger. **Behaviour**. Jumps short distances (8–10 cm) when disturbed.

**Remarks**. This species is named after its type locality the Hurunui River (NC).

At first glance *K. hurunui* may superficially resemble *K. waiho*. The eunomy of both species appears similar

although this could not be studied in detail for *K. hurunui* because most of the study material consisted of recently emerged adults (tenerals) with soft and pale cuticle that had not yet completely hardened and darkened.

In addition to differences in male paramere and parandria, *K. hurunui* has darker, less distinct preocellar and preocular spots on the head, usually paler, more strongly developed mandibular plates, as well as more broadly pale and more explanate lateral margins of pronotum. The two species are allopatric in distribution.




**FIGURES 16–23.** Schematic view of male genitalia (16–19) Paramere, ventral view. (16) *Kiwisaldula waiho* (shaft base broken), (17) *K. hurunui* (shaft base broken), (18a–b) *K. butleri*, (19) *K. laelaps*. (20–23) Parandria, posterior view. (20) *K. waiho*, (21) *K. hurunui*, (22) *K. butleri*, (23) *K. laelaps*.

### *Kiwisaldula butleri* (White, 1878)

*Salda butleri* White, 1878: 160. Holotype female (BMNH; Figs 5–6) 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. Cobben's lectotype labels associated with the holotype should be ignored (Larivière & Larochelle, 2016: 473).
*Salda bulteri* [sic]: Hutton, 1904: 223.
*Acanthia butleri*: Kirkaldy, 1909: 27.
*Saldula butleri*: Drake & Hoberlandt, 1950: 7.
*Kiwisaldula butleri*: Larivière & Larochelle, 2016: 472.

**Redescription** (Macropterous adult). Body length 3.62–4.65 (3.97 mm); elongate-ovate (Figs 3, 5); female generally more broadly shaped (Fig. 5). Dorsal colour largely dark, with moderately to broadly pale lateral margins of pronotum and slightly to moderately developed, often coalesced pale markings on hemelytra. Facial colour (Fig. 11) slightly to moderately contrasted. Head, pronotum, and scutellum barely to slightly shiny against mostly dull hemelytra. Dorsal pubescence short to moderately long, mostly reclined, mostly golden brown or silvery, usually more densely distributed on pronotum, clavus, and endocorium. Hemelytra and hindwings fully developed. **Head** (Fig. 11, facial view). Preocellar spots whitish yellow to brownish (sometimes nearly indistinct). Preocular spots whitish yellow to brownish (sometimes nearly indistinct). Transverse swelling slightly to moderately developed; lateral portions contiguous; whitish yellow to yellowish brown, darker near facial midline. Mandibular plates slightly to moderately developed, concolorous with or darker than transverse swelling. Maxillary plates slightly to moderately developed, concolorous with transverse swelling. Rostrum yellowish brown, reaching hind coxae. ***Antennae*** about 3.8x longer than pronotum + collar medially; segment I whitish yellow, ventral and dorsal sides dark throughout or nearly so (striped), ventral side usually more heavily marked than dorsal side; segment II whitish yellow to yellowish brown, often darker along one side or two sides, sometimes brownish throughout, about 2.2x longer than segment I; segments III–IV dark brown to nearly black. **Thorax**. Lateral margins of pronotum slightly to moderately convex, distinctly explanate, moderately to broadly pale whitish yellow (pale area at midlength 1.5–2x the width of antennal segment II). Scutellum about 1.9x longer than pronotum + collar medially. Thoracic underside black, with slightly contrasting acetabula (acetabulum I moderately to broadly (mostly) pale; acetabulum II narrowly pale; acetabulum III very narrowly pale or completely dark), and broadly pale lateral margins. ***Legs*** largely pale; fore and mid femora with ventral side dark brown to nearly black over most of length (distinctly striped); hind femora without ventral and dorsal sides dark brown to black, coalesced into and annulus; fore tibiae pale or slightly infumate dorsally (not striped throughout); hind tibiae about 2.6x longer than tarsal segments II+III combined. ***Hemelytra***: corium (Figs 3, 5, 14) 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; costal margin lined with narrow to moderately wide, usually interrupted pale band (often evanescent in apical half or third, or, absent in dark individuals); colour pattern in female often with more extended white markings but mostly consistent with that in male; pruinose areas strongly developed, distributed on base and apex of clavus and most of corium, 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 present or absent; membrane with four fully formed cells; cell 1 the shortest, distinctly 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 or distinctly longer than cell 3**,** ending apically nearly in line or in line with tip of cell 3. **Abdomen**. Venter: male, completely blackish (very rarely with margin of one or two segments narrowly paler); female, blackish medially with hind margin of segments narrowly pale and moderately to broadly margined with yellowish ivory to pale yellowish brown. ***Male parandria*** (Fig. 22) elongate, broadly subtriangular, acutely rounded and moderately narrowed at tip; inner margins almost straight in basal half, slightly concave in apical half; medial membrane with truncate-rounded inward projection on each side; basal margin rather straight. ***Male paramere*** (Fig. 18a–b) more variable than in other three species; with barely distinct processus sensualis bearing less than ten setae; processus hamatus moderately long, slightly to rather strongly constricted at base, its tip narrow, acutely rounded. *Other characters as in generic description (Larivière & Larochelle, 2016: 459).*

**Geographic distribution** (Fig. 24). South Island, mostly areas east of the Southern Alps (KA–SL/FD).

**Material examined**. A total of 439 specimens including type, from the following localities. **South Island**. **DN**–Bobbys Head, South beach (NZAC); Maerewhenua River, 8 km South of Duntroon (NZAC); Murdering Beach (NZAC); Ocean View (NZAC); Orire Point (NZAC). **FD**–Bluecliffs Beach, Waiau River lagoon (NZAC). **KA**–Hundalee, Conway River (NZAC); Kahutara River and Highway 70 junction (NZAC); Kahutara River mouth (NZAC); Kowhai River mouth (NZAC). **MC**–Lake Pearson, Highway 7 (NZAC); Lincoln College (NZAC); Porters Pass, Lake Lyndon (NZAC). **NC**–Amberley Beach, Mimimoto Lagoon (NZAC); Leithfield Beach (NZAC); Waiau River, 6.2 km West Highways 7 and 7A junction (NZAC); Waipara River mouth (NZAC). **SC**–Hakataramea, Hakataramea River (NZAC); Hakataramea River, Wrights Crossing (NZAC); Katiki (2 km NE) (NZAC). **SL**–Longwood Forest, Bald Hill (NZAC); Oreti Beach, 2.5 km SE of Ferry Road end (NZAC); The Catlins, Long Beach (NZAC); Waimatuku River mouth (NZAC); Winton, Oreti River (NZAC).

**Biology**. **Altitudinal range**. Lowland to lower montane; collected from sea level to around 800 m. **Habitat**. Occurs in open habitats mostly on moist to wet, bare or sparsely vegetated, sometimes silty sand along or near the banks or side-channels of gravelly or sandy streams and rivers (including sand dunes estuaries), the edge of lagoons and lakes, and small ponds; usually near water (within a few meters from the water line). Also collected in coastal situations at the edge of sparse vegetation in a tidal salt marsh with loamy soil, along debris in the intertidal zone of a lagoon, and on the wet, muddy-gravelly banks of a lagoon, covered with dry algae; and inland, on sward near a lake, in a rush meadow near a sandy-gravelly stream, and between short rushes along a narrow sandy-gravelly stream running through a subalpine scrub. **Seasonality**. Adults and tenerals (newly emerged adults) collected from January to March, but tenerals mostly found in January and March; nymphs collected in February and March; mating pairs observed in February and March; seasonality data suggests summer breeding and overwintering in the egg stage. **Food**. Predator or scavenger. **Behaviour**. Undocumented.

**Remarks**. This species was previously known from the female only.

The holotype collected by FW Hutton, is labelled as originating from "New Zealand". Larivière & Larochelle (2016) reported, based on Hutton's known collecting grounds around the year of description, that the holotype may have been collected in the "Otago Province" (most of the southern third of the South Island south of the Waitaki River [OL, CO, DN, SL in part, FD]) or the "Canterbury Province" [= NC, MC, SC, MK]. This fits well with the geographic distribution currently recorded for *K. butleri*.

*Kiwisaldula butleri* is expected to be more widely distributed in eastern areas of the South Island than might be surmised from the list of currently known collecting localities, and to be the most commonly encountered *Kiwisaldula* species in that region of New Zealand.

This is a morphologically highly variable, moderate size species with an elongate-ovate body shape, slightly to moderately convex pale lateral margins of pronotum that are moderately to broadly margined with pale, extensive pale markings on exocorium of hemelytra, and a moderately to broadly pale ventral margin in the female. Females are generally broader with a more heavyset body than males.

As a general rule *K. butleri*'s populations in the southern parts of the distribution range, in more mountainous, or in colder habitats, consist of more darkly coloured and somewhat smaller individuals. The male paramere also varies along this ecogeographic gradient, especially the length and degree of basal constriction of the processus hamatus. *Kiwisaldula butleri* is mostly macropterous, but submacropterous individuals (hemelytral membrane slightly reduced) can sometimes be seen.

### *Kiwisaldula laelaps* (White, 1878)

*Salda laelaps* White, 1878: 160. Lectotype (designated by Larivière & Larochelle, 2016): male (BMNH; Fig. 7–8) 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) / Cotype (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.
*Kiwisaldula laelaps*: Larivière & Larochelle, 2016: 474.

**Redescription** (Brachypterous adult). Body length 3.58–3.93 (3.71 mm); subelliptical or nearly pear-shaped (Figs 4, 7). Dorsal colour largely dark, with completely dark lateral margins of pronotum and highly reduced individual (not coalesced) pale markings on hemelytra. Facial colour (Fig. 12) slightly contrasted. Head, pronotum, and scutellum rather shiny against mostly dull hemelytra. Dorsal pubescence short to moderately long, mostly reclined and rather thin (as opposed *K. butleri, K. hurunui, K. waiho*), mostly golden brown or silvery, usually more densely distributed on pronotum and clavus, rather sparse and corium. Hemelytra with highly reduced or missing cells in membrane; hindwings highly reduced. **Head** (Fig. 12, facial view). Preocellar spots pale yellowish brown. Preocular spots black (indistinct). Transverse swelling slightly developed (sometimes more developed at sides); lateral portions contiguous; yellowish brown to brown, usually broadly darker near facial midline. Mandibular plates slightly developed, concolorous with or darker than transverse swelling. Maxillary plates moderately developed, concolorous with or paler than transverse swelling. Rostrum yellowish brown, reaching hind coxae. ***Antennae*** about 4.0x longer than pronotum + collar medially; segment I almost completely dark brown to black, usually narrowly paler subapically; segment II almost completely dark yellowish brown to brown (not darker on any side), about 2.1x longer than segment I; segments III–IV dark brown to nearly black. **Thorax**. Lateral margins of pronotum subrectilinear to slightly convex, distinctly explanate, completely dark or with barely visible to moderately developed short yellowish patch near posterolateral angles. Pronotum somewhat narrow and long, about 2.4x as wide as long (wider and shorter in *K. waiho*, *K. hurunui*, *K. butleri*, 3–3.5x wider than long). Scutellum about 1.6x longer than pronotum + collar medially. Thoracic underside black, mostly glabrous and shiny, without contrasting acetabula (acetabula I, II and III completely dark) and completely or almost completely dark lateral margins. ***Legs*** marginally pale; fore, mid, and hind femora almost completely dark brown to black (darkly coloured sides coalesced into a long annulus), usually narrowly pale near base and apex; fore tibiae pale or slightly infumate dorsally (not darkly striped throughout); hind tibiae about 2.3x longer than tarsal segments II+III combined. ***Hemelytra***: corium (Figs 4, 7, 15) largely dark brown to black, with nearly immaculate endocorium and highly reduced pale markings (brownish yellow) on exocorium; endocorium ill-defined, barely visible dark eyespot subbasally near R vein; costal margin dark; colour pattern in female consistent with that in male; pruinose areas well developed, distributed over most basal half of clavus and most of corium (usually slightly patchy on endocorium); basal pruinose area of clavus broad and long, covering more than one-third of clavus length (half of length); basal pale spot of clavus absent; subapical pale spot of clavus present (clearly visible or highly reduced); membrane with three or four highly reduced cells; cell 1 slightly shorter than or subequal to cells 2 and 3, oval to subtriangular; cells 2 and 3 subrectangular to suboval, subequal in length and width; cell 4 absent or when present, highly reduced and ending apically well before tip of cell 3 (near tip of corium). **Abdomen**. Venter: male, blackish, with or without hind margins of segments very narrowly pale; female, colouration as in male (not margined with pale as in other South Island species). ***Male parandria*** (Fig. 23) elongate, broadly subtriangular, acutely rounded and rather broad at tip; inner margins angled; medial membrane with blunt inward projection on each side; basal margin almost straight (barely convex medially). ***Male paramere*** (Fig. 19) with barely distinct processus sensualis bearing less than ten setae; processus hamatus moderately long, not constricted basally, its tip moderately narrowly, somewhat obtusely rounded; main body and shaft of similar width (as opposed to other three species). Female subgenital plate (segment VII ventrally) completely blackish (not pale in apical half as in other South Island species). *Other characters as in generic description (Larivière & Larochelle, 2016: 459).*

**Geographic distribution** (Fig. 24). South Island, Central Otago (Carrick Range, Watts Rock).

**Material examined**. A total of 7 specimens including types, from the following localities. **South Island**. **CO**– Carrick Range, Watts Rock (LUNZ, NZAC).

**Biology**. **Altitudinal range**. Subalpine; collected at 1,300 m. Inland. **Habitat**. Tussock grassland; collected by pitfall trapping. **Seasonality**. February. **Food**. Predator or scavenger. **Behaviour**. Undocumented.

**Remarks**. The male genitalia were previously undocumented for this species.

The lectotype was collected by CM Wakefield. It is labelled as originating from "New Zealand". Larivière & Larochelle (2016) reported that Wakefield was an active insect collector in Canterbury, then a province, and that the type specimen may have been collected in North Canterbury (NC), Mid Canterbury (MC), South Canterbury

(SC) or eastern Mackenzie (MK). The LUNZ specimens (three males, two females) collected by RM Emberson on 5–8 February 1986 at Watts Rock on the Carrick Range (CO), represent the only population that can so far be matched to the type series. The geographic location of this population sits slightly further south than expected by the authors, but it is still located within the greater "southern lakes district". This is an area which, in addition to the Otago Region (CO, OL) and parts of western Southland (SL) and northern Fiordland (FD), also includes the Mackenzie Basin of inland Canterbury. Further collecting may eventually reveal additional populations of *K. laelaps* on mountain ranges in this region of New Zealand.

*Kiwisaldula laelaps* has a very dark dorsum and an ill-defined, barely visible hemelytral eyespot. There were too few specimens available to directly examine the hindwings and these could not be seen at all when slightly lifting the hemelytra. It is likely that hindwings are highly reduced in this species or possibly even vestigial.

*Kiwisaldula laelaps* may be just an odd "*Salda"*-looking *Kiwisaldula* or may eventually prove to belong to another genus, but such considerations need to be put aside until more of the South Island saldid fauna is revised.

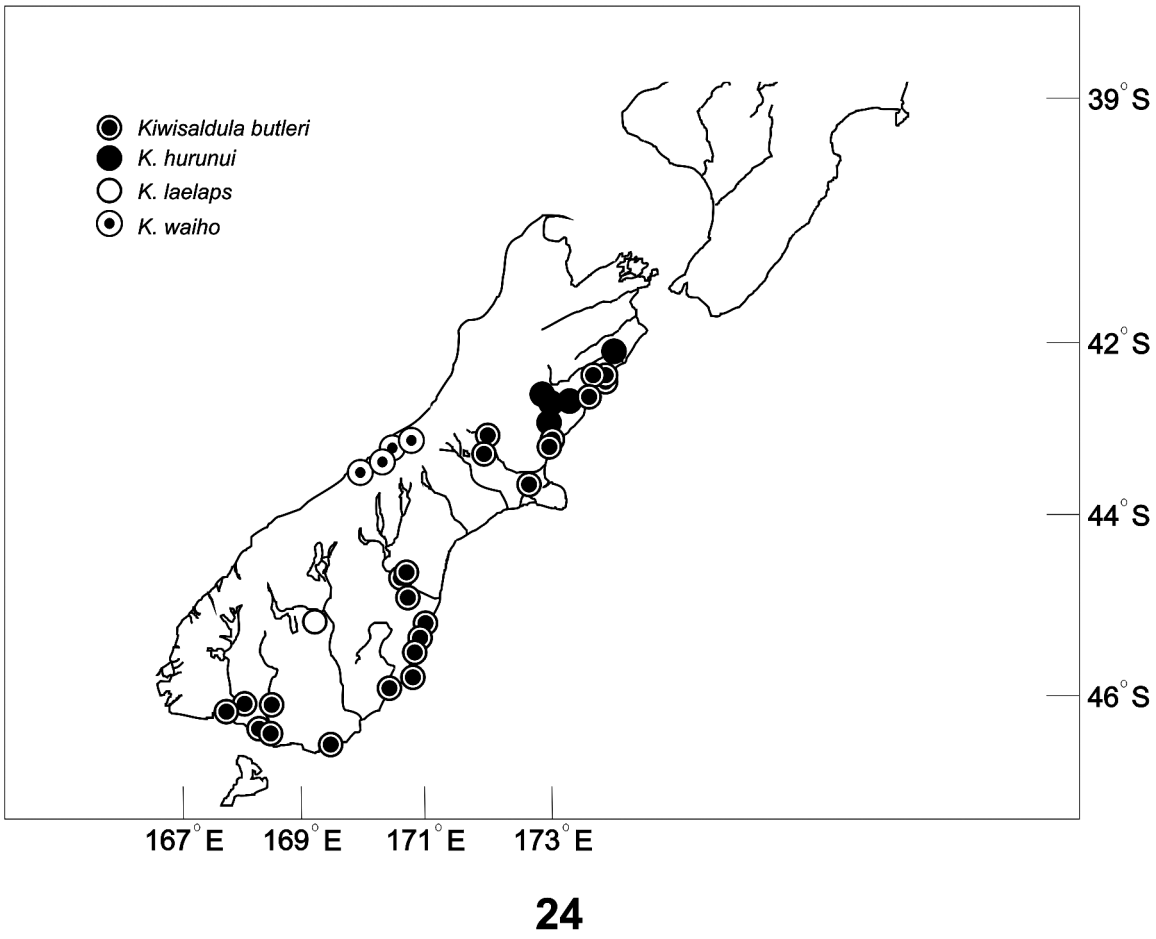



**FIGURE 24.** Collecting localities of *Kiwisaldula* species, South Island, New Zealand.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