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Ko te Aitanga Pepeke o Aotearoa

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Licinini
(Insecta: Coleoptera: Carabidae: Harpalinae)

by
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POPULAR SUMMARY

Class **Insecta**

Order **Coleoptera**

Family **Carabidae**

Tribe **Licinini**

The Licinini comprise a small group of medium sized (New Zealand species 4.5–13 mm in length), predacious ground beetles or Carabidae. Species of licinines are found almost worldwide, mainly in warm temperate regions, although the fauna is very limited in South America. They are generally believed to be predators of snails, both as adults and larvae, but direct observation of predation is restricted to a relatively few, mainly European, species.

The New Zealand licinine fauna includes 15 species in 4 genera. All species, except one that is also found in Australia, are New Zealand endemics. One of the genera is endemic to New Zealand, the other genera are also found in Australia, or more widely through Australia and island groups of the Western Pacific.

In New Zealand, licinines are most often found in damp, forested sites such as under logs or rocks alongside forest streams. They also occur in other high-humidity habitats, such as in cave entrances and in accumulations of leaf litter. Several species have regularly been found climbing tree trunks at night; other species frequent swampy areas, but can also be found in flood debris and on lake or sea shores.

Licinini can be distinguished most easily from other similar sized predacious ground beetles by the deep notch in the labrum or upper lip of the oral cavity, which can be seen readily with a hand lens.

He kāhui iti te pītara Licinini kei waenga nei tōna rahi (ko ngā momo o Aotearoa kei tōna 4.5 - 13 mm te roa), he pītara pārure, he haere whenua, ka kīia he Carabidae. E kitea ana ngā momo licinine i ngā wāhi maha o te ao i ngā whenua mahana, i ngā whenua kāore i tino makariri, engari kāore i nui tōna momo i Amerika ki te Tonga. E mōhiotia ana he pītara pārure, inā rā, ahakoa kātua, ahakoa torongū kua kitea e kai ngata ana, engari kua kitea noatia e te karu ētahi momo itiiti nei e pēnei ana, ko te nuinga he momo nō Ūropi.

Ko ētahi momo 15 o ētahi karangatanga e 4 nō Aotearoa. Ko te katoa o ōna momo, atu i tētahi mea kotahi ka kitea anō i Ahitereiria, nō Aotearoa taketake ake. Ko tētahi o ngā karangatanga nō Aotearoa taketake ake, ko ētahi atu karangatanga ka kitea anō i Ahitereiria, otirā e whānui ana te kitea i Ahitereira me ngā rōpū moutere o te Moana-nui-a-Kiwa ki te Uru.

I Aotearoa nei, e rite ana te kitea o te licinine i ngā wāhi o te ngahere e haukū ana, arā, i raro poro rākau, i te toka anō i te taha o ngā awa iti i te ngahere. Ka kitea anō i ētahi wāhi pārūrū pērā i te tomokanga ki te ana, i ngā wāhi rānei e putu mai ana te rau rākau. He maha ngā momo kua kitea e piki kahiwi rākau ana i te pō; ko ētahi anō i ngā wāhi reporepo, i ngā para wai-puke hoki, i ngā tahatika rānei o te roto, o te moana.

Ko te ara māmā e mōhiotia ai te licinini i ētahi atu pītara pārure haere whenua e rite ana te rahi, he pakini tōna kei te ngutu whakarunga o te waha. Ka kitea noatia tēnei ki te karu mōhiti.

Contributor **Rowan Mark Emberson** was born in July 1941 in Haifa, Palestine, a relatively safe haven reluctantly selected by his mother as she attempted to avoid conflict zones in the midst of the Second World War. After spending a year in Bagdad, Iraq, where his father was based, and another year in Cape Town, South Africa, where he was introduced to dung beetles, Rowan and his mother arrived in the South of England in late 1943, just in time for the V1 attacks on London. They were joined by his father in 1945, after the conclusion of the war in Europe. Rowan's parents were both excellent field naturalists and he grew up with a strong interest in all fields of natural history. From the age of nine he went to boarding school at Christ's Hospital in Sussex, which provided opportunities and encouragement to further his interests in biology. Following his schooling, he studied Forestry at Edinburgh University, graduating with a B.Sc. (Hons). At weekends much of his time was taken up with projects involving collection and identification of spiders and fleas from all over Scotland. His honours project was a study of soil mites in remnant Caledonian Scots pine forest. This led to a long-term interest in the biology and systematics of Mesostigmata, which was pursued as a Ph.D. topic at Macdonald College of McGill University in Montreal, Canada. Following his Ph.D. studies, Rowan joined the staff of the then Agricultural Zoology

Department, Lincoln College, Canterbury University in 1968. This soon became the Entomology Department and eventually the Department of Ecology, Lincoln University. He lectured on a wide range of topics loosely associated with entomology or ecology, and, with graduate students, mainly studied aspects of the adaptation of the life histories of pest and beneficial insects to the New Zealand environment. He also retained a strong personal research interest in systematics and the taxonomy of mites and insects. Over time, this research interest became focused on beetles, particularly ground beetles and dung beetles, together with macrochelid mites, an important family of Mesostigmata. He retired from full time employment in 2002, but remains an Honorary Senior Lecturer at Lincoln University and does some contract lecturing, as well as consulting and reviewing for various individuals and organizations. His contributions to entomology were recognized by the New Zealand Entomological Society, which made him a fellow of the Society in 2014.



I whānau mai te kaituhi, a **Rowan Mark Emberson**, i te marama o Hōngongoi 1941 ki Haifa, i Palestine, te āhuru mōwai i korongatā nei tana whaea ki te kōwhiri i a ia e karo ana i ngā rohe pakanga i waenganui i te Pakanga Tuarua o te Ao. Kotahi tau rātou ki Bagdad, Iraq, te wāhi mahi a tana matua, he tau anō ki Cape Town, i Āwherika ki te Tonga, te wāhi i ako ai ia mō te pītara hamuti. Ka tae a Rowan rāua ko tana whaea ki Ingarangi ki te Tonga i te paunga o te tau 1943, me tā rāua tūpono atu ki ngā pahū V1 ki runga o Rānana. Ka tae ake tana matua i te tau 1945, i muri mai o te mutunga o te pakanga i Ūropi. He tohunga tahi ngā mātua o Rowan i te ao mātai tipu, mātai kararehe i ō rātou taiao māori, ka pakeke mai ia me te kaingākau ki ngā wāhanga katoa o te hītori māori. Ka iwa

ōna tau ka haere ia ki te kura noho i Christ's Hospital i Sussex, i konei ka tuwhera mai he huarahi me te whakahau anō i a ia kia whai tonu i tāna i pai ai, arā, te mātai koiora. Whai muri i tana haere ki te kura, ka whāia e ia ngā mātauranga whakatipu rākau i te Whare Wānanga o Edinburgh, ka puta te ihu i tana B.Sc. (Hons). I ngā mutunga wiki, ka whakapau kaha ia ki ngā kaupapa e pā ana ki te kohikohi me te tautuhi i te pūngāwerewere, i te puruhi o te whānuitanga atu o Kotarani. Ko tana kaupapa hōnora ko te mātai i te momo pūwere moroiti (mite) noho oneone i ngā toenga ngahere paina Caledonian Scots. Ka tupu ki roto i a ia tana kaingākau auroa ki te mātai koiora me te pūnaha whakarōpū o te Mesostigmata, i whāia nei e ia hei kaupapa Tohu Kairangi i te Kāreti o Macdonald o te Whare Wānanga o Gill i Montreal, Kānata. I muri mai o tana whai i tana Tohu Kairangi, ka noho a Rowan hei kaimahi i te Tari Mātai Kīrehe Ahuwhenua i te Kāreti o Lincoln, Whare Wānanga o Canterbury i te tau 1968. Nā wai, nā wai ka noho tēnei hei Tari Mātai Pepeke, i muri iho ko te Tari Mātai Hauropi o te Whare Wānanga o Lincoln. He whānui ana kaupapa kauwhau e pā ana ki te mātai pepeke, ki te mātai hauropi rānei, ka mutu i te taha o ngā tauira paerua, ka mātai i ngā āhutanga e pā ana ki te urutau o ngā hītori o te oranga o te riha me ngā pepeke whai hua ki te taiaro o Aotearoa. I mau tonu hoki tana kaingākau whaiaro ki te rangahau i te pūnaha whakarōpū o te pūwere moroiti me te pepeke. I roto i te wā ka arotahi tēnei āhuatanga whaiaro ki te pītara, e aro nui ana ki te pītara haere whenua me te pītara hamuti, tae atu ki ngā pūwere moroiti macrochelid, tētahi whānau Mesostigmata tino hira. Nō te tau 2002 i mutu ai tana mahi tūturu engari e noho tonu ana ia hei Pouako Matua Hōnora i te Whare Wānanga o Lincoln, e kauwhau tonu ana ia ā-kirimana nei me tana noho ki te whakatika, ki te arotake mahi mā te tangata, mā te whakahaere rānei. I whakanuia ana mahi mātai pepeke e te Rōpū Mātai Pepeke o Aotearoa, ka noho ia hei mema o te Rōpū i te tau 2014.

Māori translation by Te Haumihia Mason

ABSTRACT

A revision of the 15 New Zealand species of the ground beetle tribe Licinini (Coleoptera: Carabidae: Harpalinae) is provided. Two of the four recognised subtribes of Licinini occur in New Zealand. The subtribe Licinina is represented by the genus *Physolaesthus* Chaudoir. In the subtribe Dicrochilina, the species formerly included in *Dicrochile* Guérin-Ménéville are divided into three groups of generic rank, based on distinctive morphological features: *Dicrochile*, *Pedalopia* Laporte de Castelnau and *Stomatocoelus* Macleay. The genus *Dicrochile* is known from New Zealand and Norfolk Island, *Pedalopia* is regarded as endemic to New Zealand, while *Physolaesthus* and *Stomatocoelus* are also found in Australia and island groups to the north of New Zealand. Original type material of all, except one, named species of New Zealand Licinini has been examined.

A single species of *Physolaesthus*, which also occurs in Australia, is found in New Zealand and 14 species of Dicrochilina, all endemic to New Zealand, are recognised. Five new species and one new subspecies of *Pedalopia* are described as follows: *P. arowhenua* **n. sp.** from South Canterbury; *P. flavipes florae* **n. subsp.** from north west Nelson; *P. oparara* **n. sp.** from north west Nelson; *P. orongorongo* **n. sp.** from Wellington; *P. waipori* **n. sp.** from the southern South Island and *P. watti* **n. sp.** from the Kaikoura Coast and North Canterbury.

Seven species names are newly synonymized: *Dicrochile limbatus* Broun, 1880 with *Physolaesthus insularis* Bates, 1878; *Dicrochile nitida* Broun, 1882 and *D. rugicollis* Broun, 1917 with *Dicrochile aterrima* Bates, 1874; *Dicrochile anchomenoides* Guérin-Ménéville, 1847, *D. subopaca* Bates, 1874 and *Agonum (Platynus) whitei* Csiki, 1931 with *Anchomenus atratus* Blanchard, 1842; *Dicrochile anthracina* Broun, 1893 with *Dicrochile maura* Broun, 1880. *Anchomenus atratus* Blanchard, 1842 is removed from secondary homonymy with *Carabus atratus* Duftschmid, 1812. Notes on type material, geographic distribution, seasonal occurrence and habitat are provided for each species. Eight of the ten Australian species placed in *Dicrochile* by Moore *et al.* (1987) are transferred to the genus *Stomatocoelus*. The possible relationships of the tribe Licinini within the subfamily Harpalinae are discussed.

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CHECKLIST OF TAXA

All the species in this list are New Zealand endemics, except for *Physolaesthus insularis* Bates, which also occurs in Australia.

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SPECIES EXCLUDED FROM THE NEW ZEALAND LICININI

Rembus zeelandicus Redtenbacher, 1868 was erroneously described as coming from Auckland, New Zealand. It is now known (Andrewes 1924) to be a northeast Asian species of *Diplocheila* Brullé (Ball, 1959).

The six Australian species of *Dicrochile* described by Laporte de Castelnau (1867) were all mistakenly listed from New Zealand in the Gemminger & Harold (1868) *Catalogus Coleopterorum*. They are all Australian endemics (Moore *et al.* 1987) that belong to the genus *Stomatocoelus* Macleay as here understood. They have never been found in New Zealand.

1. For convenience, the species of *Pedalopia* are arranged more or less from north to south, rather than alphabetically.

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Thierry Deuve (Muséum National d'Histoire Naturelle, Paris, France) very kindly undertook to locate Blanchard's *Voyage au Pol Sud* material and what remains of Guérin-Méneville's type material of *Dicrochile* when

I visited the Museum. He also helped me locate the important Bates' collection, including Bates' type material. Without his help this project would have been all but impossible. I was privileged to spend several days at the Natural History Museum in London examining their licinine material, particularly their extensive New Zealand material, including White's type material, and the Broun Collection, containing nearly all of Broun's primary type material.

In New Zealand, I have met with unfailing courtesy and help at the New Zealand Arthropod Collection (NZAC) and all the main regional museums in my quest for licinine material. I would particularly like to acknowledge the help of Trevor Crosby, Rich Leschen, Robert Hoare and André Larochelle at the NZAC, in Auckland and John Early at the Auckland War Memorial Museum, Ricardo Palma and Phil Sirvid at the Museum of New Zealand/Te Papa Tongarewa, Peter Johns at the Canterbury Museum and Tony Harris at the Otago Museum for arranging access and loans of material. In addition, Barbara Barratt, Philip Howe, John Nunn and Ian Townsend have generously loaned or given me important material from their private collections that has significantly added to the completeness of this revision.

A big thank you to John Marris, Entomology Research Collection, Lincoln University, who put up with my irregular inhabiting of the Collection over many years, helped guide me in the use of the Auto-Montage software, managed some of the loans from various institutions, provided a sounding board for my ideas and frustrations in the project and was very patient with my requests to borrow innumeral bits and pieces of curating and other equipment.

I am greatly indebted to Birgit Rhode at NZAC for her enormous help in preparing all the figures for publication and to Rich Leschen for editorial support and guidance.

I would also like to thank Dr David Kavanaugh and two anonymous reviewers for valuable and supportive comment that greatly improved the accuracy and readability of this contribution.

INTRODUCTION

The Licinini is a small tribe of snail feeding beetles belonging to the ground beetle family Carabidae. It includes about 230 described species arranged in 22–24 genera (Ball 1959, Sciaky & Facchini 1997), however, generic limits are not entirely settled and exciting new species continue to be found (e.g. Erwin & Ball, 2011). Only two genera, *Dicrochile* Guérin-Ménéville and *Physolaesthus* Chaudoir, were believed to occur in New Zealand (Larochelle & Larivière, 2007) and neither genus was thought to be endemic to New Zealand. Both genera were considered to occur also in Australia and in island groups to the North of New Zealand. Licinines are distributed almost throughout the world, although only very sparsely in South America, but see Erwin & Ball (2011). Species are most numerous in warm temperate regions, with relatively fewer species in the tropics and in cool temperate regions.

Seventeen nominal species of Licinini were recognised in the most recent catalogue of New Zealand Carabidae (Larochelle & Larivière 2016), but the tribe has never been revised in New Zealand and the list of species names includes numerous synonyms and one name, *Dicrochile fabrii* Guérin-Ménéville, that cannot be associated with any known species, owing to the lack of original material and any positive defining characteristics in the original description.

The general biology of New Zealand licinines is very poorly known. Adults are mainly litter dwelling and are most often found in moist to wet forest habitats. Larvae have not been described for any of the New Zealand species and their habitat requirements are almost entirely unknown. Elsewhere in the world, those licinines whose way of life has been studied are specialist snail predators, both as larvae and adults (Brandmayr & Brandmayr 1986, Ball 1992).

Taxonomic history of the New Zealand licinine fauna

The early literature on licinine Carabidae from New Zealand is fragmented and sometimes misleading. This, no doubt, was because the original collecting was largely by visiting European national expeditions and casual visitors. Frequently these collectors had no special knowledge of entomology. Generally, the collected material was described by European authors, who never visited the Southern Hemisphere and failed to recognise the

profound differences between the temperate insect faunas of the Northern and Southern hemispheres. This resulted in the first New Zealand licinines being placed in the unrelated but superficially similar European genus *Anchomenus* Bonelli, a member of the carabid tribe Platynini.

Licinines were first collected in New Zealand at Akaroa in the South Island in April 1840 by Jacques-Bernard Hombron and Honoré Jacquinot, the naturalists on Dumont D'Urville's *Voyage au Pol Sud* (Dunmore 2007). The species was illustrated and named *Anchomenus atratus* by Émile Blanchard (1842) and was formally described by him several years later (Blanchard 1853). Similarly, when Adam White (1846) described the beetles collected on the James Clarke Ross *Erebus and Terror* expedition, he described a licinine as *Anchomenus deplanatus*. Later, Félix Guérin-Méneville (1847a, 1847b) described a new genus, *Dicrochile*, for two new species of licinines collected from New Zealand, without a precise collection locality, by a visiting ship's surgeon, M. Fabre. In the description of the genus, however, it was with the platynine *Anchomenus* that the new genus was compared, rather than with other licinine genera, although Guérin-Méneville did note that the basal three tarsomeres of the male forelegs were dilated, as in the genus *Chlaenius* Bonelli (Chlaeniini). The situation was further confused by Victor Motschulsky (1864), who incorrectly (Kuschel 1990) described a New Zealand platynine, belonging to the endemic genus *Ctenognathus* Fairmaire, as *Dicrochile ovicollis*.

The outstanding carabid systematist Maximilien, Baron de Chaudoir (1852) resolved the systematic position of *Dicrochile* by associating it (as *Dicronochilus (sic)*) with the Licinini. He also included two Australian species, *Rhembus goryi* Boisduval and *Dicronochilus brevicollis* Chaudoir, in the genus. The scope of the genus was further extended by the French diplomat and entomologist, Francis de Laporte, Comte de Castelnau (1867), who described a further six Australian species of *Dicrochile*. At the same time, Castelnau described a new genus and species of Licinini, *Pedalopia novaezelandiae*, from New Zealand, which he thought was closely related to *Dicrochile*. However, he placed the species in a separate genus because, in the specimen he saw, he believed the labrum was not emarginate, as it is in *Dicrochile*.

Meanwhile, Ludwig Redtenbacher (1868) had described the beetles collected on the Austrian *Reise Novara* expedition, including a licinine, *Rhembus zeelandicus*, which he believed was collected in Auckland, New Zealand. As early as 1873, Henry Bates was doubting the provenance of this species, pointing out that it was identical, or nearly so, to his newly described *Rhembus gigas* from Japan (Bates 1873). This has since proved to be the case. Herbert Andrewes (1924) synonymised *R. gigas* with *R. zeelandicus*, which is now considered to be a species of the mainly Holarctic genus *Diplocheila* Brullé, subgenus *Isorembus* Jeannel, and is distributed from Korea southwards into China, Japan and Taiwan (Ball 1959). I have not seen the type material of *Diplocheila zeelandicus*, but I have collected a male specimen from Guizhou Province in southwestern China and can confirm it is nothing like anything known from the New Zealand licinine fauna. It will not be considered further here.

Bates (1874, 1875) described two new species of *Dicrochile* from Canterbury: *D. subopaca* from near Christchurch and *D. aterrima* from Lake Coleridge. Later (Bates 1878) described the first New Zealand species of *Physolaesthus* Chaudoir, *P. insularis*, also from a Canterbury specimen.

Over a 40 year period beginning in 1880, Thomas Broun (1880, 1882, 1893, 1894, 1903, 1908, 1917) described a further 11 species of *Dicrochile* from various localities around New Zealand. One of these species was subsequently transferred to *Physolaesthus* by Frederick Hutton (1904). Since Broun's time, no additional New Zealand species of licinines have been described and the only subsequent taxonomic action has been the synonymy, by Everad Britton (1941), of *Dicrochile cinctiger* Broun, 1882 with *Pedalopia novaezelandiae* Laporte de Castelnau, 1867.

With few exceptions, species of *Dicrochile* and *Physolaesthus* from New Zealand, have been found only in small numbers and are rarely common in collections. Perhaps for this reason they have been largely ignored for the last 100 years. Hudson (1934) catalogued the species and individual species have been referred to in the ecological and faunal literature (Britton 1960; May 1962, 1963, 1972; Harris 1970; Johns 1980, 1986; Johns *et al.* (1980); Butcher & Emberson 1981; Barratt & Patrick 1987; Emberson 1993; Townsend 1994; etc.). More recently, the existing names have been catalogued, together with biological and distribution data for each nominal species (Larochelle & Larivière 2001). Larochelle & Larivière (2007) have also provided a key, with habitus drawings, to separate the two genera, but no systematic treatment of the group has been undertaken.

The present revision, based on the examination of over 1200 specimens, including type material of all but one of the available names, recognises 15 species in four genera and two subtribes of Licinini. All New Zealand

species of the three recognized genera of *Dicrochilina* are endemic, but *Physolaesthus insularis* (Licinina) is also known from eastern Australia (Moore *et al.* 1987).

Although larvae of New Zealand licinines have not been described, Moore (1966) described the larva of the eastern Australian *Dicrochile brevicollis* Chaudoir, the adults of which are very similar to the New Zealand *D. cordicollis* Broun. Larvae of *Physolaesthus* are unknown, but larvae of several European species of the closely related genus *Badister* [Claireville] have been described (Arndt, 1991, Luff 1980, 1993).

SYSTEMATICS

Relationships of the Licinini

The Carabidae comprise one of the largest families of beetles including around 40,000 described species (Slipinski *et al.* 2011). Traditionally the family has been divided into a large number (70–80) of more or less distinct tribes, but there has been little consensus regarding the classification beyond the tribal level. However, it is now thought that a large group of tribes, including the Licinini, referred to by Jeannel (1941) as the Conchifera and defined by conjunct mesocoxae, asetose mandibular scrobes, and males generally with asetose conchoid parameres, in which the left paramere is much larger than the right, form a monophyletic group of subfamily rank known as the Harpalinae (Erwin 1985, Lawrence & Newton 1995, Maddison *et al.* 1999, Ober 2002, Ober & Maddison 2008). In this arrangement, the Harpalinae is the largest subfamily of carabids, including more than half of the described species. It is also thought to be one of the more derived of the carabid subfamilies (Erwin 1985, Maddison *et al.* 1999, Will *et al.* 2000).

Although there is little agreement on the relationships among the tribes of the Harpalinae, the Licinini have usually been placed with the tribes Callistini (= Chlaeniini), Panagaeini and Oodini and sometimes several other groups in a supratribal grouping. This group of tribes was originally referred to as the Patellimanes (Dejean 1826, LaFerté-Senectaire 1851, Fowler 1887, etc.) and more recently, following Jeannel (1941, 1942), as the Callistomorphi or the supertribe Callistitae (Ball 1959, 1979, 1992, Trautner & Geigenmüller 1987, Larochelle & Larivière 2001). Some authors have excluded the Panagaeini from the supertribe (i.e. Kryzhanovskij 1976, 1983, Erwin 1985, 1991, Moore *et al.* 1987), however, Bousquet (1987) and Bousquet & Larochelle (1993) have argued that panagaeines are closely related to some callistines on the basis of the chemistry of their defense secretions and morphology of their pygidial glands. The original grouping was based on the adhesive vestiture of the male protarsi where at least some of the protarsomeres, usually the basal three, are asymmetrically expanded and the ventral surface is densely covered with adhesive setae (most commonly referred to as tenant setae, but designated articulo-setae by Stork (1980)). The hypothesized relationship of this group of tribes was subsequently strengthened by the recognition of the shared possession of biperforate forecoxal cavities (Sloane 1923, Jeannel 1941), where the cavity is divided by a sclerotised bridge. However, this bridge is lacking in some Licinini (Ball 1992).

Details of the structure of the male genitalia (Jeannel 1942) also suggest this grouping and a degree of support is evident in a shared apomorphic feature of the female genitalia (Liebherr & Will 1998). Licinini and Panagaeini, together with a few other tribes including Graphipterini, Melanchitonini and Orthogonini, have a villous canal extending forward from the base of the spermatheca onto the common oviduct. This canal is not present in most other harpaline tribes and is regarded by Liebherr & Will (1998) as an uncontested synapomorphy of these tribes.

Some larval morphological characters also support the grouping of tribes including the Licinini (van Emden 1942, Thomson 1979, Arndt 1991). Larvae of at least eight genera of Licinini have been described (Gardner 1937, van Emden 1942, Moore 1966, Thomson 1979, Luff 1980, Arndt 1991), they are morphologically highly varied, but they all share the unusual character of an absent or very short epicranial suture. This feature is also found in some Callistini (*Chlaenius* Bonelli), one of the tribes with which the Licinini are traditionally grouped. However, Oodini and Panagaeini have epicranial sutures of more normal proportions.

The grouping of these tribes in the Callistitae is not supported by the structure of the abdominal defence glands or by the chemistry of the defence secretions. The morphology of carabid defence glands has been studied by Moore & Wallbank (1968), by Kanehisa & Murase (1977) and most particularly by Forsyth (1972). Forsyth (1972) found that Licinini have a secondary dorsal lobe attached to the storage reservoir and that the main collecting canal from the secretary lobe joins the reservoir near the junction of the main reservoir and the dorsal

lobe. This is thought to be an apomorphic condition shared with the Platynini, Harpalini and several other tribes of harpaline carabids, including the Lebiini (Kanehisa & Murase 1977). This derived condition is not found in the Callistini, Oodini or Panagaeini, which have a variety of other defense gland types. Similarly, the six genera of Licinini that have been investigated (Moore & Wallbank 1968, Schildknecht *et al.* 1968, Kanehisa & Murase 1977, Moore 1979) share with the same group of tribes of Harpalinae the secretion of formic acid and hydrocarbons as the principal components of their defence secretions. The hydrocarbons may act as surfactants and help spread the primary irritant component, formic acid (Will *et al.* 2000). The two species of *Dicrochile* that have been chemically investigated (Moore & Wallbank 1968) also have aliphatic ketones in their defense secretions. The tribes with which the Licinini have traditionally been linked in the Callistitae have a diverse range of chemicals in their defence secretions that does not include formic acid (Table 1). The Panagaeini and many Callistini are characterised by the unique, apomorphic, secretion of *m*-cresol (Bousquet 1987). Other Callistini, including *Callistus* and species of *Chlaenius* subgenus *Chlaeniellus* Reitter secrete quinones (Schildknecht *et al.* 1968, Kanehisa & Murase 1977), which are a characteristic part of the defensive secretion complex of Brachinini and Paussinae, though the crepitating mechanism present in these tribes is absent in Callistini. Oodini secrete high molecular weight unsaturated fatty acids (Moore 1979, Will *et al.* 2000), which are also found in the Dercyclini (Will *et al.* 2000), a tribe which has previously been associated with the Oodini (Ball 1979). High molecular weight unsaturated fatty acids are widely found in the defence secretions of Carabini, Scaritini, Bembidiini, and a number of other tribes not included in the Harpalinae. Defensive secretion of these high molecular weight unsaturated fatty acids is probably a largely plesiomorphic feature among Carabidae, though it also occurs in some other harpaline tribes including Pterostichini, Morionini and Loxandriini.

Ball (1992) introduced a number of additional characters to support the traditional tribal grouping, including the widespread occurrence of pits on the mentum in the Callistitae. He also attempted to reconcile the conflicting morphological and defence system data. He postulated that the Licinini are the sister group of the Oodini + (Callistini + Panagaeini). This arrangement fits the morphological data well and recognises the shared secretion of *m*-cresol by Callistini and Panagaeini (Bousquet 1987), but requires the Oodini to have undergone a reversion of defence gland type and secretion to a more plesiomorphic condition.

Will *et al.* (2000) mapped the distribution of some of the more reactive components of the defense secretions onto a phylogeny of the Carabidae based on characters of the female reproductive system developed by Liebherr & Will (1998). This phylogenetic hypothesis shows the traditional Callistitae as a clade within the Harpalinae, but with the Licinini as the most basal group. Their suggestion is that the Licinini has retained formic acid as the main component of its defense secretions, while the other members of the Callistitae have either lost it (Oodini) and reverted to high molecular weight fatty acids, or replaced it (Callistini, Panagaeini) with other reactive chemicals (i.e. *m*-cresol or quinones).

Molecular data have the potential to provide the independent evidence necessary to resolve the issue of the relationships of the Licinini, however, the evidence to date has been equivocal. Ober (2002) in a detailed study, mainly aimed at investigating the relationships of the Harpalinae to other groups of Carabidae, sequenced parts of two nuclear genes, the 28S rDNA gene and the *wingless* (*wg*) gene from 52 harpaline taxa representing 31 different tribes. She included *Dicaelus ambiguus* LaFerté-Sénéctère as an example of the Licinini. The resulting cladograms indicated different relationships for *Dicaelus* Bonelli with data from the two genes. However, no support for the traditional Callistitae was found.

More recently Ober & Maddison (2008) set out to investigate the relationships of tribes within the Harpalinae. They used a much larger data set including an additional 134 new 28S sequences and 108 new *wg* sequences from a wide range of harpaline beetles. The data included sequences from six additional licinine genera (*Diplocheila* Brullé, *Badister* Clairville, *Eutogeneius* Solier, *Licinus* Latreille, *Dicrochile*, and *Lacordairia* Castelnau). The results were analysed in multiple different ways with sequences from each gene separately and with the data from both genes combined. Five large cladograms of the included taxa were presented. In most of the analyses the licinine taxa, with the exception of the two *Badister* species, grouped together as a monophyletic lineage. Generally, the genera of the tribes Callistini, Panagaeini, Oodini and sometimes the Dercyclini also grouped together within a clade, often as a more or less monophyletic assemblage, but with relatively low support. However, there was no indication of a relationship of the licinine genera to those of the other callistite tribes and no consistent pattern of relationship of the Licinini to any other tribe or group of tribes was revealed, though a weak relationship

to the Harpalini is indicated in some of the analyses. Ober & Maddison (2008) commented that their analyses showed little support for the deeper nodes.

Table 1. Primary components of defense secretions of selected genera and species of *Callistitae s. lat.*

Genera and species	Compounds identified	Reference
Licinini		
<i>Badister</i>		
<i>bipustulatus</i> (Fabricius)	formic acid	Moore 1979; Schildknect <i>et al</i> 1968
<i>Dicaelus</i> sp.	formic acid	Moore 1979
<i>Dicrochile</i>		
<i>brevicollis</i> Chaudoir	formic acid + aliphatic ketones	Moore & Wallbank 1968
<i>goryi</i> (Boisduval)	formic acid + aliphatic ketones	Moore & Wallbank 1968
<i>Diplocheila</i>		
<i>zeelandica</i> (Redtenbacher)	formic acid	Kanehisa & Murase 1977
<i>elongata</i> Bates	formic acid	Kanehisa & Murase 1977
<i>Licinus</i>		
<i>aequatus</i> (Serville)	formic acid	Moore 1979; Schildknect <i>et al</i> 1968
<i>Siagonyx</i>		
<i>blackburni</i> Sloane	formic acid	Moore & Wallbank 1968
Oodini		
<i>Coptocarpus</i>		
<i>australis</i> Dejean	unsaturated fatty acids	Moore 1979
<i>Oodes</i>		
<i>amaroides</i> Dejean	unsaturated fatty acids + salicylaldehyde	Will <i>et al</i> 2000
<i>americanus</i> Dejean	unsaturated fatty acids	Attygalle <i>et al</i> 1991
<i>modestus</i> Chaudoir	unsaturated fatty acids	Moore 1979
Callistini (=Chlaeniini)		
<i>Callistoides</i>		
<i>delciolus</i> Bates	<i>m</i> -cresol	Kanehisa & Murase 1977
<i>Callistus</i>		
<i>lunatus</i> (Fabricius)	quinones	Schildknect <i>et al</i> 1968
<i>Chlaenius</i>		
<i>australis</i> Dejean	<i>m</i> -cresol	Moore & Wallbank 1968
<i>circumdatus</i> Brullé and 6 other species	<i>m</i> -cresol	Kanehisa & Murase 1977 Schildknect <i>et al</i> 1968, Moore 1979
<i>Chlaenius (Epomis)</i>		
<i>nigricans</i> Wiedermann	<i>m</i> -cresol	Kanehisa & Murase 1977
<i>Chlaenius (Macrochlaenites)</i>		
<i>costiger</i> Chaudoir	<i>m</i> -cresol	Kanehisa & Murase 1977
<i>Chlaenius (Chlaeniellus)</i>		
<i>vestitus</i> (Paykull)	quinones	Schildknect <i>et al</i> 1968
<i>inops</i> Chaudoir	quinones	Kanehisa & Murase 1977
<i>prostenus</i> Bates	quinones	Kanehisa & Murase 1977
Panagaeini		
<i>Craspedophorus</i>		
sp.	<i>m</i> -cresol	Moore & Wallbank 1968
<i>Dischissus</i>		
<i>japonicus</i> Andrewes	<i>m</i> -cresol	Kanehisa & Murase 1977
<i>mirandus</i> Bates	<i>m</i> -cresol	Kanehisa & Murase 1977
<i>Panagaeus</i>		
<i>bipustulatus</i>	<i>m</i> -cresol	Schildknect <i>et al</i> 1968
<i>japonicus</i> Chaudoir	<i>m</i> -cresol	Kanehisa & Murase 1977
<i>Peronomerus</i>		
<i>auripilis</i> Bates	<i>m</i> -cresol	Kanehisa & Murase 1977
<i>nigrinus</i> Bates	<i>m</i> -cresol	Kanehisa & Murase 1977

Ober & Maddison's (2008) data for *Badister neopulchellus* Lindroth and *B. reflexus* LeConte, the two species of *Badister* included in their analyses, showed them always as sister taxa, but their consistent separation from the other licinine genera seems entirely anomalous (but see discussion of generic relationships below). There is little doubt that *Badister* is a licinine belonging to the subtribe Licinina, based on both adult and larval morphology, including unique synapomorphies of the mandibles, and other shared traits such as molluscivory and chemical defenses.

The results of the molecular studies to date, combined with the chemical defense data, make it very unlikely that the Licinini is a member of the traditional Callistitae and its relationship to other members of the Harpalinae remains unclear. However, the Callistitae minus the Licinini may well be a natural grouping of tribes, including Oodini, Dercyclini, Callistini, Panagaeini and possibly several other less well known tribes. The chemical defense data and morphology of the defense glands suggest a relationship of the Licinini to some of the harpaline tribes, having a large number of apomorphic characters, including Harpalini, Platynini, and Lebiini, but clearly much more work is needed to resolve this issue.

The names of the tribes discussed here are generally used as they were in the cited publications, but it should be noted that current usage favours Chlaeniini and Chlaeniitae for Callistini and Callistitae respectively (Bousquet & Laroche 1993, Bouchard *et al.* 2011).

Generic relationships in the Licinini

Two different systematic arrangements of the genera of Licinini have been proposed, in the literature. The first was that of Jeannel (1942), who divided the tribe (family in Jeannel's system) into two subfamilies; the Licinitae, containing most of the genera, and the Badisteritae, which included only *Badister*. The division was made in the context of the western European fauna. It only considered the wider world fauna of licinines in a very superficial way. The division was based on the number of glabrous basal antennomeres (3 in Licinitae, 2 in Badisteritae, but see discussion under *Physolaesthus* below), the overall body size, the shape of the male genitalia, the shape of the larval gula and a number of other minor characters. This arrangement was essentially followed by Jeanne (1972), Freude (1976), Jeanne & Zaballos (1986), Herrera & Arricibita (1990) and was mentioned by Luff (2008), but is clearly inapplicable to the diversity of genera found outside Europe.

Ball (1959) pointed to the close morphological similarity of *Badister* to *Licinus* in contrast to the diversity of other genera of Licinini and suggested an alternative division of the tribe into four phyletic lineages, based on the morphology of the mandibles. He did not propose formal subtribes at the time because of the absence of other known characters supporting this division and his lack of detailed knowledge of most of the genera that occur outside North America.

Although Ball's (1959) system was founded on a single character complex, it had the advantage of taking into account the world fauna, rather than just the restricted western European fauna. Later, Ball (1992) improved on his 1959 system by providing more detailed descriptions of the important mandibular features and adding a number of supporting characters. He also proposed a formal system of four subtribes. While there is little doubt that the four groupings distinguished by Ball (1992), with the possible exception of the Dicaelina, constitute monophyletic lineages, some of the detailed characters he associated with each lineage are probably not universal for the lineage. Ball (1992) used an exemplar methodology for exploring the differences between lineages and the relevant characters of many licinine genera were not investigated in detail.

The monophyly of the Licinini has not been questioned seriously since Jeannel (1941, 1942), but Ball (1992) was the first author to attempt to demonstrate their monophyly explicitly. He suggested that the reduction of the length of the mandibular terebra relative to the basal area, the absence of occlusal grooves and an extensive ventral groove were all apomorphic features of licinine mandibles. Other apomorphic characters of the mouthparts included the mentum without a tooth and with an extensive median sinus. The morphology of the female reproductive tract is strongly conserved across all four subtribes of the Licinini (Will 1998) and characters of the spermatheca, in particular the coiled or curved apex and the frequent differentiation into a broad base and a narrow, often elongate tip constitute another synapomorphy of the tribe. The excavated anterior margins of the labrum and clypeus, which have traditionally been used as a defining character of the Licinini are somewhat varied throughout the group, but are probably a synapomorphy of the tribe. Larval features thought to be synapomorphies of the Licinini are the frontal sutures extending posteriorly to the occipital suture, the cervical suture branched ventrally,

isolating a small median sclerite referred to as a median apotome by Moore (1966), and the elongate antennae, at least 1.5 times as long as mandibles (van Emden 1942). Molluscivory is also likely to be a derived trait of the group (Ball 1992), which may have driven the modifications of the mandibles and other mouthparts.

In Ball's (1992) system, the Australasian-Oriental genus *Physolaesthus* is included in the *Licinina* Bonelli, 1810, with *Licinus*, *Badister* and a number of other less well-known genera. The nine or ten genera of *Licinina* are mainly Palaearctic in distribution, although several occur in the Oriental region and *Badister* is almost worldwide in distribution (Ball 1959, 1992, Erwin & Ball 2011). In describing *Physolaesthus*, Chaudoir (1850) noted its close similarity in appearance to *Badister*, but drew attention to a number of differences, including the inflated terminal labial palpomeres of *Physolaesthus*. Darlington (1968) pointed out some similarities of the Indo-Australasian genus *Omestes* Andrewes to *Physolaesthus* and suggested a relationship of both genera to *Badister*. *Dicrochile* has been considered the only genus in the *Dicrochilina* Ball, 1992 (but see below). In this broad sense, it is a mainly Western Pacific genus widely distributed to the east of Wallace's Line. The other two subtribes, the *Dicaelina* Laporte de Castelnau, 1834 and *Lestignathina* Ball, 1992 are both absent from New Zealand. The *Lestignathina* are predominantly Australian, where they are represented by seven genera and 24 described species (Moore *et al.* 1987), though they are also sparingly found in the Afrotropical and Oriental regions and on the southern margins of the Palaearctic region (Sciaky & Facchini 1997). The *Dicaelina*, including the genera *Dicaelus* Bonelli and *Diplocheila* Brullé only, are mainly Holarctic and Oriental in distribution, though they also occur on the northern margins of the Neotropical region (Ball 1959, 1966, 1992).

Ball (1992) postulated that the licinine subtribes might be related as follows: *Dicaelina* + ((*Dicrochilina* + *Lestignathina*) + *Licinina*). However, at the time he was uncertain of the monophyly of the *Dicaelina*. Supporting the monophyly of the subtribe, Will (1998) has since pointed out that the bursa copulatrixes of both *Dicaelus* and *Diplocheila* have an apical lobe, an apparently apomorphic feature not found elsewhere in the *Licinini*.

Composition and relationships of the New Zealand *Licinini*

Fifteen species in four genera and two subtribes of *Licinini* are recognised from New Zealand in this revision. One species is included in *Physolaesthus* Chaudoir (*Licinina*) and fourteen, including five new species, in three genera of *Dicrochilina*.

Physolaesthus is widely distributed in Australia and north into New Guinea, the Philippines and Indonesia as far west as Java (Darlington 1968, Louwerens 1969). Seven species are known to occur in Australia (Moore *et al.* 1987), one of which, *P. insularis* Bates, also occurs in New Zealand. In Australia, species of *Physolaesthus* are recorded from south-western Western Australia, the Murray-Darling Basin in South Australia and New South Wales, the Northern Territory and northern Queensland (Moore *et al.* 1987), but are likely to be widespread in damp habitats throughout the country. Based on mandibular structure, the genus is clearly a member of the *Licinina*, most closely related to *Badister* and perhaps particularly to the subgenus *Baudia* Ragusa (see below).

Dicrochile, in the traditional sense (Moore *et al.* 1987, Ball 1992), is a western Pacific genus known from Australia, New Caledonia, New Guinea, Solomon Islands, Vanuatu, and the Maluku or Molucca Islands (Indonesia), as well as New Zealand (Darlington 1968, Moore *et al.* 1987) and has been regarded as the sole genus in the licinine subtribe *Dicrochilina*. However, a careful re-examination of the New Zealand species revealed that it included three distinctive lineages, here regarded as separate genera.

The New Zealand species having the most generalised character states, *D. cordicolle* Broun and *D. aterimma* Bates, are very similar to species from south-eastern Australia, particularly to *D. brevicolle* (Chaudoir) and like the Australian species have fully developed hind wings. These species, together with all but one of the Australian species and those from the various island groups to the north of Australia and New Zealand, are here regarded as belonging to the reinstated genus *Stomatocoelus* Macleay (type species: *Stomatocoelus licinoides* Macleay, 1864 = *Rembus goryi* Boisduval, 1835).

The remaining New Zealand species comprise two distinctive lineages with vestigial hindwings. One lineage, including *D. atrata* (Blanchard) and *D. thoracica* Broun, from New Zealand and *D. idae* Moore from Norfolk Island has tended towards a more flattened, usually gracile body shape with relatively long legs and strong isodiametric dorsal microsculpture. These species remain in a more restricted concept of *Dicrochile* (type species: *Dicrochile anchomenoides* Guérin-Méneville, 1847 = *Anchomenus atrata* Blanchard, 1842). The other lineage is endemic to New Zealand and includes a series of at least ten, mostly more or less depigmented species, that have

tended towards a more rounded, *Agonum*-like facies, with relatively short legs and, in some species, female macrocephally. These species are here regarded as belonging to the reinstated genus *Pedalopia* Laporte de Castelnau (type species: *Pedalopia novaezelandiae* Laporte de Castelnau, 1867)

Physolaesthus is widely distributed in the North Island and the northern half of the South Island. Species of *Stomatocoelus* and *Pedalopia* are found more or less throughout the two main islands of New Zealand, including in-shore islands, but have not been reliably recorded from Stewart Island or any of the off-shore islands. Species of *Dicrochile* in New Zealand are restricted to the south-eastern corner of the North Island and the eastern South Island.

BIOLOGY

Members of the tribe Licinini are generally believed to be predators of shell bearing Gastropoda, both as adults and larvae (Brandmayr & Brandmayr 1986, Ball 1959, 1992, Luff 1993). One of the main characters used in defining the subtribes of Licinini is the structure of the adult mandibles, which in turn is thought to be related to the way in which the beetles attack their prey (Ball 1992). In both of the subtribes present in New Zealand, Licinina and Dicrochilina, the mandibles appear to be most suited to crushing the shells of snails to get to the soft body tissues, although direct observation of adult feeding by any species of Dicrochilina or *Physolaesthus* is lacking.

No larvae of New Zealand Licinini have been described, but the larva of the eastern Australian *Stomatocoelus brevicollis* (Chaudoir), **new combination**, a species superficially very similar to the New Zealand *S. cordicollis*, was described by Moore (1966). Larvae of *Physolaesthus* have not been described, but the larvae of a number of species of the related genus *Badister* are well known (Arndt 1991, Luff 1980, 1993).

With the exception of *P. insularis* and *S. cordicollis*, which are often found in marshes and swamps, New Zealand licinines are mainly forest inhabiting and are typically found in damp habitats, such as beside forest streams and in swampy areas, or under rocks and logs in deep litter. Occasionally they may be found in more open, mesic or xeric habitats, in pasture, sand dunes, or above the bush line. A number of species have regularly been observed climbing tree trunks at night. Several species, including *P. insularis* and *S. cordicollis*, can also be found in sea and lakeshore drift, or in flood debris, no doubt a consequence of living in flood prone habitats.

Species of *Pedalopia* have diverged strongly from the general ground plan of the Dicrochilina and developed a series of morphological adaptations that are unusual in the context of the Licinini as a whole. Species of this lineage are nearly all at least partially depigmented, and are notable for their loss of normally fixed setae, variation in the number of glabrous basal antennomeres, reduced sexual dimorphism of the protarsi and the reduced eyes of some species. It is suggested that these features are adaptations for life in deep leaf litter and other sheltered, high humidity environments such as sink holes, cave entrances, or under deeply embedded rocks and logs, where they probably feed on the extensive fauna of litter inhabiting micro-snails.

Another extraordinary feature of *Pedalopia* is that some species exhibit macrocephally or allometric sexual dimorphism of the head, in which larger females have disproportionately large heads and broader pronota. This feature is, as far as is known, unique in the Licinini and highly unusual in the Carabidae generally. It may, however, be significant that the single known specimen of *D. idae*, a female from Norfolk Island, also has a massive head (Moore, 1985). The evolutionary forces responsible for the allometric head development are entirely unknown and any discussion remains highly speculative. However, if, as generally believed, these beetles feed on snails by crushing their shells and ingesting the body tissues, then having a disproportionately large head with larger mandibles and more powerful mandibular musculature might allow larger snails to be successfully preyed upon. This could, for instance, increase the number of eggs that a female was able to mature. In these circumstances there could be a selective advantage in investing a larger proportion of the benefits derived from enhanced larval nutrition in head size, rather than overall body size.

METHODS AND CONVENTIONS

Morphology

Klimaszewski & Watt (1997, figs 1, 2) have illustrated and labelled the dorsal and ventral surfaces of a generalised carabid and Larochelle & Larivière (2005, figs 1–31) have provided a series of more detailed, labelled illustrations to outline the main morphological features of generalized Harpalini. The basic morphology of the Licinini is very

similar to that of the Harpalini, except for the specific characters that separate the two groups (see Laroche & Larivière 2007: 59–61). The general terminology used in describing the two groups is almost identical and does not need to be repeated here.

Specialist terminology for the Licinini relates particularly to the structure of the mandibles and is crucial for separating the subtribes and genera (see Ball 1992 for a full description). In the New Zealand fauna, the genus *Physolaesthus* (Licinina) has a deep notch and basal protuberance, or boss, on the dorsal surface of the right mandible, whereas in the genera of the Dicrochilina the mandibles are usually blunt-tipped and lack notches and protuberances on the dorsal surface. The asymmetric expansion of the basal three protarsomeres, in males, and the presence of specialised adhesive setae (articulo-setae of Stork (1980)) on their ventral surface, are important characteristics of the Licinini and other tribes often grouped in the Chlaeniitae or Callistitae that are not shared with the Harpalini. The anterior margins of the labrum and clypeus are usually distinctly concave or notched, whereas they are normally more or less straight or slightly emarginate in Harpalini. Other significant, though non-defining, features of the Licinini are the general presence of two pairs of supraorbital setae (reduced to one pair in a few species of *Pedalopia*) and two pairs of lateral setae on the pronotum (reduced to one pair in *Pedalopia*). In Harpalini there is only one pair of supraorbital setae and one pair of lateral pronotal setae.

Habitus drawings of *Stomatocoelus cordicollis*, *Pedalopia insignis* and *Physolaesthus insularis* were provided by Laroche & Larivière (2007, pp. 135–136).

Measurements were made with an ocular micrometer and, where available, all measurements and ratios were based on at least ten individuals. Body length was measured from the tip of the left mandible to the apex of the left elytron. Depending on the genus of Dicrochilina, up to three pronotal measurements were made to characterize the shape of the pronotum: maximum width (usually in the vicinity of the anterior pronotal setae), hind margin width (between the posterior pronotal setae, when present, or between the outer angles in the absence of these setae), and median length (Fig. 1). These measurements were then expressed as ratios.

In a few species of *Pedalopia* the usual sexual dimorphism of the basal protarsomeres is absent, in which case the sex of individuals is most easily determined externally by the number of ambulatory setae on the hind margin of the last visible abdominal ventrite, usually a single pair in males and two pairs in females.

For investigation of the male and female genitalia, beetles were softened in warm water, the elytra lifted, the abdomen detached from the rest of the specimen and the tergal membrane peeled back to expose the reproductive organs. The aedeagus or the female reproductive tract could then be removed and gently cleared in a warm 10% potassium hydroxide solution. Alternatively, if the external genitalia were exposed behind the abdomen, they could be removed without detaching the abdomen. Drawings were prepared, for selected species, of the left gonocoxite in ventral view and the aedeagus in left lateral view.

The terminology used for describing the female gonocoxites is based on Liebherr (2011). Several authors (Sciaky & Facchini 1997, Will 1998, Erwin & Ball 2011) have illustrated gonocoxites of different Licinini, but their depictions have usually been at least partially diagrammatic and the terminology used inconsistent. The structures Liebherr (2011) described for the Moriomorphini and the terminology used are directly comparable to those of the Licinini described here (Fig. 2).

Unusual for the subfamily Harpalinae and the tribe Licinini, a few species of *Pedalopia* have setae on the distal margins or ventral surface of one or both parameres (Figs. 39, 42).

Laroche & Larivière (2013) have provided an extensive glossary for the technical terms they have used in species descriptions. I have included a brief glossary of morphological terms used in the following descriptions that were not included in, or are used in a different sense to that of Laroche & Larivière (2013) (Appendix I).

Species concepts

Owing to the absence of detailed biological data and other sources of information on New Zealand Licinini, I have used a phylogenetic species concept, based on morphological data, using the criterion defined by Nixon & Wheeler (1990), "...diagnosable by a unique combination of character states in comparable individuals". The study is based almost entirely on adult, pinned museum specimens, though most species have been collected and observed alive in the field. Biogeographical information has also been useful in delimiting some species of Dicrochilina.

As noted by Laroche & Larivière (2013), many New Zealand ground beetles are flightless and so are more subject to morphological variation and local speciation than flighted species. In these respects, most New Zealand

Licinini are not different from other ground beetles. In all the species of *Dicrochilina*, except *Stomatocoelus aterrimus* and *S. cordicollis*, the hindwings are vestigial and the beetles are flightless. The more widespread of these flightless species are often quite varied from north to south across their range and *Pedalopia*, in particular, has speciated widely in the South Island with a number of apparently geographically isolated species especially in the East and South of the island. The distinctive allometric sexual dimorphism of the head and pronotum of some species in this genus also contributes to significant morphological variation in these species. Finally, there is a suggestion of introgression between *S. aterrimus* and *S. cordicollis* in the northern South Island and Kapiti Coast, which can make it difficult to separate individuals of these species. This introgression is likely to be related to changes in sea-level during the last glaciation and possible migration between the two islands.

Type material

The primary type material of all the available names of described species of New Zealand Licinini, except for one of the *Dicrochile* species named by Guérin-Méneville (1847a), has been located and examined. The data on the labels is reproduced for each nominal species enclosed in inverted commas, with the data on each label separated from the next label by a semi-colon. A description of each label is given and, if known, the identity of the author of any hand-writing. Printed holotype and lectotype labels have been prepared and attached to appropriate specimens for all primary type material recognised in this revision. The location of the recognized type material follows, using standard acronyms after Watt (1979).

Notes on the type material are provided as necessary and full information and reasons are given for all lectotype designations. All new synonymies established in this revision are based on the direct examination of the relevant primary type material.

Most of the existing primary type material is located in The Natural History Museum, London (BMNH), including material of White and Broun, or the Muséum National d'Histoire Naturelle, Paris (MNHN), including material of Blanchard, Guérin-Méneville and Bates. The Broun material is housed separately from the main collection in BMNH and the Bates material is housed in a series of boxes associated with other material acquired from René Oberthur in MNHN. Laporte de Castelnau's material of *Pedolopia novaezealandiae* is in the Museo Civico di Storia Naturale di Genova (MCSG) in Italy and Broun's original specimen of *D. cinctiger* has been located in the Fulton Collection, Otago Museum, Dunedin (OMNZ).

In the BMNH collections, including the Broun collection, many specimens have "Type" or "Cotype" discs attached to them, these were evidently added on a curatorial basis by Gilbert Arrow, or his assistants, in the 1920s and 1930s. They are often misleading and have no status in type selection (see also Emberson 1995).

Material examined

The number of specimens examined of each species is noted, along with a breakdown of the number of male and female specimens and a list of the collections holding each species, using standard acronyms after Watt (1979). A list of all material examined by species and locality is provided in Appendix II.

Distributions

The two letter geographical codes of Crosby *et al.* (1976) are used to define collection areas in New Zealand. For each species, the areas from which a species has been collected are listed separately for the North and South Islands and within each island listed from north to south and west to east. The northernmost and southernmost collection records are also given for each species, as appropriate. Distribution maps are provided for each species.

Seasonal occurrence

The seasonal occurrence of adults in the field is indicated by listing the number of collections for each month, using the first three letters of the month. However, the collection data may reflect the activity of collectors rather than the seasonality of the beetles. Collections of teneral specimens are separately noted.

Habitat

A brief general description of the habitats from which each species has been collected is given, together with collecting methods, where known. The altitudinal range from which each species has been collected is also noted and the highest collection records are listed where appropriate.

Abbreviations

Standard four letter acronyms based on those developed by Watt (1979) have been used to designate collections from which material has been sourced.

AMNZ	Auckland War Memorial Museum, Auckland, New Zealand
ANIC	Australian National Insect Collection, Commonwealth Scientific and Industrial Research Organisation, Canberra, ACT, Australia
BMNH	British Museum (Natural History), now The Natural History Museum, London, UK
BBNZ	B.I.P. Barrett, private collection, Dunedin, New Zealand
CASC	California Academy of Sciences, San Francisco, California, USA
CMNZ	Canterbury Museum, Christchurch, New Zealand
JNNZ	J.T. Nunn, private collection, Dunedin, New Zealand
JTNZ	J.I. Townsend, private collection, Levin, New Zealand
LUNZ	Entomology Research Collection, Lincoln University, New Zealand
MNHN	Muséum National d'Histoire Naturelle, Paris, France
MONZ	Museum of New Zealand/Te Papa Tongarewa, Wellington, New Zealand
MCSG	Museo Civico di Storia Naturale di Genova, Genoa, Italy
NZAC	New Zealand Arthropod Collection, Landcare Research, Auckland, New Zealand
OMNZ	Otago Museum, Dunedin, New Zealand
PHNZ	P. Howe, private collection, Timaru, New Zealand

KEY TO GENERA AND SPECIES OF NEW ZEALAND LICININI

- 1 Size small, less than 6.0 mm in length; dorsal surface of right mandible deeply notched; terminal labial palpomere strongly inflated, more or less securiform, broadly truncate distally *Physolaesthus insularis* Bates
- Size larger, species greater than 6.5 mm in length; neither mandible with a deep notch on its dorsal surface; terminal labial palpomere more or less cylindrical or fusiform, narrowly truncate distally 2
- 2 Lateral margins of pronotum with two setae, one near midpoint and the other at hind angle, if setae missing, setal punctures still evident 3
- Lateral margins of pronotum with a single seta near midpoint *Pedalopia* Castelnau ... 6
- 3 Convex, often glossy; discal elytral intervals distinctly convex; junction of anterior and lateral elytral margins evenly rounded; hind wings well developed, longer than elytra *Stomatocoelus* Macleay ... 4
- Flattened, more or less matt black with prominent dorsal microsculpture; discal elytral intervals flat to gently convex; junction of anterior and lateral elytral margins angulate; hind wings vestigial *Dicrochile* Guérin-Ménéville ... 5
- 4 Size smaller, less than 11 mm in length; pronotum transverse, lateral margins convex in front of hind angles in most specimens. *S. aterimmus* (Bates)
- Size larger, 11 mm or more in length; pronotum less transverse, more cordiform, lateral margins straight or slightly sinuate in front of hind angles. *S. cordicollis* (Broun)
- 5 Elytra almost flat, gently sloping to upturned lateral margins; matt, microsculpture exceptionally strong; discal elytral intervals flat. *D. atrata* (Blanchard)
- Elytra convex, distinctly sloping to lateral margins; microsculpture prominent, but elytra not matt; discal elytral intervals noticeably, though gently, convex. *D. thoracica* Broun

- 6 Body essentially uniform in colour, black or brown, occasionally slightly paler towards lateral margins, or elytra somewhat paler than head and pronotum; setae on 3rd elytral interval never in prominent pale foveae..... 7
 - Pronotum and elytra with distinct, though sometimes narrow, pale margins, which are more or less sharply delimited from ground colour; setae on 3rd elytral interval often in prominent pale foveae..... 11
- 7 Elytral microsculpture distinctly transverse; body colour black or dark brown; elytral intervals distinctly convex.... 8
 - Elytral microsculpture isodiametric; body mid brown in colour; elytral intervals flattened on disc..... 9
- 8 Lateral margins of pronotum evenly curved, widest near midpoint, hind angles completely effaced; penultimate labial palpomeres with 4 or 5 setae on their anterior margins; male protarsi with basal 3 tarsomeres asymmetrically expanded ***P. maura* (Broun)**
 - Lateral margins of pronotum strongly sinuate in front of distinct, bluntly obtuse, hind angles; penultimate labial palpomeres with 2 setae on their anterior margins; male protarsi with basal 3 tarsomeres not expanded, similar to female protarsi..... ***P. insignis* (Broun)**
- 9 Elytral interneurs consisting of a varied number of elongate striaform punctures; 3rd elytral interval with 4 or 5 setae; female pronotum median length to maximum width ratio <2.0 ***P. oparara* n. sp.**
 - Elytral interneurs striate, more or less continuously impressed; 3rd elytral interval with 2 setae; pronotum median length to maximum width ratio 1.4–1.9 10
- 10 Head with two pairs of supraorbital setae; junction of anterior and lateral elytral margins angulate..... ***P. cephalotes* (Broun)**
 - Head with only one pair of supraorbital setae, anterior supraorbital setae absent; junction of anterior and lateral elytral margins strongly rounded ***P. orongorongo* n. sp.**
- 11 Head with only one pair of supraorbital setae, anterior supraorbital setae absent; second antennomere with only terminal whorl of setae; male parameres with distal setae..... ***P. flavipes* (Broun)**...12
 - Head with two pairs of supraorbital setae; second antennomeres with short, sparse pubescence in addition to terminal whorl of setae; parameres glabrous in most specimens 13
- 12 Third antennomere with terminal whorl of setae only ***P. flavipes flavipes* (Broun)**
 - Third antennomere with a patch of short pubescence near midpoint, in addition to terminal whorl of setae ***P. flavipes florum* n. ssp.**
- 13 Elytral interneurs effaced, indicated laterally by rows of dark granules against a pale ground; dark fascia in centre of elytra not extending laterally beyond interneur 4 in most specimens, and beyond interval 4 in only a few specimens.
 ***P. novaezelandiae* Castelnau**
 - Elytral interneurs at least faintly impressed, striate; dark fascia in centre of elytra always extending laterally at least as far as interneur 6. 14
- 14 Pale margin of pronotum and elytra very narrow, not extending mesad on elytra past interneur 8; pronotum very slightly sinuate in front of hind angles ***P. arowhenua* n. sp.**
 - Pale margin of pronotum and elytra wider, extending mesad on elytra as far as interneur 6 or 7 and forming a prominent pale hind margin; pronotum straight or convex in front of hind angles 15
- 15 Third elytral interval with 1 seta, attached to 2nd interneur; abdominal ventrites uniformly dark brown, except for paler hind margin on ventrite 6 ***P. watti* n. sp.**
 - Third elytral interval with 3 setae in small pale foveae; abdominal ventrites with distinct pale posterior corners..... ***P. waipori* n. sp.**

DESCRIPTIONS

Tribe LICININI Bonelli, 1810

Labrum deeply emarginate or notched almost to base, either symmetric or asymmetric, with 2–3 pairs of setae. Clypeus emarginate with a setiferous puncture on each side. Eyes present, sometimes reduced; with 1 or 2 pairs of supraorbital setae. Antennae filiform, antennomere pubescence varied, starting from antennomere 4 in most Licinini, but more basal antennomeres also pubescent in all species of *Badister* and some species of *Pedalopia*. Mandibles highly varied; New Zealand genera, either right mandible with dorsal notch and basal boss, or both mandibles short, stout, more or less symmetrical. Mentum with 1 pair of setae, mental pits present or absent; penultimate palpomeres with 2–4–(7) setae on anterior margins, terminal palpomeres glabrous or distinctly setose, fusiform to securiform, sometimes swollen. Pronotum with 2 pairs of lateral setae, except posterior lateral setae absent from members of all species of *Pedalopia*. Procoxal cavities uniperforate or biperforate. Male protarsomeres 1–3 asymmetrically laterally expanded with articulo-setae on ventral surface, these either densely packed or in distinct rows, except male sexual dimorphism of fore tarsi reduced or absent from members of some species of *Pedalopia*.

Subtribe LICININA Bonelli, 1810

Mandibles broad, especially basally, and thick; terebrae short with occlusal margins nearly straight, incisors blunt, terebral teeth thick and prominent; either right or left mandible with a dorsal notch and basal boss; ventral grooves with short microtrichia. Labrum varied, varying from asymmetrically irregularly concave to symmetrically deeply V-shape notched; dorsal surface of labrum with 2 or 3 pairs of setae; internally with few epipharyngeal trichoid sensilla. Labium of most members with a pair of mental setae, but lacking mental pits in genera examined; penultimate palpomere of most members with 2 setae on anterior margin. Procoxal cavities uniperforate. Male protarsomeres 1–2 or 1–3 with articulo-setae in discrete rows or densely packed on ventral surface.

Genus *Physolaesthus* Chaudoir

Physolaesthus Chaudoir, 1850: 411. Type species: *Physolaesthus australis* Chaudoir, 1850, by monotypy, Swan River, Western Australia.

Physoloesthus: Lacordaire, 1854: 235, (incorrect subsequent spelling).

Physolesthus: Sloane, 1898: 488, (incorrect subsequent spelling).

Diagnosis. Small gracile licinines (4.3–6.0 mm in length). Integument glossy black or dark brown, sometimes with lighter markings along pronotal and elytral margins, or elytra entirely pale. Elytra often with faint metallic reflections. Appendages yellowish to dark brown.

Description. Frons depressed, flattened or slightly concave, with 2 pairs of supraorbital setae; eyes prominent, almost hemispherical; head constricted behind eyes; labrum divided by a deep V-shaped cleft, with 2 pairs of setae, each lobe with 2 apical setae; clypeus with 1 pair of setae at anterior lateral angles; dorsal surface of right mandible with a conspicuous notch and elevated basal protuberance; terminal labial palpomeres inflated, pubescent, more or less securiform, obliquely truncate distally, with a small digitiform process dorsally; penultimate palpomere with 2 or 3 setae on anterior margin; mental pits absent; three basal antennomeres glabrous except for internal median seta on antennomere 1 and terminal whorls of setae on antennomeres 2 and 3. Pronotum with two pairs of marginal setae; hind angles distinct, usually obtuse; pronotal microsculpture well developed, isodiametric. Elytra distinctly striate, with faint transverse microsculpture; third elytral interval with two setae. Hindwings fully developed. Tarsomeres 5 without rows of setae on ventrolateral margins; male protarsi with three basal tarsomeres asymmetrically expanded, with rows of adhesive articulo-setae on ventral surface.

Female gonocoxites divided (Fig. 22); gonocoxite 1 (*gc1*) with a group of lateral setae (*las*) ventrally on anterior lateral margin; gonocoxite 2 (*gc2*) with 1 dorsal ensiform seta (*des*), and 2 apical nematiform seta (*ans*) arising from a ventrolateral oval pit, also 2 lateral ensiform setae (*les*) on external margin.

Aedeagus gently curved, tubular or trough-like, weakly sclerotized dorsally; dorsal opening closed apically by two sclerotized strips; sclerotized tip beyond dorsal opening hooked (Fig. 32).

Distribution: The genus is widely distributed in Australia (Moore *et al.* 1987) and north into New Guinea, the Philippines and Indonesia, as far west as Java (Darlington 1968, Louwerens 1969), as well as in New Zealand.

Remarks: In describing *Physolaesthus*, Chaudoir (1850) compared it to *Badister*, but pointed out the strongly inflated terminal labial palpomeres of *Physolaesthus* and several other differences in the mouthparts and the proportions of the antennomeres. Darlington (1968) questioned the relationship of *Omestes* and *Physolaesthus* to *Badister*, with the suggestion that *Omestes* may be no more than a large *Physolaesthus* and that both genera may be closely related to *Badister*. There is little doubt that *Physolaesthus* is closely related to *Badister*; in fact, a case could be made for including *Physolaesthus* as a subgenus of *Badister*. *Physolaesthus*, however, differs from *Badister* in two important characters: the three glabrous basal antennomeres instead of the one glabrous antennomere found in *Badister*, and the shape of the terminal labial palpomere. The glabrous basal antennomeres of *Physolaesthus* are probably plesiomorphic, being found in most other genera of Licinini and in other related tribes. The amount of pubescence on the basal antennomeres of *Badister* is, however, quite varied. Jeannel (1942) distinguished his *Badisteritae* from *Licinidae* on the basis of the former having two glabrous antennomeres, rather than the usual three. However, in all species of *Badister* examined in the course of this study the second antennomere is distinctly pubescent and in some species there is even sparse pubescence on the first antennomere. The strongly swollen, securiform, distally obliquely truncate, terminal labial palpomeres of *Physolaesthus* are almost certainly an apomorphic feature of the genus, although something similar is seen in most species of *Badister*, where the terminal labial palpomeres are pubescent, as in *Physolaesthus*, and somewhat swollen, though usually not securiform. They are also obliquely truncate, but usually lack the small digitiform process found on the distal dorsal margin in *Physolaesthus*. The swollen, pubescent, obliquely truncate terminal labial palpomeres are a synapomorphic feature linking *Badister* and *Physolaesthus*, whereas the securiform shape and the digitiform process have been thought to be autapomorphic features of *Physolaesthus*. In general appearance, species of *Physolaesthus* are very similar to some Oriental species of *Badister* subgenus *Baudia* Ragusa and share the lack of setae on the ventrolateral margins of tarsomere 5 with this subgenus and the subgenus *Trimorphus* Stephens, but have the right mandible notched rather than the left, as is usually found in *Baudia*. Recently a species of *Badister s. str.*, *B. amazonus* Erwin & Ball, 2011, has been described from Amazonian Peru that has some characters previously thought to be diagnostic of *Physolaesthus*, particularly the swollen, securiform, distally obliquely truncate, terminal labial palpomeres, with a knob or process at the apex. Erwin & Ball (2011) noted that *B. amazonus* occupied an isolated position among Western Hemisphere members of *Badister s. str.* The discovery of this species would appear to further lessen the distinction between the genera *Physolaesthus* and *Badister*; however, a more detailed investigation of the relationships of the two genera is beyond the scope of this study.

For comparison, the characters mentioned above together with those that were used by Ball (1959) to distinguish the three subgenera of *Badister* (*Badister s. str.*, *Baudia* and *Trimorphus*) are tabulated below. It should be noted, however, that Ball (1992) abandoned the use of subgenera in *Badister s. lat.* after finding that West Indian populations of *B. (Baudia) reflexus* LeConte could have either the right or the left mandible dorsally notched, but the subgenera have continued to be used by other authors, i.e. Luff (2008), Erwin & Ball (2011), *Fauna Europaea* (2013). Lindroth (1969) had previously argued that the notching of the left or right mandible in *Badister s. lat.* could be the result of a very simple genetic change and so not an adequate character, by itself, on which to base subgeneric groupings of species.

	<i>Badister s. str.</i>	<i>Baudia</i>	<i>Trimorphus</i>	<i>Physolaesthus</i>
No of glabrous antennomeres	1 (0)	1	1	3
Right or left mandible notched	right	left (right)	right	right
Pronotal microsculpture	isodiametric	isodiametric or transverse	transverse	transverse
Setae on ventrolateral margins of tarsomere 5	+	–	–	–
Terminal labial palpomere swollen, obliquely truncate	± or ++	±	±	++

Contrary to the opinion of Darlington (1968), *Omestes* is quite different in that it lacks the synapomorphic labial palp features of *Physolaesthus* and *Badister*, having instead glabrous, cylindrical terminal palpomeres, which

are narrowly truncate distally. In addition, *Omestes* has four setae on the anterior margin of the penultimate labial palpomere, instead of the two or three seen in *Physolaesthus* and *Badister* and has one instead of two pairs of supraorbital setae. The species of *Omestes* are also considerably larger than those of any species of *Physolaesthus* or *Badister* and have an unusual autapomorphic spinose specialisation of the elytral apices, which are obliquely truncate and have spines at the outer and sutural angles, with minute teeth in between.

***Physolaesthus insularis* Bates, 1878**

Fig. 3, 22, 32, 45, 60. Map p. 68

Physolaesthus insularis Bates, 1878: 22

Dichrochile limbatus Broun, 1880: 17, **new synonymy**

Physolaesthus limbatus: Hutton, 1904: 143

Diagnosis. Dark brown with pale pronotal and elytral margins of varied width; elytra iridescent, metallic. Length 4.3–5.1 mm.

Head: Labrum asymmetric, almost completely divided by a deep V-shaped notch, left lobe longer than right, each lobe with a major and a minor seta; clypeus depigmented with a seta at each anterior lateral corner; frons flattened to slightly concave; maxillary palps glabrous, terminal palpomeres more or less cylindrical/fusiform, tapering distally; terminal labial palpomeres securiform and strongly pubescent, broadly truncate distally, with a small dorsal digitiform process; penultimate palpomeres with 2 major and occasionally 1–2 minor setae on their anterior margins; mentum with a pair of setae, but lacking pits, mental suture present; submentum with a pair of setae; dorsal microsculpture of head strong, isodiametric.

Thorax: Pronotum (Fig. 3) dark brown with a pale margin of varied width; more or less quadrate, transverse, tapering to hind angles (median length to maximum width 1: 1.41–1.55, hind margin width to maximum width 1: 1.13–1.21); lateral margins very slightly sinuate in front of obtuse hind angles, explanate posteriorly; posterior margin curved, convex; median groove shallow, not reaching anterior or posterior margins; basal impressions poorly defined; pronotal margins with narrow marginal bead; microsculpture of pronotum and scutellum well developed, isodiametric, but sculpticels tending towards arrangement in transverse rows posteriolaterally. Elytra dark brown with a pale margin of varied width; interneurs striate, deeply impressed; intervals convex; microsculpture very fine, transverse, giving a distinct iridescent, metallic sheen; scutellar striole distinct between first and second interneurs, with scutellar seta at base. Hindwings fully developed. Legs usually paler than body; male fore tarsi with 3 basal tarsomeres asymmetrically expanded, with adhesive vestiture beneath, adhesive setae arranged in 2 rows on tarsomeres 1 and 2, and 1 row on tarsomere 3.

Abdomen and genitalia: Abdominal ventrites dark, glossy and lacking obvious microsculpture.

Gonocoxites (Fig. 22). *gc1* with a group of 2 stout lateral setae (*las*); *gc2* with a single *des* seta, and 2 *ans* setae laterally and 2 *les* setae on external margin.

Aedeagus (Fig. 32). Apex of aedeagus distinctly hooked, internal sac with indications of two sclerotized areas.

Type data: *Physolaesthus insularis*: Holotype male, labelled “CanterbY N.Zeal” [Bates’ hand]; “Oakdens 3/73” [Bates’ hand]; “HOLOTYPE *Physolaesthus insularis* Bates, 1878, male. Det. R.M. Emberson”; Bates Collection, MNHN.

Dichrochile limbatus: Lectotype female, here designated, labelled “Type” [red rimmed disc]; “39” [Broun species number]; “Auckland-1873-” [Broun’s hand]; Broun accession label; “limbatus var. 35” [Broun’s hand, 35 is the Broun species number for *P. insularis* and an implicit recognition, by Broun, of the similarity of his species to that of Bates]; “LECTOTYPE *Dichrochile limbatus* Broun, 1880, female. Det. R.M. Emberson”; Broun Collection, BMNH.

Notes on type material: *Physolaesthus insularis*: The holotype is on a card point, the left antenna is missing beyond antennomere 5, the right mesotarsus is absent beyond tarsomere 2, the right metatarsus is completely missing and the pronotal lateral hind setae are also missing.

Dichrochile limbatus: The lectotype is designated in order to fix the taxonomic concept of *D. limbatus* (Broun), because although Broun (1880) mentioned he had seen two specimens, only one has been located. The lectotype is card mounted, the right antenna and maxillary palp are detached, the left antenna is lacking beyond antennomere 5 and the right fore leg is missing the tibia and tarsus.

Material examined: Type specimens plus 96 non-type examples (53 males, 44 females, 1 indeterminate; BMNH, JNNZ, JTNZ, LUNZ, MNHN, NZAC).

Distribution: Widely distributed in the North Island and the northern half of the South Island. North Island: ND, AK, WO, BP, GB, TO, TK, WI, WN; South Island: SD, BR, MC; northernmost record, Lake Wahakiri, Te Kao (ND), southernmost record, Oakdens (MC). Extralimital distribution: South-eastern Australia, Murray-Darling Basin, New South Wales; one specimen examined: Mulwala, NSW, (ANIC).

Seasonal occurrence: Aug (1), Nov (2), Dec (3), Jan (5), Feb (5), Mar (4), Apr (1). Records are concentrated in the late spring through to autumn with one collection in August.

Habitat: Mainly collected from low altitudes, generally in wet places, including sea drift, washed-up lake weed, swamps and marshes. *Physolaesthus insularis* is perhaps most easily collected by treading eutrophic swamps and is occasionally collected at light.

Remarks: There could be a question as to whether *P. insularis* is native to New Zealand or adventive. The species also occurs in eastern Australia (Moore *et al.* 1987), but the early first records, and widespread occurrence in New Zealand at that time (Canterbury 1873, C.M. Wakefield; Auckland 1873, Broun) indicate that it is probably native to both New Zealand and Australia. Individuals fly well and are regularly found in seashore drift, perhaps indicating a propensity for long distance dispersal.

Subtribe DICROCHILINA Ball, 1992

Head characteristically short and broad with heavy, usually blunt tipped mandibles. Mandibles with short terebrae, terebral teeth small, left mandible with 2 terebral ridges; ventral grooves with long, densely packed microtrichia; neither mandible with a dorsal notch and basal boss. Labrum symmetrically or asymmetrically notched; dorsal surface with 3 pairs of setae; internally with dense Y-shaped patch of microtrichia. Labium usually with a pair of mental setae, mental pits present or absent; penultimate palpomere with a varied number (2–7) of setae on anterior margin. Pronotum varied in shape, with marginal bead laterally; posterior lateral setae lacking in *Pedalopia*. Procoxal cavities biperforate. Tarsomeres 5 generally with rows of setae ventrolaterally. Male protarsi generally with basal 3 tarsomeres asymmetrically expanded, with rows of articulo-setae ventrally; male sexual dimorphism of protarsi reduced or absent in some species of *Pedalopia*.

Female gonocoxites divided; gonocoxite 1 (*gc1*) usually with a group of 3 lateral setae (*las*) ventrally on anterior lateral margin, occasionally with 4 or 5 setae or *las* setae absent; gonocoxite 2 (*gc2*) with 1 dorsal ensiform seta (*des*), and with 2 apical nematiform seta (*ans*) arising from a dorsolateral oval pit, also 2 lateral ensiform setae (*les*) on external margin. There is minor variation in general shape of the gonocoxites between genera, with *Stomatocoelus* and *Dicrochile* being most similar and sharing an exterior lateral flange apically on *gc2*, which is lacking in *Pedalopia*. Occasionally there is variation in the numbers of gonocoxal setae, between species, individuals, and between the left and right gonocoxites.

Aedeagus gently curved, tubular or trough-like, weakly sclerotized dorsally; dorsal opening closed apically by two sclerotized strips. Parameres conchoid, wider basally and rounded apically, left always larger than right, mostly glabrous, but with long setae distally or minute setae ventrally in several species of *Pedalopia*. The gross morphology of the aedeagus varies little between species, except that the sclerotized tip beyond the dorsal opening tends to be shorter and less prominent in *Pedalopia*.

Remarks: The New Zealand species of Dicrochilina are something of an enigma. Based on morphology, three distinctive lineages, here regarded as genera, are newly recognised. One of these lineages, *Stomatocoelus*, represented by two species in New Zealand, occurs throughout the geographic range of the subtribe and includes species that seem to have the most generalized character states. The other two lineages include species that have more derived character states and are also more restricted geographically. *Dicrochile* is shared with Norfolk Island and *Pedalopia* is endemic to New Zealand. This suggests that New Zealand may have been colonised by Dicrochilina on several occasions with *Pedalopia* perhaps representing the oldest colonization, as indicated by a complex of derived character states including: vestigial hindwings, depigmentation in many species, loss of some normally fixed setae, loss of secondary sexual characters in members of some species, variation in number of glabrous antennomeres, absence of an exterior apical flange on the gonocoxites, and extensive localised speciation. Species of *Dicrochile*, though distinctive, appear to have diverged less from the generalized condition. They have vestigial hindwings and strong, isodiametric dorsal microsculpture, but do not have the other derived features seen

in species of *Pedalopia* and have not speciated to quite the same extent. The New Zealand species of *Stomatocoelus* are very similar to, but generally smaller than species from south-eastern Australia and may represent a relatively recent trans-Tasman colonization.

Genus *Stomatocoelus* Macleay, reinstated

Stomatocoelus Macleay, 1864: 115. Type species: *Stomatocoelus licinoides* Macleay, 1864 (= *Rembus goryi* Boisduval, 1835), by monotypy, Queensland, Australia.

Stomatocolus: Chaudoir, 1871: 283, (incorrect subsequent spelling).

Diagnosis. Small to medium sized, moderately convex licinines, 9-20 mm in length. Integument often glossy black; elytral interneurs well impressed, intervals convex; hind wings fully developed.

Description. Mandibles usually blunt tipped, occasionally with tips divided, almost bidentate; labrum deeply divided by a symmetrical or asymmetrical U or V-shaped notch, with 3 pairs of setae, 2 towards the apices of the labral lobes and 1 towards the base of the notch, the basal setae are occasionally absent in some individuals of the New Zealand species. Antennae with 3 basal antennomeres lacking pubescence; frons with 2 pairs of supraorbital setae; penultimate labial palpomeres with 4 setae on their anterior margins. Pronotum transverse, rounded or cordate and always with both anterior and posterior lateral setae; lateral marginal bead well developed and enclosing bases of posterior lateral setae; basal impressions usually wrinkled or punctate, posterior lateral margins sometimes wrinkled or punctate, but degree of wrinkling and puncturing varies extensively within and between species. Junction of lateral and anterior margins of elytra rounded; scutellar striole and seta present; 3rd elytral interval with 2 setae, often adjacent to interneurs 2; elytral microsculpture usually well developed, isodiametric or transverse. Hindwings fully developed, longer than the elytra. Basal meso- and metatarsomeres grooved laterally; tarsomeres 5 with rows of 3–5 setae ventrolaterally; female basal protarsomeres elongate, male protarsi asymmetrically expanded, with 4 rows of adhesive setae ventrally on tarsomeres 1 and 2, and 2 rows on tarsomeres 3. Apical part of gonocoxites *gc2* with lateral flange and more broadly conical than other genera (Figs 23, 24). Aedeagus with downwards pointing sclerotized tip beyond dorsal opening (Figs 33, 34).

Distribution: A western Pacific genus found to the east of Wallace's Line. It is known from New Guinea, Solomon Islands, Vanuatu, Australia, New Caledonia, and the Maluku or Molucca Islands (Indonesia), as well as New Zealand.

Remarks: *Stomatocoelus licinoides* Macleay, 1864, the type species of the genus *Stomatocoelus*, is a junior subjective synonym of *Rembus goryi* Boisduval, 1835, as currently understood (Moore *et al.* 1987). One of Macleay's syntypes has been examined in ANIC.

Contrary to the statements of Larochelle & Larivière (2001, 2007), the two New Zealand species placed in *Stomatocoelus*, *S. cordicollis* and *S. aterrimus*, share with the Australian and Pacific Islands species of *Dicrochilina* well developed hind wings, at least 1.25 times the length of the elytra. All species of the traditional genus *Dicrochile* from outside New Zealand, with the exception of *D. idae* Moore, 1985, which is retained in *Dicrochile*, are provisionally included in *Stomatocoelus*, although members of some sub-tropical species are much larger (16–20 mm in length) and relatively more robust than members of the New Zealand and south-eastern Australian species.

Material of eight of the ten species of *Dicrochile* recognised by Moore *et al.* (1987) as occurring in Australia has been examined (ANIC), together with a possible undescribed species from the Pilbara region in northern Western Australia. These species clearly belong to the genus *Stomatocoelus*, as defined here, and are formally transferred to that genus.

Australian species of *Dicrochile* transferred to *Stomatocoelus* Macleay:

Dicrochile brevicollis Chaudoir, 1852 = *Stomatocoelus brevicollis* (Chaudoir), **new combination**

Dicrochile gigas Laporte de Castelnau, 1867 = *Stomatocoelus gigas* (Laporte de Castelnau), **new combination**

Rhombus goryi Boisduval, 1835 = *Stomatocoelus goryi* (Boisduval), **new combination**

Dicrochile minuta Laporte de Castelnau, 1867 = *Stomatocoelus minutus* (Laporte de Castelnau), **new combination**

Dicrochile punctipennis Laporte de Castelnau, 1867 = *Stomatocoelus punctipennis* (Laporte de Castelnau), **new combination**

Dicrochile punctulata Sloane, 1923 = *Stomatocoelus punctulatus* (Sloane), **new combination**

Dicrochile quadricollis Laporte de Castelnau, 1867 = *Stomatocoelus quadricollis* (Laporte de Castelnau), **new combination**

Dicrochile ventralis Blackburn, 1891 = *Stomatocoelus ventralis* (Blackburn), **new combination**

***Stomatocoelus aterrimus* (Bates, 1874), new combination**

Fig. 4, 23, 33, 46. Map p. 68

Dicrochile aterrima Bates, 1874: 238

Dichrochile nitida Broun, 1882: 216, **new synonymy**

Dichrochile rugicollis Broun, 1917: 360, **new synonymy**

Diagnosis. Body glossy black, appendages generally dark, pronotum transverse. Length 9–10.5 mm.

Head: Dorsal microsculpture poorly developed, isodiametric; labrum more or less symmetrically notched with 2 setae on each lobe and a median pair; clypeus with a pair of antero-lateral setae; frons flat, some individuals with a slight median elevation; obscurely wrinkled laterally. Antennae generally dark with proximal part of basal antennomeres paler. Maxillae with pale lacinia and galea; terminal palpomeres glabrous, pale in distal third; labial terminal palpomeres sparsely setulose; mentum with a pair of setae and distinct impressions, but lacking pits.

Thorax: Pronotum (Fig. 4) transverse, more or less quadrate, but gently tapering to hind angles (median length to maximum width 1: 1.41–1.55; hind margin width to maximum width 1.18–1.33); lateral margins straight to convex in front of very obtuse, rounded hind angles; hind margin almost straight; hind marginal bead interrupted medially; basal impressions deep; surface indistinctly wrinkled adjacent to median groove; microsculpture well developed and isodiametric laterally, slightly transverse and weaker on disc. Microsculpture of scutellum and elytra well developed, isodiametric. Elytra convex with well impressed striate interneurs; intervals convex; intervals 4 distinctly narrower than intervals 3 or 5; intervals 3 with 2 setae near interneurs 2; junction of lateral and anterior margins evenly rounded; posterior lateral margin distinctly sinuate. Hindwings well developed, at least 1.25 times length of elytra. Legs dark brown to black with paler tarsal claws; basal metatarsomeres grooved laterally; tarsomeres 5 with rows of 3–4 setae ventrolaterally; female basal protarsomeres more than twice as long as broad, as long as tarsomeres 2 and 3 together; male protarsi asymmetrically expanded, with adhesive setae ventrally.

Abdomen and genitalia: Microsculpture of abdominal ventrites isodiametric laterally, slightly transverse medially.

Gonocoxites (Fig. 23)

Aedeagus (Fig. 33)

Type data: *Dicrochile aterrima*: Lectotype male, here designated; labelled “Christchurch” [Bates’ hand]; “Lake Coleridge N.Z. under stones in dry lagoon” [presumed to be C.M. Wakefield’s original field label on a large piece of folded white paper]; “LECTOTYPE *Dicrochile aterrima* Bates, 1874, male. Det. R.M. Emberson”; Bates Collection, MNHN.

6 paralectotypes, 5 labelled “Canterbury N. Zeal.” [Bates’ hand]; 1 labelled “Christchurch” [Bates’ hand]. One of the “Canterbury N. Zeal.” specimens has the additional labels “*Dicrochile aterrima*” [Bates’ hand]; “LectoTYPE P.M. Johns 27.ix.1978”; all labelled “PARALECTOTYPE *Dicrochile aterrima* Bates, 1874. Det. R.M. Emberson”; Bates Collection, MNHN.

Dichrochile nitida: Holotype female; labelled “1325” [Broun species number]; Broun accession label; “Outram, Taieri” [Broun’s hand]; “HOLOTYPE *Dichrochile nitida* Broun, 1882, female. Det. R.M. Emberson”; Broun Collection, BMNH.

Dichrochile rugicollis: Holotype female; labelled “Type” [red rimmed disc]; “3799” [Broun species number]; Broun accession label; “Oakden 9.10.1913” [Broun’s hand]; “*Dichrochile rugicollis*” [Broun’s hand]; “HOLOTYPE *Dichrochile rugicollis* Broun, 1917, female. Det. R.M. Emberson”; Broun Collection, BMNH.

Notes on type material: *Dicrochile aterrima*: The lectotype is designated in order to fix the taxonomic concept of *Dicrochile aterrima* Bates, because the syntypic series includes at least seven specimens, possibly from more than one location. I have selected as lectotype, the specimen bearing the label “Lake Coleridge N.Z. under stones in dry lagoon” because these are the precise words used by Bates (1878) in describing the species, except

that he omitted "N.Z". C.M. Wakefield was the collector of Bates' material and the attached label is presumed to be his field label. The lectotype designation by P.M. Johns was never published and hence is invalid.

Dichrochile nitida: The holotype is pinned and lacks the distal two palpomeres of the right maxillary palp and the distal two tarsomeres of the right fore tarsus.

In the Broun Collection, standing under *D. nitida* there is an additional specimen with the labels "Type" [red rimmed disc], "1325", "Lake Tekapo" [printed], Broun accession label, "Dichrochile nitida". This cannot be the holotype as Broun (1882) specifically mentions Outram for his single specimen. As noted above, many specimens in the Broun Collection have had type discs added to them on a curatorial basis. These type discs have no status in type selection.

Material examined: Type material plus 63 non-type examples (26 males, 38 females 8 indeterminate; AMNZ, BMNH, CMNZ, JNNZ, LUNZ, MNHN, MONZ, NZAC, PHNZ).

Distribution: Widely distributed in the South Island: NN, BR, NC, MC, SC, WD, MK, OL, CO, DN, FD, SL; northernmost record, Nelson (NN); southernmost record, Catlins Forest Park (SL).

Seasonal occurrence: Sep (2), Oct (4), Nov (2), Dec (2), Jan (4), Feb (1), Mar (5), May (2), Jun (3). Records are spread more evenly through the year than for other species, with no obvious peak months.

Habitat: A mainly lowland species, it occurs in forest and in more open habitats, including riverbeds, pastures and swamps. Unlike most other species of New Zealand Dicrochilina, *S. aterrimus* is sometimes found aggregated under logs, particularly in winter.

Remarks: *Stomatocoelus aterrimus* is very closely related to *S. cordicollis* from which it differs in the smaller size and more transverse pronotum of its members. In general, the latter species replaces *S. aterrimus* in parts of the northern South Island and throughout the North Island. The two species overlap slightly in the northern South Island and there is some evidence of introgression here and on the Kapiti Coast in the North Island, where the two species could have come into contact during the low sea level stages of the last glaciation.

***Stomatocoelus cordicollis* (Broun, 1903), new combination**

Fig. 5, 24, 34, 43, 47. Map p. 68

Dichrochile cordicolle Broun, 1903: 455

Dignosis. Glossy black, convex, pronotum cordate, appendages mostly dark, palps with pale tips to terminal palpomeres. Length 11–13 mm.

Head: Dorsal microsculpture poorly developed, isodiametric; labrum more or less symmetrically notched with 2 setae on each lobe and a median pair; frons usually with a slight median elevation and wrinkled or rugose laterally. Maxillae with lacinia and galea pale; terminal palpomeres glabrous, tips pale honey coloured; labial terminal palpomeres sparsely setulose; anterior margins of penultimate labial palpomeres usually with 4 setae, occasionally 3 or 5; mentum with a pair of setae and distinct impressions, but lacking pits.

Thorax: Pronotum (Fig. 7) cordate, distinctly tapered posteriorly (median length to maximum width 1: 1.35–1.46; hind margin width to maximum width 1: 1.29–1.39); lateral margins usually sinuate, but occasionally straight, in front of very obtuse hind angles; hind margin almost straight; hind marginal bead interrupted medially; basal impressions deep; surface indistinctly wrinkled laterally and adjacent to median groove; microsculpture more or less isodiametric and well developed laterally, weak and slightly transverse on disc. Microsculpture of scutellum and elytra isodiametric, well developed. Elytra convex with well impressed striate interneurs; intervals convex; intervals 4 only slightly narrower than intervals 3 and 5; intervals 3 with 2 setae near interneurs 2; junction of lateral and anterior margins evenly rounded; posterior lateral margin distinctly sinuate. Hindwings well developed, at least 1.25 times length of elytra. Legs dark brown to black; basal metatarsomeres grooved laterally; tarsomeres 5 with rows of 4–5 setae ventrolaterally; female basal protarsomeres more than twice as long as broad and as long as tarsomeres 2 and 3 together; male protarsi asymmetrically expanded, with adhesive setae ventrally.

Abdomen and genitalia: Microsculpture of abdominal ventrites isodiametric laterally, slightly transverse medially.

Gonocoxites (Fig. 24)

Aedeagus (Fig. 34)

Type data: Lectotype male, here designated; labelled “Type” [red rimmed disc]; “2661” [Broun species number]; Broun accession label; “Te Aroha” [Broun’s hand]; “Dichrochile cordicolle” [Broun’s hand]; “LECTOTYPE *Dichrochile cordicolle* Broun, 1903, male. Det. R.M. Emberson”; Broun Collection, BMNH.

Paralectotype female, here designated; labelled “2661” [Broun species number]; Broun accession label; “Te Aroha” [Broun’s hand]; “Dichrochile cordicolle” [Broun’s hand]; “PARALECTOTYPE *Dichrochile cordicolle* Broun, 1903, female. Det. R.M. Emberson”; Broun Collection, BMNH.

There are two additional paralectotypes here designated; labelled “Te Aroha, N.Z.”; “J.J.W[alker], .5.1902”; both labelled “PARALECTOTYPE *Dichrochile cordicolle* Broun, 1903. Det. R.M. Emberson”; Champion Collection, BMNH.

Notes on type material: The lectotype is designated in order to fix the taxonomic concept of *Dichrochile cordicolle* Broun. Broun (1903) does not indicate how many specimens he had, but records J.J. Walker as the collector of his material. The lectotype and paralectotype in the Broun Collection are both card mounted.

Material examined: Type material plus 205 non-type examples (107 males, 92 females; BMNH, CMNZ, JNNZ, JTNZ, LUNZ, MONZ, NZAC).

Distribution: Widely distributed in the North Island and northern South Island. North Island: ND, AK, CL, WO, BP, TO, GB, TK, WI, WN, WA, South Island: NN, SD, BR: northernmost record, Mangamuka (ND), southernmost record, Westport (BR). Absence of records from RI and HB is probably an artefact due to lack of collecting in suitable habitats.

Seasonal occurrence: Jul (4), Aug (2), Sep (4), Oct (3), Nov (12), Dec (7), Jan (10), Feb (18), Mar (6), Apr (2), May (4), Jun (1). *S. cordicollis* has been collected in every month of the year, but with a strong peak in February, suggesting summer emergence. A teneral specimen collected in January is consistent with this timing of emergence.

Habitat: Collected in a wide variety of open and forest habitats at low elevations, usually under rocks, logs or debris, very often in wet situations such as: lakeshores, riverbanks, beaches, mudflats, seepages, and flood debris. *Stomatocoelus cordicollis* has also been collected by treading swampy vegetation. May (1963) collected *S. cordicollis* 600 m inside a cave at Matira, (WO), and Townsend (1994) recorded finding this species in some numbers on ocean beaches under driftline debris between the Otaki and Manawatu rivers after floods.

Remarks: Individuals of *S. cordicollis* are very similar to those of *S. aterrimus*, but most are noticeably larger. The only reliable external character to distinguish the two species is the more cordate, tapered shape of the pronotum in *S. cordicollis*, usually with a slight sinuation in front of the hind angles. There is evidence of some clinal variation in the species, with larger specimens generally found in the northern part of its range.

Of all the New Zealand species of Dicrochilina, *S. cordicollis* is the most similar in appearance to some of the Australian species. This similarity is particularly evident to *S. brevicollis* (Chaudoir) from Tasmania, Victoria, ACT, and New South Wales, and *S. minuta* (Laporte de Castelnau) from Victoria, ACT, and New South Wales, with which *S. cordicollis* shares a large number of characters. These characters are mostly interpreted as symplesiomorphies, including: overall glossy black colouration; general body shape; pronotum (Fig. 6) somewhat cordate with 2 pairs of lateral setae; pronotal basal impressions wrinkled; elytra convex with convex intervals and well impressed interneurs; 3rd elytral intervals with 2 setae; junction of the lateral and anterior margins of the elytra rounded; penultimate labial palpomeres with 4 setae on their anterior margins; dorsal surface with moderately developed, isodiametric microsculpture.

Genus *Dicrochile* Guérin-Ménéville

Dicrochile Guérin-Ménéville, 1847a²: ciii. Type species: *Dicrochile anchomenoides* Guérin-Ménéville, 1847, by subsequent designation of Larochelle & Larivière, 2001: 114, New Zealand.

Dicronochilus: Guérin-Ménéville, 1847b: 428, (incorrect subsequent spelling), also used by Chaudoir (1852).

- In spite of the usually quoted publication date of 1846 for the genus *Dicrochile* (Moore *et al.* 1987, Larochelle & Larivière 2001, 2007, Bouchard *et al.* 2011) there is no doubt that this name was first validly published in March 1847. The description appears in the ‘Bulletin’ part of the *Annales de la Société entomologique de France*, in the fourth number of volume 4, which records the proceedings of meetings from 14 October to 23 December 1846. The wrapper on this part bears the date 25 March 1847, which must be taken as the publication date, in the absence of any evidence to the contrary.

Dicrochile: Lacordaire, 1854, (incorrect subsequent spelling), also used by Broun 1880 *et seq.*, Hudson (1934), Britton (1941).

Diagnosis. Medium-sized, mostly gracile, flattened licinines, 9–17.5 mm in length, with relatively long legs. Integument black, dorsal surface with strong isodiametric microsculpture. Hindwings vestigial.

Description. Labrum with deep V or U-shaped notch, which does not completely divide the labrum; with 6 labral setae, 2 on each lobe and a basal median pair; clypeus with a distinct pale, unsclerotised median area and a pair of antero-lateral setae; frons depressed, flat to slightly concave with 2 pairs of supraorbital setae. Eyes well-developed, round and almost hemispherical. Antennae with 3 basal antennomeres lacking pubescence. Mandibles relatively short and blunt tipped, with short terebrae and no retinacula; ventral surface with the diagonal ventral groove densely packed with long microtrichia. Terminal palpomeres more or less cylindrical, narrowly truncate distally, lacking pubescence, or with very short pubescence; penultimate labial palpomeres with 4 setae on anterior margins. Mentum with a pair of medial setae and shallow mental pits. Pronotum more or less cordate with a shallow median groove and 2 pairs of lateral setae; lateral margins explanate. Elytra flattened, with strong isodiametric microsculpture; with 2 setae on 3rd elytral interval, scutellar striole and seta present; junction of the anterior and lateral elytral margins angulate; elytra more or less fused together; hind wings vestigial. Tarsomeres 5 with rows of 4–5 setae ventrolaterally. Female basal protarsomeres elongate; male protarsi with 3 basal tarsomeres asymmetrically expanded and with adhesive vestiture beneath; adhesive setae arranged in 4 rows on tarsomeres 1 and 2, and 2 rows on tarsomeres 3.

Gonocoxites (Fig. 25, 26) similar to those of other species of *Dicrochilina*, particularly to those of *Stomatocoelus*, with which they share apical lateral flanges on *gc2*, but gonocoxite 2 more elongate and gonocoxite 1 with more than 3 anterior lateral setae in some specimens.

Distribution: *Dicrochile* in this new sense is a New Zealand and Norfolk Island genus; in New Zealand it is restricted to the eastern side of the South Island and the southeast corner of the North Island.

Remarks: Guérin-Méneville (1847a) gives the derivation of the name *Dicrochile* from two Greek words *δύχρως*—fuscous or sombre coloured and *χλίς*—lip or labrum, probably referring to the depigmented clypeus, which is readily apparent, even to the naked eye. The usual transliteration of *χ* is *ch*, so '*Dichrochile*', the version of the name used by Lacordaire (1854), Broun (1880 *et seq.*), Hudson (1934), Britton (1941), Johns (1986), Johns *et al.* (1980) and others, would be classically more correct, but this was not the spelling originally used by Guérin-Méneville (1847a).

In establishing the genus *Dicrochile*, Guérin-Méneville (1847a) included two nominal species, which he named. It has been disputed as to whether these species were merely named or described. Bates (1874, 1875) and other subsequent authors, including Moore (1985) and Moore *et al.* (1987), have assumed that the species remain undescribed and that reporting that one was larger than the other did not amount to a description, definition or indication in terms of Article 12.1 of the International Code of Zoological Nomenclature. Therefore, Moore (1985) designated *Rhembus goryi* Boisduval as type species of the genus, as it was, in his opinion, the first validly described species subsequently included in the genus (Chaudoir 1852) (Article 69(a).2). However, Larochelle & Larivière (2001) argued that Guérin-Méneville (1847a), in reporting that one species was larger than the other, effectively provided a taxonomic character that meets the requirements of Article 12.1 for a description of both species and designated *D. anchomenoides* Guérin-Méneville as type of the genus.

The unique female holotype of *D. idae* Moore, 1985, from Norfolk Island, now in the BMNH collection, has been examined and found to share the distinctive features of *Dicrochile* with the two New Zealand species, though it is considerably larger (17.5 mm versus 9–11.5 mm in length) and more robust.

***Dicrochile atrata* (Blanchard, 1842)**

Fig. 7, 25, 35, 48. Map p. 68

Anchomenus atratus Blanchard (1842)³: Coléoptères pl. 1, fig. 15

Anchomenus deplanatus White, 1846: 3, primary junior homonym of *Anchomenus deplanatus* Chaudoir, 1843

Dicrochile anchomenoides Guérin-Méneville, 1847a: ciii, **new synonymy**

Dicrochile subopaca Bates, 1874: 237, **new synonymy**

Agonum (Platynus) whitei Csiki, 1931: 854, replacement name for *Anchomenus deplanatus* White, 1846, **new synonymy**

3. Tentative latest dates of publication of the individual plates in the *Atlas Zoologie* of Dumont D'Urville's *Voyage au Pol Sud* were established by Emberson (1992).

Dicrochile atrata, Johns 1986: 30

Diagnosis. Black with very flattened, matt elytra, elytral intervals flat; appendages dark with paler tarsi and tips of terminal palpomeres. Length 9.8–11.5 mm.

Head: Dorsal microsculpture isodiametric; labrum deeply and more or less symmetrically U-shaped notched, with 2 setae on each lobe and a medial pair; frons obliquely wrinkled laterally, with median elevation. Maxillae with pale lacinia and galea; maxillary palp pale and glabrous. Terminal labial palpomeres with very short, sparse pubescence; penultimate labial palpomeres with (3) 4 setae on anterior margins; labial mentum with a pair of setae and shallow pits.

Thorax: Pronotum (Fig. 7) cordate (median length to maximum width 1: 1.26–1.42; hind margin width to maximum width 1: 1.29–1.42); anterior angles produced; lateral margins broadly explanate and reflexed, straight or slightly sinuate in front of rounded hind angles; hind margin gently concave medially, often with strong longitudinal grooves medially; anterior margin sometimes with short longitudinal, medial grooves; microsculpture distinct, more or less isodiametric. Microsculpture of scutellum and elytra isodiametric, exceptionally strong, causing the distinctive matt appearance of the species. Elytra broadly oval, strongly flattened, only gently downturned outside interneur 7, margins somewhat reflexed; inteneurs regularly but shallowly impressed, striate; discal intervals essentially flat, interval 3 with 2 setae adjacent to interneur 2; junction of lateral and anterior margins distinctly angulate; apices flat, posterior lateral margins strongly sinuate. Legs dark brown to black, tarsi paler brown, basal and antibasal meso- and metatarsomeres grooved laterally; tarsomeres 5 with rows of 4–5 setae ventrolaterally; female basal protarsomeres more than twice as long as broad, as long as tarsomeres 2 and 3 together; male protarsomeres asymmetrically expanded, with adhesive setae ventrally.

Abdomen and genitalia: Abdominal ventrites black with isodiametric to slightly transverse microsculpture; posterior margin of ventrite 6 with extra setae, in addition to the usual one or two pairs of ambulatory setae, in some individuals.

Gonocoxites (Fig. 25), *gc1* often with 4, 5 or more *las* setae, *gc2* less conical than most other species, apically extended beyond *les* setae.

Aedeagus (Fig. 35). The internal sac includes a distinct area of sclerotisation.

Type material: *Anchomenus atratus*: lectotype female, here designated; labelled “707” [lilac disc] “41” [on reverse side]; “anchomenus atratus B1” [Blanchard’s hand]; “TYPE” [printed]; “MUSEUM PARIS NOUV.-ZÉLANDE AKAROA JAQUINOT 1841” [printed, with Akaroa crossed out in pencil]; “LECTOTYPE *Anchomenus atratus* Blanchard, 1842, female. Det. R.M. Emberson”.

Paralectotype female, here designated; labelled “7475” [lilac disc] “41” [on reverse side]; “MUSEUM PARIS NOUV.-ZÉLANDE TAVAI POUNAMOU HOMBROU 1841” [printed]; “PARALECTOTYPE *Anchomenus atratus* Blanchard, 1842, female. Det. R.M. Emberson”. Both lectotype and paralectotype are in a *Voyage au Pol Sud* box, MNHN.

Anchomenus deplanatus: lectotype female, here designated; labelled “Type HT” [red rimmed disc]; “New Zealand” [White’s hand] “71.18” [on reverse side]; “Anchomenus deplanatus Zool. Erebus & Terror” [White’s hand]; “deplanatus White N.Z.” [green label, unknown hand]; “LECTOTYPE *Anchomenus deplanatus* White, 1846, female. Det. R.M. Emberson”; general collection, BMNH.

Dicrochile anchomenoides: lectotype female, here designated; labelled “Dicrochyle anchomenoides guer Nouv, Zel.” [Guérin-Ménéville’s hand]; “Ex museo Guer- Menev.” [printed]; “LECTOTYPE *Dicrochile anchomenoides* Guérin-Ménéville, 1847, female. Det. R.M. Emberson”; MNHN.

Dicrochile subopaca: lectotype female, here designated; labelled “Christchurch N. Zeal.” [Bates’ hand]; “Anchomenus atratus Blan see Chaudoir” [Bates’ hand]; “LECTOTYPE *Dicrochile subopaca* Bates, 1874, female. Det. R.M. Emberson”; Bates’ Collection, MNHN.

Paralectotypes 7, labelled as follows; 2♂♂, 1♀ “Christchurch” [Bates’ hand]; 1♀ “Canterbury N.Z.” [Bates’ hand]; 1♂, 1♀ “New Zeal. Canterby” [Bates’ hand]; 1♂ “N.Zealand” [Bates’ hand]; “Dicrochile subopaca Bates” [Bates’ hand]; “Lectotype” [red paper]. All labelled “PARALECTOTYPE *Dicrochile subopaca* Bates, 1874. Det. R.M. Emberson”; all are in the Bates’ Collection, MNHN.

Notes on type material: *Anchomenus atratus*: The lectotype is designated in order to fix the taxonomic concept of *Anchomenus atratus* Blanchard, 1842 because there are at least two syntypes that may have come from different locations. The lectotype is much repaired; the head and thorax have been glued to the rest of the body, there is glue round the pin; the right fore leg is missing beyond the femur, as is the right antenna beyond

antennomere 4. Interestingly, Akaroa has been crossed out in pencil on the locality label and the locality mentioned on the published plate (Coléoptères pl. 1, fig. 15) is just given as “Nelle Zélande”, whereas the description (Blanchard 1853: 21) specifically mentions Akaroa. This suggests some uncertainty on Blanchard’s part as to the precise locality, but the specimen is similar to those collected around Akaroa today and does not match *Dicrochile* species from other localities in New Zealand where the *Voyage au Pol Sud* expedition is known to have called (Dunmore 2007). The paralectotype, which is very similar in appearance to the lectotype, was apparently collected by Jacques-Bernard Hombron rather than Honoré Jaquinot, the two naturalists on the expedition. It does not have a precise locality, but includes the words “Tavai Pounamou” on the printed label, an early rendering of the official Maori name for the South Island of New Zealand, Te Waipounamu.

Anchomenus deplanatus: The lectotype is designated in order to fix the taxonomic concept of *Anchomenus deplanatus* White, 1846 as it is uncertain how many specimens White had before him. The number “71.18” on the reverse side of the locality label is the accession number, in the Natural History Museum register of accessions, for Parry’s material that was described in the *Erebus and Terror* Zoology volume by White (1846). The lectotype is in very poor condition, lacking half the antennae, the left distal protarsomere, the right mesotarsomeres and all metatarsomeres. It was originally pinned through the left elytron but has been repinned through the right elytron. The head is attached but loose.

Dicrochile anchomenoides: The lectotype is designated in order to fix the taxonomic concept of *Dicrochile anchomenoides* Guérin-Méneville, 1847 as it is uncertain how many specimens Guérin-Méneville had before him and his known 1847 *Dicrochile* material is clearly incomplete. The specimen is very dirty and covered with fungal hyphae, it lacks the left antenna beyond antennomere 9 and the right antenna beyond antennomere 2. The lectotype is without locality information, but the species was said to have been collected in New Zealand by M. Fabre, a ship’s surgeon (Guérin-Méneville 1847a). It is a specimen of *D. atrata* as here understood and was likely to have been collected on Banks Peninsula, probably in Akaroa Harbour, a regular port of call for French ships at the time⁴.

Dicrochile subopaca: The lectotype is designated in order to fix the taxonomic concept of *Dicrochile subopaca* Bates, 1874 as the original syntypic series of this species is mixed, six specimens are *D. atrata* (Blanchard), as here understood, and two are *D. thoracica* Broun. These later are the male labelled “New Zeal. Canterbury” and the specimen labelled “N.Zealand”, “*Dicrochile subopaca* Bates”. The lectotype label on this last specimen was added by P.M. Johns on 27.ix.1978, but the designation was never published and so is invalid. *Dicrochile thoracica* is not known to occur in the immediate vicinity of Christchurch, the published type locality of *D. subopaca*, whereas the specimens identified here as *D. atrata* fit the description of Bates (1874: 237) “*elytris alutaceis, subopacis*” better than those of *D. thoracica*. This elytral character is also cited in the English commentary as being one of the main distinguishing features of Bates’ species. The specimen designated here as the lectotype meets this requirement and also carries Bates’ label recognising the synonymy with *D. atrata*, as apparently suggested by Chaudoir.

Material examined: Type material plus 114 non-type examples (52 males, 61 females, 1 indeterminate; AMNZ, BMNH, CMNZ, JNNZ, JTNZ, LUNZ, MNHN, NZAC, PHNZ).

Distribution: KA, NC, MC, SC/MK; northernmost record, Kaikoura; southernmost record, Brooklands, Lee River outlet. *Dicrochile atrata* appears to be a largely coastal species restricted to the Kaikoura Coast, coastal North and Mid Canterbury, throughout Banks Peninsula and along the coast southwest of the peninsula almost to the mouth of the Rakaia River. The closely related, more widespread *D. thoracica* is common in remnant native woodland on Great Island at the mouth of the Rakaia only 10 km further west.

There are two outlying locality records. One is of 8 specimens (3 males, 5 females) in CMNZ, collected on four separate occasions over a period of 14 years at Mackenzie Pass (SC/MK) by P.M. Johns. It is hard to discount this record because of the repeated nature of the collecting, though other material from South Canterbury is clearly *D. thoracica*. The other record is of three female specimens (in AMNZ), purportedly collected near Oban on Stewart Island, about 450 km southwest of the main concentration of the species. No other material of any species of *Dicrochile*, or other species of Licinini, is known to me from Stewart Island. In the absence of additional material, I am inclined to reject this record as being due to faulty labelling.

4. Monsieur Charles Fabre was an assistant ships surgeon on a French warship, the corvette *Le Rhin*, which spent about two years on station in Akaroa Harbour, between January 1843 and April 1846, in support of the French colonists based there (Tremewan 1990).

Seasonal occurrence: Jul (2), Sep (2), Oct (2), Nov (12), Dec (2), Jan (2), Feb (2), Mar (1), Apr (2), May (2), Jun (1). There are scattered records throughout the year with a peak of activity in November. Four teneral specimens were noted in March, April, May and July.

Habitat: On Banks Peninsula, *Dicrochile atrata* is most often collected in podocarp forest remnants and shrub communities, often under logs or rocks, but in North Canterbury and on the Kaikoura Coast it tends to be in more open, mainly coastal communities. It is commonly found in gardens on Christchurch's Port Hills. It has been collected almost on the beach on Kaitorete Spit and around Kaikoura and up to 400 m at Coopers Knob on Banks Peninsula and around 700 m near Mackenzie Pass.

Variation: There is unusual variation in the number of setae on the hind margin of ventrite 6, in both males and females. This is most marked in individuals from the Kaikoura Coast (KA), where males, instead of the usual single pair of setae, commonly have an extra seta unilaterally, or sometimes bilaterally, and occasionally up to three pairs of setae. Females from this area often have three pairs of setae in this position instead of the usual two pairs.

Remarks: Laroche & Larivière (2001) rejected the name *Anchomenus atratus* Blanchard on the grounds that it is a secondary homonym of *Carabus atratus* Duftschmidt, 1812, which is now generally regarded as a species of *Agonum* Bonelli or *Anchomenus* Bonelli. However, the name *Anchomenus atratus* Blanchard was not definitively replaced before 1961, as a secondary homonym and the specific epithet thus remains available, if the species is now placed in a different genus i.e. *Dicrochile* not *Anchomenus* (ICZN Article 59.2, 4).

Dicrochile atrata is most similar to *D. thoracica*, which is found on the Canterbury plains and foothills, and more widely in the eastern South Island and the very south of the North Island, but its members are easily distinguished from those of the latter species by their flatter, more matt elytra with flat elytral intervals and shallowly impressed, but very distinct, interneurs. There is some evidence of introgression with *D. thoracica* in coastal Marlborough, north of Kaikoura where the elytral intervals gradually become more convex in populations further north.

***Dicrochile thoracica* Broun, 1908**

Fig. 8, 26, 36, 49. Map p. 68

Dicrochile thoracica Broun, 1908: 345

Diagnosis. Black, very similar to *D. atrata*, but elytra narrower and moderately convex with convex elytral intervals, elytral microsculpture less pronounced, appendages dark brown to black with paler tarsi and distal palpomeres. Length 9.4–11.0 mm.

Head: Dorsal microsculpture weak, more or less isodiametric; labrum deeply and more or less symmetrically U-shaped notched, with 2 setae on each finger-like lobe and a medial pair towards base of notch; frons generally lacking obvious oblique wrinkles laterally. Terminal labial palpomeres with very short, sparse pubescence; penultimate labial palpomeres with 4 setae on anterior margins; labial mentum with a pair of setae and shallow pits.

Thorax: Pronotum (Fig. 8) cordate (median length to maximum width 1: 1.33–1.42; hind margin width to maximum width 1: 1.28–1.43); anterior margin distinctly emarginate with faint longitudinal grooves medially, anterior angles produced; lateral margins more or less explanate and reflexed, straight or slightly sinuate in front of rounded hind angles; posterior margin gently concave with longitudinal grooves medially; median groove well developed with adjacent faint transverse wrinkles; microsculpture distinct, particularly laterally, slightly transverse. Microsculpture of scutellum and elytra strong, isodiametric. Elytra oval, noticeably downturned outside interneur 5, margins slightly reflexed; interneurs strongly impressed, striate; intervals convex, interval 3 with 2 setae adjoining interneur 2; junction of lateral and anterior margins distinctly angulate; posterior lateral margins sinuate. Legs dark brown to black, tarsi paler brown; basal and antibasal meso- and metatarsomeres grooved laterally; tarsomeres 5 with rows of 4–5 setae ventrolaterally; female basal protarsomeres more than twice as long as broad, as long as tarsomeres 2 and 3 together; male protarsomeres asymmetrically expanded, with adhesive setae ventrally.

Abdomen and genitalia: Abdominal ventrites dark brown to black, often paler medially; microsculpture isodiametric to slightly transverse.

Gonocoxites (Fig. 26), *gc1* with 3 *las* setae in material examined, *gc2* more conical and less extended beyond *les* than in *D. atrata*.

Aedeagus (Fig. 36) very similar to that of *D. atrata*, but a sclerite on the internal sac was not seen in the material examined.

Type material: *Dicrochile thoracica*: Holotype female; labelled "Type" [red rimmed disc]; "2662" [Broun species number]; Broun accession label; "Broken River" [Broun's hand]; "Dichrochile thoracica" [Broun's hand]; "HOLOTYPE *Dicrochile thoracica* Broun, 1908, female. Det. R.M. Emberson"; Broun Collection, BMNH.

Notes on type material: The holotype is mounted on card and lacks the 3 distal tarsomeres of the right protarsus.

Material examined: Type specimen, plus 106 non-type examples (52 males, 57 females; AMNZ, BMNH, CMNZ, LUNZ, MNHN, MONZ, NZAC).

Distribution: Widely distributed on the eastern side of the South Island and the very south of the North Island. North Island: WN, South Island: SD, MB, KA, NC, WD, MC, SC, OL; northernmost record, Silverstream (WN); southernmost record, Staircase Southern Alps (OL). It is replaced by *D. atrata* in coastal areas of the eastern part of the South Island from Kaikoura (KA) south almost to the Rakaia river mouth (MC).

Seasonal occurrence: Aug (2), Sep (2), Oct (4), Nov (7), Dec (8), Jan (2), Feb (2), Mar (13), Apr (4). Found throughout the year, except for the winter months of May, June and July with a peak in November and December. One teneral specimen was noted, found in January. The large peak in March is probably an artifact of collecting. The former Entomology Department at Lincoln University, as part of its teaching programme, used to run multiple, annual student insect collecting trips in March and occasionally into April. On these occasions, there would be thirty or more student collectors at a time hunting for anything that moved. Some of the material collected on those trips has been accessioned into LUNZ. Most of the March records relate to specimens collected on those trips.

Habitat: *Dicrochile thoracica* occurs from sealevel to at least 1676 m on the Rainbow/Wairau divide in the Marlborough Mountains. It is found in a wide variety of habitats, from the high tide mark on ocean beaches, through open grassy areas in the lowlands and under logs in coastal forest, *Nothofagus* forest and pine plantations to subalpine tussock grasslands. It appears to be more tolerant of lower humidity environments than many other New Zealand licinine species.

***Dicrochile* species incertae sedis**

Dicrochile fabrii Guérin-Ménéville, 1847a: ciii

This species was simply described by Guérin-Ménéville (1847a) as being larger than *D. anchomenoides*. It was said to have been collected by M. Fabre, a ship's surgeon, in New Zealand (Guérin-Ménéville 1847a) (see notes on M. Fabre in the discussion of the type material of *D. anchomenoides* and its probable collection locality). No material of the species was found in the box with the *D. anchomenoides* specimen and no named material of the species was found elsewhere in the MNHN collection. In the absence of Guérin-Ménéville's type material, any defining characteristics, or certain collection locality, it is impossible to know to which species this name refers.

Genus *Pedalopia* Laporte de Castelnau, reinstated

Pedalopia Laporte de Castelnau, 1867: 68. Type species: *Pedalopia novaezelandiae* Laporte de Castelnau, 1867, by monotypy, New Zealand.

Diagnosis. Small sized (6.5–11 mm in length) relatively compact licinines with short legs and usually varying amounts of depigmentation.

Description. Labrum with deep symmetric or asymmetric V or U-shaped notch, which does not completely divide the labrum; with 6 labral setae, 2 on each lobe and a basal median pair; frons depressed and flat, usually with two pairs of supraorbital setae, but anterior supraorbitals sometimes absent, or very occasionally (fragmentary specimen from Nile River Cave, BR) posterior supraorbitals absent. Eyes usually reduced in size or convexity. In most species, antennae with 3 basal antennomeres lacking pubescence, but sometimes with only 2, or occasionally only 1 antennomere lacking pubescence. Mandibles relatively short and blunt, with short terebrae and no retinacula. Terminal palpomeres more or less cylindrical, narrowly truncate distally, either lacking pubescence, or with very short pubescence; penultimate labial palpomeres varied with 2–7 setae on anterior margins. Mentum generally with a pair of medial setae and shallow mental pits, but mental setae occasionally absent and mental pits also absent in some species. Pronotum highly varied in shape, both between species and sometimes within species; often strongly rounded posteriolaterally; median groove always present; posterior pronotal setae always absent. Elytra with 1–5 setae on the 3rd elytral intervals, setae in pale foveae in some species; elytra usually convex and

more or less fused together; hind wings vestigial. Sexual dimorphism of protarsi reduced or absent in some species, but when present, 3 basal protarsomeres of males asymmetrically expanded with adhesive setae beneath.

Gonocoxites similar to those of other Dicrochilina, but lacking lateral flange apically on *gc2*, occasionally with individual variation in the numbers of ensiform setae, and generally with 3 *las* setae on *gc1*, but anterior lateral part of *gc1* unsclerotised and these setae entirely absent from *P. maura* and *P. cephalotes*.

Aedeagi small and lightly sclerotized with sclerotized tip beyond dorsal opening short; some species with 1 or 2 major setae of varied length and several minute setae, apically on one or both parameres, or microscopic setae on the ventral surfaces.

Distribution: *Pedalopia* is a New Zealand endemic genus found more or less throughout both the North Island and the South Island.

Remarks: One of the challenges presented by this genus has been the paucity of material of several of the species recognised, which hindered or prevented detailed study of internal structures. Five species are known from 7 or fewer specimens, for these and other eastern South Island species, no attempt was made to extract the genitalia as, with one or two exceptions, the general morphology of the gonocoxites and aedeagi were found to provide few diagnostic characters.

Members of some species, most notably *P. cephalotes* (Broun) and to a lesser extent, *P. maura* (Broun), exhibit marked allometric sexual dimorphism of the head and prothorax, in which larger females have disproportionately large heads and wider pronota, which helps explain the wide variation seen in the size and shape of the pronotum in this genus.

Pedalopia represents a marked departure from the rest of the Dicrochilina. Some members of the group also exhibit characters that are unusual in the Licinini as a whole, for instance, varied depigmentation among its members, loss of the anterior supraorbital setae, loss of the mental setae, loss of the mental pits, loss of protarsal sexual dimorphism in some species, reduction in size of the eyes, variation in number of glabrous basal antennomeres and wide variation in number of setae on the 3rd elytral interval. Another very unusual feature of at least three members of the genus is the possession of varying numbers of setae on one or both parameres. Generally, in the Licinini and the wider Harpalinae the parameres are glabrous. Members of two other species have lost the *las* setae on *gc1*, which are generally consistent across many harpaline tribes.

This plasticity of *Pedalopia*, mostly involving losses from the general dicrochiline body plan, suggests adaptation to a significantly different way of life. Species of *Pedalopia* are often found in forest leaf litter, or under logs and rocks and have occasionally been found in caves, which may indicate that they have become specialised for living in deep leaf litter and other high humidity habitats protected from wide environmental fluctuations. Specimens of some of these species, particularly *P. cephalotes* (Broun) and *P. flavipes* (Broun), can be regularly found climbing tree trunks at night, so clearly they are not obligate inhabitants of deep leaf litter.

***Pedalopia maura* (Broun, 1880), new combination**

Fig. 9, 10, 11, 27, 37, 50. Map p. 68

Dichrochile maura Broun, 1880: 18

Dichrochile anthracina Broun, 1893: 161, **new synonymy**

Diagnosis. Glossy black or dark brown, some individuals with paler elytra. Pronotum usually strongly rounded posteriorly. Sexually dimorphic in size and head shape. Length: males 7.6–8.6, females 8.0–10.2 mm.

Head: Slightly sexually dimorphic, with a tendency to be proportionally wider in females than in males (head width to pronotum width, females 1: 1.24–1.50, males 1: 1.36–1.54); dark brown to black, antennae and mouthparts, except mandibles, paler; dorsal microsculpture strong, isodiametric. Labrum asymmetrically notched, left lobe distinctly larger than right, with 6 setae, 2 on each lobe and a median pair. Frons flat, with 2 pairs of supraorbital setae. Antennae with 3 basal antennomeres lacking dense pubescence. Penultimate labial palpomeres with 4–7 setae on anterior margins. Mentum with a pair of setae, but mental pits barely discernable.

Thorax: Pronotum (Fig. 9, 10, 11) dark brown to black; highly varied in shape, suborbicular to distinctly cordate; in females, generally progressively more cordate with increasing size (median length to maximum width 1: 1.48–1.71); pronotal margins convexly rounded or more or less straight in front of rounded hind angles, hind margin emarginate; posterior marginal bead absent medially; median groove almost reaching hind margin; sometimes with faint wrinkles medially; often with small punctures between lineal basal impressions and outer

margins. Microsculpture of pronotum, and scutellum isodiametric, that of elytra strongly transverse. Elytra of some individuals distinctly paler than head and pronotum or with paler margins, but usually dark brown to black; interneurs deeply impressed, more or less regular to elytral apex, striate; intervals strongly convex, occasionally fusing irregularly near posterior margin; 3rd interval with 2 setae; junction of anterior and lateral margins distinctly angulate. Legs somewhat paler than body, at least tarsi pale; male protarsi with basal 3 tarsomeres asymmetrically expanded, tarsomeres 1 and 2 with 4 rows of adhesive setae, tarsomeres 3 with 2 rows; basal protarsomeres of female more than twice as long as broad; tarsomeres 5 with rows of 3–4 setae ventrolaterally; basal metatarsomeres laterally grooved externally, grooves almost completely lacking internally.

Abdomen and genitalia: Abdominal ventrites evenly dark brown to black, glossy, with weak, irregular microsculpture.

Gonocoxites (Fig. 27), anterior lateral part of *gcl* unsclerotised and lacking *las* setae.

Aedeagus (Fig. 37). The everted internal sac has two obvious sclerites, a basal one which appears to articulate with the right apical sclerotized strip of the aedeagus and a more complex, folded median sclerite, together with a lightly sclerotized scaly area.

Type material: *Dichrochile maura*: Holotype female; labelled “40” [Broun species number]; “Type” [red rimmed disc]; “Parua” [Broun’s hand]; Broun accession label; “Dichrochile maura” [Broun’s hand]; “HOLOTYPE *Dichrochile maura* Broun, 1880, female. Det. R.M. Emberson”; Broun Collection, BMNH.

Dichrochile anthracina: Lectotype female, here designated; labelled “Type” [red rimmed disc]; “♀”; “2659 ♀” [Broun species number]; “Ligur’s Bush, Papakura” [Broun’s hand]; “Dichrochile anthracina” [Broun’s hand]; “LECTOTYPE *Dichrochile anthracina* Broun, 1893, female. Det. R.M. Emberson”; Broun Collection, BMNH.

Notes on type material: *Dichrochile maura*: The holotype lacks the right antenna beyond antennomere 3.

Dichrochile anthracina: The lectotype is designated in order to fix the taxonomic concept of *Dichrochile anthracina* Broun, 1893, as it is uncertain how many specimens Broun had before him.

Material examined: Type specimens plus 117 non-type examples (61 males, 56 females, 2 indeterminate; AMNH, BMNH, CMNZ, JNNZ, JTNZ, LUNZ, MONZ, NZAC).

Distribution: Widely distributed in the northern half of the North Island: ND, AK, CL, BP, (TO), GB, HB; northernmost record, Mangamuka Summit (ND), southernmost record, Tangoio (HB).

The record from TO is of fragments of this species from the Pureora Buried Forest and suggests the species may have been more widespread in the past.

Seasonal occurrence: Jul (1), Aug (1), Sep (9), Oct (8), Nov (13), Dec (12), Jan (14), Feb (13), Mar (5), Apr (1), May (2), Jun (1). Specimens have been collected in every month of the year, but with a peak in spring and summer from September to February.

Habitat: Most records, where habitat information is given, are from pitfall traps in forest leaf litter, or under logs and rocks. The species occurs from sea level to over 1,100 m on Mts Hikurangi and Arowhena (GB). There is some evidence that the species tolerates modified habitats better than others of the genus; it has been collected under pine logs in Cornwallis Park, in Auckland City, and on sand dunes developed for pasture at Waiuku (AK).

Variation: As noted in the description, the shape of the pronotum is highly varied from suborbicular to distinctly cordate, even within a population. This variation is particularly evident in females where larger individuals tend to have broader and more cordate pronota. The female holotype of *maura* has a suborbicular pronotum whereas the pronotum of the female lectotype of *anthracina* is more cordate. The two forms have often been recognised as separate species, but there are many intermediates and the difference in pronotal shape does not correlate with any other morphological variation. Also, there is no discernable geographic pattern for the variation.

Remarks: The deeply impressed interneurs and transverse elytral microsculpture make this a very distinctive species, the asymmetrically notched labrum and rounded posterior margin to the pronotum, help distinguish members of this species from all others. It appears to be most closely related to *P. cephalotes* as discussed under that species, but a case could be made for a relationship with *P. insignis* on the basis of the dark pigmentation and transverse elytral microsculpture of members of the two species. The first of these characters, is almost certainly plesiomorphic and so a poor indicator of relationships.

***Pedalopia cephalotes* (Broun, 1894), new combination**

Fig. 12, 13, 28, 38, 51. Map p. 68

Dichrochile cephalotes Broun, 1894: 306

Diagnosis. Dark brown, elytra often paler than head and pronotum. Sexually dimorphic in size and head shape, females usually larger than males and with relatively broader heads. Length: males 7.4–9.0 mm, females 8.2–10.0 mm.

Head: Sexually dimorphic, proportionally wider in females than males (head width: pronotum width, females 1: 1.20–1.27, males 1: 1.26–1.38); dark brown, antennae and mouthparts, except mandibles, paler; dorsal microsculpture strong, isodiametric. Eyes reduced. Labrum asymmetrically notched, left lobe larger than right, with 6 setae, 2 on each lobe and a median pair. Frons flat, with 2 pairs of supraorbital setae. Antennae with 3 basal antennomeres lacking dense pubescence. Penultimate labial palpomeres with 4–5 setae on anterior margins. Mentum with a pair of setae, but mental pits absent.

Thorax: Pronotum (Fig. 12, 13) flat, more or less cordate, relatively broader in females than males (median length to maximum width females 1: 1.50–1.70; males 1: 1.41–1.52); dark brown, often with paler lateral margins; pronotal margins in front of hind angles straight or slightly sinuate, hind angles rounded; anterior and posterior marginal beads obsolete medially; median groove almost reaching hind margin in most specimens; linear basal impressions well developed. Microsculpture of pronotum, scutellum and elytra strong, more or less isodiametric to slightly transverse; sculpticels on elytra often appearing to line up in short transverse rows. Elytra often distinctly paler than head and pronotum; interneurs well impressed, irregularly and variably striate, sometimes broken laterally or irregularly fused towards elytral apex; intervals flat to slightly convex; 3rd interval with 2 setae; junction of anterior and lateral margins strongly angulate. Legs paler than body; male protarsi asymmetrically expanded, tarsomeres 1 and 2 with 4 rows of adhesive setae, tarsomeres 3 with 2 rows; basal protarsomeres of female more than twice as long as broad; tarsomeres 5 with rows of 3–4 setae ventrolaterally; basal metatarsomeres laterally grooved externally, grooves almost completely lacking internally.

Abdomen and genitalia: Abdominal ventrites evenly dark brown, with strong isodiametric microsculpture.

Gonocoxites (Fig. 28), anterior lateral part of *gc1* unsclerotised and lacking *las* setae.

Aedeagus (Fig. 38).

Type material: *Dichrochile cephalotes*: Holotype female; labelled “Type” [red rimmed disc]; “2660” [Broun species number]; “Ngatira” [Broun’s hand]; Broun accession label; “*Dichrochile cephalotes*” [Broun’s hand]; “HOLOTYPE *Dichrochile cephalotes* Broun, 1894, female. Det. R.M. Emberson”; Broun Collection, BMNH.

Notes on type material: The holotype lacks the right antenna beyond antennomere 5.

Material examined: Type specimen plus 322 non-type examples (148 males, 172 females, 6 indeterminate; AMNZ, BMNH, CMNZ, JNNZ, JTNZ, LUNZ, MONZ, NZAC).

Distribution: Widely distributed in the North Island, but apparently absent from Northland. North Island: AK, CL, WO, BP, TO, GB, TK, RI, HB, WI, WN, WA; northernmost record, Waitakere Ra. (AK), southernmost record, Orongorongo Valley (WN).

Seasonal occurrence: Aug (2), Sep (5), Oct (11), Nov (9), Dec (22), Jan (11), Feb (11), Mar (7), Apr (1), May (3). Records are distributed almost throughout the year, but most records are in the spring and summer months from October to February, with a peak in December. A teneral specimen was collected in March.

Habitats: From near sea level to at least 1615 m on Mt Ruapehu (TO) and 1750 m in the Ruahine Range (RI), mostly in hilly areas. Usually found under logs, in all types of forest, often in damp places beside streams or in gullies, in litter and frequently in pitfall traps, but it has also been collected climbing tree trunks at night. At higher altitudes it seems to be associated with mossy vegetation, probably in scrub. One specimen was collected well inside a cave near Pio Pio (WO) (Britton 1960). Except in pitfall traps, the species is usually collected singly; only 5 out of 52 non-pitfall collections examined have included more than one individual and even in these, specimens have probably been found singly.

Remarks: The asymmetrically notched labrum, the more or less cordate pronotum, lack of distinct pale margins, flattened elytral intervals and isodiametric elytral microsculpture distinguish members of this species from those of all others. The species appears to be most closely related to *P. maura*, members of which share the asymmetric labrum, the elevated number of setae on the penultimate labial palpomere, the asymmetrically expanded male fore tarsi, and the unsclerotised anterior lateral part of *gc1*, which lacks the *las* setae. Individuals differ from those of *P. maura* in the distinctly cordate pronotal shape, generally paler colour, the strong

isodiametric microsculpture on the elytra (transverse in *P. maura*) and the almost flat discal elytral intervals (convex in *P. maura*).

The sexual dimorphism in head width is not entirely consistent, one female, from Shannon (WA), out of 12 measured had a head: pronotum width ratio of 1: 1.30. This is well within the male range. Perhaps significantly, it was one of the smallest females seen at 8.3 mm in length. There is a strong element of allometric growth in the relationship, with larger females having disproportionately larger heads.

Pedalopia maura and *P. cephalotes* are the most widespread *Pedalopia* species in the North Island. In general *P. maura* has a more northern and eastern distribution than *P. cephalotes*, which tends to be more southern and western, but with a couple of outlying records on the Coromandel Peninsula. The two species appear to meet along a belt stretching from Lake Waikaremoana (GB), where both have been collected, to Te Aroha (BP), the Kaimai Ranges (BP) and Auckland. Collection records, however, are insufficient to be sure the separation is real.

***Pedalopia orongorongo* new species**

Fig. 14, 52. Map p. 68

Diagnosis. Mid-brown, glossy; pronotum with indistinct, narrow paler margins. Length 9.5–9.7 mm (2 female specimens only).

Head: Relatively large (head width: maximum pronotum width 1: 1.23–1.33, 2 female specimens only); dorsal microsculpture well developed, isodiametric. Labrum reduced to a small fleshy lobe, partially divided by a more or less symmetrical V-shaped notch, 3 pairs of setae on anterior margin. Clypeal setae present or apparently absent. Frons with 1 pair of supraorbital setae, anterior supraorbitals absent. Antennae with 3 basal antennomeres lacking dense pubescence. Eyes strongly reduced, somewhat flattened. Mentum almost flat, lacking setae and pits; penultimate labial palpomeres with two setae on anterior margins. Terminal palpomeres and penultimate maxillary palpomeres with very short, fine pubescence.

Thorax: Pronotum (Fig. 14) short, strongly cordate, (median length to maximum width 1: 1.73–1.86; hind margin width to maximum width 1.23–1.33, 2 female specimens only); gently sinuate in front of rounded, obtuse hind angles; posterior lateral margins reflexed; marginal bead very narrow, absent medially both anteriorly and posteriorly; median groove reduced not reaching hind margin; basal fifth of pronotum depressed in one specimen, with short rounded basal impressions. Microsculpture of pronotum, scutellum and elytra more or less isodiametric to distinctly transverse. Elytra moderately convex, interneurs distinctly but not deeply impressed, slightly punctate-striate; intervals almost flat, 3rd elytral intervals with 1 or 2 short setae (right anterior setae missing in holotype), single or posterior setal bases attached to 2nd interneur; junction of anterior and lateral elytral margins strongly rounded. Legs paler than body; basal protarsomeres as long as tarsomeres 2 and 3 together; metatarsomeres grooved laterally; tarsomeres 5 with rows of 3 setae ventrolaterally.

Abdomen: Abdominal ventrites plain, dark, glossy; microsculpture isodiametric tending to slightly transverse laterally.

Type material: Holotype female; labelled “NZ–WN–Rimutaka For. Pk., Orongorongo Tk (west half), 9–13.iii.1997” [printed]; “200–300 m, Larivière/Larochelle, pitfall trap, mesic beech forest” [printed]; “HOLOTYPE *Pedalopia orongorongo* Emberson, female” [printed]; NZAC.

Paratype female; labelled “Wiltons Bush, Wellington, New Zealand, 10 Oct. 1942, G.V. Hudson, 1534b” [Hudson catalogue number]; “PARATYPE *Pedalopia orongorongo* Emberson, female”; Hudson Collection, MONZ.

Material examined: Holotype and paratype females only.

Distribution: Only known from Wiltons Bush, Wellington and the Orongorongo Valley, WN.

Seasonal occurrence: Oct (1), Mar (1). The paratype collected in October is teneral.

Habitat: Both known specimens were collected from lowland forest.

Remarks: *Pedalopia orongorongo* appears to be more closely related to *P. flavipes* than to the other *Pedalopia* species found in the North Island. In particular the two specimens share the general structure of the short, strongly cordate pronotum, the rounded junction of the anterior and lateral elytral margins and the loss of the anterior supraorbital setae with individuals of *P. flavipes*, characters not present in the other North Island species. These specimens differ from those of *P. flavipes* in the strongly reduced eyes, the absence of a well marked pale

margin to the pronotum and elytra, the absence of pale foveae on the 3rd elytral interval and the reduced number of setae on the 3rd elytral interval, one or two instead of two to five.

Owing to the paucity of material and the teneral nature of one of the specimens, the female genitalia were not dissected.

Both *P. orongorongo* and *P. cephalotes* have been collected from the Orongorongo Valley to the east of Wellington, one of only two or three instances where two species of the genus have been collected in the same locality.

Pedalopia orongorongo is named after its type locality. The specific epithet is to be regarded as a noun in apposition.

***Pedalopia flavipes* (Broun, 1917), new combination.**

Fig. 15, 29, 39, 42, 53.

Dichrochile flavipes Broun, 1917: 360.

Diagnosis. Glossy mid to dark brown, pronotum and elytra with pale yellowish brown lateral margins and, usually, pale foveae on 3rd elytral interval, exceptionally dorsal surface plain brown with a hint of yellow-brown on elytral shoulders. Length 6.6–8.6 mm.

Head: Dorsal microsculpture well developed, isodiametric. Labrum notched symmetrically or asymmetrically, left lobe usually a little larger than right; with 4 to 6 setae, 2 or 3 on each lobe. Frons flat, often with a shallow median impression; 1 pair of supraorbital setae, anterior pair absent. Antennae with basal 2 antennomeres lacking dense pubescence, antennomeres 3 either lacking pubescence, or with light pubescence in distal half. Eyes hardly reduced in size or convexity. Terminal palpomeres with fine, short, stubble-like pubescence only. Penultimate, labial palpomeres bearing 2, or exceptionally 3, setae on their anterior margins; mental setae and pits absent, but mentum with distinct impressions.

Thorax: Pronotum (Fig. 15) short and cordate, with narrow pale lateral borders; surface sculpturing individually varied; lateral margins slightly sinuate in front of rounded hind angles; hind margin distinctly emarginate; marginal bead absent medially on anterior and posterior margins; medial groove reduced not reaching hind margin; basal impressions short, rounded, sometimes deeply impressed anteriorly. Microsculpture of pronotum and scutellum isodiametric. Elytra convex, glossy, with pale yellowish brown margins; pale margins extending mesad as far as interneur 6 or 7; interneurs strongly impressed, striate; intervals convex; 3rd intervals with 2–5 setae adjoining 2nd interneurs, setae most often in pale foveae; junction of anterior and lateral margins rounded; microsculpture isodiametric or weakly transverse. Thoracic sternites pale, yellowish brown medially. Legs pale, yellowish brown; basal protarsomeres less than twice as long as wide; male protarsi not expanded laterally, similar in proportions to females, lacking ventral adhesive setae; tarsomeres 5 with rows of 2–5 fine setae ventrolaterally; basal metatarsomeres barely grooved laterally.

Abdomen and genitalia: Abdominal ventrites dark brown, with lateral pale yellowish brown margins, or at least abdominal ventrite 6 with pale markings laterally; microsculpture more or less isodiametric.

Gonocoxites (Fig. 29), *ans* setae not visible on specimen drawn.

As in so many other characters in *Pedalopia*, there is individual and bilateral variation in the number of setae on the gonocoxites. In the specimen of *P. flavipes* shown in Fig. 29, the right gonocoxite has 5 *las* setae, instead of the usual 3 as seen on the left gonocoxite, and 2 *des* setae, instead of the single seta on the left gonocoxite.

Aedeagus (Fig. 39, 42) weakly sclerotized; one or both parameres with one to several major apical setae and several minute setae, or ventral surface of left paramere with a few short setae.

Variation: There is considerable geographic variation. This is partially accounted for by the recognition of two geographic subspecies.

***Pedalopia flavipes flavipes* (Broun, 1917), new status**

Fig. 39. Map p. 68

Dichrochile flavipes Broun, 1917: 360.

Diagnosis. As described above, but on average slightly smaller, always with 3 basal antennomeres lacking dense pubescence, glabrous except for internal median seta on antennomere 1 and terminal whorls of setae on antennomeres 2 and 3. Elytral intervals 3 occasionally lacking pale foveae; elytral microsculpture weakly

transverse in specimens from northern and eastern parts of range; parameres apically with one or two long setae and several minute setae. Length 6.6–8.3 mm.

Type material: *flavipes*: Lectotype female, here designated; labelled “Type” [red rimmed disc]; “3800” [Broun species number]; Broun accession label; “Gordons 15.11.1914” [Broun’s hand]; “*Dichrochile flavipes*” [Broun’s hand]; “LECTOTYPE *Dichrochile flavipes* Broun, 1917, female. Det. R.M. Emberson”; Broun Collection, BMNH.

Paralectotype female, here designated; labelled “3800”; Broun accession label; “Gordons Knob 15.11.1914” [Broun’s hand]; “Dichro. var. *flavipes*” [Broun’s hand]; “PARALECTOTYPE *Dichrochile flavipes* Broun, 1917, female. Det. R.M. Emberson”; Broun Collection, BMNH.

Notes on type material: The lectotype is designated in order to fix the taxonomic concept of *Dichrochile flavipes* Broun, 1917 in view of the variability within the species and the fact that Broun considered the paralectotype specimen as being different from the lectotype. Both lectotype and paralectotype are in the Broun Collection, BMNH and were collected for Broun by Thomas Hall on Gordon’s Knob, in the Gordon Range, NN.

Material examined: Type specimens plus 87 non-type examples (36 males, 48 females, 5 indeterminate; BMNH, CASC, CMNZ, JNNZ, JTNZ, LUNZ, MONZ, NZAC, PHNZ).

Distribution: Widely distributed in the northern half of the South Island; NN, SD, MB, BR, WD, NC; northernmost record, Maud Island (SD), southernmost record, Andrews Stream, Arthurs Pass N.P. (NC).

Seasonal occurrence: Sep (2), Oct (9), Nov (15), Dec (14), Jan (6), Feb (5), Mar (3), May (3). Records are mainly concentrated in the spring and summer months, but with several collections as late as May.

Habitat: *Pedalopia flavipes flavipes* has been collected from just above sea level to at least 1500 m on Mt Richmond. It is usually found in *Nothofagus* forest, but it also occurs in other forest types. It is often found in leaf litter, under logs, or on mossy ground and tree trunks at night.

Remarks: Within the overall distribution of the species, the nominate subspecies is mainly eastern in distribution. Its western boundary in northwest Nelson appears to lie along the Arthur Range. The type locality is Gordon’s Knob, in the Gordon Range, about 40 km to the east of the Arthur Range. Both type specimens lack the pubescence on the 3rd antennomere that characterises the western subspecies. There is, however, substantial variation within the nominate subspecies in the amount of pale, yellowish-brown pigmented areas on the elytra and in the form of the microsculpture, which is a little more transverse on specimens from the easternmost part of its range.

A single female specimen, apparently referable to this subspecies, from Aniseed Valley, Nelson has been seen in which the body colour is almost completely dark brown, with yellowish areas reduced to narrow markings on the elytral shoulders, yellowish epipleura and yellowish spots on the anterior lateral corners of the abdominal sternites. Antennae, palps and legs are yellowish brown as in the usual colour form.

***Pedalopia flavipes florum* new subspecies**

Fig. 42. Map p. 69

Diagnosis. Differs from the nominate subspecies in being on average slightly larger and having the distal half of the 3rd antennomere lightly pubescent, the 3rd elytral intervals with 2-4 setae in pale foveae, and the elytral microsculpture always isodiametric. In the material examined, left paramere with a few short setae on ventral surface, right paramere with a patch of short setae apically. Length 7.2–8.6 mm

Type material: Holotype male; labelled “6 Mile Creek 900 m Flora Track 17 Nov. 69 S. Silcock” [printed]; “HOLOTYPE *Pedalopia flavipes florum* Emberson, male”; NZAC.

Paratypes 12; labelled as follows: 1 female “6 Mile Creek 900 m Flora Track 17 Nov. 69 S. Silcock” [printed]; 1 female, same data, but “I. Townsend” [printed], NZAC; 2 females “Flora Stream 900 m Mt Arthur Nelson 12 Nov 69, I. Townsend” [printed]; “on mossy logs at night” [printed], NZAC; 1 male, 1 female “S. of Flora Hut Nelson 12 Nov 69 I. Townsend in damp creek bed” [printed], NZAC; 2 males “Horseshoe Creek Flora Track Nelson 15 Nov 69 I. Townsend” [printed], NZAC; 5 females “New Zealand NN Flora Saddle 1000 m, 28 Jan 2010 RM Emberson, P Syrett” [printed]; “on mossy ground and tree trunks at night” [printed]. All labelled “PARATYPE *Pedalopia flavipes florum* Emberson” [printed].

Material examined: Type series plus 17 non-type specimens (10 males, 20 females; BMNH, CMNZ, JNNZ, JTNZ, LUNZ, MONZ, NZAC).

Distribution: Confined to northwest Nelson, from the Arthur Range westwards (NN); northernmost record, Mt Burnett (NN), southernmost record, Flora Saddle (NN).

Seasonal occurrence: Oct (1), Nov (4), Dec (1), Jan (6), Feb (2), Mar (3); mostly in the spring and summer. A teneral male was collected in March near the Cobb Reservoir.

Habitat: From near sea level to 1000 m around Flora Saddle and above the Cobb Reservoir in Kahurangi National Park. Mostly collected in *Nothofagus* forest often under logs or on mossy logs and tree trunks at night.

Remarks: The setae on the parameres of males of this subspecies are microscopic, a magnification of at least 80× is necessary to see them and they are best seen with a compound microscope.

The name of the subspecies is derived from the Flora Track, Flora Stream and Flora Saddle locale, which is the type locality and where many of the known specimens have been collected.

***Pedalopia oparara* new species**

Fig. 16, 54. Map p. 69

Diagnosis. Very broad, plain mid-brown in colour, with interrupted elytral interneurs. Length 9.7 mm (one female specimen only).

Head: Dorsal microsculpture well developed, isodiametric. Labrum with a broad, almost symmetrical, V-shaped notch, with 6 setae, 2 on each lobe and a median pair. Frons more or less flat, with 2 small depressions and 2 pairs of supraorbital setae. Antennae with only the 2 basal antennomeres lacking pubescence, antennomeres 3 with sparse pubescence. Labium with 2 setae on anterior margin of penultimate palpomeres; mentum almost flat, lacking setae and pits.

Thorax: Pronotum (Fig. 16) cordate, much broader than long (3.2 to 1.5 mm, maximum width to median length); lateral margins slightly sinuate in front of completely rounded off hind angles, posterior margin strongly emarginate; surface uneven; anterior marginal bead strongly thickened medially, posterior bead not interrupted medially; median groove distinct to hind margin; basal impressions deeply impressed. Microsculpture of pronotum, scutellum and elytra strong, isodiametric. Elytra broad and flat, with interneurs expressed as a series of more or less regular striaform impressions; intervals flat; 3rd interval with 3 or 4 inconspicuous setae located within impressed segments of the 2nd elytral interneur; junction of anterior and lateral margins rounded. Legs similar in colour to body; female basal protarsomeres twice as long as wide.

Abdomen: Abdominal ventrites dark brown, ventrite 6 with pale hind margin; microsculpture more or less isodiametric laterally, becoming slightly transverse medially.

Type material: Holotype female; labelled "Oparara River, 13-19.11.1957, J.I. Townsend" [printed]; "HOLOTYPE *Pedalopia oparara* Emberson, female"; NZAC.

Material examined: Holotype only.

Distribution: Currently only known from a single locality in the North West of the South Island, NN.

Remarks: Members of this remarkable species are easily distinguished by the broad body form, plain brown colour and the exceptional width to length ratio of the pronotum. The unique specimen, however, is a female and the pronotal width of male specimens may not be as distinctive. The relationships of *P. oparara* are obscure. The plain brown colouration, lacking pale margins, two pairs of supraorbital setae, interrupted elytral interneurs and isodiametric dorsal microsculpture of the holotype suggest a relationship with *P. cephalotes*, but having more than two setae on the third elytral intervals, only two basal antennomeres free of pubescence, two seta on the anterior margins of the penultimate labial palpomeres and a rounded junction of the lateral and anterior elytral margins point to a closer affinity with *P. flavipes* and the South Island species with depigmented pronotal and elytral margins.

Pedalopia oparara is named after its type locality. The specific epithet is to be regarded as a noun in apposition.

There are two fragmentary *Pedalopia* specimens (JTNZ), both collected from caves on the West Coast of the South Island that have some similarity to *P. oparara*. One of these, from Twin Forks Cave, near Paturau, (NN), which is about 65 km north of the Oparara River, is superficially very similar to the holotype of *P. oparara*, but the elytral intervals, though somewhat irregular, are more or less continuously impressed and the elytral microsculpture appears granular, but this could be a *post mortem* effect caused by the strongly alkaline preservation environment. The other specimen, from Nile River Cave, near Charleston, (BR), about 100 km south west of the

Oparara River, is considerably narrower than *P. oparara*. It has a small narrow pronotum, continuously impressed elytral interneurs and a character apparently unique in the genus: the posterior supraorbital setal pores are absent. The description of these species, if that is what they prove to be, must await better, more complete, material.

***Pedalopia watti* new species**

Fig. 17, 30, 40, 55. Map p. 69

Diagnosis. Dark brown, with margins of pronotum and elytra pale buff; appendages pale. Length 6.6–7.9 mm (five specimens).

Head: Dorsal microsculpture strong, isodiametric. Labrum more or less symmetrically notched, left lobe sometimes a little larger than right, with 3 setae on each lobe. Frons flat, with 2 pairs of supraorbital setae. Eyes reduced. Basal antennomeres lacking pubescence; antennomeres 2 with sparse, very short pubescence; antennomeres 3 distinctly pubescent, but pubescence sparser and shorter than on antennomeres 4–11. Terminal palpomeres with very short, fine pubescence; penultimate labial palpomeres with 2 setae on anterior margins. Mentum without setae and pits.

Thorax: Pronotum (Fig. 17) dark brown with narrow, pale margins; transverse (median length: maximum width ratio 1: 1.7–1.9); surface almost flat and featureless, except for well impressed median groove that does not reach anterior or posterior margins and some minor transverse wrinkles adjacent to median groove; marginal bead narrow; lateral margins rounded anteriorly, straight to slightly sinuate in front of rounded hind angles; posterior margin emarginate; basal impressions small, but usually distinct. Microsculpture of pronotum, scutellum and elytra strong, isodiametric. Elytra dark brown, with pale margins extending mesad to interneurs 6, or sometimes 5 in shoulder region; moderately convex, with interneurs lightly, but distinctly, impressed; intervals flat; 3rd intervals each with 1 seta usually attached to interneur 2, most often in a very small, pale fovea; junction of anterior and lateral margins subangulate, or rounded. Legs yellowish brown; tarsomeres 5 setose dorsally and with rows of 3 setae ventrolaterally; basal metatarsomeres without grooves laterally; female basal protarsomeres a little more than twice as long as wide; male protarsomeres not expanded laterally, similar to females, lacking adhesive setae ventrally.

Abdomen and genitalia: Abdominal ventrites plain brown, not marked with paler areas except on hind margin of ventrite 6; microsculpture isodiametric laterally, slightly transverse medially.

Gonocoxites (Fig. 30) a little narrower than similar species of *Pedalopia*.

Aedeagus (Fig. 40) weakly sclerotized. Both parameres with scattered microscopic setae on their ventral surfaces.

Type data: Holotype male, labelled “New Zealand, KA Oaro 20.xii.1991 P. Syrett R.M. Emberson” [printed]; “under rocks in coastal forest” [printed]; “HOLOTYPE *Pedalopia watti* Emberson, male” [printed]; LUNZ.

Paratypes 6; 2 females, same data as holotype; LUNZ; 1 male, “New Zealand, KA Mt Fyffe 6.ii.1994 R.R.Scott” [printed]; “under log in mixed broadleaf forest” [printed]; LUNZ; 2 females “New Zealand, NC Hunderlee Hills 9 jan 60 J.I. Townsend” [printed]; JTNZ; 1 female, “Glen Alton, Clarence V. N.Z., under stone, 10.iii.1961 J.C. Watt” [printed]; NZAC, ex J.C. Watt Collection. All labelled “PARATYPE *Pedalopia watti* Emberson” [printed];

Material examined: Type series only: 7 specimens (2 males, 5 females, JTNZ, LUNZ, NZAC).

Distribution: A small area of the East Coast of the South Island, centred around Kaikoura. KA, NC; northernmost record, Glen Alton, Clarence Valley (KA), southernmost record, Hunderlee Hills (NC).

Seasonal occurrence: Dec (1), Jan (1), Mar (2).

Habitat: All records are from low altitudes, mostly in coastal mixed forest and found under logs, or rocks.

Remarks: Principally distinguished from members of the other species of the genus with depigmented individuals by the relatively narrow, inconspicuous, pale margins to the pronotum and elytra, together with the single seta on each of the 3rd elytral intervals. It appears to be related to the complex of species scattered down the East Coast of the South Island, including *P. arowhenua*, *P. novaezealandiae* and *P. waipori*. Its members are most similar to those of *P. arowhenua*, which have only a very narrow, indistinct pale margin to the pronotum. The pale margin of individuals of *P. watti* broadens out posteriorly on the elytra to cover the hind margin as it does in individuals of *P. arowhenua* and *P. novaezealandiae*. The pronotum of specimens of *P. arowhenua* is less transverse

than those of *P. watti*, with a slight sinuation before the hind angles and most specimens have two or three setae on the third elytral intervals instead of the one seen in *P. watti* specimens. However, specimens of *P. watti* and *P. flavipes florum* share the unusual character of minute setae on the ventral surface of one or both parameres.

The species is named to honour the memory of the late Dr J. Charles Watt, friend, mentor, noted coleopterist, and collector of one of the first specimens, in recognition of his many contributions to the study of Coleoptera and New Zealand entomology.

***Pedalopia arowhenua* new species**

Fig. 18, 56. Map p. 69

Diagnosis. Dark brown with poorly defined, narrow pale margin on pronotum, pale margin broader on elytra; elytral intervals flat, interneurs very shallow. Length 7.3–8.6 mm (2 specimens only).

Head: Dorsal microsculpture strong, more or less isodiametric, sculpticels often in oblique or longitudinal lines. Labrum more or less symmetrically notched, left lobe a little larger than right, with 3 setae on each lobe. Frons flat or slightly concave, with 2 pairs of supraorbital setae. Basal antennomeres lacking pubescence; antennomeres 2 with sparse pubescence apically; antennomeres 3 distinctly pubescent, but pubescence sparser and shorter than on antennomeres 4–11. Terminal palpomeres with very short, fine pubescence.

Thorax: Pronotum (Fig. 18) dark brown with narrow, indistinct pale margins; transverse (median length: maximum width ratio 1: 1.5–1.6, 2 specimens only); surface more or less flat and relatively featureless, except for short, well impressed median groove not reaching anterior or posterior margins and faint transverse wrinkles adjacent to groove; marginal bead narrow; lateral margins rounded anteriorly, slightly sinuate in front of rounded hind angles; posterior margin emarginate; basal impressions small and indistinct, adjacent to hind margin. Microsculpture of pronotum, scutellum and elytra strong, isodiametric. Elytra brown, with indistinct pale margins extending mesad to interneurs 6 or 7 anteriorly, but broadening out posteriorly to create a pale hind margin; elytra moderately convex, with interneurs lightly, but distinctly, impressed; intervals flat; 3rd intervals each with 1–3 seta attached to interneur 2; junction of anterior and lateral margins angulate. Legs yellowish brown; tarsomeres 5 setose dorsally and with rows of 3–4 setae ventrolaterally; basal metatarsomeres without grooves laterally; male basal protarsomeres not sexually dimorphic.

Type data: Holotype male; labelled “Mtns S.W. Albury, 3,500 ft. 21-10-28” [Clarke’s hand]; “C.E. Clarke Collection” [printed]; “AMNZ 39659 Auckland Museum New Zealand” [printed on green card]; “HOLOTYPE *Pedalopia arowhenua* Emberson, male” [printed]; C.E. Clarke Collection, AMNZ.

Paratypes 2; labelled with the same first two labels as the holotype, one with “AMNZ 39660 Auckland Museum New Zealand” [printed on green card], in the C.E. Clarke Collection, AMNZ and the other in the general collection, BMNH; both labelled “PARATYPE *Pedalopia arowhenua* Emberson” [printed].

Notes on type material: The locality mentioned on all three specimens in the type series probably refers the Hunters Hills (SC), a range of low hills to the south west of Albury in South Canterbury, New Zealand.

Material examined: Type series only: 3 specimens (AMNZ, BMNH), all collected by C.E. Clarke in the same place on the same day. The specimens are all glued onto card mounts and are extremely fragile, which has precluded description of the genitalia and ventral surface.

Remarks: Members of this species are most similar to those of *P. watti*, see remarks under that species, and share with specimens of *P. novaezelandiae* the broad pale margin to the hind part of the elytra.

The species name is based on a Maori name for the region in which the type series was collected. The specific epithet is to be regarded as a noun in apposition.

C.E. Clarke was a prolific collector of Coleoptera from the 1920s through the 1940s. He collected much important material from a wide range of New Zealand localities, often from places that were still difficult of access. On his death his collection was sold and divided equally between The Natural History Museum (BMNH) and the Auckland War Memorial Museum (AMNZ). Dr Charles Watt (see above) was employed to make the division, thus specimens of the same series can often be found in both museums, as has occurred with the type series of *P. arowhenua*.

***Pedalopia novaezelandiae* Laporte de Castelnau, 1867**

Fig. 19, 57. Map p. 69

Pedalopia novaezelandiae Laporte de Castelnau, 1867: 154*Dichrochile cinctiger* Broun, 1882: 217. Synonymised by Britton (1941: 191).

Diagnosis. Matt brown, with margins of pronotum and elytra pale buff, streaked with brown on the elytra; appendages pale, testaceous. Length 7.4–8.4 mm. (4 specimens only)

Head: Dorsal microsculpture well developed, isodiametric. Labrum widely, symmetrically or slightly asymmetrically notched, left lobe usually a little larger than right, 3 setae on each lobe. Frons flat, sometimes with a slight central impression; 2 pairs of supraorbital setae. Eyes convex, only slightly reduced. Basal antennomere lacking pubescence; 2nd antennomere with very sparse pubescence, particularly in distal half; pubescence of 3rd antennomere similar to that of antennomeres 4–11. Terminal palpomeres with fine, short pubescence, penultimate labial palpomere with 2–4 setae on anterior margin. Mentum lacking setae and pits.

Thorax: Pronotum (Fig. 19) matt brown with pale, testaceous lateral and occasionally anterior margins; cordate (median length to maximum width 1: 1.70–1.78, 3 specimens), lateral margin more or less straight to distinctly sinuate in front of rounded hind angles; posterior margin strongly emarginate; median groove weakly impressed, not reaching anterior or posterior margins, with transverse wrinkles adjacent to groove; basal impressions almost effaced. Microsculpture of pronotum, scutellum and elytra strong, isodiametric; surfaces matt. Elytra with a broad, pale buff margin laterally, extending mesad to interneur 4 or 5, exceptionally pale margin only extending as far as interneur 6, hind margin of elytra also pale buff, isolating a dark brown central macula. Elytra moderately convex, with interneurs barely impressed, but indicated by rows of brown spots and streaks (absent in 1 specimen); intervals flat; interval 3 with 2–4 minute setae in prominent, pale foveae, scutellar setae also in pale foveae; junction of anterior and lateral margins rounded. Legs yellowish brown; tarsomeres 5 setose dorsally and with rows of 2–3 setae ventrolaterally; basal metatarsomeres without grooves laterally; female basal protarsomeres short, less than twice as long as wide; male protarsomeres only slightly expanded laterally, but with confused adhesive vestiture ventrally on tarsomeres 1–4.

Abdomen: Abdominal ventrites 3–6 with obscure, pale markings on posterior lateral corners; microsculpture strong, isodiametric.

Type material: *Pedalopia novaezelandiae*: Holotype male; labelled “N. Zel.” [Castelnau’s hand]; “Coll. Castelnau” [printed]; “Dunedin” [Castelnau’s hand]; “= *Dichrochile (sic) cinctiger* Broun 1882, compared with type E.B.B.” [E.B. Britton] [Britton’s hand]; “Museo Civico di Genoa” [printed]; “HOLOTYPE *Pedalopia novaezelandiae* Laporte de Castelnau, 1867, male. Det. R.M. Emberson”; MCSG.

Dichrochile cinctiger: Holotype, sex indeterminate; lacking original labels but with “Holotype, A.C. Harris” [printed on red paper]; “Fulton Coll.” [printed]; “HOLOTYPE *Dichrochile cinctiger* Broun, 1882. Det. R.M. Emberson”; Fulton Collection, OMNZ.

Notes on type material: *Dichrochile cinctiger*: Broun’s (1882) original description of *Dichrochile [sic] cinctiger*, repeated in 1886, records, “One example, minus antennae and most of the legs, was picked up dead by Mr S.W. Fulton.” This description closely matches the specimen in the Fulton Collection, which lacks antennae (except the left basal antennomere), abdomen, hind legs and palps (except left labial). Evidently Broun returned the specimen to Fulton after he had secured a more complete specimen for his collection. This latter specimen, which is more or less complete is now in the Broun Collection, BMNH, labelled “Type” [red rimmed disc], “1326” [Broun species number], “Maungatua” [printed], Broun accession label, “n. gen.” [inverted], “*Dichrochile cinctiger*” [Broun’s hand], “*Pedalopia novaezelandiae* Cast: compared with type E.B.B.” [Britton’s hand]. This specimen, however, has no type status as it clearly is not the specimen Broun had before him when he wrote the description (Broun 1882), but it is the specimen Britton compared with the holotype of *Pedalopia novaezelandiae*, on which he based his synonymy (Britton 1941).

Material examined: Type specimens plus 9 non-type examples (6 males, 4 females, 1 indeterminate, BBNZ, BMNH, JNNZ, LUNZ, MCSG, NZAC, OMNZ).

Distribution: Apparently restricted to a small area on the East Coast of the South Island around and inland from Dunedin. CO, DN; northernmost record, Rocklands Station (CO), southernmost record, Waipori Falls Reserve (DN).

Seasonal occurrence: Sep (1), Oct (1), Nov (3), Dec (1), Jan (1), Jun (1); there are not enough records for a clear pattern of seasonality.

Habitat: Found from sea level to at least 870 m on Rocklands Station. *Pedalopia novaезelandiae* has been found in both mixed forest and tussock grasslands.

Remarks: Members of this species differs from those of all others in the large extent of the pale area of the elytra, the prominent pale foveae on the third eltral intervals and in the lack of impressed elytral interneurs. They appear most similar to those of *P. watti* among the depigmented species of *Pedalopia*, in having 2 pairs of supraorbital setae and a similar pattern of antennal pubescence. They differ from specimens of *P. watti* in their more matt appearance and the unique characters mentioned above.

***Pedalopia waipori* new species**

Fig. 20, 58. Map p. 69

Diagnosis. Glossy brown, with distinct pale lateral margins to the pronotum and elytra. Length 7.2–9.0 mm (6 specimens only).

Head: Dorsal microsculpture strong, isodiametric. Labrum more or less symmetrically notched, with 3 setae on each lobe. Frons flat, with 2 pairs of supraorbital setae. Eyes reduced. Basal 2 antennomeres without pubescence; antennomere 3 with sparse pubescence in distal half, sometimes reduced to just a few fine hairs, in addition to terminal whorl of setae. Terminal palpomeres with short, sparse pubescence; penultimate labial palpomeres with 2 setae on anterior margins. Mentum without setae and pits.

Thorax: Pronotum (Fig. 20) brown with distinct, broad, pale lateral margins; similar in shape and form to *P. watti* (median length to maximum width 1: 1.68–1.85, 5 specimens only); lateral margins straight to slightly sinuate in front of rounded hind angles; median groove lightly impressed, reaching anterior and posterior margins; basal impressions almost effaced. Microsculpture of pronotum, scutellum and elytra strong, isodiametric. Elytra dark glossy brown, with with distinct, broad, pale buff lateral margins reaching interneur 6 anteriorly, but broadening posteriorly; moderately convex, with interneurs lightly, but distinctly, impressed, at least basally; intervals flat; 3rd elytral intervals with 2–3 small setae attached to interneur 2, sometimes in small, pale foveae; junction of anterior and lateral margins rounded. Legs yellowish brown; tarsomeres 5 setose dorsally and with rows of 1–3 setae ventrolaterally; basal metatarsomeres without grooves laterally; female basal protarsomeres less than twice as long as broad; male protarsomeres not expanded laterally, similar to those of females, lacking adhesive setae ventrally.

Abdomen: Abdominal ventrites brown, with pale lateral markings and a pale posterior margin to ventrite 6; microsculpture well developed, more or less isodiametric. Females sometimes with additional setae on hind margin of abdominal ventrite 6.

Type data: Holotype male, labelled “New Zealand SL Whiskey Gully Blue Mountains 21-May-05” [printed]; “In ground moss from silty area” [printed]; “HOLOTYPE *Pedalopia waipori* Emberson, male”; NZAC.

Paratypes 2; 1 female labelled “New Zealand SL Whiskey Gully Blue Mountains 3-May-03” [printed]; “Between track start and first waterfall” [printed]; LUNZ; 1 female labelled “New Zealand SL MW Relay Stn Blue Mtns, 940m 9-Jan-99” [printed]; (JNNZ); both labelled “PARATYPE *Pedalopia waipori* Emberson”. The type series was all collected by J.N. Nunn.

Material examined: Type series plus 3 non-type examples, (1 male, 4 females, 1 indeterminate, JNNZ, LUNZ, NZAC).

Distribution: Waipori Gorge (DN), Blue Mountains (SL) and Ben Lomond, Queenstown (OL). The species is only known from these three Otago and Southland localities spanning about 160 km, in the south of the South Island.

Seasonal occurrence: Sep (1), Dec (2), Jan (1), May (2); there are too few specimens to provide a pattern of seasonal distribution.

Habitat: There is very little habitat information available, but it occurs from the lowlands in Waipori Gorge to at least 940 m in the Blue Mountains. The specimen from the top of the Blue Mountains was found under a pile of cut *Aciphylla* leaves (Nunn pers. com. 2010)

Remarks: Members of *P. waipori* appear most similar to those of *P. watti* but are distinguished from the latter by less pubescent basal three antennomeres, the wider pale margins to the pronotum and elytra, the more rounded junction of anterior and lateral margins of the elytra and the 2 or 3 setae on the 3rd elytral intervals. In some of these features they more closely approach specimens of *P. novaезelandiae*, from which they are distinguished by the less pubescent basal antennomeres, the more distinctly impressed elytral interneurs, the broader dark elytral macula and

the lack of prominent pale foveae on the elytra. It is interesting to note that *P. waipori*, as represented by the eastern records from Waipori Gorge, is sympatric with *P. novaezelandiae* in the Waipori Falls Reserve. This is the only area in the South Island where two species of the genus are known to be sympatric.

Pedalopia waipori is named after its original collection locality, Waipori Gorge. The specific epithet is to be regarded as a noun in apposition.

***Pedalopia insignis* Broun, 1917, new combination**

Fig. 21, 31, 41, 44, 59. Map p. 69

Dichrochile insignis Broun, 1917: 359

Diagnosis. Body glossy, black and convex, antennae and appendages paler. Length 8.9–10.0 mm.

Head: Dorsal microsculpture well developed, isodiametric. Labrum asymmetrically notched, left lobe distinctly larger than right, with 6 setae, 2 on each lobe and a median pair. Frons flat, often with a median impression and 2 pairs of supraorbital setae. Antennae with 3 basal antennomeres lacking dense pubescence; basal 3½ antennomeres usually darker than remainder. Mentum lacking pits and setae; terminal palpomeres and penultimate maxillary palpomeres with strong pubescence, similar in length to antennal pubescence; penultimate labial palpomeres with two setae on anterior margins.

Thorax: Pronotum (Fig. 21, 44) distinctly cordate; strongly sinuate in front of distinct obtuse hind angles; posterior lateral margins reflexed and sometimes wrinkled outside deep basal impressions; median groove deeply impressed; hind margin strongly emarginate; microsculpture almost isodiametric laterally, but tending to irregularly transverse medially. Scutellum with more or less isodiametric microsculpture. Elytra convex, with interneurs strongly impressed, striate; intervals moderately convex, 3rd intervals with 2 setae, exceptionally only 1; junction of anterior and lateral margins distinctly angulate; microsculpture transverse. Legs paler than body, but femora distinctly infuscated; male protarsi not expanded laterally, similar to those of female, lacking adhesive setae ventrally; tarsomeres 5 with 1 seta on each side ventrolaterally; basal tarsomere of protarsi more than twice as long as wide.

Abdomen and genitalia: Abdominal ventrites plain, dark, glossy; microsculpture irregular laterally, tending to transverse medially.

Gonocoxites (Fig. 31) broader and more squat than other species of *Pedalopia*, with *gc2* more hooked apically.

Aedeagus (Fig. 41). Right paramere with 2 or 3 minute setae on distal margin.

Type material: *Dichrochile insignis*: Lectotype female, here designated; labelled “Type” [red rimmed disc]; “3798” [Broun species number]; Broun accession label; “Routeburn 13.2.1914” [unknown hand]; *Dichrochile insignis* [Broun’s hand]; “LECTOTYPE *Dichrochile insignis* Broun, 1917, female. Det. R.M. Emberson”; Broun Collection, BMNH.

Paralectotype female, here designated; labelled “3798” [Broun species number]; Broun accession label; “Hollyford 19.2.1914” [unknown hand]; “*Dichrochile insignis*” [Broun’s hand]; “PARALECTOTYPE *Dichrochile insignis* Broun, 1917, female. Det. R.M. Emberson”; Broun Collection, BMNH.

Notes on type material: The lectotype is designated in order to fix the taxonomic concept of *Dichrochile insignis* Broun, 1917 as the two syntypes were collected from different localities. These specimens were both collected by Thomas Hall, one of Broun’s most productive collectors, a few days apart, and may have been labeled by him as the handwriting on both specimens looks identical and has not been identified.

Material examined: Type specimens plus 26 non-type examples (11 males, 15 females, 2 indeterminate; BBNZ, BMNH, CASC, CMNZ, JTNZ, LUNZ, NZAC).

Distribution: Confined to the south west of the South Island. WD, OL, FD; northernmost record, Franz Joseph (WD), southernmost record, West Arm, Manapouri (FD).

Seasonal occurrence: Sep (1), Dec (6), Jan (4), Feb (4), Mar (2). Records are more or less confined to the summer months except for one collection in September.

Habitat: Usually in cool moist beech forest, but also in subalpine scrub above the timber line. Records are from sea level to 1050 m in the Arawata Valley (WD). The species has been found under logs, under moss, dead bark and rocks, walking on moss and damp ground at night, and collected in yellow pan traps.

Remarks: The black glossy integument, single pair of pronotal setae, pronotum with prominent, obtuse hind angles, and the transverse elytral microsculpture distinguish members of this species from those of all other species of *Pedalopia* and *Dicrochilina*. The glossy black convex body suggests a relatively unspecialised place within the genus, but this is countered by the loss of setae and pits on the mentum, the transverse elytral microsculpture and the loss of sexual dimorphism in the male fore tarsi.

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Appendix I, Glossary of technical terms not included in Laroche & Larivière (2013)

antennomere—an individual element of an antenna, each antenna has 11 antennomeres in most Carabidae.

ensiform seta—a blunt peg-like sensory seta, especially on the gonocoxites.

gonocoxite—one of a pair of sclerotized structures at the base of the bursa copulatrix, divided into a basal, gonocoxite 1 (*gc1*) and an apical gonocoxite 2 (*gc2*) in most Carabidae.

interneur—one of a series of lineal features on an elytron, sometimes referred to as striae. In most Carabidae, there are typically nine interneurs on the dorsal surface of each elytron, with remnants of a tenth adjacent to the scutellum or between the bases of interneurs 1 and 2. The interneurs are expressed as impressed lines (interneurs striate), or rows of punctures (interneurs punctate), but they may be broken, reduced or irregularly fused distally.

interval or elytral interval—the area between two adjacent interneurs.

nematiform seta—a fine tapered seta, with an elongate wavy tip, especially on the gonocoxites.

palpomere—an individual element of a palp, there are five palpomeres in a maxillary palp and three palpomeres in a labial palp, in adult Carabidae.

paramere—one of a pair of sclerotized structures lying beneath and to either side of the aedeagus, sometimes referred to as the lateral lobes. In Harpalinae, including the Licinini, these are asymmetrical with the left paramere larger than the right in most species.

segment or body segment—fundamental division of insect and arthropod bodies.

sculpticel—individual unit of microsculpture.

tarsomere—an individual element of the tarsus, each tarsus has five tarsomeres in most Carabidae.

ventrites—the sclerotized ventral plates on the abdomen, there are six visible ventrites in licinine Carabidae, but the number can vary in other carabid tribes. In Carabidae, the first ventrite is always divided by the metacoxae.

Appendix II Localities of specimens examined

The following list omits collector's name and date. Old specimens with only vague or incomplete locality labels are annotated with inverted commas, e.g., 'Canterbury', or omitted if the only locality information is 'New Zealand'. The repositories of specimens are listed in parentheses according to the abbreviations on p. 20.

Physolaesthus insularis Bates, 1878

North Island. ND. Lake Ohia (BMNH); Lake Ohia (NZAC); Te Kao, Lake Wahakiri (NZAC); **AK.** Plage d'Orewa (NZAC); 'Auckland' (BMNH); **WO.** Okaura, Upper Waikato (NZAC); **BP.** Tokata (NZAC); Te Rereauira (LUNZ); Pond nr Waipapa Stream, East Cape (NZAC); Pond W. of Waipapa Stream, East Cape (NZAC); Hicks Bay, Wharekahika Pt (NZAC); Otamaroa, 2.3 km W. of Whangaparaoa (NZAC); **TO.** Oio (NZAC); **GB.** Wherowhero Lagoon (NZAC); **TK.** Paiaka (NZAC); **WI.** Lake Koiitiata, Santoft Forest, W. of Bulls (JTNZ); **WN.** Waikawa Beach, S. of Levin (JTNZ); Paraparaumu (JTNZ); Paraparaumu (NZAC).

South Island. SD. Lagoon, N. side of Croisilles (JTNZ); **BR.** Cape Foulwind, Lighthouse Reserve (LUNZ); **MC.** 'Canterbury' (BMNH); Oakdens (MNHN).

Stomatocoelus aterrimus (Bates, 1874)

South Island. NN. Stoke, airport (CMNZ); Lake Rotoiti, Nelson Lakes (JNNZ); Kerr Bay, Nelson Lakes (JNNZ); Judges Creek, Wairau River (NZAC); **BR.** Cape Foulwind, Lighthouse Reserve (LUNZ); **NC.** Lake Sumner (CMNZ); Waipara River mouth (NZAC); **WD.** Ross, Totara River nr Moorhouse Rd (NZAC); **MC.** Oakdens (BMNH); Christchurch (MNHN); Christchurch, Lake Coleridge (MNHN); Lyttleton (BMNH); Purau (CMNZ); Orton-Bradley Park, Banks Peninsula (LUNZ); Puke Atua Bush, Port Hills (NZAC); Prices Valley, Banks Peninsula (LUNZ); Lake Ellesmere (CMNZ); Ashburton, Canterbury (BMNH); 'Canterbury' (MNHN); **MK.** Lake Tekapo (BMNH); Lake Tekapo (NZAC); **SC.** Centennial Park, Timaru (PHNZ); Caroline Bay, Timaru (PHNZ); **OL.** South Mavora Lake, Kiwi Burn Hut Track (NZAC); **CO.** Old Dunstan Road, Howels Hut (JNNZ); Ida Valley (MONZ); Poolburn (MONZ); Poolburn (NZAC); **DN.** Outram, Taieri (BMNH); 4 km North of Taieri River mouth (LUNZ); Awamoa Creek mouth (NZAC); **FD.** Hope Arm, Lake Manapouri (BMNH); **SL.** Wyndham (NZAC); Croydon Bush, Whisky Creek Parking Area (NZAC); Catlins Forest Park, Catlins River Walk (NZAC).

Stomatocoelus cordicolle (Broun, 1903)

North Island. ND. Hikurangi (BMNH); Hikurangi Swamp (MONZ); Hikurangi Swamp, Whangarei (NZAC); Mangamuka, 6km NE Opurehu River (NZAC); Mangamuka Bridge (NZAC); Waihou River (NZAC); Ruakaka Beach, N. Auckland (NZAC); **AK.** Auckland (BMNH); Lynfield, Wattle Bay (NZAC); **CL.** Broken Hills Campground (NZAC); Great Barrier Island (NZAC); Whangapoua Beach, Great Barrier Island (NZAC); **WO.** 'Waikato' (BMNH); Matira, Gaskell's Stalactite Cave (NZAC); Waipa River, Otewa, Otorohanga (NZAC); Waipa River, Otewa, Otorohanga (BMNH); Tawarau Forest, Pomarangai Rd (NZAC); Ruapuke (NZAC); **BP.** Te Aroha (BMNH); Te Aroha (MONZ); Paoneone, Te Araroa (JTNZ); Tokata, Te Araroa (JTNZ); Tokata (NZAC); Raukokore Estuary (LUNZ); Raukokore River, East Cape (JTNZ); Waiaroho, East Cape (JTNZ); Lake Okataina, nr Rotorua (JNNZ); Waiaroho (NZAC); Papatea Bay (NZAC); Waimana Valley (NZAC); **GB.** Hautai Beach, 5km E of Horoera (NZAC); Long Bush, Gisborne (NZAC); Waiherere Scenic Reserve (NZAC); Henri Loisel Scenic Reserve (NZAC); Waimata Valley, Kaharoa Stream (NZAC); **TO.** Taupo (NZAC); **TK.** Eltham, Lake Rotokare (JTNZ); Kaiwaka, Wanganui River, Wanganui NP (LUNZ); **WI.** Turakina Beach (JTNZ); Dear's Bush, nr Rongotea, Manawatu (JTNZ); Totara Reserve, Pohangina (CMNZ); **WN.** Waikawa Beach, S of Levin (JTNZ); Waitarere Beach, N of Levin (LUNZ); Mana Island, Weta Valley (JTNZ); Mana Island, Forest Valley (JTNZ); Levin (BMNH); Levin, Waiopahu Reserve (JTNZ); Levin, Barfoot's Farm (JTNZ); Otaki, Rahui Rd (JTNZ); Paraparaumu (JNNZ); Petone, Wellington (NZAC); **WN./WA.** East end Manawatu Gorge (JNNZ); **WA.** Lake Wairarapa (MONZ); Aohanga River, SW of Akitio (JTNZ); Balance Bridge Reserve, Manawatu Gorge (JTNZ); Makairo Track, E of Pahiatua (JTNZ); Masterton (JNNZ).

South Island. SD. D'Urville Island (MONZ); D'Urville Island (NZAC); Picton (BMNH); **NN.** Nelson (NZAC); Nelson, Brook Street (JTNZ); Waimea riverbed (CMNZ); **BR.** Westport (BMNH).

***Dicrochile atrata* (Blanchard, 1842)**

South Island. KA. ‘Kaikoura’ (CMNZ); Kaikoura (PHNZ); Whalers Bay, Kaikoura Peninsula (LUNZ); Oaro (LUNZ); Omihi Reserve, South of Kaikoura (JTNZ); 4 km North of Conway R. Bridge, State Highway 1 (LUNZ); **NC.** Napenape (LUNZ); Napenape Scenic Reserve (NZAC); **MC.** ‘Tavai Pounamou’ (MNHN); ‘Canterbury’ (BMNH); ‘Canterbury, N.Z.’ (MNHN); ‘Christchurch’ (BMNH); ‘Christchurch’ (MNHN); Holly Rd, Christchurch (CMNZ); Christchurch (MNHN); Christchurch, Mt Pleasant (LUNZ); Kennedy’s Bush (LUNZ); Lyttleton (BMNH); Purau, Banks Peninsula (CMNZ); Purau Valley, Banks Peninsula (LUNZ); Purau, 2 mls up stream (CMNZ); Summit Road, Port Hills (PHNZ); Coopers Knob Scenic Reserve (LUNZ); Coopers Knob (CMNZ); Coopers Knob, Banks Peninsula (JNNZ); Cass Peak (LUNZ); Ahuriri Scenic Reserve (LUNZ); Otahuna (LUNZ); Morice Settlement (JTNZ); Menzies Bay, Banks Peninsula (CMNZ); Armstrong Reserve (LUNZ); Upper Kaituna Valley (CMNZ); Prices Valley (LUNZ); Okuti Valley (CMNZ); Akaroa (BMNH); Akaroa (MNHN); Kaitorete Spit (LUNZ); Opposite Lake Forsyth (LUNZ); Selwyn District, Yars Lagoon (LUNZ); **SC/MK.** Mackenzie Monument, Mackenzie Pass (CMNZ); Mackenzie Pass (CMNZ).

***Dicrochile thoracica* Broun, 1908**

North Island. WN. Rona Bay, Wellington (BMNH); Silverstream (MONZ).

South Island. SD. Bay of Many Coves, Queen Charlotte Sound (LUNZ); NN. Rainbow/Wairau Divide, 1676 m (NZAC); Hell’s Gate, Wairau Valley (NZAC); Judges Creek, Wairau River (NZAC); **MB.** Molesworth Creek, Upper Awatere River (AMNZ); Molesworth Creek, Upper Awatere River (BMNH); Crystal Peak, Clarence Valley, 1200 m (CMNZ); Crystal Peak, Lake Tennyson, 1250 m (CMNZ); Conical Hill, Lake Taylor (CMNZ); Fuchsia Creek, Awatere Valley (CMNZ); Duncan’s Stream, Clarence Valley (CMNZ); Hanmer State Forest (LUNZ); Hanmer State Forest (NZAC); Wairau Valley, Coldwater Stream (LUNZ); Avon Valley (NZAC); Awatere Valley (NZAC); Flapper Gully, Molesworth, 1000 m (NZAC); **KA.** Woodside, Kaikoura (CMNZ); Ward Beach (CMNZ); Rarangi (CMNZ); 3 km N. of Keckerengu (CMNZ); **NC.** Upper Hurunui Gorge (CMNZ); Lake Taylor (CMNZ); nr Lake Taylor Homestead, Hurunui Valley (CMNZ); Leamington Stream, Cheviot (CMNZ); No. 2 Hut, Lake Sumner (CMNZ); below Mt Noble, Hurunui Valley (CMNZ); Manuka Stream, nr Glenwye (CMNZ); Deep Creek, Waiu Valley (CMNZ); Wandle River, nr Waiu (CMNZ); Annandale, Waiu (CMNZ); Jacks Pass, Hurunui (LUNZ); Ashley State Forest (NZAC); **WD.** Otira Gorge (MONZ); **MC.** Springfield (BMNH); Dry Creek, main road bridge, Torlesse Range (CMNZ); Broken River (BMNH); Broken River (MONZ); Broken River, Craigieburn Forest Park, 1200 m (JTNZ); Avoca, Broken River (MONZ); Craigieburn Forest Park, 1300 m (LUNZ); Cass (CMNZ); Castle Hill Basin, at Cave Stream Bridge (CMNZ); Purple Hill, above Lake Hawdon, Cass, 1250 m (CMNZ); Mt Misery, Cass, 1500 m (CMNZ); Thomas River, Craigieburn Range (LUNZ); Mt Binser, Arthurs Pass NP, 1200 m (CMNZ); Bush Creek, Lake Heron (CMNZ); Enys Flat, Waimakariri River Valley (CMNZ); Cameron Hut, Cameron Valley, 1350 m (CMNZ); Top Hut, Cameron Valley, 1150 m (CMNZ); Staveley (LUNZ); Rakaia Island (LUNZ); Boundary Creek, Hakatere Station (NZAC); Mt Hutt (NZAC); Scarcliffe (NZAC); **SC.** Lindisfarne Camp, Upper Pareora Gorge (LUNZ); **OL.** Staircase, Southern Alps (AMNZ); Staircase, Southern Alps (BMNH).

***Pedalopia maura* (Broun, 1880)**

North Island. ND. Whangarei (AMNZ); Whangarei (NZAC); Whangarei, Kara (MONZ); Whangarei, Kara (NZAC); Whangarei, 3 Mile Bush (NZAC); Whangarei, Whau Valley (NZAC); Whangarei Heads (AMNZ); Bream Head (NZAC); Whangarei Falls (BMNH); Waimatenui (AMNZ); Waimatenui (BMNH); Hirupaki Pa site (AMNZ); Parua (BMNH); Mangonui, Cable Bay Rd end (JNNZ); Copper Mine Island (MONZ); Puketi State Forest (NZAC); Puketi Forest, Waipapa River Track East Branch (NZAC); Mangamuka Summit (NZAC); Hikurangi Swamp (NZAC); Houto Mt. (NZAC); Horokaka Peak, Tangihua Range (NZAC); Parakao (NZAC); NE Glenbervie, Hutchinsons Reserve (NZAC); Waipu Gorge Scenic Reserve (NZAC); Omahuta Forest, Kauri Sanctuary, Pukekohe Stream Track (NZAC); Warawara Forest Park, Hauturu Stream (NZAC); **AK.** Waitakere Ranges (AMNZ); Waitakere Ranges (BMNH); Papakura (AMNZ); Papakura (BMNH); Papakura (CMNZ); Papakura, Kirks Bush (AMNZ); Papakura, Ligars Bush (BMNH); Grafton Gully, Auckland City (AMNZ); Cornwallis, Auckland City Forest (JTNZ); Waiuku, Karioitahi Beach (LUNZ); Kawau Island (NZAC); Duck Creek Scenic Reserve (NZAC); Hunua Range, Paparata (NZAC); Mt Auckland Walkway (NZAC); Moirs Hill

Walkway (NZAC); **CL.** Great Barrier Island, Mt Hobson (AMNZ); Great Barrier Island, Kaiarara Valley (AMNZ); Great Barrier Island, Kaiarara Valley (NZAC); Great Barrier Island, Kaiarara Stream (AMNZ); Kaitarakihi Track (NZAC); **BP.** Mt Te Aroha, 975 m (NZAC); Mt Te Aroha summit (JNNZ); S. of Tikitere, Rotorua (JTNZ); Hongi's Track, Rotorua (NZAC); Waikawa Point, NE of TeKaha (JTNZ); Oreti Forest, Te Puia Hut (LUNZ); Waimana Valley (NZAC); Papatea (NZAC); Te Koau (NZAC); Whinray Scenic Reserve (NZAC); Waioeka Gorge, Little Manganuku Track (NZAC); Waioeka Gorge, Manganuku Track (NZAC); Urewera NP, Waimana Valley, 2.8 km E of Tauwhare (NZAC); Urewera NP, Waimana Valley, Otamatuna Ridge Track (NZAC); Urewera NP, Waimana Valley, Te Waiiti Stream Track (NZAC); Lake Okataina, Rotorua Lake (NZAC); Okataina Scenic Reserve, W. Walkway (NZAC); Kaimai Range, Daily's Clearing hut, Franklin Rd (NZAC); Kaimai Range, Mangakino hut (NZAC); Kaimai Range, Wharawhara Rd Track (NZAC); **GB.** Mt Hikurangi, 1200 m (CMNZ); Lake Waikaremoana (CMNZ); Lake Waikaremoana (NZAC); Kakanui (LUNZ); Kakanui (NZAC); Taikawakawa (NZAC); Mt Arowhena, Gisborne, 1158 m (NZAC); S. of Arowhena Stream, 762 m (NZAC); Te Urewera NP, Lake Waikaremoana (NZAC); **HB.** Tangoio, White Pine Bush (NZAC); White pine Scenic Reserve (NZAC); Lindsay Scenic Reserve (NZAC); **TO.** Pureora Forest Park, Buried Forest (NZAC).

***Pedalopia cephalotes* (Broun, 1894)**

North Island. **AK.** Huia Dam (AMNZ); Waitakere Range, Nihotupu Pipeline (AMNZ); **CL.** Summit Tapu/Coroglen Rd (JNNZ); Maumaupaki track, Coroglen/Tapu Rd, 800 m (NZAC); **WO.** Okauia, Matamata (NZAC); Te Miro Scenic Reserve (NZAC); Te Tapui Scenic Reserve, Maungakawa (NZAC); Ngatiri (BMNH); Mt Maungatautari Track, Hicks Rd end (AMNZ); Maungatautari Scenic Reserve, Tari Rd Track (NZAC); Maungatautari Scenic Reserve, Hicks Rd Track (NZAC); Marakopa Falls Scenic Reserve (NZAC); Mangopohue Scenic Reserve (NZAC); Herangi Range, Te Mararama Scenic Reserve (NZAC); Herangi Range, Mangatua Track (W. end) (NZAC); Herangi Range, Manganui Gorge Scenic Reserve (NZAC); Waitomo (AMNZ); Waitomo (BMNH); Piripiri, Caves Reserve (NZAC); Nicholas Cave, 140 m into cave, Waitangururu, nr Pio Pio, (NZAC); Mangaorongo Rd, Mahoenui (JTNZ); Pirongia Forest Park, Mangakara Nature Walk, Grey Rd (NZAC); Pirongia FP, Mahaukura Tk, Grey Rd end (NZAC); **BP.** Kaimai Ra., Daily's Clearing Hut, Franklin Rd end (NZAC); Kaimai Range, Mangakino hut to Daily's Clearing tracks junction (NZAC); Kaimai Range, Woods Mill track (NZAC); Kaimai Range, Tuahu track (NZAC); Mamaku Range (NZAC); Mt Te Aroha, 957 m (NZAC); **TO.** Kaimanawa Forest Park, Kaimanawa Rd end, Pillars of Hercules, 900 m (NZAC); Pureora Forest Park, Pikiariki Ecological Area (NZAC); Pureora Forest Park, North Block, Okahukura Rd (NZAC); Lake Rotopounamu, Tongariro NP (JNNZ); Lake Rotopounamu, Tongariro NP (LUNZ); Mangawhero Forest, Tongariro NP (NZAC); Whakapapa Valley, Tongariro NP, 1050 m (LUNZ); Mt Ruapehu, Waitonga Falls, Ohakune Mountain Rd, 1220 m (LUNZ); Turoa Ski Tow 1615 m (NZAC); 1 km N.E. of Ohakune (LUNZ); Lake Rotokura, Kairoi (LUNZ); Ohakune (NZAC); Raurimu Spiral (BMNH); Raurimu (BMNH); **GB.** Lake Waikaremoana, Aniwaniwa-Waikareiti Track (AMNZ); Lake Waikaremoana (MONZ); Mt Ngamoko, Lake Waikaremoana, 1100 m (MONZ); Lake Waikaremoana (NZAC); **TK.** Patea River at Stratford (JTNZ); Holly Hut, Mt Egmont, 950 m (NZAC); Kahui track, Mt Egmont (NZAC); Mt Messenger Forest, Mokau Rd-Whitecliffs Track (NZAC); Whitecliffs State Forest (MONZ); **RI.** Mataroa, Taihape (JTNZ); Mataroa, Paengaroa Scenic Reserve (NZAC); Ruahine Ra., Rangiwahia Hut (NZAC); Rangi Hut, Ruahine Range, 1230 m (JTNZ); Mokai-Patea Ridge (NZAC); Ruahine Range, Triplex (NZAC); Ruahine Range, Limestone Rd end (NZAC); Ruahine Range, Rangitane Rd end, 800 m (NZAC); **HB.** Waipawa, Lindsay Bush Scenic Reserve (JTNZ); Mohi Bush, Upper Maraetotara Valley (JTNZ); Kaweka Range, Ngaherenui Stream (NZAC); Moto-o-Kura (Bare Is.) (NZAC); **WI.** Apiti Scenic Reserve, Oroua Gorge (JTNZ); Pohangina, N. of Palmerston North (JTNZ); **WN.** Levin (AMNZ); Makahika Stream, Gladstone Rd, Levin (JTNZ); end of Tangimoana Rd, Levin (JTNZ); Otaki Forks (JNNZ); Kapiti Island. (MONZ); Paekakariki, Mt Wainui (MONZ); Akatarawa Range, Wellington (JTNZ); Campbells Hill, Wellington (MONZ); Johnsons Hill, Karori (JNNZ); Johnsons Hill, Karori (JTNZ); Karori Wildlife Sanctuary (NZAC); Orongorongo Valley, Wellington (JTNZ); Orongorongo Track, Rimutaka Forest Park (NZAC); Tararua Range, Kaitohe, Waterworks Rd end (NZAC); **WA.** Tararua Forest Park, Mangahao Rd, Shannon (JTNZ); Tararua Range, Te Mara Track, Kiriwhakapapa Rd (NZAC).

***Pedalopia orongorongo* new species**

North Island. WN. Orongorongo Valley, Rimataka Forest Park (NZAC); Wiltons Bush, Wellington (MONZ).

***Pedalopia flavipes flavipes* (Broun, 1917)**

South Island. SD. Maud Island, Marlborough (CMNZ); Maud Island (NZAC); Mt Stokes (NZAC); Penzance, Marlborough Sounds (JTNZ); **NN.** Riwaka (JNNZ); Gordons Knob (BMNH); Gordons Knob, 1230 m (JTNZ); Whangamoia Saddle (JTNZ); Teal Valley, Nelson (CMNZ); Teal Valley (NZAC); W. of Saddle Hill (JTNZ); Aniseed Valley, Nelson (NZAC); 'Nelson' (NZAC); Upper Maitai (NZAC); Nelson, Dun Mtn (AMNZ); Near Third House, Dun Mt, Nelson (JTNZ); Dun Mtn, 1100 m (NZAC); Condis Ck, Dun Mtn (NZAC); Wooded Peak, Dun track Saddle (NZAC); Nelson, Fringe Hill (MONZ); Ben Nevis, Nelson, 920 m (JTNZ); Hope (NZAC); Left branch Motueka River, 1 mile above Ellis Stream (JTNZ); Baton Saddle, 1380 m (JTNZ); Motueka Gorge (JTNZ); Glenhope (BMNH); Glenhope (NZAC); Hope River, Nelson (CMNZ); Headwaters Patriarch Creek, Wangapeka, 1100 m (JTNZ); **MB.** Mt Richmond Range, 1230 m (JTNZ); Mt Richmond 1540 m (NZAC); Dip Flat, Rainbow Skifield, Wairau Valley (JTNZ); Fell Peak, Richmond Range 1320 m (NZAC); Head of Fabians Valley, Marlborough (NZAC); **BR.** Howard Range (NZAC); Mt Roberts (JNNZ); Mt Robert (JTNZ); Mt Robert car park, Nelson Lakes NP (LUNZ); Lake Rotoiti (NZAC); Lake Rotoiti (PHNZ); Lake Rotoiti (LUNZ); Travers Valley (NZAC); Matakītaki River (LUNZ); East Matakītaki River, Mt Una track LUNZ; Maruia Springs (CMNZ); Garnet Peak, Lewis Pass (CMNZ); Lewis Pass (NZAC); Near Lewis Pass (JTNZ); **NC.** 2 mls below Boakes Bridge, E of Lewis Pass (JTNZ); Goings Bridge, E. side Lewis Pass (JTNZ); Andrews Stream, Arthurs Pass NP (LUNZ); Arthurs Pass NP, Andrews Stream (NZAC); Hallelulah Flat, Arthurs Pass NP (CMNZ); Arthurs Pass Village (LUNZ); Arthurs Pass, Rough Creek (NZAC); Bealy River (NZAC); **WD.** Kellys Creek, Arthurs Pass NP (LUNZ); Arthurs Pass NP, Kellys Ck (NZAC); Otira (LUNZ); Otira (NZAC); Otira, Holts Creek (MONZ).

***Pedalopia flavipes florum* n. ssp.**

South Island. NN. Mt Burnett, 450 m (LUNZ); Onekaka (BMNH); Boulder Lake track (CMNZ); Below Calphurnia Pk, nr Boulder Lake (JTNZ); Canaan (NZAC); Trilobite Hut, Cobb Valley (LUNZ); Cobb Reservoir, Asbestos Hut track (LUNZ); nr Cobb Reservoir, 920 m (JTNZ); Cobb Village (JNNZ); Flora Saddle (LUNZ); Flora Track (JNNZ); 6 Mile Creek, Flora track, (NZAC); Horseshoe Creek, Flora Track (NZAC); Flora Creek, Growler Rock Shelter (MONZ); Flora Stream, Mt Arthur (NZAC); Flora Camp (MONZ); Flora River (MONZ); S. of Flora Hut (NZAC).

***Pedalopia oparara* new species**

South Island. NN. Oparara River (NZAC).

***Pedalopia wattii* new species**

South Island. KA. Glen Alton, Clarence Valley (NZAC); Hundalee Hills (JTNZ); Mt. Fyffe (LUNZ); Oaro (LUNZ).

***Pedalopia arowhenua* new species**

South Island. SC. Mountains south-west of Albury (AMNZ); Mountains south-west of Albury (BMNH).

***Pedalopia novaezelandiae* Laporte de Castelnau, 1867**

South Island. CO. Rocklands Station, 870 m (BBNZ); **DN.** 'Dunedin' (MCSG); Kaik, Dunedin (NZAC); 'Waitati or Dunedin' (BMNH); Nichols Creek (LUNZ); Maungatua (BMNH); Measly Beach, 2 km N Waikoro (JNNZ); Waipori Falls Reserve (BBNZ); Government Track, Waipori Valley (JNNZ).

***Pedalopia waipori* new species**

South Island. DN. Waipori Falls (JNNZ); Waipori Gorge (NZAC). **OL.** Ben Lomond, Queenstown (JNNZ). **SL.** Microwave Relay Station, Blue Mountains (JNNZ); Whiskey Gully, Blue Mountains (LUNZ); Whiskey Gully, Blue Mountains (NZAC).

***Pedalopia insignis* (Broun, 1917)**

South Island. WD. Franz Joseph (NZAC); Lake Paringa (NZAC); Gates of Haast (CMNZ); Okuru, Haast (JTNZ); Arawata Bivy, 840 m (LUNZ); Arawata Valley, 1050 m (LUNZ); Routeburn (BMNH); Hollyford (BMNH); Worsley Arm, Lake Te Anau (BMNH); Gut Hut, Secretary Is. (BBNZ); Lower E. Mackenzie Burn, Fiordland NP, 945 m (LUNZ); Plateau Creek, Fiordland NP, 900m (LUNZ); Aurora Cave, Murchison Range (LUNZ); Halfway Hut, Doubtful Sound (JTNZ); Deep Cove, Fiordland NP (LUNZ); nr Percy Saddle, Percy Saddle Rd (JNNZ); Wolfe Burn, Lake Manapouri (NZAC); West Arm, Lake Manapouri (NZAC).

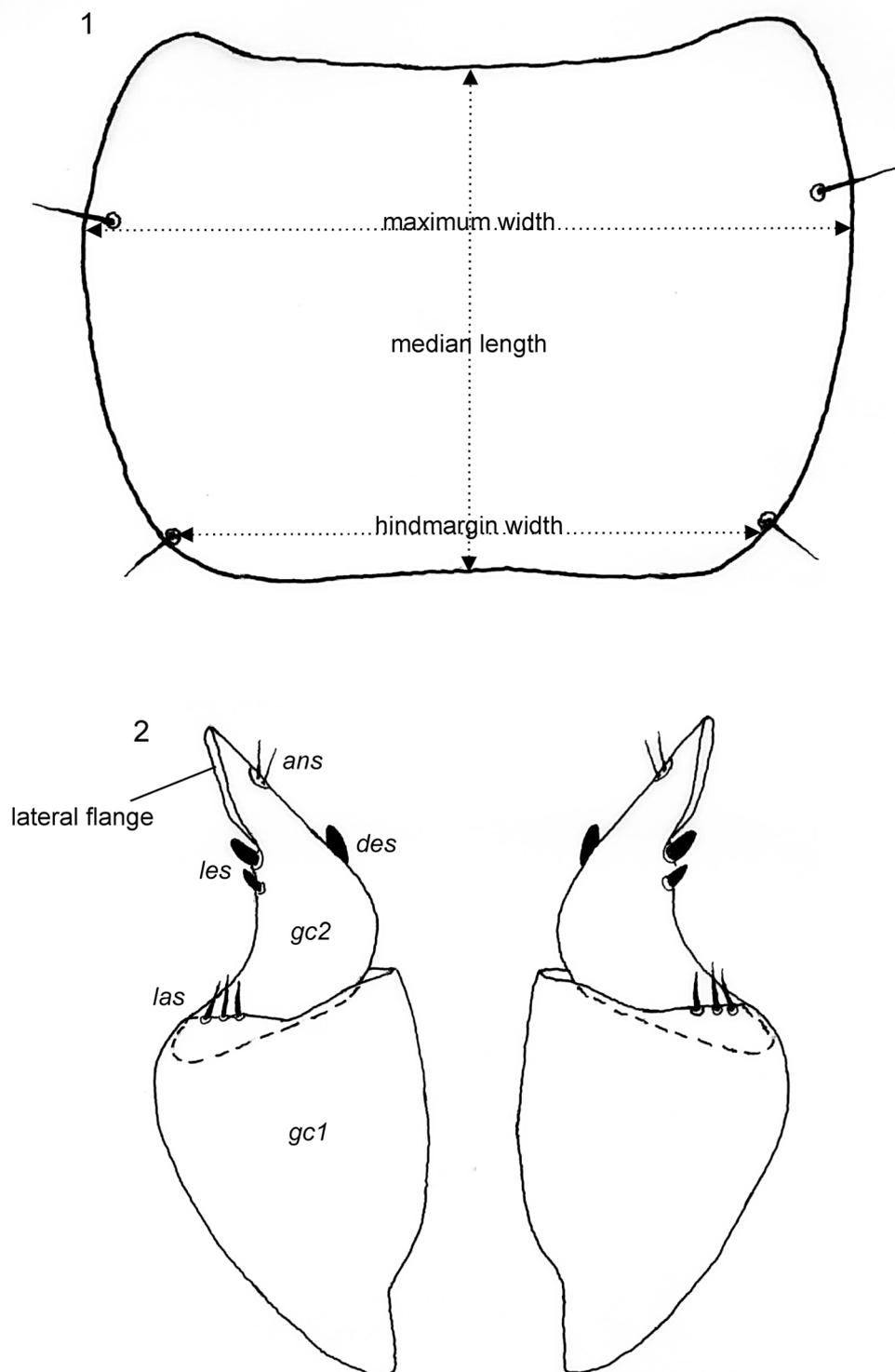


Fig. 1–2 Generalised pronotum and gonocoxites: 1 pronotum showing measurements used in descriptions; 2 gonocoxites in ventral view with structures labelled, *gc1* gonocoxite 1, *gc2* gonocoxite 2, *las* lateral setae, *les* lateral ensiform setae, *des* dorsal ensiform seta, *ans* apical nematiform setae.

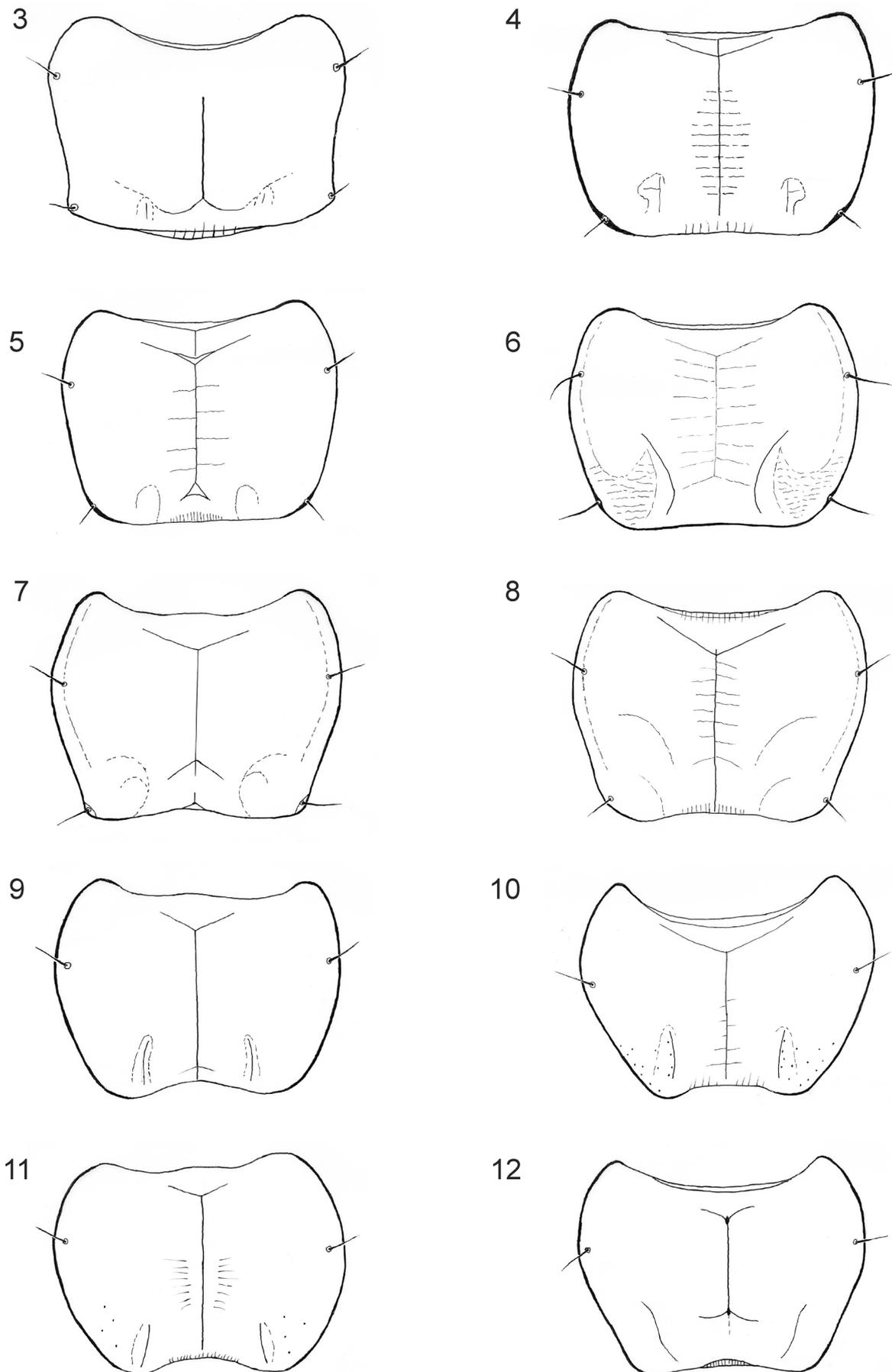


Fig. 3–10 Pronota: 3 *Physolaesthus insularis*, Lake Koitiata, WI; 4 *Stomatocoelus aterrimus*, Taieri R. mouth, DN; 5 *S. cordicollis*, Wanganui R., TK; 6 *S. brevicollis*, Brookes Creek, NSW; 7 *Dicrochile atrata*, Coopers Knob, MC; 8 *D. thoracica*, Thomas R., MC; 9 *Pedalopia maura* small, 8.0 mm ♀, Puketi ND; 10 *P. maura* large, 9.8 mm ♀, Urewera NP, BP.

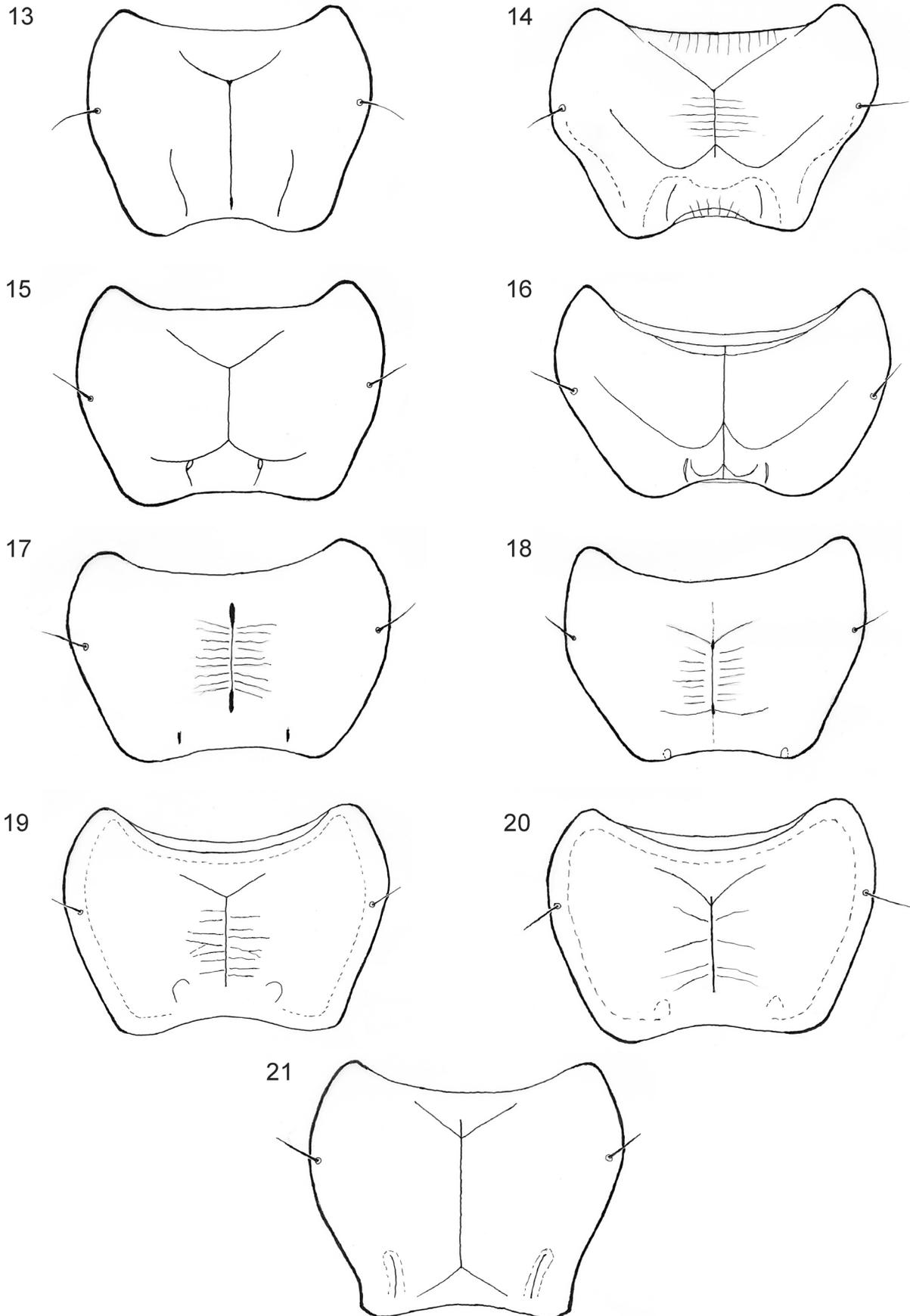


Fig. 11–21 Pronota: 11 *Pedalopia maura* ♂, Puketi ND; 12 *P. cephalotes* ♀, Piripiri, WO; 13 *P. cephalotes* ♂, Ruahine SFP, RI; 14 *P. orongorongo*, Orongorongo, WN; 15 *P. flavipes*, Arthurs Pass, MC; 16 *P. oparara*, Oparara, NN; 17 *P. watti*, Oaro, KA; 18 *P. arowhenua*, Mtns SW of Albany, SC.; 19 *Pedalopia novaezealandiae*, Nichols Creek, DN; 20 *P. waipori*, Blue Mtns, SL; 21 *P. insignis*, Arawata Biv, WD.

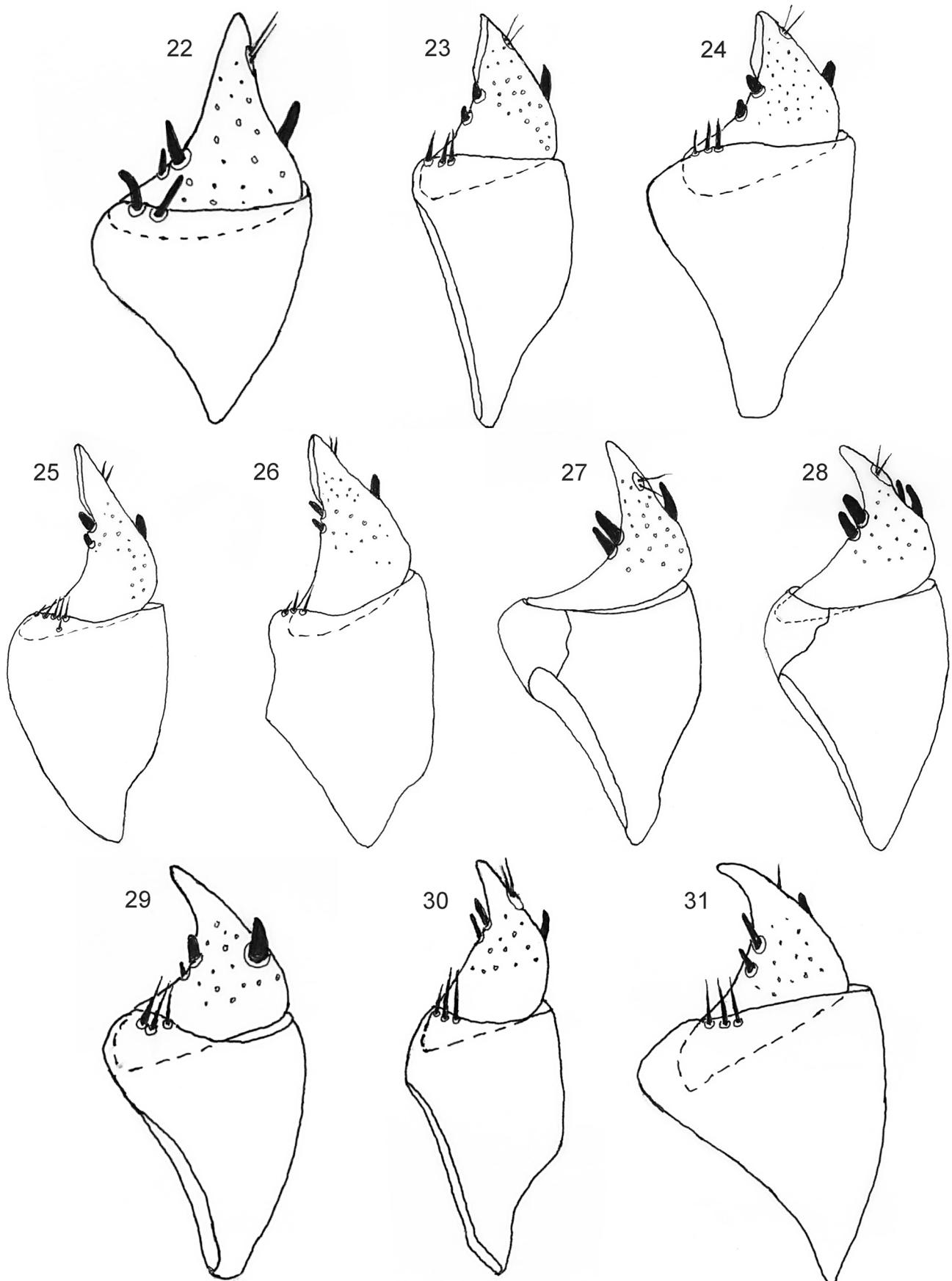


Fig. 22–31 Right gonocoxite, in ventral view, of selected species: 22 *Physolaesthus insularis*, Lake Koitiata, WI; 23 *Stomatocoelus aterrimus*, Orton Bradley Park, MC; 24 *S. cordicollis*, Lynfield, AK; 25 *Dicrochile atrata*, Coopers Knob, MC; 26 *D. thoracica*, Mt Algidus, MC; 27 *Pedalopia maura*, Kakanui, GB; 28 *P. cephalotes*, Kaimai Ra., BP; 29 *P. flavipes*, Flora Saddle, NN; 30 *P. watti*, Oaro, KA; 31 *P. insignis*, Arawata Biv, WD

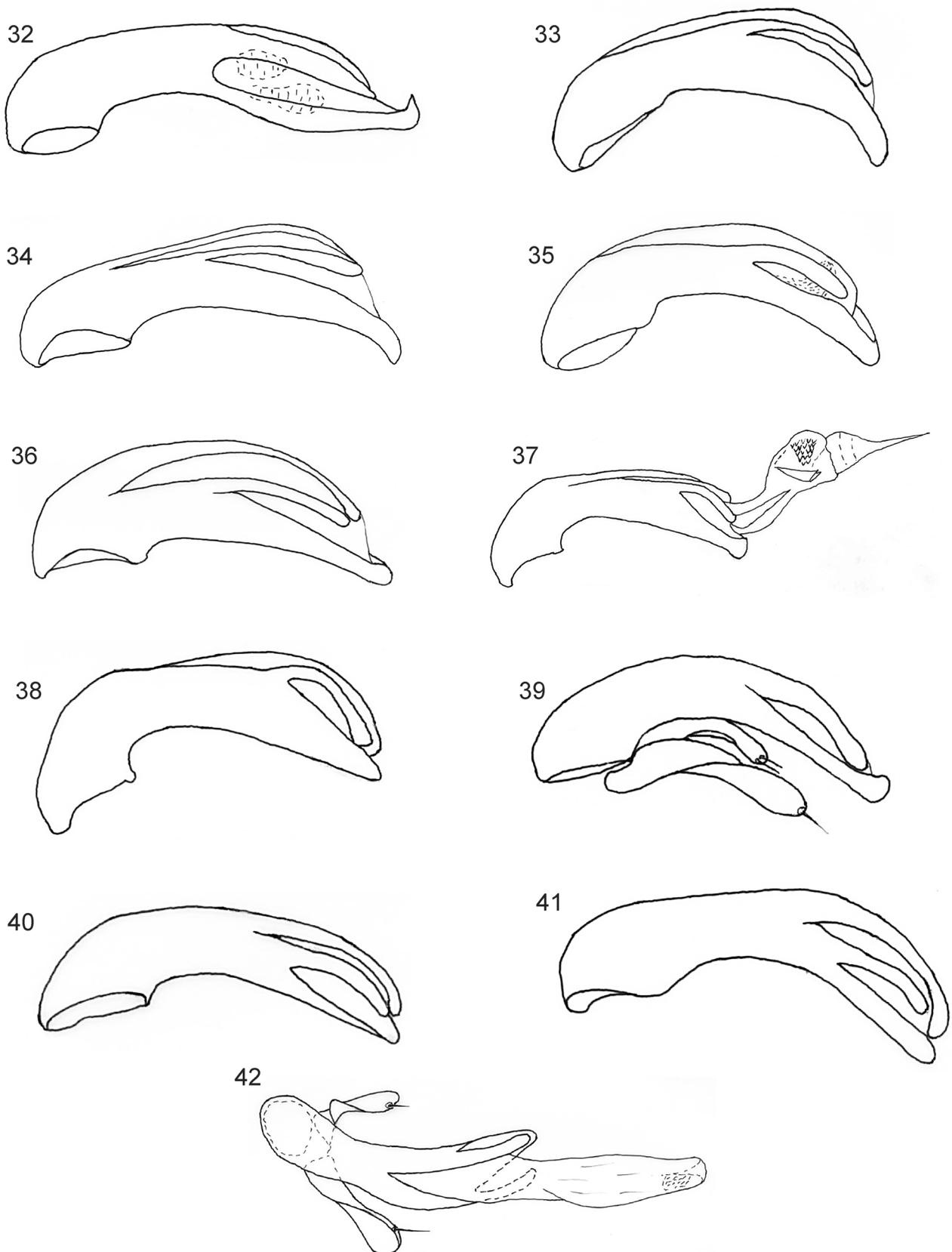


Fig. 32–42 Aedeagi of selected species, 32–41 in left lateral view, 42 in dorsal view: 32 *Physolaesthus insularis*, Lake Koiitiata, WI; 33 *Stomatocoelus aterrimus*, Prices V., MC; 34 *S. cordicollis*, Wanganui R., TK; 35 *Dicrochile atrata*, Coopers Knob, MC; 36 *D. thoracica*, Thomas R. Craigieburn, MC; 37 *Pedalopia maura* with internal sac everted, Waikuku, AK; 38 *P. cephalotes*, Tongario NP; 39 *P. f. flavipes* parameres with setae, Mt Robert NN; 40 *P. watti*, Oaro, KA; 41 *P. insignis*, Arawata Biv, WD; 42 *P. flavipes floriae* with internal sac partially everted and setae on distal margin of parameres, Flora Saddle, NN.

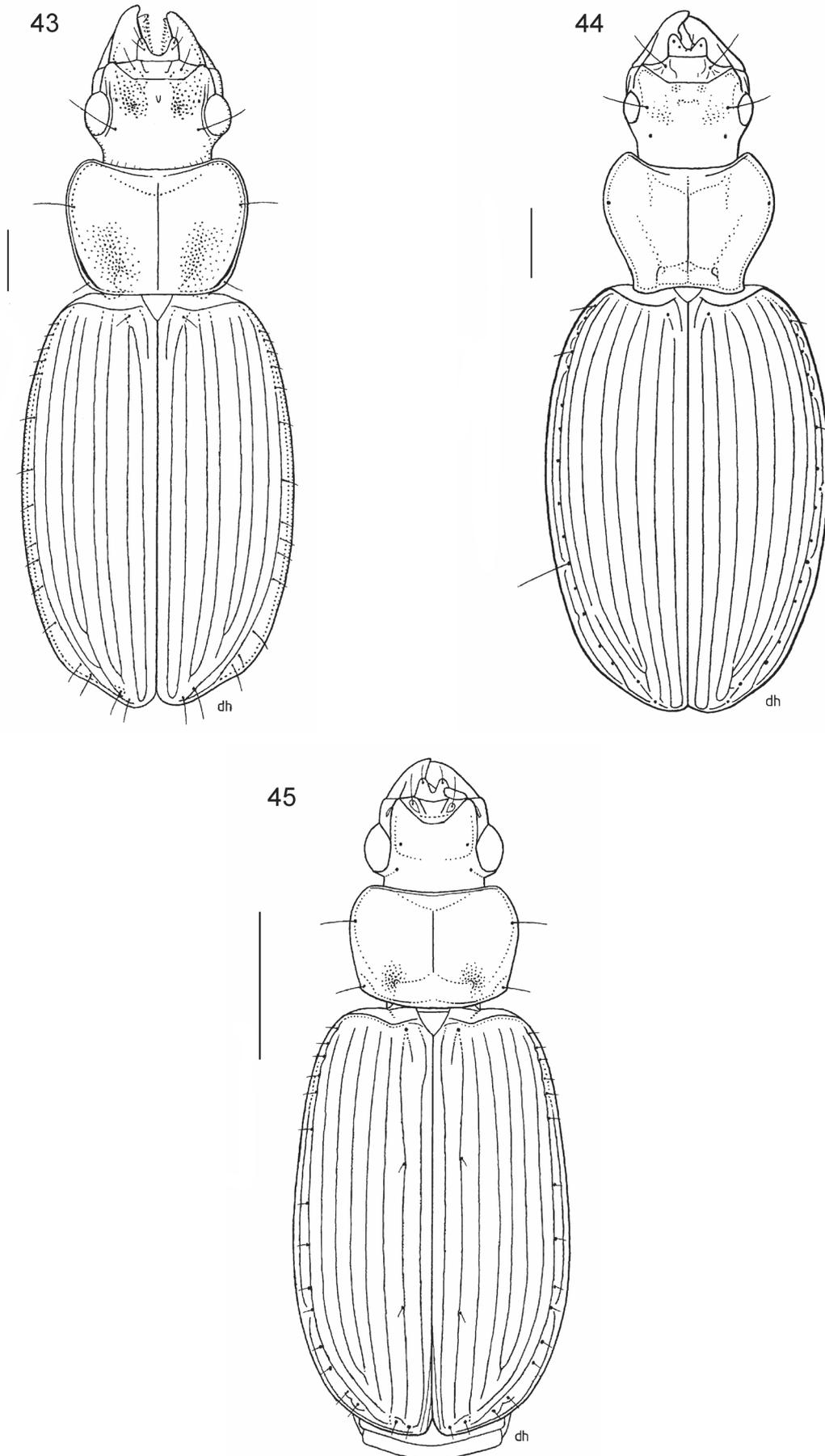


Fig. 43–45 Habitus drawings, scale bar 1 mm, 43 *Stomatocoelus cordicollis*; 44 *Pedalopia insignis*; 45 *Physolaesthus insularis*.

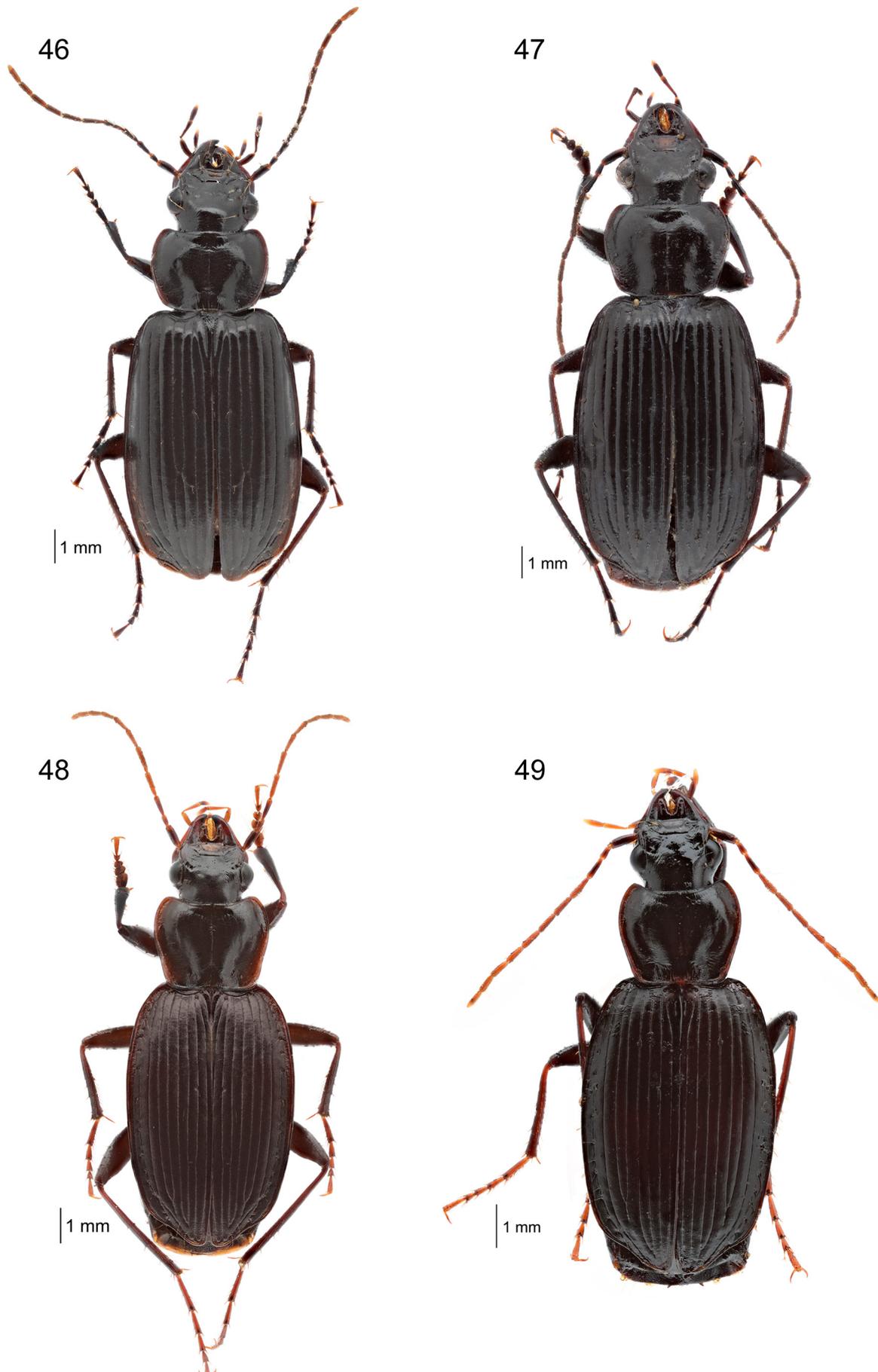


Fig. 46–60 Habitus photographs of pinned specimens, scale bar 1 mm. Fig. 46–49; 46 *Stomatocoelus aterrimus*; 47 *S. cordicollis*; 48 *Dicrochile atrata*; 49 *D. thoracica*.

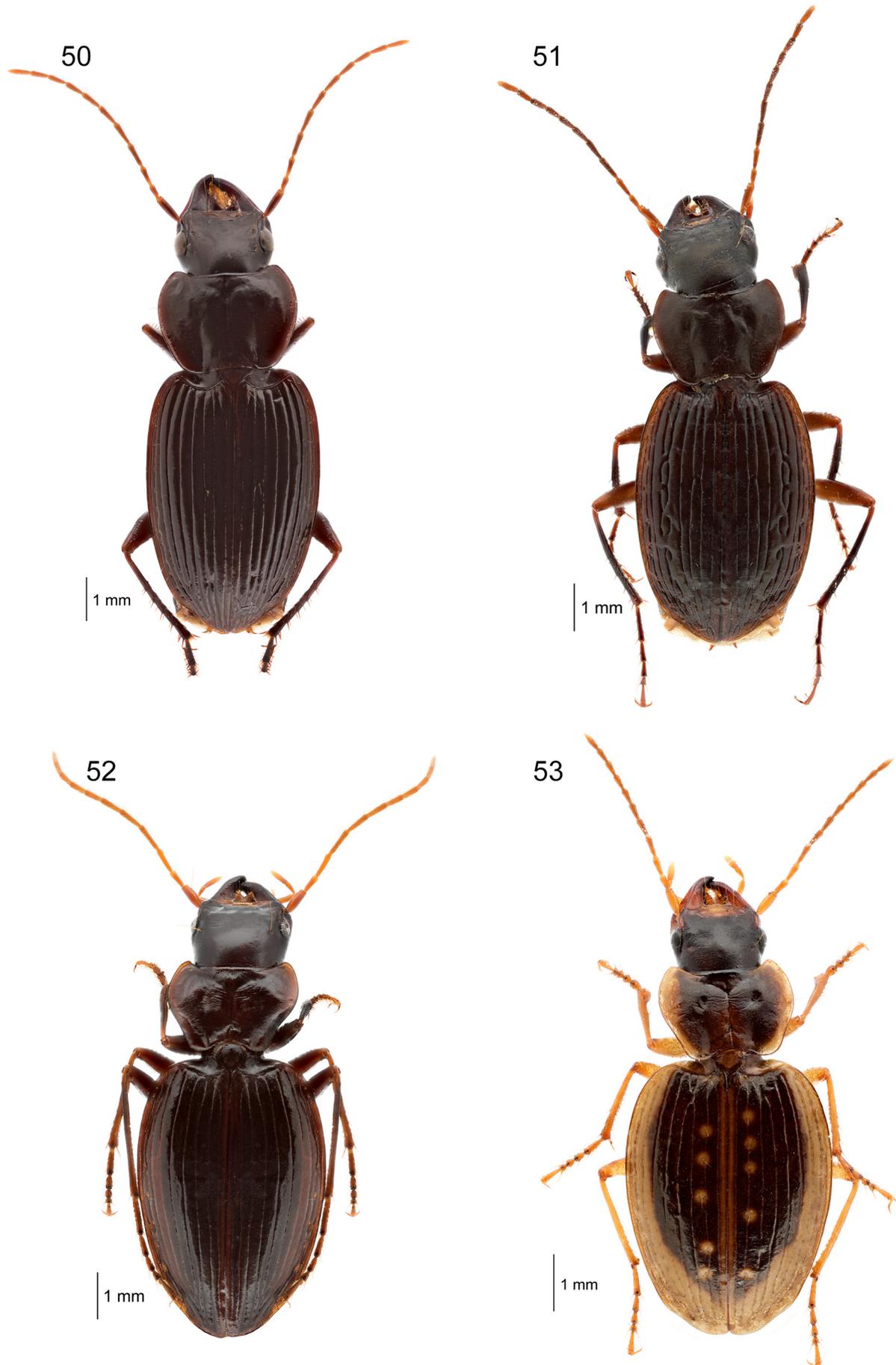


Fig. 50–53; 50 *Pedalopia maura*; 51 *P. cephalotes*; 52 *P. orongorongo*; 53 *P. flavipes*.

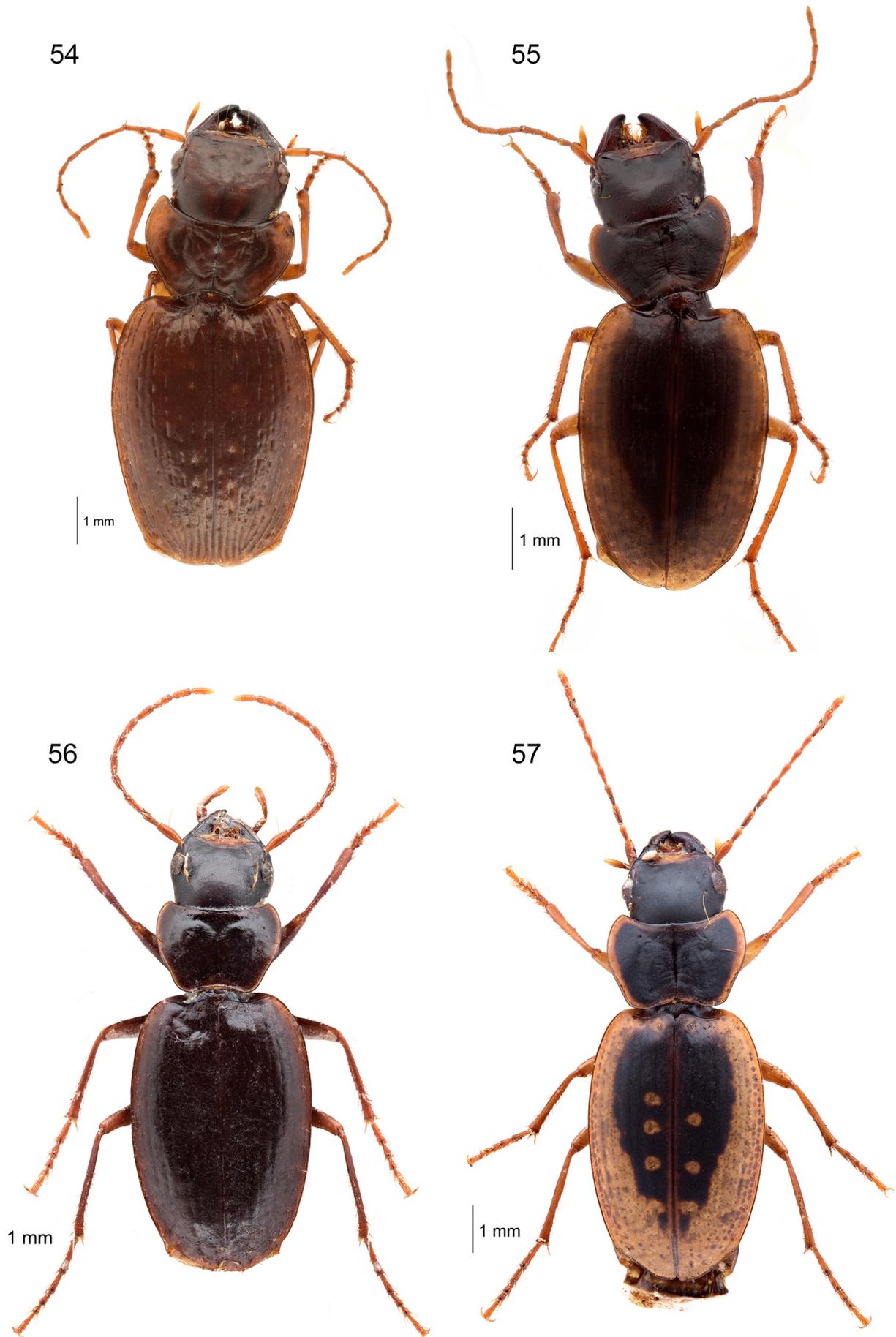


Fig. 54–57; 54 *Pedalopia oparara*; 55 *P. watti*; 56 *P. arowhenua*; 57 *P. novaezealandiae*.

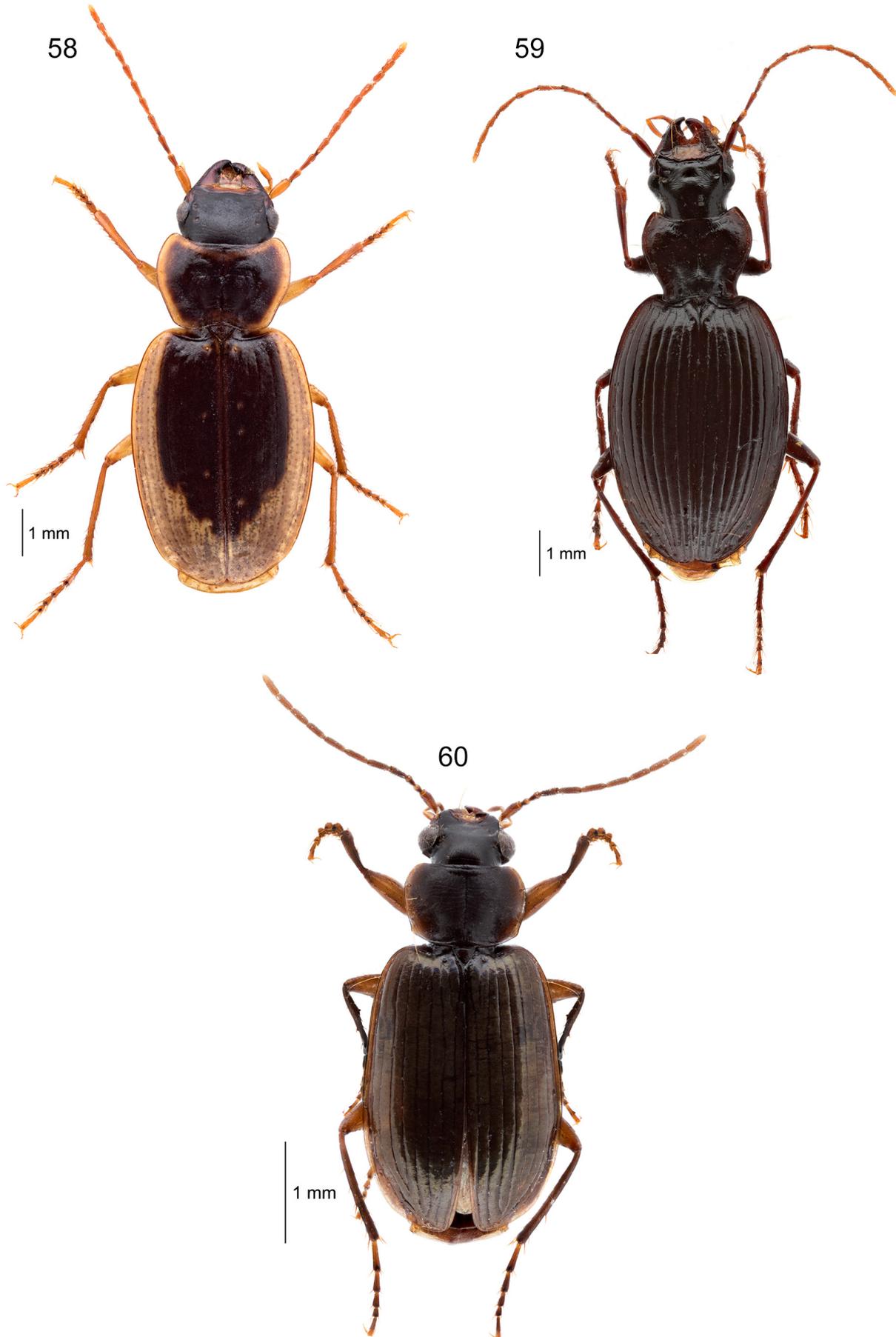
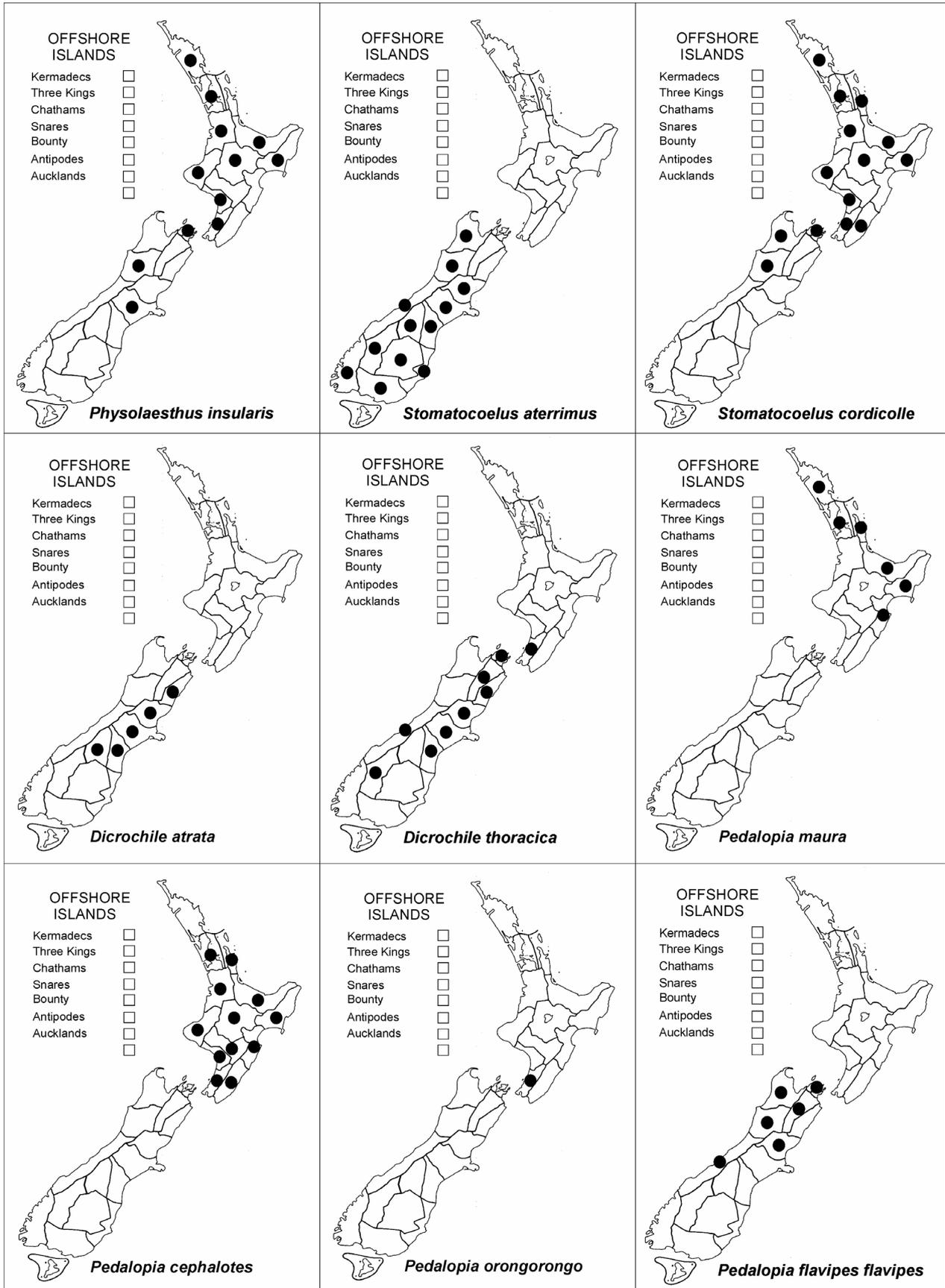
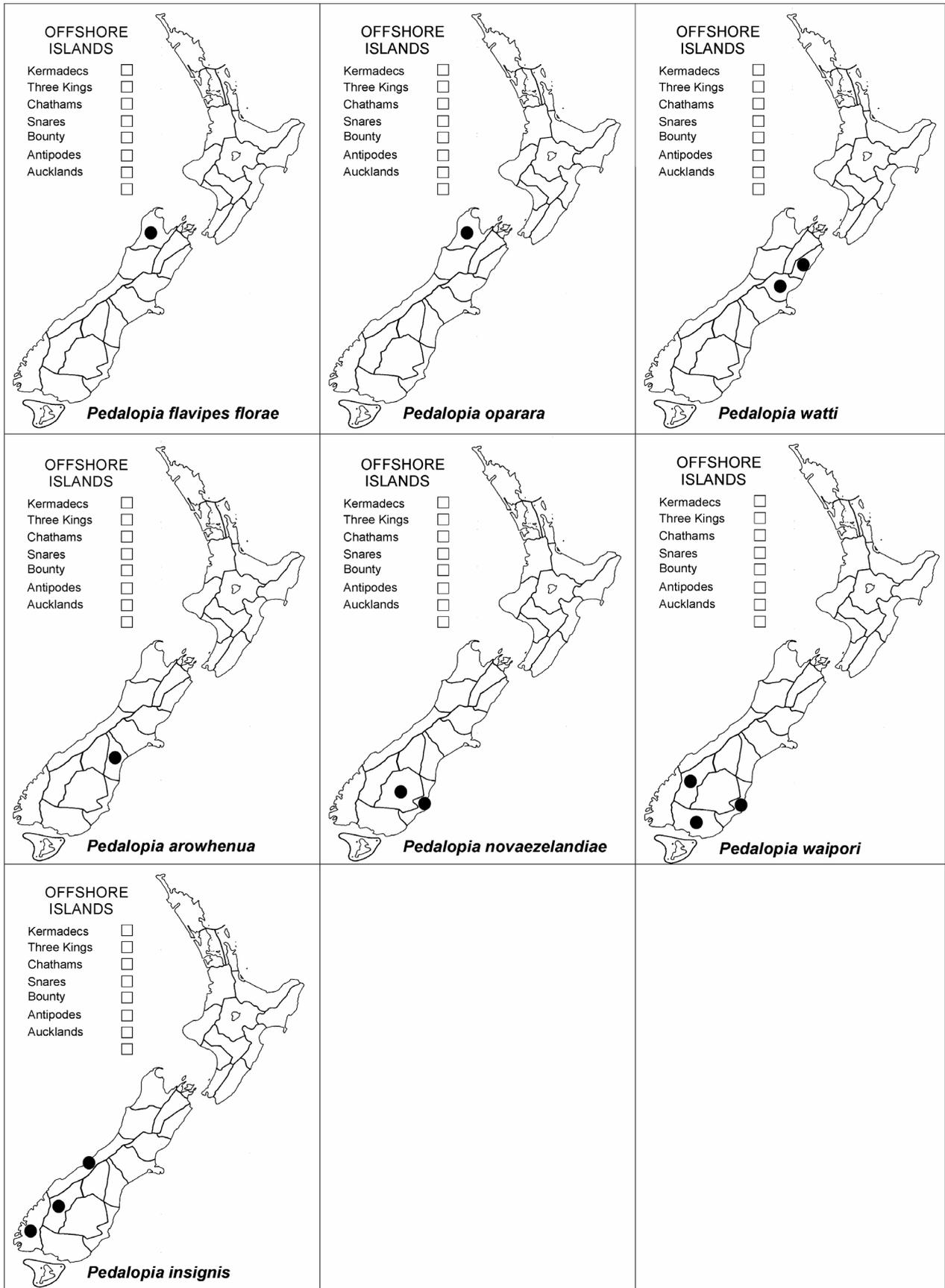


Fig. 58–60; 58 *Pedalopia waipori*; 59 *P. insignis*; 60 *Physolaesthus insularis*.





Taxonomic index

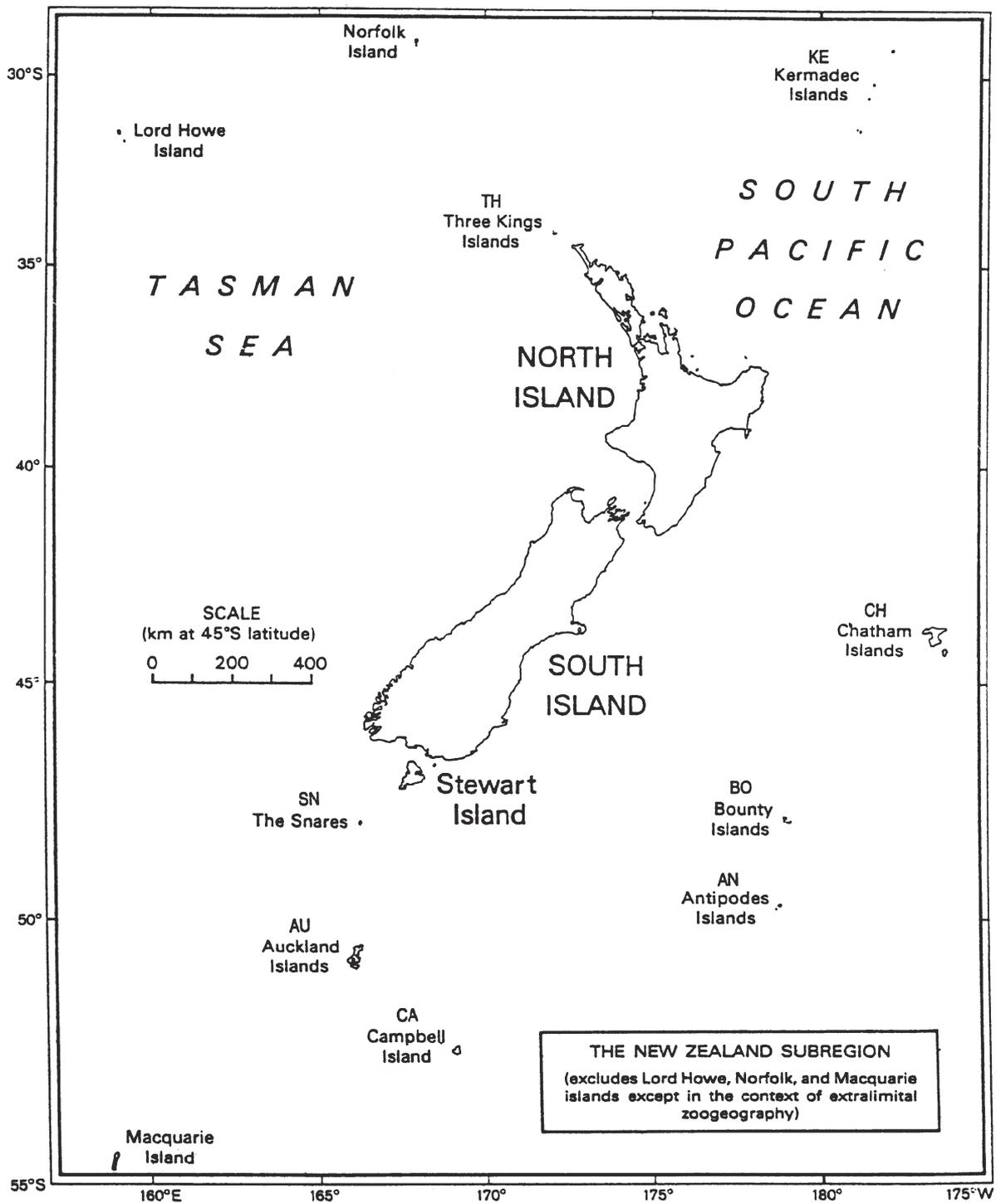
This index covers the taxa mentioned in the text, regardless of their current status in taxonomy. Taxa in **bold** are those included in the checklist. Page numbers in **bold** indicate main entries. Page numbers in *italics* indicate figures. The letter ‘**p**’ after a page indicates **habitus photographs**, the letter ‘**k**’ indicates a **key**, and the letter ‘**m**’ indicates a **distribution map**.

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Ka āhei te tangata ki te **whakauru tuhituhinga** mehemea kei a ia ngā tohungatanga me ngā rauemi e tutuki pai ai tana mahi. Heoi anō, e wātea ana te Kohinga Angawaho o Aotearoa hei āta tiro tiro mā te tangata mehemea he āwhina kei reira.

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