

Gondwanan Gymnochilini (Coleoptera: Trogossitidae): generic concepts, review of New Zealand species and long-range Pacific dispersal

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Abstract. Members of *Leperina* Erichson (Trogossitidae: Gymnochilini) from New Zealand, New Caledonia and Lord Howe Island are morphologically similar to members of the endemic Juan Fernandez Island genus *Phanodesta* Reitter, sharing at least one obvious character, elytral carinae that are beaded and contain well-defined punctures. To test the monophyly of *Leperina* and *Phanodesta*, we reconstructed phylogenetic relationships of the genera of the tribe Gymnochilini by a cladistic analysis of 22 terminals and 47 adult characters rooted with one genus of trogossitine. *Leperina* is rendered paraphyletic by the placements of *Seidlitzella* Jakobson and *Phanodesta*. *Kolibacia* **n.gen.** (type species *Leperina tibialis* Reitter) is described for east Palaearctic species included formerly in *Leperina* (two new combinations); New Zealand *Leperina* and other species from New Caledonia and Lord Howe Island (*Ostoma pudicum* Olliff) are transferred to *Phanodesta* (six new combinations); and the remaining species are retained in *Leperina*. The following species are described as new: *Phanodesta carinata* **n.sp.**, *P. manawatawhi* **n.sp.**, *P. oculata* **n.sp.** and *P. tepaki* **n.sp.** *Leperina ambiguum* Broun is transferred to *Grynoma* Sharp resulting in a new combination and three new synonymies for New Zealand trogossitines: *Leperina interrupta* Brookes **n.syn.** and *Leperina sobrina* (White) **n.syn.** [= *Phanodesta farinosa* (Sharp)], and *Trogosita affinis* White **n.syn.** (= *Tenebroides mauritanicus* Linnaeus). A key to the New Zealand species and a checklist for the species of the *Kolibacia*, *Leperina* and *Phanodesta* are provided. The derived placement of Juan Fernandez *Phanodesta* in the phylogeny is evidence for long-distance dispersal from Australasia. A tally of all Juan Fernandez Islands Coleoptera shows derivation mostly from Chile and South America, with few from the southern Pacific region, rarely from Australasia.

Introduction

The eight genera of the tribe Gymnochilini (sensu Kolibáč, 2008) are distributed in Africa, the Palaearctic, Australasia and the southern Pacific, and include elongate to suboval beetles that can be strikingly colourful but mostly are mottled and scaly (Figs 1–4). The poorly studied Juan Fernandez Island genus

Phanodesta Reitter (Trogossitidae: Gymnochilini) is very similar in adult form to many members of *Leperina* Erichson. Thus Sharp (1877a: 191; see also Broun, 1880: 179) regarded the separation of *Phanodesta* from *Leperina* as ‘uncalled for’; however, the synonymy was not implemented by subsequent authors. Sharp’s comments would have been based on his study of New Zealand gymnochilines, which were among material sent routinely to taxonomists at the Natural History Museum, London by antipodean collectors. The New Zealand forms share many characters with *Phanodesta*, including a similar habitus, colouration and beaded elytral carinae (compare among Figs 2g, 4a–i).

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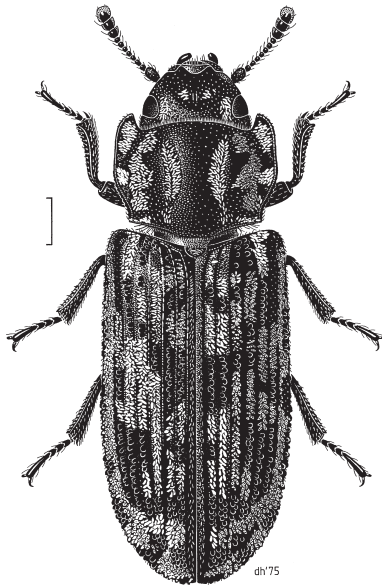


Fig. 1. Habitus of *Phanodesta nigrosparsa* (White), Des Helmore. Scale = 1 mm.

Phanodesta consists of seven Juan Fernandez species (Léveillé, 1888b, 1910; Elgueta & Arriagada, 1989). *Leperina* (variously treated as the genus *Lepidopteryx* Hope) is mainly a temperate genus and consists of 29 species ranging from the northern latitudes of eastern Asia south to Australia and New Zealand. *Leperina* is quite variable and members of *Phanodesta* are very similar to species occurring in New Zealand, most strikingly sharing a raised elytral carina that forms a keel which characterises some species and populations (Fig. 4b, g). *Phanodesta* and *Leperina* do not have the eyes divided (shared with *Melambia* Erichson from Egypt and *Seidlitzella* Jakobson from Europe). A divided eye with a small ventral portion located below the head and connected to the larger main eye by a row of elongate ommatidia (Fig. 3e) is a derived character found in the remaining gymnochiline genera (*Anacypta* Illiger, *Narcisa* Pascoe and *Xenoglana* Reitter from Asia, and *Gymnocheilus* Dejean from Africa; Figs 2a, b, d, f, 3e) and form a monophyletic group in Kolibáč (2006, 2008). We examine the morphological variation in New Zealand members of *Leperina* thoroughly, coding all of the species in a phylogenetic study of representative *Phanodesta* and other gymnochiline genera. We include Australian, New Caledonian, Lord Howe Island and Palaearctic exemplars of *Leperina* in the analysis to further determine the relationships amongst *Leperina* species and their relationship to *Phanodesta*. For all New Zealand trogossitines, we validate the names of described species by examination of types and recognise and name four new species. Eight species of *Leperina* (as *Lepidopteryx*) have been recorded from New Zealand (Maddison, 2010); one of these species is transferred to the ancyronine genus *Grynoma* Sharp and three are junior synonyms. The remaining trogossitine species *Tenebroides affinis* (White, 1846) is a synonym of *T. mauritanicus* (Linnaeus, 1758).

The placement of *Phanodesta* may have implications for tribal classification because it was placed by Kolibáč (2006) within a trichotomy containing Gymnochilini and Trogossitini in trees produced in his first family-level study (which placed *Melambia* and *Seidlitzella* in Trogossitini). However, in a subsequent family-level study that included the 'basal' cleroid *Phloiophilus* Stephens, Kolibáč (2008) placed *Phanodesta*, *Melambia* and *Seidlitzella* in Gymnochilini, thus rendering the Trogossitini paraphyletic. The trogossitid tribe Gymnochilini is most closely related to the tribe Trogossitini, sharing at least two characters as defined by Kolibáč (2006): mesocoxal cavities open and long setae absent from the elytra (as well as the procoxal cavities externally closed with an apically expanded prosternal process and the antennal club asymmetrical; e.g. Slipinski, 1992). Kolibáč (2006) considers Gymnochilini and Trogossitini (*contra* Lawrence & Newton, 1995) as separate but noted that further study of *Phanodesta* may place it eventually within Trogossitini, instead of Gymnochilini where it is classified currently (Léveillé, 1888b, 1910). In our study we include *Seidlitzella* and one genus of trogossitine to root the gymnochiline trees that would help determine the placement of *Phanodesta*.

Based on the isolated 'South American' distribution of *Phanodesta* and its similarity to true gymnochilines, Kolibáč (2006) hypothesized that the tribe may have originated in Laurasia and spread subsequently to the Americas during the Cretaceous as dated from a Baltic fossil clerid (see Kolibáč & Gerstmeier, 1997). Kolibáč (2006) admitted that his theory was weakened by the uncertain placement of *Phanodesta* in his tree, with the potential for placement within Trogossitini, a world-wide group. Perhaps more compelling is the origin of *Phanodesta* on the isolated Juan Fernandez Islands and its similarity in form to some Australasian members of *Leperina*. The Juan Fernandez Islands are located approximately 667 km off the coast of Chile, some 8792 km away from the mainland of New Zealand (Anonymous, 2012). The Juan Fernandez Islands form a small archipelago of three islands (a total of 100 km²) with the oldest island (Santa Clara) dated to 5.8 Ma (Stuessy *et al.*, 1984). The islands are located on a southern hotspot and an associated triple junction on the Nazca Plate (Cahill & Isacks, 1992). The archipelago has a rather small fauna and flora (e.g. Skottsberg, 1956; Kuschel, 1963), and biogeographic analyses are most complete for plants (150 species: Bernardello *et al.*, 2006). Much of the Juan Fernandez biota originated by dispersal from mainland South America, as indicated by plants (Bernardello *et al.*, 2006; Trénel *et al.*, 2007) and hummingbirds (Roy *et al.*, 1998), but the remainder is of Pacific origin, mainly groups that are Pan-Pacific, but with rarer cases being southern Pacific (Skottsberg, 1956; Bernardello *et al.*, 2006), including kelpfish which are Australasian in origin (BurrIDGE *et al.*, 2006). Although plants are more prone to long-distance dispersal (Sanmartín & Ronquist, 2004) and clearly there is a bias towards a South American origin for much of the flora, we wonder: is the terrestrial beetle fauna derived from South America, Australasia or from the wider Pacific? Understanding the phylogenetic placement of *Phanodesta* together with a tabulation of the distributions of all Juan Fernandez

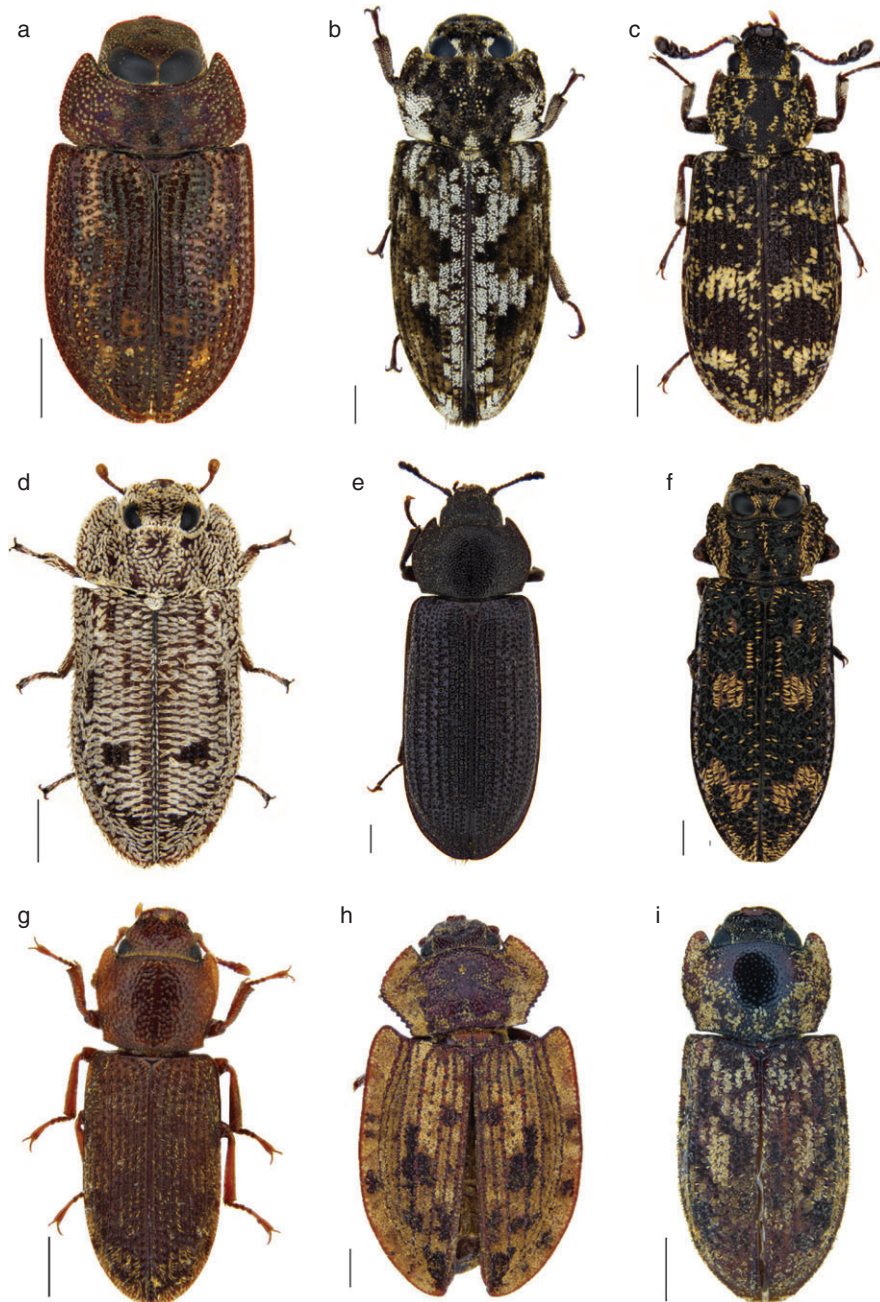


Fig. 2. (a–i) Dorsal images. a, *Anacypta punctata* (Fabricius); b, *Gymnocheilus* nr. *varia* (Fabricius) (Africa); c, *Kolibacia tibialis* (Reitter); d, *Narcisa* sp. (Philippines); e, *Seidlitzella procera* (Kraatz); f, *Xenoglena* sp.; g, *Phanodesta* sp. 1 (Juan Fernandez Islands); h, *Phanodesta pudica* (Olliff); i, *Phanodesta* sp. 1 (New Caledonia). Scale = 1 mm.

Coleoptera and their potential sister taxa would address this question.

Material and methods

Specimens examined were from the following collections: Auckland War Memorial Museum (AMNZ, John Early);

Australian Museum, Sydney (AMIC, D. Britton); John T. Nunn collection, Dunedin (JNIC); Barbara Barrett Insect Collection, Mosgeil (BBNZ); Entomology Research Museum, Lincoln University, Canterbury (LUNZ, J. Marris); Forest Research Institute Collection, Rotorua (FRNZ, John Bain); Muséum National d’Histoire Naturelle, Paris (MNHN, Antoine Manttleri); Museum of New Zealand, Wellington (Ricardo Palma and Phil Servid); Natural History Museum, London (NHML,

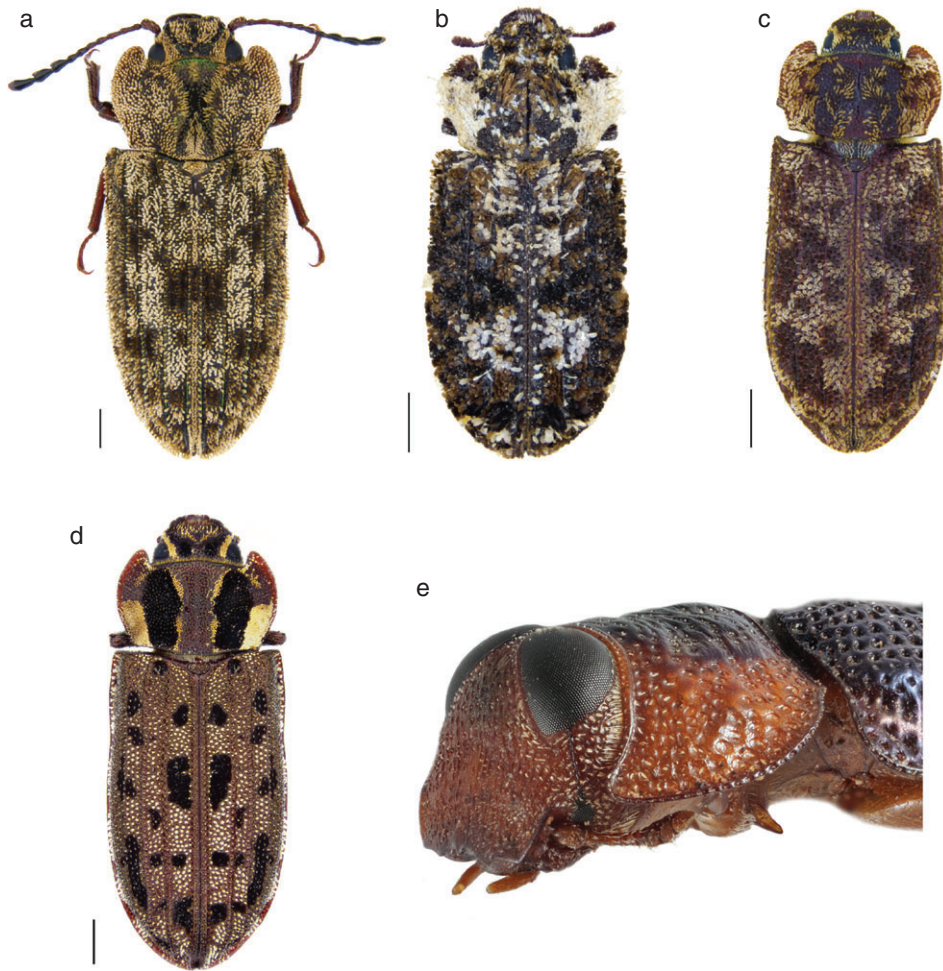


Fig. 3. (a–e) Dorsal and lateral images. a, *Phanodesta signoreti* (Montrouzier), ♂; b, *Leperina cirrosa* Pascoe; c, *Leperina moniliata* (Pascoe); d, *Leperina* nr. *decorata* (Australia); e, *Anacypta* sp. (Borneo). Scale = 1 mm.

M. Barclay and Roger Booth); New Zealand Arthropod Collection, Auckland (NZAC). Additional comparative material was made available from Australian National Insect Collection, CSIRO, Canberra (Adam Slipinski), Ehime University Museum, Matsuyama, Japan (Masahiro Sakai), Muséum d'Histoire Naturelle, Genève, Switzerland (Giulio Cuccodoro), Queensland Museum, Brisbane (QMB, Geoff Monteith), and the South Australian Museum, Adelaide (Eric Matthews). Images of some types from NHML and MNHP were sent to the authors and are noted in the checklists.

Glycerine and slide-mounted dissections were made following Leschen (2003). Length is measured from the middle edge of the pronotum to the tip of the abdomen and width is measured from the greatest width of the pronotum. Material examined is listed according to their Crosby codes (Crosby *et al.*, 1998) and exact label information is transcribed for syntypes, holotypes and historically important specimens in the NHML. The remaining data are standardised and geo-referenced with nontype material (contained in the File S1) by species.

New taxa are registered with ZooBank (zoobank.org).

Phylogeny and biogeography

Cladistic analysis

Twenty-two terminal taxa were scored for 47 adult characters (File S2). To adequately assess the monophyly of *Leperina* and *Phanodesta* we coded representatives from Australia (four species-terminals), Juan Fernandez Islands (one genus-terminal, *variegata* group), New Caledonia (two species-terminals), the eastern Palaearctic (one genus group-terminal, *tibialis* group) and all species of New Zealand *Leperina*. The Lord Howe Island species '*Ostoma*' *putidum* Olliff (Fig. 2h), is clearly not a member of the Boreal genus *Ostoma* Laicharting and is included as a species-terminal. The remaining gymnochilines were treated as genus-terminals, as was the Trogossitini outgroup, *Temnoscheila* Westwood. Dissected material on slide or glycerin includes the following: *Anacypta punctata* (Fabricius), ♂, Sarawak (Fig. 2a); *Gymnocheilis* nr. *varia* (Fabricius), ♀, Cameroon (Fig. 2b); *Leperina cirrosa* Pascoe, ♂, Australia (Fig. 3b); *Leperina decorata* (Erichson),

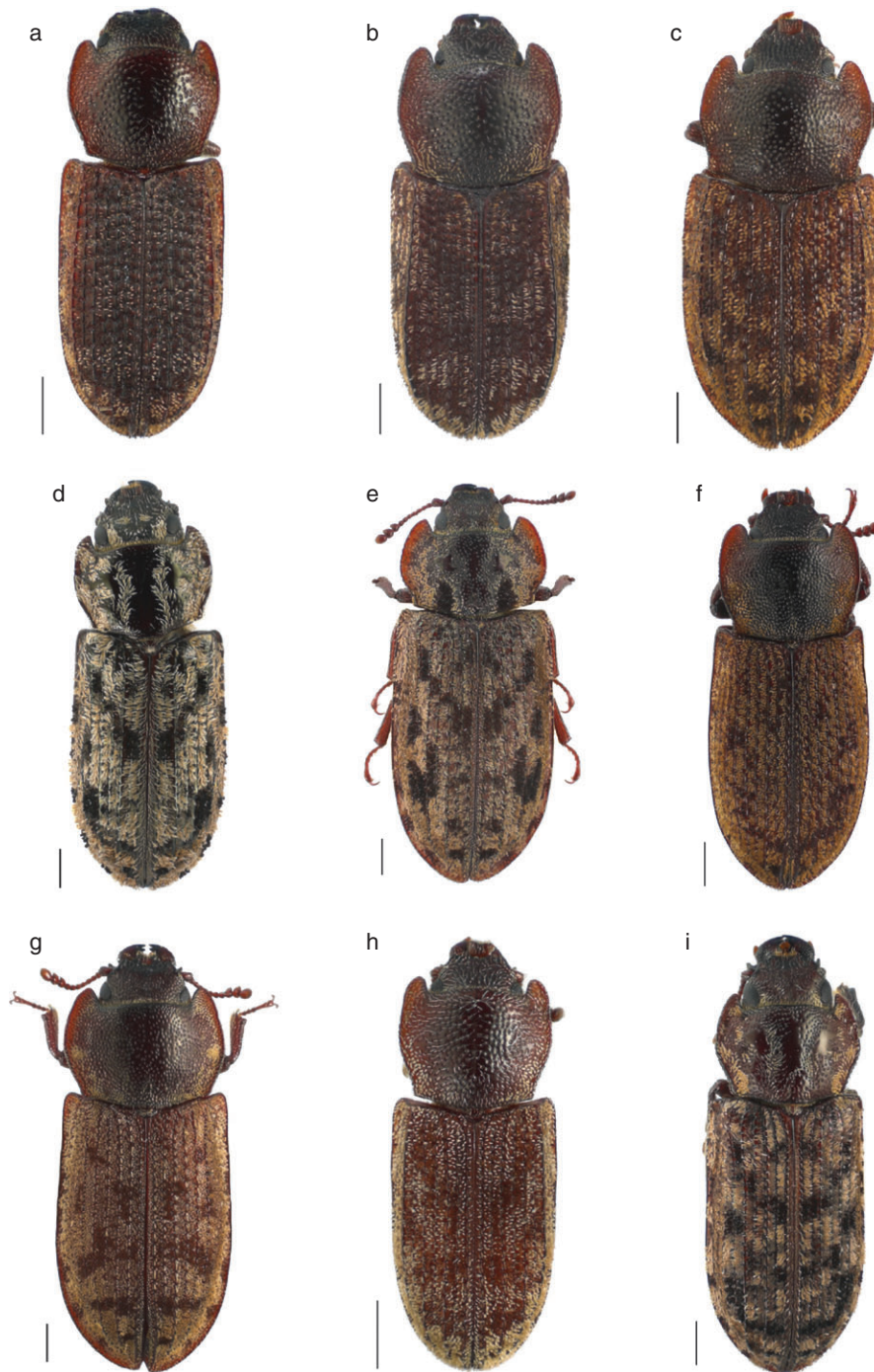


Fig. 4. (a–i) Dorsal images. a, *Phanodesta brounii* (Pascoe); b, *Phanodesta carinata* n.sp.; c, *Phanodesta manawatawhi* n.sp.; d, *Phanodesta nigrosparisa* (White); e, *Phanodesta oculata* n.sp.; f, *Phanodesta shandi* (Broun); g, *Phanodesta sobrina* (White); h, *Phanodesta tepaki* n.sp., *Phanodesta wakefieldi* (Sharp). Scale = 1 mm.

♂, Australia; *Leperina* sp.nr. *decorata*, ♂, Australia (Fig. 3d); *Leperina moniliata* (Pascoe), ♀, Australia (Fig. 3c); *Phanodesta signoreti* (Montrouzier), ♂, New Caledonia (Fig. 3a); '*Leperina*' *tibialis* (Reitter) (Fig. 2c), ♀, Japan; *Phanodesta* sp. 1, ♀, Juan Fernandez Islands (Fig. 2g); *Phanodesta* sp. 2,

♀, Juan Fernandez Islands; *Phanodesta* sp. 1, ♀, New Caledonia; *Narcisa* sp., ♂, Philippines; *Seidlitzella procera* (Kraatz), ♂, Cyprus (Fig. 2e); *Temnoscheila* sp., ♂, Bolivia; *Xenoglena* sp., ♀, Malaysia (Fig. 2f). Specimens of *Melambia* were not available for this study.

Multistate characters were treated as polymorphic and unknown states were treated as missing (?). The data were coded (Table S1, Table 1) and entered into MacClade v3 (Maddison & Maddison, 1992) for character analysis. Tree reconstruction was done with Paup* v4.0b10 (Swofford, 2003) implementing heuristic tree searches that include the following settings: swapping on all trees, random addition sequences (5000 replicates) and character states unordered. Branch support was examined using decay indices (DI; Bremer, 1994), calculated by the program TreeRot (Sorenson, 1999). Bootstrap values (BS; Felsenstein, 1985; Sanderson, 1995) were calculated by resampling at 1000 replications using simple searches while holding 1 tree at each step and swapping on the best tree. Characters were optimised onto trees using ACC-TRAN (accelerated transformation) and DELTRAN (delayed transformation) optimisations (Maddison *et al.*, 1992), and in the discussions below characters that reverse or transform to other states are indicated by superscript C^r and C^t, respectively. Characters were optimised on a reference tree (50% majority-rule consensus tree with fixed relationships) in MacClade.

Results from cladistic analysis

The analysis resulted in 75 trees [Tree Length = 138, Consistency Index (excluding uninformative characters) = 0.46, Retention Index = 0.67]. In the majority-rule consensus tree (Fig. 7), the trogossitine *Seidlitzella* and 'enigmatic' genus *Phanodesta* are placed well inside *Gymnochilini*, and the gymnochilines are divided into two groups, the split-eyed group always shown as monophyletic, and the remaining normal-eyed group monophyletic in 64% of the trees. '*Ostoma pudicum*' and *Phanodesta* are placed well within *Leperina* from New Caledonia and New Zealand. The placement of the *tibialis* group indicates that it is not a true member of *Leperina*. It is placed with *Leperina* and *Phanodesta* in only ten trees. Character distributions for the phylogenetic groups are as follows.

Gymnochilini. Dorsal vestiture consisting of scales (2-2^r, ACCTAN, reverses to glabrous in *Anacypta* and *Seidlitzella*; edge of labrum weakly emarginate (6-2); anterior prothoracic angles projecting (14-1); shape of median strut acute (43-5^t, transforms to various states); protibial mucro weakly developed or absent (45-1).

Split-eyed group. Frons strongly oblique (4-1); eye completely divided (7-1); antennal club compact (11-1); last antennomere transverse (13-2^r, reverses to circular in *Narcisa*); intercarinal scales elongate (33-0, scales are absent in *Narcisa*); epipleuron hidden in lateral view (37-1^r, ACCTAN, reverses in *Xenoglena* and present in *Phanodesta manawawhati* and Australian *Leperina*).

Normal-eyed group. Gena acute (8-1); last antennomere distinctly longer than wide (13-0^r, ACCTAN, reverses to circular in other members of the group); discal carinae of

the elytra present (25-1, DELTRAN, present outside this group in *Gymnocheilus*); seven carinae present on the elytra (28-3^t, wildly variable in this group); intercarinal scales elongate (33-1^r, reverses in several *Leperina* species and coded as inapplicable in *Seidlitzella*); protibial spur longer than tarsomere 2 (46-1, DELTRAN); anteriormost tibial spur greatly enlarged (47-1).

Leperina + Phanodesta. Pronotal surface uneven (5-0^r, reverses and variable in *Leperina*, and also present in *Xenoglena*); pronotal punctation irregular (16-1^r, variable in *Leperina* and *Phanodesta*).

Leperina. Three carinae present on the elytra (28-5); intercarinal space of elytra multipunctate (30-1); epipleuron hidden in lateral view (37-1); protibial edge spinate (44-2).

Phanodesta. Lateral carinae of prothorax unevenly crenulate (18-2^t, DELTRAN, transforms to simple in *Phanodesta* and strongly and evenly crenulate in *Leperina* New Caledonia sp. 1); prosternal process glabrous at middle (22-1^r, DELTRAN); elytral carinae beaded (26-1^r, reverses in *L. nigrosparisa*); intercarinal space of elytra apunctate (30-2); window punctures absent (31-0); protibial edge crenulate (44-1^t, smooth in '*O. pudicum*' and variable in *Phanodesta manawawhati*).

Constitution of *Gymnochilini* and *Leperina*

The classification of Trogossitidae was reviewed by Kolibáč & Leschen [(2010); see also Kolibáč (2008) and Kolibáč & Zaitsev (2010)]. The current arrangement of the family-groups is based largely on the study by Kolibáč (2006), who analysed the generic-level relationships of the Trogossitidae based on 43 terminal taxa and 88 characters (55 adult, 31 larval and 1 behavioural). Kolibáč (2006) provides the following relationships for the Trogossitinae: Calytini Larinotini Egoliini (*Phanodesta* + remaining *Gymnochilini* + Trogossitini). Subsequently, using a modified character matrix that included *Phloiophilus*, Kolibáč (2008) produced the same relationships showing a derived monophyletic *Gymnochilini* rendering Trogossitini paraphyletic. Here we focused on *Gymnochilini* and did not examine critically, character by character, the data matrix used by Kolibáč (2006, 2008; planned in a separate study). Nor did we study critically the *Gymnochilini* larvae known for Australian, New Zealand and east Palearctic forms (see below).

The monophyly of the split-eyed group is confirmed here (as in Kolibáč, 2006, 2008), but we recover fully resolved generic relationships (Fig. 7). The trichotomy at the base of *Phanodesta* + *Gymnochilini* + Trogossitini in Kolibáč (2006) and the nearest-neighbour relationship of *Leperina* and *Phanodesta* in Kolibáč (2008) may have been the result of his genus-coding of *Leperina*, which, as shown in this study, is paraphyletic. The paraphyly of Trogossitini as shown by Kolibáč (2008)

Table 1. Endemic Coleoptera of Juan Fernandez Islands^a with number of species and presumed sister-area. Endemic genera are marked (*).

| | | |
|---|-----------|-------------------------------|
| Dytiscidae ¹ | | |
| * <i>Anisomeria</i> Brinck, 1944 | 1 species | Tristan de Cunha |
| <i>Lancetes</i> Sharp, 1882 | 1 species | Australasian |
| Carabidae ² | | |
| <i>Axinopalpus</i> LeConte, 1848 | 1 species | South America |
| <i>Metius</i> Curtis, 1839 | 2 species | South America |
| <i>Trachysarus</i> Reed, 1874 | 8 species | South America |
| <i>Trechisibus</i> Motschulsky, 1862 | 2 species | South America |
| <i>Trirammatius</i> Chaudoir, 1835 | 3 species | South America |
| Staphylinidae ³ | | |
| <i>Atheta</i> Thomson, 1858 | 2 species | Widespread |
| <i>Zeoleusis</i> Steel, 1950 | 1 species | Australasia, Chile |
| <i>Medon</i> Stephens, 1833 | 1 species | Widespread |
| ' <i>Zoothesa</i> ' | 1 species | Western Palaearctic |
| <i>Teropalpus</i> Solier | 1 species | New Zealand, Australia, Chile |
| Eucnemidae | | |
| <i>Pseudodiaeretus</i> Fleutiaux, 1901 | 1 species | South America |
| Ptinidae | | |
| <i>Calymmaderus</i> Solier, 1849 | 1 species | South America |
| * <i>Masatierrum</i> Pic, 1924 | 1 species | North America |
| Trogossitidae | | |
| <i>Phanodesta</i> Reitter | 7 species | Australasia, Chile |
| Cryptophagidae ⁴ | | |
| * <i>Cryptothelypteris</i> Leschen & Lawrence, 1991 | 5 species | South Temperate |
| * <i>Cryptosomatula</i> Bruce, 1940 | 1 species | South Temperate |
| Erotylidae ⁵ | | |
| <i>Loberoschema</i> Reitter, 1896 | 2 species | Chile |
| Nitidulidae ⁶ | | |
| <i>Cnips</i> Philippi, 1864 | 5 species | Chile |
| Mycetophagidae | | |
| * <i>Filicivora</i> Leschen & Lawrence, 1991 | 1 species | Unknown |
| Ciidae | | |
| <i>Cis</i> Latreille, 1796 | 2 species | Unknown |
| Zopheridae ⁷ | | |
| <i>Pycnomerodes</i> Broun, 1886 | 2 species | New Zealand |
| <i>Pycnomerus</i> Erichson, 1842 | 1 species | Widespread |
| Tenebrionidae | | |
| <i>Nycterinus gracilipes</i> Philippi | 1 species | South America |
| Chrysomelidae ⁸ | | |
| * <i>Minotula</i> Weise, 1924 | 3 species | Unknown |
| Anthribidae ⁹ | | |
| * <i>Opisalia</i> Jordan, 1926 | 1 species | Unknown |
| Curculionidae ¹⁰ | | |
| * <i>Anolethrus</i> Aurivillius, 1931 | 1 species | Unknown |
| * <i>Apteronanus</i> Aurivillius, 1931 | 2 species | Unknown |
| <i>Cyphometopus</i> Blanchard, 1849 | 1 species | Chile |
| * <i>Juanorhinus</i> Aurivillius, 1931 | 2 species | Widespread |
| * <i>Pachystylus</i> Wollaston, 1873 | 3 species | Widespread |
| <i>Pachytrogus</i> Wollaston, 1873 | 1 species | Chile |
| <i>Pentarthrum</i> Wollaston, 1854 | 1 species | pan-Pacific, Australasian |
| * <i>Platynanus</i> Aurivillius, 1931 | 6 species | widespread |
| <i>Strongylopterus</i> Schoenherr, 1837 | 1 species | pan-Pacific, Australasian |

^aThere are about 50 introduced species from seven families (Skottsberg, 1956; Ferrú & Elgueta, 2011; M.A. Ferrú and M. Elgueta, unpublished data). The Juan Fernandez beetle fauna remains poorly documented and out of date (e.g. Will, 2005) with hundreds of unstudied specimens derived from survey work requiring description and documentation. For example, the molytine weevil tribe Juanorhinini, currently listed as endemic to Juan Fernandez Islands by Alonso-Zarazaga & Lyal (1999), has many undescribed species (Skottsberg, 1956: 309; G. Kuschel and C.W. Obrien, personal communication) but presently contains a similar number of described species as Carabidae. This imbalance is related to lack of study and does not represent true diversity.

¹Jerez & Moroni (2006); ²K. Will, personal communication; ³Steel (1950); ⁴Leschen & Lawrence (1991); ⁵Leschen (2003); ⁶Gillogly (1955); ⁷Pope (1955); ⁸Scherer (1983); ^{9,10}Elgueta & Marvaldi (2006); ¹⁰Alonso-Zarazaga & Lyal (1999), Aurivillius (1926) and Franz (2006).

Data based on Skottsberg (1956) with additional references indicated.

indicates that a comprehensive study of Trogossitinae is critically needed to determine whether or not the two tribes are synonymous (e.g. Lawrence & Newton, 1995).

The overall similarity of *Phanodesta* to some *Leperina* s.l., especially those with beaded elytral carinae (C26, Fig. 5c) and, further, to those species of *Phanodesta* and *Leperina* with a sublateral keel or ridge (C29, Fig. 4a, b) is indicative of phylogenetic relationship. *Phanodesta* also has the distinctive red-brown body colour (C1, Figs 2g, 4a–c, f–h) shared by many *Leperina*, in particular New Zealand forms, but also the intercarinal spaces lack punctures (C30), which are present in Australian (Fig. 5b) and Palaearctic *Leperina* (Fig. 5a). We propose that Australasian *Leperina* having these characters, in particular the synapomorphies of the beaded elytral carinae and the presence of crenulate protibial edges (C44, Fig. 5d), be transferred to *Phanodesta*, thereby expanding the geographic range of the genus significantly. This action supports Reitter (1876) who included non-Juan Fernandez species in the genus

Phanodesta. Larval characters may be uninformative for the separation of *Phanodesta* from the *tibialis* group, though those of *L. squamulata* (Gebler) (see Zaitsev, 2008) have distinctive well-pigmented patterns on the terga and may lack stemmata (coded as inapplicable in Kolibáč (2006); five stemmata are present in New Zealand *Phanodesta*). Therefore, we reject Sharp's (1877a) comment that *Phanodesta* was unnecessary: we place all species that have beaded carinae and lack the intercarinal punctures into *Phanodesta*. This action also places '*Ostoma*' *puddicum* in *Phanodesta*.

Paraphyly of *Leperina* is rendered also so by the placement of the Palaearctic *Leperina tibialis* group. The *tibialis* group lacks well-developed raised elytral carinae (C28, Fig. 5a), has bipunctate intercarinal spaces (C30, Fig. 5a), the epipleura are visible in lateral view (C37) and they do not have spinate protibial edges (C44) as in Australian *Leperina*. *Leperina* remains a valid genus (Löbl & Smetana, 2011, see below) and, based on our study, broad definitions of the genus, such

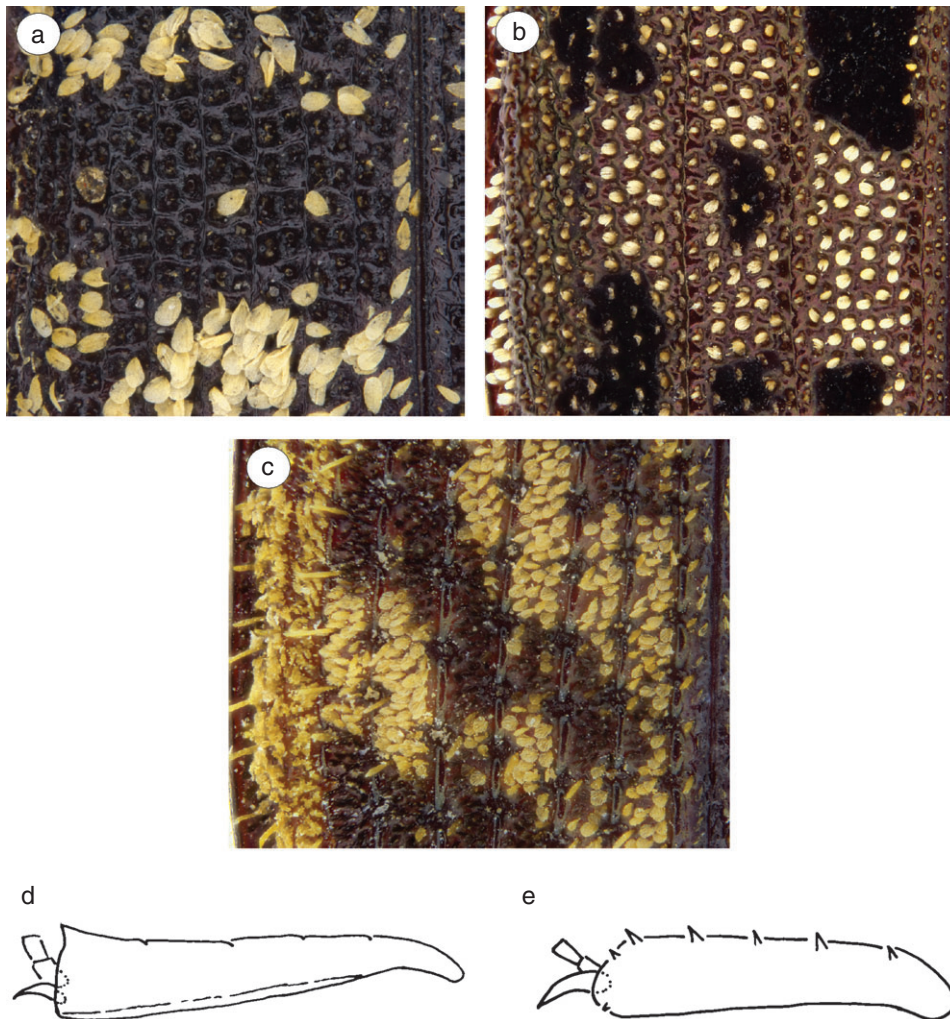


Fig. 5. (a–e) Detail of the elytra and protibiae. a, Elytron of *Kolibacia tibialis* (Reitter); b, elytron of *Leperina* nr. *decorata* (Australia); c, elytron of *Phanodesta shandi* (Broun); d, protibia of *Phanodesta shandi*; e, *Leperina decorata* (Erichson).

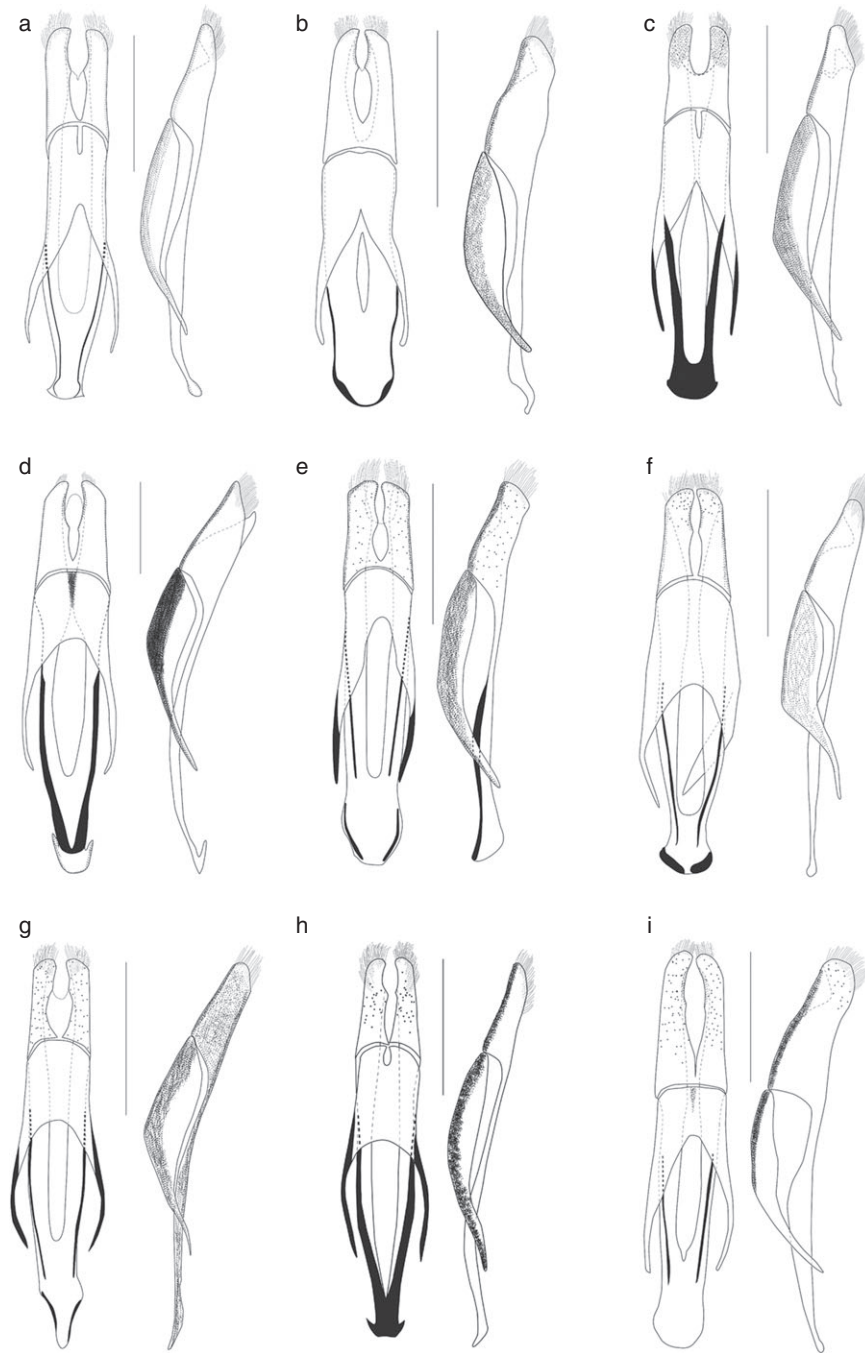


Fig. 6. (a–i) Dorsal (left) and lateral (right) views of aedeagi. a, *Phanodesta brounii* (Pascoe); b, *Phanodesta carinata* n.sp.; c, *Phanodesta manawatawhi* n.sp.; d, *Phanodesta nigrosparsa* (White); e, *Phanodesta oculata* n.sp.; f, *Phanodesta shandi* (Broun); g, *Phanodesta sobrina* (White); h, *Phanodesta tepaki* n.sp.; i, *Phanodesta wakefieldi* (Sharp).

as Erichson’s (1844) concept that included two species [*Peltis squamulata* (Gebler) and *Trogosita decorata* Erichson, 1842] require revision. Therefore, we place the Palaearctic *Leperina* formally into a new genus leaving the mainly Australian *Leperina* s.s. as the valid members of *Leperina* (the type species is from Tasmania).

This study began as a simple, modest review of the New Zealand “*Leperina*” and unexpectedly grew as we continued our research. We acknowledge that our study is incomplete taxonomically, with many unresolved issues. The variation in species that we have seen in images sent by colleagues indicate that all taxa included formerly in *Leperina* require detailed

three characters: sublateral elytral keel present (29-1, polymorphic in the *variegata* group and *P. brounii*), interstitial scales elongate (33-0) and absence of hind wings (38-2). However, discovery of the exact geographic source of Juan Fernandez *Phanodesta* must await a more detailed study. Furthermore, we cannot confirm the monophyly of Juan Fernandez Island species, although the ctenidium on the male mentum is composed of curled setae that are not tightly packed and straight as in other Gymnochilini.

Many species of *Phanodesta* lack wings or have vestigial, nonfunctional hindwings; and the absence of hindwings among Northland and Juan Fernandez species would indicate that wind-mediated dispersal is impossible, if these share a common ancestor. The lack of functional wings is direct evidence that western ocean-currents (not winds) would have to have been responsible for carriage of any Australasian colonizers across the southern Pacific Ocean, perhaps confined within dead wood held buoyant following a flood.

At the time of the writings of Skottsberg (1956) and Kuschel (1963) the Juan Fernandez beetle fauna was estimated to consist of 19 families and about 200 species. In updating this information we tallied 76 endemic species from 16 families with their broader geographic ranges shown in Table 1. Thirty-six percent of the Juan Fernandez beetles have relatives in South America (four from Chile), 36% have unknown sister relations or are contained within widespread lineages and 11% have Australasian relationships (two from New Zealand). It is difficult to distinguish between pan-Pacific/Australasian lineages (e.g. *Pentarthrum*; Alonso-Zarazaga & Lyal, 1999) from true temperate South Pacific groups (e.g. *Pycnomerodes*; Pope, 1955) because of the lack of phylogenetic data. We concur with Kuschel (1963) who believed that the pattern for insects was similar to that for plants as reported by Skottsberg (1956) and Bernardello *et al.* (2006) who argued for South American origins of the flora with a small fraction derived from Australasia. Though western drift may not explain the colonising history for the majority of Juan Fernandez beetles, the presence of Australasian lineages that have dispersed via westerly ocean currents has precedent in other groups (Burridge *et al.*, 2006).

Taxonomy

Kolibacia gen. n.

(Figs 2c, 5a)

Type species: *Leperina tibialis* Reitter, 1889, here designated. <http://zoobank.org/urn:lsid:zoobank.org:act:7E017B4C-92F0-423D-9D41-2111B41EC0C1>

Diagnosis. Eyes entire. Dorsal vestiture consisting of scales. Median lobe of clypeus absent. Antenna 11-segmented. Prothoracic lateral carinae unevenly crenulate. Elytral carinae present and not beaded; intercarinal space bipunctate; window punctures present and simple. Protibial edge smooth, mucro absent.

Description. Length 7.2–9.1 mm. Colour of body black. Dorsal vestiture consisting of scales. Head extending beyond anterior angles of pronotum. Frons more or less horizontal with mandibles visible dorsally. Median lobe of clypeus absent. Edge of labrum straight. Eyes entire. Gena acute. Supra-ocular scales present. Antenna 11-segmented with a loose club; lengths of antennomere II and III equal; antennomere XI circular, about as long as wide. Prothorax with lateral carinae unevenly crenulate; anterior angles projecting or acute; posterior angles angulate. Surface of pronotal disc even; punctation uniform and bearing scales. Procoxae visible in lateral view. Hypomeron bearing scales; anterior portion rugose. Length of elytra = or >4× as long as pronotum; seven elytral carinae present, not beaded and not rising significantly above surface of elytral disc; sublateral keel absent; intercarinal space bipunctate; window punctures present and simple; intercarinal scales never countersunk within punctures; lateral carina simple; epipleuron visible in lateral view. Hind wings present, fully developed; MP₃ spur absent. Aedeagus (Kolibáč, 2005) with parameres apically angulate; inner outline between parameres weakly sinuate or straight; length of parameres longer than base of tegmen. Protibial edge smooth, mucro absent; protibial spurs longer than T₂, anteriormost protibial spur greatly enlarged.

Comments. *Kolibacia* can easily be distinguished from *Leperina* by having the intercarinal space bipunctate with the window punctures simple, and from *Phanodesta* by having elytral carinae not beaded. The description of the genus is based on the two species we examined for the phylogenetic study, but a more thorough study will be necessary to confirm species taxonomy and validity of the two subspecies below. *Kolibacia* includes two mycophagous species from the eastern Palaearctic (Kryzhanovskij, 1965; Nikitsky, 1992) that were included most recently in the genus *Leperina* by Löbl & Smetana (2011).

Etymology. Named in honour of Jiří Kolibáč (Brno, Czech Republic) for his contributions to cleroid systematics, in particular Cleridae, Trogossitidae and the naming of the New Zealand endemic family Metaxinidae.

Checklist of *Kolibacia* species

squamulata Gebler, 1830:97 (*Peltis* O. F. Müller), **comb.n.** Asia (Kolibáč, 2007).

Lepidopteryx squamulata: Löbl and Smetana 2010:26.

Leperina squamulosa (misspelling): Léveillé 1888b:442.

squamulata squamulata Gebler, 1830:97. East Siberia, Russia Far East, Mongolia, Nei Mongol, North Korea, Northeast Territory China.

squamulata tsushimana Nakane 1985:162 (*Lepidopteryx*). Japan.

tibialis Reitter, 1889:217 (*Leperina*), **comb.n.** Japan.

Lepidopteryx tibialis: Löbl and Smetana 2010:26.

***Leperina* Erichson, 1844**

(Figs 3b–d, 5b)

Leperina Erichson in Germar, 1844:453. Type species: *Trogosita decorata* Erichson, 1844, subsequent designation by Kolibáč 2005: 65.

Onyschomorpha Arrow, 1900:94. Type species: *Onyschomorpha marmorata* Arrow, 1900:94, by monotypy. Synonymy by Kolibáč, 2005:65.

Diagnosis. Eyes entire. Dorsal vestiture consisting of scales. Median lobe of clypeus absent. Antenna 11-segmented. Prothoracic lateral carinae simple, weakly or unevenly crenulate. Elytral carinae present and not beaded; intercarinal space multipunctate; window punctures present and tuberculate. Protibial edge spinate, mucro absent.

Description. Length 5.5–15.6 mm. Colour of body black and red-brown, unicolourous to multicoloured. Dorsal vestiture consisting of scales. Head extending beyond anterior angles of pronotum. Frons more or less horizontal with mandibles visible dorsally. Median lobe of clypeus absent. Edge of labrum weakly emarginate or straight. Eyes entire. Gena acute. Supraocular scales present or absent. Antenna 11-segmented with loose antennal club, lengths of antennomeres II and III equal or not; antennomere XI distinctly longer than wide and circular, about as long as wide. Prothorax with lateral carinae simple, weakly or unevenly crenulate; anterior angles projecting or acute; posterior angles of prothorax angulate. Pronotal surface generally uneven, punctuation uniform or not with or without median glabrous areas; centre of disc usually bearing scales. Procoxae visible in lateral view. Hypomeron with or without scales, setose or glabrous; anterior portion rugose. Length of elytra 2.5–4× as long as pronotum or greater; disc with three simple carinae that are not beaded; sublateral keel absent; intercarinal space multipunctate; window punctures present and tuberculate; intercarinal scales of elytral disc variable, from very short and oval that may be countersunk within punctures or elongate with lengths at least 2.5× longer than wide; lateral carina simple; epipleuron hidden in lateral view. Hind wings present, fully developed; MP₃ spur present (see also Kukulová-Peck & Lawrence, 1993). Aedeagus (see also Kolibáč, 2005) with parameres apically rounded to acute, inner outline between parameres bisinuate, weakly sinuate, or straight, length of parameres variable, median strut acute. Protibial edge spinate, mucro absent or weakly developed, spurs longer than T2 with anteriormost spur greatly enlarged.

Comments. *Leperina* can easily be distinguished from *Kolibacia* by having the intercarinal space multipunctate with the window punctures tuberculate, and from *Phanodesta* by having elytral carinae not beaded.

The nomenclatural history of *Leperina* is complicated. Most recently, Kolibáč (2009) and Löbl & Smetana (2010) included *Leperina* Erichson, 1844 (type species: *Trogosita decorata* Erichson, 1844) erroneously as a synonym of *Lepidopteryx*

(see also Lawrence & Britton, 1991 and Matthews, 1992). However, *Gymnocheilus* Dejean, 1835 and *Lepidopteryx* Hope, 1840, are objective synonyms because they share type species (Dejean, 1835:314 listed three species under his genus, but two are *nomina nuda*). The type species of *Lepidopteryx* and *Gymnocheilus* (*Trogosita squamosa* Gray in Griffith & Pidgeon, 1832 a synonym of *Trogosita varia* Fabricius, 1801: 151; e.g. Murray, 1867: 334, Léveillé, 1888b; Löbl & Smetana, 2011:35) was described from ‘Melville’s Island’, but the figure of this species matches African species of *Gymnocheilus* Dejean with split-eyes (but see Arrow 1909) and, therefore, the taxa contained within *Gymnocheilus* are not relevant phylogenetically to true *Leperina* nor *Phanodesta* (all with normal eyes). *Gymnocheilus* Dejean, 1835 has priority of the later name *Gymnochila* Erichson, 1844 [type species: *Trogosita vestita* Griffith, 1832, by monotypy, a synonym of *Gymnochila varia* (Fabricius, 1801) according to Léveillé, 1910: 22], although Reitter (1876: 37) placed *Lepidopteryx* as a synonym of *Gymnochila*. Note that White (1846) misspelled *Gymnocheilus* as *Gymnocheila* and wrongly attributed the name to Gray. Schawaller (1993) considered the monotypic genus *Seidlitzella* a synonym of *Leperina*, following Reitter (1882, 1922), based on larval characters.

The description of *Leperina* is based on a few species we examined for the phylogenetic study, but much work is needed on the genus in Australia, New Guinea, New Caledonia and elsewhere. Members of *Leperina* are associated with dead and living trees, and may be predacious, based on observations of *Leperina cirrosa* Pascoe (Hawkeswood, 1992).

Checklist of *Leperina* species

adusta Pascoe, 1860:100. Australia (Victoria).

burnettensis W.J. Macleay, 1871:164. Australia (Queensland).

cincta Léveillé, 1888a:427. New Caledonia.

Note: An image of one of the types of this species (MHNP) indicates that this species does not have distinctly beaded elytral carinae like *Phanodesta*.

cirrosa Pascoe, 1860:100. Australia (Queensland).

conspicua Olliff, 1886:704. Australia (Queensland).

decorata Erichson, 1842:150 (*Trogosita* Fabricius). Australia (Tasmania, Queensland).

Leperina decorata: Erichson, 1844: 454

Leperina gayndahensis W. J. Macleay, 1871:164 (Synonymy by Olliff, 1886: 702).

fraterna Olliff, 1886: 707. Australia (Western Australia).

lacera Pascoe, 1860:101. Australia (New South Wales).

Lepidopteryx lacera: Matthews, 1992:65

Leperina signoreti Reitter, 1876:36 (Synonymy by Léveillé, 1889: 657).

loriae Léveillé, 1893:248. New Guinea.

Note: An image of the type of this species (MNHP) indicates that this species may have beaded elytral carinae, but also has a similar form to *Leperina marmorata* Arrow, which has a widely expanded and explanate pronotum. It is retained here until further study.

mastersi W.J. Macleay, 1871:163. Australia (Queensland).

moniliata Pascoe, 1872: 318 (*Peltis*). Australia (Victoria).

Leperina moniliata: Blackburn, 1902: 311.

marmorata Arrow, 1900: 94 (*Onyschomorpha*). Christmas Island.

Leperina marmorata: Kolibáč, 2005: 65.

Note: An image of one of the types of this species (NHML) indicates that this species does not have distinctly beaded elytral carinae like *Phanodesta*.

opatroides Lèveillé, 1884:637. New Guinea. Note: An image of one of the types of this species (MHNP) indicates that this species does not have distinctly beaded elytral carinae like *Phanodesta*.

lichenea Fauvel, 1866:180 (*Soronia* Erichson). New Caledonia.

Leperina lichenea: Lèveillé, 1888b:441.

lifuana Fauvel, 1903:298. New Caledonia.

seposita Olliff, 1886:702. Australia (Victoria).

spercheoides Lèveillé, 1878:lxxx. New Caledonia.

Note: An image of one of the types of this species (MHNP) indicates that this species does not have distinctly beaded elytral carinae like *Phanodesta*.

turbata Pascoe, 1863:29. Australia (New South Wales).

Lepidopteryx turbata: Lawrence and Britton, 1991: 646

Leperina fasciculata Redtenbacher, 1867:37 (Synonymy by Lèveillé, 1889: 657).

***Phanodesta* Reitter 1876**

(Figs 1, 2g–i, 3a, 4a–i, 5d, 6a–i)

Phanodesta Reitter, 1876: 31. Type species: *Phanodesta cordaticollis* Reitter, 1876: 33, subsequent designation by Kolibáč 2005: 77.

Diagnosis. Eyes entire. Dorsal vestiture consisting of setae, scales or both. Median lobe of clypeus absent. Antenna 11-segmented. Prothorax with lateral carinae simple, or variably crenulate. Elytral carinae present and usually beaded; intercarinal space apunctate; window punctures absent. Protibial edge smooth or crenulate; mucro absent or weakly developed.

Description. Length 5.4–11.5 mm. Colour of body black or red-brown. Dorsal vestiture consisting of setae, scales or both. Head extending beyond anterior angles of pronotum. Frons more or less horizontal with mandibles visible in dorsal view. Median lobe of clypeus absent. Edge of labrum weakly to strongly emarginate or straight. Eyes entire. Gena acute. Supra-ocular scales present or absent. Antenna 11-segmented with loose club; relative lengths antennomeres II and III variable; antennomere XI distinctly longer than wide and circular, about as long as wide or shorter. Prothorax with lateral carinae simple, or weakly to strongly and evenly or unevenly crenulate; anterior angles projecting or acute; posterior angles angulate. Pronotal surface even or uneven with impressions or shallow grooves; punctuation uniform or not, with or without median area glabrous. Procoxae visible in lateral view. Hypomeron setose, glabrous, or bearing scales; anterior portion

of hypomeron weakly to strongly rugose. Length of elytra 2.5–4 times as long as pronotum; carinae present and usually beaded, with punctures located centrally within it, or adjacent and contacting carina; number of carinae variable, but usually 7–9; sublateral keel absent or present; intercarinal space apunctate; window punctures absent; intercarinal scales of disc never countersunk within puncture, elongate with lengths 2.5× longer than wide or ovate to circular with lengths <2.5× longer than wide; scales erect or not overlapping to strongly overlapping and adpressed; lateral carina simple; epipleuron visible or hidden in lateral view. Hind wings present and fully developed with MP₃ spur present or vestigial and in the form of small buds, or absent. Aedeagus with parameres apically angulate, rounded or acute; inner outline between parameres bisinuate, weakly sinuate or straight; length of parameres and shape of median strut variable. Protibial edge smooth or crenulate; mucro absent or weakly developed; spurs longer than T2 with anteriormost protibial spur greatly enlarged. Bursa and spermatheca bulbous, spermatheca about one fifth the size of the bursa and bearing a small tubulate spermathecal gland.

Comments. *Phanodesta* can easily be distinguished from *Kolibacia* and *Leperina* by having the intercarinal space apunctate and the presence of protibial serrations in most specimens.

Reitter (1876) erected the genus *Phanodesta* for four species from Chile (Juan Fernandez Islands), and transferred to it species from New Zealand [*Gymnocheila nigrosparsa* (White, 1846), *Gymnocheila sobrina* (White, 1846)] and New Caledonia (*Nitidula argentea* Montrouzier, 1860 and *Nitidula guerini* Montrouzier, 1860) that were placed in *Leperina* by Lèveillé (1888b, 1910). Reitter (1876) noted that the morphology of *Phanodesta* was between *Tenebroides* Piller and Mitterpacher and *Leperina*, and provided characters that separated *Phanodesta* from these two genera.

Kolibáč (2005, 2006) considered the transverse ctenidium on the submentum of males (sometimes present as a single median cluster) as absent in *Phanodesta*, although this character was considered present in the original description of the genus by Reitter (1876: 31): '*Mentum in medio fasciculo transverso fulvo-piloso*'. This character is widespread in gymnochilines and in most groups the setae are erect and closely packed, whereas in some there is a single tight cluster of fewer setae. In *Phanodesta*, the ctenidium is present but the setae are apically curled and less densely clustered based on material studied in NZAC and MNHG representing at least three species. It is unclear if all described species have the ctenidium, though, and thorough examination of the type material of the Juan Fernandez species described by Germain in the Museo Nacional de Historia Natural (Santiago), Reitter (MNHP) and Pic (Naturhistoriska Riksmuseet, Stockholm) is necessary for confirming character variation and verifying taxonomic validity of the described species. Below we revise the New Zealand and Lord Howe species.

Members of *Phanodesta* may be collected commonly at night on fungi and on the trunks of dead, dying or, in some cases, live trees. In New Zealand, it seems that individuals on

offshore islands (i.e. Poor Knights and Three Kings Islands) are fairly common, but mainland species are less abundant. Larvae of *Phanodesta* are found in association with adults and are thought to be predacious under the bark of dead trees (Klimaszewski & Watt, 1997). The species *P. nigrosarsa* is restricted to certain tree species, like *Phyllocladus trichomanoides* (Kuschel, 1990) or kauri trees (*Agathis australis*) whereas *P. brounii* is a generalist (Kuschel, 1990). A Quaternary fossil of *P. wakefieldi* was reported by Marra & Leschen (2004) from Awatere Valley, South Island. The larva attributed to *Phanodesta* by Crowson (1964) was later attributed by him (Crowson, 1970) to *Acalanthis* Erichson (Trogossitinae: Egoiini).

Key to New Zealand *Phanodesta*

1. Species black; posterior margin of pronotum lobed at middle (Figs 1, 4c) *P. nigrosarsa* (White)
 - Species red-brown; posterior margin of pronotum not lobed at middle 2
2. Pronotal disc completely lacking distinct setae, with scales only 3
 - Pronotal disc having distinct setae, scales may be present 5
3. Pronotum lacking distinct shallow impressions, punctation more or less uniform over entire disc; Three Kings Islands (Fig. 4c) *P. manawatawhi* **n.sp.**
 - Pronotum with distinct shallow impressions, punctation not uniformly distributed over entire disc 4
4. Base of pronotum with large patch of black scales; width of elytral carina 3 about the same as carina 4 (Fig. 4e)
 - *P. oculata* **n.sp.**
 - Base of pronotum lacking large patch of black scales; width of elytral carina 3 wider than carina 4 (Fig. 4i)
 - *P. wakefieldi* (Sharp)
5. Pronotal setae relatively short, inconspicuous and present in the anteromedian region of disc, lengths less than two times the width of pronotal puncture; scales well developed along lateral areas of pronotum; elytral carina absent 6
 - Pronotal setae long and conspicuous over most of disc, lengths more than two times the width of pronotal puncture; scales well developed along posterolateral areas of pronotum; elytral carina present or absent 7
6. Erect elytral scales obvious (Fig. 5c) and as much as 3× the length of appressed scales (Fig. 4g); Chatham Islands
 - *P. shandi* (Broun)
 - Erect elytral scales less obvious and 2× or less the length of appressed scales (Fig. 4f); Mainland ... *P. sobrina* (White)
7. Elytral carina absent or weakly developed and never extending to anterior edge; widely distributed from Bay of Plenty to central Northland (Fig. 4a) *P. brounii* (Pascoe)
 - Elytral carina present 8
8. Elytral carina in lateral view obscuring anterior 1/3 of elytral disc; Three Kings Islands (Fig. 4b) *P. carinata* **n.sp.**
 - Elytral carina in lateral view not obscuring elytral disc; northern Northland (Fig. 4h) *P. tepaki* **n.sp.**

Phanodesta brounii (Pascoe 1876: 57)

(Figs 4a, 6a)

Leperina brounii Pascoe 1876: 57.

Diagnosis. Colour of body red-brown and lacking a metallic sheen. Dorsal vestiture of scales and setae; elongate setae present on pronotum. Length of antennomere III equal to II, antennomere XI circular, about as long as wide. Pronotum with uniform punctation and generally lacking a median glabrous area; two antebasal patches of dark scales absent; posterior margin weakly convex. Elytral carinae distinctly beaded, sublateral keel (carina 7) present and not prominent or absent; size of scales generally uniform, lacking erect and very elongate scattered scales; apex of elytra rounded.

Description. Length = 4.9–11.2; width = 2.1–4.8. Colour of body dark to medium red-brown, metallic sheen absent. Dorsal vestiture of long yellow-silver setae on head and pronotum; scales present on the posterolateral areas of the pronotum and the elytra. Head coarsely and densely punctate, frons evenly to irregularly punctate, lacking median glabrous area, with punctures ovate and separated by less than one half their diameters (or may be more separated from each other in some specimens) often combining to form lineate or weakly lineate patterns; supra-ocular scales absent. Mandibular surfaces coarsely punctate, about one half the size of those on the frons. Edge of labrum weakly emarginate. Length of antennomere III equal to II, antennomere XI circular, about as long as wide. Pronotum about 1.2× as long as wide, widest at middle, narrowest at base and not strongly transverse; sides converging and weakly sinuate in posterior ½; anterior angles with rounded apices; posterior angles acute to subacute, with some specimens having a small tooth; posterior margin weakly convex; surface of pronotal disc even and lacking shallow impressions or grooves, punctation uniform and lacking a broad median glabrous area (present in some specimens) with punctures separated by 0.4–4× their diameters, but smaller and often absent at the centre of the disc and larger and ovate over much of the surface, vestiture consisting of long decumbent simple setae with lengths >2× the width of pronotal puncture, and bearing pale-coloured scales at the posterolateral margin, two antebasal patches of dark scales absent; lateral carina unevenly and weakly crenulate. Hypomeron setose to glabrous, lacking scales; anterior portion of hypomeron weakly rugose or punctate. Prosternum with punctures round and deeply impressed and separated by about 1/3 the diameter of each puncture, longitudinal glabrous area absent (present in a few specimens); narrowest width of prosternal process about 2/3 the apical width; punctation of ventrites more or less similar to prosternum. Mesoventral process not vaulted and not extending to a level higher than mesocoxae. Scutellum transverse. Length of elytra about 2.1× as long as pronotum; eight carinae usually present and distinctly beaded with central punctures, sublateral keel (carina 7) absent or present and weakly developed and not reaching anterior margin; black and pale (or white) scales

present and size generally uniform, lacking erect and very elongate scattered scales, forming semiregular patterns (sometimes only pale scales are present), erect or not overlapping, most scales elongate with lengths $2.5\times$ longer than wide but some are ovate and weakly frayed; intercarinal space lacking micropunctures; elytral margins narrowly explanate, apex evenly rounded. Epipleuron visible in lateral view, carina setose. Hind wings absent, in the form of small buds. Aedeagus with apex of parameres rounded to acute, inner outline between parameres bisinuate, length of parameres longer than base of tegmen; shape of median strut anchor-shaped and hooked. Protibial edge crenulate; mucro very weakly developed.

Comments. The species was described from specimens collected from under bark of a Ngiao (= Ngalho) tree (*Myoporum laetum*) in Tairua (Pascoe, 1876). There was no indication on how many specimens the description was based in the original publication and no specimens matching Pascoe's typical handwritten square label were located at the NHML. Two specimens were card-mounted and hand-written by Broun's contemporary David Sharp, and one of these, which was mounted ventral side down, was designated as Neotype. This is Broun species 316, which was misspelled by Broun (1880: 178), and '*L. sobrina*' is Broun species 317.

Phanodesta brounii is the most commonly encountered species in the north of the North Island and can be separated from most other species by the presence of elongate setae on much of the surface of the pronotal disc. It is also similar to *P. tepaki*, but lacks the well-developed keel on the elytron. *Phanodesta brounii* also exhibits the greatest variation in the elytral carinae. Although most carinae (1, 3, 5 and 6) originate at the anterior elytral bead, carina 4 is obliterated at mid-length in several Auckland area specimens and otherwise extends at least to apical $\frac{1}{4}$. Carina 6 extends to the apical $\frac{1}{4}$ and is usually fused with carina 7 anteriorly, or in a few specimens, carina 6 is obliterated anteriorly whereas carinae 1, 3, 5 and sometimes 9 (in some Poor Knights specimens) extend posteriorly to the apical $\frac{1}{6}$. Carina 7 forms a moderately weak keel and carinae 8 and 9 are usually absent, especially in specimens from the Poor Knights Islands.

Type Material Examined. Neotype (NHML): (card mounted) Leperina Brounii Tairua (hw)/ Tairua, New Zealand. Broun. (red line printed beneath New Zealand)/ Sharp Coll. 1905-313./ NEOTYPE, *Leperina brounii* Pascoe, 1876 design. by R. Leschen 2012 (red label).

Phanodesta carinata n. sp.

(Figs 4b, 6b)

<http://zoobank.org/urn:lsid:zoobank.org:act:83E79CD2-287B-4520-AB5F-78FB72B36EA2>

Diagnosis. Colour of body red-brown and lacking a metallic sheen. Dorsal vestiture of scales and setae; elongate setae present on pronotum. Length of antennomere III equal to II, antennomere XI circular, about as long as wide. Pronotum

with uniform punctation and lacking a median glabrous area; two antebasal patches of dark scales absent; posterior margin weakly convex. Elytral carinae distinctly beaded, sublateral keel prominent; size of scales generally uniform, lacking erect and very elongate scattered scales; apex of elytra rounded.

Description. Length = 8.0–13.9; width = 3.5–5.9. Colour of body red-brown, metallic sheen absent. Dorsal vestiture of long yellow-silver setae on head and pronotum; scales lateral areas of the pronotum and on the elytra. Head coarsely and densely punctate, frons evenly punctate, a median glabrous area may be present; punctures ovate and separated by less than one half their diameters, or may be more separated from each other in some specimens, rarely combining to form weakly lineate patterns; supra-ocular scales absent. Mandibular surfaces coarsely punctate, more or less lineate and about one half the size of those on the frons. Edge of labrum weakly emarginate. Length of antennomere III equal to II, antennomere XI circular, about as long as wide. Pronotum about $1.2\times$ as long as wide, widest at middle, narrowest at base, not strongly transverse; sides converging and very weakly sinuate in posterior $\frac{1}{2}$; anterior angles with rounded apices; posterior angles acute to subacute, lacking a small tooth; posterior margin weakly convex; surface of pronotal disc even and lacking shallow impressions; punctation uniform or not with a median apunctate area generally present with punctures separated by $0.5\text{--}4\times$ their diameters, but smaller and less coarse at the centre of the disc and larger and ovate laterally, vestiture consisting of long decumbent simple setae with lengths more than two times the width of pronotal puncture and bearing elongate and narrow pale-coloured scales at the lateral margins, two antebasal patches of dark scales absent; lateral carina weakly and unevenly crenulate. Hypomeron setose, lacking scales; anterior portion of hypomeron rugose. Prosternum with punctures round and deeply impressed and separated by about one third the diameter of each puncture; longitudinal glabrous area absent; narrowest width of prosternal process about $\frac{2}{3}$ apical width; punctation of ventrites more or less similar to prosternum. Mesoventral process vaulted, extending to a level higher than mesocoxae. Scutellum transverse. Length of elytra about $2\times$ as long as pronotum; seven carinae present and distinctly beaded with central punctures; sublateral keel (carina 7) prominent and reaching anterior margin; black and pale (or white) scales present and forming semiregular patterns, sizes generally uniform, lacking scattered erect and very elongate white scales, generally erect or not overlapping with lengths $2.5\times$ longer than wide; intercarinal space lacking micropunctures; margins not explanate, apex evenly rounded; epipleuron visible in lateral view, carina setose. Hind wings absent, in the form of small buds. Aedeagus with apex of parameres angulate, inner outline between parameres weakly sinuate or straight, length of parameres shorter or equal to base of tegmen; shape of median strut anchor-shaped and hooked. Protibial edge crenulate; mucro absent.

Comments. This new species is restricted to the Three Kings Islands, Northland and can be distinguished from all other

Phanodesta by the presence of the prominent keel along the flank of the elytron.

Etymology. Named for the distinct keel on the elytra.

Material Examined. *Holotype* (NZAC), ♀, Three Kings Is. Great I. Nov. 70 NZ. Ent. Div. Exp./Castaway Camp/on tree trunks at night/J.C.Watt/HOLOTYPE *Phanodesta carinata* Leschen & Lackner 2012 (red label). *Paratypes* (54). *TH*: 1, Three Kings Is., Great I., Castaway Camp [34°9.136S, 172°8.272E], xi.1970, J. C. Watt, under bark *Leptospermum ericoides* (NZAC); 2, same as, but on decaying *Leptospermum ericoides* (NZAC); 16, same as, but on tree trunks at night (NZAC); 2, same as, but G. Kuschel (NZAC); 1, same as, but J. McBurney, at night (NZAC); 1, same as, but G. W. Ramsay (NZAC); 1, same as, but J. McBurney, *Metrosideros excelsa* (NZAC); 2, same as, but Tasman Valley, J. McBurney, on ground at night (NZAC); 2, same as, but G. Kuschel (NZAC); 2, same as, but G. W. Ramsay (NZAC); 1, same as, but 28.xi.1983 to 1.xii.1983, J. C. Watt, under bark *Leptospermum ericoides* (NZAC); 4, same as, but 2.xii.1983, J. C. Watt, under bark *Leptospermum ericoides*; 1, South West I, [34°10.525S, 172°4.283E], 26.xi.1983, J. C. Watt, wood mould (NZAC); 5, North West I, [34°7.898S, 172°9.967E], 1.xii.1983, J. C. Watt, under bark *Metrosideros excelsa* (NZAC); 1, Great I, South East Bay, 45 m [34°9.217S, 172°8.584E], 1.xii.1983, J. C. Watt, litter (NZAC); 1, same as, but 30 m, 27.xi to 1.xii.1983, J. C. Watt, pit trap (NZAC); 3, same as, but 45 m (NZAC); 4, same as, but West I, [34°11.091S, 172°1.972E], 28–29.xi.1983, J. C. Watt, under bark *Metrosideros excelsa* (NZAC); 1, same as, but litter (NZAC); 1, same as, but Great I., [34°9.136S, 172°8.272E], 28.xi. to 1.xii.1983, J. 1, same as, but C. Watt, at night on tree trunks (NZAC); 1, same as, but Bayliss Tk, [34°9.732S, 172°8.612E], 9.xi.2008, T. Buckley & R. Leschen, sifting leaf litter (NZAC); 1, same as, but Tasman Valley Stm, [34°9.778S, 172°8.544E], 10.xi.2008, T. Buckley & R. Leschen, sweeping vegetation (NZAC); 1, Three Kings Is., Great I., Lightouse Bush [34°9.136S, 172°8.272E], 6.xii.1996, J. W. M. Marris, on trees at night (LUNZ); 1, same as, but 5.xii.1996, among rotten logs (LUNZ); 1, same as, but Tasman Valley, 7.xii.1996, under bark and rotten logs (LUNZ); 1, same as, but 9.xii.1996, on trees and logs at night (LUNZ); 1, same as, but bush W of trig; 8.xii.1996, under rocks and rotten logs (LUNZ); 1, North East I. [34°7.898S, 172°9.967E], 5.xii.1996, J. W. M. Marris, under stones and bark (LUNZ); 1, same as, but South West I. [34°10.525S, 172°4.283E], 29.xi.1997, F. J. Brook & P. J. Anderson on *Mertya* and *Cordyline* trunks at night (LUNZ); 1, same as, but 3.iv.2000, A. Booth, on puka at night (AMNZ).

***Phanodesta manawatawhi* n. sp.**

(Figs 4c, 6c)

<http://zoobank.org/urn:lsid:zoobank.org:act:F20CC4BB-C592-452C-B8D3-F3A4E82EF546>

Diagnosis. Colour of body red-brown and lacking a metallic sheen. Dorsal vestiture consisting of mainly of scales (setae present on the head). Length of antennomere III subequal to II, antennomere XI circular, usually about as long as wide. Pronotum with uniform punctation and lacking a median glabrous area; two antebasal patches of dark scales absent; posterior margin weakly convex. Elytral carinae distinctly beaded, sublateral keel absent; size of scales generally uniform, erect and very elongate scattered scales present; apex of elytra subacute.

Description. Length = 7.1–8.8; width = 3.4–4.3. Colour of body red-brown, metallic sheen absent. Dorsal vestiture of yellow-silver setae on head; scales present on the pronotum and elytra. Head coarsely and densely punctate, frons evenly punctate, median glabrous area absent (present in a few specimens); punctures ovate and separated by less than one half their diameters, often lineate; supra-ocular scales absent. Mandibular surfaces coarsely punctate, about one half the size of those on the frons. Edge of labrum weakly emarginate. Length of antennomere III subequal to II, antennomere XI circular, usually about as long as wide (some specimens slightly longer than wide). Pronotum about 1.2× as long as wide, widest just behind middle, narrowest at base, not strongly transverse; sides converging posteriorly and not sinuate in posterior ½; anterior angles projecting and somewhat subacute; posterior angles acute to subacute; posterior margin weakly convex; pronotal disc even and lacking shallow grooves, punctation more or less uniform and generally lacking a median glabrous area with punctures separated by 0.4–4× their diameters, but smaller and somewhat sparse at centre, larger laterally, and smaller anteriorly and posteriorly; vestiture of pale yellow scales, two antebasal patches of dark scales absent; lateral carina evenly and weakly-crenulate. Hypomeron setose and subglabrous, lacking scales; anterior portion of hypomeron rugose. Prosternum punctate with punctures round and deeply impressed and separated by about one fifth the diameter of each puncture; longitudinal glabrous area absent; narrowest width of prosternal process about two third the apical width; punctation of ventrites more or less similar to prosternum. Mesoventral process not vaulted, not extending to a level higher than mesocoxae. Scutellum transverse. Length of elytra 2× as long as pronotum; usually eight carinae (sometimes 8 reduced and 9 may be present; 2, 4, 6, 8 may be strongly developed and distinct in basal 1/3); sublateral keel absent; black, pale, or white scales present and forming semiregular patterns, sizes generally uniform, overlapping and round but scattered erect and very elongate white scales are present; intercarinal space lacking micropunctures; margins moderately explanate, apex of elytra subacute. Epipleuron hidden in lateral view, carina bearing scales. Hind wings present, but vestigial. Aedeagus with apex of parameres angulate, inner outline between parameres bisinuate, length of parameres longer than base of tegmen; shape of median strut broadly rounded. Protibial edge smooth or crenulate; mucro absent.

Comments. This is a distinctive species known only from the Three Kings Islands, Northland. It can be distinguished

from other *Phanodesta* species by the relatively broad body, projecting anterior angles of the pronotum and the epipleuron hidden in lateral view.

Etymology. The epithet *manawatawhi* is the Māori name for the largest island (Great Island) in the Three Kings archipelago.

Material Examined. *Holotype* (NZAC): ♂, Three Kings Is. Great Is. xi.70 NZ. Ent. Div. Exp./Castaway Camp/on tree trunks at night/G. Kuschel/HOLOTYPE *Phanodesta manawatawhi* Leschen & Lackner 2012 (red label). *Paratypes* (50). *TH*: 17, TH, Three Kings Is, Great I, Castaway Camp, [34°9.136S, 172°8.272E], xi.1970, J. C.Watt, on tree trunks at night (NZAC); 2, same as, but G.W. Ramsay (NZAC); 7, same as, but G. Kuschel (NZAC); 1, same as, but J. McBurney, *Plectomyrtha* (NZAC); 1, same as, but *Brachyglottis repanda* (NZAC); 4, Great I., 1–3.1.1963, E. S.Gourlay (NZAC); 1, same as, but 15.iv.1966, R. G. Turbott (AMNZ); 1, same as, but Tasman Tk [34°9.778S, 172°8.544E], 7.xi.2008, T. Buckley & R. Leschen, night at large (NZAC); 1, same as, but Lighthouse Bush 6.xii.1996, J. W. M.Marris (LUNZ); 1, same as, but Baylis Stm., 11.iv.1999, M. J. Thorsen, on *Kunzea* at night (LUNZ); 1, same as, but 12.iv.1999, A.M.Booth, on *Kunzea* at night (LUNZ); 2, same as, but Tasman Valley, xi.1970, G. W. Ramsay (NZAC); 1, same as, but G. Kuschel, litter (NZAC); 2, same as, but 6.xi.2008, T. Buckley & R. Leschen, beating vegetation at night/at large (NZAC); 2, same as, but along Tasman Stm. [34°9.733S, 172°8.610E], 10.xi.2008, beating (NZAC); 4, North East I, [34°7.898S, 172°9.967E], 1.xii.1993, J. C.Watt, under bark *Metrosideros excelsa* (NZAC); 1, same as, but beating *Mysine* (NZAC); 1, South West I, [34°10.525S, 172°4.283E], xi.1970, G. Kuschel, *Melicope ternata* (NZAC); 1, same as, but NE Slope [34°10.525S, 172°4.283E], 6.iv.2000, F. J. Brook, on Puka (AMNZ); 1, same as, but 29.xi.1997, F. J. Brook & P.Anderson, on *Mertya* and *Cordyline* trunks at night (LUNZ).

***Phanodesta nigrosparsa* (White 1846: 17)**

(Figs 1, 4d, 6d)

Gymnocheila nigrosparsa White 1846: 17.

Leperina nigrosparsa (White 1846: 17).

Lepidopteryx nigrosparsa (White 1846: 17).

Diagnosis. Colour of body black with a metallic sheen. Dorsal vestiture consisting of scales. Length of antennomere III subequal to II, antennomere XI circular, about as long as wide. Punctuation of pronotum irregular with a broad median glabrous area; two antebasal patches of dark scales absent; posterior margin lobed at middle. Elytral carinae indistinctly beaded, sublateral keel absent; size of scales not uniform, suberect to erect setae present but sparse; apex of elytra rounded.

Description. Length = 6.6–10.5; width = 2.8–4.6. Colour black and highly polished, metallic green sheen present. Vestiture of yellow-silver setae absent (apart from scattered short

setae on head and on the venter). Head densely punctate, punctures ovate to lineate and separated by one half or more of their diameters, weak preantennal impressions or a medial longitudinal groove may be present on some specimens; supra-ocular scales present. Mandibular surfaces coarsely punctate, punctures about equal in size of those on the frons. Edge of labrum weakly emarginate. Length of antennomere III subequal to II, antennomere XI circular, about as long as wide. Pronotum about 1.4× as long as wide, widest just behind middle and transverse, narrowest at base; sides convergent posteriorly and weakly sinuate in basal 1/3; anterior angles with rounded apices; posterior angles acute to subacute, with some specimens having a small tooth; posterior margin lobed at middle; pronotal disc uneven with distinct sublateral shallow grooves and or submedial impressions; punctuation irregular with a broad median glabrous area with punctures separated by 0.1× or more their diameters (coarse along margins, but more or less scattered to sparse on disc), vestiture consisting of elongate pale to white scales with darker centres, two antebasal patches of dark scales absent; lateral carina unevenly crenulate, generally weak, but stronger posteriorly. Hypomeron more or less asetose, glabrous, with some scattered scales, especially near the margins of the prosternum; anterior portion of hypomeron weakly rugose. Prosternum weakly to coarsely punctate with punctures round and usually deeply impressed and separated by an average of one third the diameter of each puncture (but can be less); longitudinal glabrous area present; narrowest width of prosternal process about one half the apical width; punctuation of ventrites more or less similar to prosternum (weaker on abdominal ventrites). Mesoventral process not vaulted, not extending to a level higher than mesocoxae. Scutellum transverse. Length of elytra about 3× times as long as pronotum; six carinae usually present (seven may be present in some specimen, some carinae more laterad weakly developed in some specimens), indistinctly beaded or not with punctures lateral; sublateral keel (carina 7) present or absent; black and pale (or white) scales present and forming semiregular patterns, sizes not uniform, ovate to circular and overlapping, lengths less than 2.5× longer than wide, to elongate and erect to suberect, black scales tend to be erect and densely clumped; intercarinal space lacking conspicuous micropunctures (can be seen in dissections); margins moderately explanate, apex evenly rounded; epipleuron visible in lateral view, carina bearing scales. Hind wings present and fully developed. Aedeagus with apex of parameres angulate, inner outline between parameres bisinuate, length of parameres longer than base of tegmen; shape of median strut anchor-shaped and hooked. Protibial edge crenulate; mucro weakly developed.

Comments. White (1846) did not list the number of specimens he had examined for the description of this species, but he did mention that the specimens were collected on Kauri (= kaudi) wood by Dr. Hooker. One specimen was located in the NHML and we designated this specimen as the Lectotype. This is Broun species 315 (Broun, 1880).

Phanodesta nigrosparsa is the only black species with highly polished surfaces and is quite widespread, mainly in the North Island.

Type Material Examined (NHML). Type (round label with red border)/*Gymnocheila nigrosparsa* White Zool. Ereb. & Terror. Raoul [sic] wood Hook. (hw, last three words illegible)/LECTOTYPE *Gymnocheila nigrosparsa* White 1846 design. by R. Leschen 2010 (red label).

***Phanodesta oculata* n. sp.**

(Figs 4e, 6e)

http://zoobank.org/urn:lsid:zoobank.org:act:33BC7805-4C3E-4A28-AF26-D38E16329B65

Diagnosis. Colour of body red-brown a green or bronzy metallic sheen present. Dorsal vestiture consisting of scales and setae. Length of antennomere III equal to II, antennomere XI distinctly longer than wide. Punctuation of pronotum not uniformly distributed over disc with a median glabrous area; two antebasal patches of dark scales present; posterior margin weakly convex. Elytral carinae distinctly beaded, sublateral keel absent, width of elytral carina 3 about the same as carina 4; size of scales generally uniform, sparse erect setae present; apex of elytra rounded.

Description. Length = 6.0–8.4; width = 2.7–3.8. Colour of body medium to dark body red-brown, metallic sheen present. Vestiture lacking yellow-silver setae (apart from proximal ocular areas and the venter), scales present elsewhere. Head coarsely and densely punctate, frons unevenly punctate, lacking median glabrous area with punctures ovate and separated by less than one half their diameters, often combining to form lineate or weakly lineate patterns; supra-ocular scales present. Mandibular surfaces coarsely punctate, about one half the size of most punctures on the frons. Edge of labrum weakly emarginate. Length of antennomere III subequal to II, antennomere XI distinctly longer than wide. Pronotum about 1.4× as long as wide, transverse, widest behind middle, narrowest at base; sides sinuate in posterior 1/3; anterior angles with rounded apices; posterior angles acute to subacute, rarely having a small tooth; posterior margin weakly convex; pronotal disc uneven and with shallow irregular grooves, punctuation not uniformly distributed over disc with a median glabrous area with punctures separated by 0.3–4× their diameters, but smaller and often absent at middle of the disc and larger and ovate laterad, vestiture consisting of pale or white scales, two antebasal patches of dark scales present; lateral carina unevenly crenulate, generally weak, but stronger posteriorly. Hypomeron setose to glabrous, lacking scales; anterior portion of hypomeron weakly rugose or smooth. Prosternum punctate with punctures round, shallowly impressed and separated by about 1/3 the diameter of each puncture; longitudinal glabrous area absent or present; narrowest width of prosternal process about 2/3 the apical width; punctuation of ventrites more or

less similar to prosternum (weaker on abdominal ventrites). Mesoventral process not vaulted, not extending to a level higher than mesocoxae. Scutellum more or less transverse. Length of elytra about 3× times as long as pronotum; six carinae present (5 and 6 may be weakly produced) and distinctly beaded with central punctures with the width of elytral carina 3 about the same as carina 4; sublateral keel absent; black and pale (or white) scales present and forming semiregular patterns, sizes generally uniform, ovate to circular and overlapping, lengths less than 2.5× longer than wide, narrow and erect scales present but sparse; intercarinal space lacking micropunctures; margins moderately explanate, apex evenly rounded; epipleuron visible in lateral view, carina setose. Hind wings present and fully developed. Aedeagus with apex of parameres angulate, inner outline between parameres bisinuate, length of parameres longer than base of tegmen; shape of median strut broadly rounded. Protibial edge crenulate; mucro weakly developed.

Comments. This species is most similar to *P. wakefieldi*, but with more striking colouration with large black scalate maculae on the pronotum, presence of a metallic sheen and the posterior lateral margins of the pronotum are more sinuate. This species is uncommon, but fairly widespread in the North Island.

Material Examined. Holotype (AMNZ): ♀, NEW ZEALAND, CL, Great Barrier I, Little Windy Hill, 220 m, 1–7.xi.2001 J. W. Early, R. F. Gilbert/In forest Yellow pan trap. L11040/ HOLOTYPE *Phanodesta oculata* Leschen & Lackner 2012 (red label). *Paratypes (16).* 1, New Zealand, H. Swale 1913-117 (NHML); 1, New Zealand, Frey Coll. (NHML); 1, New Zealand, Pascoe Coll. (NHML). *ND:* 1, Waipoua SF, Wairau summit, 457 m [35°37.315S, 173°26.503E], 18.x.1967, J. S. Dugdale, reared (NZAC); 1, Herekino Forest West [36°12.594S, 173°11.44E], 12.xii.2008, R. Leschen, T. Buckley & D.Seldon, ex beating (NZAC); 1, Parua Res [35°46.055S, 174°28.130E], 17.i.1924 (AMNZ); 317, Mangawhare, New Zealand Broun collection 1922-462. (red line beneath New Zealand), Leperina sobrina. (NHML); 1, Mangamuka G., Hokianga, 9-1-24, A. Richardson, C. E. Clarke Collection, B. M. 1957-24 (NHML); 1, Waikaraka Res. Parua Bay, 16-1-24, A. Richardson, C. E. Clarke Collection, B. M. 1957-24 (NHML). *AK:* 1, Little Barrier I, summit tk, 335 m [36°13.146S, 175°3.493E], 20.iii.1974, J. C.Watt, under bark dead *Nothofagus truncatus* (NZAC), 1, 317., Waitakerei, New Zealand Broun collection 1922-462. (red line beneath New Zealand) (NHML). *CL:* 1, Great Barrier I, Little Windy Hill, 220 m [36°17.728S, 175°31.525E], 2.xi.2001, J. W.Early, R. F. Gilbert, forest at night (AMNZ). *BP:* 1, Rotorua, Blue Lake [38°12.133S, 176°20.074E], no date, R. M. Bull coll. (NZAC); 1, Mt Onewainuku, 29.i.1996, A.Tennyson, at night (MONZ); 1, Mamaku, Rotorua, under bark, H. Swale, 1913 (NHML). *HB:* 1, Kaweka Ra, Makahu Hut, 925 m [39°17.190S, 176°24.483E], 25.ii.1971, J. I. Townsend (NZAC). *RI:* 1, North Island, Ohakune, 25.xii.1919, T. R. Harris (NHML); 1, Rangitikei R., 10-4-38, C. E. Clarke Collection, B.M. 1957-24 (NHML). *WA:* 1, Wairarapa, Waewaepa

Ra [40°27.543S, 176°1.801E], 21.vi.1958, J. I. Townsend (NZAC).

***Phanodesta shandi* (Broun 1909: 307)**

Leperina shandi Broun 1909, 307
(Figs 4g, 5c, d, 6g)

Diagnosis. Colour of body red-brown and lacking a metallic sheen. Dorsal vestiture consisting of scales and setae. Length of antennomere III equal to II, antennomere XI circular, about as long as wide. Punctuation of pronotum not uniformly distributed over disc, median glabrous area generally absent; two antebasal patches of dark scales absent; posterior margin weakly convex. Elytral carinae distinctly beaded, sublateral keel absent; size of scales generally uniform, sparse erect setae present; apex of elytra rounded.

Description. Length = 5.3–10.3; width = 2.2–4.2. Colour of body medium red-brown, metallic sheen absent. Vestiture of yellow-silver setae (present on the head, centre of pronotum and venter), scales present elsewhere. Head coarsely and densely punctate, frons evenly punctate, lacking median glabrous area with punctures irregularly-ovate.; supra-ocular scales absent. Mandibular surfaces coarsely punctate, about one half the size of those on the frons. Edge of labrum weakly emarginated. Length of antennomere III equal to II, antennomere XI circular, about as long as wide. Pronotum about 1.3× as long as wide, widest at middle and not strongly transverse, narrowest at base; sides converging and more or less sinuate in posterior ½; anterior angles with rounded apices; posterior angles acute to subacute, with some specimens having a small tooth; posterior margin weakly convex; pronotal disc uneven and having shallow irregularly subovate impressions sublaterally; punctuation not uniformly distributed over disc and lacking a median glabrous area with punctures large and ovate over much of the surface separated by 0.4–4× their diameters, but smaller and often absent at the centre of the disc, vestiture consisting of short decumbent simple setae with lengths <2× the width of pronotal puncture and bearing pale-coloured scales of different sizes at the posterolateral margins, two antebasal patches of dark scales absent; lateral carina unevenly and weakly crenulate. Hypomeron with scales and setae; anterior portion of hypomeron rugose. Prosternum punctate with punctures round and deeply impressed and larger at the sides, separated by about 1/3 or less the diameter of each puncture; longitudinal glabrous area present; narrowest width of prosternal process about 1/2 the apical width; punctuation of ventrites more or less similar to prosternum (weaker and smaller on abdominal ventrites). Mesoventral process not vaulted, not extending to a level higher than mesocoxae. Scutellum transverse. Length of elytra about 2.3 × 2 as long as pronotum; seven carinae present and distinctly beaded with central punctures; sublateral keel absent; black and pale scales present and forming semiregular patterns, sizes generally uniform, ovate to circular adpressed, overlapping or not (black scales) with lengths less than 2.5× longer than wide, sparse

narrow and long erect scales present; intercarinal space lacking micropunctures; margins very narrowly explanate, apex evenly rounded; epipleuron visible in lateral view, carina bearing scales. Hind wings present, vestigial. Aedeagus with apex of parameres rounded to acute, inner outline between parameres bisinuate, length of parameres shorter than base of tegmen; shape of median strut anchor-shaped and hooked. Protibial edge crenulate; mucro weakly developed.

Comments. Broun (1909) did not list the number of specimens he examined for this species, but did mention this species was larger than *P. brounii* and was collected by Miss D. Shand from Te Whakuru, Chatham Islands. Among the specimens Broun may have studied (NHML) there were five from Whakuru, two of which were labelled as variants, and differ only by weaker irregular markings on the elytra. *Phanodesta shandi*, endemic to the Chatham Islands, can be distinguished from other species by the obvious scattered and erect white scales on the elytra and the irregular impressions on the pronotum.

Type Material Examined (NHML). Card mounted/42. (hw)/Chatham Is. Broun collection 1922-462. (red line beneath New Zealand)/blank label/Whakuru. – S. D. Shand. (hw)/*Leperina shandi*. (hw)/LECTOTYPE *Leperina shandi* Broun, 1909 design. by R. Leschen 2010 (red label); 2, Card mounted/42. (hw)/Chatham Is. Broun collection 1922-462. (red line beneath New Zealand)/blank label/Whakuru. – Shand. (hw)/PARALECTOTYPE *Leperina shandi* Broun, 1909 design. by R. Leschen 2010 (blue label).

***Phanodesta sobrina* (White 1846: 17)**

(Figs 4f, 6f)

Gymnocheila sobrina White 1846: 17
Leperina sobrina (White 1846: 17)
Leperina fasciolata Blanchard, 1853: t. 11, f. 1
Leperina farinosa Sharp 1877b: 266, **n.syn.**
Leperina interrupta Brookes, 1932: 28, **n.syn.**

Diagnosis. Colour of body red-brown, a green or bronze metallic sheen present. Dorsal vestiture consisting of scales and setae. Length of antennomere III equal to II, antennomere XI circular, longer than wide. Pronotum unevenly punctate and lacking a median glabrous area; two antebasal patches of dark scales absent; posterior margin weakly convex. Elytral carinae distinctly beaded, sublateral keel absent; size of scales generally uniform, erect setae present but sparse; apex of elytra rounded.

Description. Length = 7.5–10.4; width = 3.3–4.7. Colour of body dark to medium red-brown, metallic bronze or green sheen present. Vestiture of short yellow-silver setae (present on the head, pronotum and venter) and scales present on the head, lateral areas of the pronotum and the elytra.

Head coarsely and densely punctate, frons evenly punctate, lacking median glabrous area; punctures ovate and separated by less than one half their diameters, often combining to form lineate or weakly lineate patterns; supra-ocular scales present or absent. Mandibular surfaces coarsely punctate, about one half the size of those on the frons. Edge of labrum weakly emarginate. Length of antennomere III equal to II, antennomere XI circular, longer than wide. Pronotum about 1.4× as long as wide, widest at just behind middle, narrowest at base, not strongly transverse; sides somewhat evenly convex, converging posteriorly and weakly sinuate in posterior ½; anterior angles with rounded apices; posterior angles acute to subacute, with some specimens having a small tooth; posterior margin weakly convex; pronotal disc even or uneven (never with glabrous lateral areas) and lacking shallow grooves; punctuation uniform to uneven, with or without median asetose area with punctures separated by 0.1–4× their diameters, but smaller at the centre of the disc and larger and ovate elsewhere, vestiture consisting of short decumbent simple setae with lengths <2× the width of pronotal puncture and bearing elongate and narrow pale-coloured scales at the lateral margins, two antebasal patches of dark scales usually absent (present in a few specimens and smaller with fewer scales compared to those in *P. oculata*); lateral carina unevenly and weakly crenulate. Hypomeron setose to glabrous, lacking scales; anterior portion of hypomeron rugose. Prosternum with punctures round and deeply impressed and separated by about 1/3 the diameter of each puncture; longitudinal glabrous area absent; narrowest width of prosternal process about 1/2 the apical width; punctuation of ventrites more or less similar to prosternum (weaker on abdominal ventrites). Mesoventral process not vaulted, not extending to a level higher than mesocoxae. Scutellum transverse. Length of elytra about 2.4× as long as pronotum; six or seven carinae present (rarely with eight or nine carinae); sublateral keel absent; black and pale (or white) scales present and forming semiregular patterns, sizes generally uniform, ovate to circular and overlapping, lengths less than 2.5× longer than wide, sparse narrow and erect scales present; intercarinal space lacking micropunctures; margins narrowly explanate, apex evenly rounded; epipleuron visible in lateral view, carina setose. Hind wings absent, vestigial. Aedeagus with apex of parameres angulate, inner outline between parameres bisinuate, length of parameres shorter or equal to base of tegmen; shape of median strut apiculate or arrow-shaped. Protibial edge crenulate; mucro absent.

Comments. White (1846) did not list the number of specimens he examined for the description of *Gymnocheila sobrina*. A severely damaged specimen in the NHML with a typical Adam White hand-written label most probably is the syntype, but mysteriously had a Pascoe collection label. It was located with the *P. brounii* specimens where labels by G. J. Arrow were placed together. The colouration of the elytron of this specimen matches *P. oculata*, *P. farinosa*, *P. brounii* and *P. wakefieldi* but the scales and carinae match *P. farinosa*, and we regard this species as a junior synonym of this species. *Phanodesta sobrina* is species 317 of Broun (1880).

The description of *Leperina farinosa* (species 320 of Broun, 1880) was based on a single specimen collected by Wakefield in Christchurch that Sharp (1877b) stated was allied to *P. brounii*. Brookes' (1932) species *Leperina interrupta* that he thought was allied to '*Leperina sobrina*' is clearly a synonym based on the type specimens examined in the NZAC. Lèveillé (1888b: 442) listed *Leperina fasciolata* Blanchard and '*Gymnocheila nigrosparsa* Blanchard' as synonyms under this species, but this listing probably refers to a misidentification of specimens Blanchard made of material used for his 1853 publication and should not to be confused with true *Leperina nigrosparsa* that wrongly Blanchard (1853: 247) attributes to White (1846).

Phanodesta sobrina has black patches of scales at the base of the pronotum like *P. oculata*, but in *P. sobrina* these are much smaller and consist of fewer scales. This species is fairly widespread, with some specimens collected in the Auckland region, where it may have been secondarily introduced.

Type Material Examined. *Gymnocheila sobrina* White (NHML), *Syntype*: (abdomen and elytron only), Pacoe Coll. 93-60/Type (round label with red border)/Wellington, N. Zealand (hw, dark green label)/*Gymnocheila sobrina* White Zool. Ereb. & Terror (hw)/From Perry's Coll (hw)/Abdomen & elytron only. B. L. 20/III/07/HOLOTYPES *Gymnocheila sobrina* White, 1846 confirmed by R. Leschen 2010 (red label). *Leperina farinosa* Sharp, *Syntype* (NHML): *Leperina farinosa* Type D. S. N. Zd. (cardmounted, hw)/Type H. T. (round label with black border)/Sharp Coll. 1905-313/Lectotype (round label with light blue border)/HOLOTYPES *Leperina farinosa* Sharp, 1877 confirmed by R. Leschen 2010 (red label). *Leperina interrupta* Brookes, *Holotype* (NZAC): ♂ (cardmounted)/Coll. E. Fairburn 9-12-1-1931. (hw on hard card stock)/Stephen Isld. Cook Straight. (hw on hard card stock)/*Leperina interrupta* Brookes (hw on hard card stock)/Holotype. (hw on red label); *Paratypes* (NZAC): 1, ♀/(cardmounted)/Coll. E. Fairburn 9-12-1-1931. (hw on hard card stock)/Stephen Isld. Cook Straight. (hw on hard card stock)/*Leperina interrupta* Brookes. (hw on hard card stock)/Allotype. (hw on red label)/A. E. Brookes Collection; 6, (2♀, 2♂, two unmarked; all cardmounted, three on dorsally)/Coll. E. Fairburn 9-12-1-1931. (hw on hard card stock)/Stephen Isld. Cook Straight. (hw on hard card stock)/*Leperina interrupta* Brookes. (hw on hard card stock)/PARATYPE (blue label)/A. E. Brookes Collection.

***Phanodesta tepaki* n. sp.**

(Figs 4h, 6h)

<http://zoobank.org/urn:lsid:zoobank.org:act:E435AE79-F2D5-4966-AF39-D83FCAF10F30>

Diagnosis. Colour of body red-brown and lacking a metallic sheen. Dorsal vestiture of scales and setae; elongate setae present on pronotum. Length of antennomere III subequal to II, antennomere XI circular, about as long as wide. Pronotum with uniform punctuation and with or without a median glabrous area;

two antebasal patches of dark scales absent; posterior margin weakly convex. Elytral carinae distinctly beaded, sublateral keel (carina 7) present, well-developed, but not prominent; size of scales generally uniform, lacking erect and very elongate scattered scales; apex of elytra rounded.

Description. Length = 6.0–8.3; width = 2.5–3.4. Colour of body medium red-brown, metallic sheen absent. Dorsal vestiture of long yellow-silver setae on head and pronotum (shorter elsewhere); scales present on the posterolateral areas of the pronotum and the elytra. Head coarsely and densely punctate, frons evenly to irregularly punctate, lacking median glabrous area, with punctures ovate and separated by less than one half their diameters (sometimes more), deeply or weakly impressed, often combining to form weakly lineate patterns; supra-ocular scales absent. Mandibular surfaces coarsely punctate, about 1/2 the size of those on the frons. Edge of labrum weakly emarginate. Length of antennomere III subequal to II, antennomere XI circular, about as long as wide. Pronotum about 1.2× as long as wide, widest at middle, narrowest at base, and not strongly transverse; sides converging and weakly sinuate in posterior 1/2; anterior angles with rounded apices; posterior angles acute to subacute, with some specimens having a small tooth; posterior margin weakly convex; surface of pronotal disc even and lacking shallow grooves (very weak sublateral impressions may be present, as well as small circular glabrous areas), punctation more or less uniform and lacking a broad median glabrous area (present in some species) with punctures separated by 0.4–4× their diameters, but smaller at the centre of the disc and larger and ovate more laterad, vestiture consisting of long decumbent simple setae with lengths >2× the width of pronotal puncture and bearing pale-coloured scales at the posterolateral margin, two antebasal patches of dark scales absent; lateral carina unevenly and weakly crenulate. Hypomeron setose, lacking scales; anterior portion rugose. Prosternum with punctures round and deeply impressed and separated by about one third the diameter of each puncture, longitudinal glabrous area absent; narrowest width of prosternal process about 1/2 the apical width; punctation of ventrites more or less similar to prosternum (weaker on abdominal ventrites). Mesoventral process not vaulted and not extending to a level higher than mesocoxae. Scutellum transverse. Length of elytra about 2.1× as long as pronotum; eight carinae present and distinctly beaded with central punctures, sublateral keel (carina 7) present, well-developed, but not prominent and reaching anterior margin; chocolate and pale (or white) scales present and size generally uniform (black scales tend to be longer), lacking erect and very elongate scattered scales, forming semiregular patterns (sometimes only pale scales are present), erect or not overlapping, most scales elongate with lengths usually 2.5× longer than wide but some are ovate to trapezoidal; intercarinal space lacking micropunctures; elytral margins narrowly explanate, apex evenly rounded. Epipleuron visible in lateral view, carina setose. Hind wings absent, in the form of small buds. Aedeagus with apex of parameres rounded to acute, inner outline between parameres bisinuate, length of parameres

shorter than base of tegmen; shape of median strut anchor-shaped and hooked. Protibial edge crenulate; mucro present and weakly developed.

Comments. This new species restricted to northern Northland has a distinct, but less prominent, keel along the flanks of the elytra, making it easy to distinguish from most New Zealand *Phanodesta*, apart from keeled specimens of *P. brownii*, where it can be distinguished from it by the keel reaching the anterior elytral margin.

Etymology. This species is named for the principal area it has been collected, Te Paki area, North Cape, Northland.

Material Examined. *Holotype* (NZAC): Unuwahao 1000' Spirits Bay 20 January. 66 (hw)/Large piece of *Knightia excelsa* E.M. 13 June. 67 (hw)/HOLOTYPE *Phanodesta tepaki* Leschen & Lackner 2012 (red label). *Paratypes* (11). *ND*: 1, ND, Spirits Bay [34°26.851S, 172°49.994E], 22.i.1996, A. K. Walker (NZAC); 2, same as, but 11 January 1957, R. A. Cumber (NZAC); 2, Tom Bowling Bay, Akura stream [34°26.078S, 172°57.251E], 14.xi.1967, J. I. Townsend, under dead *Beilschmiedia tarairi* bark (NZAC); 2, same as, but Te Huka stream [34°25.829S, 172° 56.052E], 15.xi.1967, J. I. Townsend, at night (NZAC); 1, Whangaruru, North headland [35°21.546S, 174° 22.041E], 9.xii.1967, K.A.J. Wise, ex *Astelia* forest remnant (AMNZ); 1, N. Hokianga, Rangi Pt [35°27.523S, 173°22.502E], 4.xii.1985, R.F. Gilbert, beneath bark, ex rotting branches, forest (AMNZ); 1, Kohuroa, 1584790E, 6183690N, 3.2.1963, R.A. Cumber (AMNZ); 1, Whakaangi, 222m [34°56.863S, 173°32.684E], 18.i.2010, T.R. Buckley, D. Seldon & R. Hoare (NZAC).

Phanodesta wakefieldi

(Sharp, 1877a:191)

Leperina wakefieldi Sharp 1877a:191

(Figs 4i, 6i)

Diagnosis. Colour of body dark to medium red-brown and lacking a metallic sheen. Dorsal vestiture consisting of scales and setae. Length of antennomere III equal to II, antennomere XI distinctly longer than wide. Punctation of pronotum irregular with a median glabrous area; two antebasal patches of dark scales absent; posterior margin weakly convex. Elytral carinae distinctly beaded, sublateral absent, width of elytral carina 3 wider than carina 4; size of scales generally uniform, erect setae present and sparse; apex of elytra rounded.

Description. Length = 6.0–8.5; width = 2.5–3.7. Colour of body dark to medium body red-brown, metallic sheen absent. Vestiture with yellow-silver setae on the head, scattered on the pronotum and on the ventra, scales present elsewhere. Head coarsely and densely punctate, frons unevenly punctate, lacking median glabrous area with punctures ovate and

separated by less than $\frac{1}{2}$ their diameters, often combining to form lineate or weakly lineate patterns; supra-ocular scales present. Mandibular surfaces coarsely punctate, about equal in the size to those on the vertex of the head. Edge of labrum weakly emarginate. Length of antennomere III equal to II, antennomere XI distinctly longer than wide in most specimens. Pronotum about $1.3\times$ as long as wide, transverse, widest behind middle, narrowest at base; sides convergent posteriorly; anterior angles with rounded to subacute apices; posterior angles acute to subacute, rarely having a small tooth; posterior margin weakly convex; pronotal disc uneven and with shallow irregular grooves, punctation not uniformly distributed over disc with a median glabrous area with punctures separated by $0.2\text{--}4\times$ their diameters, but smaller and often absent at middle of the disc and larger and ovate laterad, vestiture consisting of white scales and elongate setae on disc and along margins, two antebasal patches of dark scales absent (dark scales may be present, but never forming large maculae); lateral carina unevenly crenulate, generally weak, but stronger posteriorly. Hypomeron setose to glabrous; anterior portion rugose. Prosternum punctate with punctures round, shallowly impressed and separated by about one third the diameter of each puncture; longitudinal glabrous area present; narrowest width of prosternal process about one-half the apical width; punctation of ventrites more or less similar to prosternum but are may be more shallowly impressed. Mesoventral process not vaulted, not extending to a level higher than mesocoxae. Scutellum transverse. Length of elytra about $2.7\times$ times as long as pronotum; seven carinae present (five and six may be weakly produced) and distinctly beaded with central punctures with the width of elytral carina 3 wider than carina 4; sublateral keel absent; black and pale (or white) scales present and forming semiregular patterns, sizes generally uniform, more or less elongate-oval and overlapping (black scales erect and may be tightly clumped in some specimens), lengths $<2.5\times$ longer than wide, sparse narrow and erect scales present; intercarinal space lacking micropunctures; margins moderately explanate, apex evenly rounded; epipleuron visible in lateral view, carina setose. Hind wings present, fully developed. Aedeagus with apex of parameres rounded to acute, inner outline between parameres weakly sinuate or straight, length of parameres longer than base of tegmen; shape of median strut broadly rounded. Protibial edge crenulate; mucro absent.

Comments. This species is based on a specimen collected by Wakefield in Christchurch that Sharp (1877a) states is intermediate between *P. nigrosparsa* and *P. brounii* probably closely allied to *P. sobrina*. This is species 318 Broun (1880). This species is most similar to *P. oculata*, but with less striking colouration, a generally darker body, lacking the large black scalate maculae on the pronotum, an absence of a metallic sheen, and having the posterior lateral margins of the pronotum, which are convergent. This species is quite widespread, ranging from the middle portion of the North Island to the South Island. The more northern distributions may have resulted from secondary introductions.

Type Material Examined. *Syntypes* (NHML): *Leperina wakefieldi* Type D. S. N. Zd. (cardmounted, hw)/Christchurch, N. Zealand/Type H. T. (round label with black border)/Sharp Coll. 1905-313/Lectotype (round label with light blue border)/LECTOTYPE *Leperina wakefieldi* Sharp, 1877 design by R. Leschen 2010 (red label); *Leperina wakefieldi* Ind. Typ. D. S. Christchurch N. Zd.(card-mounted, hw)/Christchurch, N. Zealand/Sharp Coll. 1905-313/Lectotype (round label with light blue border)/PARALECTOTYPE *Leperina wakefieldi* Sharp, 1877 design by R. Leschen 2010 (blue label); *Leperina wakefieldi* Ind. Typ. D. S. Christchurch N. Zd.(cardmounted, specimen ipsilateral, hw)/Christchurch, N. Zealand/Sharp Coll. 1905-313/Lectotype (round label with light blue border)/ PARALECTOTYPE *Leperina wakefieldi* Sharp, 1877 design by R. Leschen 2010 (blue label).

Lorde Howe Island *Phanodesta*

Phanodesta pudica (Olliff, 1889: 82), comb.n.

Ostoma pudicum Olliff, 1889: 82
(Fig. 2h)

Diagnosis. Colour body red-brown and lacking a metallic sheen. Dorsal vestiture consisting of mainly of scales (setae present on the head). Length of antennomere III longer than II, antennomere XI more or less ovate, slightly longer than wide. Pronotum with uniform punctation and with a median glabrous area; two antebasal patches of dark scales absent; posterior margin straight. Elytral carinae distinctly beaded, sublateral keel absent; size of scales generally uniform and round, very elongate scattered scales present; apex of elytra rounded.

Description. Length = 7.0–8.9; width = 4.7–5.6. Colour of body red-brown, metallic sheen absent. Dorsal vestiture of yellow setae on head and venter; scales present on the pronotum and elytra. Head coarsely and densely punctate, frons unevenly punctate, median glabrous area absent; punctures ovate and separated by less than $\frac{1}{2}$ their diameters, often lineate; supra-ocular scales absent. Mandibular surfaces coarsely punctate, about equal to the size of those on the frons. Edge of labrum emarginate. Length of antennomere III longer than II, antennomere XI more or less ovate, slightly long as wide. Pronotum $2\times$ as long as wide, widest at middle, narrowest apically, strongly transverse; sides converging posteriorly and not sinuate; anterior angles projecting and subacute; posterior angles acute; posterior margin straight; pronotal disc uneven with sublateral shallow impression, punctation more or less uniform, coarse and with a median glabrous area with punctures separated by $0.2\text{--}4\times$ their diameters; vestiture of pale yellow scales, two antebasal patches of dark scales absent; lateral carina evenly and strongly crenulate. Hypomeron setose and subglabrous, lacking scales; anterior portion of hypomeron rugose. Prosternum punctate with punctures round and deeply impressed and separated by about $\frac{1}{4}$ of the diameter of each

puncture; longitudinal glabrous area present; punctuation of ventrites more or less similar to prosternum, punctures on abdomen weaker. Mesoventral process not vaulted, not extending to a level higher than mesocoxae. Scutellum more or less transverse. Length of elytra 3× as long as pronotum; eight carinae present; sublateral keel absent; pale white and fewer darker scales present and forming semiregular patterns, sizes generally uniform, overlapping and round but scattered erect and white scales are present; intercarinal space lacking micropunctures; margins strongly explanate, apex of elytra rounded. Epipleuron visible in lateral view, carina bearing minute setae. Hind wings absent and in the form of small buds. Protibial edge smooth; mucro absent.

Comments. Olliff (1889) did not mention the number of specimens he examined in his description of this Lord Howe Island endemic. He mentions that the species is widespread, occurring also in 'low-lying land' and there is a variety with pronotum 'tinged with bronze'. We assume that the type locality is from the 'Summit of Mount Ledgebird [*sic*] (2500 ft)' and two specimens from AMSY were labeled as 'Syntypes', with one specimen from Mount Lidgbird that was selected as the Lectotype. Olliff (1889) argued that the species matched the principal characters of the genus *Ostoma*, despite the differences in the prosternum, expanded margins of the elytra and the form of the costae. This species is formally transferred to *Phanodesta* based on the beaded elytral carinae, red colouration and genal spines visible in dorsal view.

Type Material Examined. *Syntypes* (AMSY): specimen pointed (tarsi present only on right middle and hind legs), Mt. Lidgbird Ld. Howe (hw)/K 209347/*Ostoma pudicum*, Oll (hw)/SYNTYPE (yellow label)/LECTOTYPE *Ostoma pudicum* Olliff, 1889 design by R. Leschen 2011 (red label); specimen panted, Lord Howe Is (hw, different hw and on newer label paper)/K 209348/K38514. (hw)/SYNTYPE (yellow label)/PARALECTOTYPE *Ostoma pudicum* Olliff, 1889 design by R. Leschen 2011 (blue label).

Checklist of *Phanodesta* species

argentea Montrouzier, 1860: 916 (*Nitidula* Fabricius). New Caledonia.

Phanodesta argentea: Reitter, 1876:35.

Leperina argentea: Léveillé, 1888b:441

Note: Based on an image of the type (NHMP) this species requires additional study and may actually be a member of *Leperina* and closely related to *L. spercheoides*. We retain the species here following Reitter (1876).

brevipennis Reitter, 1876:33. Juan Fernandez Islands.

brownii Pascoe 1876: 57 (*Leperina*), **comb.n.** New Zealand.

carinata, **n. sp.** New Zealand.

cribraria Blanchard in Gay, 1851:441 (*Toxicum* Latrielle). Juan Fernandez Islands.

Phanodesta cribraria: Léveillé 1888c: ccvii.

Phanodesta cordaticollis Reitter, 1876:32 (Synonymy by Léveillé, 1888c: ccvii).

Trogosita picea Germain, 1855: 406 (Synonymy by Léveillé, 1888c: ccvii; see also Germain, 1898: 721).

Phanodesta picea: Léveillé 1878: lxxxii.

cribrata Germain, 1855: 407 (*Trogosita*). Juan Fernandez Islands.

Phanodesta cribrata: Léveillé, 1878: lxxxii.

Phanodesta angulata Reitter, 1876:33 (Synonymy by Léveillé, 1878: lxxxii; see also Germain, 1898: 721).

francoisi Léveillé, 1909: 163 (*Leperina*), **comb.n.** New Caledonia.

Note: Based on an image of the type (MNHP), this is an unusual species having the anterior pronotal angles strongly acute and micropunctures present in the intercarinal spaces. *guerini* Montrouzier, 1860: 916 (*Nitidula*). New Caledonia.

Phanodesta guerini: Reitter, 1876:35.

Leperina guerini: Léveillé, 1888b:441

iohowi Germain, 1898:716. Juan Fernandez Islands.

Note: There are three spellings of this patronym for the German-born naturalist, Friedrich Richard Adelbart Johow Biehler (or Federico Johow Biehler), the priority spelling appearing first and above the description (Germain, 1898: 716), *yohowi* (Germain 1898:721) and below the figure (*johowi* 1898:723), which was also included in Léveillé (1910).

manawatawhi, **n. sp.** New Zealand.

oculata, **n. sp.** New Zealand.

nigrosarsa White 1846: 17 (*Gymnocheila*). New Zealand.

Phanodesta nigrosarsa: Reitter, 1876:35.

Leperina nigrosarsa: Léveillé 1888b:441.

Lepidopteryx nigrosarsa: Klimaszewski and Watt, 1997:43. *pubescens* Germain, 1898:719. Juan Fernandez Islands.

pudica Olliff, 1889: 82 (*Ostoma* Laicharting), **comb.n.** Lord Howe Island.

robusta Pic, 1924: 378. Juan Fernandez Islands.

shandi Broun, 1909: 307 (*Leperina*), **comb.n.** New Zealand.

signoreti Montrouzier, 1860: 915 (*Leperina*), **comb.n.** New Caledonia.

Note: Images of MNHP material presumably identified by Léveillé confirmed the species we have examined for use in this study contained in the NZAC and QMB.

sobrina White, 1846:17 (*Gymnocheila*). New Zealand.

Phanodesta sobrina: Reitter, 1876: 35.

Leperina sobrina: Léveillé, 1888b: 442.

Opatrum fasciolata Blanchard, 1853: t. 11, f. 1 (Synonymy by Léveillé, 1888b: 442)

Leperina farinosa (Sharp 1877b: 266), **n.syn.**

Leperina interrupta Brookes, 1932: 28, **n.syn.**

tepaki, **n. sp.** New Zealand.

variegata Germain, 1855: 406 (*Trogosita*). Juan Fernandez Islands.

Phanodesta variegata: Léveillé, 1878: lxxxii.

Phanodesta costipennis Reitter, 1876:34 (Synonymy by Léveillé, 1878: lxxxii; see also Germain, 1898: 721).

Note: Material examined from the (MNHP) were labeled, presumably by Léveillé, as *P. variegata* and have the elytral

keel as described in Germain (1855) and in Reitter (1876) which led to L veill 's (1878) synonymy.
wakefieldi Sharp, 1877a:191 (*Leperina*), **comb.n.** New Zealand.

Other taxonomic changes

Grynoma ambiguum (Broun, 1880: 179), **comb.n.**

Leperina ambiguum Broun, 1880: 179

Comments. This species was described by Broun (1880; species 319) based on one specimen: 'I found one mutilated individual at Auckland some years ago; the genus, owing to the very much mutilated condition of the insect, must be held doubtful, as well as its real habitat'. The identification label clearly indicates that Broun placed this species in *Grynoma*, but was listed and described by him in *Leperina*. This placement was followed by Hudson (1923) whereas Maddison (2010) included it in *Lepidopteryx*.

Type Material Examined. Syntype (NHML): card mounted (damaged pronotum)/type (circular label with red border)/New Zealand Broun collection 1922-462. (red line beneath New Zealand)/Auckland Domain. (hw)/*Grynoma ambiguum*. (hw)/HOLOTYPE *Leperina ambiguum* Broun, 1880 confirmed by R. Leschen 2010 (red label).

Trogosita affinis White, 1846: 17

Comments. White (1846) did not list the number of specimens that he examined of *Trogosita affinis* and compared it to the widespread species *T. caraboides*, known now as a synonym of *Tenebroides mauritanicus* (Linnaeus, 1758: 417). This species was listed as a valid species of *Tenebroides* by L veill  (1910) and a single specimen was located in the NHML matches specimens of *T. mauritanicus* resulting in the following: *Trogosita affinis* White, 1846, **n.syn.** (= *Tenebroides mauritanicus* (Linnaeus, 1758: 417)). *Tenebroides mauritanicus* is cosmopolitan and has been spread globally through commerce (e.g. Delobel & Tran, 1993).

Type Material Examined. Syntype (NHML): pinned and inserted in a card/Type (round label with red border)/New Zealand (hw on a small round label)/*Trogosita affinis* White Zool. Ereb & Terror N. Zeal (hw)/LECTOTYPE *Trogosita affinis* White, 1846 designated by R. Leschen 2010 (red label).

Supporting Information

Additional Supporting Information may be found in the online version of this article under the DOI reference: 10.1111/j.1365-3113.2012.00661.x

File S1. Material examined of New Zealand species of *Phanodesta*.

File S2. Characters used for cladistic analyses.

Table S1. Data matrix.

Acknowledgements

Jamie Blackman, Priscilla Cameron, Nico Franz and Jiř  Kolib c assisted with references. Roger Booth helped during visits at the NHML and provided the loan of material. John Lawrence shared notes on taxonomy, Kip Will shared information on Juan Fernandez carabids and Jiř  Kolib c and Adam Slipinski reviewed the manuscript. Yves Bousquet, Pat Bouchard and Ivan L bl helped to sort out the confusion among generic names and type species. Thomas Th ry provided images of type material (MNHP) and hand-carried types of *Phanodesta* to RABL. Mario Elgueta and Jaime Solervicens answered queries about distribution and type specimens of *Phanodesta*. Nathan Lord provided images NHML types and other specimens, Kostya Nadein translated Russian references to English and Thomas Buckley commented on an early draft. We thank Thomas Buckley, Luke Dunning, Dave Seldon and others for help in the field and Grace Hall for databasing and georeferencing New Zealand *Phanodesta*. Thanks to Ng ti Kuri, Ngatiwai and Te Rarawa for access to various field sites including offshore islands. This research was supported by the New Zealand Ministry for Science and Innovation through the "Defining New Zealand's Land Biota" programme.

References

- Alonso-Zarazaga, M.A. & Lyal, C.H.C. (1999) *A World Catalogue of Families and Genera of Curculionoidea (Insecta: Coleoptera) (Excepting Scolytidae and Platypodidae)*. Entomopraxis S.C.P. Edition, Barcelona.
- Anonymous (2012) *Infoplease* [WWW document]. URL <http://www.infoplease.com/atlas/calculate-distance.html> [accessed on 10 February 2012].
- Arrow, G.J. (1900) Trogositidae. *A Monograph of Christmas Island (Indian Ocean): Physical Features and Geology, with Descriptions of the Flora and Fauna* (ed. by C.W. Andrews), pp. 92–94. British Museum (Natural History), London.
- Arrow, G.J. (1909) Systematic notes on Coleoptera of the clavicorn families. *The Annals and Magazine of Natural History*, **4**, 190–196.
- Aurivillius, C. (1926) Coleoptera Curculionidae von Juan Fernandez und der Oster-Insel. 1926–1931. *The Natural History of Juan Fernandez and Easter Island (Zoology)*, **3**, 461–478 + pls. 15–16.
- Bernardello, G., Anderson, G.J., Tod, F., Stuessy, T.F. & Crawford, D.J. (2006) The angiosperm flora of the Archipelago Juan Fernandez (Chile): origin and dispersal. *Canadian Journal of Botany*, **84**, 1266–1281.
- Blackburn, T. (1902) Further notes on Australian Coleoptera. *Transactions of the Royal Society of South Australia*, **26**, 288–321.
- Blanchard, C.E. (1851) Fauna chilena. Insectos. Coleopteros. *Historia f sica y pol tica de Chile, Zoolog a, Vol. 5* (ed. by C. Gay), pp. 285–564. Maulde & Renou, Paris.
- Blanchard, C.E. (1853) Descriptions des insectes. *Dumont D'Urville, J.S.C., Voyage au p le sud et dans l'Oc anie sur les corvettes l'Astrolabe et la Z l e; . . . Pendant les Ann es, 1837–40, par Hombron et Jacquinot*, Vol. IV (ed. by J.B. Hombron and R. Jacquinot), pp. 1–422 [+ 20 pls issued in 1847]. Gide et J. Baudry, Paris.

- Bremer, K. (1994) Branch support and tree stability. *Cladistics*, **10**, 295–304.
- Brookes, A. (1932) A new genus and six new species of Coleoptera. *Transactions and Proceedings of the New Zealand Institute*, **63**, 25–33.
- Broun, T. (1880) *Manual of the New Zealand Coleoptera*, Part I. Government Printer, Wellington.
- Broun, T. (1909) Notes on Coleoptera from the Chatham Islands. *Transactions of the New Zealand Institute*, **41**, 145–150.
- Burrige, C.P., Meléndez, R. & Dyer, B.S. (2006) Independent origins of the Juan Fernández kelpfish fauna (Perciformes: Chironemidae), and evidence for frequent and unidirectional dispersal of cirrhitoid fishes across the South Pacific. *Systematic Biology*, **55**, 566–578.
- Cahill, T. & Isacks, B.L. (1992) Seismicity and shape of the subducted Nazca Plate. *Journal of Geophysical Research*, **97**, 17,503–529.
- Crosby, T.K., Dugdale, J.S. & Watt, J.C. (1998) Area codes for recording specimen localities in the New Zealand subregion. *New Zealand Journal of Zoology*, **25**, 175–183.
- Crowson, R.A. (1964) A review of the classification of Cleroidea (Coleoptera), with descriptions of two genera of Peltidae and of several new larval types. *Transactions of the Royal Entomological Society of London*, **116**, 275–327.
- Crowson, R.A. (1970) Further observations on Cleroidea (Coleoptera). *Proceedings of the Royal Entomological Society of London*, **39**, 1–20.
- Darlington, P.J. (1957) *Zoogeography: The Geographical Distribution of Animals*. John Wiley & Sons, New York, NY.
- Dejean, P.F.M.A. (1835) *Catalogue des coléoptères de la collection de M. le comte Dejean*, Deuxième édition [Livraison 4]. Méquignon-Marvis Père et Fils, Paris.
- Delobel, A. & Tran, M. (1993) *Les coléoptères des denrées alimentaires entreposées dans les régions chaudes*. ORSTOM, Paris.
- Elgueta, D.M. & Arriagada, G.S. (1989) Estado actual del conocimiento de los coleópteros de Chile (Insecta: Coleoptera). *Revista Chilena de Entomología*, **17**, 5–60.
- Elgueta, M. & Marvaldi, A.E. (2006) Lista sistemática de las especies de Curculionioidea (Insecta: Coleoptera) presentes en Chile, con su sinonimia. *Boletín del Museo Nacional de Historia Natural*, **55**, 113–153.
- Erichson, W.F. (1842) Beitrag zur insecten-fauna von Vandiemensland, mit besonderer berücksichtigung der geographischen verbreitung der insecten. *Archiv für Naturgeschichte*, **8**, 83–287.
- Erichson, W.F. (1844) Einige nachträge zu meinem versuch einer systematischen eintheilung der Nitidularien. *German's Zeitschrift für die Entomologie*, **5**, 438–458.
- Fabricius, J.C. (1801) *Systema Eleutheratorum secundum ordines, genera, species, adjectis synonymis, locis, observationibus, descriptionibus*, Vol. I. Bibliopolii Academici Novi, Kiliae.
- Fauvel, A. (1866) Catalogue des Coléoptères de la Nouvelle-Calédonie et dépendances avec descriptions, notes et synonymies nouvelles. *Bulletin de la Société Linnéenne de Normandie*, **2**, 172–210.
- Fauvel, A. (1903) Faune analytique des Coléoptères de la Nouvelle-Calédonie. Ostomida. *Revue d'Entomologie*, **22**, 296–299.
- Felsenstein, J. (1985) Confidence limits on phylogenies: an approach using the bootstrap. *Evolution*, **39**, 783–791.
- Ferrú, M.A. & Elgueta, M. (2011) Lista de coleópteros (Insecta: Coleoptera) de las regiones de Arica y Parinacota y de Tarapacá, Chile. *Boletín del Museo Nacional de Historia Natural*, **60**, 9–61.
- Franz, N.M. (2006) Towards a phylogenetic system of derelomine flower weevils (Coleoptera: Curculionidae). *Systematic Entomology*, **31**, 220–287.
- Gebler, F.A. (1830) Bemerkungen über die Insekten Sibiriens, vorzüglich des Altai (Part 3). *Reise durch Altai gebirge und die songorische Kirgisen-steppe. Auf kosten der Kaiserlichen Universitäts Dorpat im jahr 1826 in begleitung der herren D. Carl Anton Miescher und D. Alexander von Bunge. Zweiter Theil* (ed. by C.F. Ledebour), pp. 1–228. G. Reimer, Berlin.
- Germain, P. (1855) Descripción de coleópteros de diversas especies que no se hallan en la obra del Señor Gay. *Anales de la Universidad Republica de Chile*, **1885**, 386–407.
- Germain, P. (1898) Apuntes entomológicos. El género *Phanodesta* Reitter. *Anales Universidad de Chile*, **100**, 715–722.
- Gillespie, R.G., Baldwin, B.G., Waters, J.M., Fraser, C., Nikula, R. & Roderick, G.K. (2011) Long-distance dispersal – a framework for hypothesis testing. *Trends in Ecology & Evolution*, **27**, 47–56.
- Gillogly, L.R. (1955) Los insectos de las Islas Juan Fernandez. 24. Nitidulidae. *Revista Chilena de Entomología*, **4**, 145–152.
- Gray, G.R. (1832) Notices of new genera and species. *The Animal Kingdom Arranged in Conformity with its Organization; by the Baron Cuvier, Member of the Institute of France, &c. &c. &c.*, Vol. 14, *The Class Insecta Arranged by the Baron Cuvier, Vol. 1* (ed. by E. Griffith), pp. viii + 1–570. Whittaker, Treacher, and Co., London.
- Griffith, E. & Pidgeon, E. (1832) *The Class Insecta Arranged by the Baron Cuvier, with Supplementary Additions to Each Order. And Notices of New Genera and Species by George Gray, Esq.*, Vol. 1. Whittaker, Treacher, and Co., London.
- Hawkeswood, T.J. (1992) Observations on the biology of the Australian beetle *Leperina cirrosa* Pascoe (Coleoptera: Trogossitidae). *Bulletin & Annales de la Societe Royale Belge d'Entomologie*, **128**, 229–233.
- Hope, F.W. (1840) *The Coleopterist's Manual, Part the Third, Containing Various Families, Genera, and Species, of Beetles, Recorded by Linneus and Fabricius. Also, Descriptions of Newly Discovered and Unpublished Insects*. Bowdery & Kerby, London.
- Hudson, G.V. (1923) An index of New Zealand beetles. *Transactions of the New Zealand Institute*, **54**, 353–399.
- Jerez, V. & Moroni, J. (2006) Diversidad de Coleopteros acuáticos en Chile. *Gayana*, **70**, 72–81.
- Klimaszewski, J. & Watt, J.C. (1997) Coleoptera: family group review and keys to identification. *Fauna of New Zealand*, **37**, 1–199.
- Kolibáč, J. (2005) A review of the Trogossitidae. Part 1: morphology of the genera (Coleoptera, Cleroidea). *Entomologica Basiliensia et Collectionis Frey*, **27**, 39–159.
- Kolibáč, J. (2006) A review of the Trogossitidae. Part 2: larval morphology, phylogeny and taxonomy (Coleoptera, Cleroidea). *Entomologica Basiliensia et Collectionis Frey*, **28**, 105–153.
- Kolibáč, J. (2007) Trogossitidae Latrielle, 1802. *Catalogue of Palaearctic Coleoptera*, Vol. 4 (ed. by I. Löbl and A. Smetana), pp. 364–366. Apollo Books, Stenstrup.
- Kolibáč, J. (2008) Morphology, taxonomy and phylogeny of *Phloiophilus edwardsi* Stephens, 1830 (Coleoptera, Cleroidea). *Entomologica Basiliensia et Collectionis Frey*, **30**, 105–133.
- Kolibáč, J. (2009) Some nomenclatorial notes on the family Trogossitidae (Coleoptera, Cleroidea). *Entomologica Basiliensia et Collectionis Frey*, **31**, 127–129.
- Kolibáč, J. & Gerstmeier, R. (1997) Description of *Eurymetopum wachteli* sp. n., from the Baltic amber (Coleoptera, Cleridae, Hydrocerinae). *Mitteilungen Münchener Entomologischen Gesellschaft*, **87**, 97–100.
- Kolibáč, J. & Leschen, R.A.B. (2010) Trogossitidae Fabricius, 1801. *Handbook of Zoology, Vol. IV: Arthropoda: Insecta. Part 38, Coleoptera, Vol. 1: Morphology and Systematics (Archostemata, Adephaga, Myxophaga, Polyphaga, partim)* (ed. by R.G. Beutel and R.A.B. Leschen), pp. 241–247. De Gruyter, Berlin.

- Kolibáč, J. & Zaitsev, A.A. (2010) A description of a larva of *Ancyrona diversa* Pic, 1921 and its phylogenetic implications (Coleoptera: Trogositidae). *Zootaxa*, **2451**, 53–62.
- Kryzhanovskij, O.L. (1965) 38. Fam. Ostomatidae (Trogositidae) – Schitovidki. *The Insects of the European Part of USSR, Volume II: Beetles and Strepsiptera* (ed. by E.L. Gurjeva and O.L. Kryzhanovskij), pp. 239–240. Nauka, Moscow, Leningrad (in Russian).
- Kukulová-Peck, J. & Lawrence, J.F. (1993) Evolution of the hind wing in Coleoptera. *Canadian Entomologist*, **125**, 181–258.
- Kuschel, G. (1963) Composition and relationship of the terrestrial faunas of Easter, Juan Fernandez, Desventuradas and Galapagos Islands. *Occasional Papers of the Californian Academy of Sciences*, **44**, 79–95.
- Kuschel, G. (1990) *Beetles in a Suburban Environment: A New Zealand Case Study. The Identity and Status of Coleoptera in the Natural and Modified Habitats of Lynfield, Auckland (1974-1989)*. DSIR Plant Protection Report 3. DSIR Plant Protection, Auckland.
- Lawrence, J.F. & Britton, E.B. (1991) Coleoptera (beetles). *The Insects of Australia A Textbook for Students and Research Workers*, 2nd edn, Vol. II (ed. by CSIRO), pp. 543–683. Melbourne University Press, Melbourne.
- Lawrence, J.F. & Newton, A.F. Jr. (1995) Families and subfamilies of Coleoptera (with selected genera, notes, references and data on family-group names). *Biology, Phylogeny, and Classification of Coleoptera: Papers Celebrating the 80th Birthday of Roy A. Crowson* (ed. by J. Pakaluk and S.A. Slipinski), pp. 779–1006. Museum i Instytut Zoologii PAN, Warszawa.
- Leschen, R.A.B. (2003) Erotylidae (Insecta: Coleoptera: Cucujoidea): phylogeny and review. *Fauna of New Zealand*, **47**, 1–108.
- Leschen, R.A.B. & Lawrence, J.F. (1991) Fern sporophagy in Coleoptera from the Juan Fernandez Islands, Chile, with descriptions of two new genera in Cryptophagidae and Mycetophagidae. *Systematic Entomology*, **16**, 327–352.
- Léveillé, A. (1878) Description de quatre nouvelles especes de trogositides exotiques). *Bulletin de la Société Entomologique de France*, **1878**, lxxix–lxxxii.
- Léveillé, A. (1884) Description d'une espèce de Trogositides. *Annali del Museo Civico di Storia Naturale di Genova*, **1884**, 637–638.
- Léveillé, A. (1888a) Descriptions de Temnochilides nouveaux. *Annales de la Société Entomologique de France*, **1888**, 411–430.
- Léveillé, A. (1888b) Catalogue de la famille des temnochilides. *Annales de la Société Entomologique de France*, 6e Série, **8**, 429–448.
- Léveillé, A. (1888c) Quelques renseignements nouveaux sur la famille des Trogositides. *Bulletin de la Société Entomologique de France*, **1888**, ccvii–ccviii.
- Léveillé, A. (1889) Études sur la famille des Temnochilides. *Bulletin de la Société Entomologique de France*, **68**, 645–657.
- Léveillé, A. (1893) Liste des Temnochilides recueillis par M. Loria en Nouvelle Guinée méridionale-orientale. *Annali del Museo Civico di Storia Naturale di Genova*, **13**, 248–250.
- Léveillé, A. (1909) Descriptions d'une espèce de *Leperina* et note synonymique. *Bulletin de la Société Entomologique de France*, **1908**, 163–164.
- Léveillé, A. (1910) Temnochilidae. *Coleopterorum Catalogus*, Vol. Pars 11 (ed. by S. Schenkling), pp. 1–40. W. Junk, Berlin.
- Liebherr, J.K. (2005) Platynini (Coleoptera: Carabidae) of Vanuatu: miocene diversification on the Melanesian Arc. *Invertebrate Systematics*, **19**, 263–295.
- Linnaeus, C. (1758) *Systema Naturæ per Regna Tria Naturæ, Secundum Classes, Ordines, Genera, Species, cum Characteribus, Differentiis, Synonymis, Locis*, Tomus I. Editio Decima, Reformata. Holmiae (Laurentii Salvii), Stockholm.
- Löbl, I. & Smetana, A. (2010) *Catalogue of the Palaearctic Coleoptera, Volume 6: Chrysomeloidae*. Apollo Books, Stenstrup.
- Löbl, I. & Smetana, A. (2011) *Catalogue of the Palaearctic Coleoptera, Volume 7: Curculionoidea I*.
- Macleay, W.J. (1871) Notes on a collection of insects from Gayndah. *Transactions of the Entomological Society of New South Wales*, **2**, 79–205.
- Maddison, P.M. (2010) Order Coleoptera. *Checklist of New Zealand Hexapoda*, Chapter 9: Phylum Arthropoda Subphylum Hexapoda (Protura, springtails, Diplura, and insects). *New Zealand Inventory of Biodiversity, Vol. 2: Kingdom Animalia. Chaetognatha, Ecdysozoa, Ichnofossils* (ed. by D.P. Gordon), pp. 409–436. Canterbury University Press, Christchurch.
- Maddison, W.P. & Maddison, D.R. (1992) *MacClade, Version 3: Analysis of Phylogeny and Character Evolution*. Sinauer, Sunderland, Massachusetts.
- Marra, M.J. & Leschen, R.A.B. (2004) Late Quaternary paleoecology from fossil beetle communities in the Awatere Valley, South Island, New Zealand. *Journal of Biogeography*, **31**, 571–586.
- Matthews, E.G. (1992) A guide to the genera of beetles of South Australia. Part 6 Polyphaga: Lymexyloidea, Cleroidea, Cucujoidea. *Special Educational Bulletin Series (South Australia Museum)*, **9**, 1–75.
- Michaux, B. (2009) Reciprocity between biology and geology: reconstructing polar Gondwana. *Gondwana Research*, **16**, 655–668.
- Montrouzier, X. (1860) Essai sur la faune entomologique de la Nouvelle-Calédonie (Balade) et des îles des Pins, Art, Lifu, etc. *Annales de la Société Entomologique de France*, **1860**, 866–916.
- Murray, A. (1867) List of Coleoptera received from Old Calabar, on the West Coast of Africa. *The Annals and Magazine of Natural History*, **19**, 334–340.
- Nakane, T. (1985) New or little known Coleoptera from Japan and its adjacent regions, XXXVIII. *Fragmenta Coleopterologica*, **38/40**, 153–164.
- Nikitsky, N.B. (1992) 54. Fam. Trogositidae. *Key to Insects of the Far East of USSR, Volume III: Beetles, Part 2* (ed. by P.A. Ler), pp. 79–82. Nauka, St. Petersburg.
- Olliff, A.S. (1886) A list of the Trogositidae of Australia, with notes and descriptions of new species. *Proceedings of the Linnean Society of New South Wales*, **10**, 699–715.
- Olliff, A.S. (1889) The insect fauna of Lord Howe Island. *Australian Museum Memoir*, **2**, 75–98 + plate VI.
- Pascoe, F.P. (1860) Notices of new or little-known genera and species of Coleoptera. *Journal of Entomology, Descriptive and Geographical*, **1**, 98 + pls V–VIII.
- Pascoe, F.P. (1863) Notices of new or little known genera and species of Coleoptera. *Journal of Entomological Description and Geography*, **2**, 26–56 + pls II & III.
- Pascoe, F.P. (1872) Notes on Coleoptera with descriptions of new genera and species – Part II. *The Annals and Magazine of Natural History*, **10**, 317–326 + plate XV.
- Pascoe, F.P. (1876) Descriptions of new genera and species of New Zealand Coleoptera. – Part III. *The Annals and Magazine of Natural History*, **18**, 57–67.
- Pic, M. (1924) Coleoptera-Clavicornia et autres de Juan Fernandez. *The Natural History of Juan Fernandez and Easter Island*, **3**, 377–380.
- Pope, R.D. (1955) Los insectos de las Islas Juan Fernandez. 25. Colydiidae (Coleoptera). *Revista Chilena de Entomología*, **4**, 153–158.
- Redtenbacher, L. (1867) *Zoologischer Theil. Zweiter Band: Coleopteren. Reise der österreichischen Fregatte Novara um die Erde in den Jahren 1857, 1858, 1859 unter den Befehlen des Commodore B. von Wüllerstorff-Urbair*. Karl Gerold's Sohn, Wien.

- Reitter, E. (1876) Systematische Eintheilung der Trogositidae (Familia coleopterorum). *Verhandlungen des Naturforschenden Vereines in Brünn*, **14**, 1–69 + 2 pls.
- Reitter, E. (1882) Bestimmungs-tabellen der europäischen Coleopteren, VI. Heft. Enthalend die Familien: Colydiidae, Rhysodidae, Trogositidae. *Verhandlungen des Naturforschenden Vereines in Brünn*, **20**, 113–149.
- Reitter, E. (1889) Zwei neue Trogositiden aus Japan. *Weiner Entomologische Zeitung*, **8**, 217.
- Reitter, E. (1922) *Bestimmungs-Tabellen der europäischen Coleopteren, VI. Heft. Enthalend die Familien: Colydiidae, Rhysodidae, Ostomidae, Zweite, gänzlich umgearbeitete und auf die palaearktische Fauna ausgedehnte Auflage*. E. Reitter, Troppau.
- Roy, M.S., Torres-Mura, J.C. & Fritz, H. (1998) Evolution and history of hummingbirds (Aves: Trochilidae) from the Juan Fernandez Islands, Chile. *IBIS*, **140**, 265–273.
- Sanderson, M.J. (1995) Objections to bootstrapping phylogenies: a critique. *Systematic Biology*, **44**, 299–320.
- Sanmartín, I. & Ronquist, F. (2004) Southern hemisphere biogeography inferred by event-based models: plant versus animal patterns. *Systematic Biology*, **53**, 1–28.
- Schawaller, W. (1993) Taxonomie und Larvalmorphologie paläarktischer *Leperina* (Coleoptera: Trogossitidae). *Stuttgarter Beiträge zur Naturkunde (Series A)*, **500**, 1–9.
- Scherer, G. (1983) Diagnostic key for the Neotropical alticine genera. *Entomologische Arbeiten aus dem Museum G. Frey*, **31/32**, 1–89.
- Sharp, D. (1877a) Descriptions of a new genus and some new species of New Zealand Coleoptera. *Entomologists Monthly Magazine*, **13**, 190–196.
- Sharp, D. (1877b) Descriptions of some new species and indications of new genera of Coleoptera from New Zealand. *Entomologists Monthly Magazine*, **13**, 265–272.
- Skottsberg, C. (1956) Derivation of the flora and fauna of Juan Fernandez and Easter Islands. *Natural History of Juan Fernandez and Easter Islands*, **1**, 193–405.
- Slipinski, A.S. (1992) Larinotinae – a new subfamily of Trogossitidae (Coleoptera), with notes on the constitution of Trogossitidae and related families of Cleroidea. *Revue Suisse Zoologie*, **99**, 439–463.
- Sorenson, M.D. (1999) *TreeRot, Version 2*. Boston University, Boston, MA.
- Steel, W.O. (1950) Notes on Staphylinidae, chiefly from New Zealand. (2) A new genus and three new species of Eleusiini. *Transactions of the Royal Society of New Zealand*, **78**, 213–235.
- Stuessy, T.F., Foland, K.A., Sutter, J.F., Sanders, R.W. & Silva, O.M. (1984) Botanical and geological significance of potassium-argon dates from the Juan Fernández Islands. *Science*, **225**, 49–51.
- Swofford, D.L. (2003) *Phylogenetic Analysis Using Parsimony (PAUP*)*, Version 4. Sinauer, Sunderland, MA.
- Trénel, P., Gustafsson, M.H.G., Baker, W.J., Asmussen-Lange, C.B., Dransfield, J. & Borchsenius, F. (2007) Mid-Tertiary dispersal, not Gondwanan vicariance explains distribution patterns in the wax palm subfamily (Ceroxyloideae: Arecaceae). *Molecular Phylogenetics and Evolution*, **45**, 272–288.
- White, A. (1846) Insects of New Zealand. (Coleoptera part). *The Zoology of the Voyage of the H.M.S. Erebus & Terror, Under the Command of Captain Sir James Clark Ross, R. N., F.R.S., During the Years 1839–1843*, Vol. 2 (Part 4) (ed. by J. Richardson and J.E. Gray), pp. 1–24 + 6 pls. Green and Longan, London.
- Will, K.W. (2005) New tribal and generic placement for taxa of Pterostichini (auct.) (Coleoptera: Carabidae) from the Juan Fernandez Archipelago, Chile with taxonomic notes on *Trirammatius* Chaudoir, 1838. *The Pan-Pacific Entomologist*, **81**, 68–75.
- Zaitsev, A. (2008) *Leperina squamulosa* (Trogossitidae) [WWW document]. URL <http://www.flickr.com/photos/25258027@N02/2383816786/in/set-72157604361795999> [accessed on 11 February 2012].

Accepted 4 September 2012

First published online 29 January 2013