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New Records of Large Coleoptera from
Lord Howe Island, July 2018**

by

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Citizen Science and the Art of Discovery: New Records of Large Coleoptera from Lord Howe Island, July 2018

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ABSTRACT. A citizen science event was held on Lord Howe Island, 22–28 July 2018, with the objective of training non-scientist volunteers in basic search methods for large beetles. The survey was conducted to obtain baseline data on the distribution of large beetles prior to the rat eradication programme scheduled to start in 2019. The event was hosted by the Lord Howe Island Museum and voluntary participation was organized through the Lord Howe Island Conservation Volunteers. The event was open to both residents and tourists. Guidance was provided by the two authors. Activities for the volunteers included an introductory talk on the large beetles of the island, four afternoon searches and one night search. An extra day walk was added for some interested local participants. During the remainder of the week the authors conducted their own searches. 13 areas were visited altogether, and the results concerning the large species (1 cm or more in length) are tabulated here. The citizen scientist volunteers found several species not found by the authors. The survey was in mid winter, a generally poor time for beetle activity, but 23 large species were found, all of which are discussed. These include the rediscovery of *Cormodes darwini* Pascoe, 1860 (Cleridae), hitherto considered extinct and last recorded in 1916, and the first record of the genus *Torresita* (Buprestidae) on the island.

Introduction

Citizen science is a modern term that formally names an activity that has existed for centuries: the help given to scientists by enthusiastic volunteers. The phrase has developed over the last 40 years to mean several different things, with a history best explained on perhaps the most famous citizen science platform of all, Wikipedia (Anonymous, 2018a). Here we follow the definition and objectives laid out by the European Citizen Science Association (Anonymous, 2015), which have also been adopted by the Australian Citizen Science Association (Anonymous, 2018b). The essence is that non-experts provide assistance to experts. However citizen science is, ideally, a two way process in which both scientists and non-scientist citizens gain something from the experience, ideally to the benefit of science and society. In a wide

ranging review of citizen science projects, Kosmala *et al.* (2016) showed that if carefully instituted and monitored a citizen science project can generate just as useful data as a science project without use of non-experts. They noted that, to succeed, citizen science projects should: (a) be replicable; (b) be standardized; (c) have appropriate protocols and data analyses; and (d) include accuracy assessment (Kosmala *et al.*, 2016).

The dominant culture of science rarely accounts for different ways of knowing, and often fails to engage the public. Citizen science emphasizes collaborative intelligence and co-creation to facilitate scientific and community-based solutions. This is particularly important on relatively remote Lord Howe Island, where the travel and accommodation costs are high, which limits the frequency and length of visits to monitor changes. By harnessing the energy of interested residents and visitors, many more observations can be made

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Figure 1. Introductory lecture on “large” beetles of Lord Howe (photo: Ian Hutton).

than would otherwise be available just by the use of specialist scientists occasionally visiting to carry out observations.

Lord Howe Island and its offshore islets (the Lord Howe Group) is a World Heritage Site, listed for its natural environment (Anonymous, 2018c). The terrestrial part of that environment is largely subtropical rainforest with a high diversity of endemic flora and fauna (Hutton *et al.*, 2007). The island group is often described as one of the least disturbed places in the Pacific, yet has suffered a recent mass extinction of birds due to the accidental introduction of black rat (*Rattus rattus*) in 1918 (Hutton *et al.*, 2007). Black rats are adaptable omnivores known to have caused extinctions of many different organisms on islands worldwide, including insects (St Clair, 2011). There is evidence that the introduction of black rats to Lord Howe in 1918 led to extinction of large insects on the main island of Lord Howe, most obviously of the flightless phasmid *Dryococelus australis* (Montrouzier, 1855) (Priddel *et al.*, 2003) and the flightless cockroach *Panesthia lata* Walker, 1868 (Carlile *et al.*, 2017). Large beetles also appear to have been lost, but the beetle fauna is much less well documented (Reid *et al.*, 2018a). There is also evidence on Lord Howe of beetle extinction due to house mice, accidentally introduced much earlier, in the late 1860s (Etheridge, 1889; Reid *et al.*, 2018a).

The Lord Howe Island Board intends to attempt rodent eradication on Lord Howe, through an intensive baiting

programme (Anonymous, 2018d). Following eradication of these introduced pests there will be enormous changes to the native flora and fauna on the island. It will be important to document these changes. There are monitoring methods that scientists need to undertake with rigorous procedures, but there are ample opportunities to include the layperson, not only in making observations but also adding valuable contributions to the outcomes for conservation management. This is an opportunity to regard Lord Howe as a partnership between people and nature, to harness the knowledge and expertise of the resident and visiting community in the great task of deepening the conservation of the island’s unique natural values.

The likely effect of rodent eradication on the 70 or so species of large beetle in the Lord Howe (Reid *et al.*, 2018a) is unknown, but is unknowable if there are no baseline data on abundances and distributions of these species. The authors therefore sought to use the citizen science model to develop techniques for large beetle survey on Lord Howe, during one week in July, 2018. The goal was to create highly enjoyable and productive working relationships among the community and scientists, based on mutual respect for their differing knowledge and experience.



Figure 2. Looking for large beetles in the grassed dunes of Blinky Beach (photo: Ian Hutton).

Methods

A 30 minute presentation on the large beetles of Lord Howe Island was given to the citizen scientists (Fig. 1). Collecting and survey methods were discussed and laminated 2-sided information sheets were provided, giving information such as diagnostic characters, habitat and status on the island for 18 of the approximately 70 large species. These were representative of either abundant species that volunteers would be certain to find, or extinct species that might stimulate the volunteers to search for. The importance of adequate knowledge of distributions prior to rat eradication was stressed, as a likely outcome of the latter is increased abundance of the former rat prey. Volunteers were encouraged to understand that they could make a significant contribution towards the monitoring of change as the rat eradication programme goes ahead.

The original plan was to take the volunteers into two habitat types on each activity session: a beach dune area (Fig. 2) and a nearby forest (Fig. 3). The dunes were primarily investigated for the presence of a rarely recorded scarab thought to be associated with this habitat. The forest was investigated because it was thought that at least something could be found there. This programme was adjusted slightly after the authors made their significant discovery of rare species associated with dead Sallywood (*Lagunaria*) wood

on Blackburn Island. We therefore focussed on forest with abundant *Lagunaria* (usually swampy or low-lying areas). The following sites or areas were investigated by citizen scientists: Blinky Beach (dunes and forest), Boat Harbour (littoral vegetation and forest), Clear Place track (forest), Cobbys Corner (dunes and forest), Far Flats (littoral vegetation and forest), Soldiers Creek (forest), Stevens Reserve and nearby shore (littoral vegetation and forest). The authors also collected at Blackburn Island (woodland), Catalina track and near Arijilla Resort (forest) and North Beach (littoral vegetation and forest). Collecting effort at each site varied from 30 minutes (North Beach area) to 3 hours. A night walk in Stevens Reserve was also organized, so that volunteers could be shown nocturnal beetle activity (Fig. 4).

An identifiable fragment of a dead specimen is just as good a record as a live specimen for recording the presence of species, especially if the fauna is only of limited diversity such as on Lord Howe. Participants were therefore encouraged to look for both fragments and whole individuals. Large larvae were also collected or identified in situ where possible (larvae of Lucanidae and large Cerambycidae).

Collecting methods were hand-searching, and additional sweep-netting, beating and litter sieving supervised by the two authors. Everyone took part in examining the sieved forest leaf-litter (Fig. 3). All volunteers were given one or more large dry vials and encouraged to come to one of the



Figure 3. Citizen scientists examining the contents of a leaf litter sifter in forest (photo: Ian Hutton).

authors as soon as they had captured something, so that they could be briefed on the significance of their find.

The weather was fine and sunny during the day, with occasional showers at night. Maximum diurnal temperature ranged from 16–22°C.

Results

Approximately 500 specimens of Coleoptera were collected by the authors and the citizen scientists, including at least 100 species. All collected specimens are preserved in the Australian Museum collection. The 23 large species, length ≥ 1 cm, are listed below. The larvae of some large species are easily identifiable so these specimens are also included. New records for the island are noted.

Family Buprestidae

Buprestidae, jewel beetles, are often brightly coloured. Larvae are usually wood-boring and adults usually feed on pollen or nectar. The buprestids of Lord Howe are poorly known. They are rarely collected and the taxonomy is confused. Prior to our survey three species were known from the island: two *Melobasis* (Olliff, 1889) and one *Maoraxia* (Bellamy & Petersen, 2000).

Torresita species 1

Material examined. 1 [fragments]: “betw[een] Boat Harbour & Rocky Run, vic 31.5569S 159.0939E 68 m swept/rotten wood 28.vii.2018 Reid, Hutton & volunteers.” **New record** for Lord Howe Island.

These fragments include elytra, abdomen and male genitalia and are sufficient to identify the specimen to genus *Torresita* Gemminger & Harold (Bellamy & Williams, 1985). This is a new record of the genus for the island and may represent an undescribed species. It is similar to *Torresita cuprifera* Kirby, 1818, but this widespread species on the Australian eastern seaboard needs revision as the name may mask a species complex (A. Sundholm, G. Williams, pers. comm. July 2018). Length: estimated to be 11 mm.

Family Carabidae

This family is generally known as the ground beetles and almost all the species known from Lord Howe are terrestrial predators, as adults and larvae.

Eurystomis castelnaui Chaudoir, 1878

Material examined. 1: “Stevens Res, 31.5241S 159.0655E, 15 m vic fallen tree, night searching, 25.vii.2018, Reid, Hutton & volunteers”.

Eurystomis castelnaui is flightless and endemic to the



Figure 4. Citizen scientists ready for a night walk to look for large beetles (photo: Ian Hutton).

main island of Lord Howe, where it is a lowland forest species (Reid *et al.*, 2018a). In 2017 only remains of a single dead specimen were found and concern was expressed that the population may have been affected by drought (Reid *et al.*, 2018a). We hereby confirm that the species still exists in Stevens Reserve, which seems to be its main population on the island. Length 8–10 mm.

Notoplatynus hiliaris (Olliff, 1889)

Material examined. 2: “Blackburn Id 31.5347S 159.0603E, c5 m, under rotting *Lagunaria*, top of slope under large fig, 24.vii.2018 C Reid & I Hutton”.

Notoplatynus hiliaris is endemic to Lord Howe where it is widespread and common. This species was first recorded from Blackburn Island in 2017 (Reid *et al.*, 2018a) and was again found there by us in July 2018. However, as in 2017, our survey failed to find this species anywhere on the main island. It is possible that this current rarity represents the continued effect of the 2016–2017 drought. Length 8–11 mm.

Family Cerambycidae

The family Cerambycidae includes the familiar longhorn beetles, many of which fly at night and are attracted to lights. The larvae feed in plant stems, usually in hard woody tissue.

Agrianome spinicollis (Macleay, 1826)

Material examined. 1 [elytron fragment]: “Blackburn Id 31.5346S 159.0604E, c2 m, under stones/dead wood, lower slope under large fig, 24.vii.2018 C Reid & I Hutton”; 1 [mature larva]: “Blackburn Id 31.5347S 159.0604E, c5 m, rotting *Lagunaria* below top of slope under large fig, 24.vii.2018 C Reid & I Hutton”; 1 [mature larva]: “Far Flats, up slope vic 31.5669S 159.0777E, 50 m, rotten *Lagunaria* etc, 26.vii.2018, C Reid & I Hutton”. Additional material (larvae seen, not collected): “Blinky Beach, 31.5378S 159.0806E, 4–6 m, dead wood etc under stunted forest on dunes, 24.vii.2018, Reid, Hutton & volunteers”; “N of Blinky Beach, 31.5367S 159.0813E, 20–25 m, dead wood/leaf litter/under palm/pandanus/trees, 24.vii.2018, C Reid, I Hutton & volunteers”; “start of Catalina Track, 31.5191S rotten wood, closed forest, 26.vii.2018, C Reid; Clear walk, Deep Gulch area 31.5292S 159.0762E 60 m under bark *Cryptocarya* / beating etc 27.vii.2018 C Reid, I Hutton”; “Cobbys Corner, Sallywood Swamp, 31.5440S 159.0778E, 8 m, in rotting wood, 25.vii.2018, Reid, Hutton & volunteers”; “North Beach, forest at E end, 31.5170S 159.0464E, 5 m, in rotten log, 25.vii.2018, C Reid”; “Soldiers Creek, vic 31.5527S 159.0823E, 22 m, in rotten wood, 25.vii.2018, Reid, Hutton & volunteers”; “Stevens Reserve, 31.52412S 159.0655E, 15 m rotting log in forest 26.vii.2018 C Reid”.

There are supposed to be three prionine cerambycid species on Lord Howe (McKeown, 1947), two of which are



Figure 5. First live *Cormodes darwini* discovered since 1916 (photo: Ian Hutton).

very large, >3 cm long (*A. spinicollis* and *Cnemoplites howei* (Thomson, 1864)). However all the large prionines seen in collections from Lord Howe (dated 1880–present) belong to a single species and it is most likely that these two names are synonyms, so only one large species is recognised here. *Agrianome spinicollis* is the largest beetle on the island, and the mature larvae are huge and easily identifiable to this species. Similar smaller larvae may belong to the other species of prionine cerambycid on the island, *Howea angulata* Olliff, 1889, with 2–2.5 cm long adults, so we have only included records of large larvae. In this survey we targetted the larval habitat of *A. spinicollis* and larvae of the species were found at many localities. *Agrianome spinicollis* evidently continues to be generally common in dead wood throughout the lowland forests. Length (of adult): 35–50 mm.

Longipalpus species 1

Material examined. 1 [fragments]: “Far Flats, up slope vic 31.5669S 159.0777E, 50 m, rotten Lagunaria etc, 26.vii.2018, C Reid & I Hutton”.

This species, the only member of the genus on the island, is apparently undescribed and probably endemic to Lord Howe. It was previously only known from a single specimen collected on the north slope of Lidgbird, below Goat House,

in 2005 (in AM collection), which record was noted in the recent generic revision of cerambycine cerambycids (Ślipiński & Escalona, 2016). The genus *Longipalpus* is widespread in Asia and the Pacific but is very rarely collected in Australia (Ślipiński & Escalona, 2016). Length: 11 mm.

Family Chrysomelidae

Dematochroma picea (Baly, 1864)

Material examined. 1[dead]: “Boat Harbour, vic 31.5596S 159.0982E, 5–20 m, swept/rotten wood, 28.vii.2018, Reid, Hutton & volunteers”; 1[elytron]: “betw[een] Boat Harbour & Rocky Run, vic 31.5569S 159.0939E 68 m swept/rotten wood, 28.vii.2018 Reid, Hutton & volunteers”; 1[fragments]: “N of Blinky Beach, 31.5367S 159.0813E, 20–25 m, dead wood/leaf litter/under palm/pandanus/trees, 24.vii.2018, C Reid, I Hutton & volunteers”.

Live adults of the endemic leaf beetle *Dematochroma picea* were commonly collected in the summer of 2017 (Reid *et al.*, 2018a). Only fragments of dead individuals were collected in this winter survey, suggesting that the adults are only present in summer. The larvae are likely to inhabit soil, feeding on roots. Length 8–12 mm.



Figure 6. *Cormodes darwini* safely in vial at discovery site on Blackburn Island (photo, Ian Hutton).

Family Cleridae

Clerids are active predators of other insects, usually found running about on foliage and flowers. The clerid fauna of Lord Howe was recently revised with five species recognized (Bartlett, 2009), but that revision overlooked *Omadius prasinus* Westwood, 1852 (Olliff, 1889; Reid *et al.*, 2018a).

Cormodes darwini Pascoe, 1860

Figs 5–8

Material examined. 1 mature larva: “Blackburn Id 31.5347S 159.0604E, c5 m, rotting *Lagunaria* below top of slope under large fig, 24.vii.2018 C Reid & I Hutton”; 1 adult, 1 mature larva: “Blackburn Id 31.5346S 159.0596E, c10 m, rotting *Lagunaria* branch, slope below furthest trees, 24.vii.2018 C Reid & I Hutton”.

Cormodes darwini is large for a clerid and flightless. It is endemic to Lord Howe but has been considered extinct since 1918 (Anonymous, 2007; Bartlett, 2009). On this survey, the 2 cm long larva was first discovered, in a rotten log under the large fig tree on Blackburn Island. The larva is distinctive when alive, as the pure white body strongly contrasts with the black head, pronotum and tergite 9 (Fig. 8). The mid abdominal tergites have slightly inflated ampullae. The larva was immediately recognized as belonging to *Cormodes darwini* because of its size and habitat, so the short visit to

Blackburn Island (of two hours duration) was turned into an intensive examination of rotting wood, under the few trees on the island, to find an adult and clearly establish the presence of this species. This was achieved, with discovery of another larva and an adult in rotten wood under a different patch of trees (Figs 5–7). The rediscovery of this species on Blackburn Island prompted the authors to concentrate on searching in rotten *Lagunaria* logs on the main island but no additional specimens were found. The survival of *Cormodes darwini* on Blackburn Island must be tenuous at best, as the larva is evidently a specialized predator of woodboring beetle larvae, which are severely restricted by the rarity of trees there. Length (of adult): 11–15 mm.

Family Curculionidae

Eutyrrhinus meditabundus (Fabricius, 1775)

Material examined. 1[fragments]: “Far Flats, up slope vic 31.5669S 159.0777E, 50 m, rotten *Lagunaria* etc, 26.vii.2018, C Reid & I Hutton”.

Eutyrrhinus meditabundus is a widespread species of weevil in the southwest Pacific and the eastern seaboard of Australia, first recorded from Lord Howe by Olliff (1889). It is a woodborer recorded from a large range of hosts in Australia (Hawkeswood, 1991). On Lord Howe it is restricted to lowland rainforest. Length 8–12 mm.



Figure 7. *Cormodes darwini* specimen collected on Blackburn Island, July 2018 (photo: Max Beatson).

Orthorhinus vagus Olliff, 1889

Fig. 9

Material examined. 1 dead adult, 1 elytron, 1 pupa, 6 mature larvae: “Blackburn Id 31.5347S 159.0603E, c5 m, rotting *Lagunaria*, top of slope under large fig, 24.vii.2018 C Reid & I Hutton”.

Orthorhinus vagus is also found in coastal New South Wales (Olliff, 1889). It is a rarely collected species, with only four recently collected specimens in the Australian Museum, from two lowland sites (Stevens Reserve and “Sea Breeze” Resort). Our specimens represent the first record of this species from Blackburn Island. Length 7–12 mm.

Family Elateridae

Conoderus striatus (Macleay, 1872)

Material examined. 1[prothorax]: “S Lagoon Beach nr Cobbys Corner, 31.5431S 159.0773E, 5 m, exotic grasses etc on sand, 25.vii.2018, Reid, Hutton & volunteers”; 1[fragments]: “N of Blinky Beach, 31.5367S 159.0813E, 20–25 m, dead wood/leaf litter/under palm/pandanus/trees, 24.vii.2018, C Reid, I Hutton & volunteers”.

Our records of *Conoderus striatus* add two new sites to the distribution of this widespread Australian species on Lord Howe (Reid *et al.*, 2018a). It is probably an exotic species on Lord Howe where it now occurs widely in both disturbed and natural habitats. Length 8–15 m.

Family Lucanidae

Figulus nitens Waterhouse, 1874.

Material examined. 1 adult: “forest E Arajilla Resort, vic 31.5201S 159.0595E, 20 m, at house light, 26.vii.2018 C Reid”; 1 larva: “Blinky Beach, 31.5378S 159.0806E, 4–6 m, dead wood etc under stunted forest on dunes, 24.vii.2018, Reid, Hutton & volunteers”; 1 larva: “Boat Harbour, vic 31.5596S 159.0982E, 5–20 m, swept/rotten wood, 28.vii.2018, Reid, Hutton & volunteers”; 1 adult: “Clear Place walk, Deep Gulch area, 31.5292S 159.0762E, 60 m, under bark, *Cryptocarya*/beating etc, 27.vii.2018, C Reid & I Hutton”; 1 larva: “Far Flats, up slope vic 31.5669S 159.0777E, 50 m, rotten *Lagunaria* etc, 26.vii.2018, C Reid & I Hutton”; 1 [fragment]: “Soldiers Creek, vic 31.5527S 159.0823E, 22 m, in rotten wood, 25.vii.2018, Reid, Hutton & volunteers”.

Figulus nitens is widespread in the lowlands of the island, with a slightly broader distribution than *Lamprima insularis*, apparently tolerating wetter conditions. The larva is easily distinguished from that of *L. insularis* by the presence of distinct claws at the apices of the legs. Length of adult 10–13 mm.

Lamprima insularis Macleay, 1885

Material examined. 1 adult, 1 larva: “start of Catalina Track, 31.5191S rotten wood, closed forest, 26.vii.2018, C Reid”; 2 larvae: “Middle Beach Rd reserve, 31.5252S 159.0696E, rotten wood, 25.vii.2018, C Reid”; 1 [elytron]:



Figure 8. *Cormodes darwini* mature larva, collected on Blackburn Island, July 2018 (photo: Max Beatson).



Figure 9. *Orthorhinus vagans* (specimen collected in 2000) (photo: Max Beatson).



Figure 10. Fragments of an individual of *Cryptodus tasmanianus*, collected on Blackburn Island, July 2018 (photo: Max Beatson).

“Stevens Res, 31.5241S 159.0655E, 15 m vic fallen tree, night searching, 25.vii.2018, Reid, Hutton & volunteers”. Additional material (larvae seen, not collected): “Clear Place walk (start), 31.5278S 159.0741E, 29 m, under bark/beating, 27.vii.2018, C Reid & I Hutton”; “Cobbys Corner, Sallywood Swamp, 31.5440S 159.0778E, 8 m, under bark/sifting/swept, 25.vii.2018, Reid, Hutton & volunteers”; “Soldiers Creek, vic 31.5527S 159.0823E, 22 m, in rotten wood, 25.vii.2018, Reid, Hutton & volunteers”.

Lamprima insularis is endemic to the main island of Lord Howe. Its status, biology and distribution within the island were recently reviewed (Reid *et al.*, 2018b). The larva is easily distinguished from that of *F. nitens* by the absence of distinct claws at the apices of the legs. Here we confirm that the species is still widespread in the lowlands. Length of adult 16–33 mm.

Family Melandryidae

Talayra brevipilis Lea, 1929

Material examined. 3 [dead, 2 incomplete]: “Cobbys Corner, Sallywood Swamp, 31.5440S 159.0778E, 8 m, under bark/sifting/swept, 25.vii.2018, Reid, Hutton & volunteers”.

Talayra brevipilis is endemic to Lord Howe and the largest species of the genus. Melandryid larvae are mostly borers of hardwood and these adult specimens were found partly emerged from their cylindrical burrows. *Talayra brevipilis* is widespread in lowland forest on the main island. Length 11–14 mm.

Family Scarabaeidae

Cryptodus tasmanianus Westwood, 1841

Fig. 10

Material examined. 1[elytron]: “Blackburn Id 31.5347S 159.0604E, c5 m, rotting Lagunaria, below top of slope under large fig, 24.vii.2018 C Reid & I Hutton”; 1[fragments]: “Blackburn Id 31.5346S 159.0596E, c10 m, rotting Lagunaria branch, slope below furthest trees, 24.vii.2018 C Reid & I Hutton”.

The large black scarab *Cryptodus tasmanianus* is a widespread species in southeast Australia. It is probably an introduced species to Lord Howe as it was not listed by Olliff (1889) and was first recorded from there by Carne (1957). All previously collected material in the Australian Museum collection is only from Balls Pyramid (Reid *et al.*, 2018a), and the present record is new for Blackburn Island. Our record is evidence that in the Lord Howe Archipelago this species only exists in the absence of rats. Length 17–22 mm.

Heteronychus arator (Fabricius, 1775)

Material examined. 1[elytron]: “Cobbys Corner, Sallywood Swamp, 31.5440S 159.0778E, 8 m, under bark/sifting/swept, 25.vii.2018, Reid, Hutton & volunteers”; 1[elytron]: “Lagoon Rd 31.5257S 159.0635E, 5 m, at street light, edge of trees, 29.vii.2018 C Reid”.

Heteronychus arator is known as the African Black Beetle in Australia where it is a serious lawn pest and occasional crop pest on the east coast (Carne, 1957). It has only recently been recorded from Lord Howe (Reid *et al.*, 2018a). Our survey confirms that *H. arator* is now widespread in the cultivated parts of the island. Length 10–12 mm.

Pimelopus fischeri (Montrouzier, 1860)

Material examined. 1[elytron]: forest E Arajilla Resort, vic 31.5201S 159.0595E, 20 m, at house light, 26.vii.2018 C Reid.



Figure 11. *Pimelopus noctis* (specimen collected in 2000) (photo: Max Beatson).

Pimelopus fischeri is restricted to the southwest Pacific in New Caledonia, Norfolk Island and Lord Howe Island (Carne, 1957). It is a species in lowland forest on Lord Howe, with recent records (Reid *et al.*, 2018a). Length 16–20 mm.

***Pimelopus noctis* (Olliff, 1889)**

Figs. 11, 12

Material examined. 1[hind leg]: “S Lagoon Beach nr Cobbys Corner, 31.5444S 159.0769E, 5 m, native grasses etc on sand, 25.vii.2018, Reid, Hutton & volunteers”; 1[abdomen]: “Blinky Beach, 31.5384S 159.0769E, 3 m, under spinifex/cakile on dunes, 24.vii.2018, C Reid, I Hutton & volunteers”.

Pimelopus noctis is endemic to Lord Howe. It is rarely collected and appears to be restricted to the sandy coastal margins of the lowlands. These new records from dunes or sandy grassland slightly extend its known distribution on the island. Length 15–20 mm.

Family Staphylinidae

***Thyreocephalus orthodoxus* (Olliff, 1887)**

Material examined. 2: “Cobbys Corner, Sallywood Swamp, 31.5440S 159.0778E, 8 m, under bark/sifting/swept, 25.vii.2018, Reid, Hutton & volunteers”.

Thyreocephalus orthodoxus was first recorded from Lord Howe by Bordoni (2005) on the basis of a single specimen collected in 1966. This species is widespread in south-eastern Australia where it is common in disturbed as well as natural habitats, and has been accidentally introduced to New Zealand (Kuschel, 1990).

It is probably therefore a

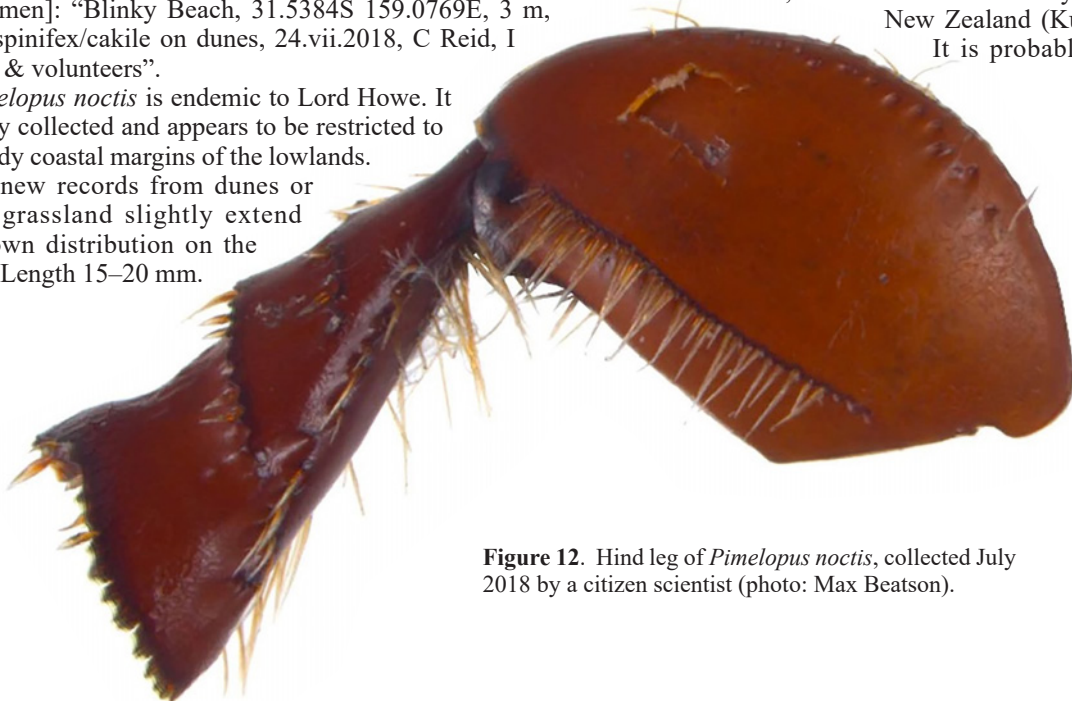


Figure 12. Hind leg of *Pimelopus noctis*, collected July 2018 by a citizen scientist (photo: Max Beatson).



Figure 13. Live adult of *Prionesthis sterrha*, on Blackburn Island, July 2018 (photo: Ian Hutton).

relatively recent introduction to Lord Howe. *Thyreocephalus orthodoxus* is a rarely collected species on Lord Howe (there is only one specimen in the Australian Museum, collected at light on the Jetty, in 1979 by Tim Kingston) but our evidence is that it is established there. Both adults and larvae are active predators of other insects and the adults are strong fliers, often flying during daylight (pers. obs. CR). Length 13–14 mm.

Family Tenebrionidae

Celibe exulans (Pascoe, 1866)

Material examined. 1: “Blackburn Id 31.5346S 159.0604E, c2 m, under stones/dead wood, lower slope under large fig, 24.vii.2018 C Reid & I Hutton”; 2: “Blackburn Id 31.5347S 159.0604E, c5 m, rotting *Lagunaria* below top of slope under large fig, 24.vii.2018 C Reid & I Hutton”; 12: “Blackburn Id 31.5347S 159.0603E, c5 m, under rotting *Lagunaria*, top of slope under large fig, 24.vii.2018 C Reid & I Hutton”; 3: “Blackburn Id 31.5348S 159.0596E, c12 m, rotting *Araucaria* branch, slope under furthest trees, 24.vii.2018 C Reid & I Hutton”; 5: “Blinky Beach, 31.5378S 159.0806E, 4–6 m, dead wood etc under stunted forest on dunes, 24.vii.2018, Reid, Hutton & volunteers”; 1: “Clear Place walk (start), 31.5278S 159.0741E, 29 m, under bark/beating, 27.vii.2018, C Reid & I Hutton”; 1: “Clear Place walk,

Deep Gulch area, 31.5292S 159.0762E, 60 m, under bark, *Cryptocarya*/beating etc, 27.vii.2018, C Reid & I Hutton”; 2: “Cobbys Corner, Sallywood Swamp, 31.5440S 159.0778E, 8 m, under bark/sifting/swept, 25.vii.2018, Reid, Hutton & volunteers”; 5: “Valley of Shadows, 31.5284S 159.0765E, 40 m, under bark/rotten wood, under figs, 27.vii.2018, C Reid, I Hutton”.

Celibe exulans is a flightless species, endemic to Lord Howe and abundant in lowland forest (Reid *et al.*, 2018a). It is found throughout the lowlands and also on Blackburn Island and Balls Pyramid. The larvae of this genus inhabit soil. Length 7–17 mm.

Hydissus vulgaris (Olliff, 1889)

Material examined. 1: “Blackburn Id 31.5347S 159.0604E, c5 m, under wood, below top of slope under large fig, 24.vii.2018 C Reid & I Hutton”; 2: “Blackburn Id 31.5347S 159.0603E, c5 m, under rotting *Lagunaria*, top of slope under large fig, 24.vii.2018 C Reid & I Hutton”; 1: “Blackburn Id 31.5346S 159.0596E, c10 m, rotting *Lagunaria* branch, slope below furthest trees, 24.vii.2018 C Reid & I Hutton”; 1[elytron]: “Boat Harbour, vic 31.5596S 159.0982E, 5–20 m, swept/rotten wood, 28.vii.2018, Reid, Hutton & volunteers”; 1: “Stevens Res, 31.5241S 159.0655E, 15 m vic fallen tree, night searching, 25.vii.2018, Reid, Hutton & volunteers”.



Figure 14. *Phanodesta pudica*, collected in Stevens Reserve, July 2018 (photo: Max Beatson).

Hydissus vulgaris is a flightless species, endemic to Lord Howe. It is widespread in low and mid elevations, often found in rotting wood or under stones (Reid *et al.*, 2018a). Length 8–13 mm.

***Metisopus curtulus* (Olliff, 1889)**

Material examined. 2: “Blackburn Id 31.5347S 159.0603E, c5 m, rotting *Lagunaria*, top of slope under large fig, 24.vii.2018 C Reid & I Hutton”; 3: “Blackburn Id 31.5348S 159.0596E, c12 m, rotting *Araucaria* branch, slope under furthest trees, 24.vii.2018 C Reid & I Hutton”; 1: “Blinky Beach, 31.5378S 159.0806E, 4–6 m, dead wood etc under stunted forest on dunes, 24.vii.2018, Reid, Hutton & volunteers”; 1[elytra]: “betw[een] Boat Harbour & Rocky Run, vic 31.5569S 159.0939E 68 m swept/rotten wood 28.vii.2018 Reid, Hutton & volunteers”; 1: “Stevens Res, 31.5241S 159.0655E, 15 m vic fallen tree, night searching, 25.vii.2018, Reid, Hutton & volunteers”.

Metisopus curtulus is flightless and endemic to Lord Howe. Its distribution and habitats are similar to *H. vulgaris* and the species are often found together (Reid *et al.*, 2018a). Length 7–11 mm.

***Promethis sterrha* (Olliff, 1889)**

Fig. 13

Material examined. 1[fragments]: “Blackburn Id 31.5346S 159.0604E, c2 m, under stones/dead wood, lower slope under large fig, 24.vii.2018 C Reid & I Hutton”; 1[fragment]: “Blackburn Id 31.5347S 159.0603E, c5 m, rotting *Lagunaria*, top of slope under large fig, 24.vii.2018 C Reid & I Hutton”. Additional material (not collected): 1: “Blackburn Id 31.5347S 159.0603E, c5 m, rotting *Lagunaria*, top of slope under large fig, 24.vii.2018 C Reid & I Hutton”.

Promethis sterrha is flightless and endemic to Lord Howe. It was noted by Reid *et al.* (2018a) that this species is now restricted to rat-free Blackburn Island. There it is dependent on the limited supply of rotting wood on which the larva feeds. We confirm that the species is still extant on Blackburn Island. Length 20–25 mm.

Family Trogossitidae

***Phanodesta pudica* (Olliff, 1889)**

Fig. 14

Material examined. 1: “Stevens Res, 31.5241S 159.0655E, 15 m vic fallen tree, night searching, 25.vii.2018, Reid, Hutton & volunteers”.

The genus *Phanodesta* Reitter was recently revised (Leschen & Lackner, 2013). The Lord Howe species, which is endemic, is particularly interesting as it is the only Australian member of a genus that is otherwise restricted to New Zealand and the Juan Fernandez Islands. Olliff (1889) described *P. pudicum* from “Mount Lidgbird [sic] (2,500 feet); also found on the low-lying land”. This height on Lidgbird is the summit, but there is no evidence that any beetle specimens were actually collected on the summit. The material appears to have come from Etheridge or Saunders (Etheridge, 1889) who seem to have paid a local to go to the summit and collect for them. All beetle species we have seen labelled “Mount Lidgbird summit” from the 1880s are lowland species. We suspect that the collector did not climb very far! *Phanodesta pudica* is a rare species and the specimen reported here may be the first collected since 1916. The adults are nocturnal and the larvae are predatory, under bark (Leschen & Lackner, 2013). Length 7–11 mm.

Discussion

Citizen science activities

The 28 citizen scientists who participated were enthusiastic volunteers. As each searching session was 3 hours duration and included two or three sites and habitats, there was always scope for changing collecting locality if little was being found. For example, the least productive site, the area of dense exotic buffalo grass on the dunes at the southern end of Lagoon Beach, was quickly found to be almost sterile and so a new site visited nearby. However, almost every site provided something of interest to the volunteers, to display to the group, or discuss with individuals, or retain for research. The high and otherwise cryptic diversity of small animals produced by sieving leaf litter was always a source of fascination (Fig. 3), with regular pleas for “one more sample”. We found that volunteers were generally adept at developing a search image for both live and fragmentary large beetles. For example, four of the sites were sand dunes, targeted to confirm the presence of *Pimelopus noctis*, a large endemic scarab (Fig. 11) rarely recorded on the island and apparently associated with grassed dunes. The two occurrences reported here were both fragments found by volunteers (Fig. 12) and both represent important range extensions. The night walk with 24 participants was rather different in scope (Fig. 4). While we believe everybody was able to find something and have something demonstrated to them, the two authors were spread too thinly to ensure that everyone enjoyed participation. However, despite the winter season, there was considerable activity by large invertebrates, including beetles, so there was plenty for people to see. During this activity one of the local residents found a beetle not previously recorded from the island (not listed above as it is less than 1 cm in length).

Field collecting as a means of searching for large beetles is relatively haphazard and dependent on weather, time of year, access, habitat type and number of observers. While providing useful records of species it difficult to replicate. However the night walk was a more controlled activity, through observation of beetles on tree trunks within a small area. This has been developed since July 2018 into a routine night walk with citizen scientists counting numbers and noting species present on the same tree trunks in the early hours of darkness. Such a routine has the potential for long term monitoring of the effects of rodent control and also climate change.

Feedback was positive. The main problem was in communicating the findings of the week to those who had participated. Most participants took part in three or fewer activities (introductory talk, an afternoon search and the night-walk), with only four people engaged in four or more activities. By the end of the week most of the tourist volunteers had left the island. Furthermore, the significance of the beetles collected during the surveys was only partially clear to the senior author, as most material had not been properly examined. So there was no debriefing at the end of the week. It is hoped that this article is some recompense.

Significance of the beetle records

The discovery of *Cormodes darwini* on Blackburn Island is a major find, with considerable implications for management of this small island. It is now established that Blackburn

Island has two large beetle endemics, *Cormodes darwini* (Figs 7–8) and *Promethis sterrha* (Fig. 12), both dependent on dead wood and both extinct on the Main Island. The life cycles of these two species may be linked as the larva of *Cormodes* is almost certain to be a predator of beetle larvae in rotting wood, including the larvae of *Prionesthis*. Furthermore, Blackburn Island is now known to have a population of *Cryptodus tasmannianus* (Fig. 10), probably an introduced species, which is also present on Balls Pyramid (Reid *et al.*, 2018a), and in NSW, Victoria and Tasmania. *Cormodes* and *Prionesthis* were formerly known from the Main Island and have not been collected there since 1916, so have almost certainly been extinguished there by black rats. We suspect the absence of *Cryptodus* from the main island is also due to rats. Blackburn Island had the highest diversity of large beetles in our survey, despite being so small and only being surveyed for two hours (Table 1). Blackburn Island has a thriving population of a cockroach, *Panesthia lata*, also extinguished by rats on the Main Island (but common on other offshore islands) (Carlile *et al.*, 2017), and the gecko (*Christinus guentheri*) is common there. The seminatural woodland conditions provided by the few trees on Blackburn therefore protect an important ecological remnant no longer found on the Main Island.

There are two threats to Blackburn Island. One is the plan to make it a release site for the stick insect, *Dryococelus australis*. While the plan will certainly enhance conditions on the island for the beetles of concern, through plantation of trees and shrubs, the activity of shipping equipment from the Main Island to Blackburn may also introduce unwanted exotics not known from Blackburn. For example, at present the lowland forest of Main Island is overrun by a large arboreal predatory spider, *Heteropoda* sp (Arachnoidea, Sparassidae), which was accidentally introduced after 2002 and, as far as we can ascertain, is absent from Blackburn Island. There are also exotic ants and other potential niche competitors which are on Main Island but probably absent from Blackburn Island. We therefore appeal for strict quarantine procedures to be put in place between Main Island and Blackburn Island and for visits to the latter to be restricted. We also strongly endorse the replanting of the island.

The second threat is a proposed runway extension 500 m into the lagoon and towards Blackburn. If that happens there may be pressure to put a signalling system on Blackburn, which should be resisted. Such a development will also halve the distance required for rats to swim to Blackburn Island, to about 500 m. Hopefully before any runway extension happens the rats will have become eliminated.

Other records

There is now a relatively clear picture of the distribution and habitat of the common larger beetles in the lowlands of Lord Howe Island and most of the scarcest species are at least known from more than one specimen or collecting event. Some of the rarest large species were collected during this survey, thus the specimens of *Longipalpus* species, *Phanodesta pudica* (Fig. 13) and *Thyreocephalus orthodoxus* represent second or third collection events for these species. Furthermore the genus *Torresita* was discovered for the first time on the island, raising the number of Buprestidae (jewel beetles) to four. Some of the interesting material

Table 1. Diversity of large species against Lord Howe Island sites.

	total	<i>Agrianome spenicollis</i>	<i>Longipalpus species</i>	<i>Eurysonis castelnaui</i>	<i>Notoplatynus hilaris</i>	<i>Dematochroma picea</i>	<i>Cormodes darwini</i>	<i>Talayra brevipilis</i>	<i>Thyrecephalus orthodoxus</i>	<i>Torresita species</i>	<i>Phanodesta pudica</i>	<i>Orthorhinus vagans</i>	<i>Eutyrihinus meditabundus</i>	<i>Conoderus striatus</i>	<i>Celibe exulans</i>	<i>Hydissus vulgaris</i>	<i>Metisopus curtulus</i>	<i>Prionesthis sterrha</i>	<i>Heteronychus arator</i>	<i>Cryptodus tasmanianus</i>	<i>Pimelopus noctis</i>	<i>Pimelopus fischeri</i>	<i>Lamprima insularis</i>	<i>Figulus nitens</i>
Blinky Beach Dunes	1																			x				
Blinky Beach Forest	6	x				x									x	x	x							x
Boat Harbour	6					x			x						x	x	x							x
Blackburn Island	9	x			x		x					x			x	x	x	x		x				
Catalina walk and Arjilla Resort area	4	x																				x	x	x
Cobbys Corner dunes	2													x							x			
Cobbys Corner forest	6	x						x	x						x				x					x
Clear Place track	4	x													x									x
Far Flats	4	x	x										x											x
Lagoon Road	1																			x				
North Beach	1	x																						
Soldiers Creek	3	x																						x
Stevens Reserve	8	x		x	x						x				x	x	x							x

recorded here was only present as long dead fragments, perhaps remnants from summer active adults (Fig. 10). But our discoveries show that there is also considerable beetle activity in winter on the island and may indicate that too much of the recent collecting has been focussed on the summer months. It is also likely that our focus on two undercollected habitats, grassed dunes and rotten wood, helped to make new discoveries.

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