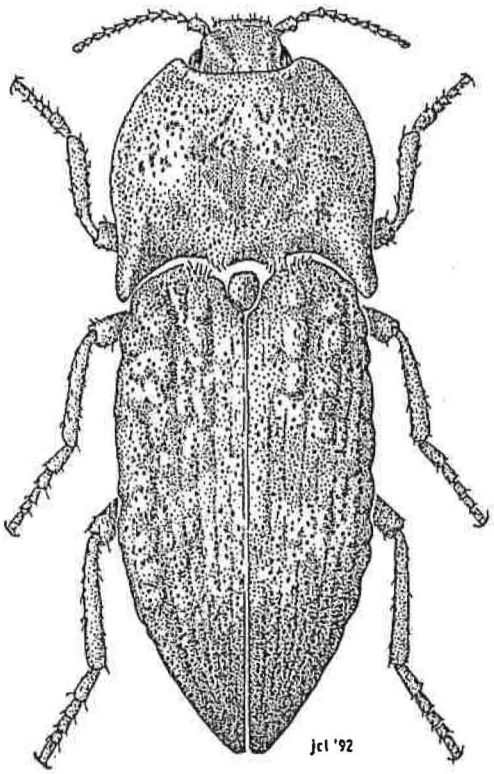
Report for the Department of Conservation

The Conservation Status of the Cook Strait Click Beetle, *Amychus granulatus* (Broun) (Coleoptera: Elateridae):

with comments on other threatened insects of the Marlborough Sounds



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INTRODUCTION

The Cook Strait click beetle, *Amychus granulatus* (Broun), is a large (18-23 mm), broad, rough-surfaced click beetle (Figs. 1 and 2). Little is known of the beetle's biology or ecology. Although *A. granulatus* is presumed to have once been present on mainland New Zealand, the beetle is now confined to islands of the outer Marlborough Sounds region.

This study has been prompted by a report (Meads, 1990) and several anecdotal accounts that indicated that populations of *A. granulatus* have declined.

The aims of this study were to:

- establish the past distribution of *A. granulatus* from collection records
- determine the present distribution of *A. granulatus* from field searches
- gauge the abundance of *A. granulatus*
- assess conservation threats to *A. granulatus* and provide recommendations for a conservation strategy.
- assess conservation threats to other threatened insects from the Marlborough Sounds region and provide recommendations for conservation strategies.

Taxonomic Status

The Cook Strait click beetle was first described by Broun (1881) as *Psorochroa granulata* from specimens collected from "The Brothers" by the lighthouse keeper, P. Stewart-Sandager (Appendix I). Hudson (1934) (Appendix II) incorrectly synonymised *Psorochroa granulata* with *Amychus candezei*, a Chatham Islands species described by Pascoe (1876), and in doing so synonymised the genus *Psorochroa* with *Amychus*. Schwarz (1901) described the species again, as *Amychus stephensiensis* (Appendix III), but was apparently unaware of Broun's description.

Three species of *Amychus* are known to occur. These are: *A. granulatus*, from the Marlborough Sounds region, *A. candezei* from the Chatham Islands, and an undescribed species known only from Great Island in the Three Kings Islands.

Figure 1

Amychus granulatus (Broun) - Illustration courtesy of Joanna Liddiard.

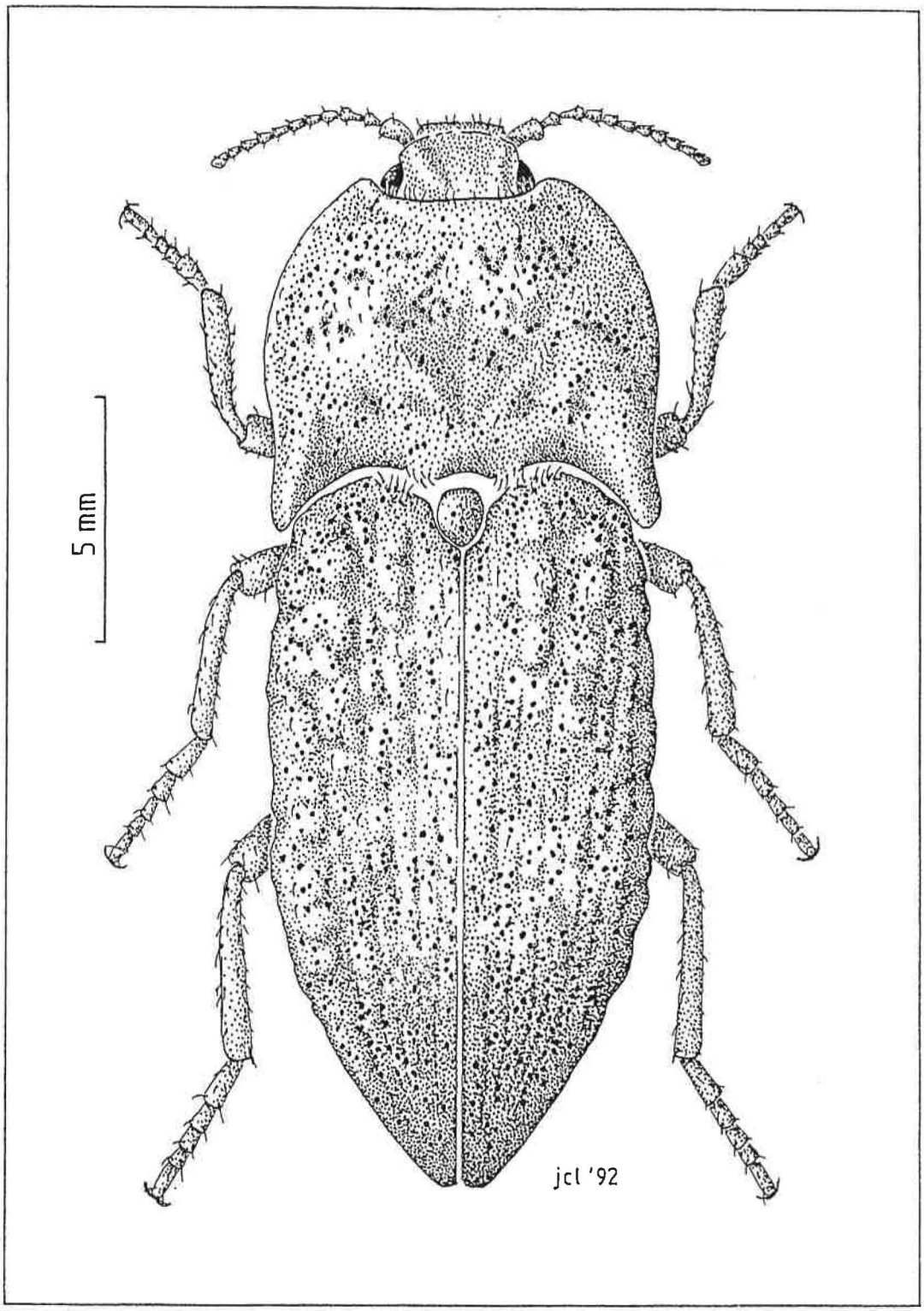

Figure 2

Amychus granulatus (Broun) - Stephens Island.

The higher classification of the family Elateridae is largely unresolved and the position of *Amychus* within the family is unclear. According to P.J. Johnson (pers. comm.) the genus belongs in the Subfamily Denticollinae and most probably the Tribe Prosternini, which includes several other endemic New Zealand genera. The genus *Amychus* a highly distinctive and unusual among the New Zealand elaterid fauna because of its broad body form, rugose surface and flightlessness.

Conservation Status

Amychus granulatus, as well as *A. candezei*, is legally protected under the Seventh Schedule of the Wildlife Amendment Act. The species is listed as 'vulnerable' by the IUCN (Groombridge, 1993) and as 'rare' by Ramsay *et al.* (1988). Molloy and Davis (1994) placed the species in their 'Category B' priority for conservation (c.f. *A. candezei* - category C).

METHODS AND RESULTS

Distribution

Past Distribution

The historical distribution of *A. granulatus* was established by checking specimen records from the main New Zealand entomological collections and from the Natural History Museum in London. A total of 188 specimens was recorded (including those collected during this study). These records are listed in Appendix IV.

Collection records for *A. granulatus* exist from The Brothers, Stephens Island, Middle Trio Island, Maud Island and Sentinel Rock.

Records of specimens collected from "The Brothers" were, in all cases, almost certainly taken from North (or Little) Brother Island. There are no confirmed records of *A. granulatus* from South (or Big) Brother Island. An attempt was made to search for the beetle on South Brother Island during the course of this study by a Department of Conservation party searching for tuatara (I. Millar, pers comm.). However, no specimens were found.

One record from the Museum of New Zealand collection was noted as from "Trio Island". This specimen was taken from Middle Trio Island (G.W. Ramsay, pers. comm.).

In addition to the above records, Meads (1976) reported *A. granulatus* as present on Outer Chetwode Island (Te Kakaho). This record was based on the sighting of beetle remains from the "nest" of a *Porrhothele* spider (M.J. Meads, pers comm.). These remains were apparently not collected. No other record of *Amychus granulatus* exists from Outer Chetwode Island (Te Kakaho).

During this study a fragment of a specimen of *Amychus granulatus* collected from the South Island mainland came to light. The fragment, a damaged prothorax (not a single elytron as reported) (Fig. 3), was collected from the remnants of a laughing owl (*Sceloglaux albifacies*) nest from Waikari, North Canterbury (Worthy and Holdaway, 1996). This is the only record of *A. granulatus*, or any *Amychus* species, from mainland New Zealand.

Present Distribution

Searches for *A. granulatus* were made to establish the present distribution of the beetle on the islands where it had previously been recorded (see above - Past Distribution) and on islands considered likely to support undiscovered populations. Searches were made by rolling rocks and logs, looking among low scrub and the bases of grasses, and at night by using a headlamp to spot beetles on tree trunks.

The following visits were made:

Dates	**Islands Visited**
6-11/2/93	North Brother Island
18-23/11/93	North Brother Island
16-20/2/94	Stephens Island
14-18/11/94	Chetwode Islands (Nukuwiata, Te Kakaho and Ninepin Rock), The Haystack, Titi Island and Stewart Island (Te kuru kuru)
13-16/2/95	The Trios (North, Middle and South Trio Islands), Sentinel Rock and the Paddock Rocks (the southern stack, NZMS 260 P26 742325)
3-6/4/95	Maud Island

Figure 3

Amychus granulatus prothorax collected from the remains of a laughing owl nest, Waikari, North Canterbury.

From these visits *A. granulatus* was found to be present on Stephens Island, Middle and South Trio Islands, Maud Island and Sentinel Rock. The South Trio Island record is a new distribution record for the species.

Two searches of North Brother Island, and a subsequent search by Dr G.W. Gibbs, failed to find any specimens of *A. granulatus*.

No evidence was found to indicate the presence of *A. granulatus* on any of the other islands visited.

Specimens collected as part of these searches are included in the collection records (Appendix IV) and are held in the Entomology Research Museum, Lincoln University.

Notes on Islands Visited

North Brother Island

Visited twice during this study, and subsequently by Dr G.W. Gibbs. Extensive searches for *A. granulatus* were made over the entire island but concentrating mainly on the *Hebe* and *Coprosma* scrub around the island's summit. No specimens were found.

Broun (1881), in his description of the beetle noted that specimens were collected from "the crevices of rocks". The most recent collections, nine specimens taken by Dr G.W. Gibbs in 1957, were found under rocks.

Stephens Island

Searches for *A. granulatus* were made by day and night in Keeper's Bush and the Frog Bank Bush. Ruston Bush was not investigated. Thirty four, of the total 36 beetles sighted, were found in Keeper's Bush. Half of these were found on a single, heavily knot-holed ngaio (*Myoporum laetum*) tree over three nights. Six further beetles were found on a ribbonwood tree feeding on oozing sap. Beetles were marked with typist's correction fluid to ensure beetle counts were not duplicated.

A single specimen of the ground beetle, *Mecodema costellum costellum*, was seen during the visit to the island. This was found under a fence post offcut in the Frog Bank Bush.

The Trios Islands

Two daytime and two night visits were made to Middle Trio Island. No beetles were found by day, although one putative larva was taken from the partially rotted base of an *Olearia paniculata* tree. Twelve beetles were found at night but from only two localities. Five were inside a dead rotten branch of a *Coprosma* tree and seven were found in or around a knot hole in a *Coprosma* tree, alongside an area of oozing sap on which the beetles were feeding. The very high density of bird burrows on the island prevented easy movement around the island and so restricted our chances of finding beetles.

One daytime visit and a brief night visit were made to South Trio Island. Three specimens of *A. granulatus* were found by day in a narrow gully on the eastern side of the island. Two were found among the damp bases of rank grasses and one under a New Zealand spinach (*Tetragonia tetragonioides*) plant. One specimen of the Stephens Island giant weta, *Deinacrida rugosa*, and the dead remains of another specimen were collected on the island. This is apparently a new locality record for the species. The live specimen was deposited with Dr G.W. Gibbs, Victoria University, for biochemical analysis.

A brief daytime visit was made to North Trio Island. Searches were made among and around the margins of the low-growing scrub on the island's south face. No *A. granulatus* were seen. A single specimen of the Stephens Island giant weta, *Deinacrida rugosa*, was collected from the island. This is apparently a new locality record for the species. The specimen was also deposited with Dr G.W. Gibbs, Victoria University.

Maud Island

Day and night searches for *A. granulatus* were made on Maud Island. Search efforts were concentrated on the Main Bush area above the Comalco Lodge. A total of 14 beetles were found, all during night searches. Beetles were found predominantly on tawa (*Beilschmiedia tawa*) and kohekohe (*Dysoxylum spectabile*) trees, particularly older, craggy specimens that provided refugia for the beetles.

Sentinel Rock

A one and a half hour daytime visit was made to Sentinel Rock. Searches were made among low-growing scrub on the island's south-west face and up to the summit. Four specimens of *A. granulatus* were found, all clustered under a single rock mid way up the face.

Chetwode Islands

Daytime and night visits were made to Inner and Outer Chetwode Islands (Nukuwiata and Te Kakaho). Searches were made on Inner Chetwode Island around the hut area in the eastern end of the island and along the summit track, and on Outer Chetwode Island along the summit track and in bush near the boat landing at the south-western end of the island. No *A. granulatus* were found. The insect fauna on Outer Chetwode Island was noticeably richer than for Inner Chetwode Island no doubt reflecting the effect of kiore (*Rattus exulans)* predation.

Ninepin Rock, at the southern tip of Inner Chetwode Island, and The Haystack were searched for signs of *A. granulatus.* No specimens were found. The conditions and insect life on The Haystack appeared suited to the presence of *A. granulatus*, being similar in many respects to South Trio Island, so further searches may yet prove fruitful.

Other islands visited

Titi Island, Stewart Island (Te kuru kuru) and the southern stack of the Paddock Rocks were visited briefly. No *A. granulatus* were found. Conditions on these islands appeared well suited to *A. granulatus* so, again, further searches on these islands may be worthwhile.

Abundance

No attempts were made to quantify *A. granulatus* populations, however, repeated night counts of the beetles were made during the visits to Stephens Island (4 nights, 1 searcher), Middle Trio Island (2 nights, 2 searchers) and Maud Island (3 nights, 2 searchers). These counts were made by viewing tree trunks with the aid of a headlamp in forested areas for an average of three hours each night.

These searches produced an average count (beetles sighted/person/night) as follows:

Stephens Island	7.5
Middle Trio Island	3.5
Maud Island	2.5

No counts were made for the Sentinel Rock and South Trio Island populations. The small size and limited habitat mean that they probably support minimal populations.

Biology

Very little is known of the biology of *A. granulatus* and, while this remains the case, some new findings were made during this study:

- Collection records show the adult beetles are present throughout the year. Although no collections have been made in June or October this is very likely an artifact of collecting rather than any reflection on the biology of the beetle. This suggests the adults may be relatively long lived.

- Adult beetles were observed feeding on sap oozing from tree trunks on Stephens and Middle Trio Islands. Meads (1990) noted that adults browse on algae and lichens on tree trunks at night, however, this behaviour was not observed during this study.

- Night searching showed the distribution of the beetles often to be aggregated, particularly favouring craggy, knot-holed trees which presumably offer suitable refugia for the beetles by day.

- Adult beetles are brachypterous and incapable of flight.

- An *A. granulatus* larva was collected on Middle Trio Island where it was boring in the partially rotten base of an *Olearia paniculata* tree. This specimen compares closely with an *A. candezei* larvae collected from fern litter from Middle Sister Island in the Chatham Islands. Most elaterid larvae found in wood or litter are predacious (Becker, 1991) but may feed on organic matter when prey species are unavailable.

DISCUSSION

Distribution

Amychus granulatus, although previously only known to occur on offshore islands of the Cook Strait region, was assumed to have once had a more widespread distribution. The discovery of an *A. granulatus* prothorax from subfossil remains in Waikari, North Canterbury (Worthy and Holdaway, 1996), has provided evidence of the previous existence of the beetle on mainland New Zealand. The introduction of mammalian predators following human occupation was almost certainly the primary factor causing the extinction of *A. granulatus* from mainland New Zealand. The present offshore island distribution can be regarded as relict.

Entomological collection records show that in recent times *A. granulatus* has been present on North Brother, Stephens, Middle Trio and Maud Islands and Sentinel Rock. Surveys of these islands during this study have confirmed the presence of *A. granulatus* on all of these islands except for North Brother. The discovery of *A. granulatus* on South Trio Island is a new locality for the species.

Failure to locate any specimens of *A. granulatus* on North Brother Island from three concentrated searches strongly suggests that this population may now be extinct, especially considering the small size of the island.

Until this study, only one specimen was known from Sentinel Rock - collected by P.M. Johns in 1963. The presence of *A. granulatus* on Sentinel Rock and the newly discovered population on South Trio Island is encouraging. It is remarkable that such small, exposed islands are capable of supporting viable populations. However, the limited amount of vegetation, and hence likely suitable habitat, means that at best only small populations of the beetle will be present on these islands.

No further populations of *A. granulatus* were discovered during this study. It remains likely, however, that further populations exist on islands within the Marlborough Sounds region. Of the islands not surveyed during this study, South Brother Island may be the most likely locality to support a population of *A. granulatus*. Any of the remaining rodent-free islands in the region, such as some of the Paddock Rocks, and Motuanauru and Otuhaereroa Islands in Croiselles Harbour, may also be likely sites for *A. granulatus* populations.

Although no *A. granulatus* were found on the Chetwode Islands, The Haystack, Titi Island, North Trio Island, Stewart Island or the southern stack of the Paddock Rocks during this study, the possibility remains that populations of *A. granulatus* exist on these islands. The cryptic colouration of the beetle makes it difficult to find. Single, brief attempts to find specimens are insufficient as measures of distribution. Only repeated surveys of these, and other candidate islands will give a confident indication of the beetle's presence or absence. Further survey work would be particularly worthwhile on Outer Chetwode Island (Te Kakaho) now that weka (*Gallirallus australis*) have been removed. If Meads's (1976) record of *A. granulatus* from this island was correct, and if weka have not caused the extinction of the species there, beetle numbers may recover to the extent that chances of find it are reasonable. It is noteworthy that weka were present on Middle Trio Island (Ramsay *et al.*, 1988) for a period but have not made any obvious detrimental impact on the *A. granulatus* population there.

Abundance

Recent reports and anecdotal accounts (Meads, 1990; Ramsay *et al.*, 1988; J.I. Townsend, pers. comm.; G.W. Gibbs, pers. comm.) indicate that *A. granulatus* has become increasingly rare since earlier historical records and reports. Unfortunately little evidence exists that provides any clear indication of previous population levels for comparison. Hudson (1934), who collected specimens of *A. granulatus* from Stephens Island in 1930, considered the beetle to be "abundant in crevices in the rocks, and under logs and stones". Other than this report, the only indication of previous population levels is provided by collection records.

During this study, 188 records of *A. granulatus* were collated from holdings from the major New Zealand entomological collections and from the Natural History Museum, London (Appendix IV). Of these records, 129 were positively identified as being from Stephens Island. These provide the best historical insight available to likely population levels. Some examples of series of collections are given below:

- Ten beetles were collected by A.C. O'Connor (and others?) in September 1916. Six of these were collected in a single day (20/9/1916).

- Ten beetles were collected by G.V. Hudson (and others?) on 3/12/1930.

- 38 specimens were collected by E. Fairburn and E.S. Gourlay (and others?) during February 1931. Included in these collections are records of 10 and 13 beetles collected on single days and a further 11 beetles collected over four days.

- More recently, 10 beetles were collected by P.M. Johns on 21/7/1963.

By comparison, in this study five days and four nights were spent on Stephens Island. This time was used specifically for searching for *A. granulatus*. During this period 36 beetles were sighted (excluding records that could be confirmed as resightings).

Given that historical records most probably represent specimens taken as part of general collecting expeditions not aimed at particular insect species, comparisons of these figures support suggestions that *A. granulatus* numbers are in decline. Differences in numbers between historical records and recent searches are further emphasised by the likelihood that most of the older collections would have been made by day (G.W. Gibbs, pers. comm.) which, by present conditions, is the least effective time for searching for these nocturnal beetles. Of the 36 beetles sighted on Stephens Island in this study, 30 were found on tree trunks during night searches and six by day.

Nightly searches for *A. granulatus* during this study gave counts of 7.5 beetles sighted/person/night for Stephens Island, 3.5 for Middle Trio Island and 2.5 for Maud Island based on searches averaging three hours in duration per night. These counts provide a crude baseline for future monitoring of the beetle. By comparison, Emberson and Marris (1993), using the same technique, regarded counts of 3-4 beetles per person per 2 hour search for the Chatham Islands click beetle (*Amychus candezei*) on South East Island as a likely average summer count. This was based on three nights of searching by four searchers in November 1992. These figures show the counts to be broadly similar for both species. All the islands considered here have been modified by human occupation to some extent and so do not necessarily represent what could be regarded as natural population levels.

Insufficient data are available to estimate the abundance of *A. granulatus* populations on Sentinel Rock and South Trio Island. But the small size of these islands means they would likely support minimal populations.

Conservation Threats

Amychus granulatus was most probably a widespread mainland species occurring in the South Island at least. The species is now restricted in its distribution to five islands of the outer Marlborough Sounds. This dramatic reduction in range is almost certainly a result of predation by introduced mammalian predators. This remains the greatest long-term threat to the species' survival. The presence of five distinct island populations of the beetle, however, act as a safeguard against any immediate threat. But two of these populations, Sentinel Rock and South Trio Island, probably support minimal populations.

Of greater immediate concern is the apparent extinction of *A. granulatus* on North Brother Island and the apparent decline in beetle numbers on Stephens Island.

The apparent absence of *A. granulatus* on North Brother Island, the type locality for the species, is puzzling. Three thorough searches for the beetle on this small island failed to find any specimens. Yet as recently as 1957 eight specimens were collected from the island in a single day (G.W. Gibbs, pers. comm.). A deterioration in the state of the vegetation on the island is an unlikely factor. Photographs taken in 1957 by Dr George Gibbs show that the *Hebe* and *Coprosma* vegetation has noticeably increased since that time. This would be expected to provide greater suitable habitat for the beetle. The recent increase in field research on the Brothers Island tuatara (*Sphenodon guntheri*) may be detrimental to the beetle. For example, researchers may disturb litter or even crush *A. granulatus* larvae and adults during efforts to capture tuatara for study.

Reasons for the decline in beetle numbers on Stephens Island is unclear but the most likely factor is the loss of suitable habitat. Stephens Island was once heavily forested. Dieffenbach (1843) reported that "the island seems to be covered with a dense forest from the water's edge to the summit". Today, in stark contrast, three small bush remnants remain. While the amount of bush remaining on the island would appear sufficient to sustain a viable population of *A. granulatus*, the beetle population is apparently in decline. What may be crucial in this instance is the quality of the forest and the particular habitat it provides.

It is noteworthy that, in the few instances where habitat information is given with specimens of *A. granulatus* collected from Stephens Island, beetles were recorded from under logs. Hudson (1934) also stated that specimens of *A. granulatus* were found "under logs and stones". It is very obvious now, however, that very few logs of any size remain in the forest except for a few crumbling remnants of, presumably kohekohe (*Dysoxylum spectabile*), logs in the Frog Bank Bush. Moreover, the regenerating nature of the forest means that very few logs are becoming available to replace the older, decomposing logs.

In five days of searching for *A. granulatus* on Stephens Island during this study only six beetles were found by means other than night spotting. Of these six, only one was found under a log. The remainder were found under man-made, 'pseudo-logs', such as a concrete fence post, the offcut of a wooden fence post and a wooden board. This supports the suggestion that a lack of log habitat is an important factor in the decline in *A. granulatus* numbers. The apparent extinction of the large ground beetle, *Mecodema punctellum*, (Molloy and Davis, 1994) and decline in numbers of the Stephens Island carabid, *Mecodema costellum costellum* - both species that would very likely use logs as part of their natural habitat - gives further support for the importance of logs as habitat for some insect species.

Emberson *et al.* (1996) suggested that reduction of habitat caused by the decaying of logs, combined with habitat modification by heavy grazing, caused the extinction of an *Amychus candezei* population at Hapupu, Chatham Island. This situation is complicated, however, by the presence of introduced predators such as cats, ship rats (*Rattus rattus*), pigs and weka.

Meads (1990) considered that the decline in *A. granulatus* numbers may be due to greater levels of predation due to increased tuatara numbers. There is no clear evidence that this is occurring. On the contrary, Walls (1981) assessed tuatara diet by analysis of 392 scat samples. No evidence of the remains of specimens of *A. granulatus* were found among these (Walls, pers. comm.).

Conservation Recommendations

- Further survey work to determine the presence or absence of *A. granulatus* on historically rodent-free islands in the Marlborough Sounds.

  Priority should be given to South Brother Island and for further searches on North Brother Island. Efforts should be made to survey Outer Chetwode Island (Te Kakaho) now that weka have been removed from the island.

- Adoption of a monitoring programme on Stephens Island to determine changes in *A. granulatus* population levels.

  The permanent presence of DOC staff on the island, historical records and evidence of declining *A. granulatus* numbers make Stephens Island an ideal locality for monitoring. A simple programme might involve a weekly count of beetles on tree trunks at night along the main Keeper's Bush track. Beetles could also be marked to provide information on longevity and on recruitment and mortality.

- Enhancement of the *A. granulatus* habitat on Stephens Island through provision of substitute 'logs'.

  A lack of log habitat is a probable factor in the decline in *A. granulatus* populations on Stephens Island. It is proposed that either logs or artificial 'logs'(such as concrete pavers used to provide habitat for the Mokohinau stag beetle, *Dorcus ithaginus*, on Stack H in the Mokohinau Islands (C.J. Green, pers. comm.) be placed out in bush areas on the island to artificially provide increased habitat. Ideally logs would provide the most realistic habitat but the danger exists of bringing non-endemic species and potential pests to the island. The use of 'inert' pavers may avoid this risk. This methodology may also provide a means of monitoring beetle numbers and aid in the understanding of the beetle's biology. Provision of log habitat may also prove beneficial for the conservation and an aid to monitoring of the *Mecodema* species discussed above. The Frog Bank Bush would be a suitable area to conduct these experiments because its relatively remote location and lack of bird burrowing would minimise disturbance.

- Establishment of new *A. granulatus* populations by relocation of beetles on rodent-free islands.

  The evidence of the previously greater range of *A. granulatus* confirms the belief that the present distribution is relict rather than the beetle being an island endemic. The establishment of new populations of the beetle, therefore, has a justifiable ecological basis. Clearance of rodents from several Marlborough Sounds islands opens up the possibility of transferal of *A. granulatus* for the establishment of new populations. Suitable localities would include Titi Island, The Chetwode Islands and Motuara Island. Motuara would be the most appropriate choice as its ease of access would be an advantage for future monitoring. It is recommended that no introductions be made to Outer Chetwode Island (Te Kakaho) because of the possibility of a naturally occurring population being present.

  The greatest impediment to the establishment of new populations is the lack of knowledge of the biology of *A. granulatus* - particularly the larval biology. A minimum of around 20 adult beetles would be required for any beetle reestablishment programme. The removal of this many beetles may well have a detrimental effect of an existent population. Increased biological knowledge may, however, provide a means of artificially rearing beetles or allow the enhancement of natural populations.

- Serious consideration should also be given to the implementation of conservation strategies for the Stephens Island weevil, *Anagotus stephenensis*, the Stephens Island carabid, *Mecodema costellum costellum*, and, if not already extinct, the large ground beetle, *Mecodema punctellum*.

  The Stephens Island weevil, like *A. granulatus*, previously had a mainland distribution (Worthy and Holdaway, 1996). Stephens Island is now the sole known locality for the species where it is rarely seen. The weevil was listed as a 'Category B' priority species by Molloy and Davis (1994). Based on their criteria, however, it could justifiably be placed in 'Category A' - the highest priority for conservation. Basic monitoring of weevil numbers could easily be undertaken. As with *A. granulatus*, weevils could be marked to provide information on population size and recruitment and mortality. There is a great need for an increased understanding of this weevil's basic biology. It is possible that searches for this species on other Marlborough Sounds may reveal further populations of the weevil. Middle Trio in particular, given its limited degree of modification, would appear to be the most likely locality to search.

Establishment of new Stephens Island weevil populations on rodent-free Marlborough Sounds Islands should be considered for the future. As with *A. granulatus* the evidence showing this weevil to have had a widespread distribution gives a justifiable ecological basis for the establishment of new populations. Again, like *A. granulatus*, the lack of basic knowledge of the weevil's basic biology and ecology is likely to be an impediment to any reestablishment programme.

As previously noted in this report, only one specimen of the Stephens Island carabid was seen during searches for *A. granulatus*. Therefore the survival of this subspecies would appear under serious threat. Searches should be undertaken for this species, and *Mecodema punctellum,* to estimate population levels. The enhancement of the log habitat, as discussed earlier, may also aid the survival of this species.

SUMMARY

- Evidence indicates that *A. granulatus* was once present on mainland New Zealand where it probably had a widespread distribution. The introduction of mammalian predators following human occupation is most probably the primary factor that has led to the extinction of A. granulatus from mainland New Zealand. The present offshore island distribution can be regarded as a relict distribution.

- Historical collection records show *A. granulatus* to have been present in recent times on North Brother Island, Stephens Island, Middle Trio Island, Maud Island and Sentinel Rock. A further, unconfirmed record exists from Outer Chetwode Island (Te Kakaho), although no specimens have been collected from that island.

- A survey of Marlborough Sounds Islands have confirmed the presence of *A. granulatus* on Stephens Island, Middle and South Trio Islands, Maud Island and Sentinel Rock.

- A new *A. granulatus* population was discovered on South Trio Island.

- Three searches of North Brother Island, the type locality of *A. granulatus*, have failed to find any specimens of the beetle. There is a strong possibility that *A. granulatus* is now extinct on this island.

- Evidence from historical accounts, collection records and recent counts and observations indicate that the *A. granulatus* population on Stephens Island has declined significantly over the past century.

- Recommendations are given for further survey work to be undertaken, monitoring of the Stephens Island *A. granulatus* population to be done, and attempts made to enhance habitat suitable for the beetle on Stephens Island. Future translocations of *A. granulatus* to establish new island populations are suggested.

- Two populations of the Stephens Island giant weta, *Deinacrida rugosa*, were found during island survey work. These were on North Trio and South Trio Islands and are apparently new distribution records for the species.

- Recommendations are given for implementation of conservation strategies for the Stephens Island weevil, *Anagotus stephenensis*, the Stephens Island carabid, *Mecodema costellum costellum*, and, if not already extinct, the large ground beetle, *Mecodema punctellum*. Survey and population monitoring work is suggested for these species.

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APPENDIX I

The description of *Psorochroa granulata* by Broun (1881).

Psorochroa.

Nov. gen.

Head small, obliquely narrowed and carinated towards the front, the middle obtuse, confounded with the clypeus, the latter indistinguishable; *labrum* prominent, rounded, nearly on the same plane as the forehead, separated from it by a deep channel; *mandibles* robust, bidentate at apex. *Antennæ* half the length of the thorax, inserted below the forehead immediately in front of the eyes; basal joints largest, third longer than second, the latter equalling the fourth; joints 4–10 sub-triangular; eleventh broadly oval. *Prothorax* broader than long, rounded laterally, tri-sinuate at base, posterior angles prominent, not divergent. *Scutellum* oblong. *Elytra* moderate, narrowed behind. *Chin-piece* extending to the tips of the mandibles. *Prosternal sutures* widely open in front only, straight, attaining outer edge of coxæ. *Prosternal process* nearly flat above, depressed at the extremity. *Mesosternal cavity* with raised hind margin, reaching the broad inter-coxal depression. *Coxal lamina* moderate, abruptly reduced beyond the trochanter. *Tarsi* rather compressed, all the joints well-developed, hispid below. *Body* apterous.

1370. **P. granulata**, *n.s.* Sub-opaque, variegate, elytra obscure-brown, thorax paler and brighter, legs and antennæ obscurely coloured.

Head slightly depressed in front, with coarse punctures on its anterior edge. *Prothorax* curvedly excised in front, narrowed towards the blunt front angles, nearly straight behind the middle; the posterior angles carinated, overlapping the shoulders, slightly incurved and deflexed at the extremity; it bears many minute glossy black granules, and short fulvous setiform hairs. *Elytra* with rounded shoulders, slightly curved sides, gradually narrowed behind, almost plane; sub-striate, interstices uneven, with fewer and smaller granules than the thorax, and with similar but more rufescent setæ. *Underside* rather dull, blackish; flanks of prosternum coarsely but remotely punctured, the rest not distinctly sculptured; sparsely clothed. The *antennæ* are covered with pubescence on the sides only; joints 4–10 are dilated inwardly, but not acute, at the extremity.

An occasional puncture may be noticed in the elytra grooves, and the humeral regions are more or less obtusely tuberculate.

Length, 8–9 lines; breadth, $2\frac{3}{4}$–$3\frac{1}{3}$.

Mr. P. Stewart-Sandager found this curious insect in the crevices of rocks on "The Brothers" (Cook Strait).

Cryptohypnus (p. 295).

1371. **C. montanus**, *n.s.* Sub-parallel, almost depressed, moderately glossy, blackish-brown, legs flavo-testaceous, antennæ rufescent, clothed with short yellowish hairs.

Head broadly impressed, finely and not closely punctated. *Prothorax* as long as broad, obtusely rounded laterally, contracted near the base, convex, its posterior angles carinate, prominent, sub-acute

APPENDIX II

The description of *Amychus candezei* by Hudson (1934).

shorter legs and antennae. Found in the same localities, and under similar circumstances.

Mecastrus convexus (9 mm. Plate VIII, fig. 6, 6a larva.) This jet black, highly polished click is sometimes found under the scaly bark of rimu trees, in the late summer. It is rather a rare species, but probably generally distributed in the North Island.

The larva was discovered, feeding on powdery wood, in the middle of a dead karaka tree, in October.

Length about 18 mm. Cylindrical, tapering at each end. Head very small, dark brown. Prothorax elongate-oblong, deep red-brown with paler anterior and posterior bands. Meso- and metathorax similar, but much shorter and slightly broader; legs small. Abdominal segments becoming much broader near middle; bright ochreous-brown, intersegmental portions paler; a dark red-brown ring at posterior end of each segment and a finer, red-brown line on anterior portion, with fine, divergent, lateral lines; terminal segment elongate, narrow, conical, deep red-brown, without markings; a large proleg at base of terminal segment. Underside ochreous, with narrow, brown, longitudinal median line.

Lomenus elegans (7-8 mm.) A very pretty species, bright orange-brown with blackish head and deeper brown shading in middle of prothorax; the elytra are finely striated; the scutellum and antennae are black, the latter thick and heavily serrate in the male. Beaten freely out of foliage about midsummer. Probably generally distributed in the North Island.

L. suffusus (7 mm.) A very similar species, but with the prothorax, except posterior angles entirely black. Found in both islands but rare.

L. rectus (7 mm.) Almost parallel-sided, black, with dull yellowish legs; elytra finely but distinctly striated, the outer striations slightly punctured. Beaten out of forest growth in November and December. Possibly attached to beech (*Nothofagus*). Has occurred on the eastern side of Wellington Harbour and at Whangarei.

L. pilicornis (5½-7 mm.) A somewhat similar species, duller, not parallel-sided, the antennae clothed with fine hair, and the posterior angles of the prothorax, as well as the legs, yellow. Beaten out of foliage, from December till middle of February. Common around Wellington. Also found at Tairua.

Amychus candezei (*Psorochroa granulata*) (17-22 mm.) Prothorax broader than long, rounded at the sides, with posterior angles prominent but not divergent; elytra nar-

r

rower than prothorax tapering behind; the whole surface of the insect much roughened, resembling bark, variegated and variable in colour, unlike any other New Zealand click. Apparently confined to the islands in Cook Strait (Stephen's Island and The Brothers), where it is abundant in crevices in the rocks, and under logs and stones.

Panspoeus guttatus (2½-3 mm.) The smallest Elaterid found in New Zealand, shining black, the posterior angles of the prothorax, and two spots on the sides of each elytron, yellow. Beaten out of foliage about midsummer; probably attached to beech (*Nothofagus*). Has occurred at Tairua, on the eastern side of Wellington Harbour, at Picton, Takaka and Lake Wakatipu, but nowhere common.

Betarmonoides gracilipes (4½ mm.) Black with slender, legs; the prothorax short, somewhat cylindrical, slightly tapering just before posterior angles; the elytra considerably wider. Abundant amongst flowering manuka (*Leptospermum*) early in December. Probably widely distributed.

Amphiplatys lawsoni (3½-4 mm.) Quite unlike any other New Zealand click. It is broad; head large, the prothorax and head together nearly as long as elytra, which are oval; antennae short, without serrations, terminal joints slightly expanded; general colour yellowish-brown, or dark brown, and highly polished. Found amongst dead leaves in the autumn. Has occurred at Auckland and Wellington but very rare.

Metablax acutipennis (20-25 mm. Plate VIII, fig. 2, 2a larva.) This fine elater although widely distributed, is rather rarely met with. It may be immediately recognised by its very acutely pointed elytra which are ornamented with four conspicuous longitudinal bands of whitish pubescence. This pubescence is, however, very easily removed, and is only clearly evident in fresh specimens. The colour of the integument varies from deep reddish-black to almost red.

The larva is found in tunnels under the bark and in the wood of recently felled trees, of many kinds, but shows a preference to hinau. It is very active and ferocious.

The length of the full-grown larva is about 33 mm. Moderately stout, subcylindrical, much flattened, fairly even in thickness throughout; anterior abdominal segments slightly narrower. Head black, flattened, rounded-oblong, anterior portion depressed,

APPENDIX III

The description of *Amychus stephensiensis* by Schwarz (1901).

[Deutsche Entomologische Zeitschrift 1901. Heft I.] 193

Elateriden
von der Stephens-Insel und den Chatam-Inseln
gesammelt von Hrn. Direktor Schauinsland.

Von

Otto Schwarz.

1. *Betarmon obscurus* Sharp. — Stephens-Insel.
2. *Corymbites agriotides* Sharp. — Chatam-Inseln.
3. *Mecastrus convexus* Sharp. — - -
4. *Thoramus laevithorax* White. — - -
5. *Amychus Stephensiensis* Schw. nov. spec. (1) — Stephens-Ins.
6. - *Schauinslandi* Schw. nov. spec. (2) — Chatam-Ins.
7. - *rotundicollis* Schw. nov. spec. (3) — - -

1. *Amychus Stephensiensis.*

Latissimus, depressus, opacus, inaequaliter breviterque aureoseto-sulus, prothorace elytrisque granulis minimis nigris nitidissimis sat dense inaequaliterque adspersis; fronte nigra, lata, longitudinaliter sat late impressa; antennis brevibus, nigro-infuscatis, articulo 3° sat elongato, 4—10 breviter triangularibus; prothorace longitudine valde latiore, postice parum, a medio antrorsum fortiter rotundatum angustato, margine antica profunde sinuato, basi trisinuato, sulcis basalibus bene definitis, linea media longitudinaliter impressa, obscuro-rufo, macula nigra lacera discoidali plus minusve magna ornato, angulis posticis validis, retrorsum productis, obtuse carinatis, apice oblique introrsum flexis; scutello subtiliter canaliculato; elytris prothorace parum angustioribus, dorso valde et late impressis, postice declivibus, nigris, lateribus plus minusve late lacerate brunneo-rufis, extrorsum abrupte declivibus, sulcatis, interstitiis ad lateris tuberculis multis inaequaliter adspersis; corpore subtus pedibusque nigris, opacis, sparsim subtiliter aureo-pilosis. — Long. 18—23 mill., lat. elytr. 6½—8 mill.

Stephens-Insel ad Neu-Seeland.

Von dieser merkwürdigen Art liegen mir 2 Exemplare vor, die in der Gröfse (s. oben) sehr verschieden sind, aber doch nur einer Art angehören; sie wurden mir, wie auch die beiden folgenden Arten, von dem Bremer Museum für Naturkunde freundlichst eingesandt; leider waren die beiden Exemplare dieser Art in thonigem Lehm so eingebettet, dafs anfangs garnichts von ihnen zu erkennen war. Den Lehm konnte ich zwar bald entfernen, aber

trotz der sorgfältigsten Reinigungsversuche ist es mir nicht gelungen, sie von einem feinen, blau-grauen Thon-Ueberzuge vollständig zu befreien; derselbe verdeckt die Grundfarbe, die aber sofort gut sichtbar wird, wenn man die Thiere mit Wasser oder Alkohol befeuchtet. — Die Oberseite ist zum gröfsten Theile schwarz, durchaus matt, mit goldglänzenden, kleinen Börstchen ungleichmäfsig und wenig dicht besetzt, sehr uneben und mit vielen schwarzen, glänzenden Körnchen besetzt. Die Stirn ist breit, der Länge nach ziemlich breit und flach eingedrückt, gelb beborstet und mit wenigen schwarzen Körnchen zerstreut besetzt. Die Fühler sind schwarz, kurz, erreichen kaum die Mitte des Halsschildes, ihr drittes Glied ist deutlich länger als das zweite und vierte, die folgenden bis zum vorletzten kurz dreieckig, das letzte länglich rund, vor der Spitze schwach abgesetzt. Das Halsschild ist deutlich breiter als lang, schwarz, an den Rändern verwaschen und zerrissen braunroth, an den Seiten gerundet, an der Basis wenig, nach vorn von der Mitte an stark verengt, der Vorderrand tief ausgerandet; die Hinterecken sind gerade nach hinten gerichtet, robust, die äufserste Spitze selbst nach innen und unten gebogen, ziemlich lang und stumpf gekielt, vor dem Kiel am Seitenrande mit einem ziemlich tiefen Quereindruck. Basalfurchen ziemlich lang und deutlich, eine flache Mittelrinne bis nahe zum Vorderrande reichend; die schwarzen Körnchen stehen neben dem Seitenrande und in Form einer breiten Querbinde vor der Mitte ziemlich dicht. Die Flügeldecken sind an der Basis etwas schmaler als das Halsschild in der Mitte, auf dem Rücken breit und flach niedergedrückt, an den Seiten steil und fast winklig abfallend, bis zum letzten Drittel parallel, dann bis zur Spitze schwach gerundet, stark verengt und ziemlich stark abschüssig, schwarz, an den Seiten mehr oder weniger verwaschen und zerrissen braunroth, flach gefurcht, die Furchen nur sehr fein und sparsam punktulirt, die Zwischenräume namentlich nach den Seiten und der Basis zu unregelmäfsig mit gröfseren und kleineren Beulen und kleinen schwarzen Körnchen besetzt, an der Basis des 3., 5. und 7. Zwischenraumes je eine Tuberkel besonders stark und dichter beborstet. Die Unterseite und Beine sind tiefschwarz, matt, mit kleinen, goldgelben, kurzen Härchen zerstreut besetzt.

2. *Amychus Schauinslandi.*

Fusco-brunneus, opacus, subtiliter brevissime sparsim flavo-setosulus; fronte antrorsum parum late impressa; antennis brevibus, brunneis,

APPENDIX IV

Collection records of *Amychus granulatus*.

No.	Locality	Date	Month	Year	Collector	Habitat	Collection	Comments
1	Maud I	6	11	1940	E S Gourlay		NZAC	
2	Maud I	2	11	1968	P Kettle		CUNZ	
3	Maud I		9	1976	M J Meads		M J Meads	
4	Maud I	3 to 5	12	1979	G W Gibbs		NZAC	
5	Maud I	29	11	1980	P R Notman	Main bush	NZAC	
6	Maud I	23	12	1980	P R Notman	Main bush	NZAC	
7	Maud I	28	12	1980	P R Notman	Main bush	NZAC	
8	Maud I	8	3	1981	P R Notman	Main bush	NZAC	
9	Maud I	4	4	1981	P R Notman		NZAC	
10	Maud I	3	4	1995	J W M Marris	Main bush, on tawa tree at night, mixed broadleaf forest	LUNZ	
11	Maud I	3	4	1995	M H Bowie	Main bush, on tawa tree at night, mixed broadleaf forest	LUNZ	
12	Maud I	4	4	1995	J W M Marris	Main bush, on kohekohe tree at night, mixed broadleaf forest	LUNZ	
13	Maud I	5	4	1995	J W M Marris	Main bush, on tawa tree at night, mixed broadleaf forest	LUNZ	
14	Middle Trio I	13	1	1952	B A Holloway		NZAC	
15	Middle Trio I	20	12	1954	G W Ramsay		MONZ	
16	Middle Trio I	2	8	1963	P M Johns	under stones	CUNZ	
17	Middle Trio I		2	1979	C Kennedy		CUNZ	
18	Middle Trio I	13	2	1995	J W M Marris	in rotten limb of Coprosma repens tree, at night	LUNZ	
19	Middle Trio I	13	2	1995	R M Emberson	under log in Coprosma repens forest at night	LUNZ	
20	Middle Trio I	13	2	1995	J W M Marris	in rotten limb of Coprosma repens tree, at night	LUNZ	
21	Middle Trio I	13	2	1995	J W M Marris	in rotten limb of Coprosma repens tree, at night	LUNZ	
22	Middle Trio I	15	2	1995	J W M Marris	in knot hole of Coprosma repens tree near oozing sap, at night	LUNZ	
23	Motahinow [sic]				JH Lewis		BMNH	Swale Collection, presumed incorrect label data
24	New Zealand						BMNH	Pascoe Collection
25	Sentinel Rock	27	7	1963	P M Johns		CUNZ	
26	Sentinel Rock	14	2	1995	R M Emberson	under rock in Coprosma repens scrub	LUNZ	
27	Sentinel Rock	14	2	1995	R M Emberson	under rock amongst Coprosma repens scrub	LUNZ	
28	Sentinel Rock	14	2	1995	R M Emberson	under rock amongst Coprosma repens scrub	LUNZ	
29	Sentinel Rock	14	2	1995	R M Emberson	under rock amongst Coprosma repens scrub	LUNZ	
30	South Trio I	15	2	1995	J W M Marris	under dead rank grass	LUNZ	
31	South Trio I	15	2	1995	B W Thomas	under dead rank grass	LUNZ	
32	South Trio I	15	2	1995	R M Emberson	under New Zealand spinach (Tetragonia tetragonioides) plant	LUNZ	

No.	Locality	Date	Month	Year	Collector	Habitat	Collection	Comments
33	Stephens I		5	1910			BMNH	
34	Stephens I		3	1916	F B Smith		MONZ	
35	Stephens I		3	1916	F B Smith		MONZ	
36	Stephens I		3	1916	F B Smith		MONZ	
37	Stephens I		3	1916	F B Smith		MONZ	
38	Stephens I		3	1916	F B Smith		MONZ	
39	Stephens I		3	1916	F B Smith		MONZ	
40	Stephens I	15	5	1916			MONZ	
41	Stephens I	15	5	1916			MONZ	
42	Stephens I	15	5	1916			MONZ	
43	Stephens I	20	9	1916			MONZ	
44	Stephens I	20	9	1916			MONZ	
45	Stephens I	20	9	1916			MONZ	
46	Stephens I	20	9	1916			MONZ	
47	Stephens I	20	9	1916			MONZ	
48	Stephens I	20	9	1916			MONZ	
49	Stephens I		9	1916			NZAC	
50	Stephens I		9	1916			NZAC	
51	Stephens I		9	1916	A C O'Connor		MONZ	
52	Stephens I		9	1916	A C O'Connor		MONZ	
53	Stephens I		1	1922	R J Tillyard		NZAC	
54	Stephens I		1	1922	R J Tillyard		NZAC	
55	Stephens I		1	1922	R J Tillyard		NZAC	
56	Stephens I		1	1922	R J Tillyard		NZAC	
57	Stephens I		1	1922	R J Tillyard		NZAC	
58	Stephens I		1	1922	R J Tillyard		NZAC	
59	Stephens I	3	12	1930		found under logs	MONZ	
60	Stephens I	3	12	1930		found under logs	MONZ	
61	Stephens I	3	12	1930		found under logs	MONZ	
62	Stephens I	3	12	1930		found under logs	MONZ	
63	Stephens I	3	12	1930		found under logs	MONZ	
64	Stephens I	3	12	1930		found under logs	MONZ	

No.	Locality	Date	Month	Year	Collector	Habitat	Collection	Comments
65	Stephens I	3	12	1930	G V Hudson		BMNH	
66	Stephens I	3	12	1930	G V Hudson		BMNH	
67	Stephens I	3	12	1930	G V Hudson		BMNH	
68	Stephens I	3	12	1930	G V Hudson		AMNZ	C E Clarke Collection
69	Stephens I	10	1	1931	E Fairburn		NZAC	
70	Stephens I	10	1	1931	E Fairburn		NZAC	
71	Stephens I	10	1	1931	E Fairburn		NZAC	
72	Stephens I	10	1	1931	E Fairburn		NZAC	
73	Stephens I	10	1	1931	E Fairburn		NZAC	
74	Stephens I	10	1	1931			NZAC	
75	Stephens I	10	1	1931			NZAC	
76	Stephens I	10	1	1931			NZAC	
77	Stephens I	10	1	1931			NZAC	
78	Stephens I	10	1	1931			NZAC	
79	Stephens I	12	1	1931	E Fairburn		NZAC	
80	Stephens I	14	1	1931	E Fairburn		NZAC	
81	Stephens I	14	1	1931	E Fairburn		NZAC	
82	Stephens I	14	1	1931	E S Gourlay		NZAC	
83	Stephens I	14	1	1931	E S Gourlay		NZAC	
84	Stephens I	14	1	1931	E S Gourlay		NZAC	
85	Stephens I	14	1	1931	E S Gourlay		NZAC	
86	Stephens I	14	1	1931	E S Gourlay		NZAC	
87	Stephens I	14	1	1931	E S Gourlay		NZAC	
88	Stephens I	14	1	1931	E S Gourlay		NZAC	
89	Stephens I	14	1	1931	E S Gourlay		NZAC	
90	Stephens I	14	1	1931	E S Gourlay		NZAC	
91	Stephens I	14	1	1931	E S Gourlay		NZAC	
92	Stephens I	14	1	1931	E S Gourlay		NZAC	
93	Stephens I	14	1	1931	E S Gourlay		NZAC	
94	Stephens I	9 to 12	1	1931	E S Gourlay		NZAC	
95	Stephens I	9 to 12	1	1931	E S Gourlay		NZAC	
96	Stephens I	9 to 12	1	1931	E S Gourlay		NZAC	

No.	Locality	Date	Month	Year	Collector	Habitat	Collection	Comments
97	Stephens I	9 to 12	1	1931	E S Gourlay		NZAC	
98	Stephens I	9 to 12	1	1931			MONZ	
99	Stephens I	9 to 12	1	1931			MONZ	
100	Stephens I	9 to 12	1	1931	E S Gourlay		BMNH	
101	Stephens I	9 to 12	1	1931	E S Gourlay		BMNH	
102	Stephens I	9 to 12	1	1931	E S Gourlay		BMNH	
103	Stephens I	9 to 12	1	1931	E S Gourlay		BMNH	
104	Stephens I	9 to 12	1	1931	E S Gourlay		BMNH	
105	Stephens I		1	1931			AMNZ	C E Clarke Collection
106	Stephens I		1	1931			AMNZ	C E Clarke Collection
107	Stephens I	14	1	1933	E S Gourlay		NZAC	
108	Stephens I	28	1	1933	E S Gourlay		AMNZ	C E Clarke Collection
109	Stephens I	28	1	1933	E S Gourlay		AMNZ	C E Clarke Collection
110	Stephens I	14 to 28	1	1933	E S Gourlay		NZAC	
111	Stephens I	14 to 28	1	1933	E S Gourlay		NZAC	
112	Stephens I	14 to 28	1	1933	E S Gourlay		NZAC	
113	Stephens I	14 to 28	1	1933	E S Gourlay		NZAC	
114	Stephens I	14 to 28	1	1933	E S Gourlay		NZAC	
115	Stephens I	14 to 28	1	1933	E S Gourlay		BMNH	
116	Stephens I	14 to 28	1	1933	E S Gourlay		BMNH	
117	Stephens I	18	12	1946	C E Clarke		BMNH	
118	Stephens I	18	12	1946	C E Clarke		AMNZ	C E Clarke Collection
119	Stephens I	18	12	1946	C E Clarke		AMNZ	C E Clarke Collection
120	Stephens I	18	12	1946	C E Clarke		AMNZ	C E Clarke Collection
121	Stephens I	18	12	1946	C E Clarke		AMNZ	C E Clarke Collection
122	Stephens I	13	9	1948	J T Salmon		MONZ	
123	Stephens I	13	9	1948	J T Salmon		MONZ	
124	Stephens I	28	11	1953	B A Holloway	under logs	MONZ	
125	Stephens I	28	11	1953	B A Holloway	under logs	MONZ	
126	Stephens I	30	11	1953	B A Holloway		MONZ	
127	Stephens I	30	11	1953	B A Holloway		MONZ	
128	Stephens I	30	11	1953	B A Holloway		MONZ	

No.	Locality	Date	Month	Year	Collector	Habitat	Collection	Comments
129	Stephens I	30	11	1953	B A Holloway		MONZ	
130	Stephens I	15 to 20	12	1954	G W Ramsay		MONZ	
131	Stephens I	15 to 20	12	1954	G W Ramsay		MONZ	
132	Stephens I		12	1954	G W Ramsay		MONZ	
133	Stephens I		12	1954	G W Ramsay		MONZ	
134	Stephens I		12	1954	G W Ramsay		MONZ	
135	Stephens I		12	1954	G W Ramsay		MONZ	
136	Stephens I		12	1954	G W Ramsay		MONZ	
137	Stephens I		12	1954	G W Ramsay		MONZ	
138	Stephens I	29	12	1955	G W Ramsay		MONZ	
139	Stephens I	16	1	1961	B A Holloway		MONZ	
140	Stephens I	21	7	1963	P M Johns	Top winch bush	CUNZ	
141	Stephens I	21	7	1963	P M Johns	Top winch bush	CUNZ	
142	Stephens I	21	7	1963	P M Johns	Top winch bush	CUNZ	
143	Stephens I	21	7	1963	P M Johns	Top winch bush	CUNZ	
144	Stephens I	21	7	1963	P M Johns	Top winch bush	CUNZ	
145	Stephens I	21	7	1963	P M Johns	Top winch bush	CUNZ	
146	Stephens I	21	7	1963	P M Johns	Top winch bush	CUNZ	
147	Stephens I	21	7	1963	P M Johns	Top winch bush	CUNZ	
148	Stephens I	21	7	1963	P M Johns	Top winch bush	CUNZ	
149	Stephens I	21	7	1963	P M Johns	paddock	CUNZ	
150	Stephens I	2	2	1964	A Ramsay		NZAC	collector GW Ramsay?
151	Stephens I	2	2	1964	A K Walker		NZAC	
152	Stephens I	10	2	1964	J I Townsend		NZAC	
153	Stephens I	10	2	1964	J I Townsend		NZAC	
154	Stephens I	20	8	1974	G Y Walls	at night	NZAC	
155	Stephens I		4	1976	M J Meads		M J Meads	
156	Stephens I		1	1978	H Moller		MONZ	
157	Stephens I	4	11	1981	P R Notman	night searching, base of tree	NZAC	
158	Stephens I	15	11	1981	P R Notman	night searching, on tree trunk, wet	NZAC	
159	Stephens I						NZAC	
160	Stephens I						NZAC	

No.	Locality	Date	Month	Year	Collector	Habitat	Collection	Comments
161	Stephens I						NZAC	
162	The Brothers	18	5	1957	G W Gibbs		VUNZ	
163	The Brothers	18	5	1957	G W Gibbs		VUNZ	
164	The Brothers	18	5	1957	G W Gibbs		VUNZ	
165	The Brothers	18	5	1957	G W Gibbs		VUNZ	
166	The Brothers	18	5	1957	G W Gibbs		VUNZ	
167	The Brothers	18	5	1957	G W Gibbs		VUNZ	
168	The Brothers	18	5	1957	G W Gibbs		LUNZ	
169	The Brothers	18	5	1957	G W Gibbs		LUNZ	
170	The Brothers	18	5	1957	G W Gibbs		LUNZ	
171	The Brothers						NZAC	
172	The Brothers					in crevices in the rocks	MONZ	
173	The Brothers						MONZ	Lewis coll. no. 5803
174	The Brothers						BMNH	Broun Collection, probable syntype
175	The Brothers				P S Sandager		BMNH	
176	The Brothers				P S Sandager		BMNH	Sharp Collection, other label data probably wrong
177	Waikari	28	11	1993	TH Worthy	ex subfossil remains of laughing owl nest	CUNZ	
178							NZAC	
179							NZAC	
180							NZAC	
181							NZAC	
182							NZAC	
183							NZAC	
184							MONZ	
185							MONZ	
186							MONZ	
187							MONZ	
188							MONZ	label data probably - Stephens I., -/1/1978, H. Moller

Key to collection acronyms

AMNZ - Auckland Institute and Museum, Auckland, New Zealand
BMNH - Natural History Museum, London, England
CUNZ - Canterbury University, Christchurch, New Zealand
LUNZ - Entomology Research Museum, Lincoln University, Lincoln, New Zealand
MONZ - Museum of New Zealand, Wellington, New Zealand
NZAC - New Zealand Arthropod Collection, Auckland, New Zealand
VUNZ - Victoria University of Wellington, Wellington, New Zealand