Existing records of the carabid beetle *Oregus inaequalis* Castelnau in coastal Otago

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Published by
Department of Conservation
Head Office, PO Box 10-420
Wellington, New Zealand

This report was commissioned by Otago Conservancy

ISSN 1171-9834

Reference to material in this report should be cited thus:

Jamieson, C., 1999
Existing records of the carabid beetle *Oregus inaequalis* Castelnau in coastal Otago. *Conservation Advisory Science Notes No. 244*, Department of Conservation, Wellington.

Keywords: Carabid beetle, *Oregus inaequalis*, Otago Coast Ecological Region

Abstract

Specimens of *Oregus inaequalis* held in institutional and private collections within New Zealand are reviewed. References to this species and to the genus *Oregus* in the scientific literature are given. Preliminary morphological examinations of four Otago Museum specimens which appear to belong to the genus *Oregus* are described. Recommendations are made for further work.

1. Advice sought

1 To collate existing records of *Oregus inaequalis* in coastal Otago.

2 To provide recommendations on the priority for conservation management of this species.

2. Introduction

Oregus inaequalis was originally described by Castelnau (1868) as *Mecodema inaequale* from a specimen collected in Dunedin. In 1873, Putzeys established the genus *Oregus* when he revised the Australian Tribe Broscini, Family Carabidae. Two species were named in this genus, *O. aereus* (originally described as *Broscus (Promocoderus?) aereus* by White and Butler (1874) and *O. inaequalis.* Broun (1880) included these two species without addition to the genus in his 'Manual of New Zealand Coleoptera'. In 1949, Britton made a thorough revision of the Tribe Broscini, and maintained the genus *Oregus* intact with the same two species. The type specimen of *O. inaequalis* is held in the Genoa Museum, Italy (Britton 1949).

This study reviews existing records of *O. inaequalis* from coastal Otago. During the course of the study there were suggestions that a third species of *Oregus* also exist (I. Townsend, pers. comm.). Thus, the study was extended to examine this possibility. The genus *Oregus* and the species O. *inaequalis* are considered in conservation management recommendations. A photo of *Oregus inaequalis* is shown in Appendix 1.

3. Methods

Enquiries were made as to the presence of *Oregus inaequalis* in major institutional collections in New Zealand, and a number of professional and ama-

teur collectors in New Zealand were also consulted (Appendix 2). Information on specimens held in museums overseas was gained from the literature.

All Department of Lands and Survey, and Department of Conservation literature concerning coastal Otago were consulted (Appendix 3). A CD rom search was made using the Zoological Record (Biosis 1989), as well as a search using the database BUGS (Crosby and Ramsay 1994). The *New Zealand Entomologist,* the *New Zealand Journal of Zoology,* and the *New Zealand Journal of Ecology* were scanned for possible incidental records. A search was made of BSc honours dissertations, and MSc and PhD theses held in the Department of Zoology, University of Otago for records of *O. inaequalis* (Appendix 4).

Specimens from the B. H. Patrick and A. C. Harris collections at the Otago Museum were examined. The male genitalia of four specimens were removed, mounted under the dissecting microscope and sketched to verify identity. It should be noted that these drawings are preliminary sketches and should not be regarded as final taxonomic drawings.

4. Results and Discussion

4.1 SPECIMENS HELD IN COLLECTIONS

Collection details of *O. inaequalis* specimens held in New Zealand are shown in chronological order (Appendix 5). Early records suggest that this species was confined to the greater Dunedin area in Otago, and all specimens of this species in New Zealand from this century are within the same boundaries.

The oldest dated specimens in New Zealand (1908) are from Dunedin, and Harewood. It is open to speculation whether 'Harewood' implies the small coastal settlement on the Otago Peninsula 'Harwood' or a private residence given this name. The second oldest specimen was collected from the Waitati Hills (Dunedin) in 1926. It was usual at this time to label specimens collected on the lower slopes of Swampy Summit as 'Waitati' (B. H. Patrick, pers. comm.).This was found to be true for species of caddis flies and moths which are only found above the bushline.

All other specimens are from the second half of this century. I. Townsend collected *O. inaequalis* from Leith Valley in 1960, and J. C. Watt collected it nearby (Ross Creek Reservoir) in 1981. Both these areas are under increasing urban pressure. There has been a major housing development in Leith Valley (Glenleith) during the 1990s, and although Ross Creek Reservoir is still surrounded by native bush it is subject to considerable recreational use by joggers and walkers. J. C. Watt also collected *O. inaequalis* from Mt Cargill in 1981.

All records since 1983 are from Swampy Summit (170°29'E, 45°47'S) which appears to have become the established collecting site for this species. Barratt has 31 specimens that she collected in 3 pitfall traps during the summer of

1984/1985. It coexists in approximately equal numbers with *O. aereus* on Swampy Summit, and this is regarded as unusual (B.I.P. Barratt, pers. comm.).

B. H. Patrick (Otago Museum), an extensive collector in the Otago region, has not found *O. inaequalis* on collecting trips in the Mihiwaka, Mopanui, Mt Cargill and Signal Hill areas during the 1990s (pers. comm.). He suggested that if it was common he would have expected to find it but did not discount the possibility of it appearing in pitfall traps.

4.2 LITERATURE SEARCH

Oregus inaequalis is only mentioned in the published literature taxonomically (Castelnau 1868, Putzeys 1873, Broun 1880, Britton 1949, Klimaszewski &Watt 1997). Most records refer to specimens from the Dunedin area (e.g. Dunedin, Port Chalmers). The exception is Britton (1949), who suggests that the species was also present in Invercargill. Also, some old DSIR records indicate that it was present at Lake Pukaki and Fox's Peak in Canterbury (I.Townsend, pers. comm.). These records outside the Dunedin area are regarded as suspect by Townsend (pers. comm.).

O. aereus is mentioned more frequently in invertebrate lists from the Coastal Otago region (Barratt & Patrick 1987, Dickinson 1988, Patrick *et al.* 1993, Patrick 1997). A reference to its biology occurs in the published literature where there is a description of a specimen parasitised by a gordian worm (Townsend 1969).

4.3 MORPHOLOGY

The descriptions and drawings of the distinguishing features of the external morphology and of the aedeagus of *O. inaequalis* (Britton 1949) make this species easy to identify.

Annotated sketch drawings of four specimens that were identified as belonging to the genus *Oregus* using the key to the genera of the Broscini (Britton, 1949) are shown (Appendix 6). Only four dissections were made for this study and each revealed sufficient variation in the aedeagus for each specimen to be regarded as a separate species. The first two drawings show *O. aereus* (Fig. 1) and *O. inaequalis* (Fig. 2) and correspond to Britton's taxonomic drawings. The only apparent difference is the view. In Britton's drawings of *O. aereus* the left paramere (which is continuously fringed) is visible but is obscured here, and in *O. inaequalis* the left paramere is visible in this drawing but not in Britton's.

The aedeagus in Fig. 3 is from a brown beetle which has the collection details 'Dunedin' (no date). It appears to have the characteristics of the *Oregus* genus as does the fourth specimen. In each specimen the terminal segment of the palpi are triangular at the apex, there is a seta in the scrobe of the mandible, there is only one seta in the supraorbital puncture at the side of the eye, and the head has more than two supraorbital punctures on each side. The

aedeagus in Fig. 4 is from a specimen collected from Woodhaugh Gardens (A. C. Harris, 7 Aug 1975). This aedeagus is heavily muscled and spring-loaded.

I.Townsend (pers. comm.) and J. Nunn (pers. comm.) have both commented on the possible existence of an intermediate species. The two specimens described above have very similar external morphology to *O. aereus*, but the apex of the aedeagi, which Britton uses in the key, shows some variation in width. In the key, Britton makes minimal use of the remaining aedeagus structures, which appear to be very different for both specimens.

5. Conclusions and recommendations

The only known population of *Oregus inaequalis* is on Swampy Summit, where it coexists with *O. aereus*. Its population appears to be stable and it is located within a protected area. This species does not appear to be as widely distributed as it once was.

Oregus aereus is widely distributed throughout Otago. Possible new members this genus were found within the Dunedin urban area and their conservation status must be regarded as critical.

Urgent work, distributional and taxonomic, on the genus in the Dunedin metropolitan area is required. Results from this brief survey suggest that some species may become extinct before they are described.

6. Acknowledgements

I am grateful for the assistance provided by the following people: Barbara Barratt, Invermay; Anthony Harris and Brian Patrick, Otago Museum; Grace Hall, Mt Albert; Ricardo Palma, Museum of New Zealand Te Papa Tongarewa; John Marris, Lincoln University; John Early, Auckland Museum, Ian Townsend, and John Nunn. My thanks to Bruce McKinlay (Department of Conservation, Dunedin) for offering me the project, and to the Otago Museum for the loan of specimens.

7. References

Barratt, B. I. P and B. H. Patrick, 1987. Insects of snow tussock grassland on the East Otago Plateau. *NZ Entomologist*, 10:69-98.

Biosis, 1989. Zoological record serial sources [on line]. *BioSciences Information Service of Biological Abstracts,* Philadelphia, PA.

Britton, E. B. 1949. The Carabidae (Coleoptera) of New Zealand Part III -A revision of the Tribe Broscini. *Transactions Royal Society of NZ.* 4:533-581.

Broun,T., 1880. *Manual of the New Zealand Coleoptera V.l.* Colonial Museum and Geological Survey Dept. 744pp.

Castelnau, Count E De., 1868. Notes on Australian Coleoptera Part II. *Transactions Royal Society Victoria* 1867-69:95-225.

Crosby, T K. and G. W Ramsay, 1994. BUGS on-disc: index to information on New Zealand terrestrial invertebrates 1775-1993 [47Mb]. *In* J. A. Jasperse (ed.), Spectrum: New Zealand science and technology databases. Wellington, SIR Publishing.

Dickinson, K. J. M., 1988. Umbrella Ecological District. A survey report for the NZ Protected Areas Programme 7. Dept. Conservation, Wellington. 179pp.

Klimaszewski, J. and J. C. Watt, 1997. Coleoptera: family-group review and keys to identification. *Fauna of New Zealand* 37:199pp.

Patrick, B. H., 1997. Invertebrates of Macraes Ecological District. *Otago Conservancy Miscellaneous Series* 30:43pp.

Patrick, B. H., B. I. P Barratt, J. B. Ward and I. D. Mclellan, 1993. Insects of the Waipori Ecological Region, Lammerlaw Ecological Region. *Otago Conservancy Miscellaneous Series* 16:42pp.

Putzeysj, 1873. Revision des Broscides de l'australie d'apres la collection de M le Comte de Castelnau. *Ann Mus. Civ. stor Nat. giacomo Doria* : 307-343.

Townsend, J. 1., 1969. Records of gordian worms (Nematomorpha) from New Zealand carabidae. *NZ. Entomologist* 4:98-99.

White, A. and A. G. Butler, 1874. Insects. In: *The Voyage of H. M. S. Erebus and Terror V2. Reptiles, Fisbes, Crustacea, Insects, Molluscs.* Ed. J. Richardson and J. E. Gray. 51 pp.

Appendix 1. Photo of *Oregus inaequalis*.

Appendix 2. Lists of institutions and private collectors.

Institutions
Auckland Museum
Cawthron Institute
Canterbury Museum
Landcare - Mt Albert
Lincoln University
Museum of New Zealand Te papa Tongarewa
Otago Museum

Private collectors
B. I. P. Barratt
A. C. Harris
John Nunn
B. H. Patrick
Ian Townsend

Appendix 3 Literature survey - Government departments.

Allen, R. B. 1978. Scenic reserves of Otago Land District. Biological Survey of Reserves Report 4. Dept. Lands and Survey, Wellington. 322pp.

No information on invertebrates.

Anon. 1992. Dept. Conservation, Dunedin.Taiaroa Head Reserves - Resource Inventory. Otago Conservancy Misc. Report Series 1. 74pp.

No information on Invertebrates.

Anon 1978. Dept. Lands and Survey, Otago Land District Coastal Reserves Investigation. Silverpeaks County, Waikouaiti Portion.

No information on invertebrates.

Anon. 1978 Dept. Lands and Survey. Otago Land District Coastal Reserves Investigation. Report on Waikouaiti County.

No information on invertebrates.

Anon 1978. Dept. Lands and Survey Otago Land District Coastal Reserves Investigation. Report on Dunedin City (Otago Peninsular). 87pp.

No information on invertebrates.

Anon 1982. Dept. Lands and Survey 1982. Catlins Coast Park Concept. Summarised edition. 47pp.

Common forest pathogens - pinhole borer, jewel beetle and huhu.

Anon 1982. Dept. Lands and Survey, Dunedin. Coastal Reserves Investigation Series No.2. Bruce County.

No information on invertebrates.

Anon 1985. Dept. Lands and Survey. Reserves of the Maungatua range and the Waipori Gorge Management Plan. Series No. 157.

No information on invertebrates.

Anon 1985. Dept. Lands and Survey, Dunedin. Management Plan Silverpeaks Scenic Reserve.

1 or 2 invertebrate species mentioned for each reserve.

Anon 1987. Dept. Lands and Survey, Dunedin. Silverpeaks Scenic Reserve Management Plan. 75pp.

Appendix of notable moth species (B. H. Patrick). No information on coleoptera.

Anon. 1987. Wildlife and Habitat Values of Lake Tuakitoto. Dept. Conservation, Dunedin. 24pp.

No information on invertebrates.

Bibby, C. J. 1997. Macraes Ecological District: A survey report for the Protected Natural Areas Programme. M. Sc. University of Otago, 203pp.

Moth species, some coleoptera and some orthopterans provided by B. H. Patrick,

Carter,J. 1994.Waipori Ecological District.A survey report for the Protected natural Areas Programme. Dept. Conservation, Otago Conservancy, Dunedin.

Refers to Patrick publications.

Cossens, P. G. 1980. Vegetation and Environment of the Nardoo Catchment on the eastern Otago uplands. 31pp

No information on invertebrates.

Dickinson, K.J.M. 1986 Umbrella Ecological District.Waikaia Ecological Region. A survey report for the New Zealand Protected Areas Programme. 163pp.

Full coleopteran survey (B. I. P. Barratt), no *Oregus sp.*

Dray,J. 1993. Lakes Waipori and Waihola Wetland. A natural resource inventory.

Insects and crustaceans mentioned, but not identified.

Grove, P 1994. Maniototo Ecological District. New Zealand Protected Natural Areas Programme Series 30. Dept. Conservation, Otago Conservancy, Dunedin. 96pp.

Fauna from Patrick 1994.

Lalas, C. 1984. Green Island, Otago: survey of fauna. Lands and Survey Dept., Dunedin. 42pp.

No information on invertebrates

Lovelock, B. A. 1984. Waipori Falls and Maungatua Range Scenic Reserves. Vegetation condition and animal population. 11 pp.

No information on invertebrates.

Patrick, B. H. 1990. The conservation values of the Lammermoor Range, Otago. Dept. Conservation, Dunedin.

Mostly Lepidoptera.

Patrick, B. H. 1994.The importance of invertebrate diversity: an Otago Conservancy review. CAS notes 53, Dept. Conservation, Wellington. 13pp.

Oregus inaequalis not cited in this report.

Patrick, B. H. 1994. Lepidoptera of the Southern Plains and Coast of New Zealand. Otago Conservancy Misc. Series 17, Dept. Conservation, Dunedin. 43pp.

Lepidoptera only.

Petrie,A. R. 1977. Landscape evaluation of S. E. Otago. Dept Lands and Survey, Dunedin. 17pp.

No information on invertebrates

Ross,A.B. 1978.Waipori Scenic Reserve.Vegetation condition and animal population. Southland Conservancy, N. Z. Forest Service. 8pp.

No information on invertebrates.

Ward, G. and C. M. Munro 1989. Otago II. Biological Survey of Reserves Series 20, Dept. Conservation, Central Office, Wellington. 357pp.

No coleoptera listed. Lepidoptera listed for some reserves (B. H. Patrick).

Appendix 4. Literature survey - theses and dissertations. Department of Zoology, University of Otago.

Alterio, N. 1967. Diet and movements of carnivores and the distribution of their prey in grassland around yellow-eyed penguin *(Megadyptes antipodes)* breeding colonies. 120pp. MSc.

No information on invertebrates.

Edwards, E. 1995.The contribution of terrestrial invertebrates to stream food-webs. MSc. thesis.

Identification of invertebrates to family.

Gore, R. J. 1961. An investigation of the insect species and their distribution in the Water of Leith. MSc. departmental project.

No terrestrial invertebrates in survey.

Patterson, G. B. 1985. The Ecology and Taxonomy of the Common Skink *Leiolopisma migriplatare* Maccanni in tussock grasslands in Otago. 217pp. PhD. thesis.

Study area - Rock and Pillars, Lammermoor Range. Invertebrate ID's to Order (e.g. Coleoptera).

Spencer, N. J. 1966. Microhabitat and thermal ecology of two sympatric species of lizard in Otago grassland. 106pp.

No information on diet.

Stark, K. B. 1991. Boulder Beach management development plan. 44pp. Dip. Wildlife dissertation.

Little known of invertebrates in the area apart from the snail *Powelliphanta gilliesi fallax*.

Winter,J.W. 1963. Observations on a population of the brush-tailed opossum *(Tricbosurus vulpecula* Kerr. 57pp. MSc.

No information on invertebrates.

Appendix 5. Collection details of *Oregus inaequalis* specimens in chronological order. (? no further details available, n number of specimens).

Location	n	Date	Collector	Collection
Dunedin (A. 08.170)	1	June 1908	D. Miller	Otago Museum
'Harewood' (A.o8.220)	1	1908	D. Miller	Otago Museum
Dunedin-Waitati Hills	1	12/9/1926	C. E. Clarke	Mt Albert
Leith Valley	2	18/4/1960	I. Townsend	I. Townsend
Ross Ck. Reservoir	1	18/10/1981	J. C. Watt	Mt Albert
Mt Cargill	1	21/10/1981	J. C. Watt	Mt Albert
Swampy Summit 700m	1	29 May 1982	B. I. P. Barratt	B. I. P. Barratt
Swampy Summit	2	26/11/1983	J. Nunn	I. Townsend
Swampy Summit 700m ex pitfall trap (1, 2, &3)	11	17 Nov-16 Dec 1984	B. I. P. Barratt	B. I. P. Barratt
Swampy Summit (3)	1	17/11/1984	B. I. P. Barratt	Lincoln University
Swampy Summit (7)	1	16/12/1984	B. I. P. Barratt	I. Townsend
Swampy Summit 700m ex pitfall trap (1, 2, &3)	10	16 Dec-12 Jan 1985	B. I. P. Barratt	B. I. P. Barratt
Swampy Summit 700m ex pitfall trap (1, 2, & 3)	8	12 Jan-16 Feb 1985	B. I. P. Barratt	B. I. P. Barratt
Swampy Summit 700m ex pitfall trap (3)	2	16 Feb-23 Mar 1985	B. I. P. Barratt	B. I. P. Barratt
Swampy Summit under rock 720m	1	13/12/1990	R. M. Emberson	Lincoln University
Bush track to Swampy Summit	1	26/11/1993	I. Townsend	I. Townsend
Swampy Summit 720m	1	11/2/1995	B. H. Patrick	Otago Museum
Flagstaff Hill	1	?	A. E. Brookes	Mt Albert
Dunedin	1	?	?	Te papa
?	1	?	?	Te papa

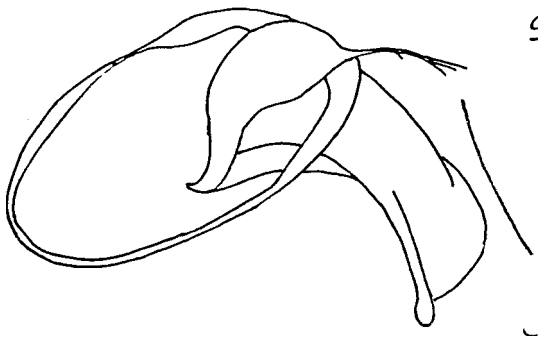
Addendum

The following records arrived after contract completion date. They provide further records of *Oregus inaequalis* but do not alter the recorded distribution of the species.

location	n	date	collector	collection
Waitati	7	7 /10/1923	C. E. Clarke	Auckland Museum
Waitati	1	1 4/10/1923	C. E. Clarke	Auckland Museum
Waitati	1	11/11/1923	C. E. Clarke	Auckland Museum
Waitati	1	1 8/10/1925	C. E. Clarke	Auckland Museum
Waitati	4	1 8/9/1926	C. E. Clarke	Auckland Museum

Appendix 6. Sketch drawings of *Oregus sp.* male genitalia.

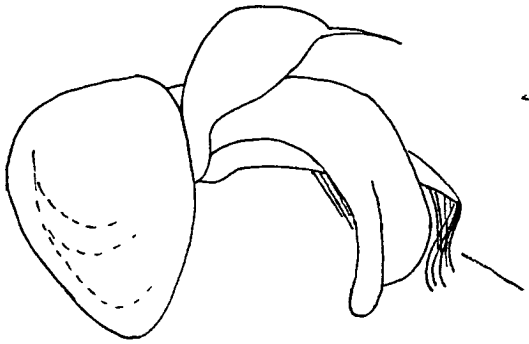
Fig. 1



Oregus aereus
Swampy Summit 700m
23 Nov. 1997
B. H Patrick
Otago Museum

3 long setae at end of paramere.

Fig. 2.

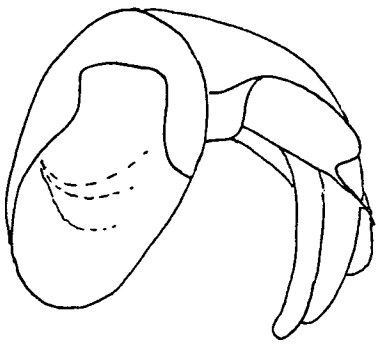


Oregus inaequalis
Swampy Summit 700m
11 Feb 1995
B. H. Patrick
Otago Museum

Right paramere - fringe longer than in *O. aereus*

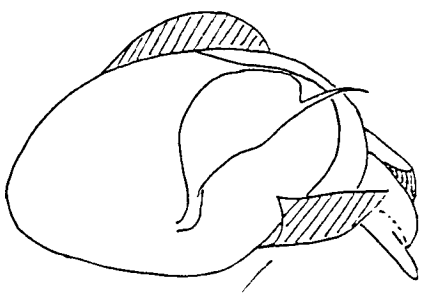
] 1mm

Fig. 3



Oregus sp.
- Brown specimen marked 'DUNEDIN' in pencil
A. C. Harris collection
Otago Museum.

Fig. 4



Oregus sp.
Woodhaugh Gardens forest
7 Aug. 1975
A. C. Harris
Otago Museum

spring loading - forms plate on other side. Thick layer of muscle around parameres.