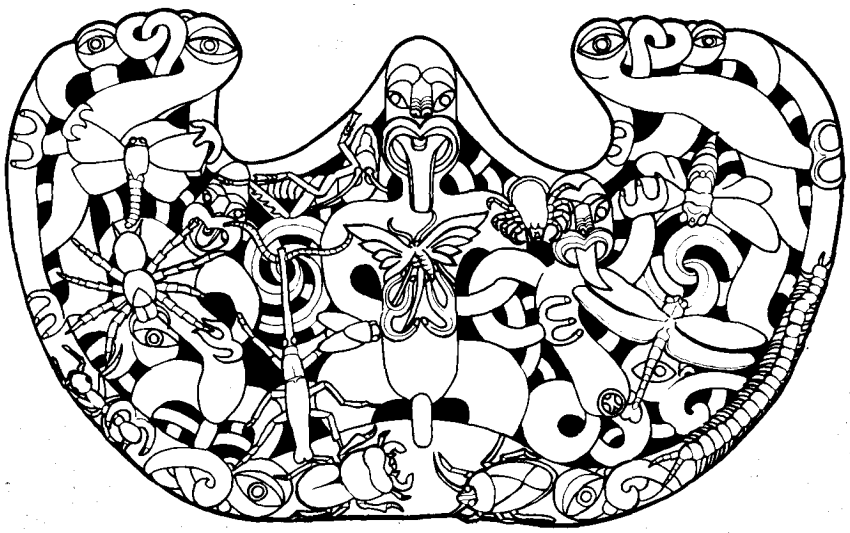

Fauna of New Zealand

Ko te Aitanga Pepeke o Aotearoa

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Number / Nama 37

Coleoptera:

family-group review and keys to identification

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with illustrations by D.W. Helmore

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Class **Insecta**

Order **Coleoptera**

Families of beetles

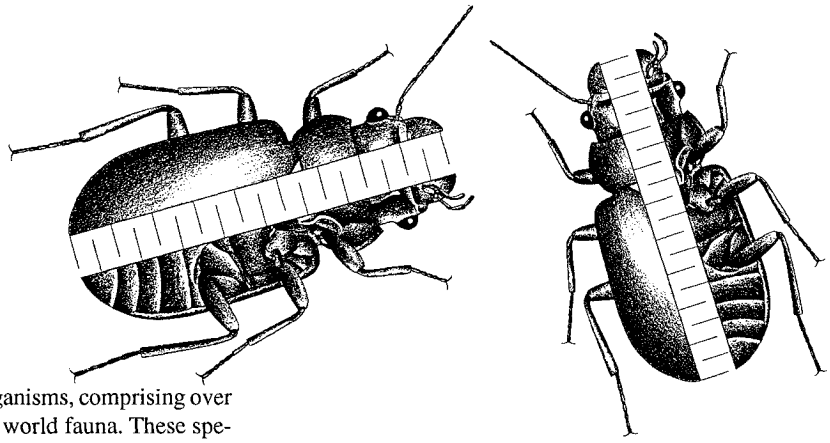

Illustration / Whakaahua: Measurement and comparison help us to classify beetles into families (Illustrator / Kaiwhakaahua: Kirsty Wilson).

Beetles are the largest order of organisms, comprising over 350 000 described species in the world fauna. These species are classified in some 23 000 genera. It has been estimated that there are more species of beetles than there are of vascular plants or fungi, and 90 times as many as there are mammal species.

In New Zealand at least 5182 native species of beetles have been recognised. A further 343 species are either self-introduced or have been deliberately brought in, for example for the biological control of noxious weeds. These beetles belong to some 1094 genera in 82 families. By comparison the vascular plant flora includes about 2500 species, and the terrestrial vertebrate fauna about 350 species. The actual number of beetle species in New Zealand is undoubtedly much higher – many are undescribed.

The first European collections of New Zealand beetles were made by Joseph Banks and Daniel Solander during Captain James Cook's first voyage, in 1769, and the first formal descriptions were by Johannes Fabricius in 1775.

The origin of New Zealand's beetles is essentially unknown, but apparently at least some had developed on an ancient land mass of continental origin which became increasingly isolated since the late Mesozoic era. The earliest known beetle fossil from New Zealand is of an incomplete front wing dating from the Cretaceous.

Four factors are responsible for the composition and diversity of the present-day beetle fauna of New Zealand. (1) The origin of some of our fauna on the ancient southern supercontinent known as Gondwana. (2) The estimated 80 million years of geographic isolation of New Zealand, which has resulted in some 90 percent endemism (local origin) of species, and high endemism also at genus level. (3) Changing climate, land areas, and land surfaces due to factors such as glaciation, mountain building, and volcanic activity. (4) The absence of mammals and other animals and plants which have dominated ecosystems elsewhere

(continued overleaf)

O ngā pūtoi raropi katoa, ko te pūtoi kurikuri te mea tino nui. Neke atu i te 350 000 ngā momo kurikuri kua oti te tautuhi, puta noa i te ao. E noho mai ana ēnei momo ki ētahi puninga āhua 23 000 nei. E ai ki te whakaaro o ētahi, he maha ake ngā momo kurikuri, tēnā i ngā momo tipu whai iaia, i ngā momo kōpura whetū rānei, ā, e 90 te whakaraunga ake o ngā momo kurikuri i ngā momo kararehe whakangote.

Neke atu i te 5182 ngā momo kurikuri o Aotearoa taketake ake kua kitea i tēnei whenua. Arā anō ētahi momo e 343 nei tau noa mai, i āta kawea mai rānei, pērā i ērā i whakanōhia mai hei pau i ngā taru kino. E noho katoa mai ana ēnei momo ki ētahi puninga 1094, me ētahi whānau e 82. Ki te whakaritea tēnei ki te nui o ētahi atu rauropi, e 2500 ngā momo tipu whai iaia, ā, e 350 noa iho ngā momo kararehe noho whenua e whai tuarā ana. Kāore e kore he nui noa atu ngā momo kurikuri i Aotearoa i tērā i huaina i runga ake nei, inā hoki, arā anō ētahi kāore anō kia āta whakaahuahia, kia āta tautuhia.

Ko Joseph Banks rāua ko Daniel Solander ngā Pākehā tuatahi i tahuri ki te āta kohikohi i ngā momo kurikuri o Aotearoa, i a rāua ka haere mai i te rerenga tuatahi mai a Hēmi Kuki ki Aotearoa i te tau 1769, ā, ko ngā tautuhinga whaitake tuatahi, nā Johannes Fabricius i te tau 1775.

Kāore e āta mōhiotia ana te pūtakenga mai o ngā kurikuri o Aotearoa, engari e ai ki te kōrero arā ētahi i takea mai i tētahi whenua rahi o tūāuriuri. Mai i te wāhanga whakamutunga o te wā Mesozoic, ka neke haere tēnei whenua rahi, me te aha, ka motuhake mai i ētahi atu whenua. Ko te parawae kurikuri tino tawhito o Aotearoa

(ara haere tonu)

in the world. The flora and fauna have been greatly modified in the last 1000 years by humans, who brought devastation to native forest and introduced exotic animals with destructive influence (e.g., deer, rats, possum, goats).

Contemporary New Zealand beetles are thus a composite of ancient, variously changed lineages, elements introduced by dispersal over short and long distances, and species intentionally and accidentally introduced by humans. The majority of species are associated with native forest, which now constitutes only 23 percent of the total land area. The shrinking forest has profoundly reduced the population size of many native species and their potential for long-term survival.

Our beetles are also vulnerable to introduced organisms: their defence mechanisms are often ineffective against the new arrivals. They may succumb to competition for food with introduced wasps, to predation by mammals, and to depletion of food sources by weeds out-competing native plants. A number of beetle species are recognised as being threatened with extinction, and are listed for protection by the Department of Conservation.

On a positive note, beetle diversity can be unexpectedly high in relatively small areas of habitat. The beetle fauna of the Auckland suburb of Lynfield has been shown to exceed 1000 species, of which three-quarters are native.

Contributor **Jan Klimaszewski** was born in Poland in 1950. He graduated MSc in 1973 and PhD in 1978 from the University of Wroclaw, with a specialisation in the beetle family Staphylinidae. He was based in Poland until 1980, when he took up a postdoctoral research fellowship in Ottawa, Canada. From 1982 to 1989 he was a research associate in the Lyman Entomological Museum at McGill University, working on lacewings (Neuroptera). Jan was then appointed as a Senior Curator of Coleoptera in the Transvaal Museum, Pretoria, South Africa. In 1993 he returned briefly to Canada before taking up the post of Coleopterist with Landcare Research in New Zealand.

Contributor **J. Charles Watt** was born in England but moved to New Zealand at an early age. He graduated MSc (Hons) in zoology from the University of Auckland in 1960. In 1965 he graduated DPhil from Oxford University, where he worked on the beetle family Tenebrionidae. He then joined the Entomology Division of DSIR, with responsibility in the Systematics Section for all beetles except the weevils. Charles was obliged to retire prematurely in 1986 because of a stroke which left him hemiplegic. He has since been an honorary research associate of the invertebrate systematics group, first under DSIR and since 1992 under Landcare Research.

e mōhiotia ana, ko tētahi wāhanga o te pakihau o mua, mai i te wā Cretaceous.

E whā ngā āhuatanga i whakatauhia ai te āhua me te nui o ngā momo kurikuri o Aotearoa i ēnei rā. (1) Ko te pūtakenga mai o ētahi momo i te whenua rahi tūāuriuri e kīia nei ko Gondwana. (2) Ko te āhua 80 miriona tau e noho motuhake mai ana a Aotearoa. Nā konei i 90% ai te nui o ngā kurikuri i Aotearoa nō konei taketake ake, ā me uaua ka kitea ēnei momo i ētahi atu whenua. Waihoki, kei te pērā ano i te āhua ki ngā puninga. (3) Ko te rerekē haere o te āhua o ngā rangi, o te takoto mai o te whenua, tae atu ki te mata o te whenua. Nā ngā āhuatanga pēnei i ngā awa hukapapa, i ngā āhuatanga hanga maunga me ngā mahi a Rūaumoko i pēnei ai. (4) Ko te kore o ētahi momo karerehe whakangote me ētahi atu kararehe, tae atu ki ētahi tipu kua noho mātāmua mai i ētahi atu rauwiringa kaiao, huri i te ao. I tēnei 1000 tau kua hori ake nei, kua kaha tonu te rawekehia o ngā tipu me ngā kararehe o Aotearoa e te ringa tangata. Nā te tangata kē hoki i kore hare ai ngā ngahere māori, nāna anō i tau mai ai te mahi a te kararehe kino i tawhiti (hei tauira, arā te tia, te kiore, te paihamu, me te koti).

Nā reira, ko ngā kurikuri o Aotearoa ināianei, i hua ake i te haere kōtui o ēnei āhuatanga e whai ake nei: ngā kākano whakauru o tuauri whāioio, ngā mea i tau ā-puananī mai, ā-manapou mai rānei, ahakoa i ahu mai i pae tawhiti, i pae tata rānei, tae atu ki ngā mea i āta haria mai e te tangata, i haria pokerehū mai rānei e te tangata. Ko te nuinga o ngā momo nei, e honoa ana ki ngā ngāhere māori, ā, o te katoa o ngā whenua o Aotearoa, ko tētahi 23% anake he wao māori. Nā te korekore o ngā ngahere māori, kua iti ake te maha o tēnā momo, o tēnā momo o ngā kurikuri tūturu o Aotearoa, ā, tērā pea kua kore e noho pūmau mai ki te mata whenua.

Kua mōrearea anō hoki ā tātou ake kurikuri i te noho tahi ki ngā rauropi kua tau mai i whenua kē, inā hoki kua kore e taea e rātou te kaupare atu ngā mate tērā pea ka pā mai i ēnei rauropi hou. Tērā kua noho papa i te whakataetae tahi ki ngā katipō haere mai i tawhiti – e rua, e rua, e whai ana i te kai kotahi; ko ngā kurikuri tonu rānei kua noho hei kai mā tētahi kararehe whakangote; kua riro rānei mā ngā taru tawhiti kē e tāmi ngā tipu o konei taketake ake, me te aha anō, kua papāroa ēnei tino kai a ngā kurikuri.

Arā ētahi momo kua tata tonu te korehāhā, ā, he mea whakauru ēnei e Te Papa Atawhai ki te rārangi o ngā rauropi kia āta maimoahia, kia āta rauhitia.

Heoi anō, inā tirohia te taha rongo pai, arā ētahi wāhi noho ririki nei, inā kē te nui o ngā momo kurikuri e noho mai ana ki reira. E ai ki ngā kōrero, neke atu i te 1000 ngā momo kurikuri e noho tahi ana i te takiwā o Lynfield, i Tāmaki-makau-rau, ā, ko tētahi 75% o ēnei, no konei taketake ake.

PREFACE

The idea of producing a manual for identification of New Zealand beetle families originated long ago in the Entomology Division of the former DSIR, yet for some time never quite got off the ground. This changed when, after graduating in 1965 from Oxford University, Charles Watt joined Entomology Division with responsibilities in the Systematics Section for Coleoptera. Over two decades he gathered together representative specimens of many beetle species, compiling their general descriptions, geographic distribution, and data on natural history, and produced a preliminary linear key for the identification of our families. His selected examples, which have been meticulously drawn by illustrator Des Helmore, represent most of the families occurring in New Zealand. In October 1985, while working at the Natural History Museum in Paris, Charles suffered a crippling stroke which culminated in his early retirement. This unfortunate event disrupted his plans for completing the key project, although he has continued to work as a Research Associate of Landcare Research.

In May 1994 Jan Klimaszewski arrived from Canada to work as a taxonomist on the beetle fauna of New Zealand. His primary task was to check and update Charles Watt's key, but he opted to prepare a manuscript reviewing New Zealand families, using many of Charles Watt's examples of species. In consultation with Charles this was completed in late 1996, when the manuscript was accepted for inclusion in the *Fauna of New Zealand* series. As first author, Jan was responsible for preparing the manuscript, the present concept of the families, the family descriptions and their arrangement according to the most recent system of classification, the data on nomenclature, geographic distribution, and economic importance, the selected references, and line illustrations of structures. He also produced a second, pyramidal key intended for quick identification. In late 1996 Jan took up an opportunity for employment in Canada, so as to be reunited with his wife Krystyna and son Philip.

The published version has been considerably improved by the suggestions of several reviewers and collaborators, all of whose input is warmly acknowledged, and with significant support and guidance from the *Fauna* Management Committee (Marie-Claude Larivière, Trevor Crosby, Ross Beever) and the Invertebrate Systematics Advisory Group (see p. ii). It has been structurally developed and completed by the Series Editor, working from Jan's final draft, and integrating the many suggestions of reviewers and collaborators.

This contribution attempts to fill a long-felt need, and critical feedback from users is invited, in anticipation that a revised edition may incorporate many further improvements.

—*Tymone Duval*, Series Editor, June 1997

WITHOUT TAXONOMY TO GIVE SHAPE TO THE BRICKS,
AND SYSTEMATICS TO TELL US HOW TO PUT THEM TOGETHER,
THE HOUSE OF BIOLOGICAL SCIENCE IS A MEANINGLESS JUMBLE.

— R.M. May, 1990: Taxonomy or destiny. *Nature 347:* 129–130

DEDICATION

This work is respectfully dedicated to G. Kuschel,[1] J.F. Lawrence,[2] and A.F. Newton, Jr,[3] whose ground-breaking work on beetles of New Zealand and Australia, and on beetle classification in general, encouraged this contribution and enabled its realisation.

[1] **Dr Guillermo ('Willy') Kuschel**, now retired, was a research scientist in Coleoptera in the former Entomology Division of DSIR, initially at Nelson and later at Mt Albert, Auckland. He was largely responsible for the expansion of the DSIR insect collection as a core element of the New Zealand Arthropod Collection. Willy is widely known and respected for his research on the systematics of Curculionoidea.

[2] **Dr John F. Lawrence** is a Chief Research Scientist with CSIRO and Curator of Coleoptera at the Australian National Insect Collection, Canberra. John is an outstanding coleopterist and a world leader in the higher classification of beetles. His work on Australian beetles, and his new system of classification, enabled us to complete our present contribution.

[3] **Dr Alfred F. Newton, Jr** is an Associate Curator and Head of the Division of Insects at the Field Museum, Chicago, U.S.A., and a renowned specialist in the higher classification of Staphylinoidea. Al is interested in the world fauna of beetles, and among many important papers has published on the New Zealand and Australian fauna.

— *Jan Klimaszewski & Charles Watt*

ABSTRACT

The 82 beetle families represented in New Zealand are reviewed. These families are briefly characterised in the phylogenetic order proposed by Lawrence & Newton (1995),[1] with family concepts similar to those defined by these authors and by Pakaluk *et al.* (1994).[2] A general introduction to the New Zealand beetle fauna is given, and collecting methods are briefly discussed, and core literature is reviewed. Two alternative keys—pyramidal and linear—are provided for identification of the families, using often different character sets. Morphological features are explained, and many are illustrated. Estimated numbers of species, genera, and (where appropriate) tribes and subfamilies are given. Known distributions are discussed, and data on natural history and collecting are summarised. For each family at least one species is represented by a habitus illustration, short description, and geographic profile, and important references are listed. Keys are provided to subfamilies of Carabidae, Leiodidae, Staphylinidae, Trogossitidae, Phloeostichidae, Scarabaeidae, Cerambycidae, Chrysomelidae, Anthribidae, Belidae, Brentidae, and Curculionidae; for some other families a substantive publication containing a key is cited. Some 1100 currently recognised genera are recorded for New Zealand, and approximately 5580 species (>5223 native, >3546 adventive) are recognised, including undescribed species housed in the New Zealand Arthropod Collection. One endemic family, Chalcodryidae, and four endemic subfamilies—Horelophinae (Hydrophilidae), Euderinae (Bostrichidae), Agapythinae (Phloeostichidae), and Cyclaxirinae (Phalacridae)—are reported. An undescribed species of *Platisus* from the Three Kings Islands is the only representative of the family Cucujidae in New Zealand.

[1] Families and subfamilies of Coleoptera (with selected genera, notes, references and data on family-group names). *In:* J. Pakaluk & A. Slipinski (eds), Biology, phylogeny and classification of Coleoptera: papers celebrating the 80th birthday of Roy Crowson. Warszawa, Museum i Instytut Zoologii PAN. Pp. 779–1006.

[2] Current classification and family-group names in Cucujoidea (Coleoptera). *Genus 5(4):* 223–268.

CHECKLIST OF FAMILIES

The checklist sequence follows mainly the classification proposed by Lawrence & Newton (1995). Numbers in brackets are unique identifiers for each family. Columns of numbers are estimated totals of genera and species currently recognised in New Zealand: col. 1 – genera; col. 2 – native species; col. 3 – adventive species. Numbers of species are based on published data (e.g., Holloway 1982, Watt 1982a, 1992, Ordish 1984, Werner & Chandler 1995, Klimaszewski *et al.* 1996) and the total number, including undescribed species, in the New Zealand Arthropod Collection (NZAC).

Superfamily **Byrrhoidea**				
[20] Family **Byrrhidae**	**8**	>79	0	*33*
[21] Family **Dryopidae**	**2**	4	0	*34*
[22] Family **Elmidae**	**1**	16	0	*34*
[23] Family **Limnichidae**	**2**	7	1	*35*
[24] Family **Heteroceridae**	**1**	1	0	*35*
[25] Family **Ptilodactylidae**	**2**	6–8	0	*35*
[26] Family **Chelonariidae**	**1**	1	0	*36*
Superfamily **Elateroidea**				
[27] Family **Eucnemidae**	**7**	22	0	*36*
[28] Family **Elateridae**	**26**	>132	3	*37*
[29] Family **Lycidae**	**1**	0	1	*37*
[30] Family **Cantharidae**	**3**	40	1	*38*
Series **Bostrichiformia**				
Superfamily **Derodontoidea**				
[31] Family **Derodontidae**	**1**	2	0	*39*
Superfamily **Bostrichoidea**				
[32] Family **Jacobsoniidae**	**2**	3/4	0	*39*
[33] Family **Nosodendridae**	**1**	2/3	0	*40*
[34] Family **Dermestidae**	**7**	11	6	*40*
[35] Family **Bostrichidae** (incl. Lyctinae)	**4**	1	7	*41*
[36] Family **Anobiidae** (incl. Ptininae)	**25**	28	11	*42*
Series **Cucujiformia**				
Superfamily **Cleroidea**				
[37] Family **Trogossitidae**	**10**	>24	1	*43*
[38] Family **Chaetosomatidae**	**2**	4	0	*44*
[39] Family **Cleridae**	**8**	37	2	*44*
[40] Family **Phycosecidae**	**1**	1	0	*45*
[41] Family **Melyridae** (also as Dasytidae)	**4**	33	0	*45*
Superfamily **Cucujoidea**				
[42] Family **Nitidulidae**	**12**	21	11	*46*
[43] Family **Monotomidae** (incl. Rhizophaginae)	**2**	1	5	*46*
[44] Family **Phloeostichidae**	**2**	2	0	*47*
[45] Family **Silvanidae**	**8**	7	5	*47*
[46] Family **Cucujidae**	**1**	1	0	*48*
[47] Family **Laemophloeidae**	**2**	3	3	*49*
[48] Family **Phalacridae**	**2**	>3	1	*49*
[49] Family **Cavognathidae**	**2**	5	0	*50*
[50] Family **Cryptophagidae**	**12**	18	12	*50*
[51] Family **Languriidae**	**5**	8	0	*51*
[52] Family **Erotylidae**	**2**	9	0	*51*
[53] Family **Bothrideridae**	**2**	6	1	*52*
[54] Family **Cerylonidae**	**2**	>5	1	*52*
[55] Family **Endomychidae** (incl. Merophysinae)	**3**	6	1	*53*
[56] Family **Coccinellidae**	**19**	22	18	*54*
[57] Family **Corylophidae**	**8**	>19	2	*54*
[58] Family **Corticariidae** (formerly as Lathridiidae)	**12**	53	11	*55*
Superfamily **Tenebrionoidea**				
[59] Family **Mycetophagidae**	**3**	12	3	*56*
[60] Family **Archeocrypticidae**	**1**	0	1	*56*
[61] Family **Ciidae**	**5**	20	0	*56*
[62] Family **Melandryidae**	**9**	38	0	*57*
[63] Family **Mordellidae**	**4**	6	1	*57*
[64] Family **Rhipiphoridae**	**3**	5	0	*58*
[65] Family **Colydiidae**	**26**	>196	0	*58*
[66] Family **Ulodidae** (formerly as Zopheridae)	**4**	20	0	*59*
[67] Family **Chalcodryidae**	**3**	5	0	*59*
[68] Family **Tenebrionidae**	**36**	139	10	*60*
[69] Family **Prostomidae**	**1**	1	0	*61*
[70] Family **Oedemeridae**	**6**	18	3	*61*
[71] Family **Pyrochroidae**	**3**	>7	0	*62*
[72] Family **Salpingidae** (incl. Inopeplinae)	**4**	22	0	*62*
[73] Family **Anthicidae**	**7**	17	9	*63*
[74] Family **Aderidae** (formerly as Euglenidae)	**1/2**	15	0	*64*
[75] Family **Scraptiidae**	**2**	>4	0	*64*
Superfamily **Chrysomeloidea**				
[76] Family **Cerambycidae**	**56**	>180	8	*65*
[77] Family **Chrysomelidae** (incl. Bruchinae)	**33**	>134	>19	*66*
Superfamily **Curculionoidea**				
[78] Family **Nemonychidae**	**1**	4	0	*67*
[79] Family **Anthribidae**	**28**	58	3	*68*
[80] Family **Belidae** (incl. Aglycyderinae = Proterhininae)	**3**	11	0	*69*
[81] Family **Brentidae** (incl. Apioninae)	**3**	3	1	*69*
[82] Family **Curculionidae** (incl. Scolytinae)	**231**	>1496	46	*70*
Totals (approx.):	**1100**	**>5223**	**>356**	

CONTENTS

ACKNOWLEDGMENTS

This work is a compilation from previous taxonomic revisions, occasional short papers, and beetle specimens that have accumulated in the New Zealand Arthropod Collection over an extensive period. The specimens were collected primarily by G. Kuschel, J.C. Watt, J.S. Dugdale, B.A. Holloway, B.M. May, and many others not mentioned but whose efforts deserve our sincere thanks.

Des Helmore executed the great majority of the habitus drawings. His superb work is indispensable to us and to the users of this publication; we salute him for his contribution. The work of other contributing illustrators—Anthony Harris, Joanna Liddiard, Shaun Forgie, and Lesley Alexander—is warmly acknowledged. We also appreciate the permission of John Lawrence and Jarmila Kukalová-Peck to reproduce figures first published in Lawrence & Britton (1994) and Kukalová-Peck & Lawrence (1993). Formal acknowledgment for illustrations is made in the captions (see especially p. 127).

Colleagues at Mt Albert Research Centre read the first draft and improved it with their comments: our thanks to Ross Beever, John Dugdale, Dianne Gleeson, and Research Associates Willy Kuschel and Brenda May. We also thank Ross Beever for promoting an atmosphere of trust, creativity, optimism, and quiet scholarship. Marie-Claude Larivière assisted with the computer literature search on staphylinids, and provided the initiative and technical *savoir faire* to permit in-house scanning of the habitus illustrations. Trevor Crosby helped in many ways during the preparation of the manuscript; his influence has greatly improved the introductory sections and the references. Birgit Rhode checked and corrected German references and their translations. André Larochelle helped in organising major publications on our beetles according to family; he also assisted in gathering data on his specialty, the Carabidae, and checked and corrected the French references and their translations. The friendly staff of our Centre Library—Marleene Boyd, Jillian Irwin, and Bella Smith—provided assistance with the references.

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in 1985 flew to Paris and remained with him until he was able to be flown home. When Charles had recovered sufficiently, his father began to bring him twice weekly to the Mt Albert Research Centre, where they would sit together preparing some of Charles's earlier work for publication. This continued until John Watt, well into his eighties, was himself laid low by a stroke, and died in late 1996. The role of helper has been taken up by Charles's sister Mrs Heather Raudon. Charles is profoundly grateful for this help, which was essential for him to be able to complete his part of the present work from a wheelchair and with impaired visual acuity.

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INTRODUCTION

Beetles are the largest order of organisms, comprising over 350 000 described species in the world fauna. They are classified in some 23 000 genera (Endrödy-Younga 1985). Lawrence & Britton (1994) estimated that there are more species of beetles than there are vascular plants or fungi, and 90 times as many as mammal species. For a comprehensive definition of beetles see Lawrence & Britton (1994).

The first collections of New Zealand beetles were made by Joseph Banks and Daniel Solander during Cook's first voyage in 1769, and the first species were described by Fabricius (1775). Watt (1979b, 1982a) and Ramsay & Singh (1982), amongst others, provide biographical notes about the early collectors and describers of beetles, and the development of entomology in New Zealand.

Origins and affinities

The exact origin of New Zealand beetles is essentially unknown, but there are indications that at least some beetles had developed on an ancient landmass of continental origin which became increasingly isolated since the late Mesozoic (Daugherty *et al.* 1993). For example, the New Zealand jacobsoniid beetle *Saphophagus minutus* is considered by Crowson (1959) to be a relict coeval with the tuatara (*Sphenodon*).

Craw & Watt (1987) reported the first New Zealand Cretaceous beetle fossil, an incomplete elytron, identified as belonging to a member of Polyphaga, either a buprestid or a chrysomelid. Kuschel (1987b) described subfossil fragments 1680 years old of a presumably extinct fern-weevil, *Tymbopiptus valeas*, from near Te Kuiti, North Island. For a recent review of the geological context of the evolution of the New Zealand biota, see Cooper & Millener (1993).

In some groups present-day distribution patterns are suggestive of a Gondwana or pre-Gondwana origin, for instance the relict genera of tenebrionoid Pilipalpinae persisting in New Zealand, Australia, southern South America, and Madagascar (Pollock 1995). The Chaetosomatidae are known only from New Zealand and Madagascar, and the Phycosecidae from New Zealand, Australia, New Caledonia, and Vanuatu (J.F. Lawrence, *in litt.*). The small family Cavognathidae, with species occurring in birds' nests, is known from Australia, New Zealand, and Chile. The New Zealand Nemonychidae are closest to species from Chile. Omaliine staphylinids of the genus *Metacorneolabium* (22 species) are distributed in New Zealand, Australia, and South America (Thayer 1985). Some southern temperate Staphylinoidea from families Hydraenidae, Ptiliidae, Agyrtidae, Leiodidae, and Staphylinidae (especially Omaliinae and Pselaphinae) show 'transaustral disjunctions,' i.e., are isolated in two or more southern land areas—New Zealand, Australia, South Africa, and/or South America; for details see Newton (1985). In contrast, the small, archaic family Agyrtidae, with fossil records from the mid Jurassic (Newton 1991a), is distributed in the Holarctic region except for two species occurring in New Zealand. Similarly, the staphylinid *Stylogymnusa subantarctica* is known only from the Auckland Islands, with its closest relatives exclusively Holarctic.

The factors responsible for the composition and diversity of the present-day New Zealand beetle fauna are: (1) the Gondwana origin of some of our biota; (2) the estimated 80 million years of geographic isolation of New Zealand, which resulted in some 90% endemism at the specific level and a high level of generic endemism; (3) changing climate, changing shorelines (Oligocene bottleneck), orogenies, glaciation, and volcanic activity; and (4) the absence of mammals and other animals and plants which have dominated ecosystems elsewhere in the world. The fauna has been greatly influenced in the last 1000 years by humans, who brought devastation to native forest and introduced exotic animals with destructive influence (e.g., deer, rats, possum, goat).

Contemporary New Zealand beetles are a composite of ancient, variously changed lineages, elements introduced by dispersal over short and long distances (e.g., groups dispersed passively over water as a result of the strong westerly winds and currents around the 40th parallel), and species intentionally and accidentally introduced by humans. In support of the hypothesis that at least some of our beetles are of ancient origin is the extraordinarily high level of endemism at the specific level, with several endemic tribes, some endemic subfamilies, and many endemic genera (Watt 1982a). Several families usually small elsewhere are represented in New Zealand by diverse endemic forms (e.g., Byrrhidae, Colydiidae, Hydraenidae, Melandryidae, Ptiliidae, Scirtidae, and Scydmaenidae). The native element in our fauna is associated primarily with the lowland forest which has prevailed throughout most of New Zealand's geological history (Kuschel 1990), alpine habitats, tussock grass-

lands, and the subantarctic islands. Introduced species are mostly associated with man-induced habitats (Kuschel 1990).

Composition of the New Zealand beetle fauna

At least 5223 native and 356 adventive species of beetles have been recognised in New Zealand, belonging to some 1100 genera in 82 families (estimates based on currently recognised species housed in the New Zealand Arthropod Collection and various museums: Watt 1976, 1982a, Klimaszewski *et al.*1996). The actual number of New Zealand beetle species, including undescribed ones, is probably much higher. By comparison the vascular plant flora includes about 2500 species, and the terrestrial vertebrate fauna about 350 species (Watt 1976). Watt (1976) estimated at 20 000 the number of described and undescribed species of terrestrial (including freshwater) Arthropoda probably occurring in New Zealand. The numbers are estimates, but nevertheless show that beetles constitute a significant proportion of New Zealand's total insect fauna.

The New Zealand beetles belong to two suborders, Adephaga and Polyphaga. The suborders Archostemata and Myxophaga, although present in Australia, do not have representatives in our fauna. Of the 82 New Zealand families, four—Archeocrypticidae, Gyrinidae, Lycidae, and Trogidae—have only adventive species present. Eleven families are represented by more than 100 described species. They are here listed in descending order, with approximate numbers in parentheses: Curculionidae (1542), Staphylinidae including former Pselaphidae (1021), Carabidae (445), Scydmaenidae (202), Colydiidae (196), Cerambycidae (188), Chrysomelidae (153), Scarabaeidae (144), Elateridae (135), Tenebrionidae (159), and Scirtidae (125). The numbers of Curculionidae, Staphylinidae, and Carabidae in relation to the total number of beetle species in New Zealand are similar to the proportions in Australia and in the temperate Holarctic. However, the Colydiidae in New Zealand are particularly diversified, being better represented than elsewhere. Some smaller families, e.g., Byrrhidae, Cleridae, Hydraenidae, Corticariidae (=Lathridiidae), Leiodidae, Melandryidae, and Trogossitidae, are also well represented in New Zealand. There is one endemic New Zealand family, Chalcodryidae, and a few endemic subfamilies—Horelophinae (Hydrophilidae), Euderinae (Bostrichidae), Agapythinae (Phloeostichidae), and Cyclaxyrinae (Phalacridae). In comparison, there are approximately 20 000 described beetle species in Australia (total beetle fauna estimated at 30 000) in 117 families; the largest are Curculionidae (6000), Scarabaeidae (3000), Chrysomelidae (3000), Carabidae (2500), Staphylinidae including Pselaphinae (2500), Cerambycidae (1500), and Tenebrionidae (1200) (data from Lawrence & Britton 1994 and Klimaszewski *et al.*1996).

The most comprehensive survey ever conducted on New Zealand beetles is that of Kuschel (1990), in the suburb of Lynfield, Auckland, in which 982 species are listed (the total number from the survey area, including some collected after the survey was published, reaches 1000 – G. Kuschel, pers. comm.). Of these, 753 are endemic and 229 adventive, and they belong to 65 families. Of the 753 indigenous species, approximately 10 are restricted to beaches or intertidal wrack and 2 others to beaches and open field situations. The great majority were associated with native bush. Sixty-eight species, constituting 9% of the 744 native non-littoral species in the survey, were found in open environments but their subsistence in these environments and their endemic status were uncertain. Kuschel (1990) presented interesting observations on the ecological flexibility of indigenous (native) and foreign (introduced/ adventive) species. Of the 982 Lynfield beetles, 55 belong to 16 genera with both native and foreign species. Of these 55 species, 22 natives were found only in the native bush, and all 33 foreign species occurred in home gardens and fields, but 14 of these occurred also in the native bush environment. Kuschel (1990) believes that the beetle population of Lynfield represents about 8–8.5% of the total (described and undescribed) New Zealand beetles—some 10 000 to 10 500 species. The conclusions of the Lynfield study relate to all our beetles, which are predominantly forest-inhabiting species and show little interest in man-induced environments.

Ground-breaking investigations on the composition of beetle faunas in native forests and in degraded habitats, and of beetles as indicators of habitat degradation, are being conducted by entomologists of the Forest Research Institute in Rotorua (Hutcheson & Hosking 1994; Hutcheson 1990, 1996; Hutcheson & Kimberley, submitted).

Conservation status

The majority of New Zealand's beetle species are associated with native forest, a habitat which has been drastically reduced by human activities over the past millennium. Native forest now constitutes only 23% of the total land area. The 'shrinking' forest has profoundly reduced the population size of many native species and their potential for long-term survival. Almost certainly many species have vanished before being documented, and this process is probably continuing. Our beetles are also vulnerable to introduced organisms because they have evolved in isolation, and their defence mechanisms are often ineffective against the new arrivals (e.g., competition for food with introduced wasps, predation by mammals, depletion of food sources by weed competition with native plants).

The major threats to biodiversity are fragmentation and degradation of ecosystems due to inappropriate use of land (e.g., deforestation) and water, invasion by exotic plants

and animals (Ramsay 1978), non-sustainable use of species, and climatic changes (global warming, etc.). Consequently populations associated with small, fragmented and degraded communities are particularly vulnerable, and are in need of conservation. The following citation from Kuschel (1990) reflects the most important conclusion from his study of the beetle fauna of the Auckland suburb of Lynfield.

> *Much of the native forest fauna is small, cryptic, elusive; and many species were rare for a start in New Zealand, before the arrival of the Polynesians and, later, the Europeans. They are now on the way to sure extinction unless the indigenous vegetation, which contains the special habitats that are so vital to their survival, is preserved. As this survey demonstrated, even the relatively small bush patches that so far have escaped destruction may contain faunas of unsuspected richness and diversity.*

Examples of small and isolated beetle populations are an undescribed *Platisus* species known only from Great Island in the Three Kings group, *Geodorcus ithaginis* from Stack H in the Mokohinau Islands, and *Stylogymnusa subantarctica*, occurring exclusively on the Auckland Islands. The first is the only representative of the family Cucujidae in New Zealand, and the last is the only surviving gymnusine staphylinid (see p. 12) in the Southern Hemisphere.

The Department of Conservation has provided a list of threatened species for New Zealand (Molloy *et al.* 1994) – see Appendix 1. There are 26 native invertebrates, including beetles, in category A (highest priority threatened species), 52 in category B, and 20 in group C. The total number of threatened invertebrates represent less than 0.1% of the taxonomic groups in categories A–C (Molloy *et al.* 1994). Examples of New Zealand beetles of indeterminate conservation status that are rare in collections are *Brounia thoracica* (Chelonariidae), *Lenax mirandus* (Monotomidae), and species of *Microsilpha* (Staphylinidae) and *Horelophus* (Hydrophilidae).

MORPHOLOGY AND BIOLOGY

The basic morphological structures of beetles referred to in this contribution are shown in Fig. 1–3, which are intended to be self-explanatory. We will, however, briefly characterise the major morphological features of the beetle body. Readers are also recommended to consult the Glossary (p. 91) for definitions of morphological terms.

Head (Fig. 4–33). The head consists of a sclerotised capsule, mouthparts, two compound eyes and sometimes one or two ocelli (e.g., Staphylinidae - Omaliinae, Derodontidae), and a pair of antennae.

The ***capsule*** dorsally consists of vertex, frons, and clypeus (Fig. 1, 6); anterior and posterior tentorial pits, the former (often called just tentorial pits) located at the border of the clypeus and the frons; and ventrally the gula, genae, submentum, and mentum. The head is usually prognathous, i.e., with mouthparts facing forward (Fig. 1, 8), but may be hypognathous with mouthparts facing downward (Fig. 9, 10). In many Curculionoidea the frons and vertex are prolonged anteriorly to form a rostrum (Fig. 6, 7).

Compound eyes are usually well developed, except in some species living in permanent darkness (e.g., in deep soil or in caves). They may be coarsely or finely faceted. They are variable in size and shape (Fig. 8–12), and sometimes (e.g., Gyrinidae, Tenebrionidae) each eye is partially or completely divided into two by a lobe (Fig. 11) called a canthus (Nichols 1989), ocular canthus, or genal canthus (Watt 1988).

The ***mouthparts*** (Fig. 4) are a labrum, two mandibles, two maxillae each comprising a lacinia, a galea, maxillary palps, glossae, and paraglossae, and a labium with labial palps (Fig. 5). The glossae and paraglossae are usually fused to form a median ligula. Variations in the terminal segment of the maxillary palp (Fig. 13–16) have diagnostic value for some groups.

The ***antennae*** are usually 11-segmented, with the basal segment, or scape, articulated to the head and the second segment, or pedicel, connecting the scape with the rest of the antenna, called the flagellum (Fig. 1, 6). The last few segments may be swollen, forming a more or less compact club. The main antennal types are:

filiform – the simplest form, with cylindrical segments which are nearly uniform in shape (Fig. 17, 18);

moniliform – with round, similar segments, resembling a string of beads (Fig. 19);

serrate – with one side of each segment slightly protruding, and forming a series of points like the teeth of a saw (Fig. 20, 21);

pectinate – with one side of each segment protruding, forming a series of long, sharp points like the teeth of a comb (Fig. 22) (if both sides of each segment are prolonged, the antenna is called *bipectinate*);

plumose – similar to the bipectinate antenna, but with the projections on both sides of each segment slender and flexible, like the vanes of a feather;

clavate – with apical segment/s enlarged into a club-like expansion, either weak and gradual or abrupt and ball-like (Fig. 23–29);

capitate (a type of clavate antenna) – with apical segments abruptly enlarged into a ball-like club (Fig. 23, 187);

lamellate – with club segments having flat, leaf-like projections on one side which usually can (Fig. 31) or sometimes cannot (Fig. 30) be brought closely together;

flabellate – with long, thin lateral processes like alternate folds of a fan (Fig, 32, 33);

geniculate – with the second segment (pedicel) attached at an angle to the first (scape), and each following segment in line with the pedicel (Fig. 28, 140–143).

Thorax (Fig. 1–3, 34–45, 52–56). The thorax consists of three parts—prothorax, mesothorax, and metathorax—each bearing a pair of legs lateroventrally. The mesothorax and metathorax are joined together to form the pterothorax, and each bears a pair of wings dorsolaterally.

Each thoracic segment is made of four sclerites, with their borders defined by sutures. The topmost (dorsal) sclerite is the notum, the two lateral sclerites are the pleura, and the bottom one (ventral) is the sternum. Any one of the thoracic sclerites is named by adding the appropriate prefix: hence pronotum, propleuron/-pleura, prosternum, mesonotum, mesopleuron/-pleura, mesosternum, etc. The prominent part of the beetle thorax is the pronotum, which is variably shaped and is often referred to as the pronotal disc (Fig. 1).

In Adephaga (also Archostemata and Myxophaga, not represented in New Zealand) the pronotum is extended and deflexed ventrally on either side, forming the *pronotal epipleuron* (Fig. 2, 34, 35). The pronotal epipleuron meets the lateral part of the *pleuron (propleuron)*, which is visible externally and forms part of the thoracic wall. The pleuron (propleuron) is separated from the *pronotal epipleuron* by the *notopleural suture*, and from the *sternum* by the *pleurosternal suture*. It may be divided into two sclerites, an anterior *proepisternum* which forms part of the wall, and a posterior *proepimeron*, which may be extended to meet the sternum and closes (partially or completely) the coxal cavities from behind. The *trochantin* is a small sclerite separated (or not) from the pleuron by a membrane and connected by the articulating condyle with the coxa (Fig. 57).

In Polyphaga the deflexed lateral portion of the pronotum is called the *hypomeron*, and is attached directly to the lateral portion of the sternum because the pleuron has become reduced, fused with the trochantin, and hidden internally (*endopleuron*) (Fig. 3, 36, 37). The hypomeron is separated from the sternum by the *notosternal suture*; the *notopleural suture* is absent as a consequence of reduction and internalisation of the pleuron. The anterior portion of the sternum varies among Polyphaga.

The nota of the mesothorax and the metathorax are divided into three sclerites: the *scutum*, *scutellum*, and *postnotum*. The mesoscutellum, usually called just the scutellum, is visible at the base of the elytra (Fig. 1). The ventral part of the pterothorax consists of two sterna and the pleura (*episterna* and *epimera*) (Fig. 2, 3). The coxal cavities are bounded anteriorly and posteriorly by the sternum and laterally by the *pleural sclerites*. The mesocoxal cavities may be considered as laterally 'open' when partly enclosed by pleural elements (Fig. 42, 44) and laterally 'closed' when closed by the sterna alone (Fig. 43, 45).

Wings (Fig. 46–51). The first pair of wings are sclerotised to form two *elytra*, which usually completely cover the abdomen (Fig. 1) or which may be reduced, exposing most of the abdomen, as in the majority of Staphylinidae (e.g., Fig. 132–138). The second pair of wings are the membranous flying wings (Fig. 46, 47), which are sometimes small or even absent, and are concealed by the elytra when not in use. For details on venation and evolution of the hind wings in Coleoptera (Fig. 48–51) see Kukalová-Peck & Lawrence (1993).

Legs (Fig. 1, 57–87). The beetle leg consists of a *coxa* (usually with *trochantin*), a *trochanter*, a *femur*, a *tibia*, and a *tarsus*. The coxa of each leg articulates with the thorax at two points: the trochantin, which is the only externally visible extension of the internal pleuron (Fig. 57), and the pleuron, which is separated from the trochantin by a membrane. The trochanter is articulated to the coxa (Fig. 58–66). Its junction with the femur may be straight (Fig. 61) or slightly oblique (Fig. 60), but sometimes is strongly oblique, as in Fig. 58 and 59 (e.g., in most Tenebrionoidea, Bothrideridae), so that there is direct contact between the femur and coxa (*heteromeroid* trochanter). Each tarsus is divided into 1–5 segments (tarsomeres or tarsites), and the last segment usually bears two claws (Fig. 67–82), rarely one. The tarsal formula refers to the number of tarsal segments on each pair of legs.

Abdomen (Fig. 2, 3, 88–92). The abdomen consists apparently of 10 segments in the male and 9 in the female, each forming a complete or partial ring. The 9th segment is modified, forming the genital segment, and in the male the 10th segment is usually much reduced or fused to segment 9. Each abdominal segment is composed of four sclerites: a dorsal tergum or tergite, two pleura or pleurites (one on either side), and a ventral sternum or sternite. A respiratory spiracle opening onto each pleuron is the aperture of a trachea. The spiracles are usually located in pleural membrane, but in some Scarabaeoidea and Staphylinoidea they may be located on tergites.

The visible part of the abdomen consists of five or more sclerotised *sternites* (called *ventrites*) (Fig. 2, 3). The first sternite is absent, or represented by a small sclerite near the metacoxae; the second sclerite may be hidden behind the edge of the elytra, and is visible only in lateral view. In referring to the first sternite we mean the first ventrite or the first visible sternite. In Adephaga the first ventrite is completely divided by the large and prominent metacoxae (Fig. 88, 89), but in the Polyphaga it is undivided and continuous from side to side (Fig. 90). The first ventrite may bear a pair of straight or curved *femoral lines* behind or between the metacoxae (e.g., in Coccinellidae) (Fig. 92, a). The abdominal ventrites are either movable and separated from each other by an intersegmental membrane (Fig. 91), or some of them are *connate*, lacking an intersegmental membrane but with the suture still visible

Table 1 Primary feeding mode of some beetle families and subfamilies (adults and larvae).

Predators	Cantharidae, Carabidae, Cleridae, Coccinellidae, Colydiidae, Cucujidae, Lycidae, Staphylinidae, Trogossitidae
Phytophages	Apioninae, Chrysomelidae, Curculionidae, Nemonychidae, Nitidulidae, Scarabaeidae
Scavengers or fungivores	Anobiidae, Anthribidae, Chalcodryidae, Ciidae, Corticariidae, Cryptophagidae, Dermestidae, Lucanidae, Ptiliidae, Ptininae, Tenebrionidae

(e.g., Buprestidae). Occasionally the suture between the first two visible segments may be partially obliterated. The last tergite of the abdomen when exposed forms the *pygidium*. The reproductive organs are usually concealed within the tip of abdomen.

The internal genital structures, although very important for distinguishing species, are complex and are not discussed here; readers may consult Lawrence & Britton (1994).

Biology

Adults usually are more conspicuous than larvae and occur virtually in all terrestrial habitats; they may be nocturnal or diurnal, and may or may not occur in the same habitat as their larvae. Kuschel (1990) discussed habitat types and the beetle fauna in the suburb of Lynfield, Auckland. The range of habitat niches even in a suburban environment is overwhelming, and includes forest canopy, tree trunks, live wood, sound dead wood, decayed wood, wood-rotting moulds, ground plants and fungi, leaf litter, compost, dung, carrion, stream banks and beds, soil, beach sand, wrack in the intertidal zone, ponds, etc.

Beetles feed on a variety of plant and animal material, and parts of living plants may be utilised (roots, stems, leaves, and flowers). Slime moulds, fungi, algae, decaying wood, leaf litter, carrion, dung, and other insects are food sources for various beetles. Feeding modes are summarised in Table 1.

For information about the biology of the Coleoptera in general, see Crowson (1981).

Beetles are *holometabolous* insects, i.e., they undergo a complete metamorphosis. Adult beetles lay eggs which hatch into larvae; frequently these occupy different habitats from the adults. When the larva has completed feeding and growing it enters a 'resting' stage called the pupa, in which the body of the larva is transformed into that of an adult (metamorphosis). This enables particular species to use different *trophic niches* (as larvae) and to prevail in unfavourable conditions (as pupae).

Pupae are partly enclosed by the larval skin in surface-feeding beetles, or pupation occurs within the food plant or in cells in the soil. Some species make cocoons, which in certain exotic aleocharine staphylinids are constructed from silk (Ashe 1982).

Coleoptera larvae have a well developed and usually sclerotised head, three thoracic segments, and commonly ten abdominal segments (rarely eight or nine). The first thoracic segment is slightly enlarged and more heavily sclerotised, abdominal segment 9 usually has paired processes called *urogomphi*, and the 10th abdominal segment is small and sometimes bears *pygopods*. Beetle larvae usually have mouthparts adapted for biting and chewing, as in the adults, and have usually from three to six simple eyes, called *ocelli* or *stemmata* (Lawrence 1991). The larval body varies a lot but is usually cylindrical, and is either legless or with apparent appendages. Many larvae which bore into plant tissue lack legs (e.g., in Curculionidae). Although beetle larvae are morphologically very diverse, their mode of life has led to the development of a few distinctive larval types; for details and illustrations see Lawrence & Britton (1994).

The main morphological categories of larvae are *eruciform*, *scarabaeiform*, *apodous*, and *campodeiform* (Fig. 97–100). Eruciform larvae are cylindrical or somewhat flattened, with short legs and with either short urogomphi or none. They are less active than campodeiform larvae. Many species of Chrysomelidae and Tenebrionidae have this type of larva. Scarabaeiform larvae are distinctive by their robust, C-shaped body and long legs. They occur in the soil or rotten wood, and are characteristic for Scarabaeoidea. Apodous larvae have reduced antennae and palps and lack thoracic legs and urogomphi. This type is typical for Curculionidae. Campodeiform larvae have a prognathous head, long and well developed legs, and commonly long, unisegmented or multisegmented urogomphi (Lawrence & Britton 1994). They are active and usually predatory. Most Carabidae and Staphylinidae have this type of larva.

Larvae are less conspicuous than adults and occur usually within their food source, e.g., inside timber (Cerambycidae, Buprestidae, Anobiidae), inside stems and leaves (Chrysomelidae, Curculionidae), in fruits (Nitidulidae) and seeds (Bruchinae), in the soil and/or leaf litter (Staphylinidae, Carabidae, Pselaphinae), in roots or dung (Scarabaeidae), in carrion (some Staphylinidae, e.g., *Aleochara*), or on the ground near the base of plants. Larvae of Coccinellidae occur on foliage, where they prey on soft-bodied insects. Many beetle larvae occur under the bark of logs or in rotten wood (e.g., Silvanidae, Cucujidae), others are associated with fungi (e.g., Ciidae, Cryptophagidae, Erotylidae), and some occur exclusively in birds' nests (Cavognathidae). Many larvae are of economic importance because they compete for human food resources or damage human food products, and are therefore regarded as pests, e.g., larvae of some Derm-

estidae, Elateridae, Scarabaeidae, Chrysomelidae, Curculionidae, Anobiidae, Cerambycidae (see Booth *et al.* 1990).

A family-level treatment of the larvae of New Zealand beetles by Dr J.F. Lawrence (CSIRO, Australia), with keys for their identification, is anticipated to be published in our *Fauna* series. Consequently mention of larvae in this work has been kept to a minimum.

STUDY AND IDENTIFICATION OF BEETLES

Important repositories of New Zealand beetle collections are identified in Appendix 2, with contact details.

Equipment and collecting methods

Beetles occur in virtually all terrestrial habitats, therefore collecting them requires knowledge of many different techniques. The most common and effective methods for collecting beetles in various environments are listed below. For more details on collecting and mounting specimens see Martin (1977), Steyskal *et al.* (1986), Walker & Crosby (1988), and Kuschel (1990).

Hand-collecting. Mainly medium-sized to large specimens may be collected by hand from a variety of habitats (e.g., from under stones, bark, rotting wood, foliage, etc.).

Collecting nets. There are three basic types of nets: aerial nets for collecting flying beetles, sweeping nets for sweeping vegetation, and aquatic nets for gathering insects from water. Aerial nets are light and the most fragile. Sweeping nets are more robust, made of strong material with reinforcement around the metal ring to withstand being dragged through dense vegetation. Water (aquatic) nets are made of metal screening or heavy scrim with a canvas bag affixed to a metal rim.

Beating sheets. A beating sheet is made of strong cloth attached to a frame about 1 metre square, with two pieces of light wood or metal crossing each other and fitted into a pocket at each corner of the cloth. The beating sheet is held or secured under a shrub or tree, and the branches or foliage are beaten with a stick. Specimens will fall onto the sheet, and can be removed using fingers, forceps, or an aspirator. (An inverted umbrella can also serve as a beating sheet.)

Sifters. Sifters are containers made of cloth, wood, or plastic with a wire-mesh bottom serving as the sifter. The size of mesh used depends on the size of the specimens sought. The most common model of sifter used in Europe and North America is made of two hoops of metal about 30 cm in diameter, each provided with a handle. The lower hoop bears a wire-mesh screen welded to its edge. The top hoop is attached to a canvas cylinder about 30 cm long connecting it with the lower hoop. The latter is attached to a sleeve 1 metre long which can be tightened at the bottom. Sifters are useful for collecting beetles from all kinds of ground litter, rotting wood, fungi, shore debris, lichens, mosses, leaf mould, and birds' nests. The beetles may be picked from sifted material placed on white sheets or large white trays, or the sifted debris may be placed into a Berlese funnel or other separator.

Berlese funnels. The Berlese funnel in its various modifications is used to separate insects from sifted debris. The sifted sample with insects is placed on a screen near the top of a funnel which is closed by a cover. An incandescent bulb above the sample produces light and heat, drying the litter and driving the insects downwards into the funnel, which ends with a container at the bottom. The container may be empty for catching live insects, or may contain a killing agent.

Flight interception traps. The basic principle of such traps is to catch flying beetles by placing a screen in their way. The most successful interception traps tested in New Zealand are the window trap, consisting of a vertical net with a trough containing ethylene glycol underneath, and the Malaise trap, which consists of a vertical net serving as a baffle, end nets, and a sloping canopy leading up to a collecting container. Attractants may be used to increase the efficiency of these traps, of which there are many varieties.

Pitfall traps. Pitfall traps are very successful devices for collecting ground-walking beetles, or flying beetles if a bait is used. They consist of an open-topped container sunk in the earth. A cover may be placed over the open top to prevent rain flooding, but open space is required between the cover and the rim of the container. The trap may be one-third filled with ethylene glycol preservative, and the bait (carrion, dung, or a specific insect attractant e.g., molasses, beer, fruits, cheese) may be suspended inside the trap above the surface of the glycol. Trapped insects should be collected regularly from the glycol solution and placed in 75% ethyl alcohol/acetic acid mixture.

Light traps. An effective way to collect nocturnal flying beetles is to use artificial light as an attractant and capture the beetles around the light. A mercury-vapour lamp, fluorescent black light, or other lamps high in ultraviolet wavelengths usually give excellent results. The light source may be placed against a vertically hung white sheet, with a bottom sheet spread on the ground underneath for falling beetles. More sophisticated light traps consist of a funnel with a killing container, and a suspended light with vertical rigid screen most often made of transparent plastic. The flying insects approach the light, hit the screen, and are collected in the killing container.

Aspirator. An aspirator is a simple suction apparatus for picking up insects. The most common model consists of a vial of glass or transparent plastic with a close-fitting rubber stopper. Two rubber or plastic tubes pass through the stopper. One is attached to a rubber tube through which suction is created (by mouth, or with a rubber bulb) while the other end is filtered. The second tube extends approximately 10 centimetres from the stopper, and sucks the insects in. This device acts as a miniature vacuum cleaner, and is very useful for collecting small beetles.

Fogging. Fogging with insecticides is the most recently developed method for collecting beetles from the tree canopy, branches, trunks, or moss-covered surfaces. For details, see Erwin (1983), Allison *et al.* (1993), and Lawrence & Britton (1994).

Killing and relaxing. Beetles should be killed in jars with a little ethyl acetate absorbed into a suitable material (e.g., coarse hardwood sawdust such as oak, or crumpled absorbent paper) inside the killing jar. The absorbent material acts as a barrier between the insect and the killing agent. An alternative solution is 75% alcohol with a little acetic acid or commercial vinegar to prevent stiffening of the insect's muscles. Ventral structures obscured by inconveniently placed legs in set specimens can be exposed by soaking the specimen for a few minutes in Barber's fluid, or water with ammonia, to soften the joints sufficiently for appendages to be moved without damage.

Accessing the literature: helpful references

The literature on New Zealand beetles is extensive but largely fragmentary. It is therefore necessary to know how to access relevant publications. During compilation of references for this review it became apparent that a few of them are of outstanding general relevance. Our selection is offered here in alphabetical order, since any attempt to categorise in order of perceived value would be unrealistic. However, it is fair to say that a comprehensive recent bibliography, a general textbook or two on beetle systematics and biology, and regional summaries both general and faunistic must be almost indispensable. Any electronic reference sources—CD-ROMs, Internet websites, searchable databases—must be seen as a bonus at the time of writing, though these will undoubtedly grow in prominence.

The following publications, then, are so relevant to the present context that we have not repeated them under the family treatments. They should be borne in mind as a first point of reference.

- Böving & Craighead (1931): the first comprehensive textbook on morphology of larvae.

- Broun (1876–1923): Thomas Broun's name is appended to more species of New Zealand beetle (and, regrettably, synonyms) than any other author's by far. His publications form a core of early literature, and central to them are the seven volumes of his *Manual of New Zealand Coleoptera*, published in four parts (Broun 1880, 1881, 1886, 1893b). His work is listed here *in extenso*, even though it may be of only limited value to workers today.

- Chapman (1971): textbook on morphology, physiology, and natural history of insects.

- Cooper (1979): review of fossil Coleoptera.

- Crosby & Larochelle (1994): preliminary list of Coleoptera genera and families represented in the New Zealand Arthropod Collection.

- Crowson (1955): major treatise on the natural classification of the families of Coleoptera, based on detailed morphology of adults and larvae. Purported to reflect the phylogeny of the Order, and gained wide acceptance. Includes keys to superfamilies, families, and some subfamilies. A cornerstone in the classification of beetles, variously modified in Crowson's later papers (1960, 1967, 1971a, b, 1973b). See Lawrence & Britton (1974) for literature.

- Crowson (1981): textbook on biology of Coleoptera.

- Hudson (1934): the first and only representative catalogue of New Zealand beetles and their larvae, with many colour plates. Forms a watershed between the earlier pioneering work and subsequent studies. An essential reference point.

- Kuschel (1990): exhaustive study of the beetle fauna of an Auckland suburb, remarkable for identifying almost 1000 species from native bush and modified habitats. Many habitus illustrations by Des Helmore, especially of weevils; also tabular summaries of species data, information on collecting methods, habitat types. A primary source of data included in the present work, and an essential resource for the student of New Zealand's Coleoptera.*

- Lawrence (1982): synoptic review of beetle families with family limits and changes to classification.

- Lawrence (1991): discussion, key, and many family treatments of the immature stages of Coleoptera.

- Lawrence & Britton (1991, 1994): the Coleoptera chapter in the primary reference book *Insects of Australia*, and its spin-off *Australian Beetles*, both with much relevance to New Zealand.

- Lawrence & Newton (1982): review of the evolution and classification of beetles at the superfamily level. Discusses origins and relationships, early fossils, subordinal classification, and evolution of Adephaga and Polyphaga.

- Lawrence & Newton (1995): comprehensive current classification of Recent Coleoptera at subfamily level and above, with complete or selective list of genera included in

each group. Discusses recent changes to classification, with extensive reference to studies providing evidence in support of these changes.

• Meads (1990): introduction to rare, endangered, and protected invertebrates in New Zealand.

• Neave (1939–50): the *Nomenclator Zoologicus* with its supplements is the definitive catalogue of genus-group names in zoology.

• New (1995): textbook on conservation biology of invertebrates; the first to give a global overview of all major habitats (terrestrial, freshwater, marine).

• Nichols (comp.) (1989): a revised edition of the well known and comprehensive Torre-Bueno glossary of entomological terminology.

• Pakaluk & Slipinski (eds) (1995): a collection of the most recent papers on biology, physiology, and classification of Coleoptera.

• Ramsay & Crosby (1992): bibliography of New Zealand entomology up to 1985, and a guide to the bibliographic database BUGS, which is searchable on a 'by family' basis [accessible on application to the Curator, NZAC, email address crosbyt@landcare.cri.nz]; see also Crosby & Ramsay (1992, 1994).

• Ramsay & Singh (1982): concise guide to entomology in New Zealand, including an historical review.

• Shapiro & Porter (1989): paper reviewing the significance of genitalia in the interpretation of insect evolution and systematics.

• Snodgrass (1935): textbook on insect morphology, useful for naming of external and internal structures.

• Walker & Crosby (1988): concise manual on the preparation and curation of insect specimens.*

• Watt (1956–92): Charles Watt's published work is listed here in full, in view of its great relevance to the modern study of Coleoptera in New Zealand. His Presidential Address to the 1981 conference of the Entomological Society of N.Z., *New Zealand beetles* (Watt 1982a), is a valuable review of the field and a primary source of information for the present work.

• Wilson (1971): review of social insects and their affiliations with other insects, including beetles.

• Winterbourn & Gregson (1989): guide to the aquatic insects of New Zealand, including the five or six beetle families with aquatic or hydrophilous habits as adults and/or larvae.

*Available from Manaaki Whenua Press, P.O. Box 40, Lincoln 8152, New Zealand, tel. (03) 325 6700, fax (03) 325 2127, email mwpress@landcare.cri.nz.

We also draw attention to the following publications reviewing beetles from other zoogeographical regions.

• AUSTRALIA: Matthews (1980–92), Lawrence & Britton (1994), Semmens *et al.* (1992).

• NEW GUINEA: Gressitt & Hornabrook (1977), Gressitt & Szent-Ivany (1968).

• PACIFIC ISLANDS: van Dyke (1953), Nishida (1994), Peck & Kukalová-Peck (1990).

• NORTH AMERICA: Bousquet (1991a), Arnett (1973), White (1983).

• SOUTH AMERICA: Solier (1849), Sharp (1882–87), Blackwelder (1957).

• SOUTHERN AFRICA: Scholtz & Holm (1985).

• GENERAL: Evans & Bellamy (1996).

Important references on beetle larvae are Arndt (1993), Booth *et al.* (1990) (pest species), Böving & Craighead (1931), Hudson (1934), Lawrence (1991) (key to families), Lawrence & Britton (1991, 1994), Lawrence & Newton (1982, 1995), Lawrence *et al.* (1993) (beetle larvae keyed on CD-ROM), May (1966, 1993) (larvae of Curculionoidae), Stehr (1991).

How to use this review

The section Review of Families is presented in systematic sequence—notionally reflecting a natural phylogeny—of numbered families, as in the Checklist of Taxa. Groupings from suborder to superfamily are briefly introduced as a framework to this systematic treatment.

Under each family [numbered in brackets, for ease of cross-reference throughout] any assistance received from specialist collaborators is acknowledged. The next line identifies the habitus figure(s) representing that family. Other relevant illustrations are not listed here, but appear in the text wherever appropriate. Next, the range of body length—measured from the apical margin of the labrum to the apex of the abdomen—for members of the family is given, along with the tarsal for-mula. This information alone can be helpful in delimiting certain families or groups of families.

Subsequent information for each family is listed under a sequence of subheads. The well defined families are accompanied by a relatively short *Diagnosis* and *Synopsis*, but those represented by more diverse forms have required longer treatments. Character states in bold type constitute the primary diagnosis; the balance are supplementary. It will be noted under Synopsis that the family is referred to by the contracted form of its scientific name, as for example Carabidae / carabid(s). This informal usage may be preferred to colloquial names suggested under Remarks.

Range is represented as 'recorded' (signified by ®) or 'unrecorded' (O) in the three major and eight minor islands or island groups constituting New Zealand; it is shown for all families alphabetically in Appendix 4.

Under *Examples*, species representative of the family or constituent subfamilies are listed. Authorship and year are cited, so that original descriptions may be pursued. Figure numbers give access to both the habitus illustration and its expanded caption (under Examples of Species), which offers a profile of the species illustrated.

Under *Remarks* are given any additional points of information thought to be helpful, including reference to any revisions known to be in progress, followed by a suggested colloquial name. Some of these names are well established internationally, others are acceptable options in New Zealand.

The major families are furnished with a *Key* to their subfamilies, or with references to such keys.

Finally, under *Selected References* we offer a list of publications considered likely to be most helpful in further exploring the family under consideration. These have been kept to a minimum in order not to deter the more casual user. Fuller bibliographies can be found elsewhere, as indicated above, although for some families very little has been published that might be helpful in a New Zealand context.

Morphological structures named in the text are introduced in the section Morphology and Biology (p. 14); most are also illustrated. A Glossary (p. 91) defines most morphological terms, along with many others used in this publication that may be unfamiliar.

Two alternative dichotomous keys are provided for identification of New Zealand Coleoptera. They represent slightly different concepts in identification, and are meant to enable users to confirm an identification by using both. The pyramidal Key I (p. 97) is divided into several components, and groups families sharing distinct features regardless of their systematic relationships; it represents the shorter identification route, and is intended for rapid or preliminary identification. The linear Key II (p. 106) is not subdivided, and represents slightly the longer identification route. The two keys often employ different character sets. They are designed to identify the families of the New Zealand coleopteran fauna, and may not be satisfactory for other faunas. Characters which require dissection or dismemberment of specimens have been avoided. Both keys have been thoroughly tested, but may still contain errors or inconsistencies. In the pyramidal key some families with characters which might be overlooked, or are dubious, or which differ between the sexes reappear under different Groups. Identifications derived from the keys may be checked against the appropriate habitus illustration(s) and, if des-ired, the family diagnosis. Cross-reference to figure num-bers and family numbers is provided for convenience.

For the benefit of anyone using this publication extensively for identifications at the microscope, we strongly recommend that you photocopy either the keys or the illustrations (or both), and use them conjointly flat on the bench-top. Single copies for this purpose are not in breach of the publisher's copyright.

REVIEW OF FAMILIES

Suborder ADEPHAGA

We have followed the concept of Lawrence & Britton (1994) in defining this suborder: 1st abdominal sternite divided by metacoxae (Fig. 2); abdominal sternites 6 in number; pygidial defence glands present; larvae characteristic (for details see Lawrence & Britton 1994). The great majority of species are predacious. The phylogeny and evolutionary history of the Adephaga is discussed by Beutel (1995). The Adephaga comprise four families in a single superfamily, all represented in New Zealand.

Superfamily CARABOIDEA

This superfamily consists of families Rhysodidae, Carabidae (including Cicindelinae), Dytiscidae, and Gyrinidae. The majority of species, except for mycophagous Rhysodidae, are predacious. Rhysodidae and Carabidae are terrestrial, Dytiscidae and Gyrinidae are aquatic.

[1] Family RHYSODIDAE

Fig. 101

Length 5–10 mm Tarsal formula 5-5-5

DIAGNOSIS. **Body narrowly elongate, subcylindrical to slightly flattened**, widest at middle of elytra, glabrous (except for tactile setae), black or exceptionally reddish brown, **strongly glossy**. **Head grooved and strongly constricted posteriorly to form a narrow neck. Antennae stout and beadlike** (Fig. 19). **Pronotum with 1–3 deep, longitudinal grooves**. Legs short, robust; **procoxae globose, their cavities closed**.

SYNOPSIS. There are 6 species of Rhysodidae known from New Zealand, in 4 genera, of which 2 are endemic.

Adults and larvae are thought to feed on plasmodia of Myxomycetes (J.F. Lawrence, pers. comm.), and live inside dead or rotten wood. They may be found under bark or in wood of logs, standing dead trunks, or stumps in a partly decayed but not excessively wet or dry condition.

Collecting: sifting leaf litter, hand picking from under bark, or crumbling and sifting pieces of moderately rotten old logs.

RANGE. North ®, South ®?, Stewart O
Kermadecs O, Three Kings O, Chathams O, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. *Rhyzodiastes proprius* (Broun, 1880) (Fig. 101).

REMARKS. The Rhysodidae are sometimes treated as tribe Rhysodini of Carabidae.

Suggested colloquial name: heraldic beetles.

SELECTED REFERENCES. Bell & Bell (1978, 1979, 1982, 1985), Bell (1991), Beutel (1990), Emberson (1995), Watt (1980a).

[2] Family CARABIDAE

(incl. CICINDELINAE)

[assisted by R.M. Emberson and J.F. Lawrence]

Fig. 102–107

Length 1.4–39 mm Tarsal formula 5-5-5

DIAGNOSIS (see Fig. 1, 2). **Body generally more or less streamlined, with series of punctures of fixed position bearing tactile setae**, usually glossy and black but in some species colourful and spotted. Head usually flattened, prognathous, with **sharp, strong mandibles facing forwards. Antennae 11-segmented, usually filiform, inserted between eyes and base of mandibles** (except Cicindelinae). Eyes prominent. **Thorax smooth, with lateral margins often well defined. Elytra simple, usually sculptured with longitudinal grooves** (striae). **Legs usually strong, suited for running; protibiae with apical antennal cleaning organ** consisting of an excavation lined with a comb-like setal fringe; **procoxae often globose, their cavities open or closed.**

SYNOPSIS. The carabids, one of the largest beetle families in New Zealand, consist of 6 subfamilies (Lawrence & Newton 1995) – CARABINAE, CICINDELINAE, MIGADOPINAE, SCARITINAE, TRECHINAE, and HARPALINAE – with some 445 species in approximately 75 genera and 16 tribes.

Many carabids are unique to New Zealand, e.g., the endemic genus *Mecodema* with some 60 species, mostly large and robust in form, which apparently occupy similar ecological niches to the northern temperate genus *Carabus*. (Several specimens of *Carabus* were found in Auckland in the 1940s, but none is established.) Many carabids are apterous, and often occupy restricted habitats or geographical areas. There are interesting large species of *Megadromus*, e.g., *M. antarcticus*, which is common on the Canterbury Plains in the South Island. Small species of the large genus *Bembidion* may commonly be found on banks of streams, rivers, and lakes.

A dominant group of terrestrial predators, with some known to be arboreal, mainly nocturnal but some diurnal. Encountered in a variety of habitats ranging from forest litter, old tree trunks, under stones, and tussock grass to some wet habitats, including riparian and coastal areas.

Collecting: baited or unbaited pitfall traps, on the ground and around the base of tree trunks, sifting organic debris, and hand-picking from logs or under stones or bark, at night with a head-light.

RANGE. North ®, South ®, Stewart ® Kermadecs ®, Three Kings ®, Chathams ®, Snares ®, Aucklands ®, Campbell ®, Antipodes ®, Bounties ®

EXAMPLES. CICINDELINAE – *Neocicindela tuberculata* (Fabricius, 1775) (Fig. 102); CARABINAE – *Maoripamborus fairburni* Brookes, 1943 (Fig. 103); MIGADOPINAE – *Loxomerus nebrioides* Guérin-Méneville, 1841 (Fig. 104); SCARITINAE – *Clivina basalis* Chaudoir, 1843 (Fig. 105); TRECHINAE – *Zecillenus alacris* (Broun, 1821) (Fig. 106); HARPALINAE – *Ctenognathus novaezelandiae* Fairmaire, 1843 (Fig. 107).

REMARKS. The most recent subfamily classifications of Carabidae have been proposed by Erwin (1991), Beutel (1992, 1993), Arndt (1993), and Lawrence & Newton (1995). In older classifications the subfamily Cicindelinae was regarded as a distinct family.

Bousquet & Larochelle (1993) proposed a classification of Carabidae with 17 tribal divisions only, because of the lack of consensus among authors at the subfamily and supertribe level. Dr J.F. Lawrence has provided a key to tribes of Carabidae in New Zealand (Appendix 3); This may be preferred by some users over the subfamily key below.

No comprehensive treatment of New Zealand Carabidae is available. However, the group is under review by Dr Rowan Emberson (Lincoln University) and by Mr André Larochelle (associate, Landcare Research, Auckland), among others.

Suggested colloquial name: ground beetles (Cicindelinae – tiger beetles).

KEY TO SUBFAMILIES OF CARABIDAE

Modified from Lawrence & Britton (1994), following the arrangement of Lawrence & Newton (1995). For identification of tribes, consult the key provided as Appendix 3.

1 Antennae inserted dorsally on frons; clypeus broader than distance between antennal sockets; eyes extremely large and protruding; legs very long and slender; protibia with 2 terminal spurs; lateral pronotal carina absent or incomplete posteriorly ... (Fig. 102) .. CICINDELINAE

—Antennae inserted on side of head between eye and mandibular scrobe; clypeus narrower than distance between antennal sockets; eyes moderately large, not or slightly protruding (exception: *Scopodes* species, which have large protruding eyes); without other combination of characters ... 2

2(1) Metepimeron not visible between posterior edge of metepisternum and anterior edge of 1st ventrite; mesocoxal cavities open laterally, partly closed by mesepimeron ... 3

—Metepimeron visible as a lobe between metepisternum and 1st ventrite; mesocoxal cavities usually closed laterally by meeting of sterna ... 4

3(2) Procoxal cavities open behind; apical segment of maxillary palp more or less expanded and truncate apically; body length more than 17 mm ... (Fig. 103) .. CARABINAE
—Procoxal cavities closed behind; apical segment of maxillary palp slender and fusiform; body length usually 17 mm or less ... (Fig. 104) .. MIGADOPINAE

4(2) Body pedunculate, with a distinct, narrow waist or peduncle between prothorax and elytra, the scutellum entirely contained within peduncle ... 5
—Body not pedunculate, or if slightly so then scutellum extending behind peduncle and forming a wedge between elytral bases ... 6

5(4) Mesocoxal cavities open laterally, partly closed by mesepimeron ... (Fig. 105) .. SCARITINAE
—Mesocoxal cavities closed laterally by meeting of sterna ... (Fig. 106) .. TRECHINAE (in part)

6(4) Mandible with 1 setiferous puncture in a scrobe along outer edge ... (Fig. 106) .. TRECHINAE (in part)
—Mandible without a setiferous puncture in a scrobe ... (Fig. 107) .. HARPALINAE

SELECTED REFERENCES. Bousquet (1991b), Britton (1940, 1941, 1949, 1958, 1959, 1960a, b, 1962, 1963, 1964), Brouerius van Nidek (1965), Butcher (1984), Gourlay (1950), Johns (1974), Lindroth (1976, 1980), Moore (1980), Pilgrim (1963), Rivalier (1964), Townsend (1965), Watt (1961), Wise (1988, 1990).

[3] Family DYTISCIDAE

Fig. 108, 109

Length 2.5–27 mm Tarsal formula 5-5-5

DIAGNOSIS. **Body elongate-oval, smooth, convex, with dorsal and ventral surfaces of similar convexity**, dark brown, dark olive, or nearly black, often with indistinct yellowish spots or margins. **Antennae slender and threadlike. Mandibles strong.** Scutellum visible or not. **Procoxae globose, their cavities open or closed; protibiae lacking spines. Hind legs enlarged, modified for swimming (moving synchronously), with paddle-like tarsi bearing a dense fringe of hairs; metacoxae large, lacking plates**; metatarsi with either 1 or 2 claws. **Sometimes males with first 3 basal segments of protarsi dilated to form adhesive pads** consisting of suction discs, enabling male to hold female during copulation. **Ventral body without a flattened keel.**

SYNOPSIS. Dytiscids are represented in New Zealand by some 16 species in 11 genera of subfamilies COPELATINAE, HYDROPORINAE, COLYMBETINAE, and DYTISCINAE.

All our dytiscids are aquatic and very good swimmers. They often occur in small bodies of water such as ponds, but may be found in streams and rivers, and even underground in waterlogged coarse alluvial gravels. They normally occur in well vegetated waters, where adults and larvae prey on small arthropods. Dytiscids breathe air trapped under the elytra, and periodically come to the surface to renew their air supply. Most species fly, and may migrate to different sites. Of special interest are phreatic water beetles of the genera *Kuschelydrus* and *Phreatodessus*, with species living in underground waters (Ordish 1976a, 1991).

Collecting: using an aquatic net in small ponds and other open waters, or by light trapping near water. Sampling the phreatic (underground) fauna requires special techniques (see, e.g., Ordish 1976a, 1991).

RANGE. North ®, South ®, Stewart ®
Kermadecs ®, Three Kings O, Chathams ®, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLES. HYDROPORINAE – *Kuschelydrus phreaticus* Ordish, 1976 (Fig. 108), *Liodessus plicatus* Sharp, 1882 (Fig. 109).

REMARKS. Suggested colloquial name: diving beetles.

SELECTED REFERENCES. Ordish (1966, 1974, 1976a, b, 1989, 1991), Spangler (1991a).

[4] Family GYRINIDAE

Fig. 110

Length 4.3–4.5 mm Tarsal formula 5-5-5

DIAGNOSIS. **Body glossy, boat-shaped**, moderately convex to slightly flattened. **Eyes completely divided into upper and lower portions by a strip of cuticle. Antennae short, compact, usually clubbed.** Middle and hind legs short, with fringes of swimming hairs; **forelegs pronounced and raptorial, with procoxae transverse, and their cavities open.**

SYNOPSIS. Represented by one species of GYRININAE, *Gyrinus convexiusculus*, self-introduced to New Zealand from Australia. First recorded from New Zealand as *Gyrinus huttoni* (1878), the original specimen was collected by Capt. F.W. Hutton in the Waikato basin in 1873. No other specimens were seen until the late 1970s, when the species was rediscovered in the Waikato basin. Mr Keith Wise (formerly of Auckland Museum) recently found it in the Ahipara area of Northland. Immigrant populations appear to establish in New Zealand sporadically but not widely.

The species occurs in small peaty lakes and man-made dams. Collecting: using aquatic nets.

RANGE. North ®, South ®?, Stewart O
Kermadecs O, Three Kings O, Chathams O, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. GYRININAE – *Gyrinus convexiusculus* Macleay, 1871 (Fig. 110).

REMARKS. Suggested colloquial name: whirligig beetles.

SELECTED REFERENCES. Ochs (1949), Spangler (1991b), Wise (1989).

Suborder POLYPHAGA

Comprises the vast majority of Coleoptera—95% according to Lawrence & Britton (1991, 1994), whose definition we follow here: prothoracic notopleural suture absent (Fig. 3); prothoracic pleuron fused with trochantin and entirely concealed, forming a cryptopleuron; hind wing without an oblongum cell, and with transverse fold never crossing MP (Fig. 51); 1st abdominal sternite not divided by metacoxae (Fig. 3), which are usually movable and not fused to metasternum; aedeagus usually with a basal piece.

Series STAPHYLINIFORMIA

Adults distinguished by reduced wing venation (except in Hydrophilidae) and a sophisticated type of wing-folding mechanism; larvae usually with articulated urogomphi (Lawrence & Britton 1991, 1994).

Superfamily HYDROPHILOIDEA

Antennae short, with a long scape and a densely pubescent 3-segmented club (Fig. 26, 27); segment preceding club ('cupule') transverse, concave, and in aquatic species used for respiration. Hind wings with a radio-median (R–M) loop, without a spring mechanism. Procoxae large; tibiae dentate or spinose; tarsi 5-5-5, 5-5-4, or 5-4-4, sometimes appearing 4-4-4 because of vestigial basal segment. Aedeagus trilobed (with fused parameres in most Histeridae). Larva distinct (for details see Lawrence & Britton 1991, 1994). A phylogenetic analysis of Hydrophiloidea based on characters of the adult head and the larvae is provided by Beutel (1994) and Hansen (1991a, b, 1995).

[5] Family HYDROPHILIDAE

Fig. 111–113

Length 2–9 mm Tarsal formula 4-4-4 or 5-5-5

DIAGNOSIS. **Body usually oval, moderately to strongly convex, smooth and usually glossy. Antennae short, 7–9-segmented, often concealed from above, with a long scape and a 3-segmented, densely pubescent club; segment preceding club ('cupule') glabrous and often embracing the following segment. Maxillary palps elongate, often longer than antennae. Legs often dentate or spinose;** procoxae large, transverse and projecting, their cavities open; **metatarsi flattened and fringed with hairs.** Metasternum often extended at rear into 4 short spines.

SYNOPSIS. Approximately 75 species of hydrophilid are recorded in New Zealand, in some 25 genera and 3 subfamilies – HORELOPHINAE, HYDROPHILINAE, and SPHAERIDIINAE. Horelophinae are endemic to New Zealand; the type genus *Horelophus* is a very atypical hydrophilid.

There are two main groups of species, aquatic and terrestrial; many New Zealand hydrophilids are terrestrial, and are found in leaf litter or carrion. Larvae tend to be aquatic or semiaquatic, but many species are known from moist, decaying organic matter. A few species are reported from thermal waters. Adults are usually herbivorous or scavengers, whereas all known larvae are carnivorous and cannibalistic.

Collecting: netting in aquatic habitats, sifting decaying vegetable matter, or light-trapping.

RANGE. North ®, South ®, Stewart ®
Kermadecs ®, Three Kings ®, Chathams ®, Snares ®
Aucklands ®, Campbell O, Antipodes ®, Bounties ®

EXAMPLES. HORELOPHINAE – *Horelophus walkeri* Orchymont, 1913 (Fig. 111); HYDROPHILINAE – *Enochrus tritus* (Broun, 1880) (Fig. 112); SPHAERIDIINAE – *Rygmodus tibialis* Broun, 1886 (Fig. 113).

REMARKS. New Zealand's diverse fauna of Hydrophilidae is much in need of revision at all levels. The Sphaeridiinae are under review by Dr M. Hansen (Zoological Museum, Copenhagen). The terrestrial forms are probably important indicators of environmental quality.

Suggested colloquial name: water scavenger beetles.

SELECTED REFERENCES. Hansen (1991b, 1995), Newton (1989), Orchymont (1913), Ordish (1974, 1976b), Spangler (1991d), Todd (1961), Winterbourn (1968, 1970), Wise (1965, 1973).

[6] Family HISTERIDAE

Fig. 114, 115

Length 1.5–10 mm Tarsal formula 5-5-5 or 5-5-4

DIAGNOSIS. **Body robust, disc-shaped,** oval or narrowly oval to nearly rectangular with rounded angles, **glabrous, moderately convex to flattened, black and strongly glossy.** Head deeply inserted. **Antennae unique in form: short and elbowed, with an abrupt, 3-segmented club, often inserted in a cavity** or hidden on

underside of prothorax. **Elytra shortened and truncate**, exposing tip of abdomen (usually 2 or 3 apical segments), with 6 or fewer striae. **Procoxae large and transverse, their cavities open; protibiae expanded, often spiny.**

SYNOPSIS. There are 29 nominal New Zealand species of histerid, of which 6 are adventive. They occupy some 13 genera, including one undescribed, in 5 subfamilies – ABRAEINAE, SAPRININAE, DENDROPHILINAE, TRIBALINAE, and HISTERINAE. *Parepierus* is the largest genus, containing about one-third of the species, and *Reichardtia* is an endemic New Zealand genus. Most species are widely distributed, although histerids are infrequently encountered in New Zealand.

Adults and larvae are almost exclusively carnivorous, and prey on other insects, usually larvae. They may be commonly found on carrion, decomposing plant materials, tree wounds, seashore debris, rotting mushrooms, and under bark in galleries of other insects. Kuschel (1990) recorded some species in a suburban environment from compost, lawn clippings, poultry straw, carcasses, fowl manure, bush floor litter, and decayed wood. The smaller species are sometimes common around seabird nests.

Collecting: hand-picking, or sifting organic material and processing it in Berlese funnels.

RANGE. North ®, South ®, Stewart ®
Kermadecs ®, Three Kings ®, Chathams ®, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLES. SAPRININAE – *Reichardtia pedatrix* (Sharp, 1876) (Fig. 114), *Tomogenius latipes* (Broun, 1881) (Fig. 115).

REMARKS. This family is under revision by Dr Masahiro Ôhara of Hokkaido University, Japan.

Suggested colloquial name: hister beetles, pill beetles.

SELECTED REFERENCES. Dahlgren (1968, 1971, 1976), Mazur (1984), Newton (1991c), Wenzel (1944).

Superfamily STAPHYLINOIDEA

Body shape variable, antlike in Scydmaenidae (Fig. 122), short, stout, and wedge-shaped in Pselaphinae (Fig. 126), ovoid in Hydraenidae (Fig. 116, 117) and Agyrtidae (Fig. 119), ovoid to nearly spherical in Ptiliidae and Leiodidae (Fig. 118, 120, 121), and elongate, slender, with exposed flexible abdomen in most Staphylinidae (e.g., Fig. 132–138). Adults distinctive in having usually strongly projecting coxae, metasternum almost always lacking a median suture, legs often spinose, elytra usually truncate, exposing at least one tergite, hind wing with reduced venation and without a radio-medial (R–M) loop, and aedeagus with a reduced phallobase. Larvae characteristic – see Lawrence & Britton (1991, 1994).

[7] Family HYDRAENIDAE

Fig. 116, 117

Length 1.3–2.6 mm Tarsal formula 5-5-5

DIAGNOSIS. **Body narrowly oval or elliptical** (broad in species of *Meropathus*), flattened to slightly convex, small, with scutellum small; generally similar to Hydrophilidae but **with 6 or 7 abdominal segments as opposed to 5. Maxillary palps elongate, usually longer than antennae. Antennae 9–11-segmented** (appearing 8-segmented in *Meropathus*) and **with a 2-, 3-, or usually 5-segmented pubescent club. Legs with last tarsomere elongate**, often longer than all preceding segments combined, with no distinct bisetose empodium between claws; **procoxae transverse, their cavities open or** (*Hydraena*) **closed.**

SYNOPSIS. Thirty-two species of hydraenid are recognised in New Zealand, in 5 genera and 2 subfamilies – HYDRAENINAE and OCHTHEBIINAE. Twenty-two species are recorded from the South Island and subantarctic islands, 4 from the North Island, and 6 occur on both main islands (Ordish 1984). This relatively rich hydraenid fauna offers an interesting field for ecological studies.

All the genera except *Meropathus* live as adults and larvae in fast-flowing streams. *Meropathus* species are terrestrial in the coastal or supralittoral zone, occurring in porous rocks, littoral moss and grasses, and seabird nests. Adults of the aquatic genera all have one or more pairs of legs modified (Ordish 1984, fig. 12–16) and feed on dead leaves.

RANGE. North ®, South ®, Stewart ®
Kermadecs O, Three Kings O, Chathams ®, Snares ®
Aucklands ®, Campbell ®, Antipodes ®, Bounties O

EXAMPLES. HYDRAENINAE – *Podaena latipalpis* Ordish, 1984 (Fig. 116); OCHTHEBIINAE – *Meropathus zelandicus* Ordish, 1984 (Fig. 117).

REMARKS. Suggested colloquial names: minute moss beetles, cascade beetles.

SELECTED REFERENCES. Gressitt & Samuelson (1964a), Hansen (1991a), Ordish (1984), Spangler (1991c).

[8] Family PTILIIDAE

Fig. 118

Body length 0.6–1 mm Tarsal formula 2-2-2 or 3-3-3

DIAGNOSIS. **Body minute**, brown to black, broadly elongate-oval. **Antennae filamentous, bearing long hairs and with a 2- or 3-segmented club. Elytra often short, exposing 1 or 2 abdominal segments. Hind wings**

feather-like, fringed with long hairs. Scutellum large. **Procoxae transverse or globose, their cavities open**; metacoxae variable in shape, often with large coxal plates. Tarsi usually 2- or 3-segmented but appearing 1-segmented in some species.

SYNOPSIS. In New Zealand there are some 56 species of ptiliid, including 8 or 9 adventive, in perhaps 13 genera and 3 subfamilies – PTILIINAE, NANOSELLINAE, and ACROTRICHINAE.

Common in decaying organic matter, where apparently they feed on fungal spores and hyphae (Lawrence & Britton 1991, 1994). Collected from garden compost, leaf litter, moss mat, forest litter, decayed wood, mouldy dung, under bark in native forests, amongst litter and tussocks, seashore debris including decaying seaweed, and humified soil (Johnson 1982, Kuschel 1990). Adults are often caught in flight interception traps.

RANGE. North ®, South ®, Stewart ®
Kermadecs ®, Three Kings ®, Chathams ®, Snares ®
Aucklands ®, Campbell ®, Antipodes ®, Bounties O

EXAMPLE. PTILIINAE – *Notoptenidium lawsoni* (Matthews, 1873) (Fig. 118).

REMARKS. Suggested colloquial name: feather-winged beetles.

SELECTED REFERENCES. Dybas (1991), Gressitt & Samuelson (1964a), Johnson (1975a–c, 1982).

[9] Family AGYRTIDAE

Fig. 119

Length 9–10 mm Tarsal formula 5-5-5

DIAGNOSIS. **Body broadly oval, slightly depressed, with sides of pronotum and elytra explanate**, brown, glabrous and glossy. **Antennae 11-segmented, with a 5-segmented pubescent club. Elytra covering entire abdomen, with 9 or 10 striae**. Hind wings well developed. **Procoxae conical, slightly transverse basally and projecting, their cavities open**. Mesotibiae and metatibiae each with a large spur. **Tarsomeres and claws large**.

SYNOPSIS. A small, archaic family with fossil records from the mid Jurassic (Newton 1991a), comprising approximately 8 genera in the world fauna. Most agyrtids are Holarctic in distribution, with the exception of two New Zealand species: '*Necrophilus*' *prolongatus* Sharp, and an undescribed species (Newton 1985). According to Newton these belong in an undescribed genus, and are erroneously placed in *Necrophilus*. Agyrtidae were removed from family Silphidae by Lawrence & Newton (1982), and are believed to be closely related to Leiodidae (Newton 1985).

Species of Agyrtidae are known from forested areas, and are common on carrion and faeces. Adults of '*N*'. *prolongatus* occur in forested areas on carrion, e.g., dead birds especially at a slightly mummified stage, or may be found in soil crevices on stream banks. Some specimens were collected from an abandoned kiwi egg in a burrow. An effective method of collecting adults is carrion-baited pitfall traps. Larvae may be seen in association with adults on carrion.

RANGE. North ®, South ®, Stewart O
Kermadecs O, Three Kings O, Chathams O, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. '*Necrophilus*' *prolongatus* (Fig. 119).

REMARKS. Suggested colloquial name: carrion beetles.

SELECTED REFERENCES. Newton (1991a).

[10] Family LEIODIDAE

[assisted by S.B. Peck and A.F. Newton, Jr]

Fig. 120, 121

Body length 0.9–4.3 mm
Tarsal formula 5-5-5, 5-5-4, or 5-4-4

DIAGNOSIS. **Body broadly oval to nearly spherical, slightly to strongly convex, or scydmaenid-like; surface glabrous and strongly glossy or pubescent**, brown to black. **Antennae with a 3–5-segmented club; when club 5-segmented then segment 8 (2nd segment of club) usually smaller than adjoining segments** (Fig. 24); **distal surface of antennal segments 7, 9, and 10 with opening of a unique type of sensory vesicle**. Elytra often striate, and often with a longitudinally impressed line along suture. **Procoxae globose and projecting; metacoxae close together. Tibiae often expanded and spiny**.

SYNOPSIS. According to unpublished data of G. Kuschel, A. Newton, and S. Peck (pers. comm.) there are some 112 species in approximately 25 currently recognised genera, including 6 or 7 new genera and nearly 50 new species. Four subfamilies are represented – CAMIARINAE, with some 69 species, is the largest, followed by CHOLEVINAE (25), LEIODINAE (17), and COLONINAE (1).

Kuschel (1990) reported collecting species of Leiodinae in the Auckland area from bush-floor litter, amongst ground plants, from grass mats of *Oplismenus* and *Microlaena*, and from an agaric in the bush. He recorded Camiarinae collected in the same area from fungi (*Auricularia polytricha, Ganoderma applanatum*), coarse floor litter, amongst *Gahnia* plants, under logs and in cracks of stream banks, decayed wood, in *Ptychomnion* moss mats,

and rotten *Pinus radiata* and *Knightia* logs. He collected Coloninae in bush litter, cracked stream banks, and Malaise traps, and collected Cholevinae from carrion. Newton (1984) reported adults and larvae of *Zearagytodes* (Camiarinae) collected in numbers on bracket fungi, with the following new host records: *Z. maculifer* and several allied undescribed species on *Ganoderma mastoporum*, *G. applanatum*, and unspecified bracket fungi, all from the North Island. Adults and larvae were browsing on the hymenial surface of *Ganoderma*. Gut contents of both stages included spores and hyphae. Newton (1984) provided some data for the worldwide genus *Colon* as collected in flight traps and by sweeping vegetation, especially grasses in wooded areas, and suspects that the genus is associated with hypogeal fungi or moulds. Species of Cholevinae, both adults and larvae, may be found on decaying organic matter, on which they feed: dung, carrion, well decayed soft fungi, forest litter, nests of vertebrates, etc. (Newton 1984).

RANGE. North ®, South ®, Stewart ®
Kermadecs O, Three Kings ®, Chathams ®, Snares ®
Aucklands ®, Campbell ®, Antipodes O, Bounties O

EXAMPLES. CAMIARINAE – *Inocatops elongellus* Broun, 1917 (Fig. 120); COLONINAE – *Colon hirtale* (Broun, 1880) (Fig. 121).

REMARKS. Suggested colloquial name: small carrion beetles.

KEY TO SUBFAMILIES OF LEIODIDAE
IN NEW ZEALAND [by A.F. Newton, Jr]

1 Head with an elevated crest (occipital carina) along hind margin, resting against front of pronotum when head in repose ... CHOLEVINAE
—Head without an elevated crest along hind margin .. 2

2(1) Antennae 11-segmented, with segment 8 as large as segments 9 and 10, and club of 4 segments (Fig. 25); dorsum setose ... (Fig. 121) .. COLONINAE
—Antennae usually 11-segmented, with segment 8 smaller than segments 7 and 9, and club usually of 5 segments (Fig. 24); if club 4-segmented then antennae 10-segmented and dorsum glabrous ... 3

3(2) Antennal insertions concealed in dorsal view; head relatively flattened and broad, usually half or more as wide as pronotum; dorsum apparently glabrous (sometimes with many short hairs visible only at higher magnification) ... LEIODINAE
—Antennal insertions exposed in dorsal view; head relatively convex and narrow, usually less than half as wide as pronotum; dorsum usually with evident long setae (exceptions: *Asphaerites*, *Catopsolius*, *Chelagyrtodes*) ... (Fig. 120) .. CAMIARINAE

SELECTED REFERENCES. Daffner (1985), Newton (1991b), Szymczakowski (1964, 1966, 1973).

[11] Family SCYDMAENIDAE

[assisted by G. Kuschel]

Fig. 122

Length 0.5–3.5 mm Tarsal formula 5-5-5

DIAGNOSIS. Body reddish brown to dark brown, **usually ant-like, with a distinct 'waist' constriction between prothorax and elytra. Head with a distinct neck. Antennae long, pubescent, with a more or less distinct 3- or 4-segmented club. Pronotum ovoid or spherical, often with basal foveae, and without carinae. Elytra oval, covering entire abdomen, with rounded humeri**; entire dorsal surface usually glossy and with long hairs. **Maxillary palps usually enlarged, with apical segment reduced**. Legs with enlarged femora. **Procoxae transverse and projecting, their cavities open.**

SYNOPSIS. Watt (1982a) recorded 165 nominal native species of scydmaenid; 201 native and 1 adventive species are now represented in NZAC, many of them undescribed. They belong to some 11 currently recognised genera of SCYDMAENINAE, of which 6 are endemic to New Zealand. For classification see Franz (1975, 1977, 1980, 1985).

Kuschel (1990) recorded several species from the Auckland area collected in leaf litter, from decayed wood of various trees and hollow logs, moss mat, leaf mould in tree hollows, and Malaise traps. Scydmaenids are nocturnal, living in concealed habitats, with some species flying at dusk. Good collections might be obtained by processing sifting organic litter through Berlese funnels.

RANGE. North ®, South ®, Stewart ®
Kermadecs O, Three Kings ®, Chathams ®, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. SCYDMAENINAE – *Adrastia clarkei* (Franz, 1985) (Fig. 122).

REMARKS. Suggested colloquial name: stone beetles.

SELECTED REFERENCES. Franz (1975, 1977, 1980, 1985).

[12] Family STAPHYLINIDAE

(incl. PSELAPHINAE, SCAPHIDIINAE)

[assisted by A.F. Newton and M.K. Thayer]

Fig. 123–138

Length 0.6–25 mm Tarsal formula 5-5-5 or heteromerous

DIAGNOSIS. **Body brown to black, less frequently brightly coloured or metallic**. Form very diverse, **usually narrowly elongate, approximately subparallel**, rarely short, oblong, or wedge-shaped, or short, stout, and oval with abdomen non-flexible (Pselaphinae, Fig. 126). Head often with a posterior constriction, sometimes with ocelli (Omaliinae, Microsilphinae). Antennae with 10 or 11 segments, filiform, beadlike; last 1–4 segments enlarged (Pselaphinae), incrassate, or clubbed. **Elytra nearly always short and truncate, exposing a variable number of abdominal segments, usually 6 or 7, exceptionally concealing all or most of abdomen** (Microsilphinae and some Omaliinae, Proteininae, Scaphiidinae) or leaving at least 2 (usually 3 or 4) tergites exposed (Pselaphinae). **Procoxae usually conical and strongly projecting, their cavities usually closed. Abdomen flexible dorsoventrally** (exception: Pselaphinae), well sclerotised except basal tergite or two.

SYNOPSIS. Staphylinids are one of the largest and most diverse families of beetles, as of 1987 comprising worldwide about 42 000 nominal species (8400 species of Pselaphinae) in several thousand genera (1091 genera in Pselaphinae) and 100 tribes (Newton 1985, 1990, Newton & Chandler 1989, Newton & Thayer 1992). Hundreds of new species are described every year. We follow Newton & Thayer (1995) and Lawrence & Newton (1995) in treating the former family Pselaphidae as a subfamily of Staphylinidae. A revised list of the subfamilies, tribes, and genera with synonyms is provided by Klimaszewski *et al.* (1996).

In New Zealand there are approximately 766 nominal native species and 85 adventive, plus 170 or more recognised but not yet named. The number of New Zealand native staphylinids may exceed 1000 (G. Kuschel, pers. comm.), making it after Curculionidae our second largest group of beetles. Our species are grouped in some 190 genera and 16 subfamilies, as follows: ALEOCHARINAE 61 genera (probably an underestimate); EUAESTHETINAE 4; HABROCERINAE 1; MICROSILPHINAE 1; OMALIINAE 16, and 4 undescribed; OSORIINAE 3 (including one of former Eleusiinae); OXYTELINAE 7; PAEDERINAE 10; PHLOEOCHARINAE 2; PIESTINAE 1; PROTEININAE 4; PSELAPHINAE 41, and 20 undescribed; PSEUDOPSINAE 1; SCAPHIDIINAE 5; STAPHYLININAE 26; and TACHYPORINAE 3 (Klimaszewski *et al.* 1996; Watt & McColl *in* McColl 1982, updated).

Staphylinid beetles are very successful and broadly distributed, occurring in almost all terrestrial habitats. Staphylinids may be found in decomposing organic matter such as garden and forest litter, mushrooms, bird and mammal nests, decaying seaweeds and other algae of tidal zones, uncompacted soil, organic matter in tree hollows and burrows, under bark, in galleries of other insects, wet moss, cracks on edges of streams, shores of lakes, etc. Some species may be found on carrion and in animal droppings, and some Omaliinae have been beaten from vegetation. The majority of known species are predators, feeding on larvae and adults of other insects including Collembola, and on mites and nematodes.

Species of Osoriinae and Oxytelinae feed on decomposing organic matter (McColl 1982, Newton 1990). Some Tachyporinae and Aleocharinae (e.g., *Gyrophaena*) feed on moulds or other fungi. Species of the aleocharine genus *Myllaena* were recorded feeding on algae (Klimaszewski 1992). Larvae of the ectoparasitic genus *Aleochara* (Aleocharinae) are exclusive parasitoids of puparia of cyclorrhaphous Diptera. The first-instar larva searches for a host pupa, gnaws a hole in the puparium, crawls inside, seals the entrance behind, and feeds on the pupa (Klimaszewski & Crosby 1997; Klimaszewski & Jansen 1993).

The majority of adult pselaphines occur in leaf and wood litter on the forest floor. Newton & Chandler (1989) reported that in general pselaphine species can also be discovered in wetland, grassland, desert, beach, cave, and even arboreal habitats, wherever debris, moss, or root mats maintain microhabitats of high humidity. Kuschel (1990) collected pselaphines in Auckland from decayed wood on the beach and amongst low coastal vegetation, coastal litter, hollow trees, wood mould, stream litter and stream banks, moss, sedges, grasses, soil around tree stumps, etc. Adults and larvae of pselaphines are predators, feeding on mites, springtails, and other small invertebrates.

More details on the natural history of New Zealand staphylinids are provided by Klimaszewski *et al.* (1996).

Collecting: hand-collecting with the aid of an aspirator; pitfall traps, unbaited or baited with carrion, faeces, or fermented fruits; processing sifted organic litter through Berlese funnels or Winkler/Moczarski extractors; Malaise traps, window traps, and other flight interception traps.

RANGE. North ®, South ®, Stewart ®
Kermadecs ®, Three Kings ®, Chathams ®, Snares ®
Aucklands ®, Campbell ®, Antipodes ®, Bounties O

EXAMPLES. MICROSILPHINAE – *Microsilpha litorea* Broun, 1886 (Fig. 123); OMALIINAE – *Omaliomimus albipennis* (Kiesenwetter, 1877) (Fig. 124); PROTEININAE – *Silphotelus nitidus* Broun, 1895 (Fig. 125); PSELAPHINAE – *Sagola laminata* Broun, 1893 (Fig. 126); PHLOEOCHARINAE – *Pseudophloeocharis australis* (Fauvel, 1900) (Fig. 127); TACHYPORINAE – *Sepedophilus* sp. (Fig. 128); HABROCERINAE – *Habrocerus capillaricornis* (Gravenhorst, 1806) (Fig. 129); ALEOCHARINAE – *Aleochara hammondi* (Klimaszewski & Crosby, 1997) (Fig. 130); SCAPHIDIINAE – *'Baeocera' scutellaris* (Redtenbacher, 1867) (Fig. 131); PIESTINAE – *Parasiagonum hudsoni* (Cameron, 1944) (Fig. 132); OSORIINAE – *Nototorchus ferrugineus* (Broun, 1893) (Fig. 133); OXYTELINAE – *Carpelimus* sp. (Fig. 134); EUAESTHETINAE – *Agnosthaetus vicinus* (Broun, 1921) (Fig. 135); PSEUDOPSINAE – *Pseudopsis arrowi* Bernhauer, 1939 (Fig. 136); PAEDERINAE – *Medon zeelandicus*

(Redtenbacher, 1867) (Fig. 137); STAPHYLININAE – *Cafius litoreus* Broun, 1880 (Fig. 138).

REMARKS. Staphylinids are an ancient group with fossil records from the early Jurassic period (Newton 1990). The New Zealand fauna of staphylinids may be characterised by (1) the absence of several subfamilies from the native fauna, a few of which are, however, represented by adventive species (e.g., Habrocerinae); (2) large species radiations in *Eupines*, *Euplectopsis*, *Hyperomma*, *Microsilpha*, *Ocalea* complex, *Oligota*, *Othius*, *Paratorchus*, '*Quedius*', *Sagola*, and *Sepedophilus*; and (3) high endemism – approx. 43% at the generic level, even higher at the species level (Klimaszewski *et al.* 1996); (4) strong southern connections – over 20 groups or genera are shared only with other southern temperate regions (Newton 1985). In general our staphylinids are poorly known; the Aleocharinae, as everywhere, are the least known amongst staphylinids, and consequently are in urgent need of revision. The classification of Staphylinidae at all levels, including family limits, is unsatisfactory and unstable (Newton 1990).

Suggested colloquial name: rove beetles.

KEY TO SUBFAMILIES OF STAPHYLINIDAE OCCURRING IN NEW ZEALAND

[Modified from Watt & McColl *in* McColl (1982) to include Microsilphinae, Pselaphinae, and Scaphidiinae.]

1 Antennae distinctly clubbed (e.g., Fig. 123, 135); body without setose foveae ... 2

—Antennae usually not distinctly clubbed; if so, body compact and with setose foveae, and tarsi 3-segmented (e.g., Fig. 124–134) ... 3

2(1) Antennal club with more than 2 segments; elytra elongate, covering most of abdomen; anterior margin of labrum not as below; body short, oval; head with paired ocelli on vertex... (Fig. 123) .. **MICROSILPHINAE**

—Antennae with a 2-segmented club; elytra short, exposing entire abdomen; anterior margin of labrum minutely crenulate or denticulate; body narrow, elongate; head without ocelli .. (Fig. 135) .. **EUAESTHETINAE**

3(1) Body wedge-shaped, short, convex and strongly glossy; elytra truncate posteriorly, concealing all but 1 or 2 abdominal tergites, and exposing pointed abdomen; legs and antennae long and slender ... (Fig. 131) .. **SCAPHIDIINAE**

—Body not so; elytra exposing at least 3 abdominal tergites (exception: *Silphotelus*, Proteininae, Fig. 125); legs and antennae usually moderately elongate and stout ... 4

4(2) Body compact, usually widest at abdomen or tip of elytra, with head and pronotum narrower; setose foveae present on head, prothorax, and other parts of body; elytra short, closely applied to body, leaving much of abdomen exposed; abdomen broad, not flexible; maxillary palps often modified; antennae often beadlike; tarsi 3-segmented ... (Fig. 126) .. **PSELAPHINAE**

—Body not so; setose foveae absent; elytra usually loosely applied to body; abdomen flexible; maxillary palps usually simple; antennae not beadlike; tarsi usually of more than 3 segments ... 5

5(4) Abdomen without paratergites; tergites and sternites usually fused together; body either cylindrical or strongly flattened ... (Fig. 133) .. **OSORIINAE**

—Abdomen with paratergites; tergites and sternites of abdomen not fused together; body not cylindrical .. 6

6(5) Head with paired ocelli on vertex between posterior margins of eyes; paratergites single ... (Fig. 124) .. **OMALIINAE**

—Head without ocelli (sometimes with a pair of depressions on vertex); paratergites usually double ... 7

7(6) Antennal insertions located between eyes and posterior to a line drawn between anterior edges of eyes (except in forms with reduced eyes); terminal segment of maxillary palp usually very small and sharp-pointed ... (Fig. 130) .. **ALEOCHARINAE**

—Antennal insertions located anterior to a line drawn between anterior edges of eyes, or inserted under shelf-like dorsolateral margins of frons; terminal segment of maxillary palp usually not as above ... 8

8(7) Body strongly depressed; antennae inserted under widely explanate dorsolateral projections of frons, their sockets facing ventrally; procoxae globular ... (Fig. 132) .. **PIESTINAE**

—Body rarely strongly depressed; antennae usually not as above, but if inserted under dorsolateral projections of frons then these are less prominent, and their sockets face laterally; procoxae elongate, transverse, or projecting ... 9

9(8) Abdomen usually strongly flattened and broad, with 7 visible sternites, excluding genital segment (exception: *Coprostygnus*, with 6 obvious sternites but also with elytral striae, which are rare in taxa keying to the alternative, below); gular sutures confluent, or at least partially so ... (Fig. 134) .. **OXYTELINAE**

—Abdomen usually less flattened and moderately broad, with 6 visible sternites (Fig. 124, 127) excluding genital segment; gular sutures separate ... 10

10(9) Elytra elongate, leaving no more than 5 abdominal tergites exposed (in *Silphotelus* elytra almost com-

pletely covering abdomen); lateral margin of frons with a small, semicircular emargination on either side, just in front of eye; body length usually less than 2 mm (maximum 4 mm) ... (Fig. 125) .. **PROTEININAE**

—Elytra shorter, leaving at least 6 abdominal tergites exposed; lateral margin of frons not so ... 11

11(10) Abdominal tergites except the last each with a diagonal impressed line on either side; pronotum and elytra longitudinally costate; tarsi short, about one-third as long as tibiae; body length 3 mm ... (Fig. 136) .. **PSEUDOPSINAE**

—Abdominal tergites without such lines; pronotum and elytra not longitudinally costate; tarsi usually more than one-third as long as tibiae ... 12

12(11) Head with sides converging evenly posteriorly, without a neck constriction clearly visible from above (Fig. 127–129) ... 13

—Head constricted behind eyes to form a distinct neck, clearly visible from above (Fig. 137, 138) ... 15

13(12) Elytra with epipleura not delimited, their sides completely rounded off; body shape distinctive, as figured ... (Fig. 127) .. **PHLOEOCHARINAE**

—Elytra with epipleura clearly delimited by a carina .. 14

14(13) Antennae stouter, expanded towards apex; head and pronotum usually densely pubescent; body shape distinctive, as figured ... (Fig. 128) .. **TACHYPORINAE**

—Antennae very slender, filiform (Fig. 18), with long tactile setae; head and pronotum glabrous except for some long tactile setae; body shape distinctive, as figured ... (Fig. 129) .. **HABROCERINAE**

15(12) Maxillary palp with apical segment always reduced, less than half as long as penultimate segment; antennal insertion obscured by a dorsolateral shelf-like expansion of margin of frons ... (Fig. 137) .. **PAEDERINAE**

—Maxillary palp with apical segment variable in length, but at least half as long as penultimate segment; antennal insertions exposed ... (Fig. 138) .. **STAPHYLININAE**

SELECTED REFERENCES. Bernhauer (1939, 1941, 1943), Cameron (1944, 1945, 1946, 1947, 1950), Fauvel (1900), Frank (1991), Hammond (1975), Herman (1975), Kasule (1966, 1968, 1970), Klimaszewski (1979), Klimaszewski & Crosby (1997), Klimaszewski *et al.* (1996), Leschen & Löbl (1995), McColl (1982, 1984a, b), Newton (1984, 1985, 1989, 1990), Newton & Chandler (1989), Newton & Thayer (1992, 1995), Park & Pearce (1962), Sharp (1876a, b), Steel (1949, 1950a, b, 1953, 1960, 1964, 1966, 1970), Thayer (1985), Williams (1976).

Series SCARABAEIFORMIA

Superfamily SCARABAEOIDEA

Characterised by a highly modified prothorax with large coxae, usually dentate tibiae with a single apical spur, lamellate antennal club (Fig. 30), no metacoxal plates, 2nd abdominal sternite represented by a lateral portion only, tergite 8 forming a pygidium, hind wing with reduced venation and with a spring mechanism for folding the wing, and larvae grub-like and usually C-shaped (Fig. 98) (Lawrence & Britton 1991).

[13] Family LUCANIDAE

[assisted by B.A. Holloway]

Fig. 139–143

Length 6–30 mm Tarsal formula 5-5-5

DIAGNOSIS. **Body robust**, medium-sized to large, brown to black, often with paler spots forming a pattern, **either glabrous and glossy or clothed with scales. Head prognathous, with well developed mandibles which are often sexually dimorphic – pronounced in males**, and bearing teeth or larger processes. **Antennae distinct, 10-segmented, usually elbowed, with a comb-like club consisting of 3 or 4 thick, lamellate segments that cannot be held together** (Fig. 30). Pronotum usually short. **Abdomen with 5 ventrites.**

SYNOPSIS. Holloway (1961, 1962, 1963b) recognised 26 species in 4 genera. There are also 3 adventive species from Australia, each in a separate genus (Holloway 1997). Four subfamilies are represented – AESALINAE, SYNDESINAE, LAMPRIMINAE, and LUCANINAE.

The species are approximately evenly divided between the North and South islands, with two endemic species restricted to the Chatham Islands and one to the Mokohinau Islands (Holloway 1961). Approximately half the species are flightless and half fully winged. The flightless species are often allopatric, with restricted ranges in lowland areas, whereas fully winged species tend to have broad and overlapping ranges, though some are restricted to montane areas (Holloway 1963a).

Hudson (1934) reported lucanids as being mainly nocturnal, the adults feeding on tree sap, and larvae living on old decaying trees or their roots, and with a life cycle of several years. Holloway (1963a) suspects that all adult lucanids feed on sap, and are not plant-specific, the larvae completing their development in rotten wood or soil. It is widely accepted that the larvae feed on rotten wood or other decomposing organic material. *Ceratognathus passaliformis* is almost certainly myrmecophilous, found in endemic formicine ant nests (Holloway 1962). Hudson (1934) reported *Ceratognathus gibbosus* as being beaten from shrubs in hot sunshine, from December until March.

RANGE. North ®, South ®, Stewart ®
Kermadecs ®, Three Kings ®, Chathams ®, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLES. AESALINAE – *Ceratognathus parrianus* (Westwood, 1863) (Fig. 139); LUCANINAE – *Paralissotes reticulatus* (Westwood, 1847), male (Fig. 140), *Geodorcus auriculatus* (Broun, 1903), male and female (Fig. 141, 142); LAMPRIMINAE – *Dendroblax earlii* (White, 1846) (Fig. 143).

REMARKS. This family is under revision by Dr B.A. Holloway, of Auckland.

Suggested colloquial name: stag beetles.

SELECTED REFERENCES. Carlson (1991a), Holloway (1960, 1961, 1962, 1963a, b, 1996, 1997).

[14] Family TROGIDAE

Fig. 144

Length 6.4–6.5 mm Tarsal formula 5-5-5

DIAGNOSIS. **Body robust, oval**, slightly subparallel, **heavily sclerotised, with dorsal surface rugose, lustrous, and often covered with debris. Head strongly deflexed. Antennae 10-segmented, elbowed, with a compact lamellate club** (Fig. 31). **Procoxae projecting; mesocoxal cavities broadly closed.**

SYNOPSIS. New Zealand has only a single adventive European species of trogid. This was first found at Kumeu, north-west of Auckland, in deep litter of poultry houses in association with mummified rat carcasses. Other records include Campbell's Beach near Matakana, Western Hills near Whangarei, the Noises Islands, and Hastings.

Adults have been collected near rat carcasses, under the hide of a long-dead cow, in dry animal remains, in wood mould in oaks and elms, and in birds' nests (Brown 1967). Larvae of other species are known to occur in vertical burrows beneath carcasses (Carlson 1991b, Lawrence & Britton 1991, 1994).

RANGE. North ®, South O, Stewart O
Kermadecs O, Three Kings O, Chathams O, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. *Trox scaber* (Linnaeus, 1767) (Fig. 144).

REMARKS. Suggested colloquial name: carcass beetles.

SELECTED REFERENCES. Britton (1956), Brown (1967), Carlson (1991b), Scholtz (1982, 1986).

[15] Family SCARABAEIDAE

[assisted by R.M. Emberson]

Fig. 145–152

Length 3–25 mm Tarsal formula 5-5-5

DIAGNOSIS. **Stout-bodied beetles, often glossy** but some dull (e.g., *Saprosites*, Aphodiinae), glabrous or moderately to densely pubescent, **usually brown or black** but occasionally brightly coloured (some Melolonthinae). **Either labrum or mandibles, or both, concealed from above by clypeus. Antennae 8–10-segmented, not elbowed; club variable, usually 3-, 4-, or 5-segmented but not cupuliform; lamellate segments appearing as elongate or oval lobes that can be folded together tightly to form a compact and asymmetrical club.** Sculpture of elytra not rough. **Legs strongly modified for digging with teeth, spines, and/or bristles. Abdomen with 6 ventrites.**

SYNOPSIS. Watt (1982a) recorded approximately 132 native and 12 adventive species of scarabaeid in New Zealand. This relatively large group of beetles represents 4 subfamilies—MELOLONTHINAE, SCARABAEINAE, DYNASTINAE, APHODIINAE—and some 25 genera, 13 of them endemic.

The subfamily Melolonthinae is by far the largest, with 103 valid native species in 10 genera (Given 1952, 1954, 1960 (key to genera), 1966, Watt 1984, Emerson & Barratt 1997). Species of *Prodontria* are all flightless, have limited ranges, and are vulnerable to habitat modification. The Cromwell chafer, *P. lewisi*, is considered to be an endangered species, and a nature reserve has been established near Cromwell to preserve it (Watt 1984). The endemic manuka beetle, *Pyronota festiva*, is common all over New Zealand, and was first collected during Captain Cook's voyage in 1769. The 9 greenish-coloured species of *Stethaspis* are common in forest habitats. This subfamily contains many species which are recognised pests of agriculture, e.g., the grass grub *Costelytra zealandica*.

The Scarabaeinae, with some 14 species, include native species in 2 endemic genera and 4 adventive species in 3 exotic genera (Emberson & Matthews 1973, Paulian 1935, Watt 1984). The Dynastinae include some 5 native species in the endemic genus *Pericoptus* (Endrödi 1974, Watt 1984) and 3 adventive species in exotic genera (Watt 1984). The Aphodiinae are represented by 6 genera, with some 10 native species and several adventive (Richards 1959, Watt 1984).

Scarabaeids include scavenging and/or phytophagous species. The melolonthines have species occurring in many different terrestrial habitats: sand dunes, manuka (*Leptospermum scoparium*) scrub, mixed scrub and forest margin, northern and southern rain forest, subalpine scrub and tussock, river or lakeside sands, and pasturelands (Given 1952). Many species are economically important, with larvae feeding on plant roots (Hoy & Given 1952).

The aphodiines are mainly dung feeders and general scavengers. The endemic dynastines are confined to sandy seashores and river floodplains (Given 1955). The endemic scarabaeines occur predominantly in forest leaf litter, and probably feed on dung of bats, birds, reptiles, and large snails (Emberson & Matthews 1973).

RANGE. North ®, South ®, Stewart ®
Kermadecs ®, Three Kings ®, Chathams ®, Snares ®
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLES. APHODIINAE – *Acrossidius tasmaniae* (Hope, 1847) (Fig. 145), *Phycochus graniceps* Broun, 1886 (Fig. 146); SCARABAEINAE – *Onthophagus granulatus* Boheman, 1858 (Fig. 147); MELOLONTHINAE – *Odontria giveni* Watt, 1984 (Fig. 148), *Costelytra zealandica* (White, 1846) (Fig. 149), *Prodontria lewisi* Broun, 1904 (Fig. 150); DYNASTINAE – *Heteronychus arator* (Fabricius, 1775) (Fig. 151), *Pericoptus truncatus* Fabricius, 1775 (Fig. 152).

REMARKS. Suggested colloquial names: scarab beetles, dung beetles, chafer beetles.

KEY TO SUBFAMILIES OF SCARABAEIDAE

1 Head with anterior margin more or less semicircular, or emarginate medially; clypeal carina continuous with canthus, which extends further laterally than eye; mesocoxae strongly oblique; antennae with 8 or 9 segments ... 2
—Head with anterior margin not as above; clypeal carina separated from canthus by a pronounced emargination on either side; mesocoxae transverse or slightly oblique; antennae often 10-segmented ... 3

2(1) Metatibiae each with 2 apical spurs; mesocoxae oblique and approximated; elytra usually concealing entire abdomen; scutellum present; body usually subparallel ... (Fig. 145, 146) .. **APHODIINAE**
—Metatibiae each with 1 apical spur; mesocoxae distally separated; elytra shortened, leaving pygidium exposed; scutellum not apparent; body stout, oval or rounded ... (Fig. 147) .. **SCARABAEINAE**

3(1) Head and pronotum in males simple; labrum sclerotised, exposed; mandibles concealed from above ... (Fig. 148–150) .. **MELOLONTHINAE**
—Head and pronotum in males usually with horns, tubercles, or complex elevations; labrum membranous, concealed; mandibles usually partly visible from above ... (Fig. 151, 152) .. **DYNASTINAE**

SELECTED REFERENCES. Bain (1980), Barratt (1982), Barratt & Campbell (1982), Brown (1967), Carlson (1991b), Dymock & Forgie (1993), Emberson & Matthews (1973), Emerson & Barratt (1997), Emerson & Wallis (1994), Endrödi (1974), Given (1952, 1954, 1960, 1964, 1966), Hoy & Given (1952), Lowe (1961), Richards (1959), Scholtz (1990), Stebnicka & Howden (1995), Watt (1971, 1979a, 1984).

Series ELATERIFORMIA

For our concept of this series we have followed Lawrence & Newton (1995), who define it in Crowson's (1960) original sense, with Scirtoidea and Dascilloidea included as basal lineages. This series in New Zealand includes four superfamilies: Scirtoidea, Buprestoidea, Byrrhoidea, and Elateroidea. Phylogenetic relationships among the superfamilies are still not well understood (Lawrence & Newton 1995). A cladistic analysis of this group was recently conducted by Lawrence *et al.* (1995).

Lawrence & Britton (1991, 1994) excluded Scirtidae, Eucinetidae, and Clambidae from Elateriformia, and defined the group by the following major characters: heterogeneous life cycle, with long-lived larvae and short-lived adults usually occupying different habitats; surface-active adults often with body streamlined and with a complex pro-mesothoracic interlocking device or, in its absence, a chemical defence system; antennae rarely clubbed, often serrate; metacoxae usually excavated to receive femora.

Superfamily SCIRTOIDEA

Comprises three families with a compacting mechanism in which the head is strongly hypognathous and fits against the procoxae or metasternum in the resting position (Lawrence & Britton 1991, 1994, *q.v.* for larval characteristics).

[16] Family SCIRTIDAE

(=CYPHONIDAE =DASCYLLIDAE =DISCYLLIDAE =HELODIDAE)

Fig. 153, 154

Length 1.5–10 mm Tarsal formula 5-5-5

DIAGNOSIS. **Body brown to black, narrowly oval to nearly round in outline. Head narrow, with sharp genal ridges which rest against the procoxae when head is fully deflexed** (Fig. 12); **eyes small but prominent.** Antennae filiform. **Pronotum short and transverse, often concealing head**, covered by fine, recumbent pubescence. **Elytra often with ridges, and with complete epipleura. Procoxae large and projecting, with prosternal region reduced; metacoxal plates often present; 4th tarsal segment lobed beneath.**

SYNOPSIS. Scirtids are well represented in the New Zealand fauna, and in the southern temperate region in

general. Watt (1982a) recorded 121 nominal native species. Some 125 species are housed in NZAC, and are placed in 11 genera. Scirtids are poorly known in New Zealand; '*Cyphon*' particularly is a widespread genus in need of revision.

Adults may be quite common on vegetation near water, and on flowers, and larvae of some species are associated with water in the base of epiphytic plants, e.g., *Collospermum hastatum*, particularly in wet forest areas. Larvae of *Veronatus* and its allies live in humus-rich soil. In general, scirtid larvae are considered to be filter-feeding detritivores (Beier 1952).

Collecting: beating shrubs, sweeping vegetation in wet places, sifting organic matter near water, intercept traps, and light traps.

RANGE. North ®, South ®, Stewart ®
Kermadecs O, Three Kings ®, Chathams ®, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLES. *Amplectopus pallicornis* Broun, 1886 (Fig. 153), *Veronatus tricostellus* White, 1846 (Fig. 154).

REMARKS. Sharp (1878) divided the New Zealand scirtids into two groups, those with a distinct antennal fossa and those without a fossa or with a weak fossa.

Suggested colloquial name: marsh beetles.

SELECTED REFERENCES. Hannappel & Paulus (1992), LeSage (1991a).

[17] Family EUCINETIDAE

Fig. 155

Length 3.0–3.6 mm Tarsal formula 5-5-5

DIAGNOSIS. **Body streamlined, elliptical,** uniformly brownish to black, **with fine decumbent pubescence. Head deflexed, concealed from above and resting against procoxae. Antennae filiform.** Eyes small but prominent. **Prothorax reduced. Elytra tapering posteriorly, often with fine cross-striations and a longitudinal impressed line on either side of suture. Procoxae projecting, their cavities open; metacoxae expanded, with oblique metacoxal plates enlarged and partly concealing 1st ventrite.** Legs short; tibiae and tarsi of middle and hind legs bearing combs of dark spines. **Adults are capable of jumping** using their modified hind legs.

SYNOPSIS. *Eucinetus stewarti*, a native species, is the only New Zealand eucinetid, and little is known concerning its status and habits. Northern temperate species are known to feed on fruiting bodies of basidiomycete fungi or on slime mould spores (Wheeler & Hoebeke 1984).

RANGE. North ®, South ®, Stewart O
Kermadecs O, Three Kings O, Chathams O, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. *Eucinetus stewarti* (Broun, 1881) (Fig. 155).

REMARKS. Suggested colloquial name: plate-thigh beetles.

SELECTED REFERENCES. Vit (1977a, b), Wheeler & Hoebeke (1984).

[18] Family CLAMBIDAE

Fig. 156

Length 0.8–1.4 mm Tarsal formula 4-4-4

DIAGNOSIS. **Body minute, globular, strongly glossy**, with sparse and indistinct pubescence; **many species are capable of partially rolling themselves into a ball. Head strongly deflexed, large, as broad as three-quarters of maximum pronotal width.** Clypeus pronounced. **Eye simple, or divided by a genal canthus** into dorsal and ventral halves (genus *Clambus*). **Antennae 10-segmented, with a 2-segmented club. Scutellum triangular, large. Procoxae projecting, their cavities open; metacoxae with expanded plates concealing ventrite 1 and folded legs.** Legs short and slender.

SYNOPSIS. Watt (1982a) reported 5 native and 2 adventive nominal species of clambid from New Zealand. Endrödy-Younga (1990) revised the New Zealand clambids, recording 11 species grouped in 2 genera.

Clambids may be found in leaf litter, lawn clippings, garden prunings, and compost. Some species are attracted to light, and can be collected using a UV light trap. Lawrence & Britton (1991, 1994) reported adults feeding on fungal spores. Kuschel (1990) collected species of *Sphaerothorax* in the Auckland area on tree stumps and in loose moss mats of Polytrichaceae, in organic litter, in a heap of *Eucalyptus* branches and cut bamboo in a sheep paddock, in a litter sample taken in *Pittosporum* and *Melicytus* scrub, and at the foot of a high coastal cliff.

RANGE. North ®, South ®, Stewart ®
Kermadecs O, Three Kings ®, Chathams O, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. *Clambus domesticus* Broun, 1886 (Fig. 156).

REMARKS. Suggested colloquial name: clam beetles.

SELECTED REFERENCES. Endrödy-Younga (1990).

Superfamily BUPRESTOIDEA

The phylogenetic affiliations of Buprestidae are not resolved. The group is currently placed in a monotypic superfamily (Lawrence & Britton 1991, 1994). Lawrence (1988) suggested that Buprestidae could be the sister-group of the Byrrhoidea, or might be derived from a dascilloid ancestor.

[19] Family BUPRESTIDAE

Fig. 157

Length 1.7–10 mm Tarsal formula 5-5-5

DIAGNOSIS. **Body bullet-shaped, subparallel, pointed at elytral tip**, metallic green or black, often with bright yellow spots, more or less glossy, heavily sclerotised, appearing glabrous or with scattered hairs. **Head strongly deflexed, deeply inserted into prothorax. Prothorax closely applied to elytra**. Antennae moderately long, threadlike to slightly serrate. **Mesosternum with a large cavity for reception of prosternal process**; metasternum with a curved transverse suture. **First 2 abdominal sternites strongly connate, the suture between them vaguely defined. Procoxae globose, their cavities open. Tarsi with segments 1–4 lobed below.**

SYNOPSIS. Watt (1982a) recorded a total of 4 nominal species of buprestid, whereas Dumbleton (1932) and Clark (1938) had indicated 2 native species and 1 adventive. The native species belong to 2 genera of BUPRESTINAE.

Adults and larvae of *Nascioides enysi* are found in *Nothofagus* forests, and are restricted to beech species (Hudson 1934, Dumbleton 1932, Milligan 1974). In contradiction to earlier beliefs, this species is a symptom rather than the cause of beech mortality. Adults and larvae of *Maoraxia eremita* occur in beech forests, but are not restricted to beech species. The larvae may be found in thin dead branches of *Nothofagus* species (Milligan 1974), and also occur in elm trees, while adults have been collected by beating scrub in summer (Hudson 1934, Dumbleton 1932, Morgan 1966).

A single flying specimen of *Buprestis aurulenta* collected in Remuera, Auckland, represents a species possibly introduced from the north-west coast of the U.S.A. The larvae bore in old wood of most of the Californian pines, and are particularly attracted to fire scars of exposed pitchy wood (Clark 1938).

RANGE. North ®, South ®, Stewart O
Kermadecs O, Three Kings O, Chathams O, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. BUPRESTINAE – *Nascioides enysi* (Sharp, 1877) (Fig. 157).

REMARKS. Suggested colloquial name: jewel beetles.

SELECTED REFERENCES. Bellamy & Williams (1985), Clark (1938), Dumbleton (1932), Milligan (1974, 1985), Morgan (1966), Stuart (1955).

Superfamily BYRRHOIDEA

The superfamily concept used here is after Lawrence & Britton (1991). Almost all species of Byrrhoidea are aquatic, semiaquatic, or associated with foliage beside streams. They have 5-5-5-segmented tarsi with the enlarged last segment bearing pronounced claws (except for Heteroceridae and some Byrrhidae, which have 4-4-4-segmented tarsi). Adults have a sophisticated type of wing-folding mechanism, and larvae usually have a single pretarsal seta.

Adults of Byrrhidae, Dryopidae, Elmidae, Limnichidae, and Ptilodactylidae have the following characteristics: head more or less concealed by pronotum from above; tarsi 5-5-5-segmented, with last segment enlarged; legs retractable into body cavities; prosternum with a process fitting into a cavity of mesosternum (Fig. 52, 53); body convex dorsally; antennae slender, sometimes weakly or distinctly clubbed. The family Heteroceridae is the most divergent in this group, and distinguished by prognathous head, short, thick, sawtoothed antennae, flat, spinose tibiae, and 4-4-4-segmented tarsi, with the last segment not pronounced. The family Chelonariidae is also quite distinct, but probably close to the main byrrhid lineage.

[20] Family BYRRHIDAE

Fig. 158

Length 1.8–8 mm Tarsal formula 4-4-4 or 5-5-5

DIAGNOSIS. Body black, brown, or greyish, sometimes metallic green, **broadly oval, short, stout, and usually strongly convex dorsally;** dorsal surface usually glabrous and strongly glossy, rarely dull and pubescent with patches of paler hair and with short bristles. **Head directed downwards, more or less concealed from above. Antennae 10- or 11-segmented, usually weakly clubbed**, with segments 3–7 gradually enlarged. **Elytra often pointed posteriorly**, often with distinct striae. **Legs often retractable into cavities of mesosternum, and prosternum with a broad process fitting into cavity of mesosternum** (Fig. 52, 53). **Procoxae transverse, with cavities open. Tarsi with segment 3 bearing an anteriorly directed membranous appendage below.**

SYNOPSIS. Watt (1982a) recorded 49 nominal native species of byrrhid from New Zealand and over 79, many undescribed, in NZAC. Broun (1910b) recognised 8 genera (including *Nosodendron*, now in the family Nosodendridae [33]); today there are 8 genera in two subfamilies – BYRRHINAE and SYNCALYPTINAE. Aspects of the higher classification of Byrrhidae are discussed by Watt (1971).

Adults have been collected from under stones and on *Celmisia* daisies in the mountains, and by beating moss-covered trees or shrubs; larvae have been found on moss and feeding on it (Broun 1910b, Hudson 1934). Kuschel (1990) recorded 2 species at Lynfield, Auckland, collected on logs and on fairly damp ground and stream beds with moss and liverworts. In general adults and larvae occur on mosses or liverworts, and some are found among the roots of higher plants (Lawrence & Britton 1991, 1994). They may be collected on moss, on the ground, or on tree trunks at night, as they appear to be nocturnal feeders.

RANGE. North ®, South ®, Stewart ®
Kermadecs O, Three Kings ®, Chathams O, Snares ®
Aucklands ®, Campbell ®, Antipodes O, Bounties O

EXAMPLE. BYRRHINAE – *Liochoria huttoni* Pascoe, 1875 (Fig. 158).

REMARKS. The New Zealand fauna is diverse, but is poorly understood at the generic and specific level, and the group requires revision.

Suggested colloquial name: moss beetles.

SELECTED REFERENCES. Broun (1910b), Gressitt & Samuelson (1964a), Watt (1971).

[21] Family DRYOPIDAE

Fig. 159

Length 3–5 mm Tarsal formula 5-5-5

DIAGNOSIS. **Body broadly oval, usually more or less cylindrical, bluntly triangular posteriorly**, brown to black, glossy, **covered with long, unruly, protruding hairs. Antennae short, with a comb-like asymmetrical club of 7 segments** (Fig. 29). **Pronotum with an impressed longitudinal groove on either side. Base of elytra with several impressions. Prosternal process broadly and deeply received into mesosternum. Procoxae transverse, their cavities open.** Legs large, thick. **Last tarsal segment enlarged** and often as long as 3 or all remaining segments, with large claws.

SYNOPSIS. Watt (1982a) recorded 4 native species of dryopid in New Zealand, in 2 genera, whereas Hudson (1934) had listed only 2 native species.

Adults and larvae of *Parnida agrestis* may be found in leaf litter, commonly in litter of hard beech (*Nothofagus truncata*) forests. Adults of *P. longulus* occur under logs in very wet places, and those of *P. agrestis* in river beds, running over stones at the water's edge in hot sunshine (Hudson 1934).

RANGE. North ®, South ®, Stewart O
Kermadecs O, Three Kings O, Chathams O, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. *Parnida agrestis* Broun, 1880 (Fig. 159).

REMARKS. Suggested colloquial name: hairy water beetles.

SELECTED REFERENCES. Brown (1981b, 1991a).

[22] Family ELMIDAE

Fig. 160

Length 2.8–5.0 mm Tarsal formula 5-5-5

DIAGNOSIS. **Body narrowly oval, slightly pointed posteriorly,** black, greyish-black, or brownish-black, sometimes slightly iridescent, moderately glossy or dull (when glossy often with a metallic sheen), **with fine and sparse pubescence, usually of a velvety appearance. Head small. Antennae moderately elongate and slender**, sometimes appearing slightly bead-like. **Eyes prominent and protruding. Pronotum trapezoidal, with sharp basal angles, narrower than elytral base. Elytra with rows of punctures. Procoxae transverse, their cavities open behind. Legs large, stout. Tarsal segments simple, the last segment enlarged** and with moderately large claws.

SYNOPSIS. Watt (1982a) recorded 7 nominal native species of elmid, but some 16 species are now represented in NZAC, many of them undescribed. All New Zealand elmids belong to a single genus of subfamily LARAINAE.

Elmids are aquatic or semiaquatic, but none can swim. Hudson (1934) reported adults of *Hydora picea* in river beds running over stones at the water's edge, sometimes taking wing with great rapidity. In general the adults may be found on stones in river and stream margins, and the larvae live under stones near the water. Few larvae have been associated with adults, and careful rearing is needed to provide information for systematic studies.

RANGE. North ®, South ®, Stewart ®
Kermadecs O, Three Kings O, Chathams O, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. LARAINAE – *Hydora picea* Broun, 1880 (Fig. 160).

REMARKS. Our elmid fauna is relatively diverse but poorly known, and there are probably many undescribed species. The southerrn Larainae are under revision by Dr Manfred Jäch (Naturhistorisches Museum, Vienna).

Suggested colloquial name: riffle beetles.

SELECTED REFERENCES. Brown (1981a, 1991c), Spangler & Brown (1981).

[23] Family LIMNICHIDAE

Fig. 161

Length 1–2.5 mm Tarsal formula 4-4-4 (Hyphalinae), 5-5-5 (Limnichinae)

DIAGNOSIS. **Body minute to small, oval, convex, moderately glossy**, black, with short yellowish or greyish **pubescence often forming wavy patterns on pronotum and elytra. Frontoclypeal suture present**; clypeus distinct. **Antennae slender, often with a 3-segmented club; basalmost 2 segments enlarged**; antennal insertion on base of frons. **Pronotal base sinuate. Scutellum large. Procoxae transverse, their cavities open** behind. Mesosternum long and wide, well extended into procoxae; **metasternum with a distinct transverse suture**. As in byrrhids, **legs may be folded into ventral cavities.**

SYNOPSIS. Watt (1982a) reported 7 nominal native species of limnichid and 1 adventive. The 2 limnichid genera in New Zealand belong in subfamilies HYPHALINAE (5 species) and LIMNICHINAE (3 species, with possibly a fourth undescribed).

Species of *Hyphalus* are known from the intertidal zone on barnacle-encrusted rocks and beach rocks. Species of *Limnichus* occur under rocks at the margin of streams and rivers, and in moist litter in forested areas (e.g., *Nothofagus* forest).

RANGE. North ®, South ®, Stewart O
Kermadecs O, Three Kings O, Chathams O, Snares O Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. LIMNICHINAE – *Limnichus nigripes* Broun, 1886 (Fig. 161).

REMARKS. Very little is known about New Zealand's Limnichidae.

Suggested colloquial name: lake beetles.

SELECTED REFERENCES. Britton (1973, 1977), Brown (1991b).

[24] Family HETEROCERIDAE

Fig. 162

Length 3.8–4 mm Tarsal formula 4-4-4

DIAGNOSIS. **Body robust, elongate,** densely pubescent, **the pubescence forming a variegated pattern. Head prognathous**, with strong mandibles and with large labrum and clypeus. **Antennae short and thick, with an elongate, apparently 7-segmented club**. Pronotum strongly transverse. **Elytra largely subparallel. Procoxae transverse, their cavities open** behind. **Tibiae flattened, spinose.**

SYNOPSIS. Heterocerids are represented in New Zealand by a single native species in the type genus. The type specimen is from Wedderburn in Central Otago, but the species has also been found at Whatipu and Bethels Beach near Auckland, Ballantrae near Palmerston North, Haumoana near Hastings, and in Northland.

All known species live in tunnels in moist sand or mud, and feed on algae and organic debris. Our species may be found in mud alongside streams and rivers, where adults may be collected by 'shore washing' with water and collecting floating debris by net. Occasionally large numbers of adults have been caught in light traps near rivers.

RANGE. North ®, South ®, Stewart O
Kermadecs O, Three Kings O, Chathams O, Snares O Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. HETEROCERINAE – *Heterocerus novaeselandiae* Charpentier, 1968 (Fig. 162).

REMARKS. There are related species in Australia.

Suggested colloquial name: mud beetles.

SELECTED REFERENCES. Charpentier (1968).

[25] Family PTILODACTYLIDAE

Fig. 163

Length 5–8 mm Tarsal formula 5-5-5

DIAGNOSIS. **Body oblong to elongate,** pale brown sometimes with a reddish tinge to dark brown, moderately densely pubescent. **Head small, strongly deflexed and concealed from above**; frontal suture distinct. **Antennae 11-segmented, filiform or serrate, moderately long** (Fig. 20). **Eyes large and protruding. Pronotum small, transverse, with a well developed basal locking mechanism consisting of a comb with small teeth or crenulations; lateral carinae sharp and incomplete anteriorly**. Elytra striate. **Scutellum heart-shaped**, notched anteriorly. **Procoxae conical, transverse, narrowly separated, their cavities open behind. Tarsi simple; tarsomere 4 small.**

SYNOPSIS. Watt (1982a) reported 2 nominal native species of ptilodactylid and a total of some 8 species, several undescribed, represented in NZAC. As conceived here, the family includes 1 described species of *Byrrocryptus* (subfamily ANCHYTARSINAE) with 4–7 awaiting description, and possibly another undescribed genus (Kuschel 1990). Following the classification proposed by Lawrence & Newton (1995), *Brounia*—hitherto placed in Ptilodactylidae—is transferred to Chelonariidae [26].

Adults are predacious, and occur on vegetation near water in wooded areas. Kuschel (1990) reported adults of *Byrrocryptus* collected by Malaise trap near a stream,

underneath overhanging stream banks, and amongst fern and moss on a steep, seeping slope. Specimens of *B. urquharti* have been collected by beating vegetation near margins of streams. Ptilodactylid larvae from other regions occur in wet habitats, and may be riparian or aquatic; they feed on rotting vegetation, including leaves, roots, or dead wood (Lawrence 1991, LeSage & Harper 1976).

RANGE. North ®, South ®, Stewart O
Kermadecs O, Three Kings O, Chathams O, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. ANCHYTARSINAE – *Byrrocryptus urquharti* Broun, 1893 (Fig. 163).

REMARKS. The New Zealand fauna of Ptilodactylidae is probably richer than is apparent from its representation in collections. The subfamily Anchytarsinae is almost certainly paraphyletic, as suggested by Lawrence & Newton (1995). *Byrrocryptus*, which occurs also in Australia, was placed in this subfamily on the basis of a larval synapomorphy—longitudinal division of expanded submentum into three parts—with four other genera unknown in New Zealand (Lawrence & Newton 1995). The entire group is much in need of revision.

Suggested colloquial name: comb-waist beetles.

SELECTED REFERENCES. Stribling (1986).

[26] Family CHELONARIIDAE

Fig. 164a,b

Length 5–6 mm Tarsal formula 5-5-5

DIAGNOSIS. **Body narrowly oval, partly subparallel, moderately convex, in lateral view with an anterodorsal pronotal hump, black. Head small, strongly deflexed, concealed from above; frontal suture distinct. Antennae 11-segmented, with basal 2 segments small and segments 4–11 pectinate, asymmetrical** (Fig. 22). **Eyes large and protruding. Pronotum small, transverse, with a well developed basal locking mechanism consisting of a comb with small teeth; lateral carinae sharp and complete. Elytra with faint indications of striae. Scutellum small, oval. Procoxae transverse, their cavities open behind**; mesocoxae separated by a distance shorter than coxal width; metacoxae transverse, in contact basally. Metasternal longitudinal suture present and transverse suture absent. **Tarsi simple, with segment 3 bilobed beneath and segment 4 minute**.

SYNOPSIS. There is a single native species of chelonariid, *Brounia thoracica*, in New Zealand. We have examined only 1 specimen, collected in a Malaise trap in cattle-browsed forest at Hicks Bay, north of Te Araroa.

RANGE. North ®, South O, Stewart O
Kermadecs O, Three Kings O, Chathams O, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. *Brounia thoracica* Sharp, 1878 (Fig. 164).

REMARKS. According to Lawrence & Newton (1995) *B. thoracica* resembles some members of the Callirhipidae more than it does species of *Chelonarium* or *Pseudochelonarium* (Chelonariidae), but it shares the serrate tibiae, tarsal structures, wing venation, and type of male genitalia typical of chelonariids.

Suggested colloquial name: none.

SELECTED REFERENCES. Lawrence & Newton (1995).

Superfamily ELATEROIDEA

The superfamily definition used here is after Lawrence & Britton (1991, 1994) and Lawrence & Newton (1995). Adults of all elateroids lack a mandibular mola and a transverse metasternal suture, and have an unsophisticated wing-folding mechanism; larvae have a single stemma on either side of the head and a feeding mechanism adapted for liquid diets (Lawrence & Britton 1991, 1994). These plant-feeders usually have the rear of the prosternum elongated into a process that fits into the mesosternum (Fig. 54). Phylogeny is discussed by Muona (1996).

[27] Family EUCNEMIDAE

[assisted by J. Muona]

Fig. 165

Length 4–10 mm Tarsal formula 5-5-5

DIAGNOSIS. **Very similar to Elateridae [28], but differing in having the labrum membranous and concealed beneath the clypeus**. Body brown to black, narrowly elongate, subparallel, pubescent, broadest at pronotum and tapering posteriorly. Front edge of prosternum straight across and not lobed. Head deflexed. Antennae 11-segmented, filiform or serrate. **Pronotum with hind angles acutely produced posteriorly**. Elytra striate. **Clicking device present (consisting of prosternal process fitting into mesosternal cavity), clicking ability well developed. Procoxae globular, their cavities open.** Tarsomeres simple. **First 5 ventrites connate.**

SYNOPSIS. Watt (1982a) reported 20 nominal native species of eucnemid from New Zealand. We estimate 22 species, including 2 undescribed, in 7 genera and 2 subfamilies – MELASINAE and MACRAULACINAE. Apart from the scattered original descriptions, very little information is available on the group.

Adults may be found on forest growth, in leaf litter or wood mould. Kuschel (1991a) reported 2 eucnemid species collected under bark of *Pinus radiata* logs lying in the bush and in decayed wood in the Auckland area. Hudson (1934) recorded some species collected by beating forest growth. May also be collected using interception traps, including Malaise traps, or by sweeping forest vegetation.

New Zealand larvae are known from dead wood of *Metrosideros* (rata). Most Australian larvae also occur in dead wood (Lawrence & Britton 1991, 1994), and Nearctic larvae of the group are known as cross-wood borers because they cut characteristic mines across the grain of wood (White 1983).

RANGE. North ®, South ®, Stewart ®
Kermadecs O, Three Kings O, Chathams ®, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. MELASINAE – *Neocharis simplex* Sharp, 1877 (Fig. 165).

REMARKS. In early classifications the eucnemids were treated as a subfamily of Elateridae [28], but Broun treated them as a distinct family. Their phylogeny, classification, biogeography, and biology (including New Zealand genera) were recently reviewed by Muona (1991, 1993).

Suggested colloquial name: false click beetles.

SELECTED REFERENCES. Muona (1991, 1993), Sharp (1877b).

[28] Family ELATERIDAE

[assisted by J. Muona]

Fig. 166, 167

Length 3–30 mm Tarsal formula 5-5-5

DIAGNOSIS. **Body elongate, narrow, cylindrical to slightly flattened**, usually brown or black, rarely spotted, finely pubescent or nearly glabrous, often glossy, with medial part usually subparallel and both ends rounded. **Head with labrum sclerotised, visible and free, and clypeus not distinct**. Antennae 11-segmented, located near but not between eyes, usually sawtoothed or comb-like, never clubbed. **Prothorax loosely joining mesothorax and capable of rapid movement on basal joint, which produces a jumping movement. Pronotum with hind angles acutely produced posteriorly. Click mechanism always present** (Fig. 54)—the most distinctive feature of the family, consisting of prosternal process and mesosternal cavity. Elytra usually subparallel for most of length, tapering posteriorly. **Procoxae globose, their cavity open behind**. Tarsi simple, sometimes with setal brushes or membranous appendages. Prosternum truncate or lobed in front. **Abdomen with 5 ventrites, rarely 6, all usually well separated, the last 2 connected by a membranous suture.**

SYNOPSIS. Watt (1982a) reported 132 native and 3 adventive species of elaterid in New Zealand, belonging to 26 genera in 6 subfamilies – AGRYPNINAE, PITYOBIINAE, DENTICOLLINAE, LISSOMINAE (PROTELATERINAE), ELATERINAE, and CARDIOPHORINAE. For subfamily and tribal identification, see Stibick (1979).

Adults occur on foliage of trees and shrubs, in rotting logs, under bark of dead trees, and on the ground, and may be collected by sweeping vegetation, collecting at light, or netting in flight in the daytime. Kuschel (1990) collected adults at Lynfield, Auckland from vegetation by beating, from *Acacia* and *Eucalyptus*, in bush litter and on low-growing plants at night, at light, in paddocks, in Malaise traps, in leaf litter and prunings, under bark, from sifted decaying wood, and reared from abandoned boards of *Pinus radiata*.

According to Lawrence & Britton (1991, 1994), in general there are three types of elaterid larvae: (a) saprophagous – feeding on rotten wood; (b) phytophagous – feeding mainly on roots of plants; and (c) predacious. Many phytophagous larvae, known as wireworms, are agricultural pests feeding on roots of cereals and other plants. For example, *Ctenicera* larvae are soil-inhabiting wireworms, some of them damaging root vegetables such as carrots. *Thoramus* larvae live in dead wood, including standing dead trunks of *Pinus radiata*, where they prey on larvae of Cerambycidae. Most larvae are probably facultative predators on soil-inhabiting arthropods.

RANGE. North ®, South ®, Stewart ®
Kermadecs ®, Three Kings ®, Chathams ®, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLES. AGRYPNINAE – *Thoramus wakefieldi* Sharp, 1877 (Fig. 166); DENTICOLLINAE – *Amychus candezei* Pascoe, 1876 (Fig. 167).

REMARKS. This group is in need of taxonomic revision, as there is no comprehensive treatment available. The general classification of Elateridae is in a state of flux, and the subfamilies are variously combined by different authors (Lawrence & Newton 1995).

Suggested colloquial name: click beetles (some larvae – wireworms).

SELECTED REFERENCES. Calder (1976, 1984, 1996), Gaedike (1969), Sharp (1877b), Stibick (1979).

[29] Family LYCIDAE

Fig. 168

Length 9–10 mm Tarsal formula 5-5-5

DIAGNOSIS. **Body black and orange, soft, flattened, loosely formed. Head small, partially concealed from above. Antennal bases in proximity**; antennae thick, strongly serrate, moderately long (Fig. 21). **Eyes protruding. Pronotum narrower at base than elytra, with several ridges dividing disc into irregular depressions**; base slightly sinuate. **Elytra leathery,** narrowly elongate, subparallel, expanded beyond body margins, **with distinct round humeri and longitudinal ridges**, between ridges **with a double row of large punctures. Procoxae projecting, their cavities open** behind. Femora and tibiae slightly flattened. **Tarsi with segment 3 and particularly segment 4 bilobed.**

SYNOPSIS. Watt (1982a) recorded a single species of lycid from New Zealand, corresponding to *Metriorrhynchus erraticus* Broun (1893a), described from Drury, Pokeno, and Clevedon. This is implicitly a synonym of *Porrostoma rufipenne*, an adventive Australian species, reported by Kuschel (1990) from Lynfield, Auckland.

Adults fly on warm days, and feed on flower nectar and pollen. Larvae may be found under the bark of logs.

RANGE. North ®, South ®, Stewart O
Kermadecs O, Three Kings O, Chathams O, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. *Porrostoma rufipenne* (Fabricius, 1801) (Fig. 168).

REMARKS. The bright colours of, e.g., *Porrostoma rufipenne* may be a warning signal to potential predators, since lycids in general are believed to mimic the colours of insects distasteful to predators.

Suggested colloquial name: net-winged beetles.

SELECTED REFERENCES. Bocák & Bocáková (1990).

[30] Family CANTHARIDAE

Fig. 169

Length 1.9–7 mm Tarsal formula 5-5-5

DIAGNOSIS. **Body usually uniformly black or brown, sometimes with pronotum yellowish to orange, soft**, narrowly oval to subparallel, slightly convex to flattened, moderately densely pubescent, often slightly glossy. **Head large, deflexed but partially visible from above. Eyes protruding. Labrum membranous and inconspicuous. Antennae filiform** (Fig. 17) **or serrate, with insertions well separated.** Pronotum transverse, broadly oval or approximately subquadrate, sometimes with 2 small, round basal impressions, and sometimes emarginate. **Elytra narrowly oval, often subparallel** for most of length, **usually loosely covering abdomen but sometimes distinctly shortened**, exposing wings and many tergites, often with inconspicuous ridges. **Procoxae projecting, their cavities open.** Legs long and slender. **Tarsi with segment 4 bilobed.**

SYNOPSIS. Watt (1982a) recorded 40 native and 1 adventive species of cantharid in New Zealand, belonging to 3 genera in 2 subfamilies – DYSMORPHOCERINAE and MALTHININAE. By far the most species (37) are placed in *Asilis* (Wittmer 1979). A new subfamily classification was proposed by Brancucci (1980).

Adults are diurnal and often seen on flowers and foliage of various trees and shrubs, and occasionally may be found under stones and bark. The majority of species are believed to be predacious on other insects, but some feed on plants, nectar, and pollen (LeSage 1991b). A common method for collecting adults is sweeping and beating vegetation.

Kuschel (1990) reported 3 cantharid species from Auckland, collected by sweeping grass and weeds, beating vegetation, from flowers in a swamp, and in a Malaise trap. Larvae are primarily nocturnal, preying chiefly on small arthropods living in debris on the ground (LeSage 1991b). In New Zealand some larvae have been extracted from leaf litter using Berlese funnels.

RANGE. North ®, South ®, Stewart O
Kermadecs O, Three Kings O, Chathams O, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. DYSMORPHOCERINAE – *Asilis fulvithorax* (Broun, 1880) (Fig. 169).

REMARKS. Suggested colloquial name: soldier beetles.

SELECTED REFERENCES. Brancucci (1980), LeSage (1991b), Wittmer (1979).

Series BOSTRICHIFORMIA

We have followed the concept of Lawrence & Britton (1991, 1994) and Lawrence & Newton (1995) in defining this group. It is considered to be a paraphyletic assemblage consisting of Polyphaga with strong affiliation to the cucujiform lineage, but lacking shared apomorphies with the series Cucujiformia. Jacobsoniidae are tentatively included here because they lack some important synapomorphies of Cucujiformia (Lawrence & Newton 1995).

Superfamily DERODONTOIDEA

Members of this group are distinct in having paired ocelli on the frons, an elaborate system of depressions and usually ridges and canals on head and pronotum, and elytral striae with deep basal pits.

[31] Family DERODONTIDAE

Fig. 170

Length 2.0–2.4 mm Tarsal formula 5-5-5

DIAGNOSIS. Body small, **approximately oval in outline, brown or black**, moderately glossy, with inconspicuous short adherent pubescence. **Head with paired ocelli and usually elaborate depressions. Antennae 11-segmented, the basalmost 2 segments enlarged, and with a 3-segmented club.** Eyes protruding, coarsely faceted. **Pronotum** distinctly narrower than base of elytra, **with a series of depressions and usually with ridges dividing disc into several sections.** Elytra broadly oval, with deeply impressed striae each usually having a deep pit at base. **Procoxae projecting, their cavities usually closed behind; metacoxae transverse, with well developed plates.**

SYNOPSIS. There are 2 native species of derodontid in New Zealand, both in genus *Nothoderodontus* of subfamily LARICOBIINAE (Watt 1982a, Lawrence 1985, Lawrence & Newton 1995).

Nothoderodontus gourlayi feeds on hyphae and conidia of sooty moulds (Ascomycetes: Capnodiaceae and related families) (Lawrence 1985). Specimens including larvae have been taken in *Nothofagus* forest from sooty mould growing on the honeydew excreted by a scale insect.

RANGE. North O, South ®, Stewart O
Kermadecs O, Three Kings O, Chathams O, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. LARICOBIINAE – *Nothoderodontus gourlayi* Crowson, 1959 (Fig. 170).

REMARKS. Derodontids are considered to be among the most primitive of Polyphaga (Lawrence & Newton 1995).

Suggested colloquial name: sooty fungus beetles.

SELECTED REFERENCES. Crowson (1959), Lawrence (1985), Lawrence & Hlavac (1979).

Superfamily BOSTRICHOIDEA

The concept used here is after Lawrence & Britton (1991, 1994) and Lawrence & Newton (1995). The superfamily comprises five very diverse families (Anobiidae, Bostrichidae, Dermestidae, Jacobsoniidae, and Nosodendridae), all with 5-5-5-segmented tarsi. Lawrence & Newton (1982) and Lawrence & Britton (1991, 1994) proposed inclusion of the Dermestidae in Bostrichoidea on the basis of modified cryptonephridism, similar aedeagal structures, and lack of a basal mandibular mola in larvae. Ivie (1985) added Nosodendridae to this superfamily on the grounds of assumed secondary loss of cryptonephridism in both Dermestidae and Nosodendridae. Lawrence & Britton (1991, 1994) and Lawrence & Newton (1995) considered their placement of Jacobsoniidae in Bostrichoidea to be a tentative arrangement, as at present there is only weak evidence of some similarity between the two groups in aedeagal characters.

[32] Family JACOBSONIIDAE

Fig. 171

Length 0.7–2 mm Tarsal formula 5-5-5 or 3-3-3 (appearing 2-2-2)

DIAGNOSIS. **Body small to minute, elongate, reddish-brown or brown, glossy, usually punctate, with (unique character) metasternum at least as long as 5 visible sternites combined**, giving the appearance of hind legs emerging near the end of the abdomen. **Antennae with a 1–3-segmented club. Procoxae projecting, their cavities usually open.**

Of the two distinct groups in our fauna the first, represented by a single species in genus *Saphophagus*, has the body larger (length 1.9–2 mm) and tarsi 5-5-5-segmented. The second comprises possibly three undescribed native or introduced species in genus *Derolathrus*, distinct by their minute body size (length 0.7–0.8 mm), yellowish rust-brown colour, antennae appearing to have a 1-segmented club, **head abruptly constricted behind eyes to form short temples**, oval pronotum, and narrowly oval elytra, tapering distally.

SYNOPSIS. Watt (1982a) recorded 1 described native species and 2 other species of jacobsoniid housed in NZAC. These are grouped in 2 genera – *Saphophagus*, with 1 native species known only from the South Island, and *Derolathrus*, with 1 undescribed species (or possibly 3), collected in Omahuta State Forest, Northland, and on Codfish Island and Rurima Island in the far south. Derolathrines are also known from Norfolk Island, Lord Howe Island, Christmas Island, and Australia (Lawrence & Britton 1991, 1994, Löbl & Burckhardt 1988). Crowson (1959) considers *S. minutus* to be one of the most remarkable of New Zealand's endemic insects, possibly a relict coeval with the tuatara, *Sphenodon*.

Adults of *S. minutus* occur under loose bark of dead *Nothofagus* branches. Larvae of *S. minutus* described by Crowson (1959) were found under moist and close-fitting bark of dead *Nothofagus* or, in one instance, of pukatea *(Laurelia novae-zelandiae)*. Specimens of *Derolathrus* were found in guano and in a nest of kiore, *Rattus exulans*.

RANGE. North ®, South ®, Stewart ®
Kermadecs O, Three Kings O, Chathams O, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. *Saphophagus minutus* Sharp, 1886 (Fig. 171).

REMARKS. The taxonomic position of this small family is uncertain (Lawrence & Newton 1995).

Suggested colloquial name: Jacobson's beetles.

SELECTED REFERENCES. Crowson (1959), Löbl & Burckhard (1988).

[33] Family NOSODENDRIDAE

Fig. 172

Length 4–7 mm Tarsal formula 5-5-5

DIAGNOSIS. **Body black, ovoid, strongly convex, glabrous or with sparsely distributed short bristles**, moderately to strongly glossy. **Head prognathous and not retractable**; clypeus narrow but visible; maxillae and prementum concealed beneath enlarged mentum. **Antennae 11-segmented, with a 3-segmented tomentose club**. Pronotum strongly transverse (Fig. 118). Scutellum triangular, large. Elytra broadly curved laterally, rounded posteriorly, with punctate or setose striae. **Prosternum with a triangular process fitting into mesosternal cavity. Procoxae transverse, their cavities open. Legs capable of folding into ventral cavities. Tarsal segments simple**.

SYNOPSIS. Watt (1982a) recorded 2 native species of nosodendrid in New Zealand, whereas Hudson (1934) and Endrödy-Younga (1989) reported 3 species. There are 2 species represented in NZAC, *Nosodendron zealandicum* and the smaller *N. ovatum*.

Adults are encountered infrequently in slime fluxes on wounded trees, where they probably feed on bacteria and products of fermentation. Specimens of *N. ovatum* have been collected from under rotten branches, from litter, and one from bat guano; two specimens of *N. zealandicum* were taken in a light trap. No habitat data for our larvae are available, but Lawrence & Britton (1991, 1994) reported larvae of Australian species living in slime fluxes.

RANGE. North ®, South ®, Stewart O
Kermadecs O, Three Kings ®, Chathams O, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. *Nosodendron zealandicum* Sharp, 1882 (Fig. 172).

REMARKS. Adults of Nosodendridae may be readily distinguished from the externally similar Byrrhidae [20] by their prognathous (not retractable) head, distinct clypeus, and enlarged mentum.

Suggested colloquial name: wounded tree beetles.

SELECTED REFERENCES. Crowson (1959), Endrödy-Younga (1989).

[34] Family DERMESTIDAE

Fig. 173

Length 3–10 mm Tarsal formula 5-5-5

DIAGNOSIS. **Body compact, usually robust, oblong, elliptical, or broadly ovate**, usually brown to black, rarely reddish-brown (*Trichelodes*), sometimes with pale spots, slightly to strongly glossy, **clothed with short or long, erect or decumbent hairs or scales, these often forming patterns. Head deflexed and more or less concealed from above, usually with a median ocellus. Antennae filiform or pectinate, short and clubbed, the club usually 3-segmented but sometimes 4–8-segmented**; antennae often fitting into grooves below either side of pronotum. Eyes moderate-sized to large and protruding. **Pronotum transverse, narrower than elytral base, sometimes strongly convex medio-apically, giving a hump-backed appearance laterally**, usually with sharp lateral margins (absent in Trichelodini). **Procoxae transverse, conical or globose and usually projecting, their cavities open; metacoxae usually excavated for reception of femora** (Fig. 56). **Tarsal segments simple.**

SYNOPSIS. Watt (1982a) reported 11 native and 6 adventive species of dermestid in New Zealand. They belong in 7 genera representing 4 subfamilies – DERMESTINAE, TRINODINAE, ATTAGENINAE, and MEGATOMINAE. Species of *Anthrenocerus*, *Anthrenus*, *Attagenus*, *Dermestes*, and *Trogoderma* especially are economically important, and are represented here mostly by adventive cosmopolitan species. According to Crowson (1959) native New Zealand species represent only 2 of the 6 subfamilies that he recognised, Trinodinae (*Trichelodes*) and Anthreninae (*Trogoderma*). Kuschel (1990) recorded 8 species from the Auckland area, most with adults taken from flowers.

In general adult dermestids usually feed on nectar or pollen (e.g., *Anthrenus*, *Trogoderma*), though some species are known to use the larval food sources or do not take food at all (Booth *et al.* 1990, Lawrence & Britton 1991, 1994). Larvae are primarily scavengers, feeding on dried animal remains such as bones, meat or carrion, hides, furs, leather, wool and woollen products, silk, feathers, dried insects, spider webbing, nests of birds and mammals, and even wasps' nests (*Reesa vespulae* – Waller & Watt 1979), and some are known from stored grain. Some species of *Trogoderma* can subsist partly or entirely on vegetable matter. Larvae of *Trogoderma* were reported by Crowson (1959) from a number of unspecified New Zealand localities, in cavities and under dry bark, mainly of Podocarpaceae, and especially rimu *(Dacrydium cupressinum)*.

For cosmopolitan pest species of this group see Booth *et al.* (1990), Bousquet (1990), Harney (1993), and Lawrence & Britton (1994). Adventive species in New Zealand include the carpet beetle, *Anthrenus verbasci*,

larvae of which can seriously damage untreated woollen carpets and garments; adults may be found on flowers in spring. The Australian carpet beetle, *Anthrenocerus australis*, has rather similar habits. The hide beetle, *Dermestes maculatus*, can seriously damage hides and skins. When ready to pupate, its larvae bore into wood or other dense material, often causing damage to structural timbers.

RANGE. North ®, South ®, Stewart O
Kermadecs ®, Three Kings O, Chathams ®, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. MEGATOMINAE – *Trogoderma maestum* Broun, 1880 (Fig. 173).

REMARKS. An economically important group with several serious pests of hides, wool products, museum collections, and stored grain products. The dry exuviae and spear-headed hairs of the larvae can cause asthma or allergies.

Suggested colloquial name: hide beetles.

SELECTED REFERENCES. Beal (1991), Crowson (1959), Mroczkowski (1968), Peacock (1978, 1993).

[35] Family BOSTRICHIDAE
(incl. LYCTINAE)

Fig. 174–176

Length 3–7 mm Tarsal formula 5-5-5

DIAGNOSIS. **There are three distinct morphological types of bostrichid in our fauna.**

The first type (Fig. 174), represented by the monotypic genus *Euderia* (EUDERINAE), may be characterised as follows. **Body (except pronotum) elongate and slightly flattened; dorsal surface with protuberances and depressions, and covered with white and brown scales forming a pattern. Antennae with a 3-segmented club, consisting in males of long flabellate branches and in females of shorter asymmetrical segments. Pronotum narrow, irregularly cylindrical, as broad as head. Eyes large, protruding. Elytra subparallel, nearly twice as broad at base as pronotum, and with distinct shoulders.** Tarsi with basal segment as long as the following two combined.

The second type (Fig. 175) is represented by mainly introduced species of DINODERINAE (*Dinoderus*, *Rhizopertha*), and may be characterised as follows. **Body cylindrical, similar to Scolytinae [82]. Head partially or completely concealed from above by the hood-like extended pronotum. Antennae with a 3-segmented asymmetrical club. Pronotum with rasplike teeth at front. Elytra often obliquely cut posteriorly, and usually bearing spines or lateral teeth.**

The third type (Fig. 176), represented by members of the LYCTINAE, is distinguished as follows. **Body elongate but flattened. Head prognathous, visible from above. Antennae with a compact 2-segmented club. Pronotum approximately trapezoidal, broadest apically, with distinct lateral carinae. Elytra subparallel, with parallel rows of hairs. Tarsi with basalmost 4 segments equally short.**

SYNOPSIS. Watt (1982a) reported 1 native, 2 adventive, and 1 undescribed species of bostrichid (including Lyctinae) in New Zealand. Our current estimate indicates 8 species, in 4 genera and 3 subfamilies – DINODERINAE, LYCTINAE, and EUDERINAE (see Remarks for details). *Euderia* is represented by a single native species, and the remaining genera by adventive pest species.

Adults of *Euderia squamosa* have been collected by beating *Nothofagus* branches, and larvae have been found in galleries in moist or sappy bark of dead or injured trees. A detailed description of the bostrichid larva is provided by Crowson (1961). Elsewhere, bostrichids are known to bore into sapwood and bamboo.

RANGE. North ®, South ®, Stewart O
Kermadecs O, Three Kings O, Chathams O, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLES. EUDERINAE – *Euderia squamosa* Broun, 1880 (Fig. 174); DINODERINAE – *Dinoderus minutus* (Fabricius, 1775) (Fig. 175); LYCTINAE – *Lyctus brunneus* (Stephens, 1829) (Fig. 176).

REMARKS. There are several unreported, probably recently adventive species of Lyctinae and Bostrichinae in NZAC which might become of economic importance to the timber industry. Present holdings are: 1 species of Euderiinae, *Euderia squamosa* (Fig. 174); 3 species of Dinoderinae – *Dinoderus minutus* (pantropical pest of bamboo and maize) (Fig. 175), *Rhizopertha dominica* (a major economic pest in a variety of dried food products), and one undetermined; and possibly 4 species of Lyctinae – *Lyctus brunneus*, a cosmopolitan pest in a wide variety of timbers (Fig. 176), *L. planicollis*, *L. linearis*, and one of uncertain identity.

One of the most interesting bostrichid species in our fauna is *Euderia squamosa*. According to Lesne (1934, 1938) it represents the most primitive surviving bostrichid type. Crowson (1961) considers *Euderia* to be more closely related to Bostrichinae than to any other group, and to be regarded as a probable relict of a group from which the Bostrichinae were derived. *Euderia squamosa* has also some anobiid features (Crowson 1961), and was originally placed by Broun (1880) in the Anobiidae [36].

For a key to subfamilies of bostrichid adults, see Crowson (1961).

Suggested colloquial name: twig borer beetles (Lyctinae – powder post beetles).

SELECTED REFERENCES. Bain (1978), Crowson (1961), Lesne (1934).

[36] Family ANOBIIDAE

(incl. PTININAE)

Fig. 177, 178

Length 3–9 mm Tarsal formula 5-5-5

Of at least 3 distinct subfamilies in New Zealand, the Ptininae are readily distinguishable by their spider-like appearance. **Ptininae also have approximated antennal insertions, lack lateral pronotal carinae, and have widely separated metacoxae. In contrast most Anobiinae have a hooded prothorax, usually completely concealing head from above**, and contiguous metacoxae.

DIAGNOSIS. **Body pale brown, dark brown, or greyish, usually elongate and cylindrical, sometimes ovate** (Anobiinae, Dorcatominae) **or spider-like and often multicoloured** (Ptininae), **clothed with decumbent or erect hairs or with scales, these often forming colour patterns** (Ptininae), rarely appearing glabrous. **Head deflexed and usually concealed from above** (Fig. 10). **Antennae 9–11-segmented, filiform and without a distinct club** (Ptininae), **or usually serrate or pectinate, with a 3-segmented club, its segments asymmetrical, lengthened, and expanded. Prosternum reduced, often deeply excavate, with cavity continuing on mesosternum. Procoxae globose or projecting; metacoxae usually contiguous, excavated to receive femora and with coxal plates in Anobiinae, not excavated and without coxal plates in Ptininae.** Abdomen with usually 5 ventrites.

SYNOPSIS. The world fauna of anobiids (in the sense of Lawrence & Britton 1991, 1994) comprises some 180 genera with over 2000 species; their higher classification requires revision. A modern subfamily arrangement is provided by Lawrence & Newton (1995), and a key to the subfamilies of Anobiidae of the world (older concept, excluding Ptinidae) is provided by White (1974).

In New Zealand there are 23 native and 5 adventive nominal species of ANOBIINAE and DORCATOMINAE (originally in Anobiidae), and 5 native and 6 adventive species of PTININAE (originally in Ptinidae) (Watt 1982a); these belong to some 25 genera. Kuschel (1990) recorded 9 species of Anobiidae including 1 ptinine from Lynfield, Auckland. Five species in 2 genera have been recorded from the Kermadec Islands, with some extralimital records from Norfolk Island and Lord Howe Island (Español 1979). *Ptinus tectus* has been recorded from the Auckland Islands, Antipodes Islands, Campbell Island, and The Snares (Watt 1962, 1971).

Adults and larvae may be found in dead trees, logs, or timber, though some species bore into furniture, organic stored products, fungal fruiting bodies, and dried organic material of animal and plant origin. Larvae are generally wood and bark borers, but larvae of Dorcatominae feed on woody or fibrous fungi. Larvae of Ptininae are generally found in dry organic material of animal or plant origin, e.g., leaf litter, and some Australian species are known to occur in nests of birds and social insects (Lawrence & Britton 1991, 1994). Some ptinines are widespread, cosmopolitan species recognised as minor pests of stored products, woollen goods, and book bindings (Booth *et al.* 1990, Bousquet 1990, Harney 1993). One of the adventive European ptinines in New Zealand, *Ptinus tectus*, infests stored foods. Hudson (1934) reported adults of some species collected by beating forest growth, amongst kiekie (*Freycinetia*), and from dry timber of houses (*Anobium ruficorne*, *Stegobium paniceum*). In New Zealand *Anobium punctatum* may cause serious damage to untreated structural timbers, and occasionally to furniture. The several species recorded in the Auckland area by Kuschel (1990) were collected from wallboards of old homes and sheds, wood and foliage of native and introduced trees and shrubs, and leaf litter.

RANGE. North ®, South ®, Stewart ®
Kermadecs ®, Three Kings ®, Chathams ®, Snares ®
Aucklands ®, Campbell ®, Antipodes ®, Bounties O

EXAMPLES. ANOBIINAE – *Hadrobregmus magnus* (Dumbleton, 1941) (Fig. 177); PTININAE – *Ptinus speciosus* Broun, 1880 (Fig. 178).

REMARKS. According to Ivie (1985) the Anobiidae should be considered as a subfamily of Bostrichidae [35]. For information on the species of economic importance see Hinton (1941), Booth *et al.* (1990), Bousquet (1990), and Harney (1993).

Suggested colloquial names: borer beetles, furniture beetles (Ptininae – spider beetles).

SELECTED REFERENCES. Español (1976a, b, 1979), Hosking (1976, 1978f), Milligan (1977, 1979a), White (1974).

Series CUCUJIFORMIA

We have followed the concept of Lawrence & Britton (1991, 1994) and Lawrence & Newton (1995) in defining this series. Adults are characterised by acone eyes, cryptonephridial Malpighian tubules, lack of functional spiracles on abdominal segment 8, metacoxae not excavate, absence of metacoxal plates, reduction of pregenital segments 9 and 10, and the form of the male genitalia. Larvae have many primitive polyphagan features; usually the galea and lacinia are fused into a single mala.

Superfamily CLEROIDEA

Characterised by adults with dorsum of body usually covered with protruding bristly hairs, projecting procoxae, and 5-segmented tarsi with segments often lobed, and larvae with a single pretarsal seta, lack of mandibular mola in all stages, and usually predacious habit (Lawrence & Britton 1991, 1994, Lawrence & Newton 1995). Larvae usually have a basal mandibular process and a pedunculate seta on the mala (Lawrence & Newton 1995).

A key to the families of Cleroidea (adults and larvae) is provided by Crowson (1964).

[37] Family TROGOSSITIDAE

(incl. PELTIDAE)

Fig. 179–181

Length 0.6–18 mm Tarsal formula 5-5-5

DIAGNOSIS. We have followed the classification proposed by Lawrence & Newton (1995).

General characteristics: antennae 11-segmented, with a loose 3-segmented club sometimes appearing asymmetrical; procoxal cavities open or closed; abdomen with 5 visible segments. Three main body forms may be recognised in our trogossitid fauna, as follows.

PROTOPELTINAE: **body medium-sized (length 2.6–4 mm), of nitidulid form, broadly oval, subparallel medially, covered with long hairs; antennae with a symmetrical, oval, 3-segmented club; elytra strongly punctate but without striae.**

RENTONIINAE (Fig. 179): **small to minute beetles (length 0.6–1 mm), superficially similar to clambids but readily distinguishable by the lack of metacoxal plates; body oval to nearly spherical, strongly convex and glossy, glabrous or with short and sparse pubescence**; colour brown to black or sometimes pale reddish brown; **head broad and deflexed; pronotum broadly rounded anteriorly, with front angles not produced; scutellum moderately large.**

LOPHOCATERINAE and TROGOSSITINAE (Fig. 180, 181): **small to medium-sized beetles (length 3–18 mm) superficially similar to tenebrionids, but readily distinguishable by 5-5-5-segmented tarsi and other characters; body broadly to narrowly oval; elytra often subparallel, flattened to moderately convex; upper surface with short or long hairs, bristles, or scales, often bicoloured and spotted**; colour brown to black with paler spots (greyish, yellowish, etc.), moderately glossy to dull; **head moderately narrow and prognathous; pronotum usually with anteriorly produced front angles.**

SYNOPSIS. Lawrence & Newton (1995) recognise trogossitids as comprising 9 subfamilies, of which 4 are represented in New Zealand – PROTOPELTINAE, RENTONIINAE, LOPHOCATERINAE, and TROGOSSITINAE. Our fauna of some 24 species in 10 genera is endemic except for the adventive stored products pest *Tenebroides mauritanicus*.

Most species of Trogossitidae are predacious as larvae and adults (Lawrence & Britton 1991, 1994), but probably all (or at least some) adults of the tribe Rentoniini are not. These usually occur in leaf litter of native forests, under loose bark, or on flowers of *Pinus radiata* (one record); at least some of them feed on pollen (Crowson 1966a). The single known rentoniine larva is suspected to occupy an arboreal habitat (Crowson 1966a). The remaining species will probably be most common under bark of dead trees. Larvae of many species of *Lepidopteryx* (formerly as *Leperina*) are predators in this habitat, and occur in association with the adults.

Collecting: sifting leaf litter and processing it through Berlese funnels, beating forest foliage, or picking adults from under bark. Kuschel (1990) collected eight species of Rentoniinae in Auckland, from vegetation, decayed wood, ground litter, and stream-bed moss.

RANGE. North ®, South ®, Stewart ®
Kermadecs O, Three Kings ®, Chathams ®, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLES. RENTONIINAE – *Rentonidium costiventris* Crowson, 1966 (Fig. 179); LOPHOCATERINAE – *Grynoma regularis* Broun, 1886 (Fig. 180); TROGOSSITINAE – *Lepidopteryx nigrosparsa* (White, 1846) (Fig. 181).

REMARKS. The higher classification of Trogossitidae is not settled. An important step in classification of the group was the establishment by Crowson (1964, 1966a) of the trogossitid complex within the superfamily Cleroidea. Crowson (1966a) recognised family Peltidae as having 4 subfamilies, of which Rentoniinae was erected for 5 New Zealand genera. Subsequently Crowson (1970) divided the trogossitids (in a broad sense) into 3 distinct families, distinguishing the Peltidae and Trogossitidae by differences in their mouthparts, the latter group having adult mandibles without a definite molar part and the lacinia without an apical hook, and larval mandibles with a different 'lacinia mandibulae' and the maxillary mala with a pedunculate seta. The classification of Trogossitidae and relationships of the higher taxa of Cleroidea are discussed by Barron (1971) and Slipinski (1992). Lawrence & Britton (1991, 1994) merged the 3 trogossitid families of Crowson (1970) into the single family Trogossitidae.

Suggested colloquial name: cadelle beetles (peltines – shield beetles).

KEY TO SUBFAMILIES OF TROGOSSITIDAE OCCURRING IN NEW ZEALAND

[Modified from Slipinski 1992]

1 Procoxal cavities externally closed
... (Fig. 181) .. **TROGOSSITINAE**

—Procoxal cavities externally open ... 2

2(1) Protibia with 1 spur; antennal club markedly asymmetrical ... (Fig. 180) .. LOPHOCATERINAE
—Protibia with 2 unequal spurs; antennal club symmetrical ... 3

3(2) Very convex and rounded, clambid-like; procoxal cavities internally closed ... (Fig. 179) .. RENTONIINAE
—Never very convex and rounded, not clambid-like; procoxal cavities internally open ... PROTOPELTINAE

SELECTED REFERENCES. Crowson (1964, 1966a, 1970), Foster (1991a), Slipinski (1992).

[38] Family CHAETOSOMATIDAE

Fig. 182

Length 7–14 mm Tarsal formula 5-5-5

DIAGNOSIS. **Body rectangulate, at least 4x longer than broad, subdepressed, coarsely punctate, glossy, with exceptionally long and protruding hairs** (often longer than width of elytron). **Head strongly prognathous, with pronounced mandibles. Antennae 11-segmented, uniform in width, about as long as forebody, the segments bead-shaped**. Eyes small but slightly protruding. **Pronotum subquadrate**, in our fauna without setal tufts; front angles pointing slightly anteriorly. **Elytra subparallel and elongate,** with humeral angles acute (*Chaetosoma*) or obtuse (*Chaetosomodes*), and with longitudinal rows of punctures. Scutellum oblong. **Procoxae globose and slightly transverse, their cavities open**. Legs with distinct trochanters. **Tarsal segments simple**. **Pygidium slightly exposed**.

SYNOPSIS. Chaetosomatids are known to occur in New Zealand and Madagascar (Ekis & Menier 1980). There are 2 endemic genera in New Zealand, *Chaetosoma* with 1 described species and 2 undescribed (NZAC) and *Chaetosomodes* with 1 described species.

Adults and larvae may be found under bark of dead trees, logs, etc., where they feed on other wood-boring insects. The larva of *Chaetosoma scaritides* inhabits burrows in *Nothofagus* and other trees.

RANGE. North ®, South ®, Stewart O
Kermadecs O, Three Kings O, Chathams ®, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. *Chaetosoma scaritides* Westwood, 1851 (Fig. 182).

REMARKS. Their present widely disjunct distribution suggests that chaetosomatids are an old group of Gondwana origin.

Suggested colloquial name: southern cadelle beetles.

SELECTED REFERENCES. Watt (1979b).

[39] Family CLERIDAE

Fig. 183, 184

Length 5–20 mm Tarsal formula 5-5-5, appearing 4-4-4

DIAGNOSIS. **Body elongate, usually subparallel, often subcylindrical, with dorsal surface usually coarsely punctate**. Coloration dark to pale brown, black, violet, yellow, often spotted with yellow or pale brown, rarely multicoloured, **often with a metallic tinge. Setation of variable length, short and decumbent or long and erect, uniformly brown or yellow, and often forming a colour pattern. Head slightly deflexed**, usually insignificantly broader than pronotum. **Antennae short, sawtoothed or filiform, most often with a 3-segmented club** consisting of elongate and often asym-metrical segments. **Eyes large, often protruding, slightly to strongly emarginate**. Labial palps with terminal segment often enlarged. Pronotum usually narrower than elytral base (exception: *Necrobia*), broadest medially and of equal width basally and apically, usually without lateral carinae (with carinae in *Metaxina*). **Elytra subparallel, pear-shaped or gradually broadening apically** (exception: abbreviated in *Paupris*), irregularly and more or less coarsely punctate. **Procoxae projecting, their cavities open or closed. Legs long**. Mesotrochanters oblique (Fig. 58). **Tarsi usually with 1 or 2 segments lobed** (simple in *Metaxina*); basal segments sometimes reduced. Abdomen with 5 or 6 ventrites.

SYNOPSIS. Watt (1982a) reported 37 native and 2 adventive species of clerid in New Zealand. These represent some 8 genera in 6 subfamilies – THANOCLERINAE, PHYLLOBAENINAE, CLERINAE, ENOPLIINAE, TARSOSTENINAE, and KORYNETINAE. *Phymatophaea* is the largest New Zealand genus, containing the majority of species. Our endemic genus *Metaxina* is the most divergent, and there is some confusion as to its phylogenetic affiliations; it probably represents a primitive lineage, and may be considered a relict in the New Zealand fauna (Crowson 1964). Kuschel (1990) collected 5 clerid species in Auckland, including the 2 adventive ones.

Adults of many New Zealand native species are commonly found on flowers and leaves in sunny locations, where they prey on other insects. The predominant habitat of larvae is dead wood, and their food consists of larvae of woodborers such as Anobiidae, Bostrichidae, Buprestidae, Cerambycidae, or Scolytinae (Crowson 1964). The cosmopolitan species *Necrobia ruficollis* and *N. rufipes* occur on carrion and stored products of animal origin, and have been reported as feeding on a cargo of copra (Watt 1975).

Collecting: netting adults in flight, sweeping vegetation particularly when in flower, and sifting bark and forest debris for larvae.

RANGE. North ®, South ®, Stewart ®
Kermadecs ®, Three Kings ®, Chathams ®, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLES. THANEROCLERINAE – *Metaxina ornata* Broun, 1909 (Fig. 183); ENOPLIINAE – *Phymatophaea violacea* (Fabricius, 1775) (Fig. 184).

REMARKS. A generic key to adults and larvae of New Zealand taxa is provided by Crowson (1964), with a key to the subfamilies of adult Cleridae. For cosmopolitan species of economic importance, see Booth *et al.* (1990).

Suggested colloquial name: checkered beetles.

SELECTED REFERENCES. Crowson (1964), Foster (1991b).

[40] Family PHYCOSECIDAE

Fig. 185

Length 2.5–3 mm Tarsal formula 5-5-5

DIAGNOSIS. **Body elongate oval, convex, variable in colour, mostly dull black, but with most of pronotum and head bearing whitish scales. Head prognathous, partially concealed by semicircular anterior margin of pronotum, with 2 angular projections between eye and base of antenna. Antennae appearing 10-segmented, with a 1-segmented club (club actually appears 2-segmented). Pronotum horseshoe-shaped in outline**, with front angles strongly produced anteriorly. **Elytra oval, with sparsely distributed thick bristles. Hind wings absent. Procoxae transverse, their cavities closed. Tibiae spinose**. Tarsal segments simple. Metasternum short. Abdomen with 5 ventrites.

SYNOPSIS. Phycosecids are known from New Zealand, New Caledonia, Vanuatu, and Australia (Lawrence & Newton 1995). The family comprises only a single genus, *Phycosecis,* with 1 species occurring in New Zealand and 3 others reported from Australia (Lawrence & Britton 1991, 1994, Watt 1982a, b, 1983a).

Adults and larvae of *P. limbata* are common on sandy beaches and coastal dunes. Both feed on small beach arthropods, and are frequently seen in dead fish or birds.

RANGE. North ®, South ®, Stewart ®?
Kermadecs ®, Three Kings O, Chathams ®, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. *Phycosecis limbata* (Fabricius, 1781) (Fig. 185).

REMARKS. For a key to the adults of all described species of *Phycosecis*, see Crowson (1964).

Suggested colloquial name: beach beetles.

SELECTED REFERENCES. Crowson (1964), Watt (1975, 1983a).

[41] Family MELYRIDAE

(also as DASYTIDAE)

Fig. 186

Length 2.5–6 mm Tarsal formula 5-5-5

DIAGNOSIS. **Body soft, oblong to narrowly elongate, dorsally flattened, usually with decumbent hairs and often with additional scattered erect setae**, uniformly dark-coloured in black, grey, brown, greenish, or blue, **often with a metallic tinge**, usually glossy; dorsal surface of forebody sometimes with meshed microsculpture. **Head often depressed medially, not or scarcely rostrate**, usually comparable in size to pronotum. **Labrum well sclerotised**; segments of maxillary palp not enlarged. Antennae usually filiform, without a club. **Eyes entire, moderately large, slightly protruding. Pronotum distinctly narrower than elytral base** (slightly broader than width of elytron), often broadest at middle, **often with depressions. Elytra entirely covering abdomen or slightly shorter**, exposing abdominal apex, subparallel and rounded posteriorly or gradually broadening towards apex. **Procoxae projecting, their cavities open. Legs long and slender. Tarsal segments simple; terminal segments bearing claws usually with membranous appendages.** Abdomen with 6 ventrites.

SYNOPSIS. Watt (1982a) reported 33 native species of melyrid in New Zealand, all in subfamily DASYTINAE. There are 3 described genera and 1 undescribed endemic genus. Most species belong in '*Dasytes*' or in *Arthracanthus*, the status of which is not clear.

Adults are mainly herbivorous, and may be found on flowering shrubs, where they feed on pollen. Larvae of New Zealand species occur in leaf litter, in dead tree-fern rachides, and under bark (Crowson 1964). Kuschel (1990) collected seven species in Auckland, from vegetation, flowers, and using a Malaise trap.

RANGE. North ®, South ®, Stewart ®
Kermadecs O, Three Kings ®, Chathams ®, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. DASYTINAE – '*Dasytes*' *subcyaneus* Broun, 1880 (Fig. 186).

REMARKS. Majer (1994) proposed a new family-group classification of Melyridae and related families, based on cladistic analysis, in which former Dasytinae are elevated

to family rank. The group is badly in need of revision.
Suggested colloquial name: flower beetles.

SELECTED REFERENCES. Crowson (1964), Foster & Lawrence (1991), Majer (1994).

Superfamily CUCUJOIDEA (CLAVICORNIA)

The group concept and family arrangement used here is similar to that of Pakaluk *et al.* (1994), Lawrence & Britton (1994), and Lawrence & Newton (1995). The family name Lathridiidae is replaced by its older synonym Corticariidae. Members of Cucujoidea are characterised by females having a tarsal formula other than 5-5-4, distinctive male genital configuration, and larvae approximately cylindrical, with a pygopod-like 10th abdominal segment (Lawrence & Britton 1994). Adults are generally small, and most have clubbed antennae.

[42] Family NITIDULIDAE

Fig. 187

Length 2–6 mm Tarsal formula 5-5-5

DIAGNOSIS. **Body narrowly to broadly oval, or narrowly subparallel** (*Brachypeplus*), **moderately convex to flattened**, glossy to matt (*Soronia*), glabrous or with short and sparse pubescence, or with bristles (*Soronia*), smooth or with tubercles (*Soronia*). Coloration brown to black, or pale brown; **elytra and often pronotum with yellowish spots. Head usually abruptly constricted at base of clypeus and behind eyes; frontoclypeal suture almost always absent. Antennae with an abrupt, usually 3-segmented, ball-like club** (Fig. 23). Lacinia usually without a galea. **Mandibles often projecting**. Pronotum transverse, often emarginated apically, with anterior angles often projecting. **Elytra usually short, exposing pygidium and some tergites or entirely covering abdomen** (e.g., *Platipidia*), rounded apically, truncate, or split with apices sinuate (some *Epurea*). **Procoxae transverse, with exposed trochantins**, their cavities open or close behind. **Tibiae often expanded and spinose. Tarsal segments 1–3 usually lobed, and segment 4 sometimes reduced.**

SYNOPSIS. Watt (1982a) recorded 20 native and 8 adventive species of nitidulid in New Zealand. We recognise 21 native and 11 adventive species (not all necessarily described) in NZAC, assigned to some 12 genera in 4 subfamilies – CARPOPHILINAE, NITIDULINAE, CILLAEINAE, and CRYPTARCHINAE. For subfamily classification see also Kirejtshuk (1986, 1990). The cosmopolitan genus *Carpophilus* contains several species of field and stored products pests.

Adults are found in a diverse range of habitats, including forest growth, flowers, wounds in trees with dripping sap, vegetable debris, fermented fruits, on fungi, and in stems of dead fronds of tree ferns. Many species are known to feed on sap and fermented juices. Kuschel (1990) recorded 16 species in 8 genera from Auckland, from fermenting fruits and vegetables, garden litter, lawn clippings, old logs, trunks of puriri (*Vitex lucens*) with sap, dry carrion, and sooty mould on manuka (*Leptospermum scoparium*). Introduced *Carpophilus* species occur in fallen fruits in orchards, and may transmit yeasts causing fruit degradation.

RANGE. North ®, South ®, Stewart ®
Kermadecs ®, Three Kings O, Chathams ®, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. NITIDULINAE – *Platipidia asperella* Broun, 1893 (Fig. 187).

REMARKS. This family is very poorly known in New Zealand, and is in need of revision.
Suggested colloquial name: sap beetles.

SELECTED REFERENCES. Dobson (1993), Kirejtshuk (1990), Pakaluk *et al.* (1994).

[43] Family MONOTOMIDAE

Fig. 188, 189

Length 2–6 mm Tarsal formula 5-5-5 or 5-5-4 (males)

DIAGNOSIS. **Body narrowly oval and moderately convex** (*Monotoma*) **to elongate, subparallel and subcylindrical** (*Lenax*), nearly glabrous with some vestigial pubescence to scarcely and finely pubescent. **Head abruptly constricted behind eyes, forming distinct temples; frontoclypeal suture absent. Antennae appearing 10-segmented, and antennal club appearing 2-segmented with a distinct seam between club segments** (club actually might be 1-segmented with 2 distinct areas). **Eyes coarsely faceted.** Pronotum elongate, with anterior angles more or less produced and lateral carinae distinct. **Elytra shortened**, exposing at least 2 distal segments (*Monotoma*) or only the pygidium (*Lenax*), with punctate striae or ridges. **Procoxae globose and separate, their cavities closed. Tarsi with the last segment enlarged**, as long as remaining segments combined. **First ventrite as long as the next 2 combined**.

SYNOPSIS. New Zealand has a single native monotomid, *Lenax mirandus*, and 5 adventive European species of *Monotoma* (Watt 1982a), all in subfamily MONOTOMINAE. The native species, originally found in Peel Forest, Canterbury, has since been recorded from native forests on both main islands. Adults of *Monotoma* have been collected mainly in the Nelson and Auckland areas.

Kuschel (1990) recorded 4 species of *Monotoma* from Auckland.

Adults of *Lenax mirandus* have been collected from under bark of dead trees of *Nothofagus fuscus* and *N. menziesii*, and in dead wood and/or *Platypus* tunnels in heketara (*Olearia rani*). Adults of *Monotoma spinicollis* in the Auckland area were found in mixed compost, lawn clippings, garden litter, hen-house straw, and sheep shelters in a paddock (Kuschel 1990).

RANGE. North ®, South ®, Stewart O
Kermadecs O, Three Kings O, Chathams O, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLES. MONOTOMINAE – *Lenax mirandus* Sharp, 1877 (Fig. 188), *Monotoma spinicollis* Aubé, 1857 (Fig. 189).

REMARKS. Suggested colloquial name: none.

SELECTED REFERENCES. Kuschel (1979), Pakaluk *et al.* (1994).

[44] Family PHLOEOSTICHIDAE

(= PRIASILPHIDAE)

Fig. 190, 191

Length 3–5 mm — Tarsal formula 5-5-5 or (males) 5-5-4

A diverse assemblage of primitive cucujoids, which may be variously rearranged after adequate revision. Pakaluk *et al.* (1994) and Lawrence & Newton (1995) listed 6 subfamilies of Phloeostichidae in the world fauna. The New Zealand fauna belongs to 2 subfamilies, as follows.

DIAGNOSIS. AGAPYTHINAE (Fig. 190): superficially **similar to salpingids**, but distinguished as follows. **Body narrow, moderately convex. Head with a distinct neck**, nearly as broad as maximum width of pronotum. **Clypeus large. Antennae bead-like, with a weakly defined 3-segmented club. Eyes protruding. Pronotum slightly narrower than elytra, with lateral carina incomplete anteriorly**, broadest at middle and with 2 deep foveae on either side of base. **Elytra oval in outline, the shoulders slightly produced** anteriorly, with 2 oblique depressions basally. **Hind wings present**. Scutellum transverse. **Procoxae separated, slightly globose and transverse**. Legs long. **Tarsal segments simple.**

PRIASILPHINAE (Fig. 191): superficially **similar to silphids and agyrtids**, but distinguished as follows. **Body broadly oval and slightly depressed. Head small, partially retractable into pronotum, without an apparent neck, strongly narrower than maximum pronotal width. Antennae with a distinct 3-segmented club.** Eyes protruding. **Pronotum strongly transverse and laterally explanate, with lateral margins complete. Elytra broad basally, tapering posteriorly, with sides slightly explanate. Hind wings absent**. Legs long. **Tarsal segments simple. Procoxae broadly separated** (Fig. 55) **and globular, their cavities open.**

SYNOPSIS. Two subfamilies occur in New Zealand, each represented by a single genus and species. Adults and larvae of *Agapytho foveicollis* (AGAPYTHINAE) live in a black sooty mould which grows on the honeydew excreted by scale insects on the trunks of beech trees (*Nothofagus*), or in moss and leaf litter. Those of *Priasilpha obscura* (PRIASILPHINAE) occur in leaf litter of beech forests.

RANGE. North ®, South ®, Stewart O
Kermadecs O, Three Kings O, Chathams O, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLES. AGAPYTHINAE – *Agapytho foveicollis* Broun, 1921 (Fig. 190); PRIASILPHINAE – *Priasilpha obscura* Broun, 1886 (Fig. 191).

REMARKS. The status of Phloeostichidae is unsettled. Sen Gupta & Crowson (1969b) redefined the concept of the family, discussed larval characteristics, and provided a key to the subfamilies.

Suggested colloquial name: bark row beetles.

KEY TO SUBFAMILIES OF PHLOEOSTICHIDAE KNOWN FROM NEW ZEALAND

Winged, with metasternum not very short and metacoxae narrowly separated; protrochanter partly occluded; head with a weak postocular constriction
... (Fig. 190) .. **AGAPYTHINAE**

—Apterous, with metasternum very short and metacoxae widely separated; protrochanter fully exposed; head without a postocular constriction
... (Fig. 191) .. **PRIASILPHINAE**

SELECTED REFERENCES. Crowson (1973), Pakaluk *et al.* (1994), Sen Gupta & Crowson (1969b).

[45] Family SILVANIDAE

Fig. 192, 193

Length 2.5–9 mm — Tarsal formula 5-5-5, appearing 4-4-4

DIAGNOSIS. **Body small to medium-sized, narrowly elongate and subparallel, slightly flattened to weakly convex**, moderately glossy to matt, **with inconspicuous short, decumbent pubescence**. Colour brown or rust brown. **Head prognathous, abruptly constricted posteriorly to form temples. Antennae usually 11-segmented, without** (native species, Fig. 192) **or with a 3-segmented**

club (introduced species, Fig. 193); **insertions often hidden from above by sides of frons. Eyes distinct, coarsely faceted. Pronotum usually elongate** (transverse in *Ahasverus*), and **often with projecting front angles and/or dentate or crenulate lateral margins**; disc sometimes with longitudinal depressions. **Elytra subparallel, broader than pronotum and with distinct shoulders**, usually striately punctate. **Procoxae small, globose, narrowly separated and open or closed. Tarsal segment 3 bilobed** (exception: Brontinae), **and segment 4 usually small**, giving the impression of pseudotetramerous segmentation.

SYNOPSIS. Watt (1982a) included silvanids as a subfamily of Cucujidae [46], and reported the number of nominal species as 6 native and 6 adventive. Following Pakaluk *et al.* (1994) and Lawrence & Newton (1995) we recognise silvanids and cucujids as distinct families, and find 7 native and 5 adventive silvanids represented in NZAC. In New Zealand, silvanids are represented by 2 subfamilies, BRONTINAE and SILVANINAE, each with 4 genera.

Our species of Brontinae live under bark of dead native trees or sometimes pine trees, or in leaf litter. Adults and larvae of *Cryptamorpha brevicornis* often occur together under loose bark of dead trees and in the base of dead, fallen leaves of nikau palm (*Rhopalostylis sapida*).

Silvanids are known to feed primarily on dead plant material and fungi, but our adventive species are stored products pests. For instance, the cosmopolitan *Ahasverus advena* is found frequently in stored grain, nuts, and beans, where it feeds on moulds and plant debris, and *Oryzaephilus surinamensis* is an economically important pest of cereals, dried fruits, and oilseeds. Adults of *Nausibius clavicornis* were introduced with Australian raisins. For details on the economically important silvanid species, see Booth *et al.* (1990), Bousquet (1990), and Harney (1993).

Brontines may be collected by picking specimens from under bark, by sifting forest litter and processing it through Berlese funnels, or using pitfall traps in native beech or kauri forests. For collection details of silvanid species occurring in Auckland, see Kuschel (1990).

RANGE. North ®, South ®, Stewart O
Kermadecs ®, Three Kings O, Chathams O, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLES. BRONTINAE – *Brontopriscus pleuralis* (Sharp, 1877) (Fig. 192); SILVANINAE – *Oryzaephilus surinamensis* (Linnaeus, 1758) (Fig. 193).

REMARKS. Halstead (1973, 1980) revised the genera *Silvanus* and *Oryzaephilus*, and discussed biologically important species. Lefkovitch (1961) proposed a classification of genera in the two New Zealand families differing from that of Lawrence & Britton (1994) and Lawrence & Newton (1995).

Silvanid beetles are often confused with Cucujidae/Laemophloeidae [46, 47], and are sometimes regarded as a subfamily of that group (e.g., Watt 1982a). Couplet I2 of the 'quick' key should be helpful to separate them.

Suggested colloquial name: none.

SELECTED REFERENCES. Halstead (1973, 1980), Lefkovitch (1961), Pakaluk *et al.* (1994), Thomas (1984).

[46] Family CUCUJIDAE

Fig. 194

Length 15–20 mm — Tarsal formula 5-5-5 or 5-5-4 (males)

DIAGNOSIS. **Body elongate-oval, subparallel, strongly flattened, glabrous** and moderately glossy. **Head large, slightly broader than pronotum; labrum concealed. Antennae 11-segmented, moniliform; basal segment broadly elongate, 2nd segment small and beadshaped, 3rd one narrowly elongate and the longest, 7th and 8th slightly elongate, and 3 terminal segments beadshaped, giving the impression of a weak club.** Eyes small but slightly protruding. **Pronotum transverse, with serrate, distinct lateral carinae;** front angles slightly produced anteriorly. **Elytra completely covering abdomen, subparallel in basal two-thirds, with scarcely visible striae and with complete lateral carinae. Procoxae globose, broadly separated by prosternal process, with cavities open**; mesocoxae globose, broadly separate and open; metacoxae transverse, separated apically but in contact basally.

SYNOPSIS. Cucujids are represented in New Zealand only by an undescribed species of *Platisus* endemic to the Three Kings Islands, first recorded by Watt (1986). Most specimens were collected in November and February from under bark of kanuka (*Kunzea ericoides*), especially large old trees near mixed forest remnants.

RANGE. North O, South O, Stewart O
Kermadecs O, Three Kings ®, Chathams O, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. *Platisus* sp. (Fig. 194).

REMARKS. This unique species from the Three Kings is the only representative of the family Cucujidae in New Zealand. According to Watt (1986), representatives of *Platisus* probably once occurred on the New Zealand mainland, and survived glacial climates only in the north on the relatively mildly affected Three Kings, becoming extinct on the mainland. Several species of *Platisus* are known from eastern Australia (Lawrence & Britton 1994).

In the past, members of the Silvanidae [45] and Laemophloeidae [47] were erroneously treated as cucujids.

Suggested colloquial name: flat beetles.

SELECTED REFERENCES. Pakaluk *et al.* (1994), Watt (1986).

[47] Family LAEMOPHLOEIDAE

Fig. 195

Length 1.8–3 mm Tarsal formula 5-5-5 or (males) 5-5-4

Includes all the smaller, flattened cucujoids with submarginal carinae on the pronotum.

DIAGNOSIS. **Body narrowly elongate, strongly flattened, glabrous or with fine and sparse pubescence**, dark brown to yellowish or reddish-brown, moderately to densely punctate. **Head flat, as broad as pronotum or slightly narrower. Labrum concealed. Antennae 11-segmented, moniliform, without a distinct club; males with various modifications of the scape, in *Microbrontes* taking the form of a mesally directed horn or process. Eyes small. Pronotum with a sublateral carina on either side**; anterior angles often acute. Elytra usually completely covering abdomen, striate or striate-punctate. **Procoxae transverse, globose, their cavities open or closed**; mesocoxae globose, broadly separate, open; metacoxae transverse, broadly separate. **Legs with femora swollen.**

SYNOPSIS. In New Zealand, laemophloeids are represented by 3 adventive cosmopolitan species of *Cryptolestes*, 2 native species (1 undescribed) in *Microbrontes*, and a third, apparently undescribed and tentatively assigned to *Notolaemus*. *Microbrontes lineatus* is known from several localities in the North Island and from the Three Kings. Adults of *Cryptolestes pusilloides* have been collected in Auckland, and adults of *C. ferrugineus* are known from several widespread localities.

Most laemophloeids usually feed on moulds or on the spores and stromata of ascomycete fungi (Lawrence & Britton 1994), and live under bark of trees, but species of *Cryptolestes* are pests of stored products – see Booth *et al.* (1990), Bousquet (1990), and Harney (1993). Adults of *Microbrontes lineatus* have been collected from ferns at night, dead twigs of pohutukawa (*Metrosideros excelsa*), and nests of *Turdus* sp. *Cryptolestes pusilloides* is known from stored maize and wheat, and an adult specimen was collected in winter from a starling (*Sturnus vulgaris*) nest in a bird box; *C. ferrugineus* has been found in stored cereals, prunes, garlic cloves, and a drying kiln.

RANGE. North ®, South ®, Stewart O
Kermadecs ®, Three Kings ®, Chathams O, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. *Microbrontes lineatus* (Broun, 1893) (Fig. 195).

REMARKS. Thomas (1995) recognised *Microbrontes*, *Cryptolestes*, and *Placonotus*—males of which possess various modifications to the antennal scape—as members of family Laemophloeidae (Cucujidae in a broad sense). Pakaluk *et al.* (1994), Lawrence & Britton (1994), and Lawrence & Newton (1995) recognised Cucujidae and Laemophloeidae as distinct families.

Suggested colloquial name: none.

SELECTED REFERENCES. Lefkovitch (1958, 1961), Pakaluk *et al.* (1994).

[48] Family PHALACRIDAE

Fig. 196

Length 2–3 mm Tarsal formula 5-5-5 or 5-5-4

DIAGNOSIS. **Body small, approximately hemispherical, flat ventrally**, variably punctate, at x40 magnification **appearing glabrous, strongly glossy, red-brown or dark brown to black**, with a metallic sheen; appendages paler and usually reddish-brown. **Head short, broad, deeply inserted under anterior pronotal margin.** Mandibles moderately large. **Antennae 11-segmented, with a large 3-segmented club. Pronotum strongly transverse and emarginate apically; posterior angles tightly join-ing angular humeri of elytra in lateral view**, with lateral narrow portion of pronotum and elytra explanate. **Scutellum large** and more or less triangular. **Elytra broadly rounded. Procoxae convex and transverse, their cavities open. Tarsi 5-5-5-segmented in both sexes, with the 4th segment reduced and the 3rd lobed (*Phalacrus*), or 5-5-5 in females or 5-5-4 in males**, with the 4th segment normally developed and the 3rd not lobed (*Cyclaxyra*).

SYNOPSIS. There are 2 native phalacrids in New Zealand, with possibly a third undescribed, all in the endemic subfamily CYCLAXYRINAE, and an adventive Australian subspecies in PHALACRINAE, known from Auckland and Rotorua (Kuschel 1990, Thompson & Marshall 1980). *Cyclaxyra impressa* ranges from the Nelson area to the Muttonbird (Titi) Islands off Stewart Island; *C. politula* is known from a few records on both main islands.

Adults of *Phalacrus uniformis frigoricola* have been found in rust fungus galls on an introduced wattle (*Acacia mearnsii*). Adults and larvae of *Cyclaxyra impressa* occur in sooty mould growing on the honeydew of scale insects on the trunks of mountain beech and red beech (*Nothofagus*). Very little is known about *C. politula*, some records indicating the same habitat as for *C. impressa*, plus moss on branches of a stunted *Senecio* sp. which also frequently bears sooty mould.

The biology of phalacrid beetles is reviewed by Steiner (1984).

RANGE. North ®, South ®, Stewart ®
Kermadecs O, Three Kings O, Chathams O, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. CYCLAXYRINAE – *Cyclaxyra impressa* Broun, 1915 (Fig. 196).

REMARKS. The systematic position of *Cyclaxyra* is controversial, and is under review by R.A. Crowson and by S.A. Slipinski (Lawrence & Newton 1995).

Suggested coloquial name: shining fungus beetles.

SELECTED REFERENCES. Pakaluk *et al.* (1994), Steiner (1984), Thompson & Marshall (1980).

[49] Family CAVOGNATHIDAE

Fig. 197

Length 2.5–4.0 mm Tarsal formula 5-5-5

DIAGNOSIS. **Body narrowly elongate, broadly curved laterally, somewhat depressed**, moderately glossy; **dorsal surface with decumbent pubescence; punctation irregular**; colour brown to reddish-brown, often with paler appendages. **Head narrower than pronotum**; frons sometimes with impressions; **frontoclypeal suture absent; gular region with longitudinal grooves. Mandibles each with 1 or 2 cavities opening outwards. Antennae 11-segmented, with enlarged scape and with a 3-segmented, elongate and loosely formed club. Pronotum simple, approximately square or rectangular** in outline, with margins broadly arched and angles rounded; **lateral carinae indistinct**; disc with a smooth, raised, median impunctate area near base and with a shallow, punctate depression on either side. **Elytra with anterior angles (shoulders) slightly produced**, and base concave; **epipleura distinct in basal third; sutural flanges widened apically** (Fig. 93), creating a small gap; striae absent. **Procoxae slightly globose and transverse, their cavities narrowly open behind. Legs stout.** Protarsi and mesotarsi with 3 basalmost segments expanded in males.

SYNOPSIS. The cavognathids comprise 4 genera, all in the Southern Hemisphere. Watt (1982a) listed 2 described native species of *Zeonidicola* and 1 of *Neocercus* for New Zealand. NZAC now has an additional 1 or perhaps 2 undescribed species of *Zeonidicola*.

Adults and larvae of *Zeonidicola dumbletoni* have been found in nests of spotted shag (*Stictocarbo punctatus*). Adults of *Z. chathamensis* have been extracted from nest debris of sooty shearwater (*Puffinus griseus*), fairy prion (*Pachyptila turtur*), giant petrel (*Macronectes giganteus*), northern royal albatross (*Diomedea epomophora sanfordi*), and pipit (*Anthus novaeseelandiae*) (Watt 1980b). Adults of *Neocercus electus* are known to occur in damp native forests in the northern South Island (Watt 1980b).

RANGE. North ®, South ®, Stewart O
Kermadecs O, Three Kings ®, Chathams ®, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. *Zeonidicola chathamensis* Watt, 1980 (Fig. 197).

REMARKS. It seems likely that cavognathids will be found in nests of other bird species.

Suggested colloquial name: birds' nest beetles.

SELECTED REFERENCES. Crowson (1973), Pakaluk *et al.* (1994), Sen Gupta & Crowson (1969b), Watt (1980b).

[50] Family CRYPTOPHAGIDAE

[assisted by R. Leschen]

Fig. 198

Length 1–3.5 mm Tarsal formula 5-5-5 or (males of Cryptophaginae) 5-5-4

DIAGNOSIS. **Body oval to elongate oval, variously yellow-brown or red-brown to dark brown, sometimes bicoloured**, with appendages usually paler, **often clothed with silky hairs (decumbent and/or erect)**, rarely globose and appearing glabrous, convex to slightly flattened. **Head narrower than pronotum, without a frontoclypeal suture. Antennal insertions exposed, approximated or well separated. Antennae 11-segmented, with a loose 3-segmented club** (exception: 2-segmented in *Picrotus*). Eyes small. **Pronotum subquadrate or rounded, with lateral carinae;** lateral margins occasionally serrate (introduced *Cryptophagus*); base often with a narrow, variously formed depression; prosternal process moderately broad, overlapping mesosternum; **pronotal base usually narrower than elytral base** (usually as broad as in Mycetophagidae [59], or only slightly narrower). **Elytra subparallel or broadly arched** laterally, rounded posteriorly; punctation confused, the punctures not in rows; **sutural flanges widened apically, forming a small gap**; epipleura incomplete, visible in basal third. **Procoxae globose, with cavities open behind.** Abdomen with 5 ventrites, the basal one longest.

SYNOPSIS. Watt (1982a) reported 23 native and 4 adventive species of cryptophagid in New Zealand. There are at present 18 native and 12 adventive species housed in NZAC, belonging to some 12 genera in 2 subfamilies, CRYPTOPHAGINAE and ATOMARIINAE.

Cryptophagids in general feed on hyphae, conidia, and spores of fungi, including moulds, in leaf litter, forest litter

(e.g., beech forest), vegetable debris, rotten wood, bird and insect nests, and under bark (Leschen 1996). Cosmopolitan species found in stored products feed only on mould, their presence indicating poor storage conditions; Bousquet (1990) reviewed stored products pests. Kuschel (1990) recorded 13 species from Auckland, collected from heaps of garden prunings, lawn clippings, compost, henhouse straw, paddocks, leaf litter, *Phellinus* fungus, fresh-cut branches of various trees and shrubs, and foliage of tree ferns; some were associated with sedges and galls.

RANGE. North ®, South ®, Stewart ®
Kermadecs O, Three Kings O, Chathams ®, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. CRYPTOPHAGINAE – *Thortus ovalis* Broun, 1886 (Fig. 198).

REMARKS. Cryptophagids are poorly known in the Southern Hemisphere, and those placed in the Cryptophaginae (Cryptosomatulini) are in need of revision (Leschen & Löbl 1995).

Suggested colloquial name: silken fungus beetles.

SELECTED REFERENCES. Leschen (1996), Pakaluk *et al.* (1994).

[51] Family LANGURIIDAE

[assisted by R. Leschen]

Fig. 199

Length 2–6 mm Tarsal formula 5-5-5

This group is heterogeneous in appearance, and its classification is not clear. Some members are similar to Cryptophagidae [50], but are distinct in having the first ventrite less than twice as long as the second (cf. more than twice as long in Cryptophagidae), posterior elytral sutural gap absent (cf. present), epipleura complete, hind wing with 4 anal veins (cf. usually 5) and a closed radial cell, usually a transverse groove on the anterior part of the gular region, and 5-5-5-segmented tarsi in both sexes (Atomariinae of Cryptophagidae have the same tarsal formula). For discussion see Sen Gupta (1968), Sen Gupta & Crowson (1969a, 1971), and Lawrence & Britton (1994).

DIAGNOSIS. **Body moderately to strongly elongate, narrowly oval to subparallel, subcylindrical to flattened,** pubescent or glabrous, moderately to strongly glossy, pale brown to almost black, rarely with pale maculae on elytra. **Head moderately large, with eyes coarsely faceted. Antennae with a distinct, elongate, 3-segmented club. Pronotum with lateral margins simple,** slightly crenulate in *Hapalips* and *Loberonotha*, **usually distinctly narrower than elytral base**; base sometimes with 2 small depressions. **Elytra often elongate and usually with well defined epipleura** (absent in *Loberonotha*) **and distinct punctate striae** (irregularly punctate in *Loberonotha*). **Procoxae globose, their cavities open or closed** behind. **Tarsi with 4th segment reduced; segments 2 and 3 with setose lobes.**

SYNOPSIS. Watt (1982a) recorded 8 native languriids for New Zealand, 7 of them represented in NZAC. Our present estimate is 7 nominal species plus 1 undescribed; these are placed in 5 genera representing 2 subfamilies – XENOSCELINAE and CRYPTOPHILINAE.

Adults and larvae of *Hapalips prolixus* occur under dead leaf bases of nikau palm (*Rhopalostylis sapida*) and in decayed tree-fern fronds. Adults of *Loberus depressus* have been collected by beating foliage of cabbage tree (*Cordyline australis*), pohutukawa (*Metrosideros excelsa*), and from tea tree blossom. Watt (1982b) recorded adults of *L. nitens* beaten from *Coprosma repens*, *Carmichaelia* sp., *Melicytus ramiflorus*, and *Pittosporum crassifolium*. Adults of *Loberonotha* have been collected by beating various vegetation, from litter, and from flowers of *Traversia*. Adults of *Cathartocryptus maculosus*, our sole cryptophiline, have been found under bark of dead *Beilschmiedia tawa* and on foliage of *Coprosma robusta*.

RANGE. North ®, South ®, Stewart ®
Kermadecs O, Three Kings O, Chathams O, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. XENOSCELINAE – *Hapalips prolixus* (Sharp, 1876) (Fig. 199).

REMARKS. As at present defined, the family Languriidae includes several genera formerly placed in Cryptophagidae [50] and Erotylidae [52] (Lawrence & Newton 1995).

Suggested colloquial name: slender beetles.

SELECTED REFERENCES. Pakaluk *et al.* (1994), Sen Gupta (1968), Sen Gupta & Crowson (1969a, 1971).

[52] Family EROTYLIDAE

Fig. 200

Length 4–8 mm Tarsal formula 5-5-5

DIAGNOSIS. **Body elongate oval, moderately convex but with slightly flattened pronotum, usually glabrous or with sparse inconspicuous pubescence, strongly glossy**, with punctation forming striae on elytra. Coloration usually dark brown to nearly black with reddish-brown appendages, rarely yellowish brown. **Head deeply inserted into thorax; frontoclypeal suture indistinct or absent. Antennae 11-segmented, with a 3-segmented club. Eyes prominent** and coarsely faceted. **Pronotum with sharp lateral margins and anteriorly produced front angles**; base of pronotum and elytra slightly sinuate. **Elytra striate, with epipleura complete**. Prosternal pro-

cess broad. **Procoxae globose, inserted into articular depressions, their cavities closed.** Legs robust. **Tarsi with all segments except the last lobed and setose beneath, or simple. Femoral lines sometimes present** on basal ventrite, which is 1.5x as long as ventrite 2.

SYNOPSIS. Watt (1982a) reported 9 native species of erotylid. Seven species are represented in NZAC, belonging to 2 genera of DACNINAE.

Both adults and larvae are in general mycetophagous, feeding within fruiting bodies of mushrooms and bracket fungi. Kuschel (1990) reported two species of *Cryptodacne* from Auckland, collected from moist decayed wood and from wood mould of *Vitex*. We have seen specimens from dead, standing *Corynocarpus laevigatus*, from under various logs, in the dead bole of a bat roosting tree, from *Piptopterus portentosus* on *Nothofagus*, from *Ganoderma* on a dead standing tree, and from *Grifola colensoi*.

RANGE. North ®, South ®, Stewart ®
Kermadecs O, Three Kings O, Chathams ®, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. Dacninae – *Thallis polita* White, 1846 (Fig. 200).

REMARKS. Suggested colloquial name: pleasing fungus beetles.

SELECTED REFERENCES. Pakaluk *et al.* (1994).

[53] Family BOTHRIDERIDAE

Fig. 201, 202

Length 2–7 mm Tarsal formula 4-4-4 (*Ascetoderes*), 3-3-3 (*Anommatus*)

DIAGNOSIS. **Body elongate-elliptical, subcylindrical, sometimes with pronotum slightly flattened, glabrous, slightly glossy**, dark brown to black. **Head narrower than pronotum. Antennae 11-segmented, the basal segment enlarged, and with a 2-segmented club; insertions exposed. Eyes small and projecting or reduced** (*Anommatus*). **Pronotum trapezoidal, with front angles usually slightly produced**, coarsely punctate, and often with medial impression(s); base usually distinctly narrower than elytral base. **Elytra with rounded shoulders, broadly arcuate laterally**, broadest in basal half, with longitudinal striae and coarse punctation; alternate intervals costate at least apically, even intervals usually smooth; **epipleura present. Procoxae globose, their cavities open** (*Anommatus*) **or closed** (*Ascetoderes*); metacoxae globose, moderately to widely separated. **Legs elongate, stout. Tarsal segments simple. Abdomen with basal ventrite elongate, at least as long as the 2 following ventrites combined.**

SYNOPSIS. Hudson (1934) recorded 7 species of bothriderid from New Zealand. Five are represented in NZAC, belonging to the subfamilies ANOMMATINAE, with 1 adventive species, and BOTHRIDERINAE, with 4 native species. A review of the world Bothriderini is provided by Slipinski *et al.* (1989).

All our bothriderids are predacious. Adults of the adventive hypogeal species *Anommatus duodecimstriatus* are recorded from rotten wood buried in earth, under deeply buried stones (Sen Gupta & Crowson 1973), and from deep pitfall traps sealed off at the top (Kuschel 1990). Adults of *Ascetoderes paynteri* from the Chatham Islands have been collected in bush at night, suggesting a nocturnal habit; others were taken from rotting *Plagianthus* logs. Adults of *A. obsoletus* are occasionally found under bark of dead tree trunks.

RANGE. North ®, South ®, Stewart O
Kermadecs O, Three Kings O, Chathams ®, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLES. ANOMMATINAE – *Anommatus duodecimstriatus* (Müller, 1821) (Fig. 201); BOTHRIDERINAE – *Ascetoderes obsoletus* (Broun, 1895) (Fig. 202).

REMARKS. Adult bothriderids superficially resemble some Colydiidae [65], from which they may be distinguished by having exposed antennal insertions.

Suggested colloquial name: none.

SELECTED REFERENCES. Sen Gupta & Crowson (1973), Slipinski *et al.* (1989).

[54] Family CERYLONIDAE

(= CERYLIDAE)

Fig. 203

Length 2–3 mm Tarsal formula 4-4-4

DIAGNOSIS. **Body narrowly elongate, subparallel** (*Philothermus*) **or broadly oval** (*Hypodacnella*), moderately convex to flattened, **glabrous to microsetose, moderately to strongly glossy**, often with a metallic shine (*Hypodacnella*), pale brown or dark brown to black, with fine or coarse punctures. **Head without a neck, partially concealed by pronotum**; frontoclypeal suture present or absent (*Philothermus*). **Antennae 10- or 11-segmented, with a 1- or 2-segmented club** (superficially appearing 3-segmented in *Hypodacnella*). **Pronotum transverse or slightly elongate**, distinctly margined laterally, often coarsely punctate; base broadly arcuate or sinuate in *Hypodacnella*. **Elytra usually striate-punctate.** Hind wings often with anal cell closed. **Procoxae small and semiglobular externally, their cavities open or closed;**

metacoxae widely separated. Abdomen with segments freely articulated; 1st ventrite markedly longer than 2nd ventrite; femoral lines usually present on 1st ventrite and/or metasternum. Last ventrite with posterior edge crenulate in *Philothermus*.

SYNOPSIS. Watt (1982a) reported 5 native and 1 adventive species of cerylonid from New Zealand. We now recognise 5+ native species in NZAC, belonging to 2 genera in 2 subfamilies, EUXESTINAE and CERYLONINAE.

Cerylonids occur in rotten wood, leaf litter, forest debris, and fungus-infested bark (Slipinski 1988), where they probably feed on fungal hyphae and spores (Lawrence & Britton 1994). Kuschel (1990) reported *Hypodacnella rubriceps* (as *Hypodacne*) from Auckland, collected in rich, moist humus under logs, in hollow trees, and in decayed wood. We have seen specimens collected from forest litter, rotten logs, and fungus on a *Beilschmiedia* log, and reared from *Helichrysum coralloides*. Species of *Philothermus* occur under bark of native trees, or in rotten logs and forest litter, especially with mould.

RANGE. North ®, South ®, Stewart ®
Kermadecs O, Three Kings O, Chathams ®, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. EUXESTINAE – *Hypodacnella rubriceps* (Reitter, 1880) (Fig. 203).

REMARKS. Some cerylonids may be confused with Colydiidae [65], from which they differ, besides other characters, in having the upper body surface glabrous or microsetose and glossy (cf. either dull or roughly sculptured), the maxillary and labial palps geniculate (cf. never so), the 1st ventrite markedly longer than the 2nd, and all 5 ventrites movably articulated (cf. 1st ventrite not markedly longer, and 3 or 4 basalmost ventrites connate in Colydiidae). Slipinski (1988) provided characteristics of the genera of Cerylonidae. This group is in need of revision.

Suggested colloquial name: waxen beetles.

SELECTED REFERENCES. Pakaluk *et al.* (1994), Sen Gupta & Crowson (1973), Slipinski (1990).

[55] Family ENDOMYCHIDAE

(incl. former MEROPHYSIIDAE)

Fig. 204, 205

Length 1–2.0 mm Tarsal formula 4-4-4 (*Mycetaea*), 3-3-3 (*Holoparamecus*)

New Zealand species of this family belong to two genera in separate subfamilies, which are more readily diagnosed separately, as follows.

DIAGNOSIS. MYCETAEINAE (*Mycetaea*, Fig. 204). **Body small (length 1.8–2.0 mm), ovate and slightly tapering posteriorly, moderately convex, yellow, with long and sparse, decumbent and erect hairs. Head partly concealed by pronotum; frontoclypeal suture distinct. Antennae 11-segmented, with an elongate 3-segmented club. Pronotum transverse, almost as broad as elytral base**; front angles slightly produced anteriorly; **lateral margins sharply carinate, with an additional lengthwise ridge on either side. Elytra with punctures forming rows. Procoxae small, hemispherical, narrowly separated by prosternal process, their cavities open behind. Abdomen with 1st sternite as long as the following 2 combined, or somewhat longer.**

HOLOPARAMECINAE (*Holoparamecus*, Fig. 205). **Body minute (length 1.0–1.6 mm), narrowly oval, round posteriorly, moderately convex, reddish brown, yellowish, or brown, appearing almost glabrous but with short, inconspicuous decumbent hairs, strongly glossy. Head somewhat concealed basally by pronotum; frontoclypeal suture present. Antennae 11-segmented, with a large, 2-segmented club. Pronotum restricted behind to a distinct 'waist,' with a series of laterally elongated foveae** near posterior margin forming a basal impression; base markedly narrower than elytral base; additional longitudinal carinae absent. **Elytra oval, with 2 impressed lines along suture**; punctate striae absent. **Procoxae small, hemispherical, narrowly separated by prosternal process, their cavities appearing narrowly closed behind. Abdomen with 1st ventrite elongate, as long as the following 3 combined.**

SYNOPSIS. Endomychids are represented in New Zealand by an adventive European species of MYCETAEINAE and at least 6 native species of HOLOPARAMECINAE, 3 of them in *Holoparamecus* and the remainder in an undetermined genus. Watt (1969) classified *Holoparamecus* in subfamily Merophysiinae of the Corticariidae [58], and considered *Mycetaea lucidus* to be a synonym of *Holoparamecus tenuis*. A new classification is proposed by Pakaluk *et al.* (1994) and Lawrence & Newton (1995).

Our holoparamecines occur in forest litter, organic litter probably associated with nest debris, wood mould, and bird nest litter; some adults have been reared from bracket fungus growing on dead roots, and others from dead *Coprosma robusta*. Species of this group most likely feed mainly on moulds associated with decomposing organic material. Kuschel (1990) reported 2 species of *Holoparamecus* from Auckland, collected from logs, stumps covered with fruiting bodies of larger fungi, rotted wood, moulds inside hollow trees, humus under logs and at the base of herbaceous plants, and stream-bed litter.

RANGE. North ®, South ®, Stewart O
Kermadecs O, Three Kings ®, Chathams O, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. MYCETAEINAE – *Mycetaea subterranea* (Fabricius, 1801) (Fig. 204); HOLOPARAMECINAE – *Holoparamecus tenuis* Reitter, 1879 (Fig. 205).

REMARKS. The higher classification of Endomychidae was discussed by Lawrence (1982), Slipinski (1990), and Slipinski & Pakaluk (1992).

Suggested colloquial name: waisted mildew beetles.

SELECTED REFERENCES. Pakaluk *et al.* (1994), Watt (1969).

[56] Family COCCINELLIDAE

Fig. 206

Length 1–7 mm Tarsal formula 4-4-4 or 3-3-3

DIAGNOSIS. **Body narrowly to broadly ovate or hemispherical, moderately to strongly convex, with ventral surface usually flat**, glabrous or pubescent, slightly to strongly glossy or matt. Setation short and decumbent or long and protruding, often yellowish or greyish. **Coloration usually uniformly brown in small species and bicoloured in larger ones**, variously pale brown, brown, yellowish, reddish brown, black, or metallic blue, often with spots on pronotum and elytra or with a paler margin on pronotum and spots on elytra, the spots yellow, reddish yellow, reddish brown, or black. **Head partially or (rarely) almost entirely inserted into prothorax; frontoclypeal suture absent. Maxillary palps with apical segment usually enlarged, securiform or oblong, and apex obliquely truncated. Antennae usu-ally 10- or 11-segmented, short, with a weak and usually 3-segmented club.** Pronotum transverse, usually strongly convex; lateral margins entire; anterior margin often strongly emarginate; scutellum small to large. **Elytra usually strongly rounded, with confused punctation, never striate;** lateral margins entire; epipleura sometimes foveate to receive femora. **Procoxae transverse, their cavities open. Tarsi pseudotrimerous or trimerous, with segments 1 and 2 strongly produced beneath. Abdomen with 5 or 6 ventrites, the basalmost 2 often connate; basal ventrite with impressed femoral lines** (Fig. 92).

SYNOPSIS. Watt (1982a) reported 27 described native species of coccinellid and 14 adventive or introduced. There are at present 22 native species and about 18 representing introductions in NZAC, classified into some 19 genera in 4 subfamilies – COCCIDULINAE, SCYMNINAE, CHILOCORINAE, and COCCINELLINAE.

Most known adults and larvae are predators, feeding generally on soft-bodied insects and mites. A considerable number of exotic species have been introduced into New Zealand for biological control of insect pests in agriculture, and 6 are known to be well established. In general, members of the subfamily Coccinellinae usually feed on aphids and homopterans, and occasionally on larvae of Chrysomelidae and other Coccinellidae, whereas the Scymninae feed on aphids, scale insects, mealybugs, whiteflies, and plant mites (Booth *et al.* 1990). Kuschel (1990) listed 26 coccinellid species from Auckland, most of them in genus *Rhyzobius*, and the majority collected from garden plants and foliage of shrubs and trees. Very common in Auckland is the introduced Australian species *Halmus chalybeus*, steel-blue in colour, and occurring in gardens and native bush.

Collecting: sweeping and beating vegetation.

RANGE. North ®, South ®, Stewart ®
Kermadecs ®, Three Kings ®, Chathams ®, Snares O
Aucklands ®, Campbell ®, Antipodes ®, Bounties O

EXAMPLE. COCCINELLINAE – *Coccinella leonina* Fabricius, 1792 (Fig. 206).

REMARKS. Species introduced for biological contol of hemipteran pests are in *Coccinella*, *Cryptolaemus*, *Exochomus*, *Halmus*, *Hippodamia*, *Illeis*, *Rhyzobius*, *Rodalia*, and *Scymnus*. The family is in need of taxonomic revision.

Suggested colloquial name: ladybirds.

SELECTED REFERENCES. Bielawski (1976), Klausnitzer (1970), LeSage (1991c), Pakaluk *et al.* (1994), Pope (1989), Read (1965), Sasaji (1968).

[57] Family CORYLOPHIDAE

Fig. 207

Length 0.8–2 mm Tarsal formula 4-4-4 or 3-3-3

DIAGNOSIS. **Body minute, oblong to broadly ovate or nearly hemispherical, moderately to strongly convex**, sparsely pubescent or glabrous, often glossy. Coloration pale brown, brown, yellowish with brown markings, reddish brown, or reddish yellow. **Head small, completely concealed by expanded pronotum forming a hood anteriorly** (partially concealed in *Orthoperus*); **frontoclypeal suture absent. Antennae 9–11-segmented, with a 3-segmented club. Pronotum expanded anteriorly into a sharp margin over head**, strongly transverse, broadly rounded; posterior angles sometimes strongly produced posteriorly (*Anisomeristes*) or slightly conically elongate (*Arthrolips*). Elytra subparallel or narrowed posteriorly and usually truncate, exposing pygidium. **Procoxae transverse or globose, their cavities closed. Tarsi with 2nd segment bilobed, 3rd segment vestigial and inconspicuous. Abdomen with 6 ventrites, the basalmost very long and bearing subparallel femoral lines.**

SYNOPSIS. Watt (1982a) recorded 5 native and 1 adven-

tive species of corylophid in New Zealand, but the actual number is much higher, with many species undescribed. They belong to 8 genera in 3 subfamilies – CORYLOPHINAE, SERICODERINAE, and PARAMULINAE. Kuschel (1990) reported 20 species in 8 genera from Lynfield, Auckland alone.

Corylophids are known to feed on fungi, and may be found in association with decaying plant material such as forest litter, organic litter generally, compost heaps, birds' nests, grass cuttings, mouldy hay, rotten wood, dead branches, litter in coastal cliff vegetation, and leaf litter at the base of sedges and flax. Some New Zealand species have been collected from under bark, on mossy vegetation at night, on logs overgrown with moss, on moss and liverworts on damp slopes near streams, on foliage of native shrubs, occasionally on flowers, and on bracket fungi.

Sifting organic material and processing it through Berlese funnels is the most efficient method of collecting; for details see Kuschel (1990).

RANGE. North ®, South ®, Stewart ®
Kermadecs ®, Three Kings ®, Chathams ®, Snares O
Aucklands O, Campbell ®, Antipodes ®, Bounties O

EXAMPLE. Sericoderinae – *Anisomeristes sharpi* Matthews, 1886 (Fig. 207).

REMARKS. Broun (e.g., 1886, 1893a) habitually treated corylophids as Coccinellidae [56]. Corylophids are poorly known, and the subfamily classification is not settled, although Lawrence & Newton (1995) have listed 4 subfamilies in the world fauna. The group is in need of taxonomic revision.

Suggested colloquial name: hooded beetles.

SELECTED REFERENCES. Endrödy-Younga (1964), Gressitt & Samuelson (1964b), Pakaluk *et al.* (1994).

[58] Family CORTICARIIDAE

(= LATHRIDIIDAE = LATRIDIIDAE)

Fig. 208

Length 0.8–2.2 mm Tarsal formula 3-3-3

DIAGNOSIS. **Minute oblong beetles, with pronotum usually markedly narrower than elytra** (as broad as elytral base, or nearly so in *Metophthalmus* (= *Lithostygnus*)). **Body surface glabrous or finely tomentose, often covered by a waxy exudate, moderately glossy to matt, smooth and punctate or with ridges, tubercles, and/or depressions. Head with clypeus laterally expanded** in front of antennal insertions; **frontoclypeal suture present. Antennae 11-segmented, with a 2- or 3-segmented club; scape usually enlarged**, often globular. **Eyes small but protuberant**, sometimes reduced, **coarsely faceted.** Pronotum usually distinctly narrower than elytra at base (exception: *Melanophthalma*), often with ridges and/or depressions, or evenly convex and punctate, sometimes with a single basal depression; lateral margins smooth or with fine dentation (e.g., *Corticaria*). **Elytra elongate oval, broadest at middle, usually much broader than pronotum**, or oval, sometimes swollen (*Melanophthalma*), with more or less distinct punctate striae. **Procoxae projecting, their cavities closed behind. Tarsal segments simple. Abdomen with 5 or 6 ventrites, the basal one markedly elongate** (much longer than the 2 following ventrites combined).

SYNOPSIS. Hudson (1934) recorded 57 nominal species of corticariid for New Zealand. Watt (1982a) recorded 40 native and 11 adventive species, and some 53 native species and 11 adventive are now represented in NZAC. Our corticariid fauna is rich, with many undescribed species, belonging to some 12 genera in 2 subfamilies, LATHRIDIINAE and CORTICARIINAE. Kuschel (1990) listed 32 species in 9 genera from Auckland.

Lathridiines are subglabrous, with separated procoxae, often with carinae on the pronotum and elytra, and waxy exudate on various parts of the body; corticariines are usually setose, with contiguous procoxae, lacking carinae on the pronotum and elytra, and with no waxy exudate.

Adults and larvae feed on fungal spores. They occur in leaf litter, decaying trunks and stumps, wood mould, cut branches, foliage of various plants, bracket fungi, moss and liverworts on tree trunks, hollows of old trees, bush floor litter, epiphytes, lawn clippings, and garden compost. Some cosmopolitan species are associated with stored products, and *Aridius nodifer*, recorded from a wide variety of mouldy vegetables, is now established in New Zealand. For other cosmopolitan species of economic importance see Booth *et al.* (1990). For details on the bionomics of species occurring in Auckland, see Kuschel (1990).

RANGE. North ®, South ®, Stewart ®
Kermadecs ®, Three Kings ®, Chathams ®, Snares O
Aucklands ®, Campbell ®, Antipodes O, Bounties O

EXAMPLE. LATHRIDIINAE – *Enicmus caviceps* Broun, (1893) (Fig. 208).

REMARKS. The name Corticariidae has priority over the universally used Lathridiidae for this family (Pakaluk *et al.* 1994). First revisions of New Zealand corticariid species were published by Belon (1884, 1897). Watt (1969) provided a generic key to New Zealand Corticariidae, including *Holoparamecus*, now referred to Endomychidae [55].

Suggested colloquial name: mildew beetles.

SELECTED REFERENCES. Belon (1884, 1897), Gressitt & Samuelson (1964a), Pakaluk *et al.* (1994), Watt (1969).

Superfamily TENEBRIONOIDEA (HETEROMERA)

Members of this group are distinct in having tarsi 5-5-4-segmented in both sexes, rarely 4-4-4 in a few lineages, trochanterofemoral attachment strongly oblique (Fig. 59), procoxae tending to be conical and projecting, hind wings with a reduced number of veins (4 or fewer) behind the media posterior (MP), aedeagus heteromeroid with the tegmen incomplete ventrally, and in certain characteristics of the larvae (Lawrence & Britton 1991, 1994).

[59] Family MYCETOPHAGIDAE

Fig. 209

Length 1.5–3 mm Tarsal formula 4-4-4 (females), 3-4-4 (males)

DIAGNOSIS. **Body broadly oval, somewhat flattened, evenly pubescent, moderately glossy, punctate**, yellowish to dark brown to black, sometimes with pale or dark markings on elytra and/or pronotum. **Head narrower than pronotum; antennal insertions exposed. Maxillary palps with last segment enlarged. Antennae 11-segmented, usually with a 3-segmented club. Eyes coarsely faceted. Pronotum transverse; sides arcuate, sometimes with minute serrations, smoothly continuous with sides of elytra**; base as wide as elytra. Scutellum transverse. **Elytra broadly oval**, punctate. **Procoxae transverse, their cavities open.** Legs well developed.

SYNOPSIS. Watt (1982a) reported 12 native and 1 adventive species of mycetophagid for New Zealand. These are in 3 genera of subfamily MYCETOPHAGINAE. Kuschel (1990) recorded 5 native species and 3 adventive from Lynfield, Auckland.

Adults and larvae may be found on or in fungi and organic material infested with fungi. Some species have been collected by beating or sweeping foliage of native shrubs. The adventive species have been found in a sheep carcass, coarse prunings, a starling nest, bumble bee nests, lawn clippings, compost, trees, shrubs, and a rotting seed head of *Cynara scolymus* (Kuschel 1990).

RANGE. North ®, South ®, Stewart O
Kermadecs O, Three Kings ®, Chathams ®, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. MYCETOPHAGINAE – *Triphyllus hispidellus* (Broun, 1880) (Fig. 209).

REMARKS. Mycetophagids are poorly known in New Zealand. The European concept of *Triphyllus* applied to our native species needs clarification.

Suggested colloquial name: hairy fungus beetles.

SELECTED REFERENCES. Lawrence (1987), Leschen & Lawrence (1991), Parsons (1975).

[60] Family ARCHEOCRYPTICIDAE

Fig. 210

Length 2.7–3.5 mm Tarsal formula 5-5-4

DIAGNOSIS. **Body uniformly oval, slightly flattened,** dark brown to almost black, with short pubescence. **Head partially retracted into prothorax, broadly arcuate anteriorly; frontoclypeal suture distinct. Maxillary palps with apical segment enlarged and truncate. Antennae 11-segmented, with a 3-segmented club. Eyes coarsely faceted. Pronotum transverse, with sharp lateral margins**, slightly emarginate anteriorly and insignificantly sinuate basally. Elytra arcuate laterally, with confused punctation. **Procoxae globose, separated by prosternal process, which is gradually expanded apically. Tarsal segments simple. Abdomen with 5 ventrites, the first 2 connate (3 connate in Tenebrionidae [68]); basal ventrite slightly longer than 2nd ventrite.**

SYNOPSIS. There is a single adventive species of archeocrypticid, *Archeocrypticus topali*, in New Zealand.

Adults and larvae are reported from leaf litter and some polypore fungi with softer fruiting bodies (Lawrence & Britton 1994). Our species has been recorded from gardens, parks, litter in beech forest, under stones (rarely), under seaweed on beaches, moss on banks, nests of gulls (*Larus* sp.), on mummified apples, and under mature cabbages. In all these habitats it is probably associated with moulds or other fungi. Many adults and larvae have been collected in pitfall traps in pastures around Nelson.

RANGE. North ®, South ®, Stewart O
Kermadecs O, Three Kings O, Chathams O, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. *Archeocrypticus topali* Kaszab, 1964 (Fig. 210).

REMARKS. Suggested colloquial name: ancient fungus beetles.

SELECTED REFERENCES. Kaszab (1981, 1984), Lawrence (1994), Watt (1974a).

[61] Family CIIDAE

Fig. 211

Length 1–3 mm Tarsal formula 4-4-4

DIAGNOSIS. **Body elongate, subcylindrical or narrowly ovate and moderately convex**, yellowish, brownish, reddish brown, dark brown, or greenish, uniform in colour or with yellowish or brownish elytral spots sometimes of irregular shape, **glabrous and strongly glossy or moderately glossy and with short decumbent hairs and/or bristles. Head deflexed, with a distinct frontoclypeal**

ridge, this in male sometimes forming a plate or 2 tubercles or horns. Maxillae with reduced lobes and fusiform palps. **Antennae 8–10-segmented, with usually a 3-segmented loose club** (Fig. 9) (cf. a similar 3-segmented compact club in Curculionidae: Scolytinae [82]). **Pronotum large, partially or entirely covering head** (Fig. 9); base often approximately straight; **lateral edges incomplete. Elytra elongate, usually subparallel, with punctures confused or in rows. Procoxae transverse, projecting, their cavities open. Tibiae often with spines on outer edge.** Abdomen with 5 ventrites; basal ventrite usually with a setose fovea in male.

SYNOPSIS. Watt (1982a) recorded 20 native species of ciid for New Zealand. These belong to 5 genera of subfamily CIINAE. Kuschel (1990) recorded 17 species from Lynfield, Auckland, in 5 genera.

Adults and larvae are typically mycetophagous in fruiting bodies of shelf fungi (Polyporaceae). Some occasionally occur in forest litter, dead wood, or cut branches.

RANGE. North ®, South ®, Stewart ®
Kermadecs O, Three Kings ®, Chathams ®, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. CIINAE – *Cis zeelandicus* Reitter, 1880 (Fig. 211).

REMARKS. Suggested colloquial name: shelf fungus beetles.

SELECTED REFERENCES. Abdullah (1973), Lawrence (1971), Zimmerman (1938).

[62] Family MELANDRYIDAE

Fig. 212

Length 1.5–12 mm Tarsal formula 5-5-4

DIAGNOSIS. **Body elongate, approximately wedge-shaped, tapering posteriorly, convex dorsally and ventrally, with fine and decumbent pubescence**, finely or coarsely punctate; coloration uniformly dark brown to black, pale brown, or yellowish orange, sometimes with yellow, orange, or brown markings on elytra and pronotum. **Head deflexed, deeply inserted into prothorax, not constricted behind. Maxillary palps with last segment enlarged, often securiform. Antennae usually filiform or incrassate, but without a distinct club.** Eyes entire, not pubescent. **Pronotum with lateral carinae incomplete anteriorly,** sometimes with small longitudinal depressions. **Elytra tapering posteriorly**, sometimes with impressed longitudinal lines subparallel to suture. **Procoxae projecting, their cavities open** behind. **Legs long. Tibial spurs often comb-shaped, extremely elongate on metatibiae** (Fig. 84). **Tarsi with basal segment elongate at least in mesotarsus and metatarsus, and penultimate segment lobed.** Abdominal ventrites movable (not fused).

SYNOPSIS. Watt (1982a) reported 38 native species of melandryid for New Zealand. The species are assigned to 9 genera, 5 in subfamily MELANDRYINAE and the remainder of uncertain affiliation. Kuschel (1990) recorded 8 species in 7 genera from Auckland.

Adult melandryids occur in rotten wood, logs, organic litter including leaf litter, cut branches, flowers, at the base of bush-floor sedges, and on forest foliage. Adults are very agile, and are capable of jumping; some have been collected using interception traps. Larvae inhabit hard substrates, such as bracket fungi or wood (Lawrence & Newton 1995).

RANGE. North ®, South ®, Stewart ®
Kermadecs O, Three Kings ®, Chathams ®, Snares ®
Aucklands ®, Campbell ®, Antipodes ®, Bounties O

EXAMPLE. MELANDRYINAE – *Hylobia nubeculosa* Broun, 1886 (Fig. 212).

REMARKS. Suggested colloquial name: leaping beetles.

SELECTED REFERENCES. Crowson (1966b), Gressitt & Samuelson (1964a), Viedma (1966).

[63] Family MORDELLIDAE

Fig. 213

Length 4–17 mm Tarsal formula 5-5-4

DIAGNOSIS. **Body wedged-shaped, tapered posteriorly, laterally compressed, characteristically humped in lateral view, with the last abdominal segment produced and forming an acute process extending beyond elytra (often extremely elongate); surface with fine, decumbent pubescence**; coloration brown with darker markings on pronotum, uniformly black, or black with small white spots on elytra and often on lateral parts of sternites. **Head deflexed, flat ventrally and concealing prosternum (in resting position), abruptly constricted behind eyes and forming a narrow neck. Maxillary palps with last segment expanded. Antennae 11-segmented, filiform or slightly serrate.** Eyes entire. **Pronotum as broad as elytra or slightly broader,** transverse, sinuate basally and **with complete lateral carinae. Elytra tapering posteriorly. Procoxae projecting, their cavities open; metacoxae enlarged, plate-like. Tibiae often with comb-shaped spines.**

SYNOPSIS. Watt (1982a) recorded 5 native species of mordellid for New Zealand. Kuschel (1990) listed 6 species, including 1 adventive, in 4 genera from Lynfield,

Auckland. Two genera are in subfamily MORDELLINAE and the remainder are unassigned.

Adults have often been found on flowers of manuka (*Leptospermum scoparium*), ragwort (*Senecio jacobaea*), umbelliferous flowers, foliage of native shrubs and trees, forest litter, and grass. Larvae occur in rotten wood or stems of various species, e.g., castor oil plant (*Ricinus communis*).

Collecting: sweeping or beating foliage of trees, shrubs, and lower vegetation, or from interception traps.

RANGE. North ®, South ®, Stewart ®
Kermadecs O, Three Kings O, Chathams ®, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. MORDELLINAE – *Mordella antarctica* White, 1846 (Fig. 213).

REMARKS. New Zealand's mordellids are currently being studied by Dr M.E. Franciscolo of Genoa, Italy.

Suggested colloquial name: pintail beetles.

SELECTED REFERENCES. Batten (1990), Ermisch (1950), Franciscolo (1980), Odnosum (1991).

[64] Family RHIPIPHORIDAE

Fig. 214

Length 6–8 mm Tarsal formula 5-5-4

DIAGNOSIS. **Body elongate, more or less laterally compressed, tapering posteriorly but lacking an abdominal spine**, finely pubescent, the pubescence dark or yellowish and decumbent; coloration pale brown to dark brown, with head sometimes black and elytra usually paler. **Head deflexed (in natural position), abruptly constricted behind eyes to form a neck. Antennae with last 7 segments flabellate in males** (Fig. 33). **Eyes usually emarginate, more or less kidney-shaped** and partly surrounding base of antennae. **Pronotum trapezoidal, sinuate basally**. Elytra covering abdomen entirely, or shortened and exposing at least abdominal apex, with longitudinal ridges but not striate. **Procoxae projecting, their cavities open behind. Legs slender. Tibial spurs non-serrate. Tarsal segments simple; tarsal claws toothed** (Fig. 87).

SYNOPSIS. Hudson (1934) listed 5 native species of rhipiphorid for New Zealand, but Watt (1982a) recorded only 4. The species are placed in 3 genera of subfamily PELECATOMINAE, but the status of 1 genus is uncertain, and it may have to be synonymised. Kuschel (1990) recorded 1 species from Lynfield, Auckland.

Adults are found on scrubby vegetation, in dead wood, and on foliage of native shrubs, with one record from the cocoon of a cerambycid beetle. Kuschel (1990) reported *Allocinops brookesi* to be a predator on larvae of *Oemona hirta* (Cerambycidae). The larvae are known to be entomophagous parasitoids of immature Hymenoptera, Coleoptera (Cerambycidae), and Blattodea, and their development involves both external and internal feeding stages (Selander 1991). Unlike other rhipiphorids, the larva of *Rhipistena* is an eruciform, apparently free-living predator of larvae of *Prionoplus* (Cerambycidae) (Hudson 1934).

RANGE. North ®, South ®, Stewart O
Kermadecs O, Three Kings O, Chathams O, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. PELECATOMINAE – *Rhipistena lugubris* Sharp, 1878 (Fig. 214).

REMARKS. The relationships of our rhipiphorid genera in the world context require investigation.

Suggested colloquial name: antlered beetles.

SELECTED REFERENCES. Selander (1991).

[65] Family COLYDIIDAE

Fig. 215, 216

Length 1–19 mm Tarsal formula 4-4-4

DIAGNOSIS. **Body broadly oval or ovate to narrowly subparallel, sometimes extremely elongate** (e.g., *Rytinotus*), convex to flattened, **often with ridges, protuberances, or ornamentation, dark in colour**, usually brown to black, sometimes variegated with paler or darker markings, **usually matt with various pubescence, decumbent or erect or with bristles or scales**, rarely glossy and subglabrous. **Head usually partially retracted into thorax, often with a well developed frontoclypeal ridge which may be expanded forwards; antennal insertions usually concealed. Maxillary palp with last segment small. Antennae 10- or 11-segmented, incrassate, with a 2- or 3-segmented club. Pronotum usually transverse**, occasionally quadrate or elongate, **usually explanate laterally, with lateral carinae complete and often crenulate or dentate, sometimes expanded laterally and with apically produced front angles**; disc usually grooved, carinate, and/or tuberculate. **Elytra with ridges and/or tubercles and rows of punctation. Procoxae globular, their cavities open or closed. Tarsal segments simple.** Abdomen with 5 ventrites, the basal 3 free or connate.

SYNOPSIS. Watt (1982a) reported 196 native species of colydiid for New Zealand. There are 133 species represented in NZAC, belonging to some 26 genera in 2 sub-

families, PYCNOMERINAE and COLYDIINAE. The status of some genera needs revision. Kuschel (1990) recorded 24 species in 14 genera from Lynfield, Auckland.

Pycnomerines are distinct by having partly closed procoxal cavities, a laterally expanded prosternal process, and widely separated metacoxae, and by features of their larvae; colydiines are distinct by having procoxal cavities either open or closed by projections of the notum, moderately widely separated metacoxae, and by larval characteristics (Lawrence & Britton 1991).

Adults may be found under bark, on standing dead tree trunks, in rotten wood, cut branches, leaf litter, forest litter, and on various trees and shrubs. Most species are believed to be mycetophagous, but Lawrence & Britton (1994) reported certain New Guinean species as being predators of platypodine weevils. Larvae are generally taken from rotten wood.

RANGE. North ®, South ®, Stewart ®
Kermadecs ®, Three Kings ®, Chathams ®, Snares O
Aucklands ®, Campbell ®, Antipodes O, Bounties O

EXAMPLES. COLYDIINAE – *Pristoderus antarcticus* (White, 1846) (Fig. 215), *Rhizonium antiquum* Sharp, 1876 (Fig. 216).

REMARKS. The placement of *Rhizonium antiquum* in Colydiidae is uncertain, and should be treated as a temporary arrangement. Lawrence (1994) has shown that Pycnomerinae are more closely related to Monommatidae and Zopheridae (sensu Lawrence & Newton 1995) than they are to Colydiinae.

New Zealand's Colydiidae are under investigation by Dr M.A. Ivie (Montana State University, Bozeman, U.S.A.) and by Dr S.A. Slipinski (Polish Academy of Science, Warsaw, Poland).

Suggested colloquial name: rough mould beetles.

SELECTED REFERENCES. Sharp (1876c), Slipinski & Burakowski (1988), Wollaston (1873).

[66] Family ULODIDAE
(formerly as ZOPHERIDAE)

Fig. 217

Length 4–20 mm Tarsal formula 5-5-4

DIAGNOSIS. **Body broadly oval, slightly depressed, brown**, matt (exception: *Arthopus*, glabrous and strongly glossy); **dorsal surface with decumbent and/or erect pubescence, bristles, or scales usually forming a pattern. Head partially retracted into prothorax; antennal insertions exposed. Antennae 11-segmented, filiform, with at most a weak club. Eyes almost circular. Pronotum narrower at base than elytra, often with front angles produced anteriorly. Elytra usually broad**, often tuberculate, **with complete epipleura. Procoxal cavities closed behind by lateral extensions of prosternal intercoxal process** (Fig. 39) (in Tenebrionidae [68] closed by mesal extensions of pronotal hypomera – Fig. 38). Tarsal segments simple. **Abdomen with 3 basal ventrites connate.**

SYNOPSIS. Watt (1982a) reported 20 native species of ulodid (as Zopheridae) for New Zealand. Fourteen species are represented in NZAC, belonging to 4 genera, of which one is confined to New Zealand.

Adults and larvae of *Brouniphylax squamiger* occur in dead bracket fungi (*Fomes*), and adults alone are sometimes found under logs. Both stages of *Syrphetodes* are found under loose bark of standing dead trees or logs and in rotten branches; adults also are found on the underside of logs. Kuschel (1990) reported *B. squamiger* in dead Polyporaceae on decaying logs from Lynfield, Auckland.

RANGE. North ®, South ®, Stewart O
Kermadecs O, Three Kings ®, Chathams O, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. *Syrphetodes marginatus* Pascoe, 1875 (Fig. 217).

REMARKS. Ulodids are superficially similar to tenebrionids [68], from which they can be readily separated by having exposed antennal insertions, an apically expanded prosternal process, and in larval features (clypeus fused to frons, and frontoclypeal suture obliterated). In tenebrionid larvae the clypeus is always distinct from the frons. For comparisons of Ulodidae, Chalcodryidae [67], and Zopheridae see Watt (1974a), Doyen & Lawrence (1979), Lawrence (1994), and Lawrence & Newton (1995). For a key to all genera of Ulodidae see Lawrence (1994).

Suggested colloquial name: false darkling beetles.

SELECTED REFERENCES. Doyen & Lawrence (1979), Lawrence (1994), Watt (1974a).

[67] Family CHALCODRYIDAE

Fig. 218

Length 5–22 mm Tarsal formula 5-5-4

DIAGNOSIS. **Body fairly soft, loosely articulated, narrowly elongate, subparallel, moderately convex, glossy, pale to dark green or brownish to dark brown,** often with metallic reflections, and sometimes with patches of yellowish pubescence; surface punctate. **Head prognathous, slightly narrowed behind eyes, with a broad neck; antennal insertions exposed. Maxillary palp with last segment enlarged**, securiform. **Antennae 11-segmented, filiform, sometimes with last 3 segments slightly larger but not forming a distinct club. Pronotum transverse,**

rectangular, with sides explanate. Elytra subparallel, without clearly defined striae but with irregular rows of punctures; **epipleura with a carina extending almost to apex. Procoxae projecting, their cavities large, transverse, closed** behind partly by inward extensions of propleura and partly by lateral extensions of narrow intercoxal process; mesocoxal cavities narrowly separated, open laterally. Legs long and slender. Tarsal segments elongate, not lobed. **Abdomen with 3 or 4 basal ventrites weakly connate.**

SYNOPSIS. Chalcodryids are the only endemic family in New Zealand, with 5 native species in 3 genera. A key to genera and species is provided by Watt (1974b), together with a detailed description of this family. Distribution records suggest a northern limit to the south of Auckland.

Watt (1974b) collected adults by beating branches covered with moss and/or lichen in cool, wet forests, especially of *Nothofagus*. Adults of *Chalcodrya* are encountered most frequently, and their larvae have been found in short refuge galleries in dead suppressed twigs or small branches on various trees; they can be collected at night from moss-covered branches (Watt 1974b). Larval gut contents predominantly consist of lichen and moss, with some fragments of mites and spiders (Watt 1974b).

RANGE. North ®, South ®, Stewart ®
Kermadecs O, Three Kings O, Chathams O, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. *Chalcodrya variegata* Redtenbacher, 1868 (Fig. 218).

REMARKS. Chalcodryids in many features are similar to Periomylopidae, Ulodidae, and Tenebrionidae. They may be distinguished from Tenebrionidae [68] in having the procoxal cavities partly closed by lateral extensions of the prosternal intercoxal process, 4 connate abdominal sternites (3 in Tenebrionidae), and exposed antennal insertions. Chalcodryids differ from Ulodidae [66] in their fairly soft and loosely articulated body (cf. compact and strongly sclerotised), narrow prosternal intercoxal process, and lack of concealed lateral procoxal extensions. According to Watt (1974b), chalcodryids differ from Periomylopidae in having concealed trochantins on the procoxae and having usually 4 connate abdominal sternites.

Lawrence (1994) transferred the Tasmanian genus *Sirrhas*—placed in Chalcodryidae by Watt (1974b)—to the Periomylopidae, leaving Chalcodryidae restricted in distribution to New Zealand. Lawrence (1994) discussed the new concept of the family.

Suggested colloquial name: southern beech beetles (R. Palma, *in litt.*)

SELECTED REFERENCES. Lawrence (1994), Watt (1974b).

[68] Family TENEBRIONIDAE

Fig. 219–221

Length 2.9–18 mm

Tarsal formula 5-5-4 or (*Archaeoglenes*) 4-4-4

Adult tenebrionids are highly variable in form, and some are superficially similar to members of other families, e.g., Carabidae [2], Scarabaeidae [15], Ulodidae [66], and Chrysomelidae [77]. However, they are distinct in the following combination of characters.

DIAGNOSIS. **Body usually black or brown,** rarely pale, moderately glossy (rarely glossy metallic) to matt, **often subglabrous. Head not sharply constricted behind eyes; antennal insertions under a canthus** (Fig. 11), **which conceals at least base of scape from above and usually extends back to anterior margin of eye,** on which it usually encroaches. **Maxillary palp with last segment often securiform. Antennae usually filiform, incrassate, distinctly clubbed or bluntly serrate. Eyes usually emarginate. Pronotum usually carinate or explanate laterally. Elytra usually narrowly oval or subparallel, with distinct epipleura,** if striate then usually with 9 or fewer striae (exception: 10 striae in some Lagriinae), often with a scutellary striole or with sutural striae diverging basally. **Hind wings sometimes reduced. Procoxae variable in shape, often projecting, their cavities almost always closed behind by extensions of pronotal hypomera,** but not by lateral extensions of prosternal intercoxal process as in Ulodidae [66] and Chalcodryidae [67], without exposed trochantins. **Trochanters heteromeroid** (e.g., Fig. 59). Legs variable in form and function, from stout and specialised for digging to slender for running. **Tarsal segments usually not lobed below, the claws simple or pectinate** (Alleculinae) but never appendiculate. **Abdomen with 5 ventrites, the first 3 connate,** and often with intersegmental membrane clearly visible between ventrites 3/4 and 4/5.

SYNOPSIS. Tenebrionids are a major group, comprising approximately 15 000 described species worldwide. There are 149 valid species in New Zealand, 10 of them adventive, in 36 genera, 16 tribes, and 8 subfamilies (Watt 1992) – LAGRIINAE, ZOLODININAE, PIMELIINAE, TENEBRIONINAE, ALLECULINAE, DIAPERINAE, and COELOMETOPINAE. Tenebrionids constitute 3.3% of the total known species of Coleoptera in New Zealand (Watt 1992). Kuschel (1990) recorded 21 species in 15 genera from Lynfield, Auckland.

The biology of New Zealand tenebrionids is recorded by Watt (1992). Many of our native species live in rotten wood (*Aphtora*, *Menimus*, *Uloma*, *Ulomotypus*, *Zolodinus*), or in powdery, dry rotten wood (*Mimopeus opaculus*). *Archeoglenes* occurs in leaf litter and under logs. *Menimus* inhabits dead fruiting bodies of large woody fungi. *Actizeta* and *Chaerodes* live in sandy beaches, recalling the many species overseas known mainly from

arid and semi-arid habitats. Some species (in *Artystona*, *Pseudhelops*, *Partystona*, and *Cerodolus*) feed on lichens at night. *Lorelus* lives in dead tissue of tree ferns and dead flower stalks of speargrass. *Amarygmus*, *Chrysopeplus*, and *Demtrius* occur under loose bark of standing dead trees. *Gonocephalum*, *Mimopeus*, *Omedes*, *Zomedes*, and Adeliini are frequently found under stones. *Tanychilus* and *Xylochus* occur on flowers. *Mimopeus* occasionally feeds on live plant tissue.

The adventive cosmopolitan elements in our fauna are in the genera *Alphitobius*, *Gnathocerus*, *Tenebrio*, and *Tribolium*, of which a few species infest stored products.

Collecting: hand picking from under stones or logs (at night with a headlamp); processing organic litter through Berlese funnels; pitfall trapping; and sifting sand.

RANGE. North ®, South ®, Stewart ®
Kermadecs ®, Three Kings ®, Chathams ®, Snares ®
Aucklands ®, Campbell ®, Antipodes ®, Bounties ®

EXAMPLES. LAGRIINAE – *Chaerodes trachyscelides* White, 1846 (Fig. 219); PIMELIINAE – *Actizeta albata* Pascoe, 1875 (Fig. 220); TENEBRIONINAE – *Mimopeus elongatus* (Brême, 1842) (Fig. 221).

REMARKS. Keys to subfamilies of Tenebrionidae of the world (based on adults and larvae) are provided by Watt (1974a). Keys to New Zealand subfamilies, genera, and species of Tenebrionidae (based on adults) are provided by Watt (1992). Doyen *et al.* (1990) discussed the subfamily classification of Tenebrionidae, with Zolodininae treated as a subfamily (in agreement with Watt 1974a). For cosmopolitan pest species see Booth *et al.* (1990).

Adults and larvae of Tenebrionidae may be reared on a diet consisting of wholemeal flour and dried yeast, with access to water.

Suggested colloquial name: darkling beetles.

REFERENCES. Doyen *et al.* (1990), Skopin (1964), Watt (1967, 1968, 1974a, 1988, 1989b, 1992), Watt & Triplehorn (1991).

[69] Family PROSTOMIDAE

Fig. 222

Length 6–8 mm Tarsal formula 4-4-4

DIAGNOSIS. **Body narrowly elongate, subparallel, strongly depressed, glabrous, glossy**, reddish brown, yellowish brown, or brown, with surface punctate. **Head prognathous, large, slightly broader than pronotum at base, strongly produced posterolaterally behind eyes, with a distinct narrow neck; frontoclypeal suture present. Antennae 11-segmented, with a 3-segmented elongate club; scape enlarged, with segments bead-shaped. Eyes small**, round, projecting. **Pronotum elongate**, slightly depressed medially; **lateral carinae indistinct. Elytra with angular shoulders** and with striae weakly defined except for lateral ones. **Procoxae globose, their cavities closed behind; procoxal process broad; both procoxae and mesocoxae widely separated. Tarsal segments simple. Abdomen with 5 ventrites, the basal 2 connate.**

SYNOPSIS. Only a single species of prostomid, *Dryocora howitti*, is recorded from New Zealand.

Adults and larvae occur in logs of rimu (*Dacrydium cupressinum*), totara (*Podocarpus totara*), and hinau (*Elaeocarpus dentatus*) which have reached the red stage of decay, breaking up into rectangular pieces with mud-like substrate in between, on which they feed.

RANGE. North ®, South ®, Stewart O
Kermadecs O, Three Kings O, Chathams O, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. *Dryocora howitti* Pascoe, 1868 (Fig. 222).

REMARKS. In earlier classifications prostomids were sometimes treated as a subfamily of Cucujidae [46], probably owing to their strongly depressed body. The genus *Dryocora* is also known from Australia.

Suggested colloquial name: red log beetles.

SELECTED REFERENCES. Pascoe (1868), Schawaller (1993).

[70] Family OEDEMERIDAE

Fig. 223

Length 6–20 mm Tarsal formula 5-5-4

DIAGNOSIS. **Body soft, elongate, subparallel, finely and uniformly pubescent**, testaceous or fuscous, sometimes with dark brown pattern, or uniformly black. **Head small, moderately deflexed, elongate before eyes, equal in width to pronotum. Maxillary palp showing sexual dimorphism in almost all species, the apical segment expanded and truncate in males. Antennae long, usually filiform, 11-segmented. Eyes variable in size, entire or slightly emarginate** near antennal insertions. **Prothorax subcylindrical,** usually longer than broad, widest anteriorly or at middle, **without lateral carinae, distinctly narrower than elytra. Elytra either elongate, with fully developed hind wings, or shortened and exposing abdomen, with reduced hind wings,** rounded apically, with indistinct epipleura restricted to basal half; elytral surface sometimes costate. **Procoxae projecting, their cavities open. Legs slender and long, with hind femora usually swollen. Tarsi with penultimate segment bilobed;** claws simple or toothed. **Abdomen with 5 ventrites, and with genitalia usually exposed in male.**

SYNOPSIS. There are 21 species of oedemerid in New Zealand, of which 18 are native and 3 adventive (Hudson 1975, Watt 1982a). They belong in 6 genera representing 2 subfamilies, NACERDINAE and OEDEMERINAE. All our native species are oedemerines, and some are restricted to the alpine zone of the South Island. Of the adventive species, 2 are Australian and the other, our only nacerdine, is cosmopolitan. Kuschel (1990) recorded 2 adventive species collected at light from Lynfield, Auckland.

Adult oedemerids occur in coastal habitats, under driftwood just above high tide, and in inland habitats on vegetation; they may be common on flowers or herbage or under driftwood. Some species are restricted in habitat, whereas others range from coastal to inland areas (Hudson 1975). Larvae live in decaying and/or wet wood, sometimes in timber partly or intermittently submerged in saline or fresh water, and are common in driftwood along coastal shores; others occur in decaying *Olearia* and *Dracophyllum* logs and dead branches inland (Hudson 1975).

RANGE. North ®, South ®, Stewart ®
Kermadecs ®, Three Kings O, Chathams ®, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. OEDEMERINAE – *Thelyphassa lineata* (Fabricius, 1792) (Fig. 223).

REMARKS. Haemolymph of oedemerids contains the irritant cantharidin, which may cause blistering of the skin, so caution is necessary in handling them.

Suggested colloquial name: lax beetles.

SELECTED REFERENCES. Arnett (1950), Hudson (1975), Rozen (1960).

[71] Family PYROCHROIDAE

Fig. 224, 225

Length 5–10 mm Tarsal formula 5-5-4

DIAGNOSIS. **Body soft, flattened dorsoventrally, elongate, subparallel, with elytra often slightly widened posteriorly from midlength,** slightly glossy or matt, variously punctate, **with decumbent and erect hairs**; coloration uniformly brown or black, or bicoloured with pronotum orange and remainder of body dark. **Head entirely visible from above, gradually narrowed behind eyes** (never abruptly narrowed posteriorly as in Scraptiidae, Fig. 233); **clypeus with an anterior membranous area; frontoclypeal suture slightly depressed to distinctly carinate; antennal insertions exposed. Maxillary palps with terminal segment expanded and truncate apically. Antennae usually sexually dimorphic (males with increased pectination), filiform, serrate, or pectinate. Eyes large, projecting,** entire or slightly emarginate (*Techmessodes*). **Pronotum small**, two-thirds of elytral width, subquadrate or subcylindrical, with lateral margin smooth. **Elytra flat to slightly convex**, with larger punctures bearing shorter decumbent setae and smaller punctures bearing longer, secondary elytral setae; **epipleura distinct,** narrow, extending almost to apex of elytra. **Legs long, slender. Procoxae conical, projecting, their cavities open posteriorly and internally**; mesocoxae narrowly separated. **Tarsi with penultimate and antepenultimate segments lobed** beneath and with dense, fine ventral setae. **Abdomen with 5 movable ventrites.**

SYNOPSIS. According to Watt (1987) and Pollock (1995) there are 7 native species of pyrochroid described and 3 or so undescribed. They belong to 3 endemic New Zealand genera of subfamily PILIPALPINAE.

Adults are found under bark of dead trunks and branches, or on foliage or flowers. Watt (1987) found very little pollen in gut contents, which usually contained fungal hyphae and spores and much amorphous vegetable matter. Larvae are almost invariably subcortical on logs, dead branches, or standing dead trunks, where they feed on decaying cambial matter and fungal hyphae. Larvae of various sizes are found at most times of the year, indicating that the life cycle may take 2 years or more to complete (Watt 1987).

RANGE. North ®, South ®, Stewart O
Kermadecs O, Three Kings O, Chathams O, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLES. PILIPALPINAE – *Techmessa concolor* Bates, 1874 (Fig. 224), *Exocalopus pectinatus* Broun, 1893 (Fig. 225).

REMARKS. The New Zealand Pyrochroidae as defined by Pollock (1995) are equivalent to the subfamily Pilipalpinae of Pythidae proposed by Watt (1987). These authors discuss the relationships between genera and the status of the family, and provide keys to species (adults and larvae) and genera. We have followed the family concept proposed by Pollock (1995), who studied the classification, phylogeny, and geographic history of pilipalpine genera worldwide, and extended the family limits of Pyrochroidae.

Suggested colloquial name: cardinal beetles.

SELECTED REFERENCES. Pollock (1994, 1995), Watt (1987).

[72] Family SALPINGIDAE

(incl. INOPEPLINAE)

Fig. 226, 227

Length 2–10 mm Tarsal formula 5-5-4

Members of this family are represented by two distinct

forms: **small carabid-like species**, moderately convex to slightly flattened, with a distinct 'waist' between prothorax and elytra, and elytra narrowly oval (Aegialitinae and Salpinginae); and **a staphylinid-like species** of Inopeplinae with short elytra, exposed abdomen, and strongly flattened body.

DIAGNOSIS. **Body usually coarsely punctate, subglabrous or with long, protruding setae** (*Trichocolposinus*), uniformly black, dark brown, reddish brown, or bicoloured reddish brown with brown elytral spots. **Head prognathous, never abruptly narrowed behind eyes; antennal insertions exposed. Maxillary palps with terminal segment enlarged,** broad and truncate apically or narrowly elongate (Inopeplinae). **Antennae 11-segmented, filiform, without a club** (Inopeplinae) **or with a loosely formed 3-, 4-, or indistinctly 5-segmented club** (*Trichocolposinus*). **Pronotum narrowed at base, broadened apically. Prosternum long in front of coxae. Procoxae globose, narrowly separated, open** behind; mesocoxae globose, and metacoxae transverse; coxae narrowly or moderately broadly separated (Aegialitinae). **Abdomen with 5 ventrites, the 2 basal ones connate.**

SYNOPSIS. There are 22 native nominal species of salpingid in New Zealand (Watt 1982a); 13 of them are represented in NZAC. The species belong to 4 genera in 3 subfamilies – AEGIALITINAE, INOPEPLINAE, and SALPINGINAE. Kuschel (1990) listed 8 species of *Salpingus* from Lynfield, Auckland.

Species of *Salpingus* are found on foliage of various trees, shrubs, and herbaceous plants, with some in sooty moulds, and are easily collected by beating or sweeping. Some larvae of *Salpingus* live under the bark of dead twigs. Species of *Diagrypnodes* live under bark of dead trees, including *Nothofagus*. The most specialised species are in *Antarcticodomus*, living under stones in the intertidal zone on many offshore islands (Watt 1962, 1982b). They have an elongate terminal tarsomere with strong claws, as in species of Dryopidae and Elmidae [21, 22] – an adaptation for life on rocks in the intertidal zone.

RANGE. North ®, South ®, Stewart ®
Kermadecs ®, Three Kings ®, Chathams ®, Snares ®
Aucklands ®, Campbell ®, Antipodes ®, Bounties ®

EXAMPLES. SALPINGINAE – *Salpingus bilunatus* Pascoe, 1876 (Fig. 226); INOPEPLINAE – *Diagrypnodes wakefieldi* Waterhouse, 1876 (Fig. 227).

REMARKS. Salpingidae are poorly known, and the family is in need of taxonomic revision.

Suggested colloquial name: bark mould beetles.

SELECTED REFERENCES. Spilman (1954, 1967), Young (1991a, b).

[73] Family ANTHICIDAE

Fig. 228–231

Length 2–7 mm Tarsal formula 5-5-4

DIAGNOSIS. **Body antlike, elongate, convex, with elytra much broader than head and pronotum,** variously punctate, **clothed with decumbent and erect hairs**; coloration black, brown, rust brown, or bicoloured with dark or yellowish spots on elytra which sometimes form broad bands. **Head as broad as pronotum or slightly broader, abruptly constricted basally and forming a narrow neck** (exception: *Lagrioida*, Lagrioidinae); **antennal insertions exposed. Maxillary palps with last segment usually securiform. Antennae 11-segmented, filiform, usually incrassate apically but without a distinct club** (a weak 3-segmented club present in *Macratria* and *Lagrioida*). Eyes small to large, slightly protruding laterally. **Pronotum** approximately oval or quadrate in outline, **widest at front and constricted** (slightly so in *Lagrioida*) **at or near base** (*Cotes*); **lateral pronotal carinae absent. Elytra elongate** oblong to elongate or subparallel (some *Anthicus*), **much broader than pronotum or head**; punctation confused; epipleura incomplete. Procoxae projecting, their cavities confluent, open behind (but closed internally); metacoxae almost touching (Macratriinae) or separated (Anthicinae, Lagrioidinae). **Tarsi with penultimate segment lobed. Abdomen with 5 ventrites, the basalmost 2 connate in *Lagrioida*.**

SYNOPSIS. In New Zealand there are 26 species of anthicid, 9 of them adventive, in 7 genera and 4 subfamilies – ANTHICINAE, LAGRIOIDINAE, LEMODINAE, and MACRATRIINAE (Werner & Chandler 1995). Two genera are endemic to New Zealand. Kuschel (1990) recorded 12 species in 4 genera from Lynfield, Auckland.

Anthicids are general scavengers, and occur in decaying vegetation such as compost or heaps of prunings, on vegetation near streams, in forest litter, and under logs. They may be collected by sweeping vegetation, sifting organic matter, or from pitfall traps. *Lagrioida brouni*, which occurs on beaches of the North Island, has related species in Australia and Chile (Lawrence & Britton 1994).

RANGE. North ®, South ®, Stewart ®
Kermadecs O, Three Kings ®, Chathams ®, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLES. ANTHICINAE – *Anthicus hesperi* King, 1869 (Fig. 228); LAGRIOIDINAE – *Lagrioida brouni* Pascoe, 1876 (Fig. 229); LEMODINAE – *Cotes crispi* (Broun, 1880) (Fig. 230); MACRATRIINAE – *Macratria exilis* Pascoe, 1877 (Fig. 231).

REMARKS. New Zealand's anthicids have been revised and described by Werner & Chandler (1995).

Suggested colloquial name: ant beetles.

SELECTED REFERENCES. Abdullah (1969), Kitayama (1982), Werner & Chandler (1995), Young (1991c).

[74] Family ADERIDAE

(= EUGLENIDAE = XYLOPHILIDAE)

Fig. 232

Length 1–3 mm Tarsal formula 5-5-4

DIAGNOSIS. **Body soft, elongate**, brown or black, often with bicoloured elytra, with **head and pronotum markedly narrower than elytra**, convex, punctate, and **with erect and/or decumbent hairs. Head deflexed, abruptly constricted behind eyes. Maxillary palps with last segment securiform. Antennae 11-segmented, filiform. Eyes large, coarsely faceted. Pronotum small, subquadrate, without lateral carinae. Elytra broad, oval, with distinct shoulders but lacking epipleura; punctation confused. Procoxae projecting, their cavities open**; metacoxae separate. **Tarsi with penultimate segment reduced and the preceding ones lobed. Abdomen with 2 basal sternites connate or solidly fused.**

SYNOPSIS. Watt (1982a) reported 9 native species of aderid for New Zealand. Fifteen species (many undescribed) are represented in NZAC, almost all of them belonging to a genus at present recognised as '*Xylophilus.*' The assignment of New Zealand species to this European genus is, however, questionable. *Scraptogetus* (*Metasclera*) is also recorded from New Zealand (Hudson 1934), but its assignment to Aderidae is only partially confirmed (Watt 1987). Kuschel (1990) recorded 5 species of '*Xylophilus*' from Lynfield, Auckland.

Adult aderids are commonly found on foliage, and larvae live in rotten wood, under bark, and in leaf litter. Adults may be collected by beating foliage, in Malaise traps, or by light trapping. The larvae are probably associated with decaying wood (Young 1991d).

RANGE. North ®, South ®, Stewart ®
Kermadecs O, Three Kings ®, Chathams ®, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. '*Xylophilus*' *nitidus* (Broun, 1893) (Fig. 232).

REMARKS. Aderids are similar in appearance to Anthicidae [73], but are distinguished by having the penultimate tarsal segment vestigial (cf. well developed and lobed) and the preceding segment lobed, larger and coarsely faceted eyes, no elytral epipleura (cf. present but incomplete), and first 2 ventrites connate or solidly fused. This group is very poorly known in New Zealand.

Suggested colloquial names: puppet beetles, ant-like leaf beetles.

SELECTED REFERENCES. Hayashi (1972), Young (1991d).

[75] Family SCRAPTIIDAE

Fig. 233

Length 1–3 mm Tarsal formula 5-5-4

DIAGNOSIS. **Body soft, slightly flattened, oblong to narrowly elongate**, black, brown, or yellowish brown, sometimes with dark spots on elytra, uniformly pubescent. **Head strongly deflexed, abruptly constricted behind eyes into a narrow neck; frontoclypeal suture distinct; antennal insertions exposed. Maxillary palp with terminal segment securiform. Antennae filiform, without a club. Eyes emarginate, C-shaped, coarsely faceted. Pronotum transverse, with lateral margins incomplete anteriorly;** disc sometimes with 2 small basal impressions. **Elytra as broad as pronotum at base**, with confused punctation; **epipleura incomplete. Procoxae projecting, their cavities open behind. Tarsi with penultimate segments lobed beneath. Tibial spurs well developed** (Fig. 85), **pubescent, not serrate. Abdominal ventrites free.**

SYNOPSIS. There are 4 nominal species of scraptiid recorded from New Zealand (Watt 1987), plus several undescribed in NZAC. The described species belong to 2 genera in subfamily SCRAPTIINAE. Kuschel (1990) reported 3 species of *Nothotelus* from Lynfield, Auckland.

Adults occur on foliage and flowers in mainly forested areas, and larvae are known from leaf litter. Young (1991e) recorded scraptiid larvae from beneath bark, among decaying woody fibres of dead logs, and from lichens. In Australia, larvae occur under bark, in rotten wood, or in leaf litter (Lawrence & Britton 1994).

RANGE. North ®, South ®, Stewart ®
Kermadecs O, Three Kings O, Chathams ®, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. SCRAPTIINAE – *Nothotelus usitatus* (Broun, 1880) (Fig. 233).

REMARKS. Scraptiidae may be readily distinguished from Anthicidae [73] and Aderidae [74] by the pronotum having lateral carinae and being equal in width to the elytral base, and from Melandryidae [62] by having the eyes deeply emarginate, head strongly constricted posteriorly, and tibial spurs not serrate (Fig. 85).

Suggested colloquial name: soft leaping beetles.

SELECTED REFERENCES. Franciscolo (1964), Watt (1987), Young (1991e).

Superfamily CHRYSOMELOIDEA (PHYTOPHAGA)

Adults are characterised by having pseudotetramerous tarsi (5-5-5-segmented with the 4th segment reduced), the head usually not prolonged into a rostrum, antennae filiform, not clubbed, and male genitalia of a reduced cucujoid type (Lawrence & Britton 1994). Larvae lack a distinct mandibular mola, gular area, and hypopharyngeal bracon. All species are phytophagous.

[76] Family CERAMBYCIDAE

[assisted by G. Kuschel]

Fig. 234–237

Length 2.5–50 mm Tarsal formula 5-5-5, appearing 4-4-4

DIAGNOSIS. **Body elongate, subcylindrical or flattened and wide, often broad-shouldered**, pubescent or subglabrous; coloration variable through brown, black, or green, or of complex pattern. **Head variable in form, from prognathous with strongly projecting mandibles to hypognathous or slightly opisthognathous; antennal insertions on 2 pronounced tubercles or swellings on frons, either between eyes and mandibles** (Prioninae, Spondylidinae) **or between eyes** (Cerambycinae, Lamiinae). Maxillary palps with last segment tapering apically or truncate (Cerambycinae). **Antennae capable of being flexed backwards against body, elongate, extending beyond middle of elytra, often equal to body length or much longer. Eyes usually emarginate**. Pronotum cylindrical, with lateral margin distinct, at least basally (Prioninae), to completely absent. Mesonotum usually with stridulatory files. Elytra variable, from narrow and subcylindrical to broad and flattened (Prioninae), variously sculptured. **Procoxae from globular to transverse, their cavities open or closed. Tarsi with penultimate segment reduced. Abdomen usually with 5 ventrites.** Aedeagal apodemes free, or largly so; internal sac long, with pigmentation confined to struts (paraprocts); styli usually large. Larvae with ambulatory ampullae present on abdominal segments 1–6 or 7.

SYNOPSIS. One of the largest beetle families in New Zealand. Hudson (1934) recorded 250 native and 6 adventive species of cerambycid, whereas Watt (1982a) estimated 180 valid nominal native species and 8 adventive. Approximately 196 native and 8 adventive species are represented in NZAC, belonging to some 56 genera (8 of them exotic) in 4 subfamilies – PRIONINAE, SPONDYLIDINAE, CERAMBYCINAE, and LAMIINAE. Kuschel (1990) recorded 56 species in 33 genera from Lynfield, Auckland.

The Prioninae are represented by an endemic species, *Prionoplus reticularis*, which is one of the largest beetles in our fauna, reaching 50 mm in length. The Spondylidinae are represented by an adventive Palearctic species, *Arhopalus tristis*. The majority of our species are cerambycines, of which 6 or so species of *Zorion* are perhaps the most strikingly colourful beetles in our fauna. The species of Lamiinae were treated by Breuning (1962), who also provided keys for their identification.

Adults feed on foliage, flowers, or bark, and some adults feed in live shoots before sexual maturation; larvae feed internally on bark or woody material of trees and shrubs. A few larvae of exotic species are known to develop in seed pods, or in stems of herbaceous plants (Booth *et al.* 1990, Lawrence & Britton 1994). Many species, particularly adventive ones, are of economic importance as pests of commercial timber.

Collected by netting, sweeping foliage and flowers, at light, or by rearing larvae from wood.

RANGE. North ®, South ®, Stewart ®
Kermadecs ®, Three Kings ®, Chathams ®, Snares O
Aucklands O, Campbell O, Antipodes ®, Bounties O

EXAMPLES. PRIONINAE – *Prionoplus reticularis* White, 1846 (Fig. 234); CERAMBYCINAE – *Zorion* sp. (Fig. 235), *Oemona hirta* (Fabricius,1775) (Fig. 236); LAMIINAE – *Xylotoles costipennis* (Breuning, 1982) (Fig. 237).

REMARKS. Important references for identification are Duffy (1953) for British species and imported timber pests, and Duffy (1963, 1968) for Australian and Oriental larvae. For world references on economically important cerambycids, see Booth *et al.* (1990). The subfamily classification was discussed by Napp (1994) and Lawrence & Newton (1995).

Suggested colloquial name: longhorn beetles.

KEY TO SUBFAMILIES OF CERAMBYCIDAE

1 Antennal insertions distant from base of mandibles in lateral view ... 2
—Antennal insertions close to base of mandibles (Fig. 234), nearly in contact in lateral view ... 3

2(1) Protibiae not grooved before apex; head weakly prognathous; maxillary palps with apical segment slightly expanded and truncate at apex; antennae moderately to extremely elongate ... (Fig. 235, 236) .. CERAMBYCINAE
—Protibiae obliquely grooved on internal face before apex; head usually hypognathous or opisthognathous; maxillary palps with apical segment fusiform; antennae usually moderately elongate ... (Fig. 237) .. LAMIINAE

3(1) Pronotum with lateral carinae, at least in basal half, and bearing spines; procoxae strongly transverse; labrum firmly united to clypeus ... (Fig. 234) .. PRIONINAE
—Pronotum lacking lateral carinae; procoxae rounded; labrum free ... SPONDYLIDINAE

SELECTED REFERENCES. Bain (1976a, b), Blair (1937), Breuning (1962), Dumbleton (1957), Hosking (1978a–e, h), Napp (1994), Watt (1983c), Zondag & Bain (1976).

[77] Family CHRYSOMELIDAE

(including BRUCHINAE)

[assisted by L. LeSage]

Fig. 238–243

Length 1–10 mm Tarsal formula 5-5-5, appearing 4-4-4

DIAGNOSIS. **Body form very diverse, elongate and subparallel, oval, hemispherical, cylindrical or subcylindrical, flattened or strongly convex, usually subglabrous but sometimes pubescent or bearing scales** (Bruchinae, some Eumolpinae), glossy or dull (e.g., some Galerucinae); coloration brown, black, yellowish, or multicolored with spots or stripes, often with a metallic shine (e.g., Chrysomelinae). Head prognathous, hypognathous, or opisthognathous, sometimes deeply inserted into prothorax, sometimes bearing grooves or prominences, sometimes rostrate but with rostrum no longer than wide (Bruchinae); **antennal insertions either close together on frons or well separated, never on a prominence. Antennae not capable of being flexed backwards against the body, usually shorter than body, filiform, sometimes broadening apically.** Eyes usually entire. Pronotum narrower than elytra or as broad as elytral base, with or without lateral margins. Mesonotum lacking stridulatory files. Elytra entire or shortened and leaving pygidium exposed, striate or with confused punctures. **Tarsi with 4th segment usually short and concealed at base of preceding segment. Abdomen with 5 ventrites; basal ventrites not fused.** Aedeagal apodemes fused to form a spoon-like roof over internal sac, which is short and in dorsal view completely covered by fused apodemes; ovipositor with proximal hemisternites short, weakly pigmented or membranous; styli usually very small or absent. Larvae without ambulatory ampullae on abdominal segments.

SYNOPSIS. Hudson (1934) recorded 155 native species of chrysomelid and 1 adventive species of bruchid (here as Bruchinae). Watt (1982a) recorded 146 native species and 7 adventive or introduced, including 1 bruchine. Five more introduced bruchines are now represented in NZAC, making a total of some 134 native species and 19 adventive or introduced. These belong to some 33 genera in 5 subfamilies – BRUCHINAE, CRYPTOCEPHALINAE, EUMOLPINAE, CHRYSOMELINAE, and GALERUCINAE. Kuschel (1990) reported 20 species in 12 genera from Lynfield, Auckland.

The Bruchinae, represented by 6 species in 4 genera, are distinct in having an ovate body, usually broad posteriorly, the head concealed from above and prolonged into a short, broad beak, notched eyes, enlarged hind femora usually bearing teeth, and shortened elytra exposing the pygidium.

There are 25 native species in 4 genera of Eumolpinae in our fauna. For a key to genera and descriptions of some species see Shaw (1957a, b).

Our 4–9 species in 2 genera of Cryptocephalinae are distinct in their partially glabrous, compact, subcylindrical or cylindrical body form, hypognathous head deeply inserted into the prothorax, broadly separated long antennae, and often exposed pygidium.

Our Galerucinae include some 76 species in 2 tribes, Galerucini and Alticini (the latter is often given subfamily status). Galerucini, represented by some 57 species in 3 endemic genera, are characterised by their prognathous or hypognathous head, with usually filiform antennae inserted close together on the frons, pronotum with distinct lateral margins, and metafemora swollen not much more than the mesofemora.

The Alticini, commonly called flea-beetles because of their usually small size (1–5 mm) and ability to jump, are represented by some 19 species (6 exotic, 13 native) in 10 genera. They vary in form from elongate to oval and convex, and usually are glabrous and variable in colour—metallic, brownish, yellowish, black, blue, or dark with pale stripes. They are distinct in having usually filiform antennae with narrowly separated insertions, pronotum with distinct lateral margins, and strongly enlarged metafemora containing the endoskeletal jumping organ.

Our Chrysomelinae comprise some 41 species (including 5 exotic) in 9 genera. They are usually of medium size, predominantly glossy and metallic, with body shape variable from narrowly elongate to broad or hemispherical and of differing convexity, and head usually oblique, with front margin of clypeus approximately truncate, antennae filiform and widely separated, and procoxae transverse.

The majority of chrysomelids feed on leaves, though some are known to consume pollen and anthers. Bruchines feed mainly on legume seeds, and all but one are considered to be agricultural pests. In New Zealand chrysomelid adults are commonly collected from low-growing plants or bushes. Many species are host-specific. The family contains a relatively large number of pests of cultivated plants, some of them transmitting plant viruses. *Paropsis charybdis* (Chrysomelinae), self-introduced to New Zealand from Australia, is causing severe damage in gum plantations (Selman 1963, Bain 1977a). For cosmopolitan species of economic importance see Booth *et al.* (1990).

Larvae have very diverse feeding habits, foraging externally or internally on leaves, or stems, or roots. In general, larvae of Cryptocephalinae feed on dead leaves accumulated on the ground (known only from exotic species), those of Eumolpinae occur in the soil and probably are root feeders, those of Chrysomelinae feed on foliage, and many Galerucinae are miners of roots and leaves, though some feed externally on foliage, fruits, and flowers; all our introduced Bruchinae feed on legume seeds.

Several beneficial leaf beetles have been deliberately introduced to New Zealand for weed control: Alticini – *Agasicles hygrophila*, originally from South America, for control of alligator weed (*Alternanthera philoxeroides*), and *Longitarsus jacobaeae*, from Europe, for control of ragwort (*Senecio jacobaea*); Chrysomelinae – *Chrysolina hyperici* and *C. quadrigemina*, from Europe, for control of St John's wort (*Hypericum*); Bruchinae – *Bruchidius villosus*, from the United Kingdom, for biological control of broom (*Cytisus scoparius*) (see Syrett *et al.* 1996).

RANGE. North ®, South ®, Stewart ®
Kermadecs ®, Three Kings ®, Chathams ®, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLES. BRUCHINAE – *Bruchidius villosus* (Fabricius, 1792) (Fig. 238); CHRYSOMELINAE – *Chrysolina hyperici* Forster, 1771 (Fig. 239); GALERUCINAE – *Agasicles hygrophila* Selman & Vogt, 1971 (Fig. 240), *Adoxia vulgaris* (Broun, 1880) (Fig. 241); CRYPTOCEPHALINAE – *Arnomus brouni* Sharp, 1876 (Fig. 242); EUMOLPINAE – *Eucolaspis brunnea* (Fabricius, 1792) (Fig. 243).

REMARKS. New Zealand's chrysomelids are poorly known and badly in need of taxonomic revision. Many of our genera which are now considered as native may reveal a broader origin in the light of detailed studies of the entire Australasian fauna.

Suggested colloquial name: leaf beetles (Alticini – flea-beetles).

KEY TO SUBFAMILIES OF CHRYSOMELIDAE

1 Body ovate, slightly broadening posteriorly, bearing recumbent setae or scales; head produced anteriorly into a short, broad rostrum, strongly deflexed, constricted behind eyes into a distinct neck ... (Fig. 238) .. **BRUCHINAE**

—Body not ovate, lacking setae and scales (exception: some Eumolpinae); head not rostrate, usually not strongly deflexed, without a neck, and usually deeply inserted into prothorax ... 2

2(1) Antennae closely adjacent, inserted between eyes on frons (Fig. 240) ... 3

—Antennae well separated, inserted above mandibular bases (Fig. 239, 243) ... 4

3(2) Metafemur moderately to strongly enlarged, in Alticini adapted for jumping, with an endosclerite, in Galerucini not so ... (Fig. 240, 241) .. **GALERUCINAE**

—Metafemur not enlarged, not adapted for jumping, without an endosclerite ... 5

4(2) Body cylindrical or subcylindrical, with pronotum about as wide as elytral base; antennae usually long and filiform; pygidium usually partly exposed ... (Fig. 242) .. **CRYPTOCEPHALINAE**

—Body oval to rounded or robust, but not cylindrical (Fig. 239, 243), often strongly convex and constricted anteriorly; antennae usually short ... 5

5(4) Head oblique, with frontal margin straight or broadly arcuate; clypeus distinct, more or less membranous; body usually broadly oval, robust, slightly depressed, glabrous; pygidium usually not exposed; 3rd tarsal segment usually bilobed ... (Fig. 239) .. **CHRYSOMELINAE**

—Head hypognathous, with frontal margin usually broadly emarginate; clypeus indistinct; body elongate-robust to oval and convex, sometimes pubescent, with elytra often broader than pronotum; pygidium usually at least partly exposed; 3rd tarsal segment distinctly bilobed ... (Fig. 243) .. **EUMOLPINAE**

SELECTED REFERENCES. Bain (1977a), Borowiec (1987), Jolivet & Cox (1996), Kay (1980), Lawson (1991), Pfaffenberger (1991), Reid (1995), Seeno & Wilcox (1982), Selman (1963), Shaw (1957a, b).

Superfamily CURCULIONOIDEA
(RHYNCHOPHORA)

[assisted by G. Kuschel and B.M. May]

Adult weevils are distinct in having the anterior part of the head extended into a long or short rostrum (Fig. 6, 7), in which the mouthparts are often strongly modified (fusion of labrum, fusion of lacinia and galea, usually reduction of mandibles, formation of rigid palps). Additional diagnostic characters are antennae not filiform, usually clubbed, with a long scape sometimes fitting into grooves on either side of rostrum (Fig. 7), body rigid, with closed procoxal and mesocoxal cavities, procoxae globular with concealed trochantins, 2 or more abdominal sternites connate, and tarsi pseudotetramerous (5-5-5-segmented but appearing 4-4-4-segmented).

Larvae are distinct in their cylindrical body form (Fig. 99), with abdominal segments 2–7 unsclerotised and with dorsal plicae or folds, the presence of a hypopharyngeal bracon (except in some leaf miners), maxillae with lacinia and galea united to form a mala, and legs absent or vestigial (May 1993).

[78] Family NEMONYCHIDAE

[assisted by G. Kuschel]

Fig. 244

Length 2.0–2.8 mm Tarsal formula 5-5-5, appearing 4-4-4

DIAGNOSIS. **Body moderately elongate, narrowly oval in outline**, rust brown to dark brown, **with yellowish-white decumbent pubescence and some scattered erect and inconspicuous setae. Head abruptly constricted in**

front of eyes, forming an elongate, narrow rostrum, somewhat flattened apically, slightly shorter than prothorax in male and longer in female; **antennal insertions in apical third of rostrum, distant from mandibular sockets by at least twice width of scape. Labrum free, small, sinuously triangular, with 4 short peg-like setae at apex and 2 pairs of setiferous punctures dorsally.** Mandibles acute. **Maxillary palps short, flexible, loosely articulated. Antennae straight, with scape short**, approximately as long as 2 following segments combined, and **with a loose, 3-segmented club. Eyes round laterally, coarsely faceted. Pronotum not carinate. Elytra distinctly and regularly striate**. Hind wings well developed. Procoxae conical, their cavities closed. **Tibiae with 2 spurs in both sexes. Tarsal claws with a dentiform appendage. Abdominal ventrites freely articulated; pygidium concealed by elytra.**

SYNOPSIS. New Zealand has 4 species of nemonychid, of which 1 native species is described and 3 are undescribed (G. Kuschel, pers. comm.); all belong to the subfamily RHINORHYNCHINAE.

Rhinorhynchus rufulus represents an archaic lineage associated with Podocarpaceae (Kuschel 1995). Adults occur in epiphytes of podocarp forests and occasionally in forest litter; a few have been collected in Northland from logs of kauri (*Agathis australis*). Kuschel (1990) recorded this species from Lynfield, Auckland, on tanekaha (*Phyllocladus trichomanoides*), miro (*Prumnopitys ferruginea*), and kahikatea (*Dacrycarpus dacrydioides*). Larvae, described and illustrated by May (1993), are pollen feeders developing in male cones (strobili) of Podocarpaceae.

RANGE. North ®, South ®, Stewart ®
Kermadecs O, Three Kings O, Chathams O, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLE. RHINORHYNCHINAE – *Rhinorhynchus rufulus* (Broun, 1880) (Fig. 244).

REMARKS. Suggested colloquial name: straight-horned weevils.

SELECTED REFERENCES. Kuschel (1983, 1995), May (1993).

[79] Family ANTHRIBIDAE

[assisted by B.A. Holloway]

Fig. 245, 246

Length 0.8–7 mm

Tarsal formula 5-5-5, appearing 4-4-4

DIAGNOSIS. **Body moderately elongate to ovate, moderately to strongly convex**, usually strongly sclerotised, **clothed with black, brown, greenish, and/or white hairs or scales forming patterns. Head produced anteriorly into a rostrum lacking a paired gular suture ventrally and usually short, broad, and flattened** (not cylindrical), rarely moderately elongate. **Labrum distinct, free**, separated by a groove from rest of head. Mandibles well developed. Maxillae with long, flexible palps and a distinct lacinia. **Antennae straight, not elbowed** (exception: slightly elbowed in males of *Hoherius*), in some males much longer than body length, **with a more or less distinct 2- or 3-segmented club, and with scape received into a scrobe on side of head. Pronotum usually with a transverse sub-basal carina joined to lateral carinae of varying length**. Elytra internally with a supracostal flange, and usually with a scutellary striole. Procoxae globose, projecting, their cavities closed behind. **Tibiae lacking spurs. Abdomen with 5 ventrites, the basal 4 fused together; pygidium exposed beyond elytra.**

SYNOPSIS. There are 58 endemic New Zealand species of anthribid, and 3 introduced (2 adventive, 1 commonly intercepted), belonging to 28 genera in 2 subfamilies – ANTHRIBINAE and CHORAGINAE. Of the endemic species, 5 are confined to the Three Kings, 6 have been recorded only from the North I. and 7 from the South I., 6 are confined to the Chathams, 1 is found only on Bounty I., 1 is shared by Stewart I. and The Snares, and 1 is present on Stewart I., The Snares, and the Auckland Is. The remainder are more widely distributed on the main islands. The majority of endemic species restricted to a particular zoogeographic region are flightless.

Most of our anthribids are associated with standing vegetation in natural plant communities. Holloway (1982) established the following groups of habitats for adults: (1) exclusively on standing vegetation; (2) on standing vegetation or in litter; (3) exclusively in litter; and (4) in or on littoral lichens or fungi. Adult anthribids feed on fungi (mainly Ascomycetes and Fungi Imperfecti) and lichens (Holloway 1982, Kuschel 1995). The fungal material consists of spores, fragments of hyphae, and ruptured fruiting bodies. Four species feed on hyphae and ascospores of sooty moulds, which grow on the honeydew deposited by some scale insects (Coccoidea). Larvae are mostly endophytic in dead and dying branches of trees and shrubs (Holloway 1982).

RANGE. North ®, South ®, Stewart ®
Kermadecs O, Three Kings ®, Chathams ®, Snares ®
Aucklands ®, Campbell O, Antipodes O, Bounties ®

EXAMPLES. ANTHRIBINAE – *Sharpius venustus* (Broun, 1914) (Fig. 245); CHORAGINAE – *Dysnocryptus pallidus* Broun, 1893 (Fig. 246).

REMARKS. For keys to the genera and species occurring in New Zealand see Holloway (1982).

Suggested colloquial name: fungus weevils.

KEY TO SUBFAMILIES OF ANTHRIBIDAE

[Slightly modified from Holloway 1982]

First and 2nd antennal segments not arched, usually symmetrical, but if asymmetrical then antennae very slender and reaching back beyond middle of elytra; these 2 segments no more convex on external margin than on internal margin when antennae folded against body; scrobes either lateral or, if dorsolateral, then 1st antennal segment pyriform or obliquely truncate at base ... (Fig. 245) .. ANTHRIBINAE

—First and 2nd antennal segments arched and asymmetrical, more convex on external margin than on internal margin when antennae folded against body; scrobes always dorsal ... (Fig. 246) .. CHORAGINAE

SELECTED REFERENCES. Holloway (1971, 1982), Kuschel (1995), May (1993), Zimmerman (1994).

[80] Family BELIDAE

[assisted by G. Kuschel]

Fig. 247, 248

Length 3–13 mm

Tarsal formula 5-5-5, appearing 4-4-4; or 4-4-4, appearing 3-3-3

DIAGNOSIS. **Body elongate and subparallel or broadly, irregularly oval,** with **head and pronotum distinctly narrower than elytra** and tapering anteriorly; surface especially of elytra sometimes tuberculate, with decumbent or erect pubescence or scales. **Head either broad, abruptly constricted behind eyes, and with rostrum short and broad** (Aglycyderinae) **or not constricted behind eyes and with rostrum elongate and usually broad** (Belinae); **antennal insertions usually in basal half of rostrum. Labrum not visible. Antennae straight, with a well defined 2-segmented club** (Aglycyderinae) **or without a club, rarely with a weak and loosely defined 4-segmented club** (Belinae). Pronotum with sides subparallel or converging apically, lacking lateral margins. Elytra variable in shape, often subparallel in part, sometimes with protuberances (Belinae) or with coarsely punctate striae and projecting short hairs and scales. Procoxae projecting, their cavities broadly closed behind but sometimes with narrow lateral extensions. **Tarsi with 4th or 3rd segment reduced. Abdomen with 5 ventrites; pygidium concealed.**

SYNOPSIS. Belids are represented in New Zealand by 2 subfamilies – BELINAE with 10 described native species in 2 genera, and AGLYCYDERINAE with 1 endemic New Zealand species. Kuschel (1990) recorded the latter from Lynfield, Auckland, and May (1993) from Whangamoa and Cuvier Island.

Adults of *Cyrotyphus* are usually found in association with Podocarpaceae, but utilise dead wood of many kinds for oviposition and larval development, pupation occurring *in situ* (May 1993). Adults of *Pachyurinus* are often beaten from Podocarpaceae, but the host trees of known larvae are angiosperms, *Nothofagus* and *Toronia* (May 1993). *Aralius wollastoni* lives subcortically in dying or dead branches of *Pseudopanax arboreus* and *P. lessonii*, where the thin bark layer has not yet become dry (Kuschel 1990, May 1993). For general information on natural history see May (1993) and Kuschel (1995).

RANGE. North ®, South ®, Stewart O
Kermadecs O, Three Kings O, Chathams O, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLES. BELINAE – *Cyrotyphus tridens* (Fabricius, 1792) (Fig. 247); AGLYCYDERINAE – *Aralius wollastoni* (Sharp, 1876) (Fig. 248).

REMARKS. Suggested colloquial name: austral weevils.

KEY TO SUBFAMILIES OF BELIDAE OCCURRING IN NEW ZEALAND

[by G. Kuschel]

Antennae lacking a distinct club (a weak, loosely defined 4-segmented club rarely present); tarsal formula 5-5-5, but appearing 4-4-4 because of vestigial 4th segment; tarsal segment 1 at least as long as segments 2 and 3 combined ... (Fig. 247) .. BELINAE

—Antennae with a distinct 2-segmented club; tarsal formula 4-4-4, appearing 3-3-3 because of vestigial 3rd segment; tarsal segment 1 shorter than segments 2 and 3 combined ... (Fig. 248) .. AGLYCYDERINAE

SELECTED REFERENCES. Kuschel (1995), May (1993), Zimmerman (1994).

[81] Family BRENTIDAE

(incl. APIONINAE)

[assisted by G. Kuschel]

Fig. 249, 250

Length 2–4//18–75 mm

Tarsal formula 5-5-5, appearing 4-4-4

DIAGNOSIS. **Body either extremely narrowly elongate, with head as long as pronotum and elytra combined or slightly shorter in females** (Brentinae), **or moderately elongate and pyriform, with head as long as elytra or shorter** (Apioninae), subglabrous or pubescent. **Head with rostrum long and narrow; gular suture distinct and merged into one;** antennal insertions at base, at apex, or in middle of rostrum. **Labrum not visible. Maxillae and labium reduced;** maxillary palps rigid and labial palps reduced. **Antennae straight or** (*Neocyba*) **slightly geniculate, lacking a club** (Brentinae) **or club present**

(Apioninae). **Prothorax without lateral carinae. Elytra concealing pygidium. Procoxae projecting, their cavities closed. Protibiae without a grooming device** on inner face (consisting of dense vestiture in a groove or impression). **Tarsi with penultimate segments bilobed. Abdomen with first 2 visible sternites fused together, much longer than remaining sternites.**

SYNOPSIS. New Zealand's brentid fauna comprises 3 genera, with 1 very distinctive native species in subfamily BRENTINAE and 5 species (1 exotic, 2 undescribed) in subfamily APIONINAE.

The giraffe weevil, *Lasiorhynchus barbicornis*, occurs on a variety of trees including kauri (*Agathis australis*), pigeonwood (*Hedycarya arborea*), rewarewa (*Knightia excelsa*), tawa (*Beilschmiedia tawa*), and karaka (*Corynocarpus laevigatus*). The female chews a cavity in the bark of dying or suppressed trees and in freshly felled logs for oviposition (Meads 1976, May 1993). The gorse weevil, *Exapion ulicis*, was introduced for biocontrol of gorse (*Ulex europaeus*), and *Neocyba metrosideros*, a native species, occurs on pohutukawa (*Metrosideros excelsa*) (Kuschel 1990).

RANGE. North ®, South ®, Stewart O
Kermadecs O, Three Kings O, Chathams O, Snares O
Aucklands O, Campbell O, Antipodes O, Bounties O

EXAMPLES. BRENTINAE – *Lasiorhynchus barbicornis* (Fabricius, 1792) (Fig. 249); APIONINAE – *Neocyba metrosideros* (Broun, 1880) (Fig. 250).

REMARKS. Suggested colloquial name: primitive weevils.

KEY TO SUBFAMILIES OF BRENTIDAE

Body extremely elongate and narrow, length 18–75 mm; head as long as remainder of body, or nearly so; antennae without a club; tibial spur present; trochanters not elongate, hence femora contiguous with coxae at base ... (Fig. 249) .. **BRENTINAE**

—Body moderately elongate and pyriform, length less than 4 mm; head as long as elytra or shorter; antennae with a club; tibial spur absent; trochanters elongate, hence femora distinctly disjunct from coxae at base ... (Fig. 250) .. **APIONINAE**

SELECTED REFERENCES. Kuschel (1995), May (1987, 1993), Zimmerman (1994).

[82] Family CURCULIONIDAE

[assisted by B.M. May and G. Kuschel]

Fig. 251–260

Length 0.7–30 mm Tarsal formula 5-5-5 or 4-4-4

DIAGNOSIS. **Body highly variable in form, robust, strongly sclerotised, convex, subglabrous or with scales and/or bristles. Head with a long or short rostrum. Labrum absent. Maxillae reduced, with short rigid palps; gular sutures fused. Antennae geniculate, with a long scape and more or less compact club** (Fig. 7, 28). **Procoxae projecting, their cavities closed. Tarsi with penultimate segment minute and concealed at base of lobed 3rd segment** (exception: Platypodinae).

SYNOPSIS. Curculionids are the most diversified group of beetles, with some 50 000 species in the world fauna (Lyal 1993). They are also the largest beetle family in New Zealand. Watt (1982a) recorded 1279 native and 42 adventive species. There are 1496 native and 46 adventive species in 231 genera represented in NZAC, belonging to 6 subfamilies in the new system of classification proposed by Kuschel (1995) – BRACHYCERINAE (49 genera), CURCULIONINAE (126), DRYOPHTHORINAE (Rhynchophorinae) (4), COSSONINAE (36), SCOLYTINAE (14), and PLATYPODINAE (2). Kuschel (1990) recorded 184 species (24 adventive) in 102 genera and 6 subfamilies from Lynfield, Auckland.

So far as is known, weevils are exclusively phytophagous. They occur in a wide range of habitats: some feed on leaves, others live in the soil and feed on roots; some bore into stems, and others mine between the upper and lower surface of leaves (May 1993). Larvae are cryptic, and usually feed internally in plant tissue; some feed on flowers and in developing ovaries (May 1987, 1993).

Females of Brachycerinae oviposit in the soil, and the larvae feed on roots (May 1993). The curculionines have many host-specific species, with larvae usually feeding endophytically on living plants (May 1993). Cossonines and some rhynchophorines utilise dead tissue of bark or rotten wood. Adults of Scolytinae bore through bark to construct a nursery gallery, later expanded by the larvae. Platypodinae, known as pinhole borers, cause damage to timber by their tunnelling activities and by 'sap staining' from secondary fungal infection, making them considerable pests in the timber industry. Both scolytines and platypodines feed on ambrosia fungi cultivated in the galleries.

Several weevil species have been accidentally introduced into New Zealand, and some of these are considered to be pests of agriculture, forestry, or gardens. For a list of adventive species see Kuschel (1972).

RANGE. North ®, South ®, Stewart ®
Kermadecs ®, Three Kings ®, Chathams ®, Snares ®
Aucklands ®, Campbell ®, Antipodes ®, Bounties O

EXAMPLES. BRACHYCERINAE – *Anagotus turbotti* (Spiller, 1942) (Fig. 251), *Mandalotus miricollis* (Broun, 1917) (Fig. 252); CURCULIONINAE – *Andracalles spurcus* (Broun, 1880) (Fig. 253), *Myrtonymus zelandicus* Kuschel, 1990 (Fig. 254), *Stephanorhynchus lawsoni* Sharp, 1876 (Fig. 255); COSSONINAE – *Macroscytalus remotus* (Sharp, 1878)

(Fig. 256), *Xenocnema spinipes* Wollaston, 1873 (Fig. 257); SCOLYTINAE – *Hylastes ater* (Paykull, 1800) (Fig. 258), *Phloeosinus cupressi* Hopkins, 1903 (Fig. 259); PLATYPODINAE – *Platypus apicalis* White, 1846 (Fig. 260).

REMARKS. The most striking New Zealand weevils are in the brachycerine genus *Anagotus,* which includes both small species and the largest, often called giant weevils. All are flightless and have specialised habitat requirements. They are considered endangered because they are prone to predation by the Polynesian rat (kiore, *Rattus exulans*), and many are surviving on rat-free islands (see Examples of Species and Appendix 1). Evidence that they were once broadly distributed on the mainland includes fragmentary remains found in cave deposit at Waitomo (approx. 1700 years old) and in the Pureora Buried Forest deposits formed during the Taupo eruption (*circa* A.D. 130).

New Zealand species of Cryptorhynchini (Curculioninae), originally treated as a subfamily, were revised by Lyal (1993). New Zealand species of Molytini are revised by Craw (in press), under subfamily Molytinae.

Suggested colloquial name: weevils.

KEY TO SUBFAMILIES OF CURCULIONIDAE OCCURRING IN NEW ZEALAND

[Modified from Kuschel 1995]

1 Epistome (dorso-apical part of rostrum, Fig. 6) usually uneven, raised or impressed in relation to surrounding area; mandibles usually multisetose; rostrum usually short and thick, not sexually dimorphic; underside of elytra lacking stridulatory files; sclerolepidia absent; ventrite 9 of male with bladal part extensively sclerotised, the arms pigmented, broad, usually discontinuous with apodeme ... (Fig. 251, 252) .. **BRACHYCERINAE**

—Epistome even, not raised or impressed in relation to surrounding area; mandibles usually more sparsely setose; rostrum mainly long and slender, usually sexually dimorphic; underside of elytra frequently with stridulatory files; sclerolepidia frequently present; ventrite 9 of male with bladal part largely membranous, the arms pigmented, usually narrow, fused to apodeme ... 2

2(1) Mesotibia and metatibia with distal or ascending combs ... (Fig. 253–255) .. **CURCULIONINAE**

—Mesotibia and metatibia lacking distal and ascending combs ... 3

3(2) Prementum invisible in ventral view, inflexed over postmentum; antennal funicle with 6 or fewer segments, and segment 7 added to a compact club ... **DRYOPHTHORINAE** (= Rhynchophorinae)

—Prementum visible in ventral view; antennal funicle with 7 segments, if apparently fewer then because of fusion of segments ... 4

4(3) Mandibular socket deep (deeply emarginate); hypostomal tooth long, usually sharply pointed; pharyngeal process long, about as long as a mandible or longer ... (Fig. 256, 257) .. **COSSONINAE**

—Mandibular socket shallow (shallowly emarginate); hypostomal tooth absent or indistinct; pharyngeal process less than half of mandibular length, or absent ... 5

5(4) Procoxa antemedian; antennal funicle 5–7-segmented; first 2 visible sternites fused; sternite 2 distinctly longer than sternite 3; tarsi not or slightly longer than tibiae; sternite 9 of male present ... (Fig. 258, 259) .. **SCOLYTINAE**

—Procoxa postmedian; antennal funicle 4-segmented; first 2 visible sternites usually free; sternite 2 not longer than sternite 3; tarsi distinctly longer than tibiae; sternite 9 of male usually absent ... (Fig. 260) .. **PLATYPODINAE**

SELECTED REFERENCES. Bain (1976c, 1977b–e), Barratt (in press), Craw (in press),Hosking (1978g, 1979), Kuschel (1964, 1966, 1969, 1970, 1971, 1972, 1987, 1995), Lyal (1993), Marshall (1926, 1937, 1944, 1953), May (1966, 1987, 1993), Milligan (1978, 1979b, c), Zimmerman (1992–[98]), Zondag (1976, 1977).

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GLOSSARY OF TECHNICAL TERMS

Most of the definitions below have been formulated with reference to Lawrence & Britton (1994), Snodgrass (1935), and Nichols (1989).

aciculate, slender and needlelike.

acone, a condition of the insect eye in which the ommatidium has neither a crystalline nor a liquid cone, in place of which there is a group of elongate transparent cells; eye with open rhabdoms.

adventive (of species, populations), having arrived only recently in an area under discussion, either through dispersal or through inadvertent or deliberate human agency.

aedeagus, the male copulatory organ, derived from the posterior portion of the ejaculatory duct and consisting of three parts: the basal *tegmen*, which is often composed of a *basal* piece (*phallobase*) and usually two lateral lobes called *parameres*; the *penis* (*median lobe*), which is usually enclosed at the base by the tegmen; and the *internal sac* (*endophallus*), which is primarily membranous but often bears internal sclerites and a sclerotised *flagellum* (after Lawrence & Britton 1994).

allopatric (of populations or species), occupying mutually exclusive geographic areas (cf. *sympatric*).

alluvial (of soils), deposited by the action of water.

ambrosia, the fungus cultivated by wood-boring Scolytinae and Platypodinae; more specifically, the part of the fungus that grows out into the burrows and is eaten by the beetles.

ampulla (pl. ampullae), a blisterlike structure; often referring to larval structures, e.g., *ambulatory ampullae*

antemedian, situated before the middle (cf. *postmedian*).

antenna (pl. antennae), paired segmental appendages borne on either side of head, and bearing sensory receptors (Fig. 1, 17–33).

antennal cleaning organ, an excavation of the protibia lined with a comb-like setal fringe for cleaning antennae, e.g., in Carabidae.

antennomere, one of the antennal divisions (usually 11 in Coleoptera), which are jointed together and form the entire antenna (Fig. 1).

anterior pit (= anterior tentorial pit), a small round, internal depression between clypeus and frons (see also tentorial pit) (Fig. 1).

apodeme, an ingrowth of the insect exoskeleton (q.v.) to which muscles are attached.

apomorphy, a derived character or character state (cf. *plesiomorphy*); hence *apomorphic*.

approximated, in close physical relationship.

apterous, without wings.

articulation, mobile joint between two rigid structures.

aspirator, suction device for capturing small insects.

Barber's fluid, beetle relaxing fluid: ethanol 95% (53 parts), water (49 parts), ethyl acetate (19 parts), and benzol (7 parts).

Berlese funnel, see p. 17.

biforous (of a spiracle), with two extended openings, or with one but in appearance similar to the double spiracle.

biodiversity, the totality of all the different plants, animals, fungi, and microorganisms, their genetic components, and their ecological associations. Normally used in a narrower sense, e.g., biodiversity of beetles from a particular area.

bionomics, the life habits, reproduction, and adaptations of organisms.

biota, the fauna and flora of a defined habitat or region.

bipectinate (of antennae), see p. 14.

bladal, pertaining to the bladelike portion of sternite 9.

cambium, an area of growing and differentiating cells in the stems and roots of vascular plants.

campodeiform (of larvae), at least in the early stages resembling *Campodea* (Diplura), i.e., elongate, well sclerotised, dorsoventrally flattened, usually long legged, predacious, with prognathous head and usually with terminal abdominal processes (Fig. 100).

cantharidin, a defensive chemical found in the haemolymph of adult Meloidae and Oedemeridae, blistering human skin.

canthus, a shelf-like lateral expansion of the head, practically covering the base of the first antennal segment (e.g., in Tenebrionidae: Fig. 11, f).

capitate (of antennae), see p. 14 and Fig. 23, 187.

capsule, a small, closed, container-like structure; often referring to insect head capsule (Fig. 1, 2, 4, 6, 7).

cardo (pl. cardines), the basal division of the maxilla in Coleoptera (Fig. 5).

carina (pl., carinae), an elevated ridge or keel.

cercus (pl. cerci), an appendage (generally paired) of abdominal segment 9, but often appearing to belong to abdominal segment 10.

cladistic analysis, technique for grouping taxa according to probable ancestral relationships, based on measures of similarity and difference.

clavate (of antennae), see p. 14 and Fig. 23–29.

clavicorn, with antennae more or less distinctly clubbed; hence *Clavicornia*, a group of beetles with this feature.

click mechanism, in adult Elateridae and Eucnemidae, a complex 'peg and socket' structure consisting of the long prosternal process and mesosternal cavity; sudden forcing of the process out of the cavity causing convulsive movement of the prothorax relative to the hind body, often resulting in a jump and/or an audible click (Fig. 54).

club (of antennae), see p. 14 and Fig. 23–31.

clypeus, part of the insect head capsule below the frons, to which the labrum is attached anteriorly (Fig. 1).

coeval (of two or more organisms), having evolved contemporaneously in the geological time scale.

comb, a row or patch of specialised spines, usually on tibiae (Fig. 162).

compound eye, in many arthropods, an aggregation of visual elements (*ommatidia*) each of which corresponds with a single facet of the cornea.

conidia, asexual spores of fungi.

connate (of sternites), immovably joined together, cf. the more usual movable (Fig. 91) and separate configuration.

coronal suture, the median unpaired part of the epicranial suture.

costate, with longitudinal raised ribs or ridges (*costae*), much coarser than *carinae*.

coxa (pl., coxae), the basal segment of the leg, articulating to the body (Fig. 57–65).

coxal cavity, the opening or space in which the coxa articulates. May be laterally *closed* by sterna alone, i.e., excluding pleural elements, or laterally *open*, when only partly or completely closed by pleural elements (Fig. 40–45).

crenulate (of margins), evenly notched with small, rounded teeth (Fig. 163, 164 – hind margin of pronotum).

Cretaceous, third period of the Mesozoic Era, extending about 135–70 million years before the present.

cryptic, hidden or concealed, referring to (a) life habit or (b) taxonomic status, e.g., *cryptic species*.

crypto-, hidden, as in, e.g, *cryptopleuron*.

cryptonephridism, a condition in which the *Malpighian tubes* are closely associated with the rectum, forming a convoluted layer over its surface.

cucujoid (of the aedeagus), a configuration in which the phallobase forms a ring around the penis.

cupule (of antennae), transverse and concave segment preceding the *club* (e.g., in Hydrophilidae, Fig. 27); hence *cupuliform*.

cuticle, outer layer of the insect *integument*.

decumbent, bent downwards.

deflexed, abruptly bend downwards.

denticulate, beset with tiny teeth or notches.

detritivore, an animal that feeds on organic detritus.

dichotomy, a branching of a single stem into two equal and diverging parts; hence *dichotomous key*, a key with couplets divided into pairs of opposing character sets.

dimorphic, existing in two forms; hence *sexually dimorphic*, differing between male and female.

disc, medial surface of a body sclerite; e.g., central surface of pronotum.

disjunct, separated or lacking continuity; often referring to distribution of species or populations.

distal, near or towards the free end of any appendage; that part of a segment farthest from the body (cf. *proximal*).

diurnal, active or habitually flying by day (cf. *nocturnal*).

dorsal, on the functionally upper surface (cf. *ventral*). Hence *dorsoapical*, on the upper surface and towards the apex; *dorsolateral*, at the top and to the side; *dorsoventral*, in a line from the upper to lower surface.

dorsum, the anatomically upper surface.

ectoparasite, an external parasite (cf. *endoparasite*).

elytron (pl., elytra), the leathery forewing of beetles, serving as a covering for the hind wings (Fig. 1). Hence *elytral suture*, a median ridge dividing the elytra symmetrically (Fig. 93, 94).

empodium, a pad or extension between the tarsal claws.

endemic, pertaining to species or higher taxa confined to a geographical area under discussion; hence *endemism*.

endophallus, part of the *aedeagus*.

endopleuron (pl., endopleura), the reduced pleuron of Polyphaga which is fused with the *trochantin* and hidden internally.

endosclerite, an internal sclerite, e.g., of the metafemur in Alticini, sometimes called a metafemoral spring, which constitutes a skeletal jumping organ.

epicranium, upper part of head capsule from frons to neck, including frons, vertex, and genae (Fig. 1, 6, 7). Hence *epicranial stem*, or coronal suture, and *epicranial suture*, a Y-shaped suture on the head capsule above the antennae (Fig. 113).

epigeal, living on the surface of the earth (cf. *hypogeal*).

epimeron (pl. epimera), the posterior division of a thoracic pleuron, delimited anteriorly by the pleural sulcus (Fig. 2, 3).

epiphyte, a plant growing nonparasitically upon others, especially in the upper branches of trees, e.g., some ferns and orchids.

epipleuron (pl., epipleura), in adult beetles, deflexed or inflexed lateral portion of pronotum or elytra (Fig. 2, 3, 34, 35); hence *epipleural carina*, a sharp ridge at lateral edge of epipleuron.

episternum (pl., episterna), anterior sclerite of pleuron, delimited posteriorly by pleural sulcus (Fig. 2).

epistome, sclerite immediately behind labrum (Fig. 6, b).

eruciform (of a larva), resembling a caterpillar (Fig. 97).

excavate(d), hollowed out, concave, as of a margin.

exoskeleton, external skeleton of arthropods, consisting of hard or flexible cuticle to the inside of which muscles are attached.

explanate (of a margin), spread out and flattened (Fig. 217 – pronotal margin).

exuviae, the moulted, cast-off skin of larvae or nymphs.

femoral lines, fine ridges on basal abdominal sternite running backwards and outwards from inner end of metacoxae (Fig. 92).

femur (pl., femora), third and usually stoutest segment of the leg, articulated to *trochanter* proximally and to *tibia* distally (Fig. 57).

filiform (of antennae), see p. 14 and Fig. 17, 18.

flabellate (of antennae), see p. 14 and Fig. 33.

flagellum (pl., flagella), third part of antenna beyond pedicel. Also part of the *aedeagus*.

flight interception trap, see p. 17.

fossorial (of legs), adapted for burrowing in soil.

fovea (pl., foveae), a pit; e.g., on head and pronotum of Pselaphinae, Staphylinidae (Fig. 126).

frons, upper anterior portion of head *capsule*, usually a distinct sclerite between *epicranium* and *clypeus* (Fig. 1).

frontoclypeal suture, suture between *frons* and *clypeus* (Fig. 1).

fungivore, fungus-eater; hence *fungivorous* (= *mycophagous*).

fuscous, dark brown, approaching black.

fusiform, spindle-shaped, i.e., broad at middle and narrowing towards the ends.

galea, outer lobe of *maxilla* (Fig. 5).

gall, abnormal growth of plant tissue caused by various organisms, including insects.

gena (pl., genae), cheek, that part of head capsule on either side below eye (Fig. 2, 4).

geniculate (of antennae), see p. 15 and Fig. 6, 28.

genital segment, modified 9th abdominal segment in beetles, containing the genitalia; in the male the 10th segment is usually highly reduced or fused to segment 9.

genitalia, structures relating to reproduction.

gibbosity, irregular protuberance; hence *gibbose*, very crooked, twisted.

glabrous, without *setae*.

globose, nearly spherical.

glossa (pl., glossae), tongue; inner pair of lobes at apex of *prementum* of *labium*.

Gondwana ('Land of the Gonds'), during much of the Mesozoic Era, a southern supercontinent consisting of continental blocks of South America, Africa, Madagascar, India, Antarctica, and Australia with New Zealand.

grooming device, area of vestiture in a groove or impression on inner face of protibia, usually for cleaning the antennae.

gula, in prognathous insects, fused lower ends of *post-occiput*, forming a ventral plate (Fig. 2, 4). Hence *gular suture*, line of division between gula and *genae*; ventro-anterior extension of postoccipital suture.

haemolymph, watery body fluid in insects corresponding to blood.

habitus, general form and appearance.

hemisternites (of female genitalia), two sclerites of sternum 9 surrounding vulva.

heterogeneous, differing in kind, unlike in quality.

heteromeroid (of trochanterofemoral junction), strongly oblique, so that there is direct contact between *femur* and *coxa* (Fig. 58, 59).

heteromerous, with the three pairs of tarsi having different numbers of *tarsomeres*, e.g., tarsal formula 5-5-4.

Hexapoda, superclass of phylum Arthropoda, including Collembola, Protura, Diplura, and Insecta, characterised by mouthparts consisting of mandibles, maxillae, and labium, head with anterior and posterior tentorial arms, 3-segmented thorax, normally with 3 pairs of legs in the adult, and abdomen with 6–12 segments, with at most rudimentary limbs.

hinge mechanism, a structure of the *medial loop* of the hind wing used for wing folding (in Archostemata and Adephaga) (Fig. 51).

Holarctic, faunal region comprising the northern part of the Northern Hemisphere.

holometabolous, passing through a complete *metamorphosis* in which the larva is very different from the adult and transforms dramatically by means of a pupal stage.

humeral angle, anterolateral portion of elytra.

humerus (pl. humeri), shoulder, anterior basal portion of wing.

hydrophilous, water loving, living at least partly in water.

hyphae, threadlike strands making up the mycelium of a fungus.

hypogeal, subterranean (cf. *epigeal*).

hypognathous (of the head), vertical, with mouthparts facing downwards (Fig. 9, 10).

hypomeron (pl., hypomera), epipleural fold, or in adult beetles (Polyphaga) lateral portion of pronotal disc extended ventrally on either side which meets lateral part of sternum (Fig. 3).

hypopharynx, a median lobe immediately behind mouth, bearing taste receptors. Hence *hypopharyngeal bracon* (of beetle larvae), a transverse brace between hypopharynx and anterior part of hypostomal margin.

hypopleurum (pl. hypopleura), in beetle larvae, area below ventrolateral suture.

hypostoma (pl., hypostomata), region of subgena behind mandible. Hence *hypostomal margin* (of beetle larvae), a ventral marginal thickening of the epicranial halves; *hypostomal tooth* (in some groups of Curculionoidea), a tooth situated in lower mouth between mandibles and base of maxillae.

incrassate (of antennae, etc.), thickened, suddenly swollen towards the apex (Fig. 134).

indigenous, originally inhabiting a particular geographical area (but not necessarily restricted to that area).

instar, life stage between moults in a nymph or larva, numbered to designate developmental sequence; e.g., the first instar is the stage between the egg and the first moult.

integument, outer layer of an insect, comprising epidermis and cuticle (see also *exoskeleton*).

internal sac, part of the *aedeagus*.

intersegmental membrane, flexible, infolded membrane connecting segments of body and appendages which allows freedom of movement (Fig. 91).

Jurassic, second period of Mesozoic Era, between Triassic and Cretaceous, extending about 180–135 million years before the present.

labium (pl., labia), lower lip, or fused second *maxillae*, forming floor of mouth in mandibulate insects, behind first maxillae and opposed to labrum. Hence *labial palp*, a paired, 1–4-segmented sensory appendage of labium.

labrum, upper lip, joined to *clypeus* in front of mouth (Fig. 1).

lacinia (pl. laciniae), bladelike inner lobe of *maxilla*, articulated to *stipes* and bearing brushes of hairs or spines (Fig. 5).

lamella (pl. lamellae), a thin, platelike or leaflike process. Hence *lamellate* (of antennae), with apical segments having flat, leaflike projections on one side which sometimes cannot (Fig. 30) but usually can (Fig. 31) be brought closely together.

lateroventral, lateral and below median horizontal plane.

ligula (pl., ligulae), collective name for *glossae* plus *paraglossae*, whether fused or separate (Fig. 2).

littoral, in freshwater ecosystems, in shallow water where light penetration extends to the bottom sediments, which are colonised by rooted plants; in marine ecosystems, intertidal, inhabiting the shore.

locking mechanism, a structure preventing movement, e.g., pronotal locking mechanism in adult ptilodactylid and chelonariid beetles (Fig. 163, 164).

mala, a lobe of the mandible or jaw.

Malaise trap, see p. 17.

Malpighian tubes, internal excretory structures removing impurities from the body fluid.

mandibles, first paired mouthparts, stout and jawlike in chewing insects (Fig. 1, 4). Hence *mandibular socket*, an impression or emargination containing mandibular base.

maxilla (pl., maxillae), second pair of jaws in insects with chew-ing mouthparts; represented in all insects with functional mouthparts (Fig. 5). Hence *maxillary palps*, paired, 1–5-segmented (usually 3 or 4 in Coleoptera) sensory appendages of the maxillae.

maxillolabial complex, a compound structure consisting of maxillary and labial elements (e.g., in larvae of Limnichidae).

media, fifth longitudinal vein system (M), usually divided into a generally convex anterior branch (MA) and a concave posterior branch (MP) (Fig. 46, 47).

medial, near or at the middle of a structure or area.

medial loop, see *oblongum cell.*

median lobe, part of *aedeagus.*

membranous, thin and more or less transparent (of wings); thin and pliable (of cuticle).

mentum (pl., menta), part of labium, proximal to prementum, attached to and sometimes fused with submentum (Fig. 2, 4).

meso-, prefix often pertaining to the middle segment of the thorax, used as in 'mesocoxa', 'mesepimeron'.

Mesozoic, geological era about 225–70 million years before the present.

meta-, prefix often pertaining to the hind segment of the thorax, as in 'metacoxa', 'metepimeron'.

metamorphosis, a radical change in form, especially the change larva–pupa–adult in *holometabolous* insects.

microsculpture, microscopic textural features of insect integument.

microsetae, very small, short, hairlike structures; hence *microsetose*.

mola, ridged or roughened grinding surface of mandible, corres-ponding to subgalea of maxilla when the mandible is compound.

moniliform (of antennae), see p. 14 and Fig. 19.

monophagous, host-specific; restricted to one species of food plant or animal (cf. *polyphagous*).

monotypic (of a taxon), containing only one subordinate taxon, e.g., a genus of only one species (cf. *polytypic*).

multisetose, bearing numerous setae.

mycangium (pl., mycangia), any one of a variety of special pocket-shaped receptacles used to carry symbiotic fungi, e.g., in bark beetles (Scolytinae).

mycophagous, fungus-eating (= fungivorous).

myrmecophilous, ant-loving; applied to insects that live in ant nests.

nacreous, having an iridescent lustre like mother of pearl.

niche, functional position of an organism in a community.

nocturnal, active at night (cf. *diurnal*).

nominal (of a species), bearing a name, but not necessarily a valid biological entity.

notopleural suture, in Adephaga, Archostemata, and Myxophaga (Coleoptera), suture separating pronotal epipleuron from pleuron (Fig. 2).

notosternal suture, in Polyphaga, suture between hypomeron of pronotum and prosternum where these plates meet directly (i.e., not separated by an external pleuron).

notum (pl., nota), dorsal sclerite of a thoracic segment (Fig. 1 – pronotum).

oblongum cell, feature of venation in hind wing of Adephaga (Fig. 46–48).

occiput, posterior part of epicranium between vertex and neck, rarely present as a distinct sclerite (Fig. 6). Hence *occipital carina*, a well defined, elevated crest along hind margin of occiput (e.g., in some Leiodidae).

ocellus (pl., ocelli), in adult insects, a simple eye consisting of a single beadlike lens, occurring singly or in small groups; in holometabolous larvae, a *stemma.*

ocular canthus, a lobe partially or completely dividing each eye (e.g., in Gyrinidae, Tenebrionidae – Fig. 11, f).

Oligocene, geological epoch, about 40–25 million years before the present.

ommatidium (pl. ommatidia), a visual 'cell' or element of the arthropod compound eye.

onisciform (of larvae), shaped like a slater (*Oniscus* sp.), depressed and broadly spindle-shaped; e.g., Elmidae.

operculum (pl., opercula), a lid or cover; in larval Dryopidae a ventral, flat cover to the chamber containing the retracted anal gills.

opisthognathous (of head), with a posteroventral position of mouthparts resulting from deflexion of the facial region.

orogeny, episode of mountain building in geological time.

oviposit, to lay eggs.

palpiger, a sclerite bearing a palp, esp. the palp-bearing structure of the mentum.

paraglossa (pl., paraglossae), a paired labial structure at apex of prementum, connected at either side to glossae and either free or two-jointed; corresponding to galea of maxilla (Fig, 4, 5).

paraphyletic (of a taxon or taxa), not including all the descendants of a common ancestor, i.e., not a 'natural' group.

paraprocts, the halves of the ninth tergite.

parasitoid, an internal or external parasite that eventually kills its host organism.

paratergite, lateral marginal region of notum, lateral sclerite of abdominal segments.

pectinate (of antennae), with one side of each segment protruding greatly, forming a series of long, sharp points like the teeth of a comb (Fig. 22).

pedicel, second segment of the insect antenna, supporting the flagellum (Fig. 1, 6).

peduncle, a stalk or stalklike structure, usually supporting an organ or other structure; hence *pedunculate.*

phallobase, part of the *aedeagus.*

pharyngeal process, a hollow membranous structure projecting into the oral cavity from the internobasal angle of the mandibles; present in nearly all Curculionoidea, absent or only rudimentary in other beetles.

phloem, vessels transporting dissolved nutrients from leaves to roots in vascular plants.

phreatic, underground, usually in reference to the moist habitat between the particles of coarse *alluvial* sediments.

phylogeny, evolutionary history of a group of organisms.

phytophagous, feeding in/on plants; hence *phytophage*.

plasmodia, in myxomycete fungi, a motile mass of protoplasm characteristic of the growth phase.

plesiomorphy, ancestral character state (cf. *apomorphy*).

pleurite, see pleuron.

pleuron (pl., pleura), in adults of Adephaga, ventrolateral part of thoracic wall meeting epipleuron laterally and sternum medially; separated from pleuron by notopleural suture, and from sternum by pleurosternal suture (Fig. 2).

plica (pl., plicae), a fold or wrinkle.

plumose (of antennae), see p. 14.

posterolateral, towards the rear and to one side; similarly with -dorsal, -median, -ventral, etc.

postmedian, situated behind the middle.

postmentum, basal part of labium proximal to prementum.

postocular, behind the compound eyes.

predacious, preying upon other organisms, e.g., Carabidae, most Staphylinidae.

prementum, region of labium distal to mentum, formed by *palpigers* and labial *stipites*.

prepygidium, part of last abdominal tergum separated from pygidium by a transverse suture.

pro-, prefix often pertaining to anterior segment of thorax, as in *procoxa, proepimeron*.

prognathous (of the head), horizontal, with mouthparts directed forwards (Fig. 8).

pronotum, upper and dorsal part of prothorax (Fig. 1). Hence: *pronotal carina*, e.g., basal transverse carina in Anthribidae (Fig. 245, 246), and sometimes referring to lateral margin of pronotum (Fig. 1); *pronotal comb*, a row of spines on posterior margin of pronotum, e.g., in Ptilodactylidae (Fig. 163); *pronotal epipleuron*, in adult Adephaga, deflexed or inflexed portion of pronotum (Fig. 2).

prosternum, sternum of the prothorax (Fig. 2, 3, 34–39). Hence *prosternal process,* a posterior prolongation of prosternum behind procoxae.

prothorax, first thoracic segment, bearing anterior legs but no wings (Fig. 2, 3, 34–39).

proximal, near or towards the anchored end of any appendage; that part of a segment closest to the body (cf. *distal*).

pseudotetramerous (of the tarsus), having apparently 4 constituent articles, although 5 are actually present (Fig. 67–81).

pseudotrimerous (of the tarsus), having apparently 3 articles, although 4 are actually present (Fig. 80–82).

pterostigma, pigmented spot on anterior margin of wing.

pterothorax, fused mesothorax and metathorax.

pubescent, clothed with fine hairs.

punctate, with puncture-like depressions, e.g., of the integument.

pupa, inactive transformative stage of holometabolous insects, intermediate between larva and adult; hence *pupal cell*, a cavity in the soil or made of plant material or debris in which the larva pupates; *puparium* (pl. puparia), final-instar larval integument within which pupation occurs.

pygidium (pl., pygidia), tergum of last visible abdominal segment; in many adult beetles, the segment left exposed by the termination of the elytra (Fig. 189, 238).

pygopod, paired footlike organ at hind end of abdomen of certain larvae, assisting locomotion.

pyriform, pear-shaped.

radial cell (Fig. 46), structure formed around a sclerotised, pigmented blood sinus (pterostigma), playing a part in folding the wing apex beneath the elytra.

radial loop, hind wing structure in beetles, consisting of the *radial bar*, which ends abruptly soon after entering the *pterostigma*, and the pterostigma itself, transformed into the *radial cell* (Fig. 46–51).

raptorial (of legs), adapted for seizing and holding prey (Fig. 110a, b).

recumbent, lying down, reclining.

relict, surviving in isolation.

rhabdom, site of photoreception in the compound eye.

riparian, living on banks of watercourses.

rostrum (pl., rostra), a snoutlike projection or rigid extension of the head, bearing the mouthparts at the end, e.g., in adult weevils (Fig. 6, 7); hence *rostrate*.

scape, first or basal segment of insect antenna (Fig. 1, 6).

sclerite, any discrete plate of the body wall bounded by membrane or by sutures.

sclerolepidia, a row of pits with special setae or scales at the metepisternal suture in some weevils.

sclerotisation, hardening of the cuticle, involving development of crosslinks between protein chains.

scrobes, grooves for reception or concealment of an appendage; in adult Curculionoidea a pair of grooves, one on either side of the rostrum, in which the antennae can rest (Fig. 7, d).

scutellum (pl., scutella), any small, shield-shaped plate; posterior division of pterothoracic notum; in adult beetles, triangular piece at base of pronotum and between elytra (Fig. 1). Hence *scutellary striole.*

scutum (pl., scuta), second dorsal sclerite of mesothorax and metathorax, the middle division of the notum.

securiform, hatchet-shaped; e.g., the terminal segment of the palpi of some beetles (Fig. 15).

sensorium (pl., sensoria), a sensory receptor visible as a circular opening covered by a membrane on antennae or legs.

sensory seta, a seta used as a simple sense organ, often a contact or touch receptor.

seriate-punctate, with punctures arranged in *striae*.

serrate (of antennae, etc.), see p. 14 and Fig. 20, 21.

sessile, attached directly, without any stem or petiole.

seta (pl. setae), a hairlike projection of the cuticle; hence *setiferous*, bearing a seta or setae; *setose*, furnished with setae.

sinuate (of edges and margins), wavy.

slime moulds, Mxomycetes, one of the four fungal phyla; hence *slime flux*, a plasma-like stage of slime moulds.

sooty moulds, fungi of the Ascomycetes: Capnodiaceae and related families.

spiracle, external opening of a *trachea*.

spore, among fungi, a microscopic structure functioning in dispersal and vegetative reproduction.

spring mechanism, in Polyphaga, an elastic structure of the *median loop* used for folding the hind wing (Fig. 51).

spur, a thick cuticular appendage or spine connected to the body wall by a joint, especially on the tibia.

stemma (pl., stemmata), a simple eye of the often circular, lateral eye-groups in holometabolous insect larvae.

sternite, see sternum.

sternum (pl., sterna), entire ventral division of any body segment.

stipes (pl., stipites), basic sclerite of maxilla, articulating partly with head, partly with cardo, and bearing galea, lacinia, and maxillary palp.

stria (pl., striae), in general, any fine longitudinal impressed line; in beetles, a longitudinal depressed line or furrow, often punctured, usually extending from the base to the apex of the elytra; hence *striate*.

stridulatory apparatus, structure used in making sounds, consisting of a file-like organ and an opposing scraper or rasp.

striole, rudimentary or reduced stria.

stroma (pl. stromata), mass of vegetative fungal hyphae bearing fruit bodies and/or spores.

stylus (pl. styli), a small, pointed, non-articulated process.

sub-, prefix denoting under, slightly less than, or not quite.

subcortical, beneath the bark of a tree.

submentum, basal part of labium by which it is attached to head capsule (Fig. 2).

sulcus, a groove or suture marking the line of fusion of two formerly distinct plates or structures.

suture, a seam or impressed line indicating where two sclerites join. Hence *sutural flanges*, posterior sutural edges of elytra, separated by the *sutural gap* (Fig. 93).

synapomorphy, a shared derived character.

systematics, study of biological classification based on relationship through inherent similarity; hence *systematic sequence* of taxa, as used in this volume.

tactile, pertaining to sense of touch, or used for touching.

tarsus (pl., tarsi), terminal leg segment attached to apex of tibia, consisting of 1–5 articles or *tarsomeres*. Hence *tarsal formula*, the number of tarsomeres on the protarsus, mesotarsus, and metatarsus.

taxonomy, theoretical study of classification, including its bases, principles, procedures, and rules.

tegmen, part of the *aedeagus*.

tentorial pit, lateral depression in cranial wall usually near or at frontoclypeal suture (Fig. 1).

tergite, see tergum.

tergum (pl., terga), upper or dorsal surface of any body segment of an insect, consisting of one or more sclerites.

terrestrial, living on land (cf. *aquatic*); sometimes taken as the complementary opposite of *marine*, i.e., including freshwater.

testaceous, brownish yellow.

thorax, middle portion of insect body between head and abdomen, consisting of three segments, each of which usually bears a pair of articulated legs (Fig. 2).

tibia (pl., tibiae), fourth segment of leg, between femur and tarsus (Fig. 57). Hence *tibial spur*, a spinelike projection at or near end of tibia.

tomentose, covered with short, matted, woolly hairs.

tooth (in insects), a short, pointed process from an appendage or margin; a very stout spicule with a blunt apex.

trachea (pl., tracheae), a spirally ringed, internal elastic air tube in insects; an element of the respiratory system.

trilobed (of the aedeagus), consisting of a ventrally sclerotised phallobase to which a pair of freely articulated parameres are attached, and a simple penis lying above it; generally considered to be the most primitive configuration in beetles.

trochanter, second segment of insect leg, between coxa and femur (Fig. 57–66).

trochanterofemoral, pertaining to trochanter and femur conjointly.

trochantin, a small sclerite separated from pleuron by a membrane and connected by articular condyle with coxa (Fig. 57).

trophic, pertaining to food or eating.

truncate, cut off squarely at the tip.

tubercle, a small, knoblike or rounded protuberance; hence *tuberculate*.

Tulgren funnel, funnel-shaped device for sorting living insects from organic debris by means of light and heat.

urogomphi (sing., urogomphus), in larval beetles usually paired posterior processes on tergum of ninth abdominal segment, either jointed and movable by muscles or unjointed and immovable.

UV light-trap, see p. 17.

venter, entire undersurface of body of an animal; hence *ventral*.

ventrad, towards the venter.

ventrite, sternal sclerite of abdomen; the first ventrite is equivalent to the first visible basal sternite.

vertex, top of head between eyes, frons, and occiput, anterior to occipital suture.

vesicle, a small sac or bladder.

waist, basal constriction of pronotum in beetles, e.g., Anthicidae (Fig. 228–231).

weevil, beetle of the family Curculionidae.

window trap, see p. 17.

wireworm, soil-inhabiting larva of Elateridae feeding on roots.

KEYS TO FAMILIES OF COLEOPTERA KNOWN FROM NEW ZEALAND

I: PYRAMIDAL KEY

[provided by J. Klimaszewski]

1 First ventrite divided by metacoxae (Fig. 88, 89); prothorax usually with distinct notopleural sutures, distinct from sharp lateral margins (Fig. 2); tarsi 5-segmented; antennae usually filiform (Fig. 17, 18); medial loop of hind wing with a hinge mechanism (Fig. 51) ... (p. 20) **ADEPHAGA** .. 2

—First ventrite usually undivided by metacoxae and continuous from side to side (Fig. 90); prothorax without notopleural sutures – ventral portion of notum (hypomeron) jointed direcly to sternum on either side by notosternal suture (Fig. 3); tarsi and antennae often not as above; medial loop of hind wing with a spring mechanism (Fig. 51) ... (p. 23) **POLYPHAGA** .. 5

Suborder Adephaga
Superfamily Caraboidea

2(1) Terrestrial beetles with legs adapted for crawling or running; metacoxae not meeting elytra laterally (Fig. 2); antennae largely pubescent; dorsal surface with pronounced, erect sensory setae (Fig. 107) ... 3

—Aquatic beetles with at least hind legs adapted for swimming, often flattened and with dense pubescence (Fig. 108–110); metacoxae extending laterally to meet elytra (Fig. 88, 110, b); antennae entirely glabrous, or nearly so; dorsal surface without pronounced, erect sensory setae (phreatic species, e.g., *Kuschelydrus*, with long, fine, setae on sides – Fig. 109) ... 4

3(2) Metacoxae widely separated; antennae thick, moniliform (Fig. 19); pronotum usually with 3 deep longitudinal grooves, or at least 1 groove; head with a distinct neck; metasternum without transverse suture ... (Fig. 101) .. [1] **RHYSODIDAE**

—Metacoxae contiguous or narrowly separated (Fig. 2); antennae slender, filiform (Fig. 1); pronotum without deep grooves; head usually without a distinct narrow neck; metasternum with a transverse suture (Fig. 2) ... (Fig. 102–107) .. [2] **CARABIDAE**

4(2) Antennae longer, filiform; eyes not divided into two; forelegs short; hind legs long, modified for swimming, flattened and fringed with hairs ... (Fig. 108, 109) .. [3] **DYTISCIDAE**

—Antennae short, with a large pedicel; eyes each divided into two; forelegs long, raptorial; middle and hind legs short and modified for swimming ... (Fig. 110) .. [4] **GYRINIDAE**

Suborder Polyphaga

5(1) Antennae with a lamellate, flabellate, or exceptionally pectinate club (Fig. 30–33) ... (p. 98) .. **Group A**

—Antennae not as above ... 6

6(5) Tarsi 5-5-5-segmented but appearing 4-4-4-segmented, with segment 4 reduced and segment 3 distinctly bilobed, not so in some Chrysomelidae (exception: weevil groups Belidae : Aglycyderinae and Brentidae : Apioninae (*Neocyba*), in which tarsi appear 3-3-3-segmented but then head with a rostrum) (Fig. 67–81) ... (p. 98) .. **Group B**

—Tarsi not as above, if 5-5-5-segmented with segment 4 reduced then all segments simple, and if appearing 3-3-3-segmented then head without a rostrum ... 7

7(6) Body bullet-shaped, with sides subparallel and abdominal apex triangular; head deflexed; abdomen with first 2 ventrites strongly connate, the suture partially obliterated; metasternum with a distinct transverse suture ... (Fig. 157) .. [19] **BUPRESTIDAE**

—Body not so; first 2 ventrites rarely fused ... 8

8(7) Tarsi usually 5-5-5-segmented, with terminal segment enlarged and ending in strong claws, often longer than all other segments combined (Fig. 160); aquatic or semi-aquatic beetles broadly oval in outline, convex, with deflexed head more or less concealed by pronotum from above; legs retractable into body cavities (Fig. 52, 53); prosternum with a process fitting into a cavity of mesosternum (Fig. 52, 53); antennae weakly clubbed (3–7 segments), comblike, sawtoothed, or distinctly clubbed (Fig. 29) ... (p. 99) .. **Group C**

—Tarsi other than 5-5-5, or if 5-5-5-segmented then terminal segment not enlarged; sometimes segment 4 reduced and tarsi appearing 4-4-4-segmented (Phalacridae); other features not as in above combination... 9

9(8) Maxillary palps usually longer than antennae (Fig. 112, 116) (exception: *Meropathus*, with maxillary palps much shorter than antennae – Fig. 117); antennae 7–11-segmented with a 2–5-segmented club; hydrophilous species, spherical or moderately convex to ovoid and flattened ... (p. 99) .. **Group D**

—Maxillary palps shorter than antennae, inconspicuous; antennae usually 11-segmented, with a 3-segmented club or unclubbed; shape usually not as above ... 10

10(9) Pronotum with posterolateral angles strongly produced behind (Fig. 165–167); body elongate and narrowly subparallel (Fig.165–167); click mechanism present, consisting of a prosternal process (Fig. 54, a) which fits into a deep mesosternal cavity (Fig. 54, b); antennae filiform, serrate, pectinate, flabellate, or incrassate ... (p. 99) .. **Group E**

—Pronotum and body shape not sas above; click mechanism absent; antennae often clubbed ... 11

11(10) Elytra short, truncate, exposing at least 2 abdominal tergites, usually more, the exposed tergites well sclerotised rather than membranous; abdomen usually flexible ... (p. 99) .. **Group F**
—Elytra not so, broadly rounded posteriorly and usually covering entire abdomen, but if shorter then exposing only the abdominal apex; tergites membranous or weakly sclerotised ... 12

12(11) Antennae with an abrupt 3- or 4-segmented club, geniculate, usually retractable into a cavity on underside of prothorax; body oval, disc-shaped, moderately to strongly convex, glossy, usually glabrous and black; elytra shortened, exposing the pygidium; length 2–9 mm ... (Fig. 114, 115) .. [6] **Histeridae**
—Antennae and body not as above ... 13

13(12) Body broadly oval, strongly convex, glossy; elytra usually with 2 fine grooves near suture; in lateral view basal part of elytra and pronotum angular; antennae with a 3-segmented club; tarsi 5-5-5- or 5-5-4-segmented but appearing 4-4-4-segmented because of vestigial segment 4 ... (Fig. 196) .. [48] **Phalacridae**
—Body not as above; elytra usually without 2 grooves near suture; in lateral view basal part of elytra and pronotum not distinctly angular; antennae and tarsi not as above ... 14

14(13) Frons with 1 or 2 ocelli ... (p. 100) .. **Group G**
—Frons without ocelli ... 15

15(14) Body loosely articulated, elongate, oblong to subparallel; integument soft, often velvety in appearance (e.g., Fig. 169, 186, 223), with decumbent pubescence and often additional scattered and erect setae, or with short and inconspicuous pubescence; pronotum and elytra sometimes with ridges divided into cell-shaped compartments (Fig. 168) ... (p. 100) .. **Group H**
—Body compact; integument hard, glabrous or with decumbent pubescence; pronotum and elytra not as above ... 16

16(15) Tarsal formula 5-5-4, exceptionally 4-4-4 in some Tenebrionidae, but then base of each antenna obscured from above by a shelf-like expansion (canthus – Fig. 11, f) and first 3 ventrites fused together; body broadly to narrowly oval, medium-sized to large (1.5–20 mm); procoxae usually conical and projecting; antennae 11-segmented (10-segmented in *Archaeoglenes*, Tenebrionidae), filiform, serrate, incrassate, sawtoothed, comblike, or flabellate, without a club or with a loosely defined, elongate, 3- or 4-segmented club ... (p. 101) .. **Group I**
—Tarsal formula 2-2-2, 3-3-3, 3-4-4, 4-4-4, or 5-5-5, if 4-4-4 then canthus absent and first 3 ventrites not fused together ... 17

17(16) Tarsal formula 5-5-5 (excluding those families with 5-5-5-segmented tarsi already keyed out) ... (p. 102) .. **Group J**
—Tarsal formula 2-2-2, 3-3-3, 3-4-4, or 4-4-4; antennae filiform, moniliform, or with a distinct, compact, 1–3-segmented club; mostly small beetles of average length 2.5–3 mm, but some up to 17 mm long ... (p. 104) .. **Group K**

Group A

Includes families with a lamellate or flabellate (exceptionally pectinate) antennal club.

Scarabaeoidea: Lucanidae, Trogidae, Scarabaeidae. Bostrichoidea: Bostrichidae (*Euderia*). Byrrhoidea: Chelonariidae (*Brounia*). Tenebrionoidea: Rhipiphoridae.

A1 Lamellae of antennal club not capable of close apposition (Fig. 30) ... 2
—Lamellae of antennal club capable of close apposition (Fig. 31) ... 3

A2(1) Antennae geniculate (exception: *Ceratognathus parrianus*) ... (Fig. 139–143) .. [13] **Lucanidae**
—Antennae not geniculate ... 4

A3(1) Elytra dull, more or less tuberculate, without striae ... (Fig. 144) .. [14] **Trogidae**
—Elytra usually glossy, glabrous, or semiglabrous, or with velvety pubescence (e.g., *Costelytra*), and often with striae ... (Fig. 145–152) .. [15] **Scarabaeidae**

A4(2) Metatarsi 4-segmented ... (Fig. 214) .. [64] **Rhipiphoridae**
—Metatarsi 5-segmented ... 5

A5(4) Antennal club with more than 3 lamellae (up to 7) ... (Fig. 164) .. [26] **Chelonariidae** (*Brounia*)
—Antennal club of male with 3 flabella ... (Fig. 174) .. [35] **Bostrichidae** (*Euderia*)

Group B [assisted by G. Kuschel]

Includes families with tarsi 5-5-5-segmented but appearing 4-4-4-segmented because of vestigial segment 4, and segment 3 distinctly bilobed. Exception: Aglycyderinae (family Belidae) and *Neocyba* (Brentidae: Apioninae), in which tarsi appear 3-3-3-segmented but are 4-4-4-segmented, and head with a rostrum.

Chrysomeloidea: Chrysomelidae (incl. Bruchinae), Ceram-

bycidae. CURCULIONOIDEA: Nemonychidae, Anthribidae, Belidae (incl. Aglycyderinae), Brentidae (incl. Apioninae), Curculionidae (including Brachycerinae, Curculioninae, Rhynchophorinae, Cossoninae, Scolytinae, Platypodinae).

B1 Anterior part of head never with a rostrum ... 2
—Anterior part of head elongate, forming a long or short rostrum (exceptionally short in Scolytinae, Platypodinae), with modified mouthparts (Fig. 6, 7) ... 3

B2(1) Antennae usually inserted on frontal prominences and capable of being flexed backwards over body, at least two-thirds as long as body
... (Fig. 234–237) .. [76] **CERAMBYCIDAE**
—Antennae not inserted on frontal prominences, not capable of being flexed backwards, usually only moderately elongate (exception: Cryptocephalinae, with long antennae capable of being flexed backwards)
... (Fig. 238–243) .. [77] **CHRYSOMELIDAE**

B3(1) Antennae geniculate, with a more or less compact club (Fig. 6, 28); scape long
... (Fig. 251–260) .. [82] **CURCULIONIDAE**
—Antennae straight, with or without a club (Fig. 244–249) ... 4

B4(3) Labrum separated from clypeus by a distinct suture (Fig. 6, b); mandibles with a mola ... 5
—Labrum fused with clypeus, without a suture; mandibles without a mola ... 6

B5(4) Pronotum without carinae as below; antennal segment 3, 4, or 5 extending to eye; spurs present on all tibiae; all 5 ventrites free
... (Fig. 244) .. [78] **NEMONYCHIDAE**
—Pronotum usually with a transverse basal carina and a lateral carina; antennal segment 1 or 2 extending to eyes; spurs absent on all tibiae; only 5th ventrite completely free, other ventrites partly fused or firmly braced ... (Fig. 245, 246) .. [79] **ANTHRIBIDAE**

B6(4) Rostrum moderately elongate and narrow; protibia with a grooming device on inner face opposite tarsal articulation, consisting of fine and dense pubescence in a broad, shallow groove or impression; gular sutures distinctly separate or obsolete
... (Fig. 247, 248) .. [80] **BELIDAE**
—Rostrum usually extremely elongate (Fig. 249); protibia without a grooming device; gular sutures merged into one and always distinct
... (Fig. 249, 250) .. [81] **BRENTIDAE**

Group C

Includes families with 5-5-5-segmented tarsi, each terminal segment enlarged, often longer than all other segments combined, and ending in strong claws (exception: some Limnichidae (*Hyphalus*) and some Byrrhidae, with 4-4-4-segmented tarsi); body broadly oval and convex, deflexed head concealed by pronotum from above, legs retractable into body cavities, prosternum with a process fitting into a cavity of mesosternum, and antennae with a weak club of 3–7 segments; aquatic or semi-aquatic.

BYRRHOIDEA: Byrrhidae, Dryopidae, Elmidae, Limnichidae.

C1 Antennae shorter than pronotum, comblike, often concealed ... (Fig. 159) .. [21] **DRYOPIDAE**
—Antennae usually longer than pronotum, slender, sawtoothed, sometimes weakly clubbed ... 2

C2(1) Body narrowly elongate; elytra with lateral margins subparallel ... (Fig. 160) .. [22] **ELMIDAE**
—Body broadly oval; elytra with lateral margins broadly curved (Fig. 158, 161) .. 3

C3(2) Hind margin of pronotum evenly curved or slightly sinuate; frontoclypeal suture absent; body glabrous or semiglabrous ... (Fig. 158) .. [20] **BYRRHIDAE**
—Hind margin of pronotum strongly sinuate; frontoclypeal suture present; body densely pubescent
... (Fig. 161) .. [23] **LIMNICHIDAE**

Group D

Includes families with hydrophilous species commonly bearing extremely elongate maxillary palps, usually longer than the antennae, and antennae 7–11-segmented with a 2–5-segmented club.
HYDROPHILOIDEA: Hydrophilidae. STAPHYLINOIDEA: Hydraenidae.

D1 Body usually spherical or broadly oval and strongly convex; maxillary palps usually shorter than antennae; antennae with a 3-segmented pubescent club
... (Fig. 111–113) .. [5] **HYDROPHILIDAE**
—Body usually moderately narrowly elongate, rarely more broadly rounded; maxillary palps often longer than antennae (exception: *Meropathus* species, with maxillary palps much shorter than antennae); antennae usually with a 5-segmented pubescent club
... (Fig. 116, 117) .. [7] **HYDRAENIDAE**

Group E

Includes families with posterolateral angles of pronotum strongly produced posteriorly, body narrowly elongate and subparallel, clicking apparatus present, and antennae filiform, serrate, pectinate, flabellate, or incrassate.

ELATEROIDEA: Elateridae, Eucnemidae.

E1 Labrum concealed beneath clypeus, externally not

visible; ventrites 4 and 5 connate
... (Fig. 165) .. [27] **EUCNEMIDAE**
—Labrum visible; ventrites 4 and 5 not connate
... (Fig. 166, 167) .. [28] **ELATERIDAE**

Group F

Includes families with short and usually truncate elytra, exposing at least 2 but usually more abdominal tergites, the exposed tergites well sclerotised, and abdomen usually flexible. Family Ptiliidae, with some species having truncate elytra and 2 abdominal tergites exposed, is included in Group K (p. 104).

CHRYSOMELOIDEA: Chrysomelidae (Bruchinae). CUCUJOIDEA: Nitidulidae (in part; see also Group J), Monotomidae (in part; see also Groups J, K). ELATEROIDEA: Cantharidae (in part; see also Group H). STAPHYLINOIDEA: Staphylinidae (except Microsilphinae and some Proteininae of genus *Silphotelus*). TENEBRIONOIDEA: Salpingidae (Inopeplinae only), Rhipiphoridae (see also Group A).

F1 Elytra usually truncate posteriorly, exposing at least 3 but most often 6 or 7 abdominal tergites ... 2
—Elytra truncate or rounded posteriorly, exposing 2 or rarely 3 abdominal tergites ... 4

F2(1) Abdomen short, broad, inflexible; head, pronotum, and often elytra with setose foveae
.. (Fig. 126) .. [12] **STAPHYLINIDAE** (Pselaphinae)
—Abdomen more elongate, narrow to moderately broad, flexible; usually 6 or 7 tergites exposed ... 3

F3(2) Metatarsi 4-segmented; tarsal formula 5-5-4
... (Fig. 227) .. [72] **SALPINGIDAE** (Inopeplinae)
—Metatarsi not 4-segmented, or if so then tarsal formula other than 5-5-4
... (e.g., Fig. 125) .. [12] **STAPHYLINIDAE** (in part)

F4(1) Antennae appearing 10-segmented, with usually a 1-segmented club; elytra parallel-sided, usually with rows of punctures, truncate posteriorly, leaving pygidium exposed ... (Fig. 188, 189) .. [43] **MONOTOMIDAE** (*Lenax, Monotoma*)
—Antennae usually 11-segmented and not as above; elytral shape not as above ... 5

F5(4) Tarsi appearing 4-4-4-segmented, with segment 3 bilobed; body robust, egg-shaped, usually broadest towards apex; head often concealed from above
... (Fig. 238) .. [77] **CHRYSOMELIDAE** (Bruchinae)
—Tarsi 5-5-5-segmented; body shape not as above ... 6

F6(5) Antennae flabellate; body wedge-shaped
... (Fig. 214) .. [64] **RHIPIPHORIDAE** (see also Group A)
—Antennae and body shape not as above ... 7

F7(6) Antennae filiform, serrate, or pectinate but never with a distinct club ... (Fig. 169) .. [30] **CANTHARIDAE** (in part; see also Group H)
—Antennae with a distinct, compact club (Fig. 23)
... (Fig. 187) .. [42] **NITIDULIDAE** (in part)

Group G

Includes families with frons bearing 1 or 2 ocelli.

BOSTRICHOIDEA: Dermestidae (in part). DERODONTOIDEA: Derodontidae. STAPHYLINOIDEA: Staphylinidae (Microsilphinae, Omaliinae, some Proteininae).

G1 Head with 1 ocellus on frons, positioned medially
... (Fig. 173) .. [34] **DERMESTIDAE** (in part)
... [12] **STAPHYLINIDAE** (some Proteininae)
—Head with 2 ocelli on frons, positioned laterally (Fig. 123, 124) ... 2

G2(1) Head and pronotum not strongly sculptured; body smooth and glabrous or with sparse pubescence and punctation ... (Fig. 123, 124) .. [12] **STAPHYLINIDAE** (Microsilphinae, Omaliinae, some Proteininae)
—Head with a series of canals and bridges; pronotum divided by longitudinal ridges into several cell-like depressions ... (Fig. 170) .. [31] **DERODONTIDAE**

Group H

Includes families with soft-bodied species having decumbent pubescence and often additional scattered and erect setae, or with inconspicuous pubescence, and body surface often with a velvety appearance.

BYRRHOIDEA: Ptilodactylidae. CLEROIDEA: Cleridae, Melyridae. ELATEROIDEA: Cantharidae (in part; see also Group F), Lycidae. EUCINETOIDEA: Scirtidae (=Helodidae). TENEBRIONOIDEA: Oedemeridae, Pyrochroidae, Scraptiidae.

H1 Tarsal formula 5-5-5 ... 2
—Tarsal formula 5-5-4 ... 7

H2(1) Body flattened, loosely articulated; pronotum with several ridges dividing disc into irregularly shaped cell-like depressions; elytra leathery, with strong, depressed punctures between longitudinal ridges
... (Fig. 168) .. [29] **LYCIDAE**
—Body form not as above; pronotum without ridges and irregularly shaped cell-like depressions; elytra hard, with or without longitudinal ridges, but never with strongly impressed punctures between them ... 3

H3(2) Scutellum heart-shaped; hind margin of pronotum with minute, blunt teeth forming a transverse comb
... (Fig. 163) .. [25] **PTILODACTYLIDAE**

—Scutellum subtriangular; hind margin of pronotum without such teeth ... 4

H4(3) Penultimate tarsal segment simple, never bilobed ... (Fig. 186) .. [41] **Melyridae** (=Dasytidae)
... (Fig. 183) .. [39] **Cleridae** (*Metaxina*)
—Penultimate tarsal segment bilobed ... 5

H5(4) Body often subcylindrical, usually covered with bristly hairs; head broad, as broad as pronotum or broader; pronotum much narrower than elytra; antennae often with a loose 3-segmented club ... (Fig. 184) .. [39] **Cleridae**
—Body flattened to moderately convex, lacking bristly hairs (pubescence short and decumbent); head usually narrower than pronotum; pronotum as broad as elytra or slightly narrower; antennae without a 3-segmented club ... 6

H6(5) Labrum sclerotised and distinct, visible from above; head with characteristic keels below eyes (Fig. 12) ... (Fig. 153, 154) .. [16] **Scirtidae**
—Labrum membranous and covered by clypeus, not visible from above ... (Fig. 169) .. [30] **Cantharidae**

H7(1) Eyes not projecting, C-shaped, strongly emarginate; pronotum usually with 2 small basal impressions ... (Fig. 233) .. [75] **Scraptiidae**
—Eyes prominent, slightly to strongly projecting, slightly emarginate or not; pronotum usually without 2 basal impressions ... 8

H8(7) Eyes not strongly projecting laterally; only penultimate tarsal segment bilobed; antennae usually filiform ... (Fig. 223) .. [70] **Oedemeridae**
—Eyes strongly projecting laterally; penultimate and antepenultimate tarsal segments lobed; antennae usually pectinate or serrate ... (Fig. 224, 225) .. [71] **Pyrochroidae**

Group I

Includes families with 5-5-4-segmented tarsi, exceptionally 4-4-4-segmented in some Tenebrionidae (but then base of antenna covered by a canthus), procoxae usually conical and projecting, and antennae without or with a loosely defined, elongate, 3- or 4-segmented club.

Cucujoidea: Cucujidae, Laemophloeidae, Silvanidae (in part; see also Group J). Tenebrionoidea: Aderidae, Anthicidae (incl. Pedilinae), Archeocrypticidae, Chalcodryidae, Melandryidae, Mordellidae, Phloeostichidae (males only; females in Group F), Salpingidae (excl. Inopeplinae: see Group F), Tenebrionidae, Ulodidae (formerly as Zopheridae).

I1 Body moderately to strongly flattened (Fig. 192–195), often hairless; antennae filiform or beadlike, sometimes with a loose 2–4-segmented club; mandibles more or less pointing forwards; elytra usually striate ... 2
—Body and antennae not as above; mandibles usually not pointing forwards; elytra striate or not ... 4

I2(1) Body moderately flattened, appearing pubescent; tarsal segment 2 and/or 3 lobed below or, if not lobed, then antennal scape at least as long as 3 following segments combined; pronotum without sublateral ridges, often with anterior angles produced; antenna with or without club ... (Fig. 192, 193) .. [45] **Silvanidae**
—Body strongly flattened, usually glabrous (Fig. 194, 195); tarsal segments 2 and 3 not lobed below; antennal scape as long as or shorter than the 2 following segments combined; pronotum usually with sublateral carinae; antennae without a club ... 3

I3(2) Pronotum without 2 sublateral carinae ... (Fig. 194) .. [46] **Cucujidae**
—Pronotum with 2 sublateral carinae ... (Fig. 195) .. [47] **Laemophloeidae**

I4(1) Base of each antenna covered by a canthus (Fig. 11, f); abdominal sternites 1–3 fused together ... (Fig. 219–221) .. [68] **Tenebrionidae**
—Base of antennae exposed; abdominal sternites 1–3 not fused together ... 5

I5(4) Pronotum distinctly narrower at base than elytra, half to two-thirds of elytral width (Fig. 228–232)... 6
—Pronotum usually as wide at base as elytra, or nearly so (exception: Ulodidae, with pronotum much narrower basally than elytra – Fig. 217) ... 9

I6(5) Pronotum without lateral margins; body ant-shaped (Fig. 228–232) ... 7
—Pronotum with lateral margins; body not as above ... 8

I7(6) Ventrites all free; penultimate tarsal segment lobed; eyes with fine facets, not notched near antennal base; elytral epipleura incomplete ... (Fig. 228–231) .. [73] **Anthicidae**
—Basal 2 ventrites connate; penultimate tarsal segment small, simple, and antepenultimate segment lobed beneath; eyes coarsely faceted, slightly notched near antennal base; elytral epipleura absent ... (Fig. 232) .. [74] **Aderidae** (= Euglenidae)

I8(6) Pronotum and elytra with fine and dense punctation; antennae slightly incrassate, but without a distinct club; body form not as below ... (Fig. 190) .. [44] **Phloeostichidae** (males of *Agapytho*; see also Group J)

—Pronotum usually coarsely punctate, and elytra with rows of coarse punctures; antennae with a 3-segmented, loosely formed club; often resembling small carabid beetles ... (Fig. 226) .. [72] **Salpingidae** (excl. Inopeplinae)

I9(5) Antennae with a 3-segmented, elongate club ... 10
—Antennae filiform, serrate, or slightly incrassate, without a distinct 3-segmented club ... 11

I10(9) Body irregularly oval in outline; pronotum and elytra with margins not as below ... (Fig. 191) .. [44] **Phloeostichidae** (males of *Priasilpha*)
—Body approximately oval in outline; pronotum and elytra with distinct sharp margins ... (Fig. 210) .. [60] **Archeocrypticidae**

I11(9) Body broadly oval, flattened, with decumbent or erect pubescence, bristles, or scales forming patterns; pronotum narrower than elytral base, often with apical angles produced ... (Fig. 217) .. [66] **Ulodidae** (formerly as Zopheridae)
—Body narrowly elongate, convex to slightly flattened, with decumbent pubescence often forming patterns; pronotum as wide as elytral base, with apical angles rounded but not produced ... 12

I12(11) Body narrowly subparallel, flattened; head not deflexed, not deeply inserted into prothorax; tibiae without combs or spurs ... (Fig. 218) .. [67] **Chalcodryidae**
—Body wedge-shaped, tapering posteriorly, convex; head deflexed, deeply inserted into prothorax; tibiae often with serrate combs or spines (Fig. 84) ... 13

I13(12) Last sclerotised tergite usually covered by elytra and not forming an acute process extending beyond elytra; head not abruptly constricted behind eyes; pronotum with lateral carinae incomplete; metacoxae not plate-shaped ... (Fig. 212) .. [62] **Melandryidae**
—Last sclerotised tergite produced posteriorly and forming an acute process extending beyond elytra; head abruptly constricted behind eyes; pronotum with lateral carinae complete; metacoxae enlarged, plate-shaped ... (Fig. 213) .. [63] **Mordellidae**

Group J

Includes families with tarsal formula clearly 5-5-5 not already listed (see Groups B, C, D, F, and H).

Bostrichoidea: Anobiidae, Bostrichidae (in part, incl. Lyctinae; see also Group A), Dermestidae (in part; see also Group G), Jacobsoniidae (in part; see Group K for species with tarsi 3-3-3), Nosodendridae, Ptinidae. Cleroidea: Chaetosomatidae, Phycosecidae, Trogossitidae (incl. Protopeltinae). Cucujoidea: Cavognathidae, Cryptophagidae (in part; males with tarsi 5-5-4 are in Group I), Cucujidae, Laemophloeidae, Silvanidae (in part; see also Group I), Erotylidae, Languridae, Nitidulidae (in part; see also Group F), Phloeostichidae, Monotomidae (in part; see also Groups F and K). Eucinetoidea: Eucinetidae. Staphylinoidea: Agyrtidae, Leiodidae, Scydmaenidae.

J1 Pronotum hood-like in lateral view, partially covering head from above; antennae, if clubbed, then with all segments long and club not symmetrical; body shape from elongate cylindrical to oval ... (Fig. 177) .. [36] **Anobiidae** (excluding Ptininae)
—Pronotum not as above; antennae, if clubbed, then with club symmetrical (exception: some Dermestidae); body shape rarely cylindrical ... 2

J2(1) Antennae not clubbed ... 3
—Antennae with a more or less distinct, 1–8-segmented, elongate and loosely formed or compact club; if club not distinct then segment 8 smaller than adjoining segments ... 8

J3(2) Body appearing spider-like; legs and antennae long and thin; antennal insertions close together; body covered with dense pubescence or scales forming patterns ... (Fig. 178) .. [36] **Anobiidae** (Ptininae)
—Body elongate or oval; legs and antennae moderately long; antennal insertions distant from each other ... 4

J4(3) Body elongate-oval, narrowed posteriorly; head concealed from above, resting against procoxae in natural position; metacoxae greatly expanded, covering much of 1st ventrite; elytra often with cross-striations ... (Fig. 155) .. [17] **Eucinetidae**
—Body broadly to narrowly elongate, subparallel, often flattened; head usually prognathous, exposed and not concealed by pronotum; metacoxae not enlarged; elytra without cross-striation ... 5

J5(4) Body with long and erect hairs, sparsely and coarsely punctate, moderately flattened; elytra not striate ... (Fig. 182) .. [38] **Chaetosomatidae**
—Body without long and erect hairs, glabrous or with short, sparse pubescence and coarse punctation; elytra usually striate ... 6

J6(7) Body moderately flattened, usually pubescent; tarsal segment 2 and/or 3 lobed below or, if not lobed, then antennal scape at least as long as the 3 following segments combined; pronotum without sublateral carinae ... (Fig. 192, 193) .. [45] **Silvanidae**
—Body strongly flattened, appearing glabrous; tarsal segments 2 and 3 not lobed below; antennal scape as

long as or shorter than the 2 following segments combined ... 7

J7(6) Pronotum without 2 sublateral carinae ... (Fig. 194) .. [46] **Cucujidae**
—Pronotum with 2 sublateral carinae ... (Fig. 195) ... [47] **Laemophloeidae**

J8(2) Antennae with a 3–5- or 7-segmented club and usually with segment 8 smaller than adjoining ones (Fig. 24), or if not so then body densely pubescent; often glabrous beetles; legs usually bearing strong spines ... (Fig. 120, 121) .. [10] **Leiodidae**
—Antennae usually with segment 8 normally developed; usually pubescent beetles; legs without spines or with small spines ... 9

J9(8) Body oblong to broadly oval, robust, with short, dense pubescence or with erect hairs or scales often forming patterns; lower surface often with close, silky pubescence; elytra if striate then with a scutellary striole; antennae with club 3–8-segmented, usually 3-segmented ... (Fig. 173) .. [34] **Dermestidae**
—Body shape variable, glabrous or with sparse to dense pubescence, rarely forming patterns (with patterns in Trogossitidae, some Nitidulidae); lower surface without silky pubescence; elytra with or without striae; scutellary striole absent ... 10

J10(9) Antennal club 5-segmented; body flat, strongly glossy; elytra with longitudinal striae ... (Fig. 119) .. [9] **Agyrtidae**
—Antennal club 1–3-segmented ... 11

J11(10) Antennal club 1- or 2-segmented; anterior pronotal angles produced (Fig. 185, 189) ... 12
—Antennal club 3-segmented; anterior pronotal angles not produced ... 13

J12(11) Body elongate-oval; pronotum horseshoe shaped, with anterolateral angles strongly produced anteriorly; pygidium covered by elytra; tarsi pubescent ... (Fig. 185) .. [40] **Phycosecidae**
—Body narrowly elongate; pronotum oval or rectangular, with anterolateral angles more or less produced; pygidium exposed; tarsi glabrous; head with prominent temples ... (Fig. 188, 189) .. [43] **Monotomidae** (*Lenax, Monotoma*)

J13(11) Body ant-like; antennal club loose; dorsal surface usually with long pubescence; head with a distinct neck, nearly as wide as pronotum; pronotum and elytra oval, with humeri rounded ... (Fig. 122) .. [11] **Scydmaenidae**
—Body not ant-like; antennal club distinct, usually compact; dorsal surface glabrous or variably pubescent...14

J14(13) Body surface glabrous or with inconspicuous pubescence, usually strongly glossy ... 15
—Body surface moderately to densely pubescent, matt or slightly glossy ... 18

J15(14) Body narrowly elongate, subparallel to cylindrical; pronotum slightly to distinctly elongate ... 16
—Body broadly to narrowly oval; pronotum transverse and narrow, as wide as elytral base ... 17

J16(15) Body narrowly elongate, not cylindrical, subparallel; pronotum without rasplike teeth at front; metasternum extremely elongate, as long as all 5 ventrites combined or longer; body length 0.8–2 mm ... (Fig. 171) .. [32] **Jacobsoniidae**
—Body cylindrical or narrowly elongate and slightly flattened; pronotum often with rasplike teeth at front; antennal club often asymmetrical (enlarged to one side); metasternum not extremely elongate, much shorter than all 5 ventrites combined; body length 2.8–6 mm ... (Fig. 174–176) .. [35] **Bostrichidae** (incl. Lyctinae; see also Group A)

J17(15) Body black, broadly oval, strongly convex; elytra with tufts of short pubescence in rows; legs retractable into ventral body cavities; scutellum large, triangular ... (Fig. 172) .. [33] **Nosodendridae**
—Body often bicoloured, narrowly oval, moderately convex to slightly flattened, glabrous; legs not retractable into ventral body cavities; scutellum small ... (Fig. 200) .. [52] **Erotylidae**

J18(14) Elytral shoulders more or less produced anteriorly; elytral suture with a posterior gap (Fig. 93) created by widened sutural flanges; pronotum with indistinct and incomplete lateral carinae; frons usually with a pair of cavities; basal antennal segment enlarged, as long as the 2 following segments combined ... (Fig. 197) .. [49] **Cavognathidae**
—Elytral shoulders not produced anteriorly; elytral suture complete (Fig. 94) (exception: Cryptophagidae); pronotum usually with complete lateral carinae; frons without cavities; basal antennal segment slightly enlarged, usually shorter than segments 2+3 ... 19

J19(18) Body narrowly subparallel, subcylindrical to slightly flattened, moderately elongate; eyes coarsely faceted; head, pronotum, and elytra nearly equal in width; elytra striate or seriate-punctate; tarsal segments 2 and 3 with setose lobes ... (Fig. 199) .. [51] **Languriidae**
—Body broadly to narrowly oval, rarely subparallel; eyes finely to moderately coarsely faceted; head distinctly narrower than pronotum; elytra as broad as pronotum, usually without distinct striae; tarsal segments 2 and 3 without setose lobes ... 20

J20(19) Antennae usually closely approximated at base, often diverging to form a distinct V; pronotum often depressed at base; body often with silky pubescence ... (Fig. 198) .. [50] **CRYPTOPHAGIDAE**

—Antennal bases broadly separated, and antennae not forming a V-shape; pronotum not depressed; body with short pubescence and sometimes with additional longer hairs ... 21

J21(20) Antennal club abruptly compact or ball shaped; tarsal segments 1–3 more or less dilated, and segment 4 sometimes smaller ... (Fig. 187).. [42] **NITIDULIDAE** (in part)

—Antennal club loosely formed, not ball shaped; tarsal segments simple ... 22

J22(21) Body regularly oval and convex or elongate and subparallel; pronotal base usually not sinuate; pubescence short or long, with bristles or scales often forming patterns ... (Fig. 179–181) .. [37] **TROGOSSITIDAE**

—Body irregularly oval and flattened, narrowed posteriorly; pronotal base sinuate; pubescence sparse and short, grouped into clumps on elytra ... (Fig. 191) .. [44] **PHLOEOSTICHIDAE** (*Priasilpha*)

Group K

Includes families with tarsal formula 2-2-2, 3-3-3, 3-4-4, or 4-4-4; antennae often with a 1–3-segmented distinct club; mostly small beetles averaging 2.5–3.0 mm, though some species up to 17 mm long.

BOSTRICHOIDEA: Jacobsoniidae (see also Group J) (tarsi 2-2-2, or 5-5-5 but appearing 3-3-3; antennae 10- or 11-segmented with a 1–3-segmented club). BYRRHOIDEA: Heteroceridae (tarsi 4-4-4; antennae 11-segmented with a 6- or 7-segmented club). CUCUJOIDEA: Bothrideridae (tarsi 4-4-4; antennae 11-segmented with a 2- or 3-segmented club), Cerylonidae (tarsi 3-3-3 or 4-4-4; antennae 11-segmented with a 1- or 2-segmented club), Coccinellidae (tarsi 3-3-3 or 4-4-4; antennae 7–11-segmented, incrassate or with a 1–6-segmented club), Corylophidae (tarsi 3-3-3; antennae 11-segmented with a 3-segmented club), Endomychidae (incl. Holoparamecinae) (tarsi 3-3-3; antennae 11-segmented with a 2- or 3-segmented club), Corticariidae (=Lathridiidae) (tarsi 3-3-3; antennae 11-segmented with a 2- or 3-segmented club), Monotomidae (see also Groups F and J) (tarsi 4-4-4; antennae 10-segmented with a 1- or 2-segmented club). EUCINETOIDEA: Clambidae (tarsi 4-4-4; antennae 8–10-segmented with a 2-segmented club). STAPHYLINOIDEA: Ptiliidae (tarsi 2-2-2; antennae 10- or 11-segmented with a 2- or 3-segmented club). TENEBRIONOIDEA: Ciidae (tarsi 4-4-4 or 3-3-3; antennae 8–10-segmented with a 2- or 3-segmented club), Colydiidae (tarsi 4-4-4 or 3-3-3; antennae 10- or 11-segmented, incrassate or with a 1–3-segmented club), Mycetophagidae (tarsi 3-4-4 or 4-4-4; antennae 11-segmented with a 3- or 4-segmented club), Prostomidae (tarsi 4-4-4; antennae 11-segmented with a 3-segmented club).

K1 Tarsal formula 2-2-2; body minute, often less than 1 mm long, broadly to narrowly oval; elytra often exposing 1 or 2 abdominal tergites; hind wings featherlike, fringed with long hairs; antennae thin, bearing long hairs and with a 2- or 3-segmented club ... (Fig. 118) .. [8] **PTILIIDAE**

—Tarsal formula 3-3-3, 3-4-4, or 4-4-4; body usually over 1 mm long, variable in shape; elytra covering abdomen (exception: Rhizophaginae); hind wings not featherlike, not fringed with hairs ... 2

K2(1) Body broadly oval to hemispherical; head more or less concealed by pronotum ... 3

—Body oblong oval to narrowly elongate and subparallel; head not concealed by pronotum ... 5

K3(2) Tarsi 4-4-4-segmented, with all segments simple; antennae 8–10-segmented with a 2-segmented club; metacoxae expanded into large plates concealing femora; eyes partly or entirely divided; body small (0.9–1.5 mm), in life capable of rolling into a ball ... (Fig. 156) .. [18] **CLAMBIDAE**

—Tarsi truly 3-3-3-segmented or appearing 3-3-3-segmented, with at least the 2nd bilobed; antennae 7–11-segmented with a 1–6- (most often 3)-segmented club; metacoxae without large plates; eyes not divided ... 4

K4(3) Head partially or entirely concealed by pronotum, but anterior part of pronotum usually emarginate and not extended into a sharp margin over head; body often larger (1–7 mm), often spotted, usually glabrous or subglabrous; antennae shorter than pronotum, with a 1–6-segmented club; maxillary palps securiform or with apex obliquely truncate (Fig. 13–15) ... (Fig. 206) .. [56] **COCCINELLIDAE**

—Head partially or entirely concealed by pronotum, with anterior part of pronotum extending into a sharp margin over head; body small (0.5–2.5 mm), usually unicoloured, densely pubescent; antennae longer than pronotum, with a 3-segmented club; maxillary palps not as above ... (Fig. 207) .. [57] **CORYLOPHIDAE**

K5(2) Pygidium exposed; antennae 10-segmented, with a 1- or 2-segmented club; tarsal formula 4-4-4 ... (Fig. 188, 189) .. [43] **MONOTOMIDAE** (*Lenax*, *Monotoma*)

—Pygidium covered by elytra or (Prostomidae) partially exposed; antennae usually 11-segmented (10-segmented in some Colydiidae), with a 1–4-segmented club; tarsal formula 3-3-3, 3-4-4, or 4-4-4 ... 6

K6(5) Antennae as long as width of clypeus, with a pectinate 7-segmented club; tibiae flattened, spin-ose; body robust; elytra subparallel, with paler longitudinal spots ... (Fig. 162) .. [24] **Heteroceridae**

—Antennae much longer than width of clypeus, with a 1–4-segmented club; tibiae not spinose; body usually not robust; elytra rarely with spots ... 7

K7(6) Antennae with a loose club; temples strongly produced posteriorly; eyes prominent, projecting; body strongly depressed, subparallel, 6–8 mm long ... ... (Fig. 222) .. [69] **Prostomidae**

—Antennae with a strongly defined, usually compact club; temples not produced posteriorly; eyes moderately to strongly prominent; body convex to slightly depressed, subparallel to broadly oval ... 8

K8(7) Pronotum distinctly narrower than elytral base (exception: *Lithostygnus*, Corticariidae) ... 9

—Pronotum as broad as elytral base or slightly narrower ... 12

K9(8) Tarsal formula 4-4-4; antennal insertions exposed; antennae with a compact 2-segmented club; pronotum usually with a medial impression; elytra with distinct striae; body narrowly oval, depressed, glossy ... (Fig. 201, 202) .. [53] **Bothrideridae**

—Tarsal formula 3-3-3 ... 10

K10(9) Pronotum distinctly waisted, with a basal series of laterally elongate foveae; antennae with a 2-segmented spherical club and with segments appearing to be fused together; small beetles, 1.4–1.7 mm long ... (Fig. 205) .. [55] **Endomychidae** (Holoparamecinae)

—Pronotum not as above ... 11

K11(10) Body less than 0.6 mm long, rust-brown; head abruptly constricted behind eyes; antennae with club appearing 1-segmented ... [32] **Jacobsoniidae** (*Derolathus*) (see also Group J)

— Body 0.8–3.0 mm long, brown to black; head not abruptly constricted behind eyes; antennae with club 2- or 3-segmented ... (Fig. 208) .. [58] **Corticariidae** (= Lathridiidae)

K12(8) Pronotum with a conspicuous raised, sharp carina on either side of disc (exception: Holoparamecinae) ... (Fig. 204) .. [55] **Endomychidae**

—Pronotum not as above ... 13

K13(12) Body elongate, usually cylindrical, glabrous or with erect bristles; pronotum and/or head often bearing tubercles or horns; head deflexed; antennal club large, loose, 2- or 3-segmented; body length 1–3 mm ... (Fig. 211) .. [61] **Ciidae**

—Body elongate to broadly oval, flattened or moderately convex, rarely cylindrical (exception: some Colydiidae), variably pubescent, rarely with bristles; head and pronotum without horns; head usually not deflexed ... 14

K14(13) Antennal insertions exposed; antennal club 1- or 2-segmented; body usually narrowly elongate and slightly flattened, with dorsal surface glabrous and glossy, or with sparse short bristles; elytra striate ... (Fig. 203) .. [54] **Cerylonidae**

—Antennal insertions concealed from above; body with dorsal surface usually pubescent ... 15

K15(14) Tarsal formula 3-4-4 (male) or 4-4-4; sides of pronotum smoothly continuous with sides of elytra; pronotum often with 2 depressions near base; body broadly to narrowly oval, densely pubescent, often with orange or yellowish spots on elytra or uniformly brown; antennae usually with a loose 3- or 4-segmented club; antennal insertions exposed ... (Fig. 209) .. [59] **Mycetophagidae**

—Tarsal formula 3-3-3 or 4-4-4 in both sexes; sides of pronotum not as above; pronotum without 2 basal depressions and differently sculptured, often covered with pubescence or scales forming patterns; antennae with an abrupt, 1–3-segmented club; antennal insertions concealed ... (Fig. 215, 216) .. [65] **Colydiidae**

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II: LINEAR KEY

[provided by J.C. Watt]

Families with tarsal formula 5-5-5 in females but 5-5-4 in some or all males—MONOTOMIDAE, CUCUJIDAE, LAEMOPHLOEIDAE, CRYPTOPHAGIDAE (all N.Z. genera), PHLOEOSTICHIDAE (all N.Z. genera), and PHALACRIDAE (*Cyclaxyra*) —key out in two places.

1 Metacoxae large, fused to metasternum, completely dividing 1st ventrite (Fig. 88, 89); sternites 1–3 fused; prothorax with distinct notopleural sutures (Fig. 2) ... **ADEPHAGA** .. 2

—Metacoxae varying in size, usually movably articulated to metasternum, never completely dividing 1st ventrite (Fig. 90); all sternites usually free; prothorax without notopleural sutures (Fig. 3) .. **POLYPHAGA** .. 5

2(1) Hind legs without swimming hairs; prosternum not prolonged behind as a median keel; terrestrial beetles not streamlined for aquatic life ... 3

—Hind legs with swimming hairs; prosternum prolonged behind as a median keel; body streamlined for aquatic life ... 4

3(2) Antennae moniliform (Fig. 19); head and pronotum with deep, paired, longitudinal grooves ... (Fig. 101) .. [1] **RHYSODIDAE**

—Antennae usually filiform (Fig. 1), never moniliform; head and pronotum without deep, paired, longitudinal grooves ... (Fig. 102–107) .. [2] **CARABIDAE** (incl. Cicindelinae)

4(2) Eyes not divided, or absent (e.g., *Kuschelydrus*); hind legs longer than forelegs or middle legs ... (Fig. 108, 109) .. [3] **DYTISCIDAE**

—Eyes completely divided into upper and lower parts; forelegs distinctly longer than middle or hind legs ... (Fig. 110) .. [4] **GYRINIDAE**

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5(1) Antennae with 10 or fewer segments, the terminal segments lamellate, produced anteriorly into laterally flattened plates (Fig. 30, 31) ... **SCARABAEOIDEA** .. 6

—Antennae rarely lamellate or flabellate, if so then 11-segmented ... 8

6(5) Antennae geniculate, with club segments not able to be folded closely together; mandibles prominent ... (Fig. 139–143) .. [13] **LUCANIDAE**

—Antennae not geniculate, with club segments able to be folded closely together; mandibles not prominent ... 7

7(6) Abdomen with 5 ventrites; elytral sculpture very rough ... (Fig. 144) .. [14] **TROGIDAE**

—Abdomen with 6 ventrites; elytra smooth, or if sculptured then not rough ... (Fig. 145–152) .. [15] **SCARABAEIDAE**

8(5) Tarsi pseudotetramerous (5-5-5 but appearing 4-4-4), with segment 3 usually strongly bilobed, rarely pseudotrimerous (4-4-4 but appearing 3-3-3) (Fig. 67–81) ... **CHRYSOMELOIDEA, CURCULIONOIDEA,** some **BYRRHOIDEA** .. 9

—Tarsi not so ... 19

9(8) Antennae lamellate (Fig. 22); pronotum humped laterally ... (Fig. 164) .. [26] **CHELONARIIDAE**

—Antennae and pronotum not so ... 10

10(9) Head without a rostrum, or rarely (*Acanthoscelides*) slightly rostrate; antennae without a club, not geniculate; antennal scrobes absent; gular sutures distinct and separate ... **CHRYSOMELOIDEA** .. 11

—Head usually produced into a rostrum (Fig. 6, 7) (rostrum short and not apparent in Scolytinae, Platypodinae); antennae with a more or less distinct club, often geniculate and retractable into scrobes on side of rostrum (Fig. 6, d); gular sutures usually confluent (Fig. 7) or obsolete ... **CURCULIONOIDEA** .. 13

11(10) Antennae inserted on tubercles, and capable of being flexed backwards against body, usually extending at least to base of elytra ... (Fig. 234–237) .. [76] **CERAMBYCIDAE**

—Antennae not inserted on tubercles, not capable of being flexed backwards against body, usually not extending to base of elytra ... 12

12(11) Head somewhat rostrate; antennae and body bearing scales ... (Fig. 238) .. [77] **CHRYSOMELIDAE** (Bruchinae)

—Head not at all rostrate; antennae and body without scales ... (Fig. 239–243) .. [77] **CHRYSOMELIDAE** (excl. Bruchinae)

13(10) Antennae usually geniculate (Fig. 6, 28), with 1st segment retractable into scrobes (Fig. 7, d) ... (Fig. 251–260) .. [82] **CURCULIONIDAE**

—Antennae not geniculate ... 14

14(13) Tarsi appearing 3-3-3; body form characteristic, as figured .. (Fig. 248) .. [80] **BELIDAE** (Aglycyderinae)

—Tarsi appearing 4-4-4; body form not so ... 15

15(14) Labrum distinct, separate (Fig. 6, b) ... 16

—Labrum not distinct, not separate ... 17

16(15) Prothorax without transverse or lateral carinae; abdominal ventrites free and not strongly sclerotised ... (Fig. 244) .. [78] **NEMONYCHIDAE**

—Prothorax with a transverse carina and often additional lateral carinae; ventrites 1–4 fused, strongly sclerotised ... (Fig. 245, 246) .. [79] **ANTHRIBIDAE**

17(15) Body strongly elongate, at least 18 mm long including rostrum ... (Fig. 249) [81] **Brentidae** (Brentinae)
—Body length considerably less than 18 mm ... 18

18(17) Trochanters strongly oblique, not separating femora and coxae (Fig. 62); 2 gular sutures, distinct and separate ... (Fig. 247) .. [80] **Belidae** (Belinae)
—Trochanters slightly oblique, distinctly separating femora and coxae (Fig. 63); 1 gular suture, positioned medially ... (Fig. 250) .. [81] **Brentidae** (Apioninae)

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19(8) Antennae geniculate, with a compact 3-segmented club; elytra truncate, exposing last 2 broad abdominal tergites, never regularly 9- or 10-striate; body strongly sclerotised, usually black, distinctive in form ... (Fig. 114, 115) .. [6] **Histeridae**
—Antennae rarely geniculate, or if so then without a compact and 3-segmented club; other characters never all present in combination ... 20

20(19) Metacoxae with posterior face vertical and at least slightly, usually strongly, excavate to receive retracted femur (Fig. 66); antennae filiform, serrate, pectinate, or thickened but never with a true club; ocelli absent; procoxal cavities open behind (Fig. 40) ... 21
—If metacoxae with posterior face vertical and excavate (Nosodendridae, Dermestidae, Anobiidae) then antennae with a distinct 3-segmented club, or head with a median ocellus, or prothorax produced over head in the form of a hood; procoxal cavities usually partly or completely closed behind (Fig. 41) ... 37

21(20) Abdomen with 2 basal ventrites fused together, the suture partly obliterated; tarsi with ventral adhesive lobes on segments 2–4; body form distinct, cylindrical anteriorly ... (Fig. 157) .. [33] **Buprestidae**
—Abdomen with all ventrites usually free, or if fused (Elateroidea) then suture between 1st and 2nd ventrites as distinct as that between 2nd and 3rd; tarsi rarely with adhesive lobes on more than 1 segment; body form not as above ... 22

22(21) Anterior median part of mesosternum deeply and narrowly excavate, with sides of cavity vertical, receiving narrow, pointed posterior process of prosternum, these together usually forming part of 'click mechanism' (Fig. 54); abdomen with basal 4 ventrites fused; body form characteristic, as in Fig. 165–167; hind angles of pronotum almost always produced backwards, partly around elytral shoulders ... **Elateroidea** .. 23
—Anterior median part of mesosternum shallowly and broadly excavate, or not excavate at all; posterior prosternal process absent, or not shaped as above; abdominal ventrites free; body form not as above; hind angles of pronotum at most rectangular, not produced backwards ... 24

23(22) Labrum not visible externally; antennal insertions distant from eyes ... (Fig. 165) .. [27] **Eucnemidae**
—Labrum free, visible externally; antennae inserted near eyes ... (Fig. 166, 167) .. [28] **Elateridae**

24(22) Minute beetles less than 1 mm long; antennae slender, filiform, with last 3 segments enlarged; wings reduced to a central axis with anterior and posterior fringes of long hairs ... (Fig. 118) .. [8] **Ptiliidae**
—Larger beetles, length exceeding 1 mm; antennae not so; wings (if present) with a broad lamina and venation ... 25

25(24) Elytra truncate, leaving usually 6 sternites exposed ... (Fig. 124, 127–130) .. [12] **Staphylinidae** (in part)
—Elytra rarely truncate, leaving fewer than 6 sternites exposed (usually 1–3) ... 26

26(25) Loosely articulated, elongate beetles with soft integument (e.g, Fig. 169); elytra not closely embracing abdomen laterally; metacoxae very short, without plate-like extensions of ventral hind margin (femoral plates) ... 27
—Compact, usually less elongate beetles, with firmer integument; elytra closely embracing abdomen laterally; metacoxae usually longer, and with distinct femoral plates (Fig. 52, 53) ... 28

27(26) Elytra with longitudinal costae between pairs of striae; trochanters long, transversely joined to femora (Fig. 64) ... (Fig. 168) .. [29] **Lycidae**
—Elytra without distinct striae or longitudinal costae; trochanters short, obliquely joined to femora (Fig. 65) ... (Fig. 169) .. [30] **Cantharidae**

28(26) Base of pronotum crenulate; scutellum heart shaped ... (Fig. 163) .. [25] **Ptilodactylidae**
—Base of pronotum not crenulate; scutellum not so ... 29

29(28) Metacoxae at least narrowly separated by a triangular anterior median projection of basal sternite; body without sessile scales; anterior part of prosternum somewhat produced forwards to partly cover ventral surface of head ... **Byrrhoidea** (in part) .. 30
—Metacoxae contiguous, or if narrowly separated (Byrrhidae, *Curimus*) then body clothed dorsally with sessile scales; prosternum emarginate anteriorly ... 34

30(29) Antennae very short, with anterior processes on last 7 or 8 segments (Fig. 29); body densely setose or with very long pubescence (Fig. 159, 162) ... 31

—Antennae not as above; body neither densely setose nor with very long pubescence ... 32

31(30) Legs without spines; tarsal formula 5-5-5 ... (Fig. 159) .. [21] **Dryopidae**
—Legs, especially forelegs, with a row of spines on external edge; tarsal formula 4-4-4 ... (Fig. 162) .. [24] **Heteroceridae**

32(30) Metacoxae widely separated, oval; body less than 1.4 mm long; intertidal ... [23] **Limnichidae** (Hyphalinae)
—Metacoxae narrowly separated, transverse; body larger, length more than 1.4 mm; not intertidal ... 33

33(32) Body elongate, with pubescence not forming a pattern; ventral surface without grooves for legs and antennae ... (Fig. 160) .. [22] **Elmidae**
—Body broadly oval, with pubescence forming a pattern; legs and antennae retractable into grooves on ventral surface... (Fig. 161) .. [23] **Limnichidae** (Limnichinae)

34(29) Metacoxae scarcely contiguous, occasionally not contiguous; body broad, convex; mesocoxae widely separated (Fig. 52, 53); legs and antennae retractable into grooves or depressions on ventral surface ... (Fig. 158) .. [20] **Byrrhidae**
—Metacoxae strongly contiguous; body form variable, not as above; mesocoxae narrowly separated; legs and antennae usually not retractable into grooves or depressions on ventral surface ... **Eucinetoidea** .. 35

35(34) Metacoxae considerably narrowed laterally; femoral plates small; 4th tarsomere lobed below; head with characteristic keels behind and below eyes (Fig. 12) ... (Fig. 153, 154) .. [16] **Scirtidae**
—Metacoxae not narrowed laterally; femoral plates very large; tarsi without lobed segments; head without such keels ... 36

36(35) Elongate-oval beetles; head narrow, concealed by pronotum; tarsal formula 5-5-5 ... (Fig. 155) .. [17] **Eucinetidae**
—Hemispherical beetles; head very broad, reflexible against a cavity (bounded posteriorly by a semicircular carina) on underside of thorax; tarsal formula 4-4-4 ... (Fig. 156) .. [18] **Clambidae**

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37(20) Antennae short, with 6th segment modified as a cupule (Fig. 26, 27) and terminal 3 or 4 segments forming a strong, pubescent club (exception: *Meropathus*, with club elongate and not as above – Fig. 117), or, if club weak and not pubescent, then maxillary palps much longer than antennae; head often with a Y-shaped impressed line on vertex ... 38
—Antennae not as above, longer than maxillary palps; head without a Y-shaped impressed line ... 39

38(37) Body usually very convex, elongate-oval to almost hemispherical; abdomen with 5 ventrites ... (Fig. 111–113) .. [5] **Hydrophilidae**
—Body less convex, more elongate; abdomen with 6 or 7 ventrites ... (Fig. 116, 117) .. [7] **Hydraenidae**

39(37) Elytra truncate at apex, leaving at least 3 sclerotised abdominal tergites uncovered; antennae filiform or thickened towards apex, but without a strong, compact club (exception: Staphylinidae : Euaesthetinae, Microsilphinae) ... 40
—If 3 or more sclerotised tergites exposed then elytra not truncate (Salpingidae : Inopeplinae), or antennae with a strong, compact club (Nitidulidae) ... 41

40(39) Abdomen with very limited dorsoventral flexibility; maxillary palps usually long and modified (Fig. 16); integument with characteristic deep foveae in various positions, especially on vertex of head and pronotum ... (Fig. 126) .. [12] **Staphylinidae** (Pselaphinae)
—Abdomen flexible dorsoventrally; maxillary palps usually moderately long and not modified; integument rarely with such foveae ... (e.g., Fig. 127–138) .. [12] **Staphylinidae** (excl. Pselaphinae, *Silphotelus*)

41(39) Body less than 1.8 mm long, convex; vertex with a pair of deep foveae between eyes; sides of frons with a deep semicircular incision in front of each eye ... (Fig. 125) .. [12] **Staphylinidae** (*Silphotelus*)
—Head without this combination of foveae and lateral incisions ... 42

42(41) Metacoxae with posterior face vertical and excavated to receive retracted femur (Fig. 56) ... 43
—Metacoxae with posterior face not vertical ... 47

43(42) Head with a pair of ocelli between and close to eyes; small beetles, length less than 1.8 mm ... (Fig. 170) .. [31] **Derodontidae**
—Paired ocelli absent ... 44

44(43) Head with a median ocellus (sometimes obscured by long, coarse setae) ... [34] **Dermestidae** (in part)
—Head without any ocellus ... 45

45(44) Prothorax produced over head in a hood-like fashion; antennae serrate, flabellate, or with 3 segments each enlarged but not forming a compact club ... (Fig. 177) .. [36] **Anobiidae** (Anobiinae)
—Prothorax not hooded; antennae with a compact club ... 46

46(45) Form very convex, broadly oval; tibiae flattened, expanded towards apex; procoxal process received by median cavity in mesosternum
... (Fig. 172) .. [33] **Nosodendridae**
—Form less convex, elongate; tibiae not flattened nor expanded apically; procoxal process absent
... [34] **Dermestidae** (Dermestinae)

47(42) Tarsal formula 5-5-4 ... 48
—Tarsal formula not 5-5-4 ... 69

48(47) Head sharply constricted to a narrow neck, best seen in oblique views in most specimens ... 49
—Head not sharply constricted to a narrow neck ... 53

49(48) Apical abdominal tergite produced posteriorly into a stout spine ... (Fig. 213) .. [63] **Mordellidae**
—Apical abdominal tergite not produced as a spine ... 50

50(49) Antennae flabellate; tarsal claws toothed (Fig. 87) ... (Fig. 214) .. [64] **Rhipiphoridae**
—Antennae not flabellate; tarsal claws not toothed ... 51

51(50) Tibial spurs pubescent (Fig. 85)
... (Fig. 233) .. [75] **Scraptiidae**
—Tibial spurs absent ... 52

52(51) First 2 sternites fused, the suture between them obliterated, at least medially; tarsi with penultimate segment small and simple, antepenultimate segment lobed below ... (Fig. 232) .. [74] **Aderidae**
—First 2 sternites freely movable, the suture between them distinct; tarsi with penultimate segment lobed below, antepenultimate segment simple
... (Fig. 228–231) .. [73] **Anthicidae**

53(48) Elytra abbreviated, leaving at least 4 sclerotised tergites exposed ... (Fig. 227) .. [72] **Salpingidae** (Inopeplinae)
—Elytra not or only slightly abbreviated, covering abdominal tergites, which except for pygidium are membranous ... 54

54(53) With a shelf-like canthus formed by dorsolateral margin of frons under which antennae are inserted, the canthus extending back and usually encroaching on front margin of eye (Fig. 11, f); antennal socket and scape not visible from above ... 55
—Without a true canthus extending back to eye; antennal socket and base of scape usually visible ... 56

55(54) Only ventrites 1 and 2 fused, remaining ventrites movable, with visible intersegmental membranes; antennae with a distinct, loosely articulated, 3-segmented club; body length less than 3.5 mm
... (Fig. 210) .. [60] **Archeocrypticidae**
—Basal 3 ventrites fused, the sutures between them shallower and narrower than those between 3rd/4th and 4th/5th ventrites (which are freely movable, usually with exposed intersegmental membranes); antennae variable in shape, but very rarely with a 3-segmented club; body length usually over 3.5 mm
... (Fig. 219–221) [68] **Tenebrionidae**

56(54) Procoxal cavities closed behind by lateral expansions of apex of prosternal process (Fig. 39); basal 3 or 4 ventrites fused together ... 57
—Procoxal cavities closed behind by inward extensions of hypopleura (Fig. 38), or not completely closed; ventrites usually free, rarely with basal 2 fused together ... 58

57(56) Prosternal intercoxal process broad; basal 3 ventrites fused together, and 4th and 5th movable; scales usually present ... (Fig. 217) .. [66] **Ulodidae** (formerly as Zopheridae)
—Prosternal process very narrow between coxae; basal 4 ventrites fused together, only the 5th movable; scales usually absent ... (Fig. 218) .. [67] **Chalcodryidae**

58(56) Tibial spurs serrate (exception: *Doxozilora*) (Fig. 84) ... (Fig. 212) .. [62] **Melandryidae**
—Tibial spurs simple or absent ... 59

59(58) Penultimate tarsal segment bilobed, extending beneath last segment ... 60
—All tarsal segments simple, without lobes ... 62

60(59) Basal 2 ventrites fused together, and ventrites 3–5 with visible intersegmental membranes
... (Fig. 229) .. [73] **Anthicidae** (Lagrioidinae)
—Ventrites free, the lines between equally distinct... 61

61(60) Elytral epipleura indistinct (Fig. 95), restricted to proximal (basal) half of elytra; body form as illustrated
... (Fig. 223) .. [70] **Oedemeridae**
—Elytral epipleura distinct but narrow (Fig. 96), extending to, or almost to apex of elytra; body form as illustrated ... (Fig. 224, 225) .. [71] **Pyrochroidae**

62(59) Body usually strongly depressed, usually narrow and parallel sided (Fig. 193–195) ... 63
—Body not strongly depressed, if broad then not parallel sided ... 65

63(62) Body pubescent; tarsal segment 2 and/or 3 lobed below or, if not lobed, then antennal scape at least as long as the 3 following segments combined; pronotum without sublateral carinae and often with anterior angles produced... (Fig. 192, 193) .. [45] **Silvanidae**

—Body appearing glabrous; tarsal segments 2 and 3 not lobed below; antennal scape as long as or shorter than the 2 following segments combined; pronotum usually with sublateral carinae (Fig. 195) ... 64

64(63) Pronotum without 2 submarginal carinae ... (Fig. 194) .. [46] **Cucujidae**
—Pronotum with 2 submarginal carinae ... (Fig. 195) .. [47] **Laemophloeidae**

65(62) Procoxae strongly, obliquely projecting, contiguous or almost so, obscuring intercoxal process; body shape as illustrated ... (Fig. 226, 227) .. [72] **Salpingidae**
—Procoxae not projecting above level of intercoxal process, which is clearly visible between them; body shape not as above ... 66

66(65) Elytra truncate, leaving pygidium exposed; antennae apparently 10-segmented (segments 10 and 11 fused, forming a 1-segmented club in males) ... (Fig. 189) .. [43] **Monotomidae** (*Monotoma*)
—Elytra not truncate; pygidium not exposed; antennae 11-segmented, with a 3-segmented club ... 67

67(66) Form broad, convex, almost hemispherical; body glossy, glabrous, 1.6–2 mm long (males of *Cyclaxyra*) ... (Fig. 196) .. [48] **Phalacridae** (in part)
—Form elongate, less convex; body matt to slightly glossy, pubescent ... 68

68(67) Male mesocoxal cavities open laterally, reached by mesepimera; body form as illustrated; length 2.5–5 mm ... (Fig. 190, 191) .. [44] **Phloeostichidae**
—Male mesocoxal cavities closed laterally by meeting of mesosternum and metasternum, not reached by mesepimera; body form as illustrated; length usually less than 2.5 mm ... (Fig. 198) .. [50] **Cryptophagidae**

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69(47) Tarsal formula 4-4-4, rarely 3-4-4 in males (Mycetophagidae) ... 70
—Tarsal formula not as above ... 80

70(69) Tarsi with antepenultimate segment and often basal segment lobed below; femoral lines often present on ventrite 1 (Fig. 92, a) ... 71
—Tarsal segments not lobed; femoral lines absent ... 73

71(70) Body form characteristic, with pronotum bearing a conspicuous raised, curved, sharp carina on each side... (Fig. 204) .. [55] **Endomychidae** (Mycetaeinae)
—Body and pronotum not as above ... 72

72(71) Anterior margin of pronotum almost always emarginate, leaving most of head visible from above ... (Fig. 206) .. [56] **Coccinellidae**
—Anterior margin of pronotum almost always convex, covering head, which is not visible from above; if pronotum emarginate anteriorly, leaving head partly visible (*Orthoperus*), then femoral lines absent ... (Fig. 207) .. [57] **Corylophidae**

73(70) Body characteristically strongly depressed; head sharply constricted to a distinct neck behind prominent temples; basal 2 ventrites fused ... (Fig. 222) .. [69] **Prostomidae**
—Body convex to moderately depressed; head without a distinct neck; all ventrites free, or basal 3 ventrites fused ... 74

74(73) Trochanters of oblique clavicorn type (Fig. 60, d); terminal segment of maxillary palp more slender than penultimate segment, often needle-like; body form as illustrated ... (Fig. 203) .. [54] **Cerylonidae**
—Trochanters of heteromeroid type (Fig. 58, 59), with base of femur extending around trochanter on one side to coxa; terminal segment of maxillary palp broader than penultimate segment ... 75

75(74) Basal 3 ventrites fused, the lines between them fine and shallow in contrast with the broad, deep sutures between ventrites 4 and 5 ... 76
—Ventrites free, the divisions between them equal in depth and width ... 77

76(75) Antennae 10-segmented; sides of head and anterior part of prothorax with deep cavities for retracted antennae (Fig. 8, b) ... [68] **Tenebrionidae** (Phrenapatinae)
—Antennae 11-segmented; sides of head and prothorax without cavities ... [65] **Colydiidae** (Pycnomerinae)

77(75) Antennae 9- or 10-segmented with a 3-segmented club (Fig. 9); head deflexed (Fig. 9); prothorax somewhat hooded over head (Fig. 9); lateral margins of frons explanate above antennal base (Fig. 9), but tangential to top of eye, not forming a true canthus ... (Fig. 211) .. [61] **Ciidae**
—Antennae 11-segmented, usually with a 3-segmented club; head not deflexed; prothorax sometimes extending forward over head, but not hooded as in Ciidae; lateral margin of frons often forming a canthus in line with eye and often encroaching on front margin ... 78

78(77) Mesocoxal cavities open laterally (Fig. 42), reached by mesepimera; dorsal body surface smooth, pubescent, without scales; male tarsi 3-4-4 ... (Fig. 209) .. [59] **Mycetophagidae**
—Mesocoxal cavities closed laterally (Fig. 43) by mesosternum and metasternum, not reached by mesepimera; dorsal body surface often rough (e.g., Fig. 215) and clothed with scales; tarsi 4-4-4 in both sexes ... 79

79(78) Body usually subcylindrical, glabrous or microsetose, glossy; antennal insertions exposed; all ventrites free ... (Fig. 201, 202) .. [53] **Bothrideridae**
—Body rarely subcylindrical, its surface usually rough and clothed with hairs or scales, usually dull; antennal insertions concealed; ventrites 1–3 or 1–4 connate ... (Fig. 215, 216) .. [65] **Colydiidae**

*

80(69) Tarsal formula 3-3-3 ... 81
—Tarsal formula 5-5-5 ... 84

81(80) Body minute, less than 0.7 mm long; antennal pedicel larger than scape; common in bat guano, and known from nests of *Rattus exulans* ... [32] **Jacobsoniidae** (Derolathrinae)
—Body larger, exceeding 1 mm in length; antennal scape larger than pedicel ... 82

82(81) Eyes absent; body parallel-sided ... (Fig. 201) .. [53] **Bothrideridae** (Anommatinae)
—Eyes present; body not as above ... 83

83(82) Procoxal cavities open behind; body form characteristic, as illustrated ... (Fig. 205) .. [55] **Endomychidae** (Holoparamecinae)
—Procoxal cavities closed behind; body form not so ... (Fig. 208) .. [58] **Corticariidae** (= Lathridiidae)

84(80) Metasternum longer than combined length of ventrites 1–4; legs very short; body depressed, characteristic in shape, as illustrated ... (Fig. 171) .. [32] **Jacobsoniidae** (in part)
—Metasternum shorter than combined length of ventrites 1–4; legs longer; body shape not so ... 85

85(84) Prothorax hooded (Fig. 10), produced over head; head partly or entirely concealed from above ... 86
—Prothorax not hooded; head not concealed ... 87

86(85) Antennal insertions separated by more than length of scape; trochanters obliquely joined to femora (Fig. 60, a); elytra elongate, parallel-sided ... (Fig. 174–176) .. [35] **Bostrichidae** (incl. Lyctinae)
—Antennal insertions closely approximated on frons, separated by much less than length of scape; trochanters squarely joined to femora (Fig. 61, d); elytra broad, convex ... (Fig. 178) .. [36] **Anobiidae** (Ptininae)

87(85) Antennae with last 5 segments distinctly broader than basal segments, forming a loosely articulated club, with segment 8 smaller than segment 7 or 9 (Fig. 24), or rarely with a 4-segmented club with segment 8 smaller than segment 9, 10, or 11, or if antennae filiform then elytra with transverse striae; protarsi broader in males than in females; body moderately to strongly convex, oval in outline ... (Fig. 120, 121) .. [10] **Leiodidae**
—Antennae not so; elytra without transverse striae; protarsi usually not broader in males than in females ... 88

88(87) Antennae weakly but distinctly clubbed, with segments 1–6 glabrous, segment 3 longer than scape, and segments 7–11 much broader, pubescent, forming a loose club; protarsi and mesotarsi expanded in males ... (Fig. 119) .. [9] **Agyrtidae**
—Antennae not so; protarsi and mesotarsi rarely expanded in males ... 89

89(88) Body small, less than 2.5 mm long, glossy, very convex; elytra truncate apically, exposing sclerotised pygidium; ventrite 1 at least as long as next 3 ventrites together ... (Fig. 131) .. [12] **Staphylinidae** (Scaphidiinae)
—Body usually larger, if small then not glossy and strongly convex; elytra not truncate; pygidium not sclerotised; ventrite 1 shorter than next 3 ventrites together ... 90

90(89) Body shape characteristically ant-like; head strongly constricted to a narrow neck; prothorax and elytra narrowed at base, forming a distinct waist; antennae not clubbed; body strongly pubescent; terminal segment of maxillary palp short and sharply pointed ... (Fig. 122) .. [11] **Scydmaenidae**
—Body shape not so; other characters not present in combination ... 91

91(90) Abdomen with pygidium not exposed; antennae with last 2 segments fused, forming a conspicuous club; body moderately to strongly elongate ... (Fig. 188) .. [43] **Monotomidae** (*Lenax*)
—If abdomen with pygidium exposed and sclerotised then antennal club 3-segmented and body less elongate ... 92

92(91) Antennae with a very broad, compact, 3-segmented club; pygidium, and sometimes 1 or 2 tergites in front of it, usually sclerotised and exposed ... (Fig. 187) .. [42] **Nitidulidae**
—Antennae with club (if any) narrower and more loosely articulated; abdominal tergites concealed under elytra ... 93

93(92) Procoxae strongly projecting and contiguous externally, their cavities oblique; body with stout, erect pubescence (Fig. 182–184) ... 94

—Procoxae not or weakly projecting, not contiguous externally, their cavities not oblique; body if pubescent dorsally then with pubescence shorter, finer, and less projecting, or with short bristles ... 96

94(93) Tarsi with at least segments 2 and 3 lobed below (exception: *Metaxina,* all segments simple); antennae usually with a loosely articulated, 3-segmented club ... (Fig. 183, 184) .. [39] **Cleridae**
—Tarsi with all segments simple; antennae filiform ... 95

95(94) Body bearing very long, erect dorsal setae; mouthparts, especially mandibles, prominent; body shape characteristic, as illustrated ... (Fig. 182) .. [38] **Chaetosomatidae**
—Not as above ... (Fig. 186) .. [41] **Melyridae** (also as Dasytidae)

96(93) Antennae 10-segmented, with a strong, apparently 1-segmented club formed by fusion of segments 10 and 11; body shape characteristic, as illustrated ... (Fig. 185) .. [40] **Phycosecidae**
—Antennae not as above, usually 11-segmented; body shape not so ... 97

97(96) Mesocoxal cavities open laterally (Fig. 44), i.e., mesepimeron reaching cavity ... 98
—Mesocoxal cavities closed laterally (Fig. 45) by meeting of mesosternum and metasternum, which exclude mesepimeron from cavity ... 106

98(97) Body elongate, strongly depressed ... (Fig. 194) .. [46] **Cucujidae**
—Body usually less elongate, less depressed, and if elongate then strongly convex ... 99

99(98) Protibia with outer edge characteristic, carinate, with regularly spaced narrow, transverse indentations (Fig. 83); body usually very small and convex, less than 1.7 mm long ... (Fig. 179) .. [37] **Trogossitidae** (Rentoniinae)
—Protibia with outer edge not so, not carinate; body length exceeding 1.7 mm ... 100

100(99) Procoxal cavities closed behind; elytra distinctly striate ... (Fig. 181) .. [37] **Trogossitidae** (Trogossitinae)
—Procoxal cavities open behind; elytra without distinct striae, though occasionally with numerous rows of punctures ... 101

101(100) Elytra with numerous long, erect setae on dorsal surface (Fig. 180), or with numerous rows of punctures; body broad, parallel-sided; lateral margins of pronotum and elytra explanate ... 102
—Elytra without erect setae on dorsal surface, without definite rows of punctures; body shape not so; lateral margins of pronotum and elytra usually not explanate ... 103

102(101) Protibia with a single spur; antennal club usually markedly asymmetrical ... (Fig. 180) .. [37] **Trogossitidae** (Lophocaterinae)
—Protibia with 2 unequal spurs; antennal club symmetrical ... [37] **Trogossitidae** (Protopeltinae)

103(101) Body small, strongly convex, glossy, less than 2.5 mm long; elytral epipleura each with 2 very deep, interconnected pits in females ... (Fig. 196) .. [48] **Phalacridae** (genus *Cyclaxyra*)
—Body not so, more than 2.5 mm long; elytral epipleura without deep pits ... 104

104(103) Body broadly oval; sides of pronotum explanate; antennae with last 3 segments much broader than the remainder in females ... (Fig. 191) .. [44] **Phloeostichidae** (Priasilphinae)
—Body elongate, parallel-sided; sides of pronotum not at all explanate; antennae with last 3 segments scarcely differentiated from the remainder ... 105

105(104) Prothorax with lateral gibbosities, but not carinate laterally in females; body form as illustrated ... (Fig. 190) .. [47] **Phloeostichidae** (Agapythinae)
—Prothorax without lateral gibbosities, carinate laterally, at least at apex and base; body form as illustrated ... (Fig. 197) .. [49] **Cavognathidae**

*

106(97) Elytral epipleura indistinct or well marked only in proximal half; epipleural carinae indistinct or absent posteriorly; body form as illustrated ... (Fig. 198) .. [50] **Cryptophagidae** (females)
—Elytral epipleura distinct, extending to apex or almost so; epipleural carinae distinct throughout ... 107

107(106) Tarsal claws strongly toothed at base; body broad, strongly convex ... (Fig. 196) .. [48] **Phalacridae**
—Tarsal claws simple; body less convex, more elongate ... 108

108(107) Pronotum with distinct paired impressions basally; procoxal cavities open behind ... (Fig. 199) .. [51] **Languriidae**
—Pronotum without paired impressions basally; procoxal cavities closed behind ... (Fig. 200) .. [52] **Erotylidae**

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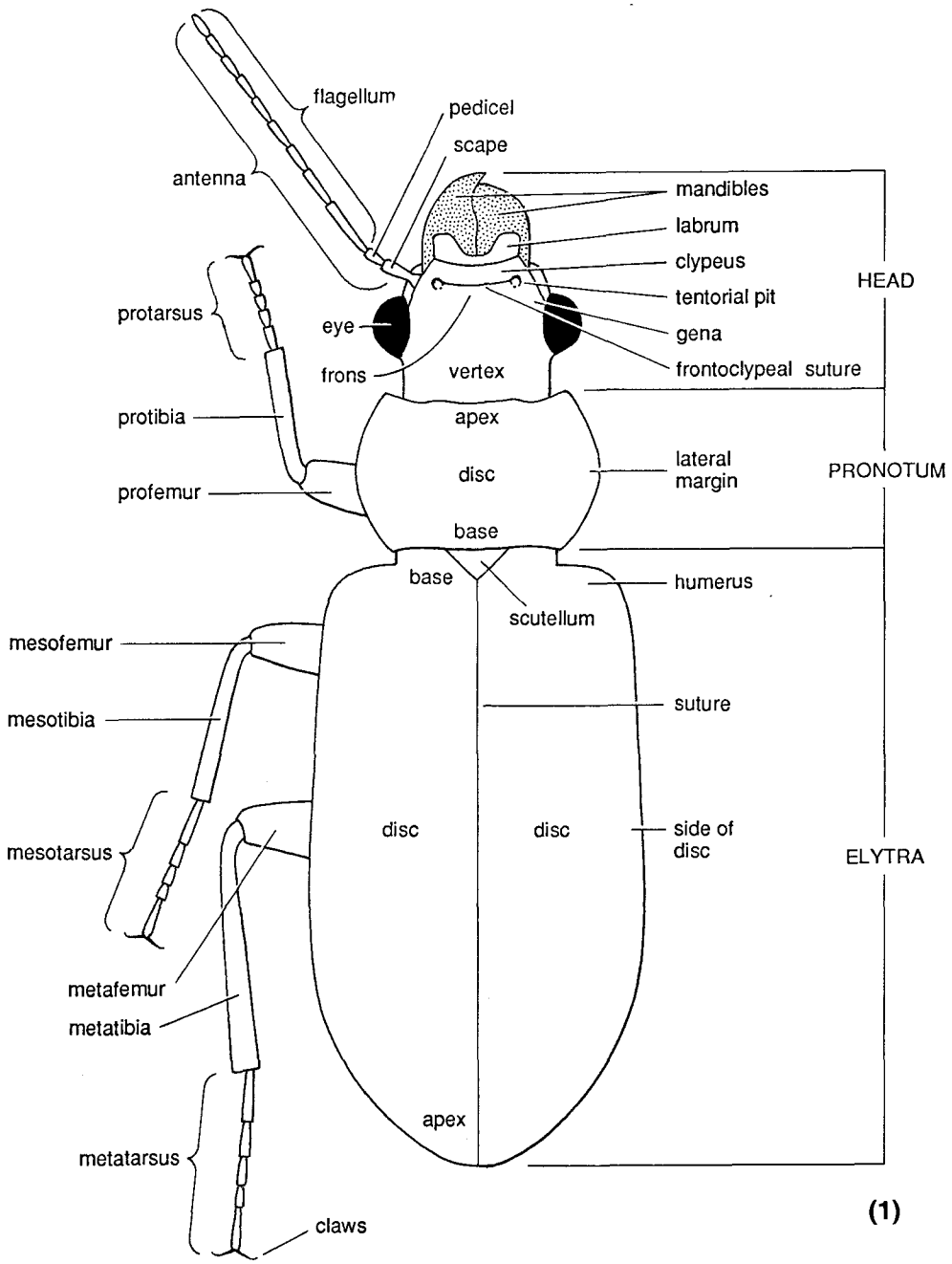


Fig. 1 Body divisions in Coleoptera: dorsal view, based on Adephaga: Carabidae [after Lawrence & Britton 1994].

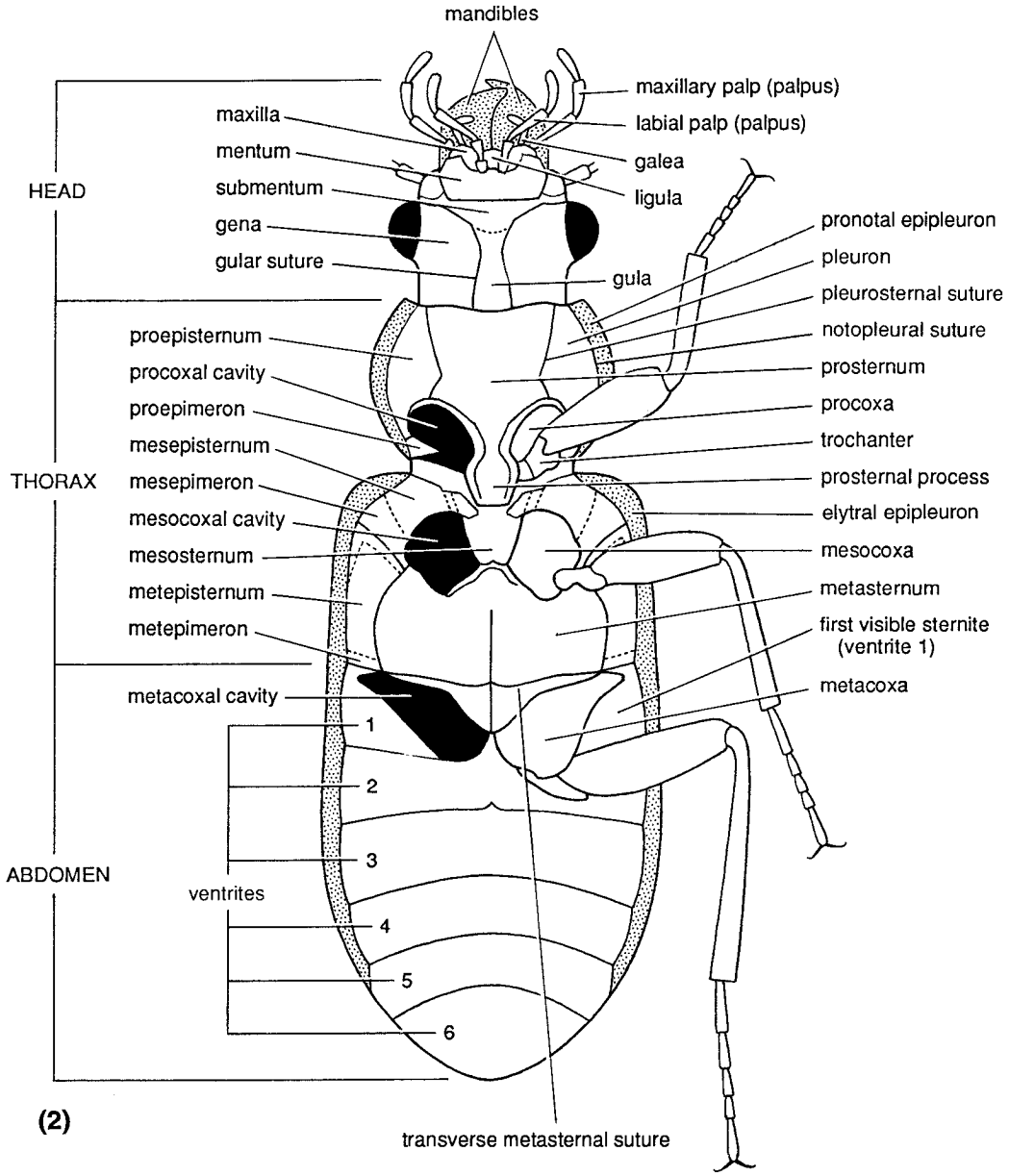


Fig. 2 Body divisions in Coleoptera: ventral view, based on Adephaga: Carabidae [after Lawrence & Britton 1994].

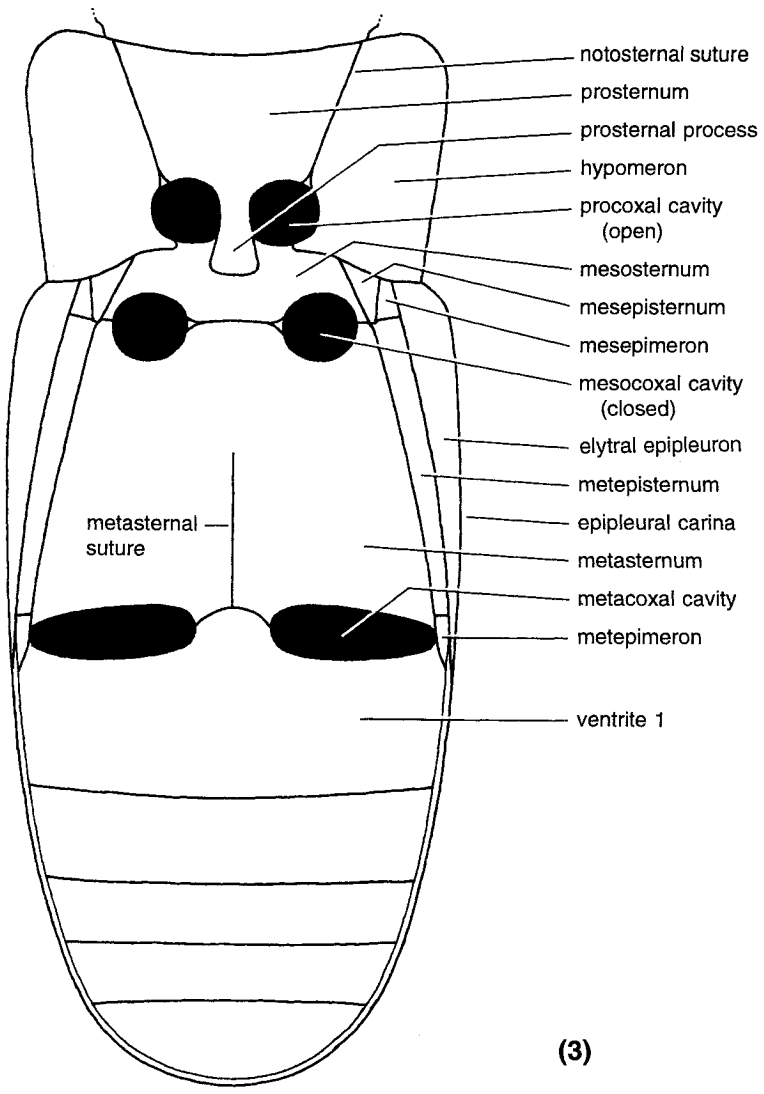
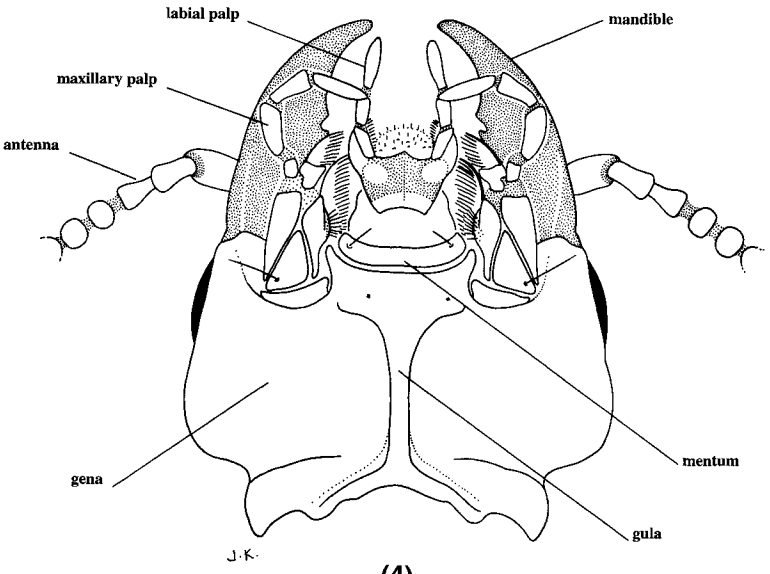


Fig. 3 Body divisions in Coleoptera: ventral view, based on Polyphaga: Cryptophagidae [after Lawrence & Britton 1994].



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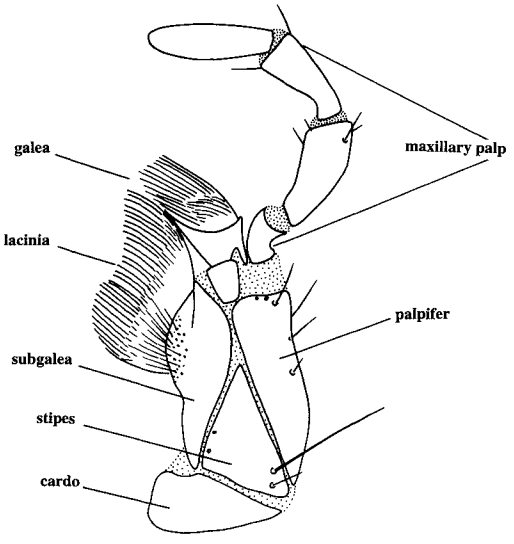

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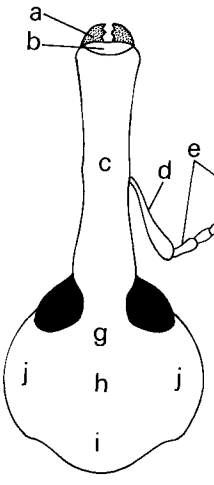

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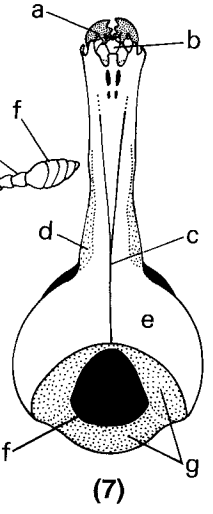


(7)

Fig. 4, 5 Head, ventral, showing mouthparts, and detail of maxilla, ventral (*Creophilus oculatus*, Staphylinidae).
Fig. 6, 7 Snoutlike head of Curculionidae: (6) dorsal view (a, mandible; b, epistome; c, snout or rostrum; d, scape; e, funicle; f, club; g, frons; h, vertex; i, occiput; j, epicranium); (7) ventral view (a, mandible; b, mouthparts; c, gular suture; d, antennal scrobe; e, gena; f, occipital foramen; g, occipital area).

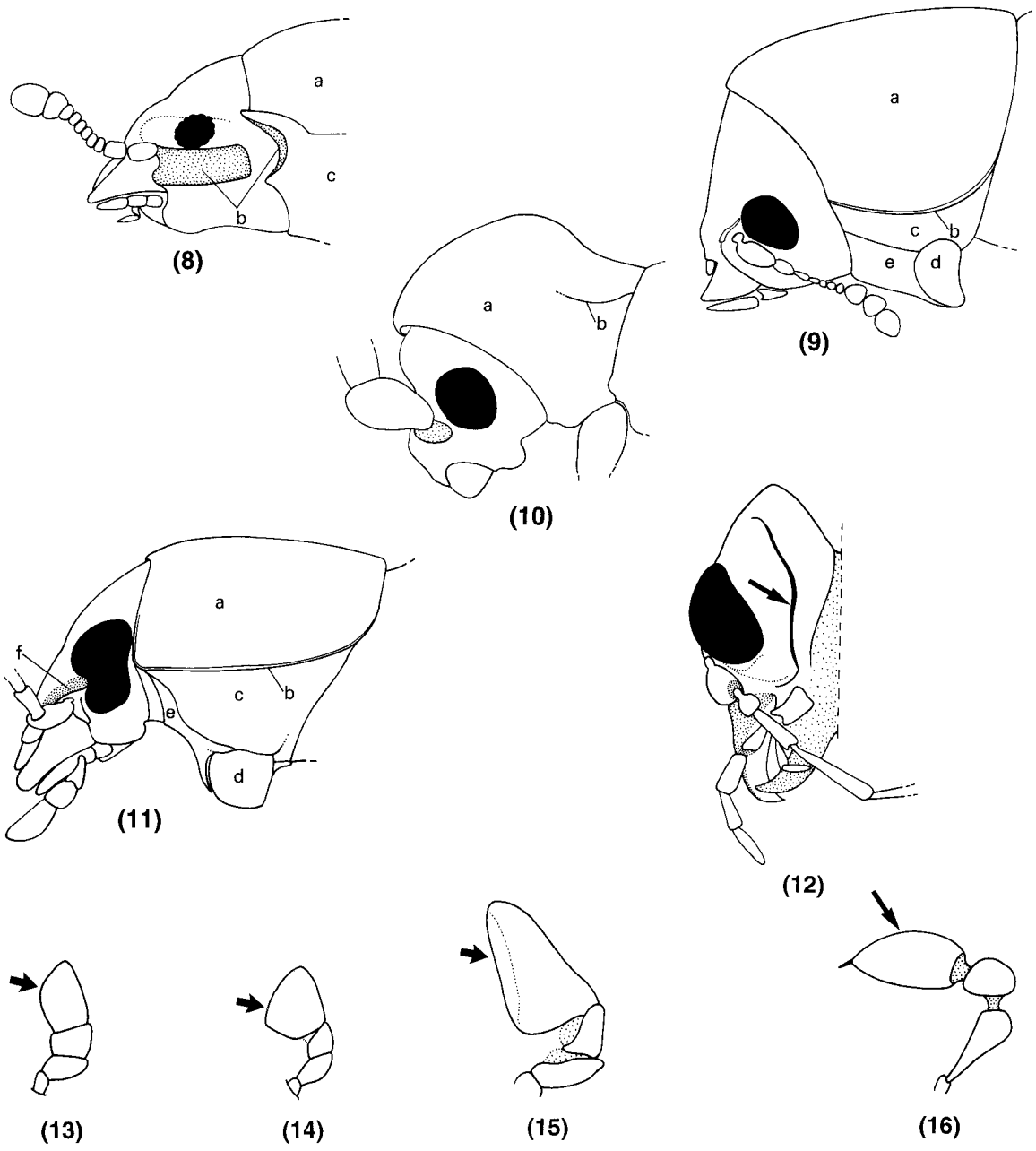


Fig. 8–12 Schematic lateral views of head/prothorax: (8) prognathous – *Archaeoglenes costipennis* (Tenebrionidae) (a, anterior part of pronotum; b, antennal grooves; c, hypomeron); (9) hypognathous – *Cis zeelandicus* (Ciidae) (a, pronotum; b, complete pronotal carina; c, hypomeron; d, procoxa; e, prosternum); (10) hypognathous – *Ptinus speciosus* (Anobiidae) (a, prothorax, b, incomplete pronotal carina); (11) head of *Artystona erichsoni* (Tenebrionidae), showing canthus (a, pronotum; b, complete pronotal carina; c, hypomeron; d, procoxa; e, prosternum; f, canthus); (12) head of *Veronatus* sp. (Scirtidae), showing characteristic keel on genal area.

Fig. 13–16 Maxillary palps: (13–15) apex obliquely truncate or securiform – *Scymnus*, *Rodalia*, *Coccinella* (Coccinellidae); (16) apex elongate, with peglike extension – *Physobryaxis inflata* (Staphylinidae: Pselaphinae).

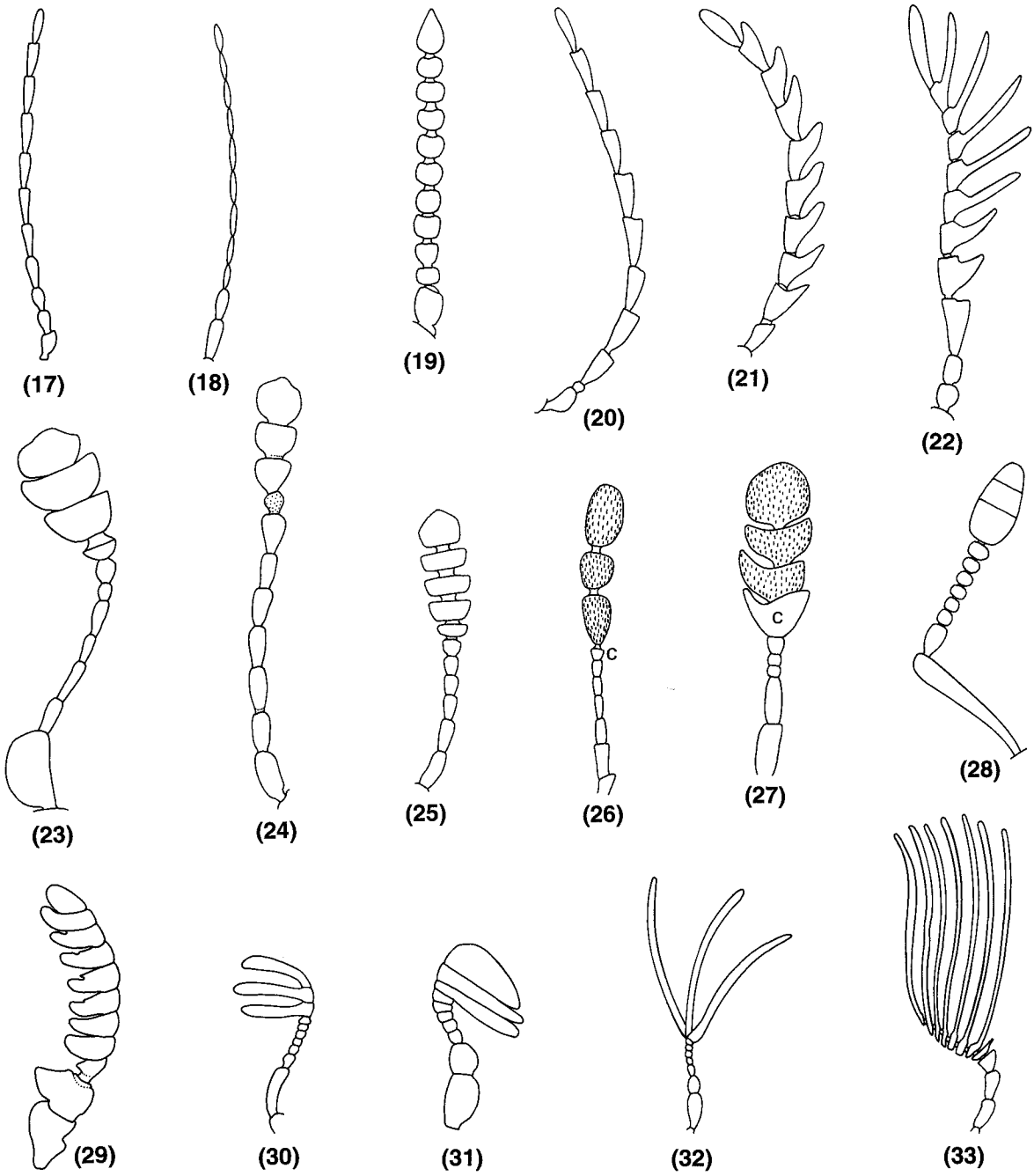


Fig. 17–33 Types of antennae (pubescence not shown): (17, 18) filiform – 17, Cantharidae; 18, Staphylinidae: Habrocerinae; (19) moniliform, Rhysodidae; (20, 21) serrate – 20, Ptilodactylidae; 21, Lycidae; (22) pectinate, Chelonariidae; (23–29) clavate – 23, abrupt club of Nitidulidae; 24, gradual club with reduced segment 8 of Leiodidae; 25, more evenly developed club of Leiodidae; 26, 27, segment preceding club a cupule (c), Hydrophilidae; (28) geniculate, Curculionidae; (29) extended, Dryopidae; (30, 31) lamellate – 30, Lucanidae; 31, Trogidae; (32, 33) flabellate – 32, Bostrichidae; 33, Rhipiphoridae.

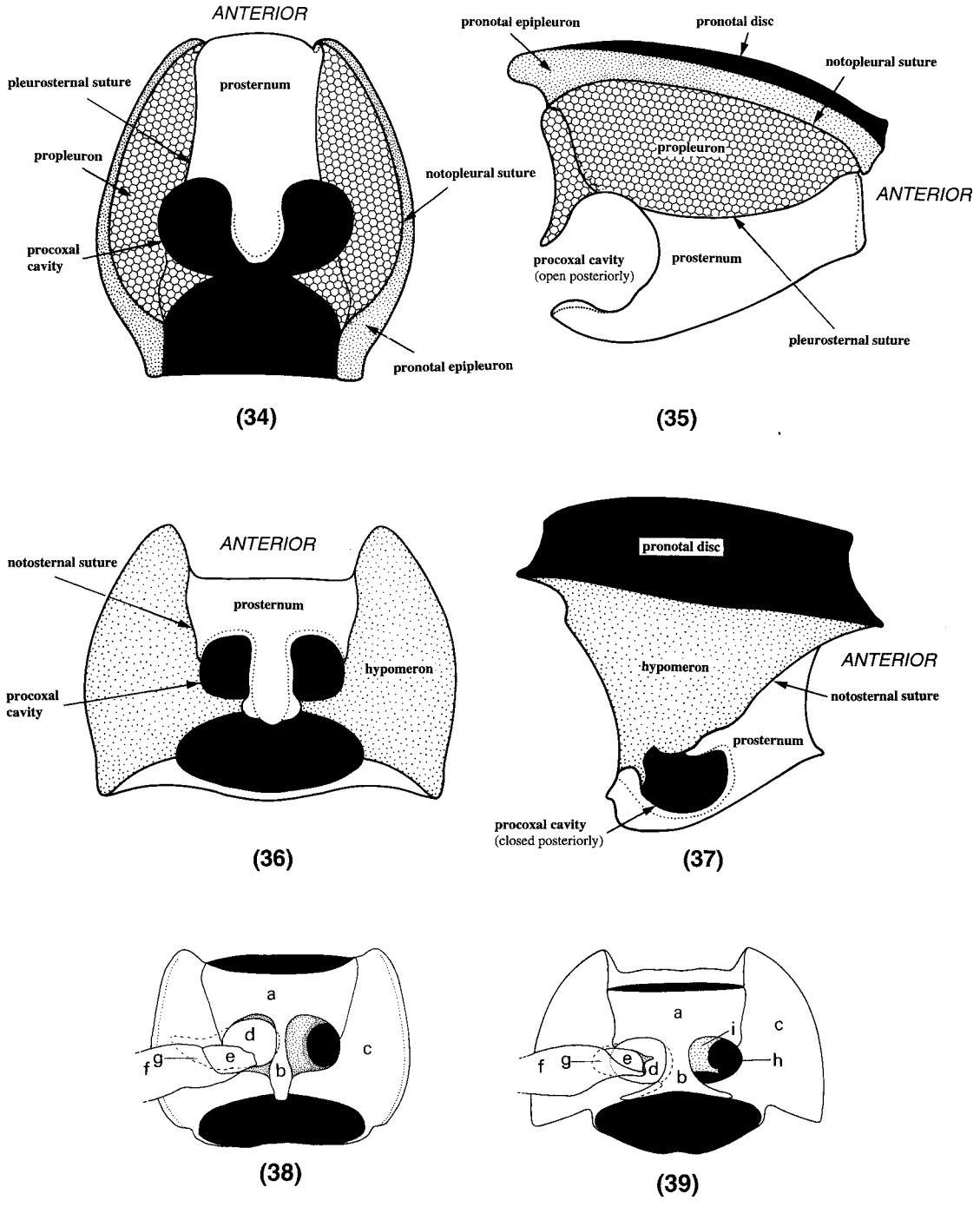
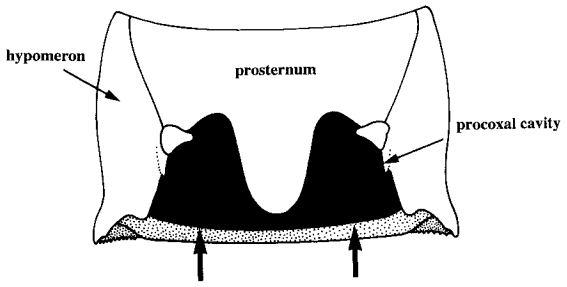
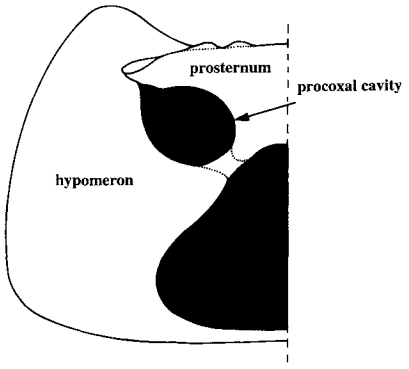


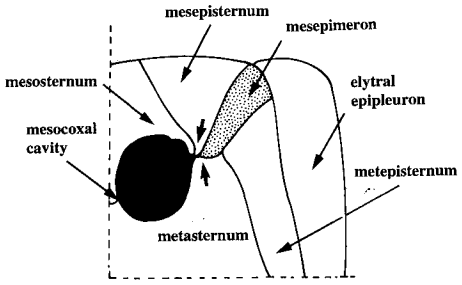
Fig. 34–37 Division of prothorax in the suborders of Coleoptera, ventral and lateral: (34, 35) Adephaga (*Maoripamborus fairburni*, Carabidae); (36, 37) Polyphaga (*Mimopeus subcostatus*, Tenebrionidae).
Fig. 38, 39 Types of procoxal closure: (38) tenebrionid; (39) zopherid / ulodid (a, prosternum; b, prosternal process; c, hypomeron; d, coxa; e, trochanter; f, femur; g, concealed membranous extension; h, aperture; i, membrane).



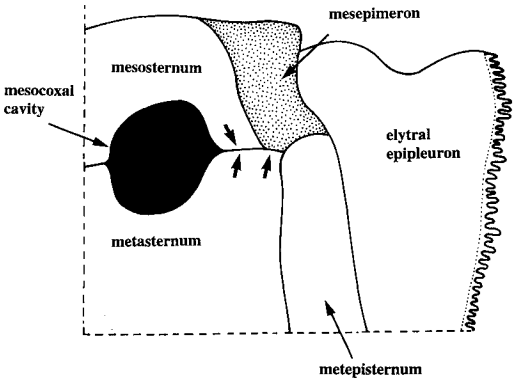
(40) OPEN PROCOXAL CAVITIES



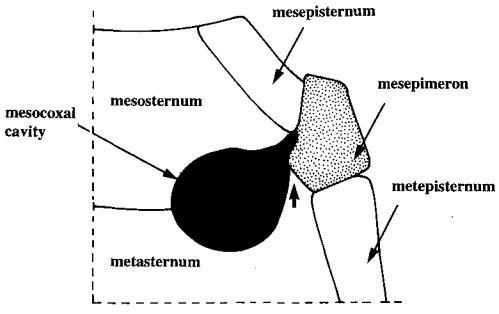
(41) CLOSED PROCOXAL CAVITY



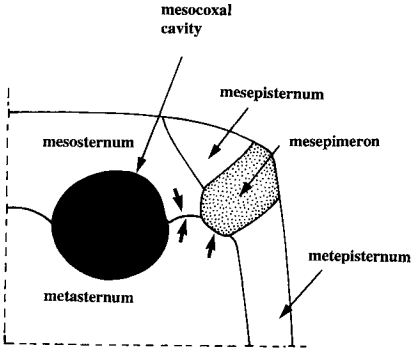
(42) OPEN MESOCOXAL CAVITY



(43) CLOSED MESOCOXAL CAVITY



(44) OPEN MESOCOXAL CAVITY



(45) CLOSED MESOCOXAL CAVITY

Fig. 40–45 Types of coxal closure: (40) procoxae completely open behind, *Nascioides enysi* (Buprestidae); (41) procoxal cavity closed, *Rygmodus incertus* (Hydrophilidae); (42) mesocoxal cavity open laterally, *Typhaea stercorea* (Mycetophagidae); (43) mesocoxal cavity closed laterally, *Enarsus bakewelli* (Colydiidae); (44) mesocoxal cavity open laterally, *Platisus* sp. (Cucujidae); (45) mesocoxal cavity closed laterally, *Cryptodacne brouni* (Erotylidae).

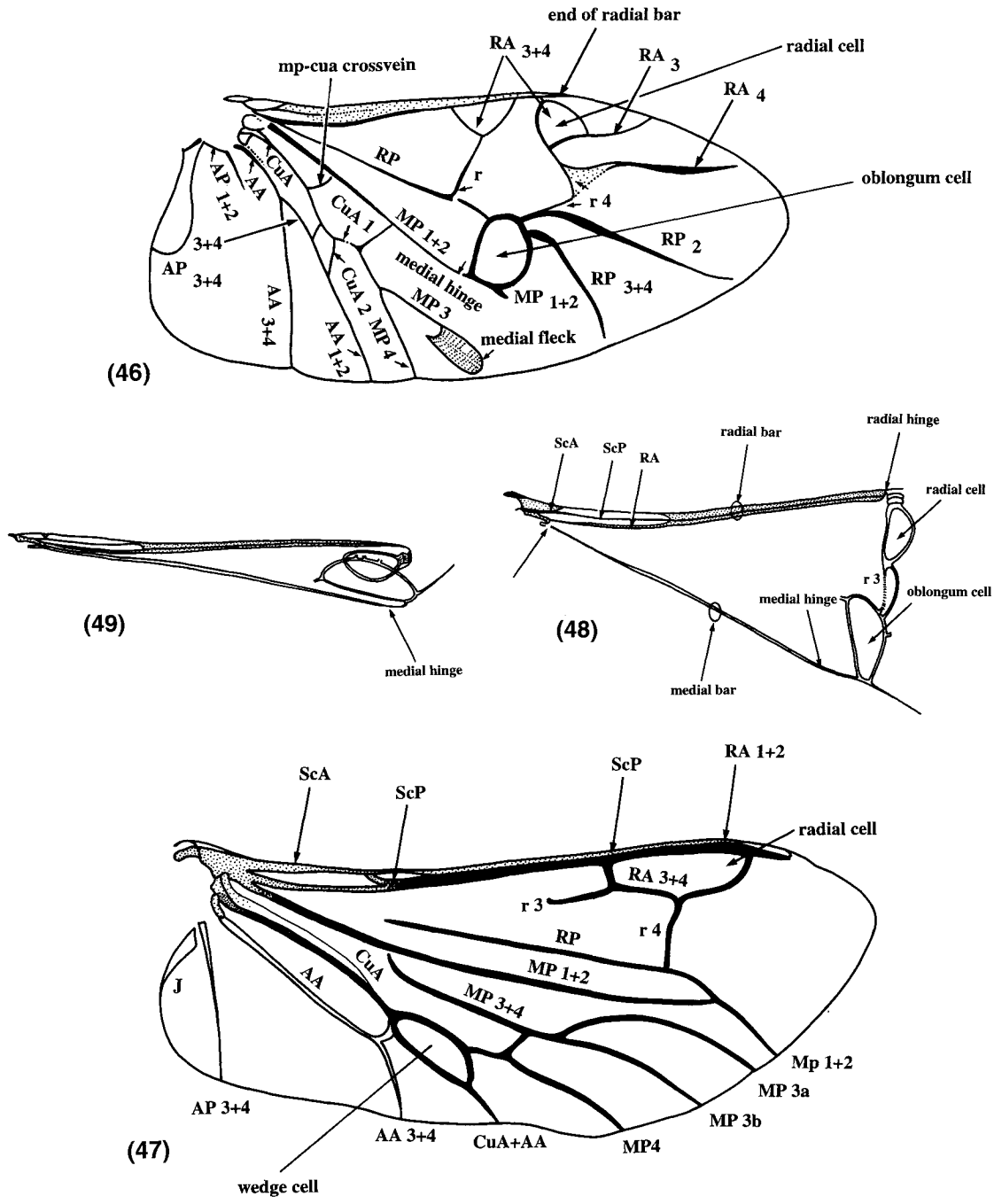


Fig. 46–49 Hind wing venation in Coleoptera: (46) example from Adephaga; (47) example from Polyphaga; (48, 49) position of radial loop (radial cell) and medial loop (oblongum cell) in the unfolded and folded wing in Adephaga, after Kukalová-Peck & Lawrence (1993). Veins: A, anal; AA, anal anterior; AP, anal posterior; Cu, cubitus; CuA, cubitus anterior; CuP, cubitus posterior; J, jugal; M, media; MA, media anterior; MP, media posterior; R, radius; RA, radius anterior; RP, radius posterior; r, radial cross-vein; Sc, subcosta; ScA, subcosta anterior; ScP, subcosta posterior.

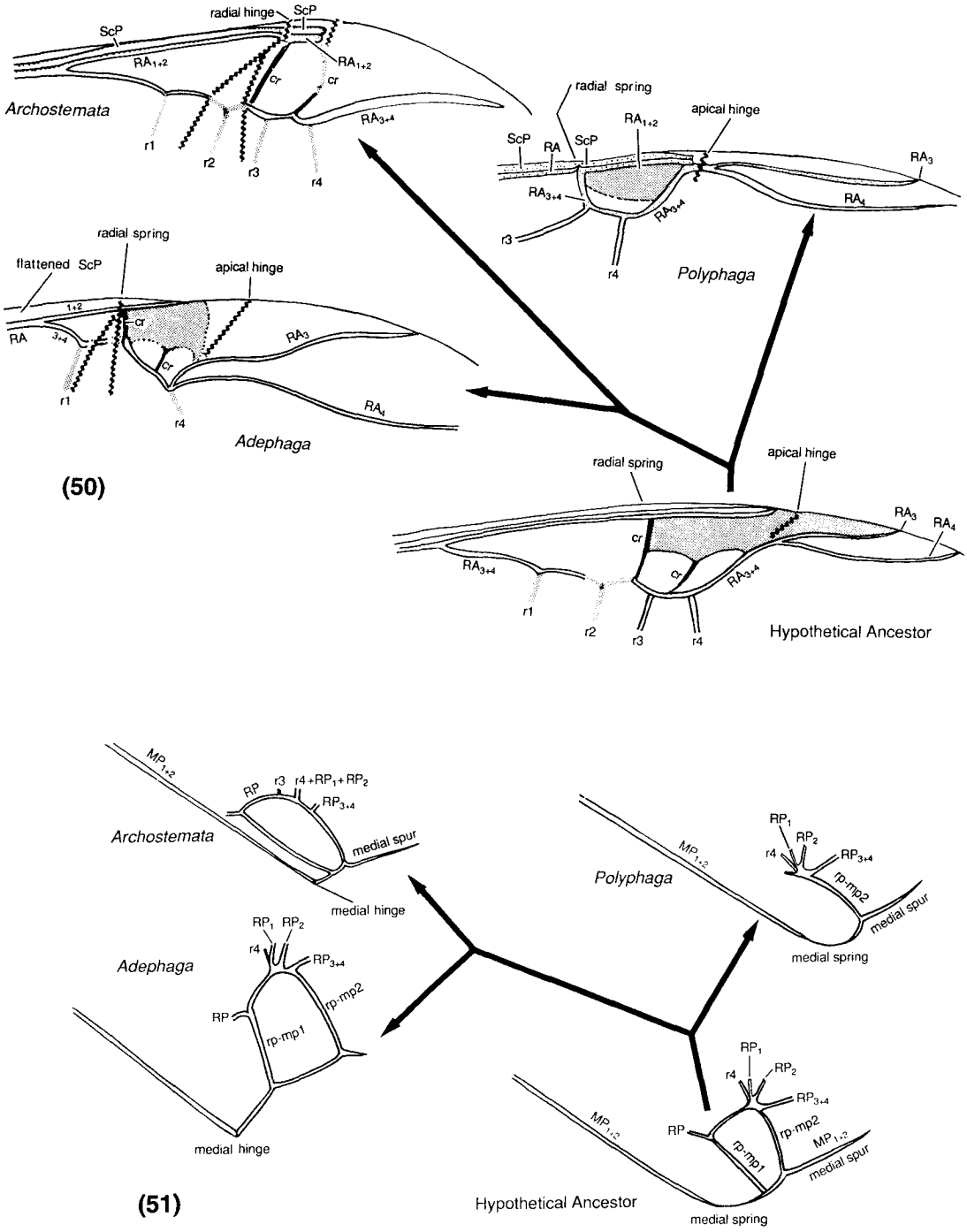
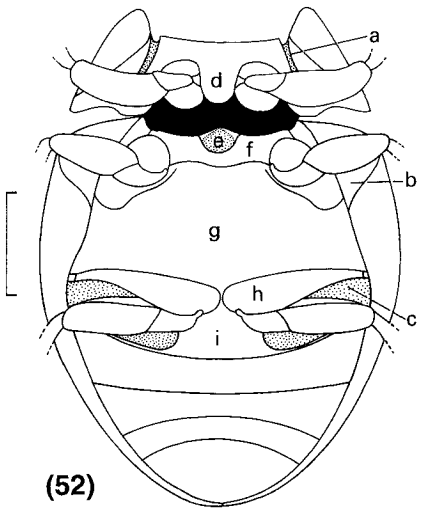


Fig. 50, 51 Evolution of end of radial loop (50) and medial loop (51) in Coleoptera. Veins: cr, cross-vein; MP, media posterior; r, radial cross-vein; RA, radius anterior; RP, radius posterior; rp–mp1 and 2, radio-medial cross-veins; ScP, subcosta posterior [Fig. 48–51after Kukalová-Peck & Lawrence 1993].



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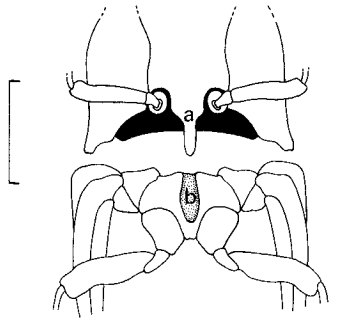

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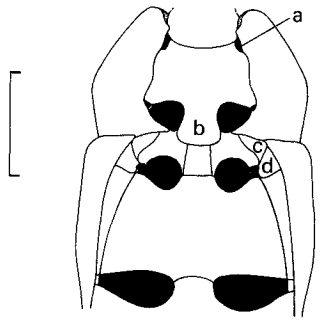

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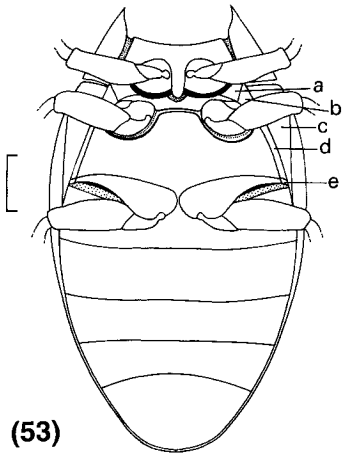

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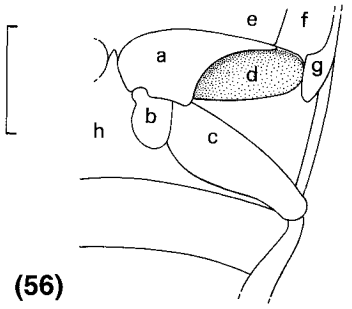


(56)

Fig. 52–56 Structural features of ventral thorax and abdomen: (52) *Synorthus insularis* (Byrrhidae), after Watt (1971) – a, antennal groove; b, epipleuron; c, crural or femoral depression; d, prosternal process; e, mesosternal depression for receiving prosternal process; f, mesosternum; g, metasternum; h, metacoxa; i, ventrite 1; (53) *Epichorius longulus* (Byrrhidae), after Watt (1971) – a, mesepisternum; b, mesepimeron; c, epipleuron; d, metepisternum; e, metepimeron; (54) 'click mechanism' in Elateridae – a, prosternal process; b, mesosternal cavity receiving prosternal process; (55) *Priasilpha obscura* (Phloeostichidae) – a, antennal groove; b, prosternal process; c, mesepisternum; d, mesepimeron; (56) *Dermestes maculatus*, Dermestidae – a, coxa with extended femoral plate; b, trochanter; c, femur; d, femoral excavation; e, metasternum; f, metepisternum; g, metepimeron; h, ventrite 1. Scale lines = 1 mm.

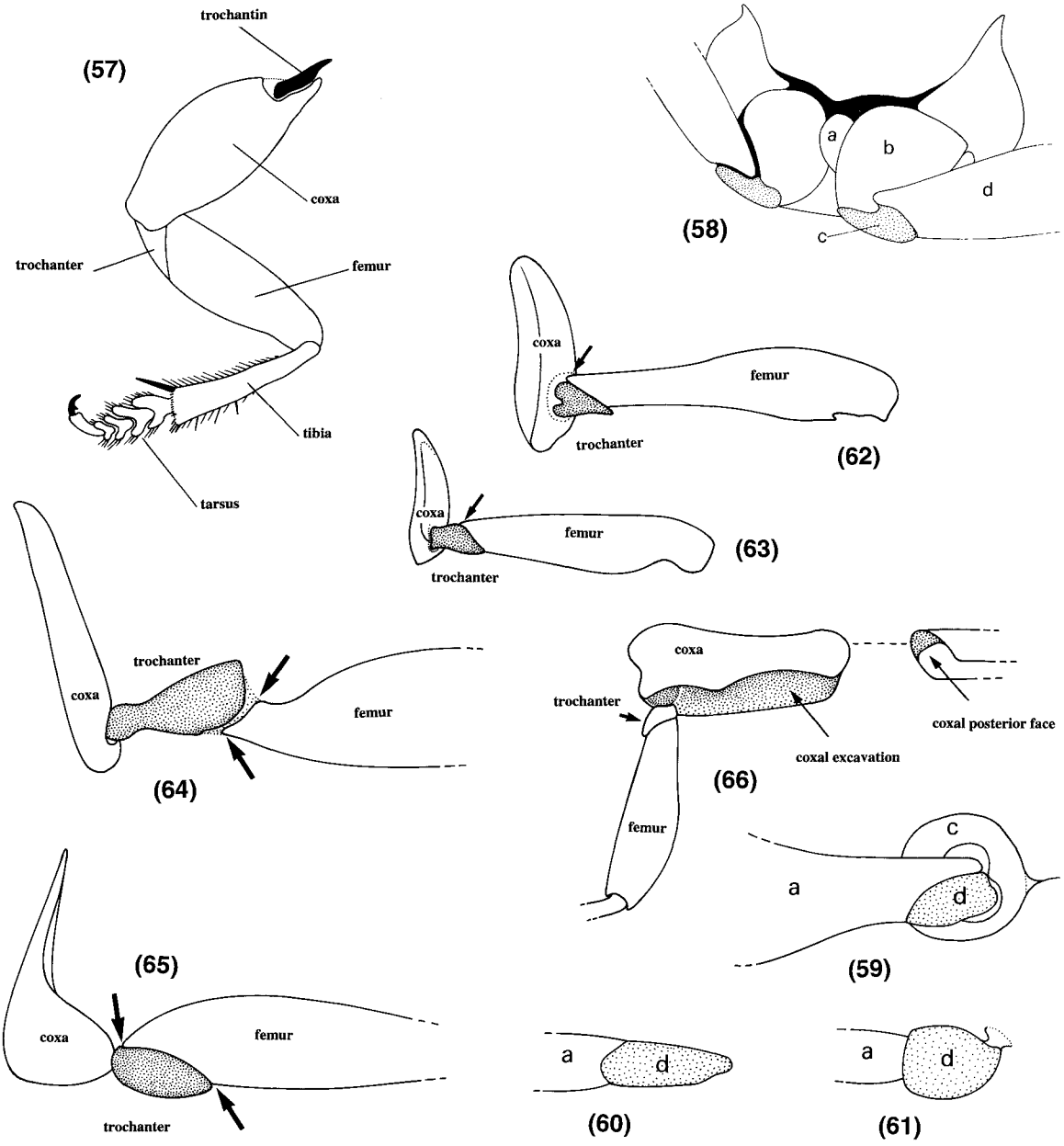


Fig. 57 Divisions of foreleg (*Creophilus oculatus*, Staphylinidae). **Fig. 58–66** Coxa/femur articulation through trochanter: (58) heteromeroid type, oblique ventral, *Phymatophaea lugubris* (Cleridae) – a, prosternal intercoxal process; b, coxa; c, trochanter; d, femur; (59) heteromeroid type, *Pycnomerus sophorae* (Colydiidae) – a, basal part of femur; c, coxa; d, trochanter; (60) oblique mesotrochanterofemoral junction, *Euderia squamosa* (Bostrichidae) – a, basal part of femur, d, trochanter; (61) transverse mesotrochanterofemoral junction, *Ptinus speciosus* (Anobiidae: Ptininae) – a, basal part of femur; c, coxa; d, trochanter; (62) femur contiguous with coxa, not separated by trochanter, *Agathinus tridens* (Belidae: Belinae); (63) femur separated from coxa by trochanter, *Apion* sp. (Brentidae); (64) metatrochanter long, transversely joined to femur, *Porrostoma rufipenne* (Lycidae); (65) metatrochanter short, obliquely joined to femur, *Asilis fumida* (Cantharidae); (66) metacoxa excavated, with posterior face vertical, *Nascioides enysi* (Buprestidae).

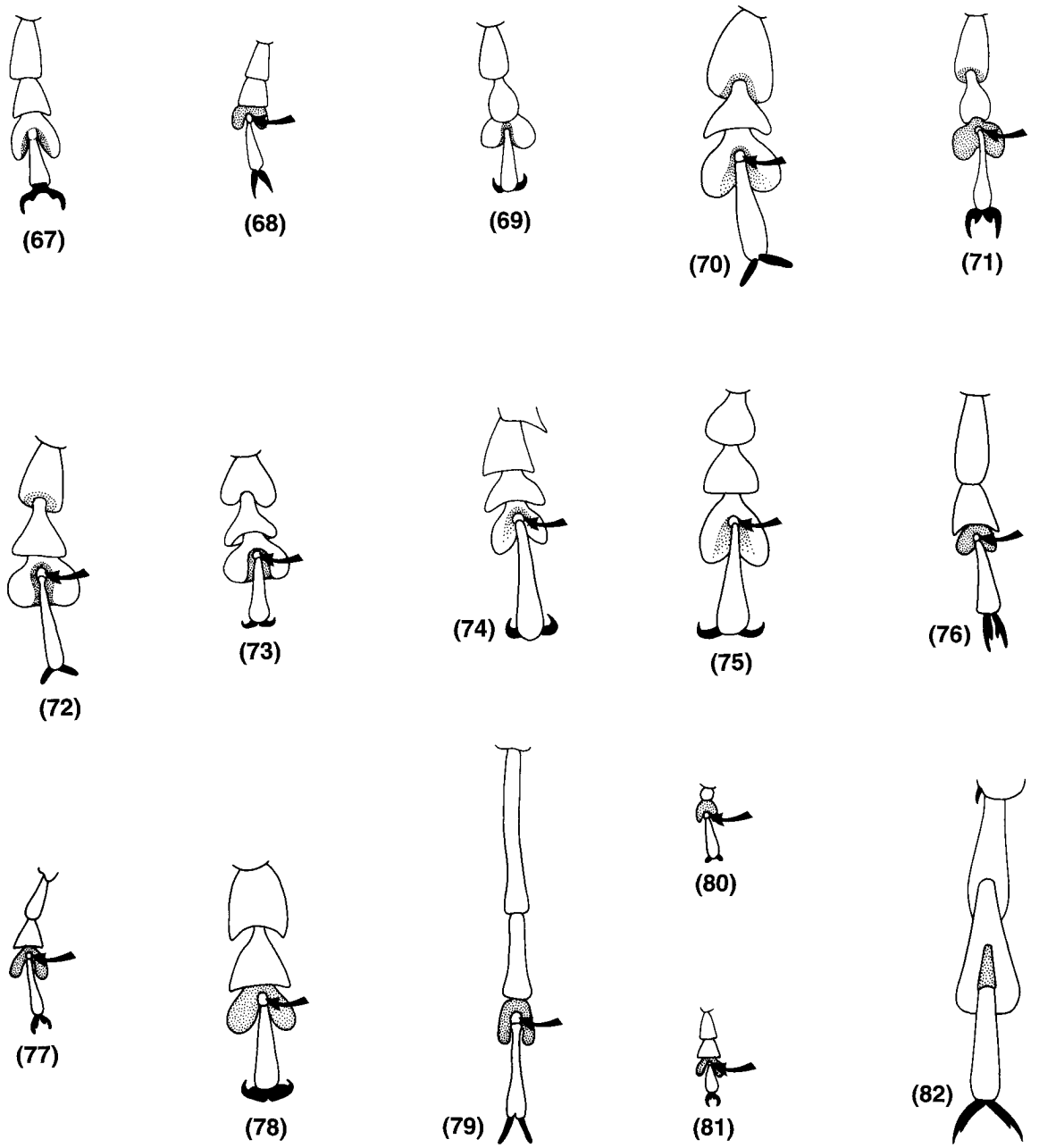


Fig. 67–81 Protarsal configuration in Chrysomeloidea and Curculionoidea, 5-5-5 with reduced 4th segment (67–79) and 4-4-4 with reduced 3rd segment (80, 81): (67) *Arnomus* sp., Chrysomelidae; (68) *Acanthoscelides obtectus*, Chrysomelidae; (69) *Adoxia* sp., Chrysomelidae – 4th and 5th segments often imperceptibly fused; (70) *Caccomolpus* sp., Chrysomelidae; (71) *Alema spatiosa*, Chrysomelidae; (72) *Eualema speculifera*, Chrysomelidae; (73) *Allocharis* sp., Chrysomelidae; (74) *Prionoplus reticularis*, Cerambycidae; (75) *Anagotus fairburni*, Curculionidae; (76) *Cacephatus incertus*, Anthribidae; (77) *Rhinorhynchus rufulus*, Nemonychidae; (78) *Agathinus tridens*, Belidae; (79) *Lasiorhynchus barbicornis*, Brentidae; (80) *Aralius wollastoni*, Belidae; (81) *Neocyba metrosideros*, Brentidae.

Fig. 82 Right metatarsus, *Coccinella leonina* (Cucujoidea:Coccinellidae), showing reduced 3rd segment (shaded).

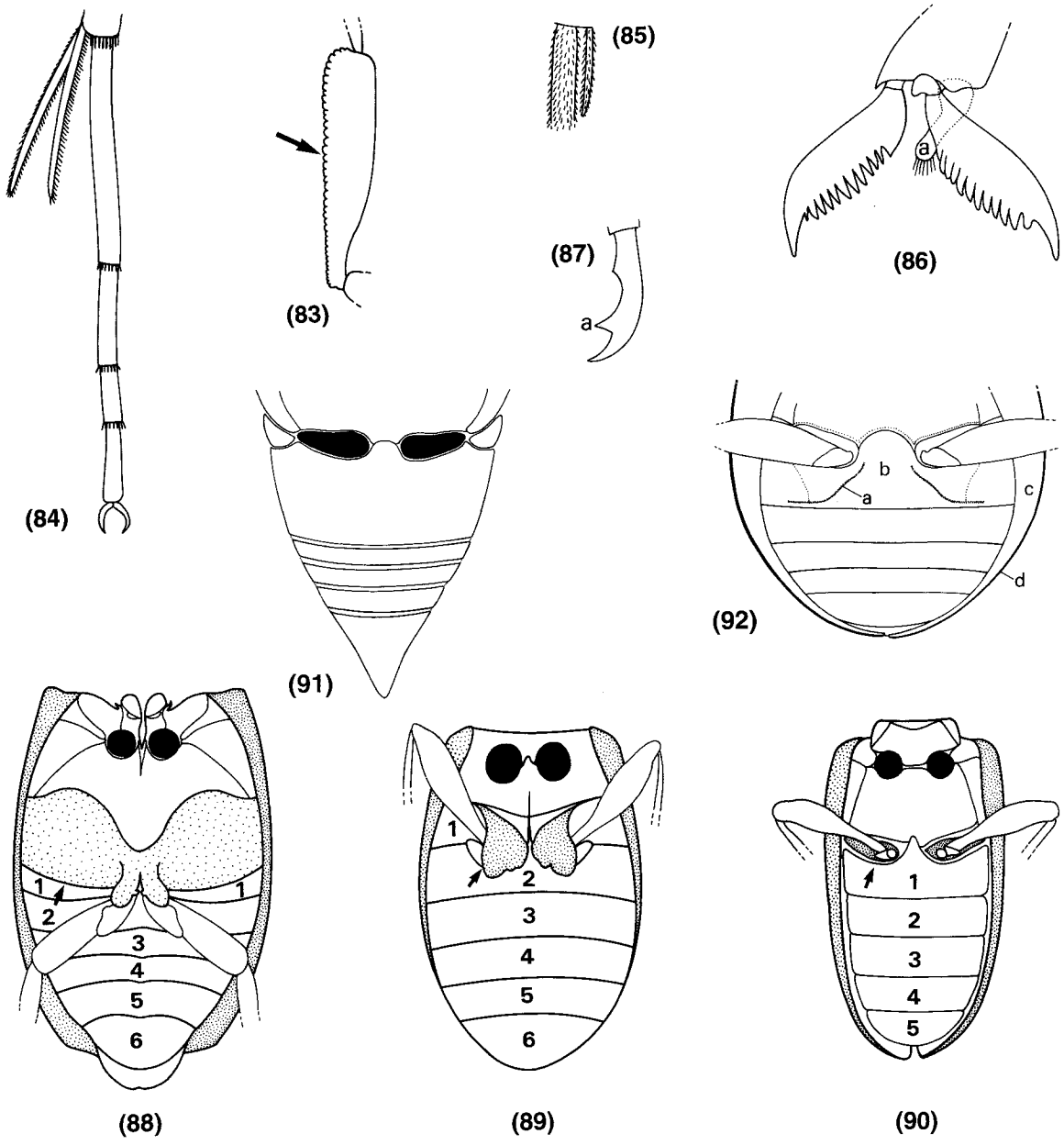
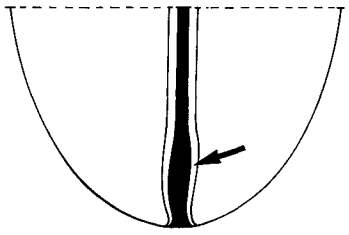


Fig. 83–87 Diagnostic features of coleopteran legs: (83) protibia with transversely indented outer carina, *Rentonidium costiventris* (Trogossitidae: Rentoniinae); (84) right metatarsus and tibial spurs, *Hylobia pulla* (Melandryidae); (85) basal metatarsal segment and tibial spur, *Nothotelus usitatus* (Scraptiidae); (86) serrate mesotarsal claws, *Tanychilus sophorae* (Tenebrionidae: Alleculinae) -a, empodium; (87) toothed tarsal claw, *Allocinops brookesi* (Rhipiphoridae).

Fig. 88–92 Diagnostic features of coleopteran abdomen: (88, 89) 1st ventrite bisected by metacoxae (Adephaga – *Lancetes lancelatus*, Dytiscidae and *Loxomerus nebrioides*, Carabidae); (90) 1st ventrite undivided by metacoxae (Polyphaga – *Platisus* sp., Cucujidae); (91) intersegmental membranes (free ventrites), *Baeocera scutellaris* (Staphylinidae: Scaphidiinae); (92) part metathorax and abdomen, Cocinellidae (a, femoral line; b, ventrite 1; c, epipleuron; d, epipleural carina).



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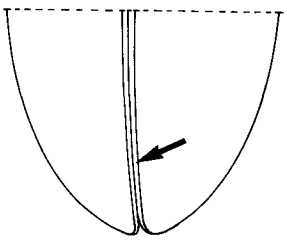

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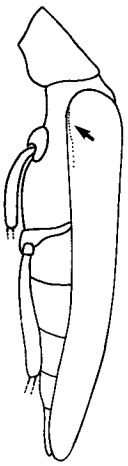

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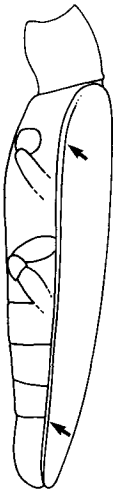

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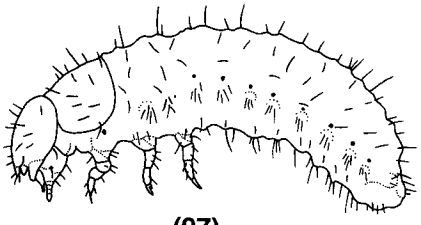

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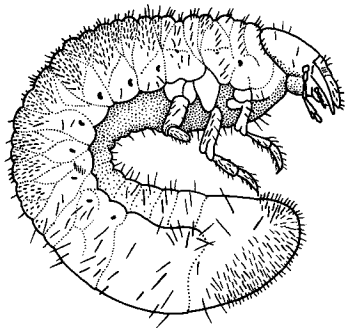

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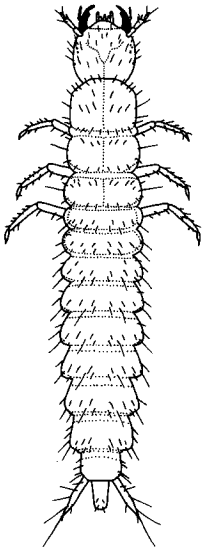

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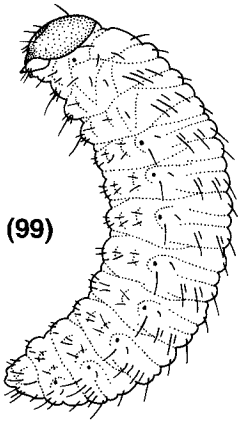
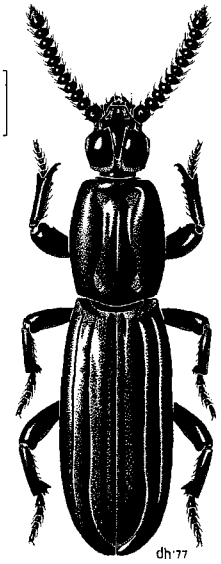


(99)

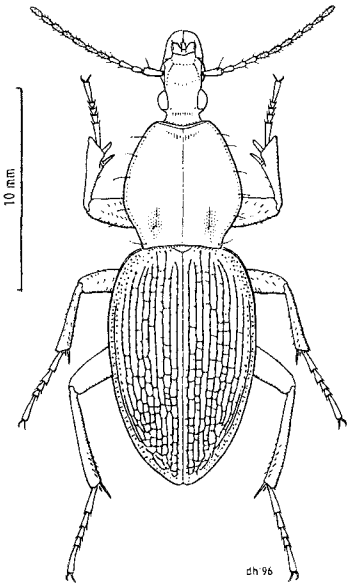
Fig. 93–96 Diagnostic features of coleopteran elytra: (93) elytral suture with a posterior gap, *Neocercus electus* (Cavognathidae); (94) elytral suture complete, *Loberus depressus* (Languriidae); (95) elytral epipleura indistinct, *Parisopalpus macleayi* (Oedemeridae); (96) elytral epipleura distinct, *Techmessa telephoroides* (Pyrochroidae).
Fig. 97–100 Morphological types of beetle larvae: (97) eruciform, *Eucolaspis brunnea* (Chrysomelidae); (98) scarabaeiform, *Costelytra zealandica* (Scarabaeidae); (99) apodous, *Sitona discoidea* (Curculionidae); (100) campodeiform, *Arpediomimus kronei* (Staphylinidae).

Fig. 101–260 Habitus studies of representative members of the families of New Zealand Coleoptera (individually captioned). Scale lines 1.0 mm unless otherwise indicated. *[Expanded captions commence on p. 168.]*

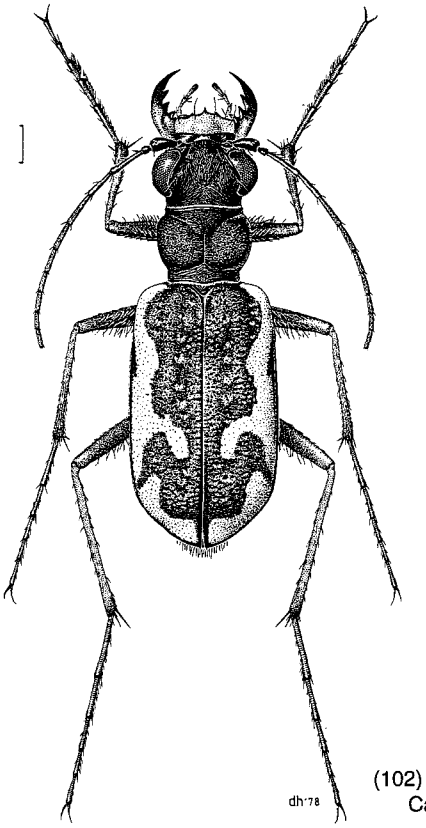
Illustrators: Fig. 1–3, 101–107, 110–118, 120–145,148, 149, 151, 153, 155, 156, 158, 159, 161–165, 168, 169, 171–186, 188–205, 207–214, 216–228, 230–260 D. W. Helmore; Fig. 4–47, 52–100 J. Klimaszewski; Fig. 48–51 J. Kukalová-Peck; Fig. 108, 114, 119, 138, 146, 152, 154, 157, 160, 166, 170, 187, 206, 215, 219 A. C. Harris; Fig. 147 S. Forgie; Fig. 150 L. Alexander; Fig. 167 J. Liddiard. Fig. 109 after Ordish (1976a); Fig. 124, 125, 132 after Steel (1964, 1966, 1950a).



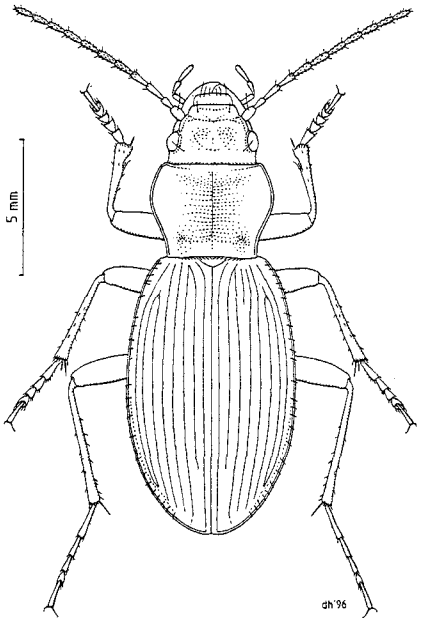
(101) *Rhyzodiastes proprius*
Rhysodidae



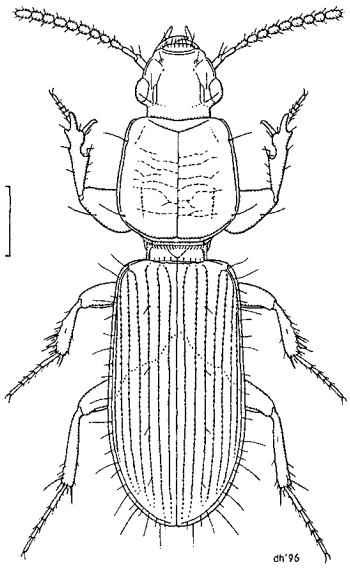
(103) *Maoripamborus fairburni*
Carabidae: Carabinae



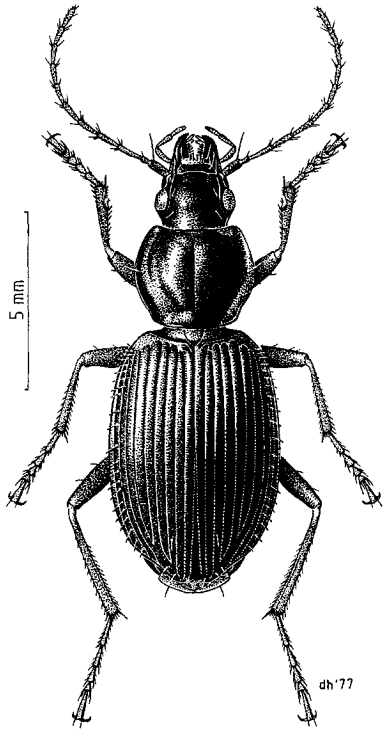
(102) *Neocicindela tuberculata*
Carabidae: Cicindelinae



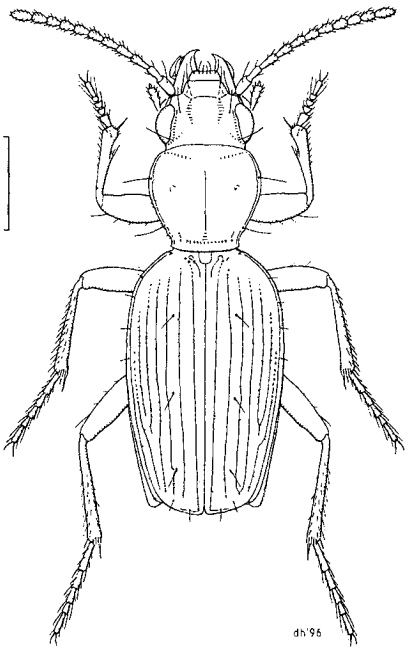
(104) *Loxomerus nebrioides*
Carabidae: Migadopinae



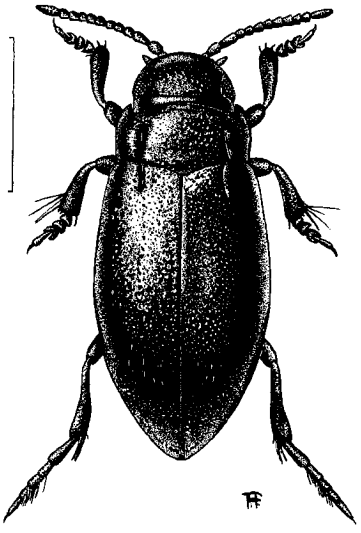
(105) *Clivina basalis*
Carabidae: Scaritinae



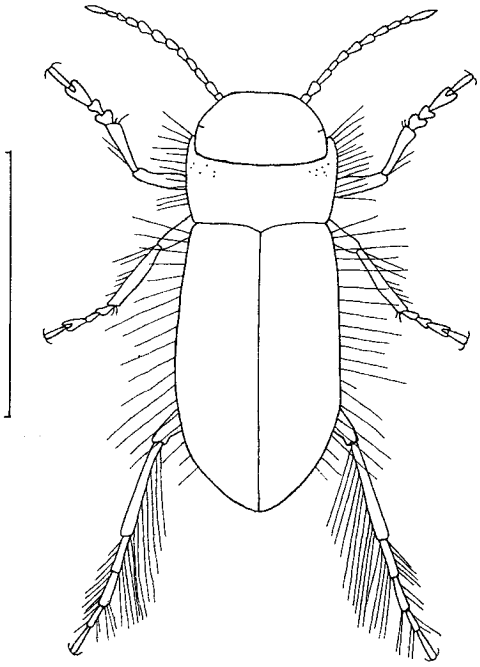
(107) *Ctenognathus novaezelandiae*
Carabidae: Harpalinae



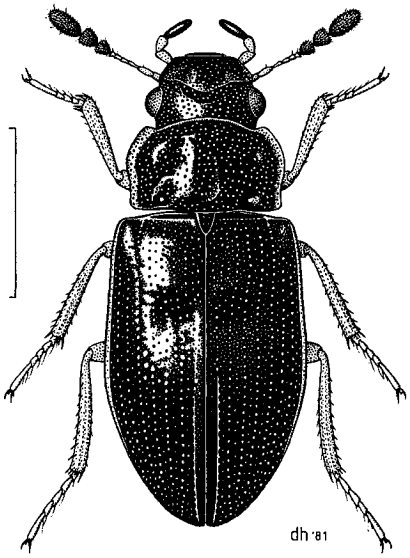
(106) *Zecillenus alacris*
Carabidae: Trechinae



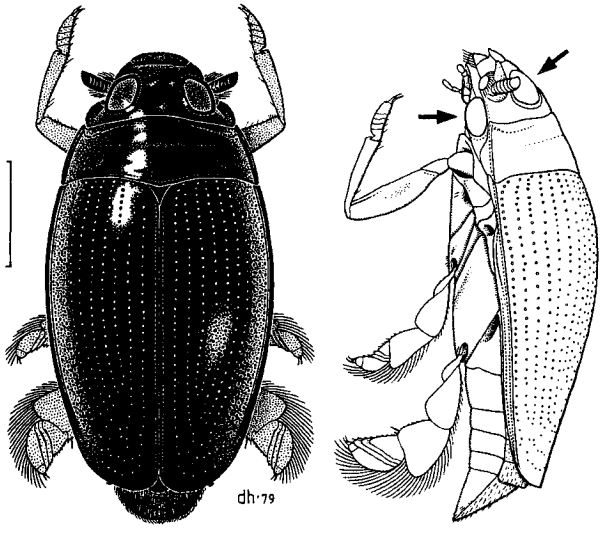
(108) *Liodessus plicatus*
Dytiscidae: Hydroporinae



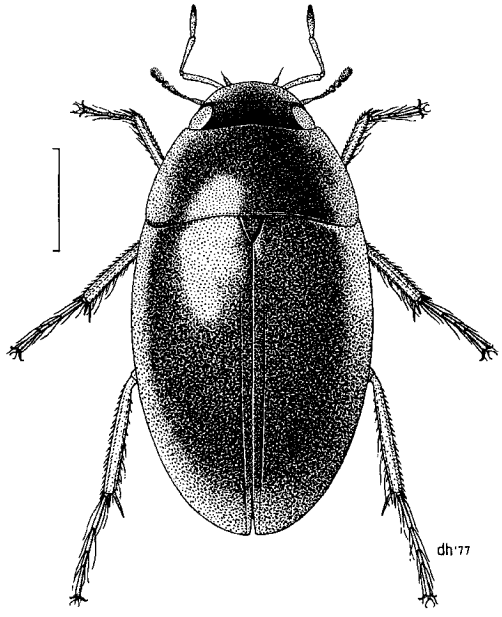
(109) *Kuschelydrus phreaticus*
Dytiscidae: Hydroporinae



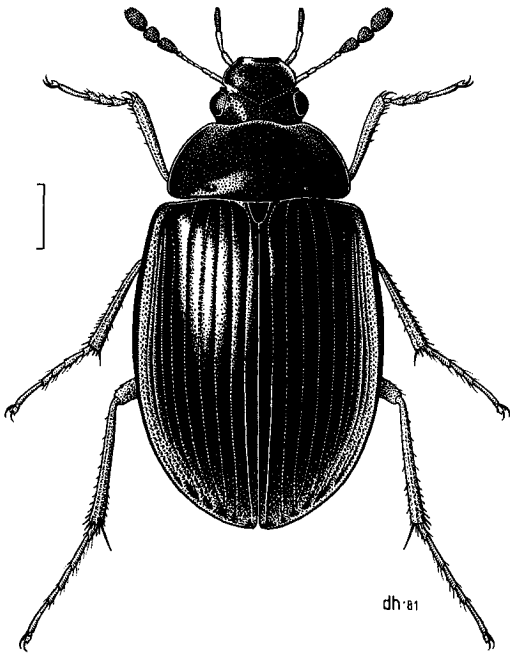
(111) *Horelophus walkeri*
Hydrophilidae: Horelophinae



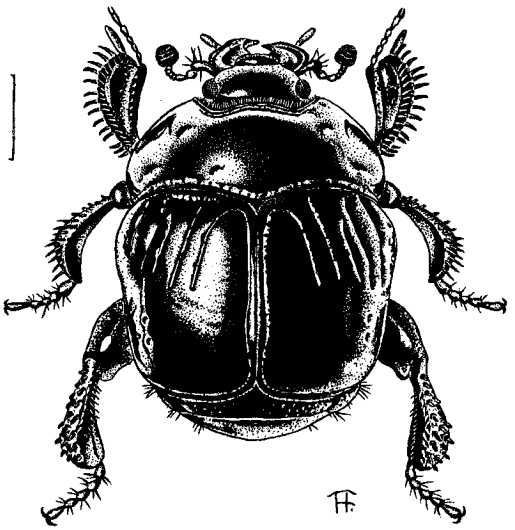
(110) *Gyrinus convexiusculus*
Gyrinidae: Gyrininae



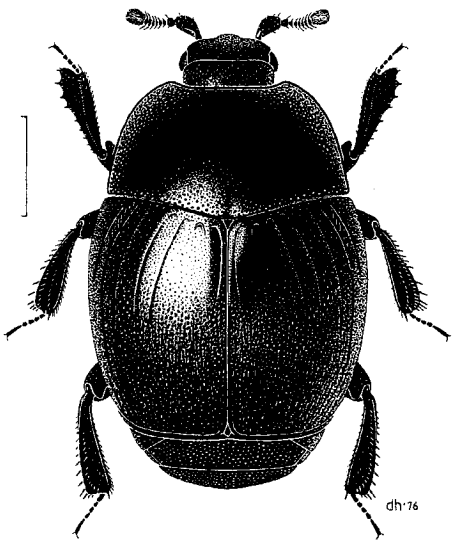
(112) *Enochrus tritus*
Hydrophilidae: Hydrophilinae



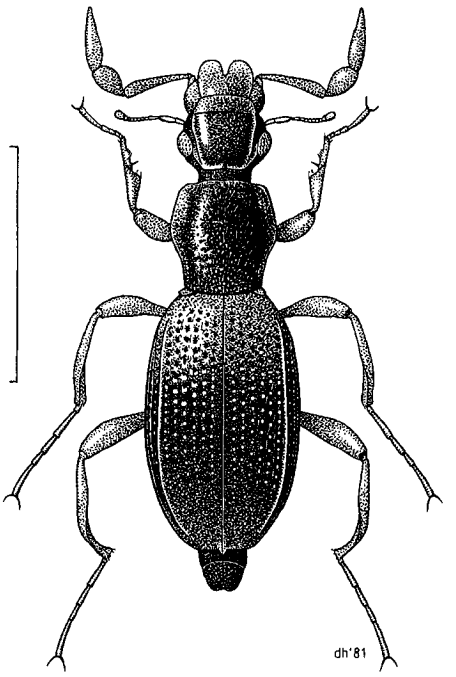
(113) *Rygmodus tibialis*
Hydrophilidae: Sphaeridiinae



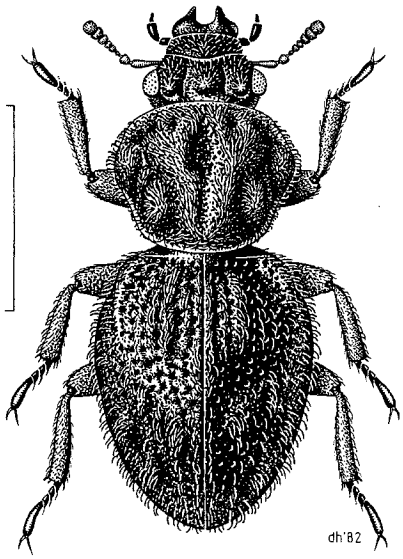
(114) *Reichardtia pedatrix*
Histeridae: Saprininae



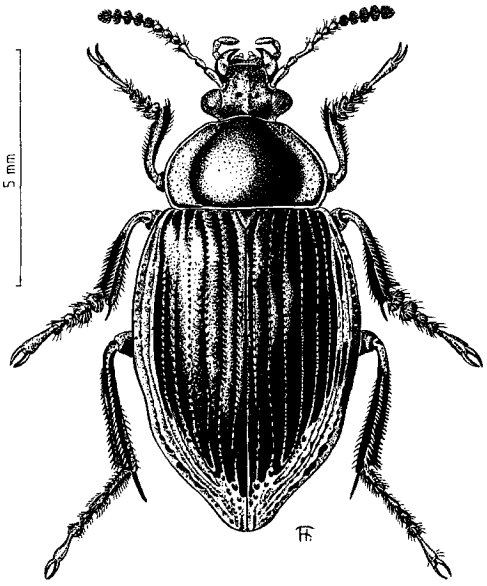
(115) *Tomogenius latipes*
Histeridae: Saprininae



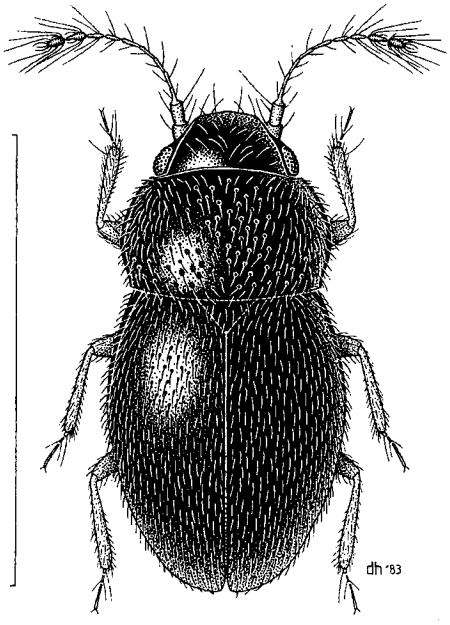
(116) *Podaena latipalpis*
Hydraenidae: Hydraeninae



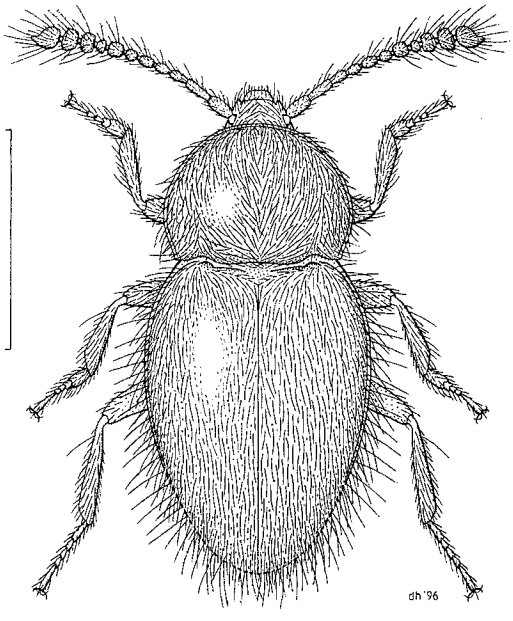
(117) *Meropathus zelandicus*
Hydraenidae: Ochthebiinae



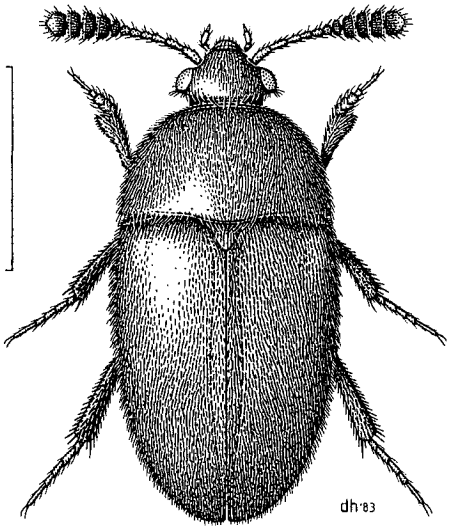
(119) *'Necrophilus' prolongatus*
Agyrtidae



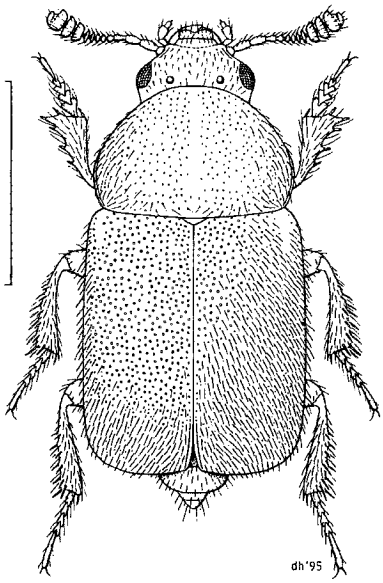
(118) *Notoptenidium lawsoni*
Ptiliidae: Ptiliinae



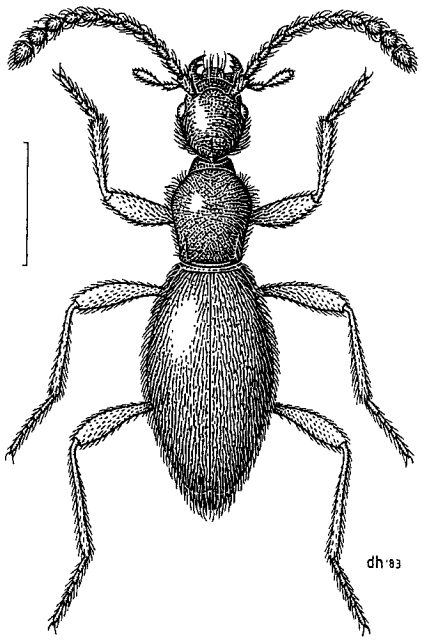
(120) *Inocatops elongellus*
Leiodidae: Camiarinae



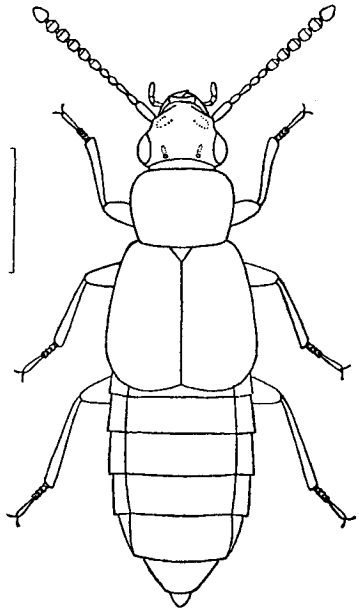
(121) *Colon hirtale*
Leiodidae: Coloninae



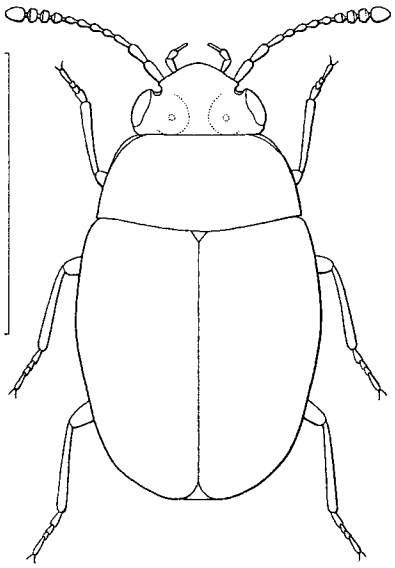
(123) *Microsilpha litorea*
Staphylinidae: Microsilphinae



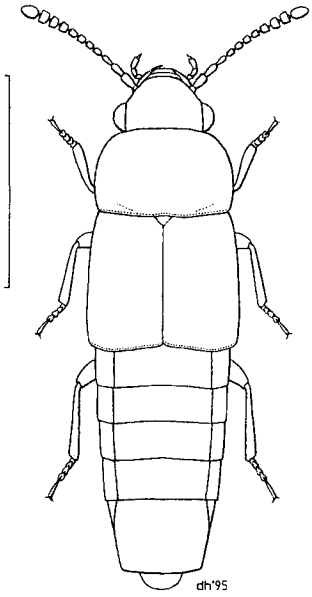
(122) *Adrastia clarkei*
Scydmaenidae: Scydmaeninae



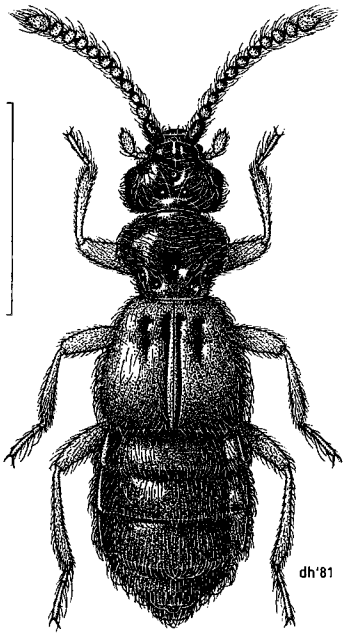
(124) *Omaliomimus albipennis*
Staphylinidae: Omaliinae



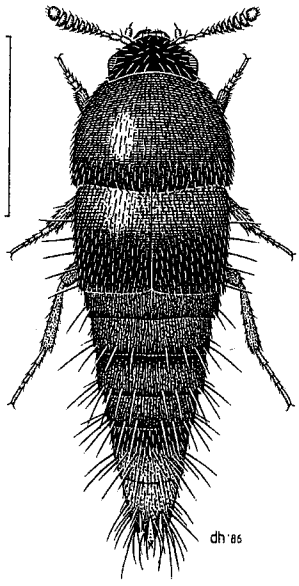
(125) *Silphotelus nitidus*
Staphylinidae: Proteininae



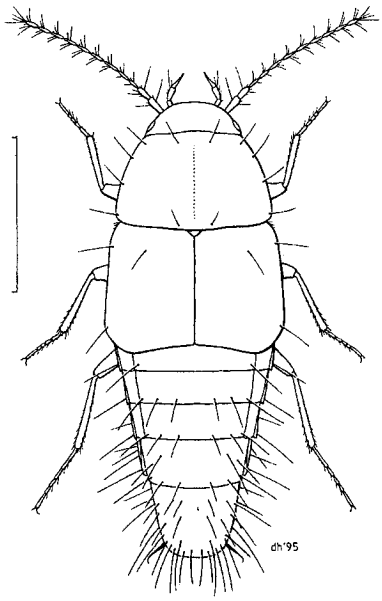
(127) *Pseudophloeocharis australis*
Staphylinidae: Phloeocharinae



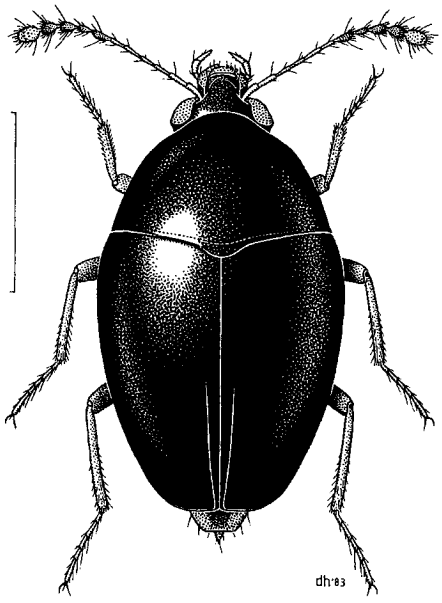
(126) *Sagola laminata*
Staphylinidae: Pselaphinae



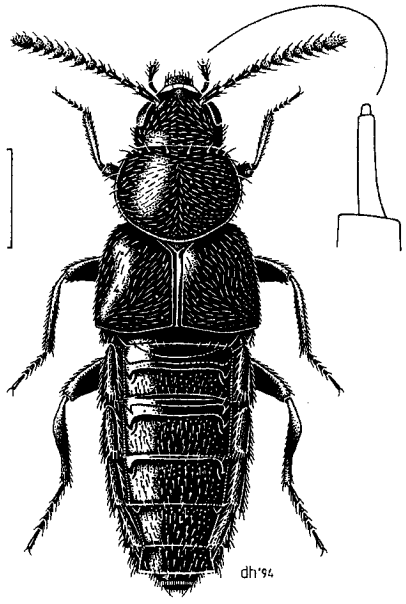
(128) *Sepedophilus* sp.
Staphylinidae: Tachyporinae



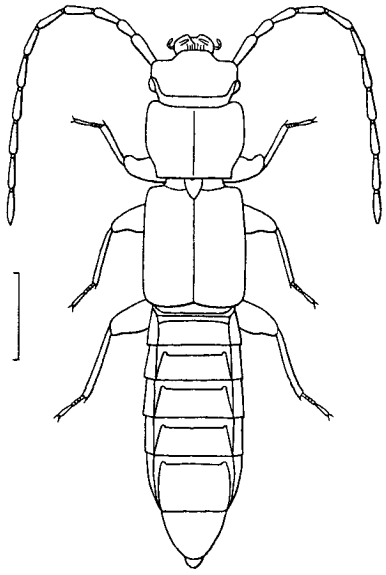
(129) *Habrocerus capillaricornis*
Staphylinidae: Habrocerinae



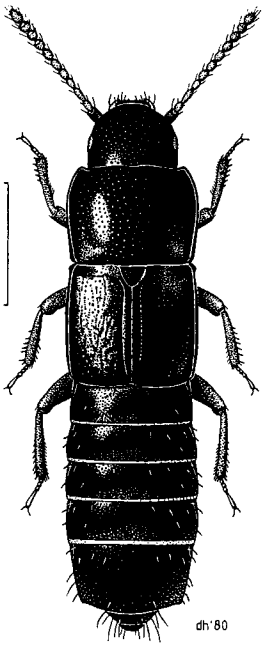
(131) *Baeocera scutellaris*
Staphylinidae: Scaphidiinae



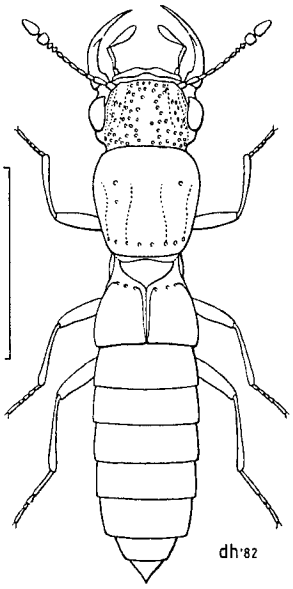
(130) *Aleochara hammondi*
Staphylinidae: Aleocharinae



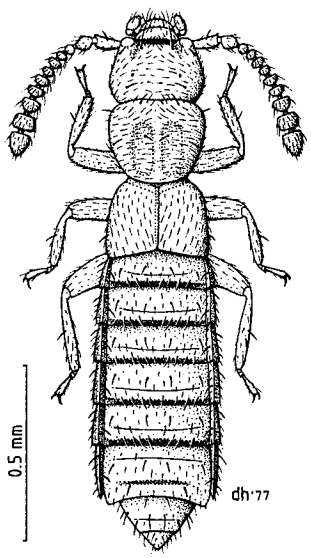
(132) *Parasiagonum hudsoni*
Staphylinidae: Piestinae



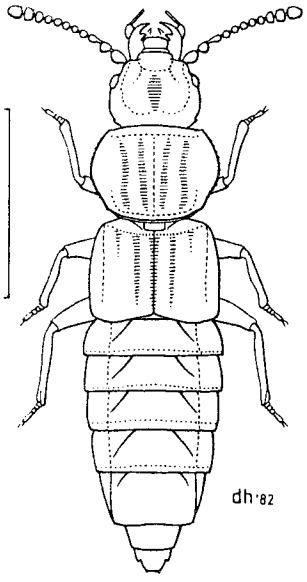
(133) *Nototorchus ferrugineus*
Staphylinidae: Osoriinae



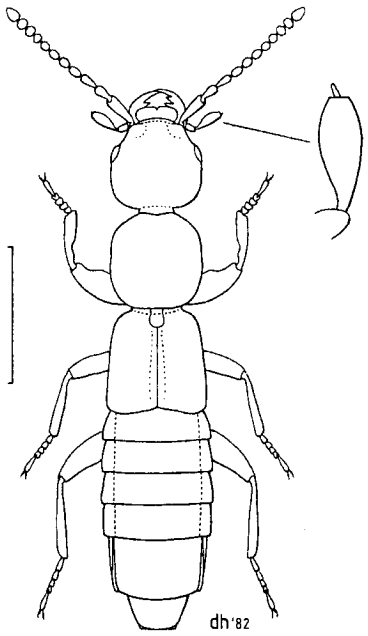
(135) *Agnosthaetus vicinus*
Staphylinidae: Euaesthetinae



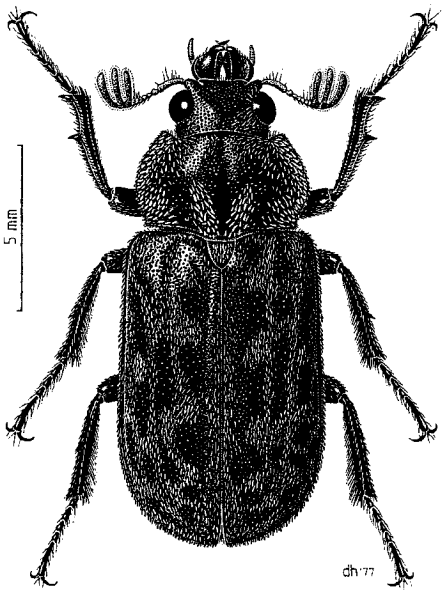
(134) *Carpelimus* sp.
Staphylinidae: Oxytelinae



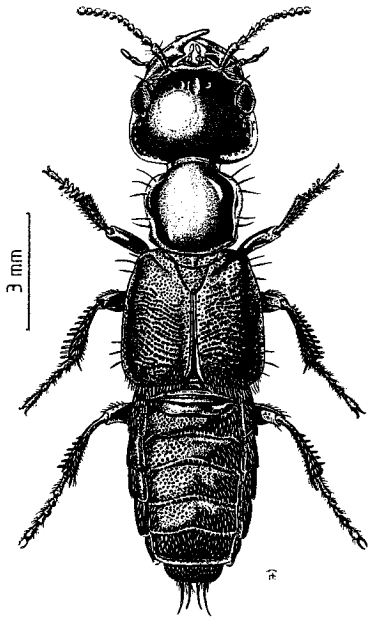
(136) *Pseudopsis arrowi*
Staphylinidae: Pseudopsinae



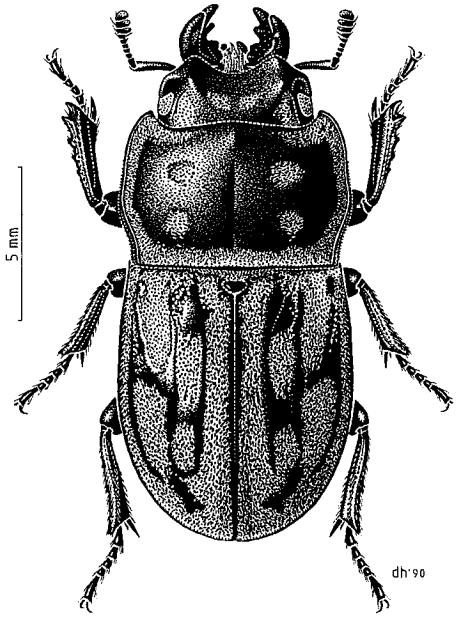
(137) *Medon zeelandicus*
Staphylinidae: Paederinae



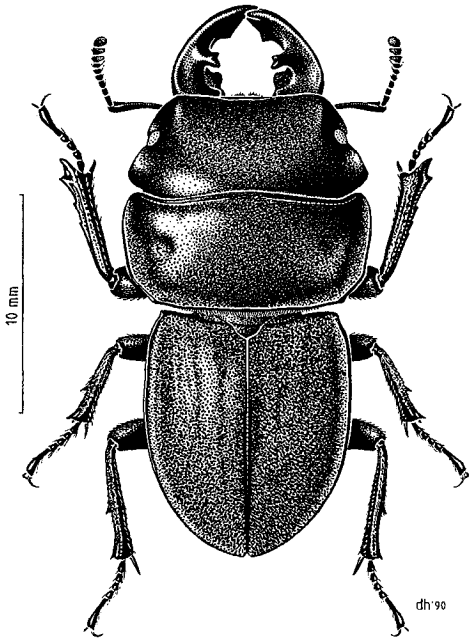
(139) *Ceratognathus parrianus*
Lucanidae: Aesalinae



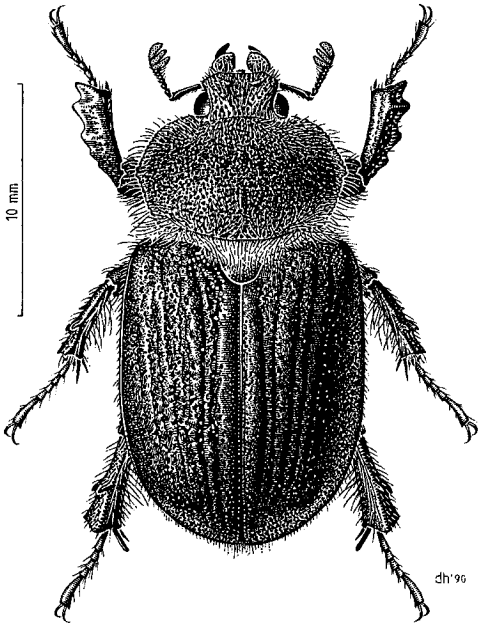
(138) *Cafius litoreus*
Staphylinidae: Staphylininae



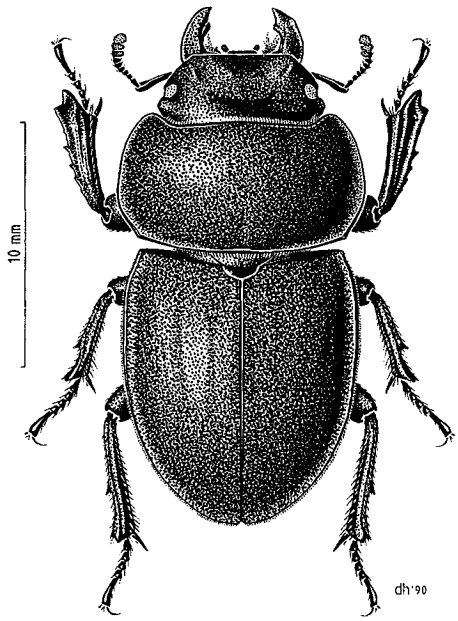
(140) *Paralissotes reticulatus*,
male, Lucanidae: Lucaninae



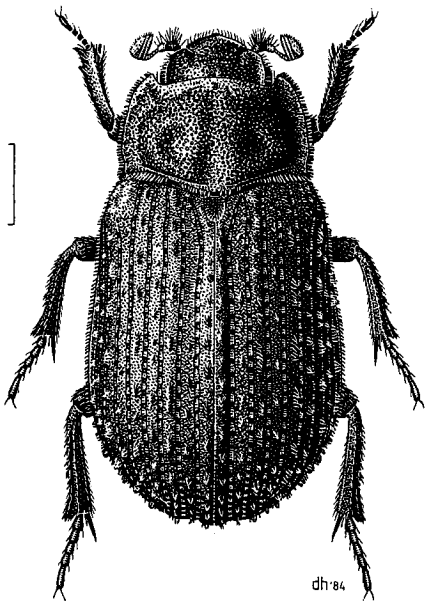
(141) *Geodorcus auriculatus*,
male, Lucanidae: Lucaninae



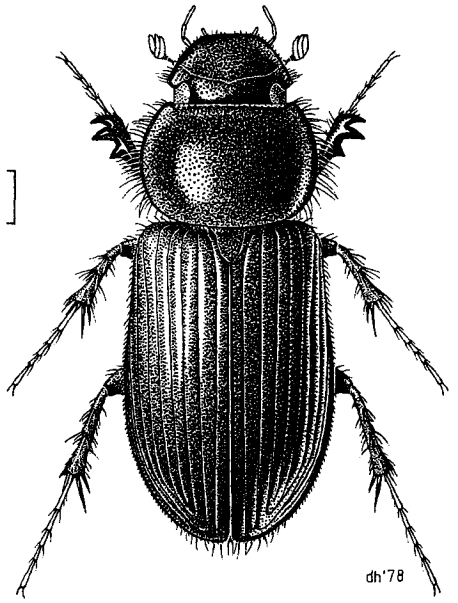
(143) *Dendroblax earlii*
Lucanidae: Lampriminae



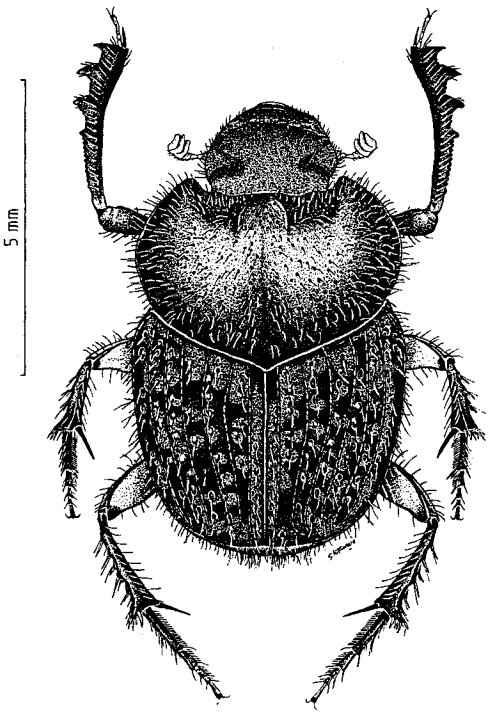
(142) *Geodorcus auriculatus*,
female, Lucanidae: Lucaninae



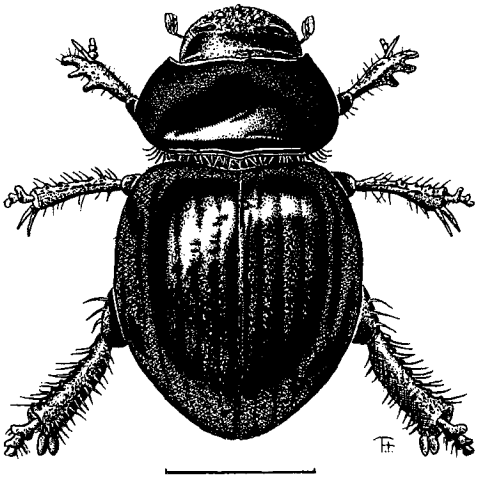
(144) *Trox scaber*
Trogidae



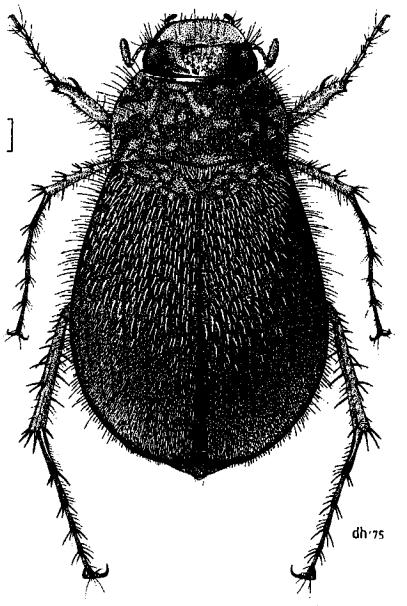
(145) *Acrossidius tasmaniae*
Scarabaeidae: Aphodiinae



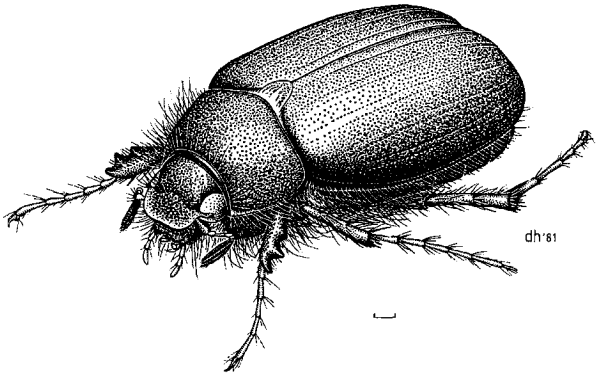
(147) *Onthophagus granulatus*
Scarabaeidae: Scarabaeinae



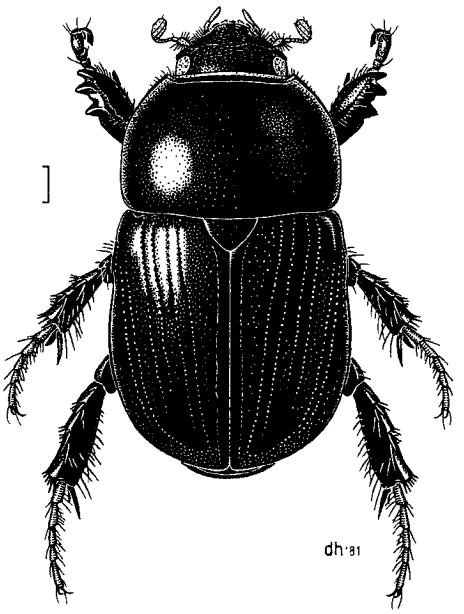
(146) *Phycochus graniceps*
Scarabaeidae: Aphodiinae



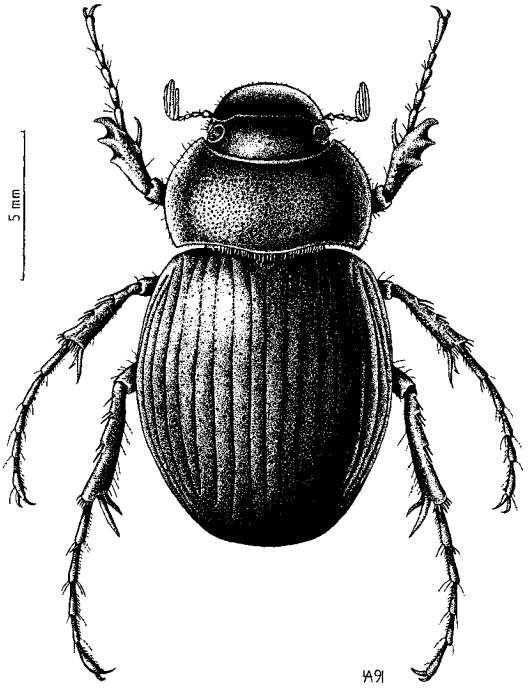
(148) *Odontria giveni* Watt
Scarabaeidae: Melolonthinae



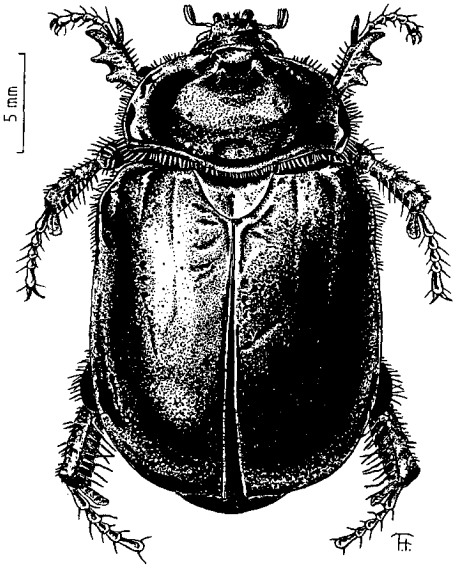
(149) *Costelytra zealandica*
Scarabaeidae: Melolonthinae



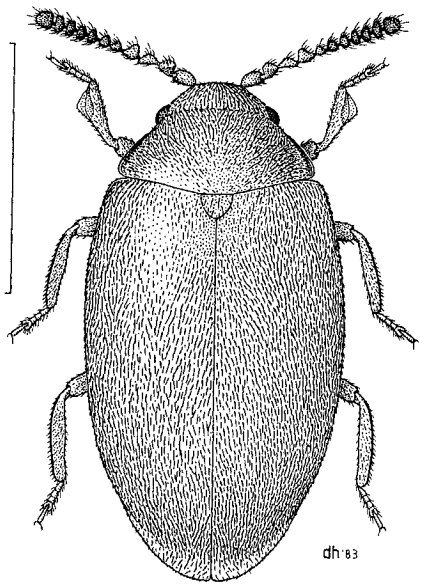
(151) *Heteronychus arator*
Scarabaeidae: Dynastinae



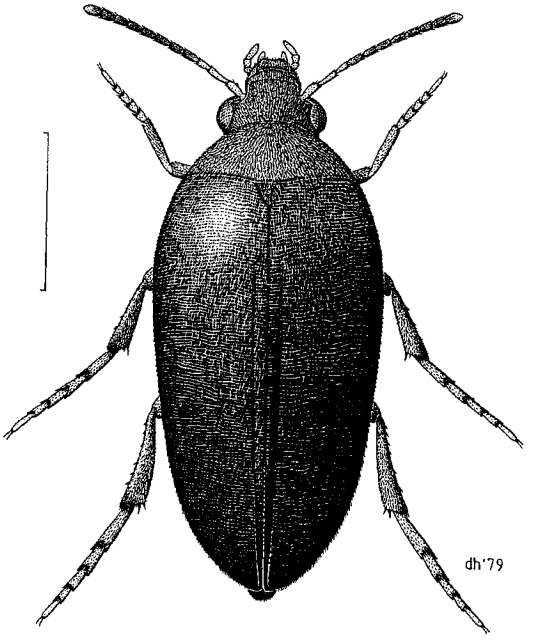
(150) *Prodontria lewisi*
Scarabaeidae: Melolonthinae



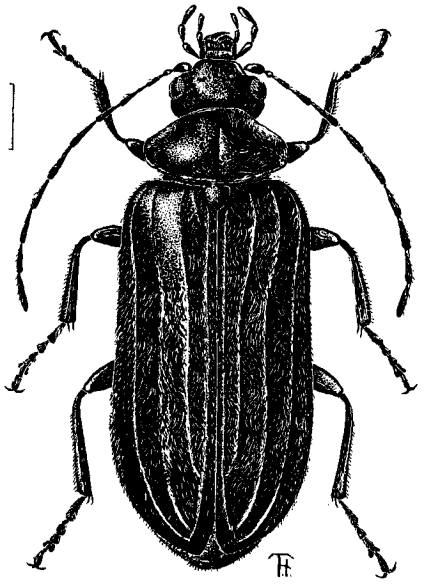
(152) *Pericoptus truncatus*
Scarabaeidae: Dynastinae



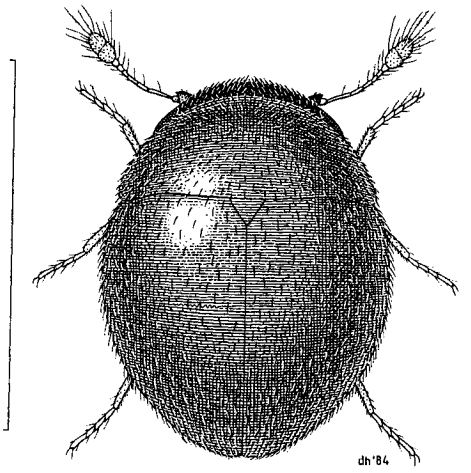
(153) *Amplectopus pallicornis*
Scirtidae



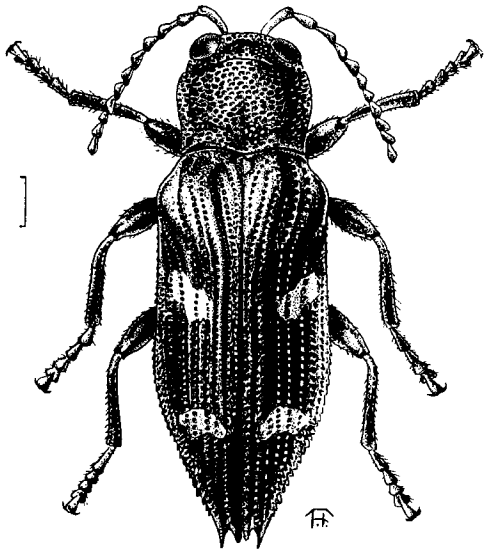
(155) *Eucinetus stewarti*
Eucinetidae



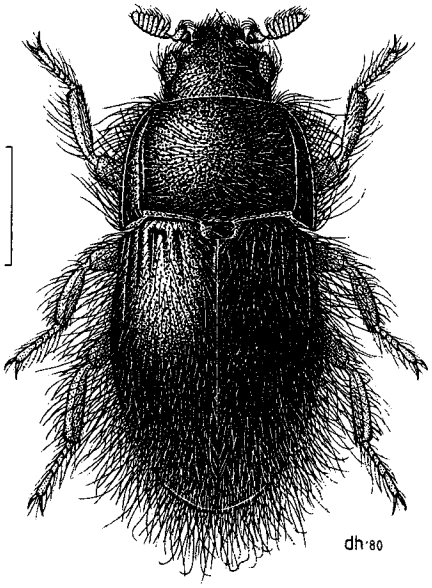
(154) *Veronatus tricostellus*
Scirtidae



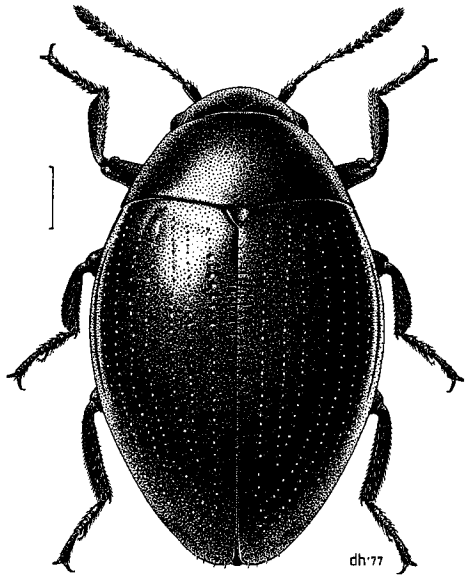
(156) *Clambus domesticus*
Clambidae



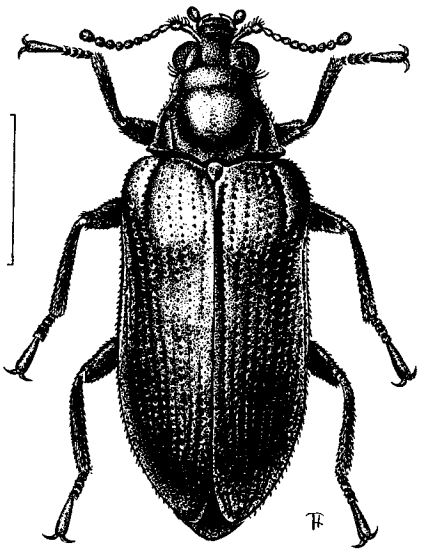
(157) *Nascioides enysi*
Buprestidae



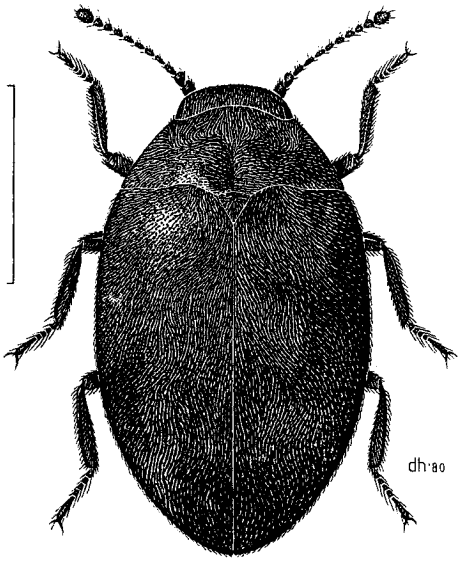
(159) *Parnida agrestis*
Dryopidae



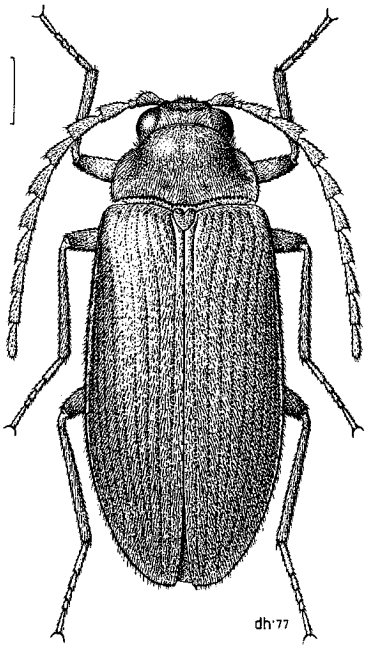
(158) *Liochoria huttoni*
Byrrhidae: Byrrhinae



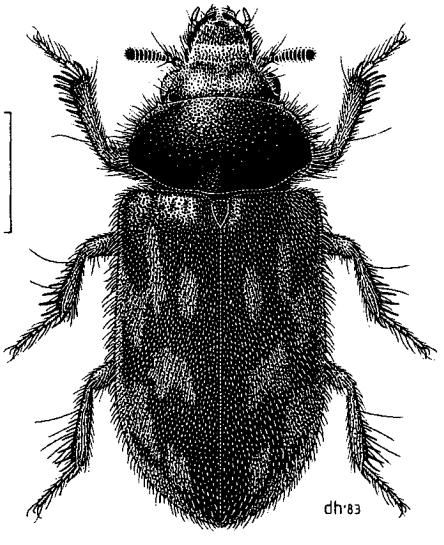
(160) *Hydora picea*
Elmidae: Larainae



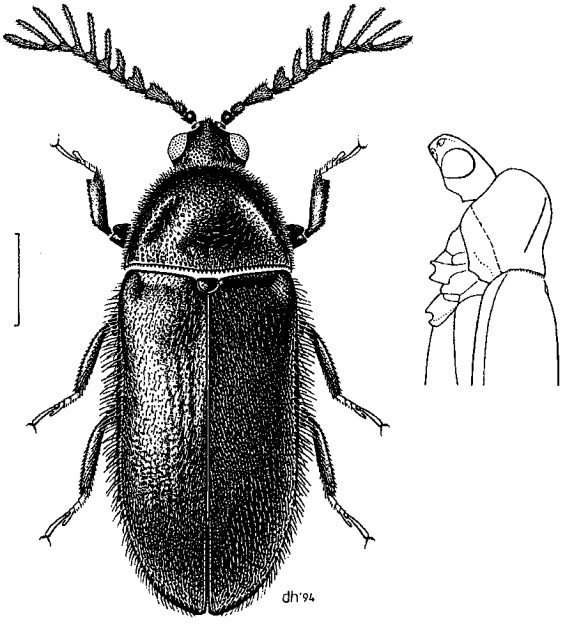
(161) *Limnichus nigripes*
Limnichidae: Limnichinae



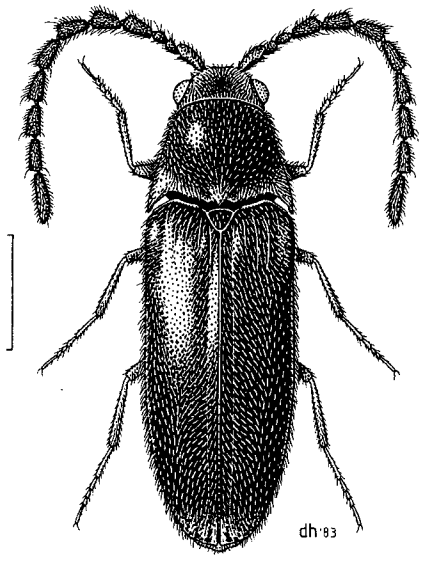
(163) *Byrrocryptus urquharti*
Ptilodactylidae: Anchytarsinae



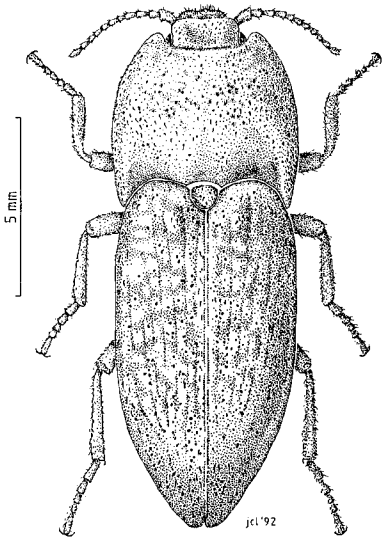
(162) *Heterocerus novaeselandiae*
Heteroceridae: Heterocerinae



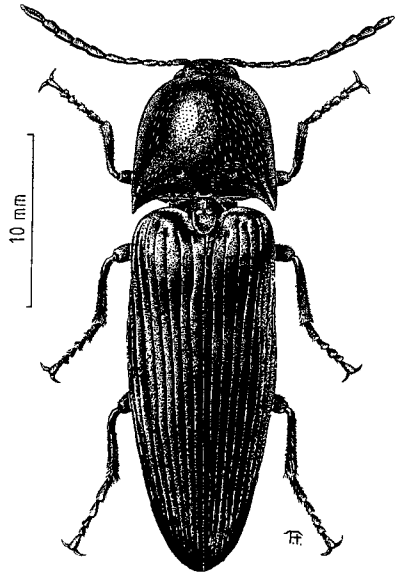
(164) *Brounia thoracica*
Chelonariidae



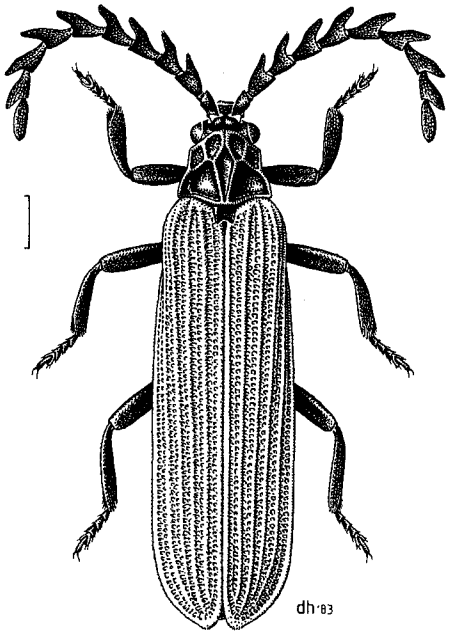
(165) *Neocharis simplex*
Eucnemidae: Melasinae



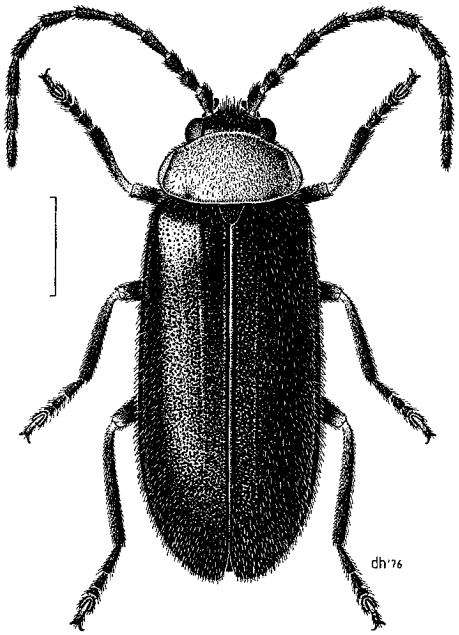
(167) *Amychus candezei*
Elateridae: Denticollinae



(166) *Thoramus wakefieldi*
Elateridae: Agrypninae

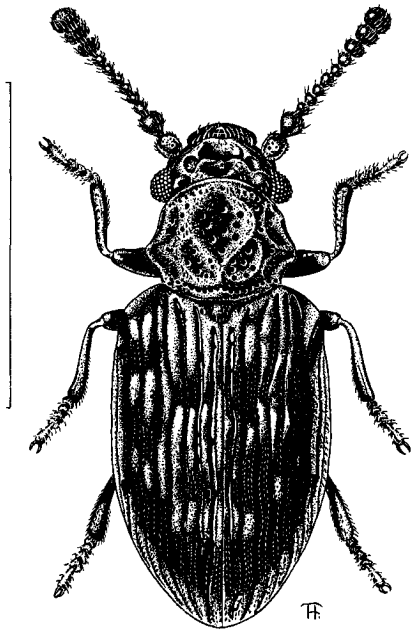


(168) *Porrostoma rufipenne*
Lycidae

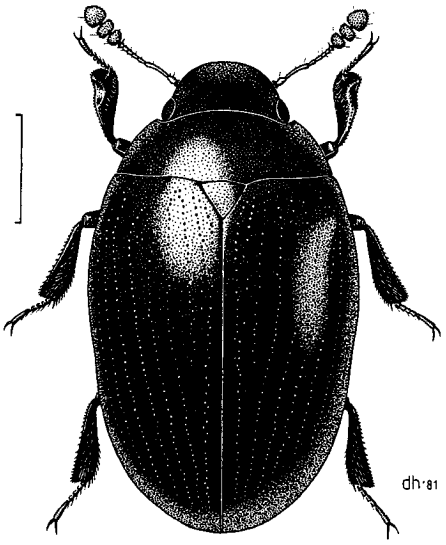


(169) *Asilis fulvithorax*
Cantharidae: Dysmorphocerinae

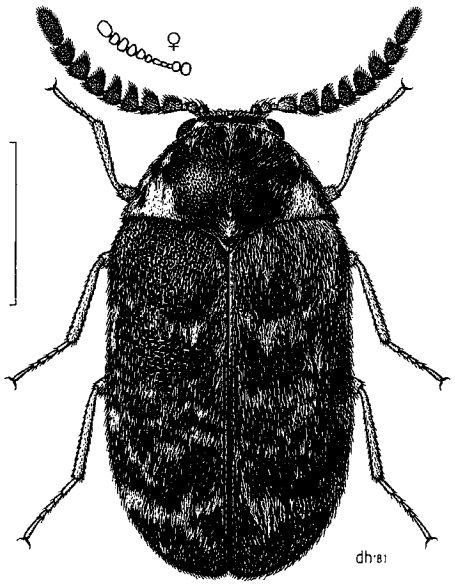
(171) *Saphophagus minutus*
Jacobsoniidae



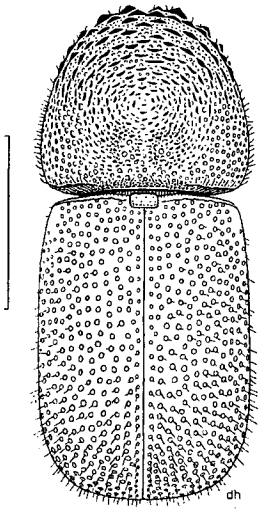
(170) *Nothoderodontus gourlayi*
Derodontidae: Laricobiinae



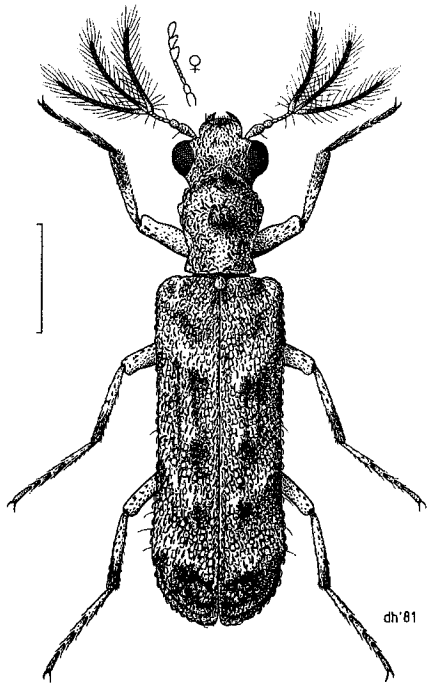
(172) *Nosodendron zealandicum*
Nosodendridae



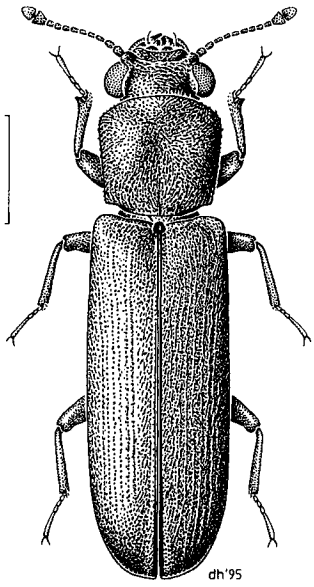
(173) *Trogoderma maestum*
Dermestidae: Megatominae



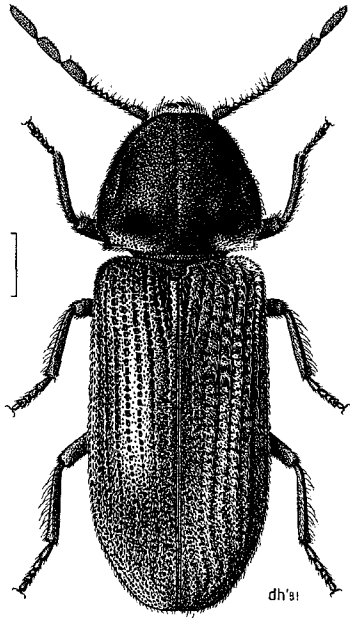
(175) *Dinoderus minutus*
Bostrichidae: Dinoderinae



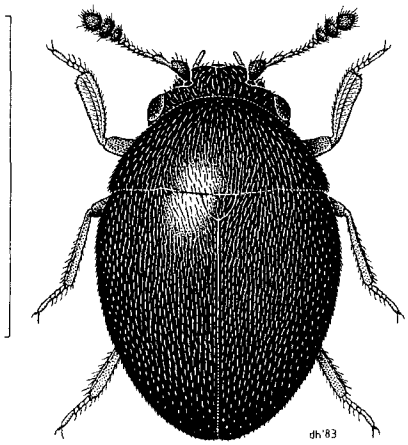
(174) *Euderia squamosa*
Bostrichidae: Euderinae



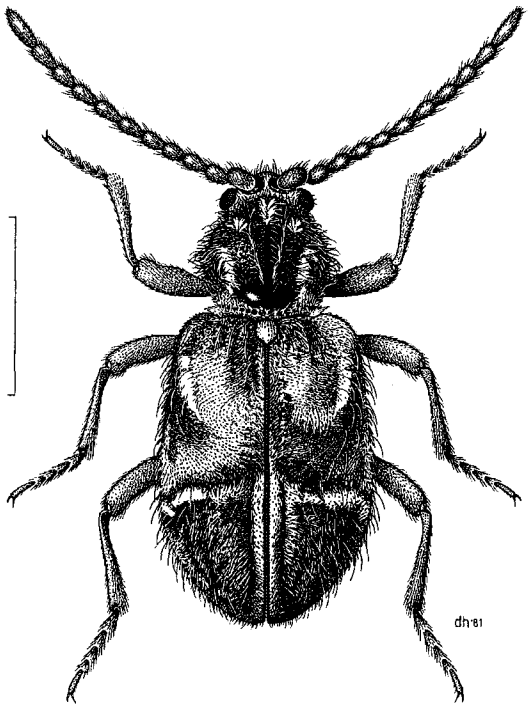
(176) *Lyctus brunneus*
Bostrichidae: Lyctinae



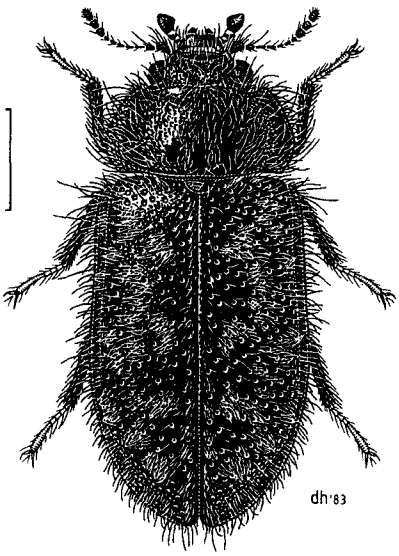
(177) *Hadrobregmus magnus*
Anobiidae: Anobiinae



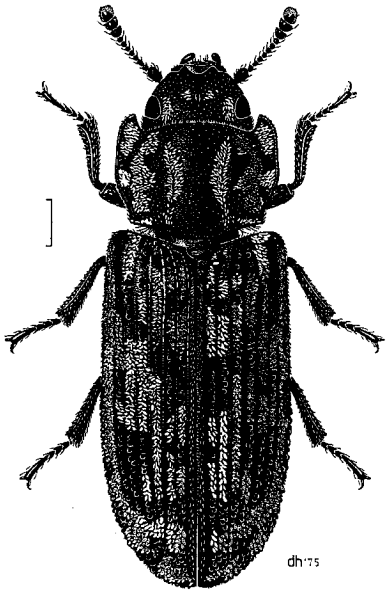
(179) *Rentonidium costiventris*
Trogossitidae: Rentoniinae



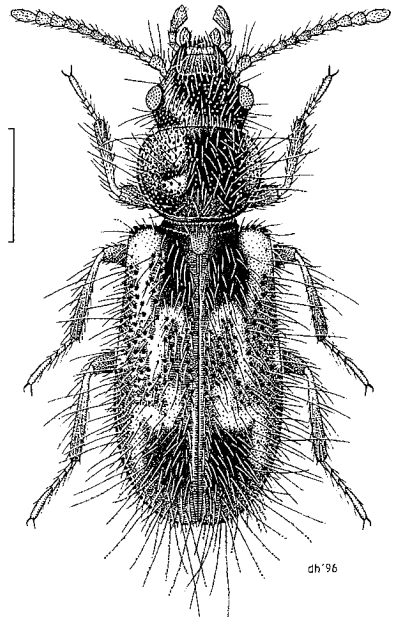
(178) *Ptinus speciosus*
Anobiidae: Ptininae



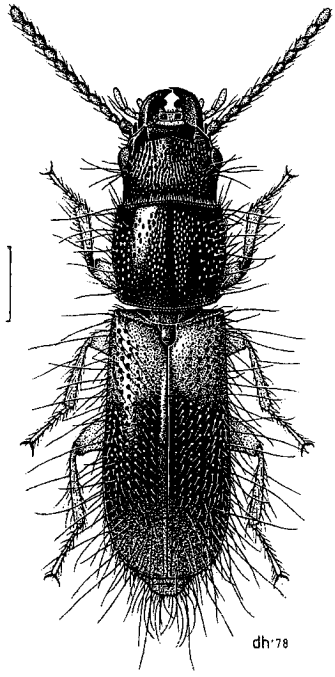
(180) *Grynoma regularis*
Trogossitidae: Lophocaterinae



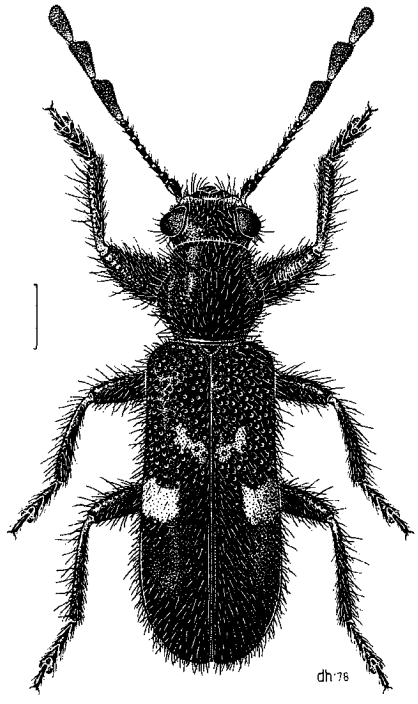
(181) *Lepidopteryx nigrosparsa*
Trogossitidae: Trogossitinae



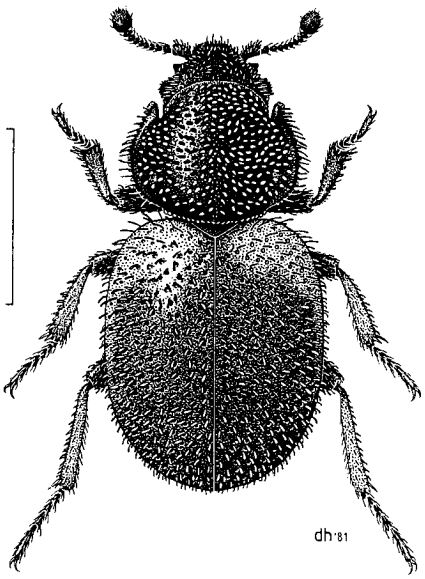
(183) *Metaxina ornata*
Cleridae: Thaneroclerinae



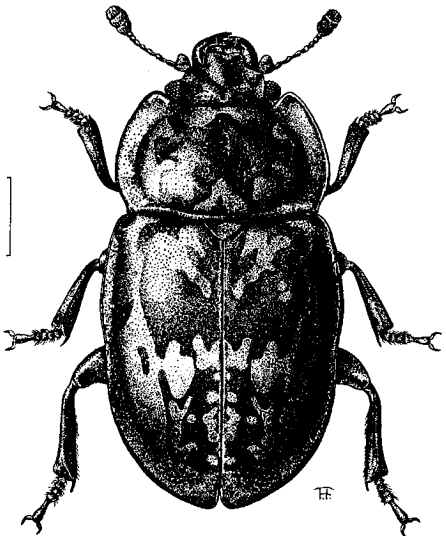
(182) *Chaetosoma scaritides*
Chaetosomatidae



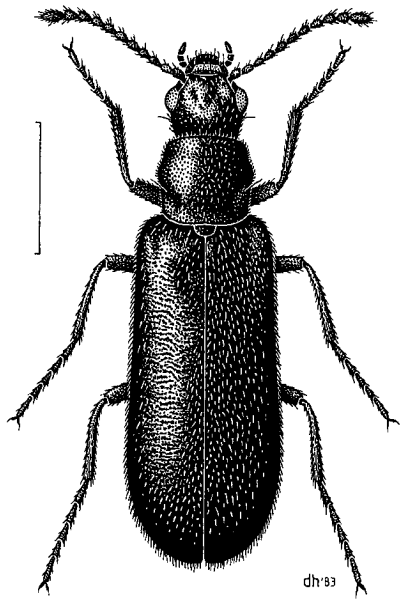
(184) *Phymatophaea violacea*
Cleridae: Enopliinae



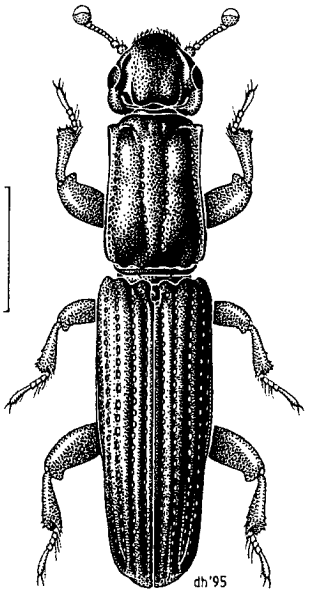
(185) *Phycosecis limbata*
Phycosecidae



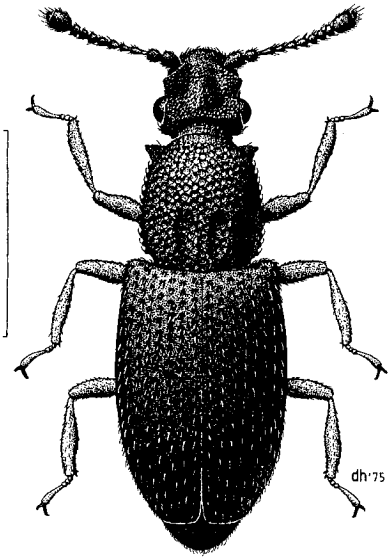
(187) *Platipidia asperella*
Nitidulidae: Nitidulinae



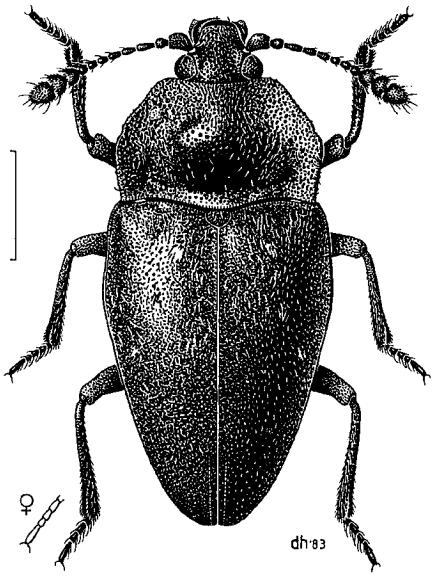
(186) '*Dasytes*' *subcyaneus*
Melyridae: Dasytinae



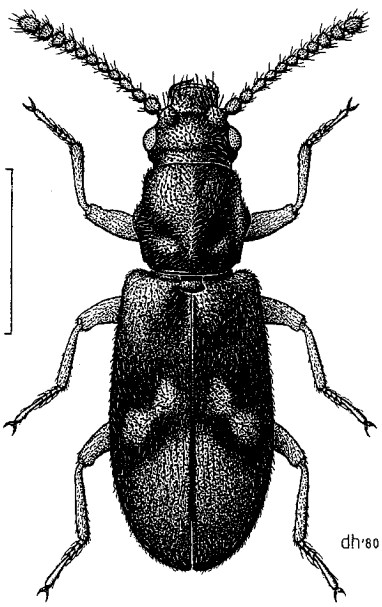
(188) *Lenax mirandus*
Monotomidae: Monotominae



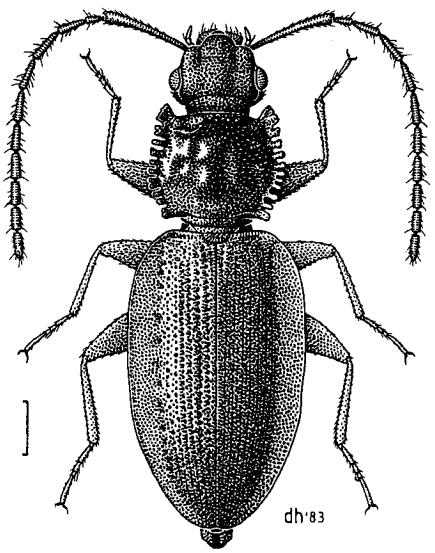
(189) *Monotoma spinicollis*
Monotomidae: Monotominae



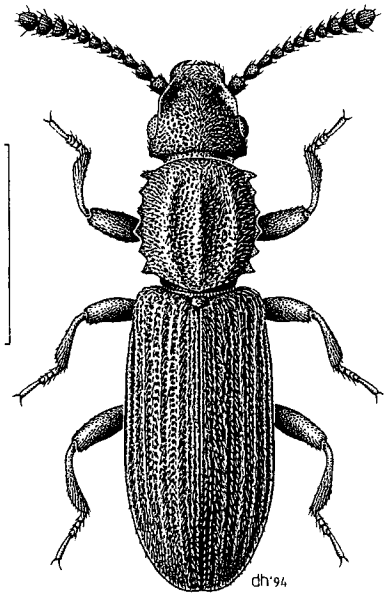
(191) *Priasilpha obscura*
Phloeostichidae: Priasilphinae



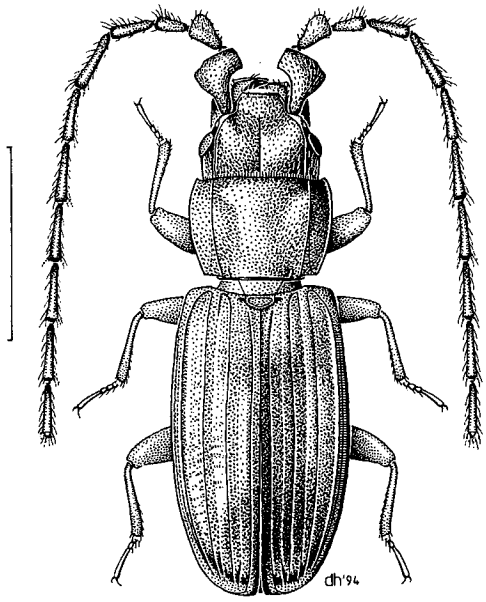
(190) *Agapytho foveicollis*
Phloeostichidae: Agapythinae



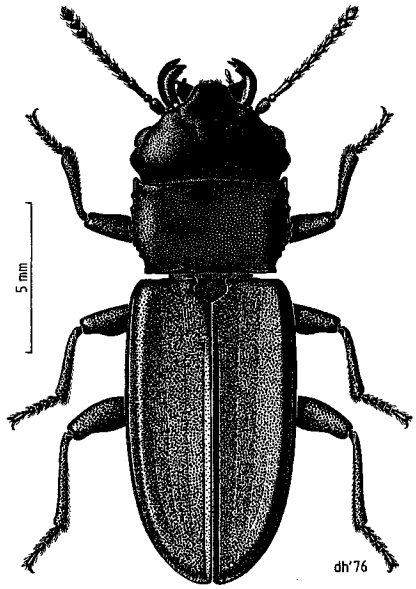
(192) *Brontopriscus pleuralis*
Silvanidae: Brontinae



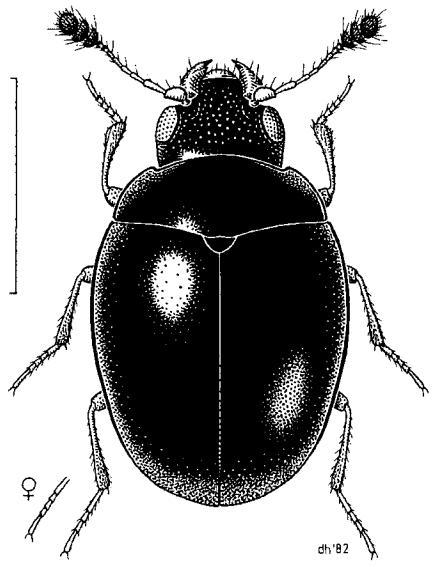
(193) *Oryzaephilus surinamensis*
Silvanidae: Silvaninae



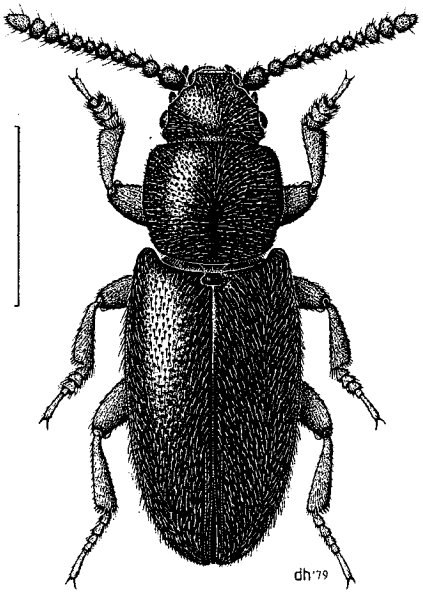
(195) *Microbrontes lineatus*
Laemophloeidae



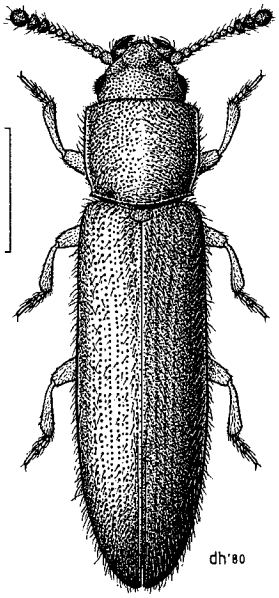
(194) *Platisus* sp.
Cucujidae



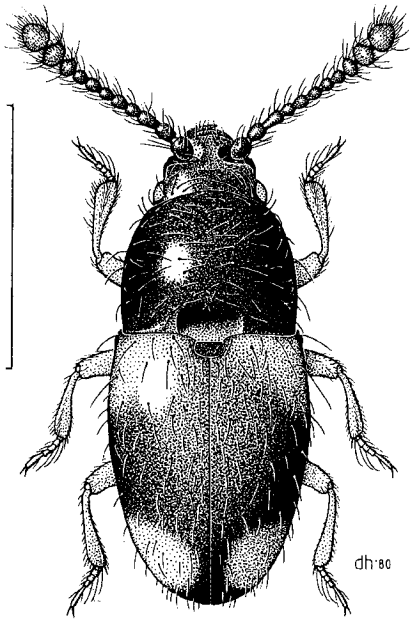
(196) *Cyclaxyra impressa*
Phalacridae: Cyclaxyrinae



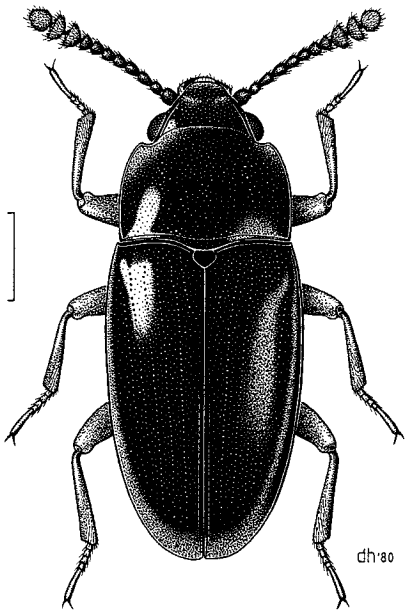
(197) *Zeonidicola chathamensis*
Cavognathidae



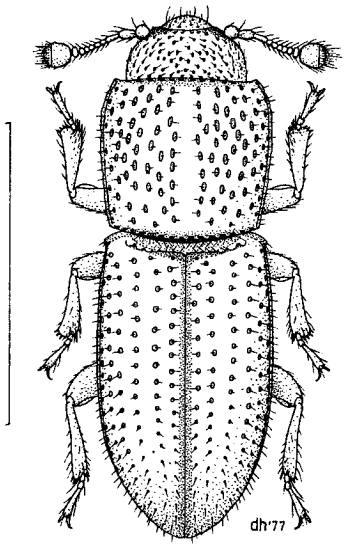
(199) *Hapalips prolixus*
Languriidae: Xenoscelinae



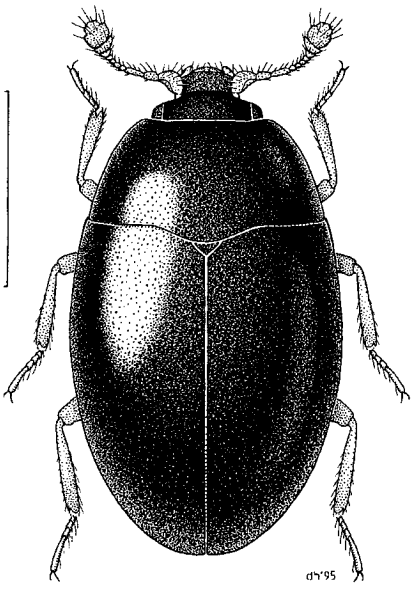
(198) *Thortus ovalis*
Cryptophagidae: Cryptophaginae



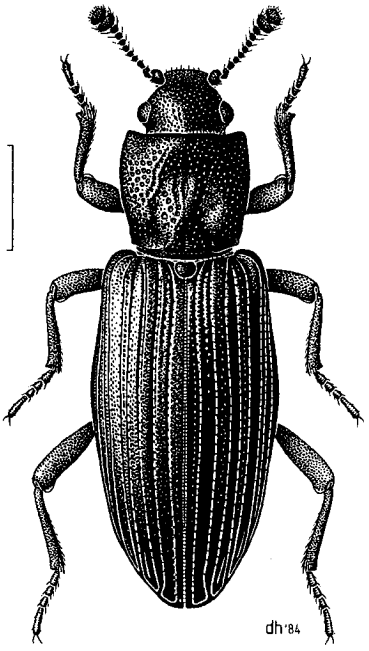
(200) *Thallis polita*
Erotylidae: Dacninae



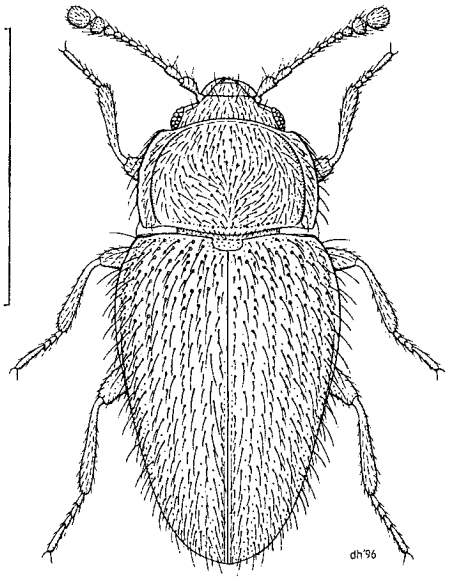
(201) *Anommatus duodecimstriatus*
Bothrideridae: Anommatinae



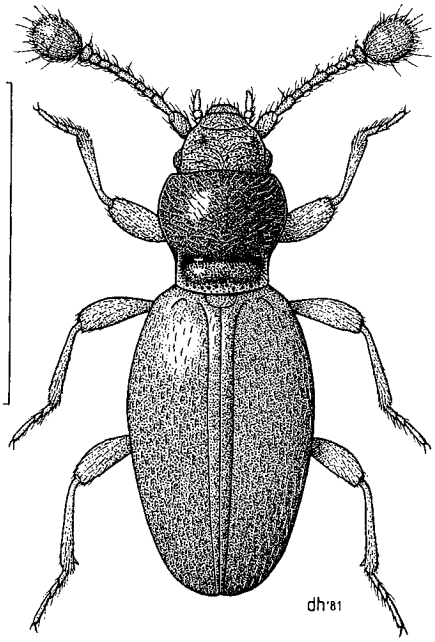
(203) *Hypodacnella rubriceps*
Cerylonidae: Euxestinae



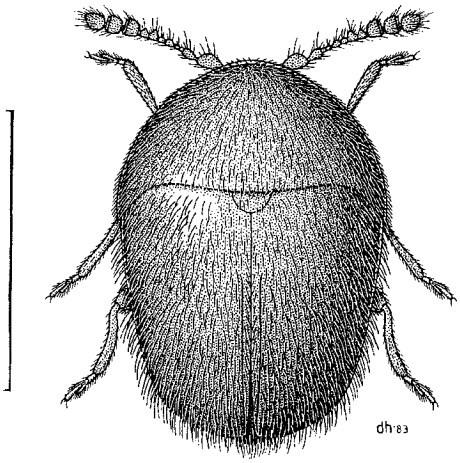
(202) *Ascetoderes obsoletus*
Bothrideridae: Bothriderinae



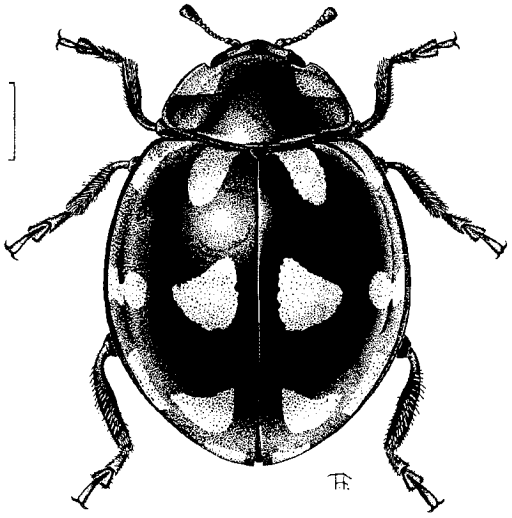
(204) *Mycetaea subterranea*
Endomychidae: Mycetaeinae



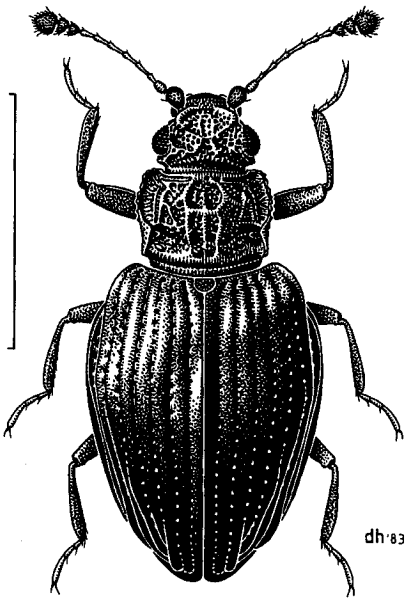
(205) *Holoparamecus tenuis*
Endomychidae: Holoparamecinae



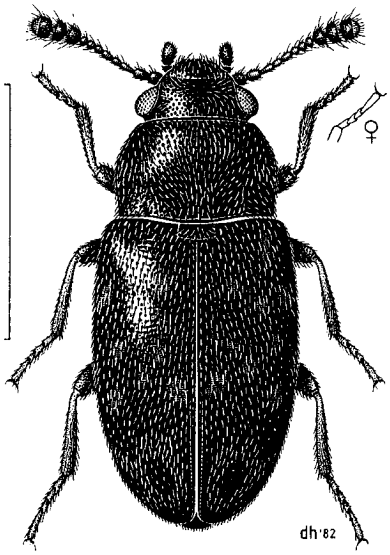
(207) *Anisomeristes sharpi*
Corylophidae: Sericoderinae



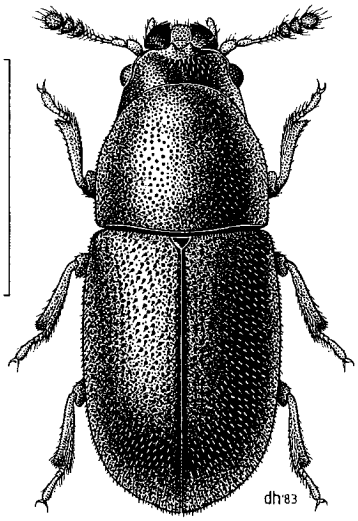
(206) *Coccinella leonina*
Coccinellidae: Coccinellinae



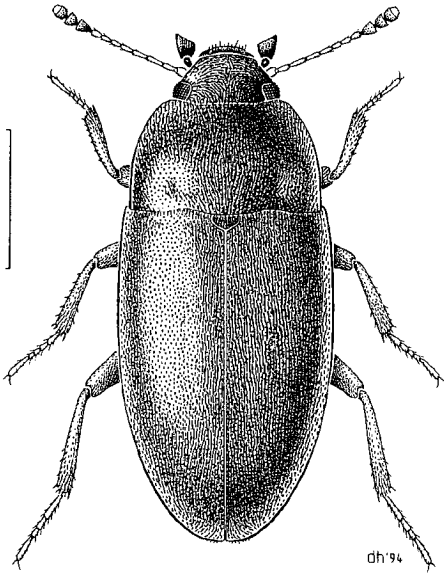
(208) *Enicmus caviceps*
Corticariidae: Lathridiinae



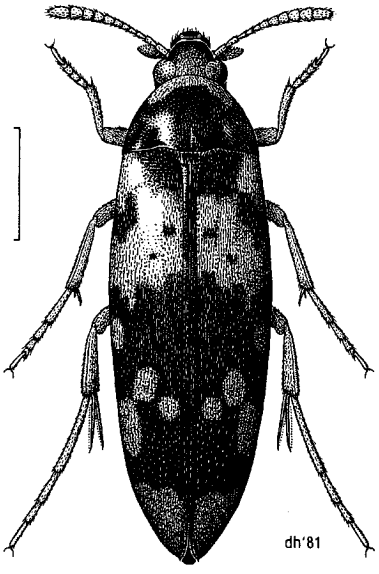
(209) *Triphyllus hispidellus*
Mycetophagidae: Mycetophagidae: Mycetophaginae



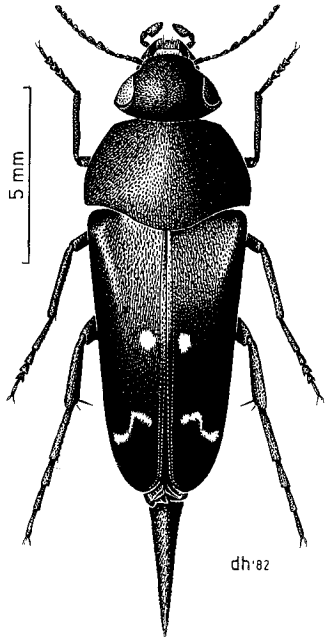
(211) *Cis zeelandicus*
Ciidae: Ciinae



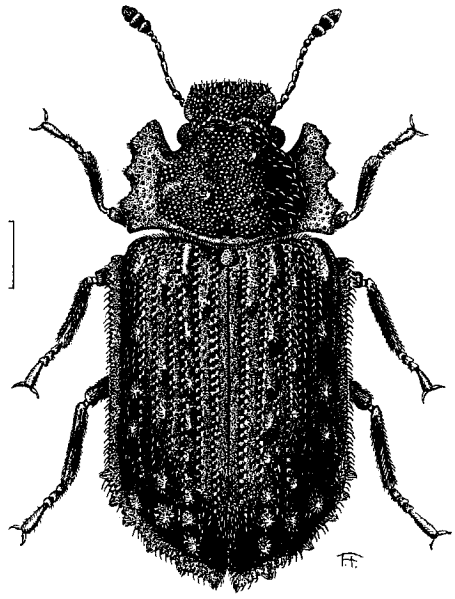
(210) *Archeocrypticus topali*
Archeocrypticidae



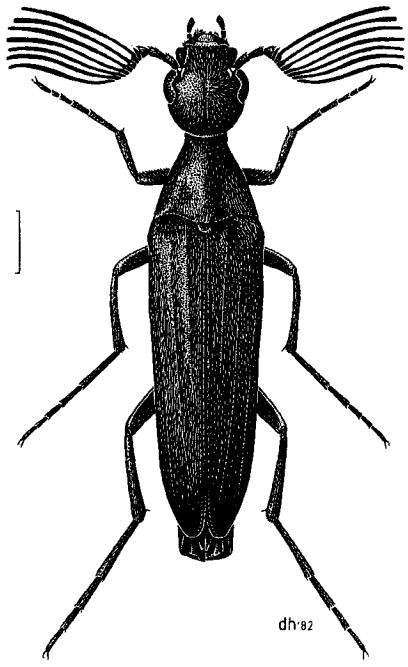
(212) *Hylobia nubeculosa*
Melandryidae: Melandryinae



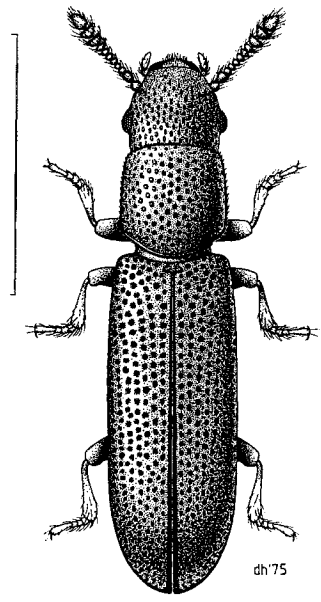
(213) *Mordella antarctica*
Mordellidae: Mordellinae



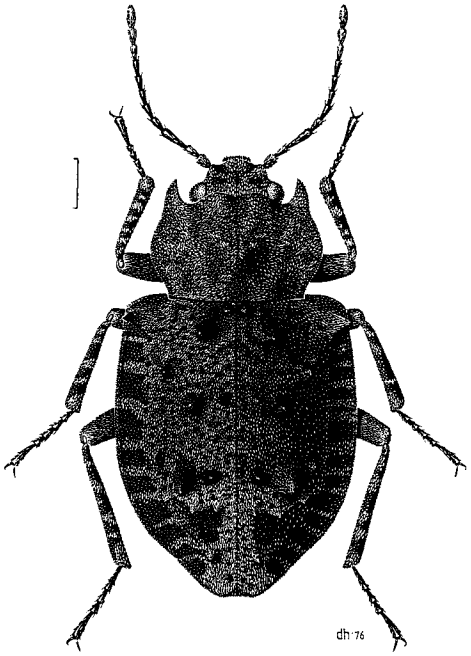
(215) *Pristoderus antarcticus*
Colydiidae: Colydiinae



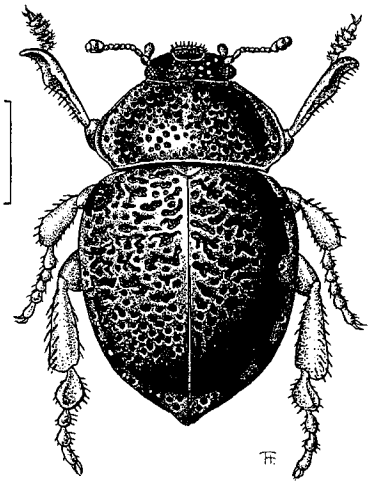
(214) *Rhipistena lugubris*
Rhipiphoridae: Pelecotominae



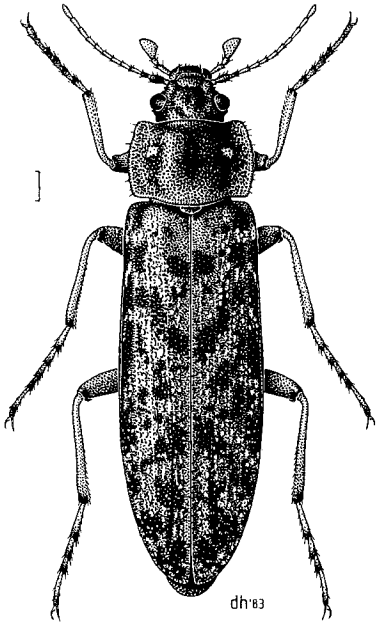
(216) *Rhizonium antiquum*
Colydiidae: Colydiinae



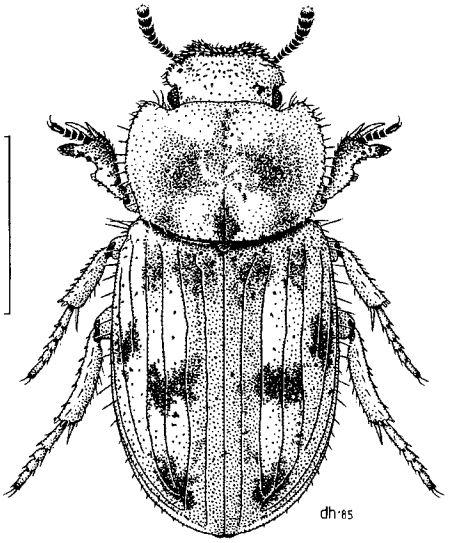
(217) *Syrphetodes marginatus*
Ulodidae



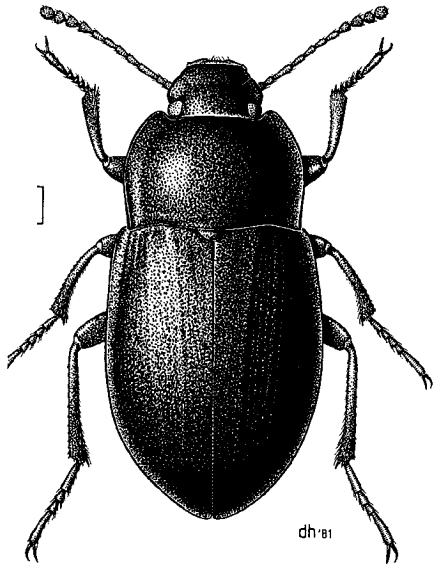
(219) *Chaerodes trachyscelides*
Tenebrionidae: Lagriinae



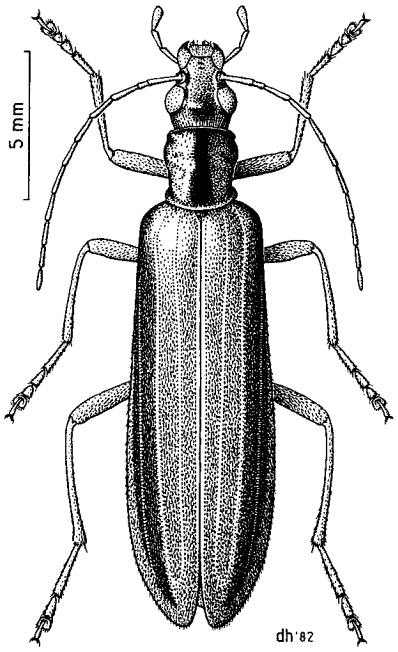
(218) *Chalcodrya variegata*
Chalcodryidae



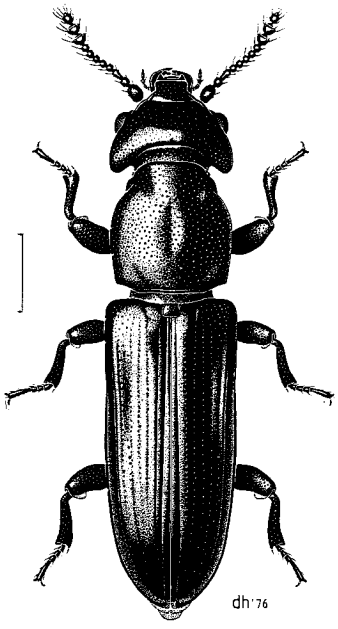
(220) *Actizeta albata*
Tenebrionidae: Pimeliinae



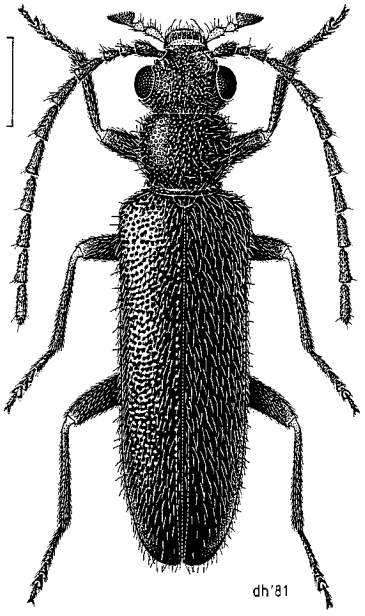
(221) *Mimopeus elongatus*
Tenebrionidae: Tenebrioninae



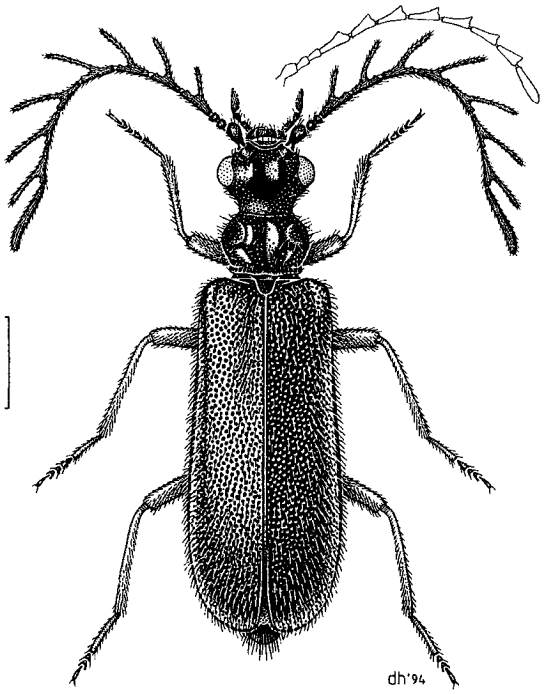
(223) *Thelyphassa lineata*
Oedemeridae: Oedemerinae



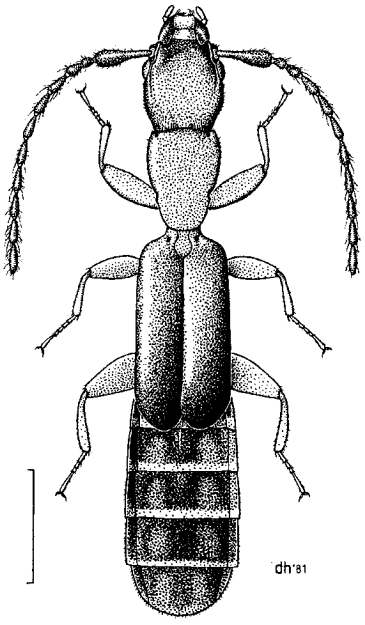
(222) *Dryocora howitti*
Prostomidae



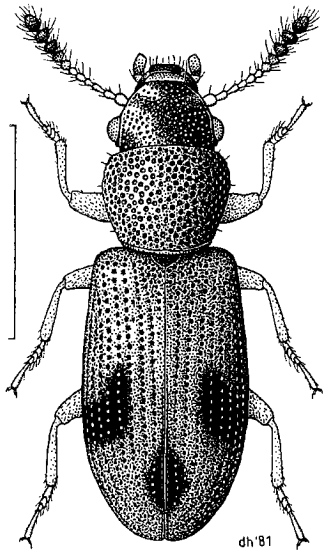
(224) *Techmessa concolor*
Pyrochroidae: Pilipalpinae



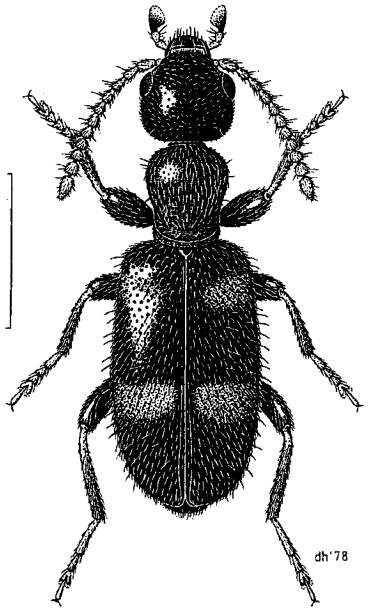
(225) *Exocalopus pectinatus*
Pyrochroidae: Pilipalpinae



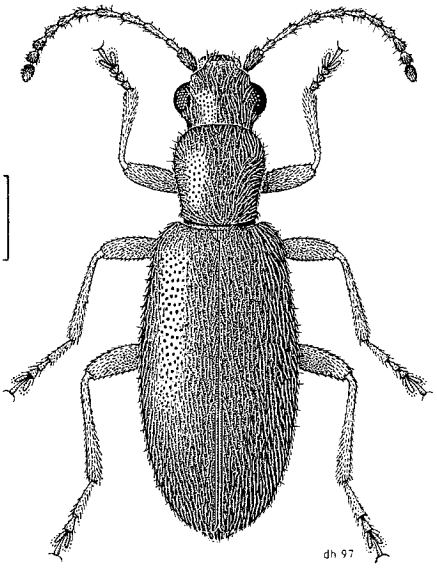
(227) *Diagrypnodes wakefieldi*
Salpingidae: Inopeplinae



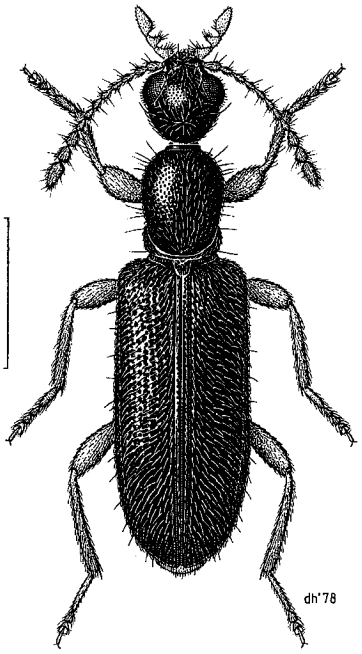
(226) *Salpingus bilunatus*
Salpingidae: Salpinginae



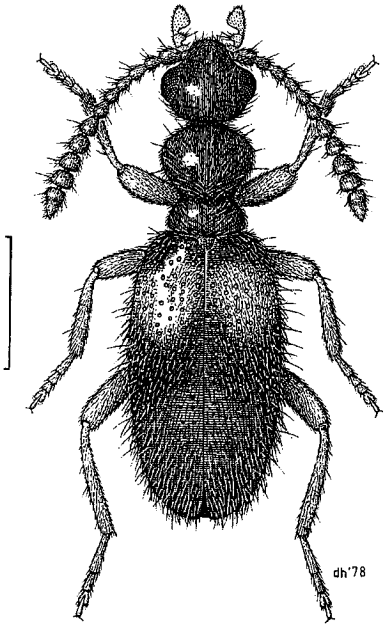
(228) *Anthicus hesperi*
Anthicidae: Anthicinae



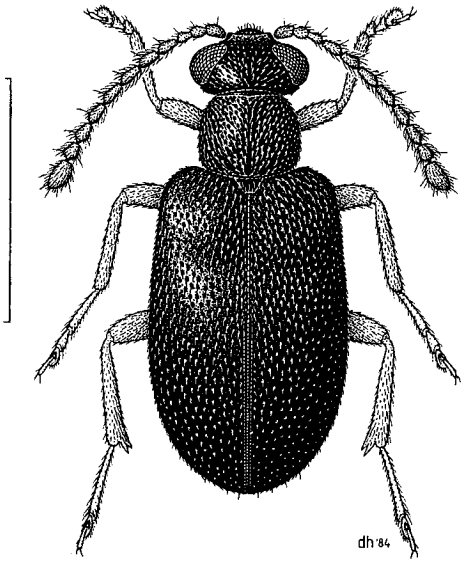
(229) *Lagrioida brouni*
Anthicidae: Lagrioidinae



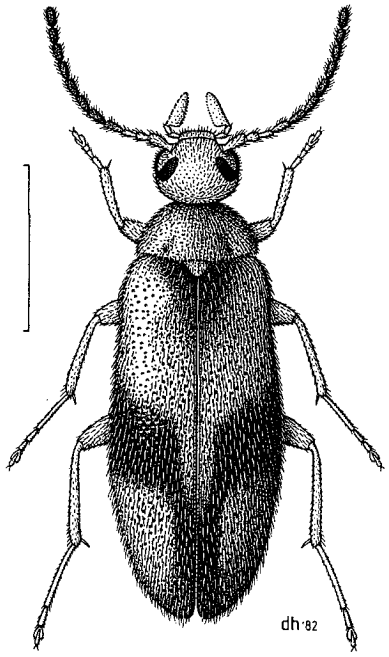
(231) *Macratria exilis*
Anthicidae: Macratriinae



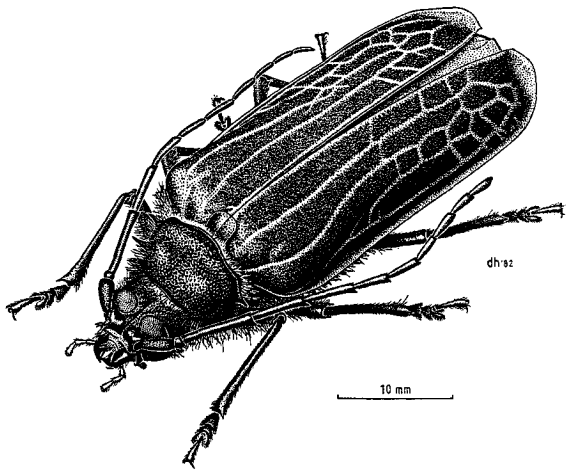
(230) *Cotes crispi*
Anthicidae: Lemodinae



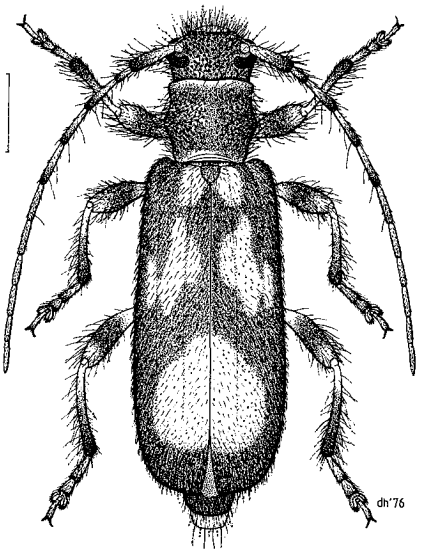
(232) '*Xylophilus*' *nitidus*
Aderidae



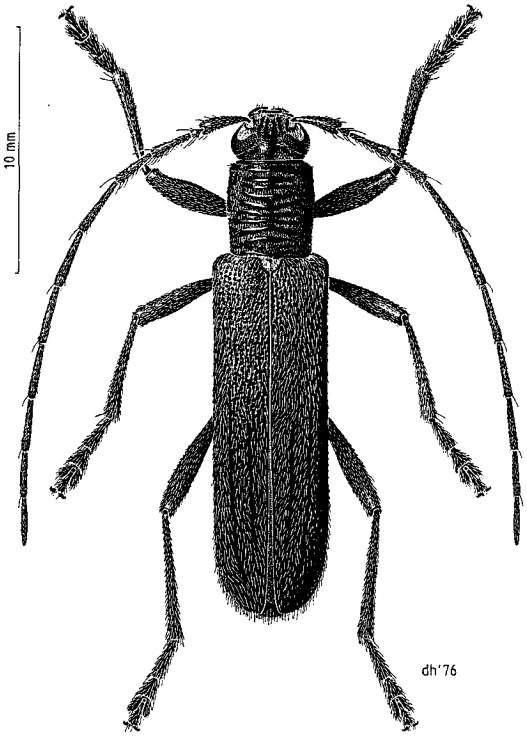
(233) *Nothotelus usitatus*
Scraptiidae



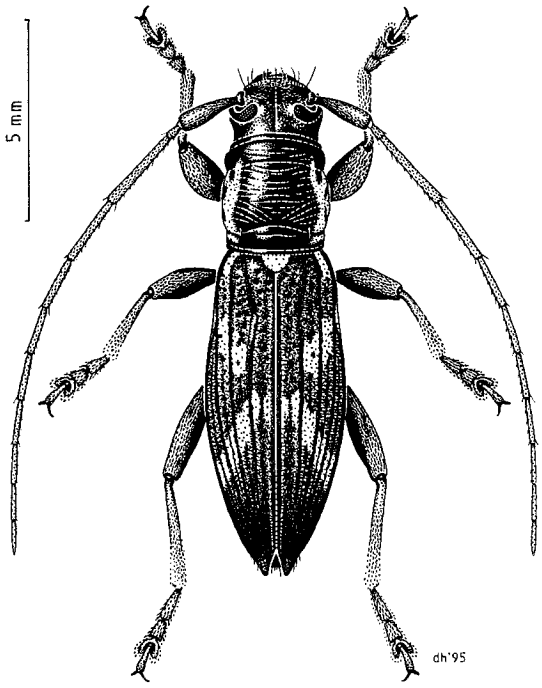
(234) *Prionoplus reticularis*
Cerambycidae: Prioninae



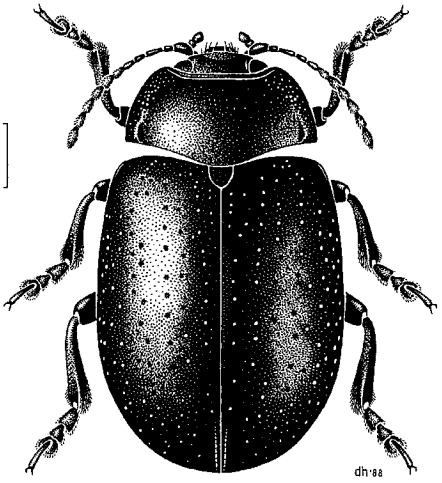
(235) *Zorion* sp.
Cerambycidae: Cerambycinae



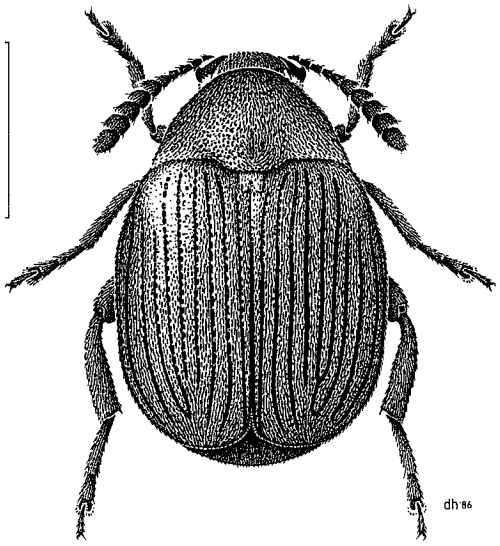
(236) *Oemona hirta*
Cerambycidae: Cerambycinae



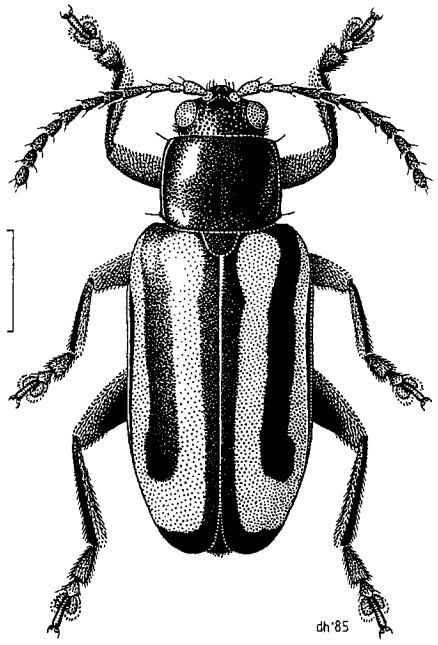
(237) *Xylotoles costipennis*
Cerambycidae: Lamiinae



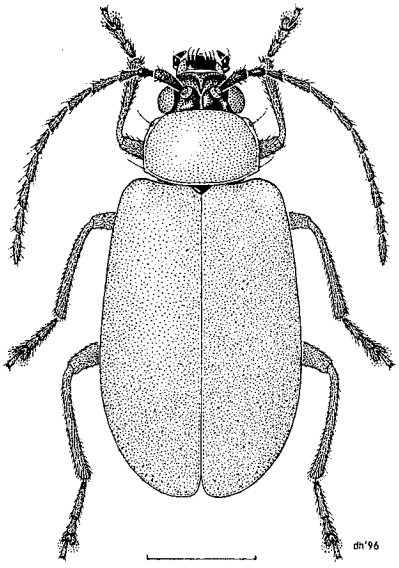
(239) *Chrysolina hyperici*
Chrysomelidae: Chrysomelinae



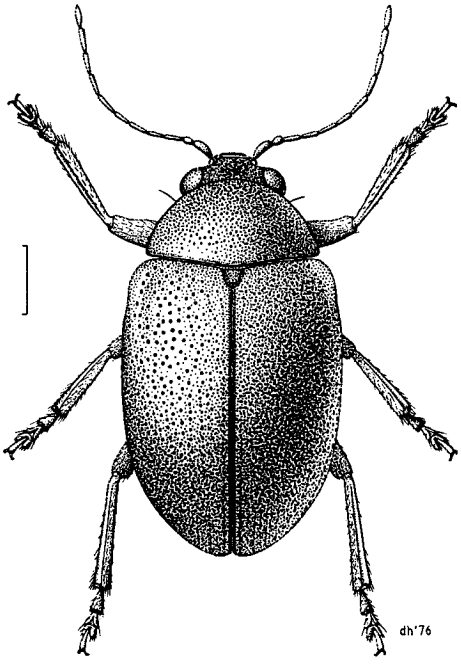
(238) *Bruchidius villosus*
Chrysomelidae: Bruchinae



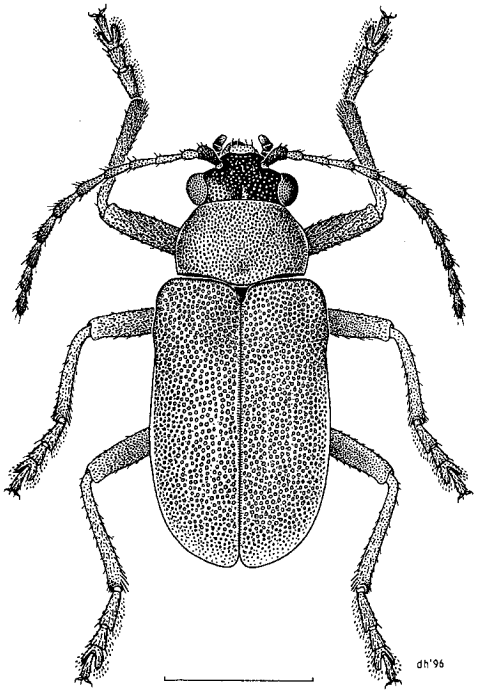
(240) *Agasicles hygrophila*
Chrysomelidae: Galerucinae (Alticini)



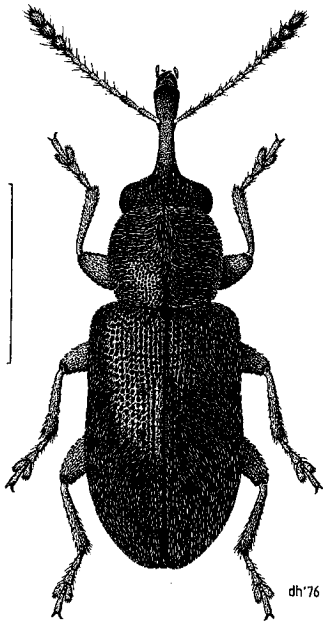
(241) *Adoxia vulgaris*
Chrysomelidae: Galerucinae
(Galerucini)



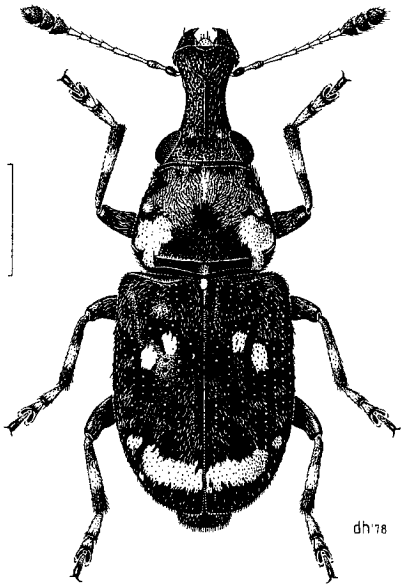
(243) *Eucolaspis brunnea*
Chrysomelidae: Eumolpinae



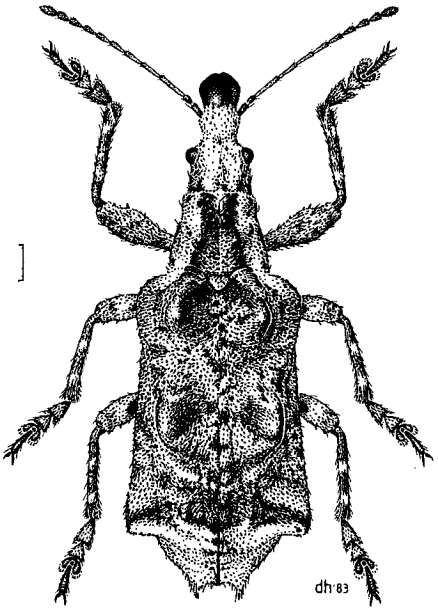
(242) *Arnomus brouni*
Chrysomelidae: Cryptocephalinae



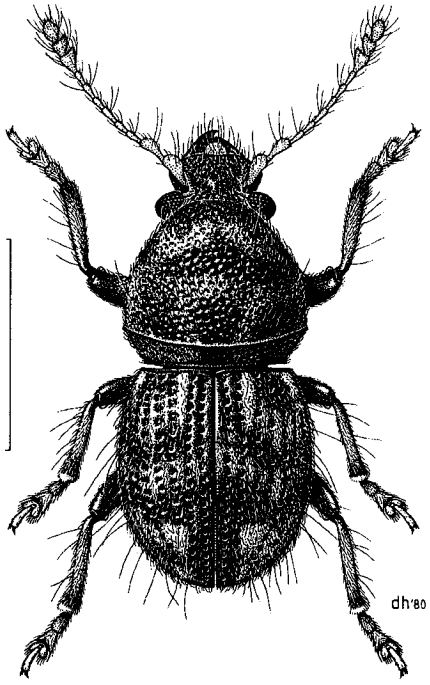
(244) *Rhinorhynchus rufulus*
Nemonychidae: Rhinorhynchinae



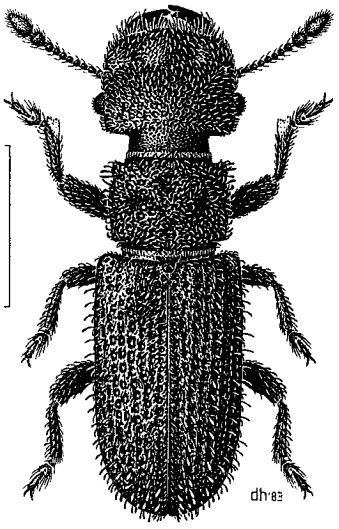
(245) *Sharpius venustus*
Anthribidae: Anthribinae



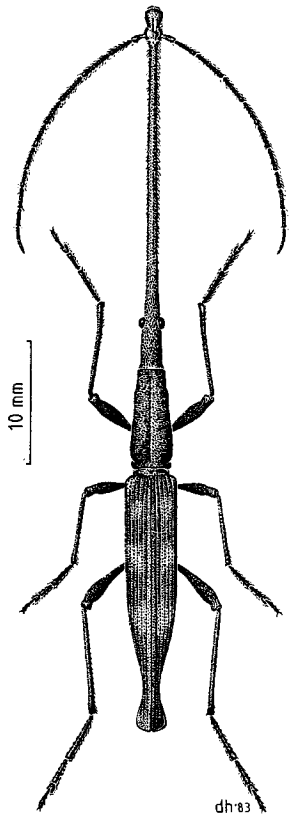
(247) *Cyrotyphus tridens*
Belidae: Belinae



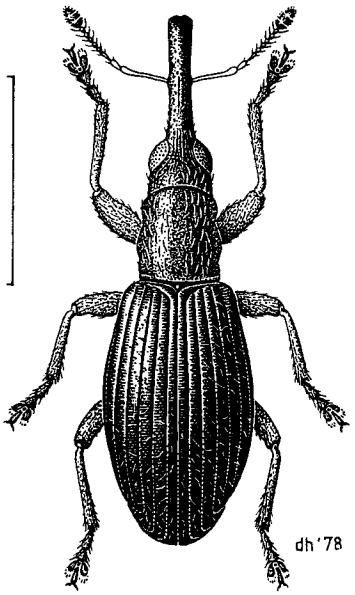
(246) *Dysnocryptus pallidus*
Anthribidae: Choraginae



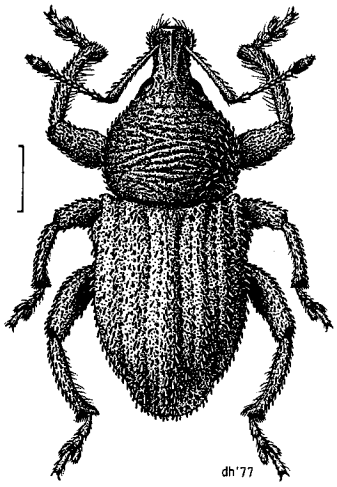
(248) *Aralius wollastoni*
Belidae: Aglycyderinae



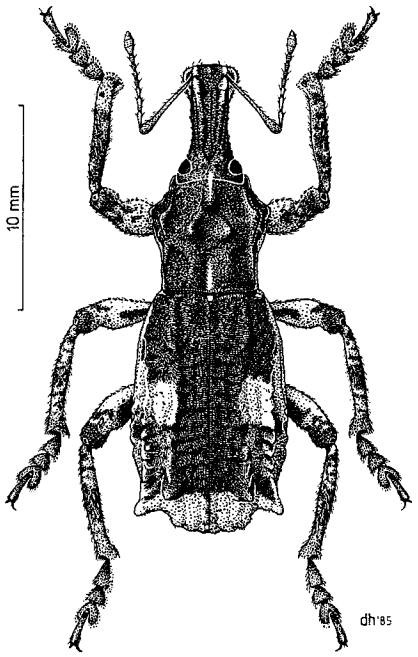
(249) *Lasiorhynchus barbicornis*
Brentidae: Brentinae



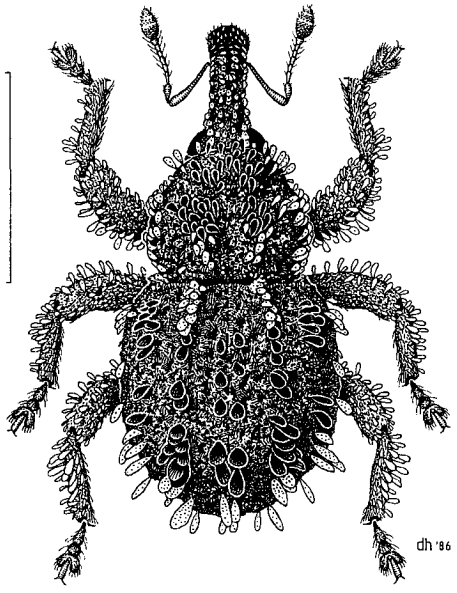
(250) *Neocyba metrosideros*
Brentidae: Apioninae



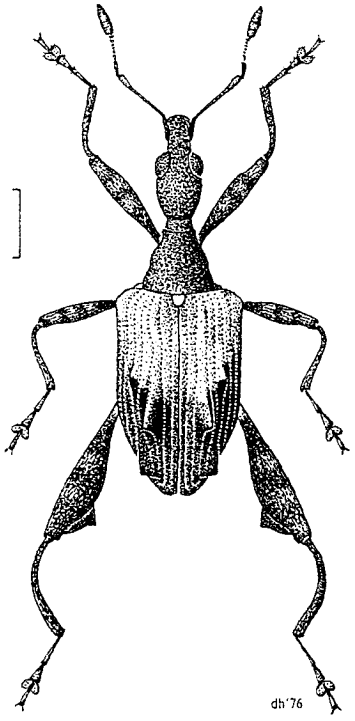
(252) *Mandalotus miricollis*
Curculionidae: Brachycerinae



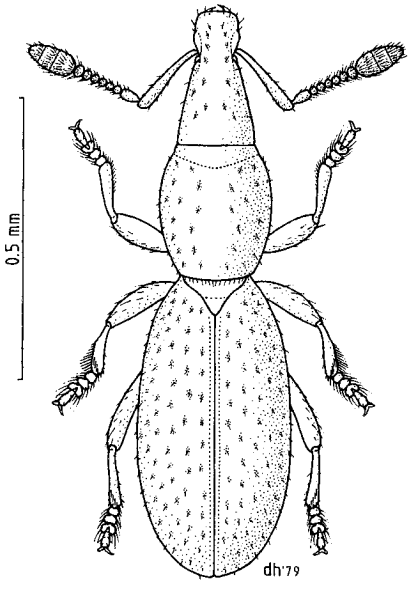
(251) *Anagotus turbotti*
Curculionidae: Brachycerinae



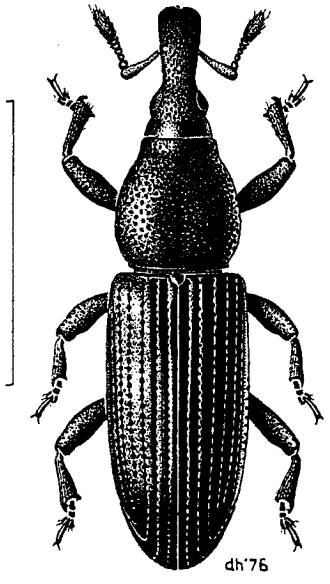
(253) *Andracalles spurcus*
Curculionidae: Curculioninae



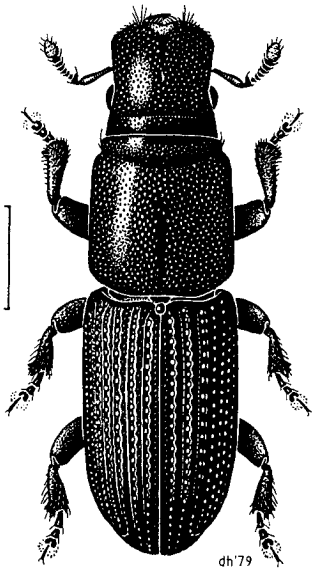
(255) *Stephanorhynchus lawsoni*
Curculionidae: Curculioninae



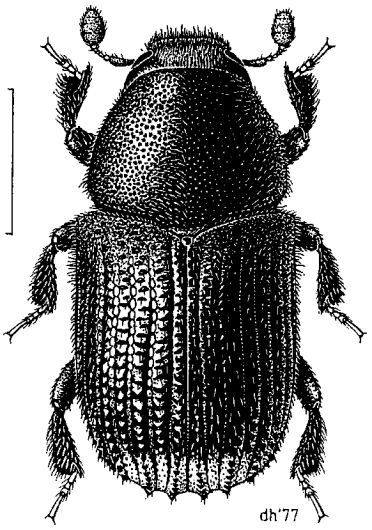
(254) *Myrtonymus zelandicus*
Curculionidae: Curculioninae



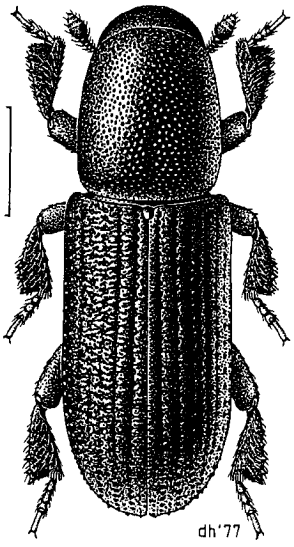
(256) *Macroscytalus remotus*
Curculionidae: Cossoninae



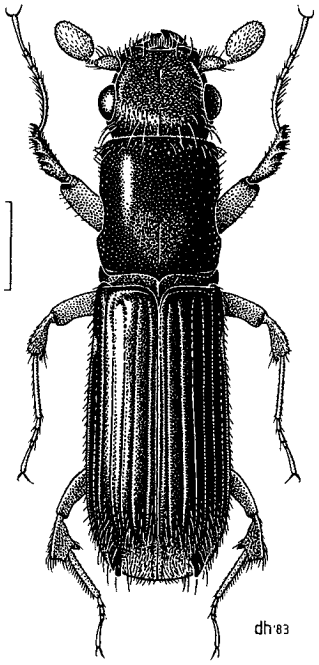
(257) *Xenocnema spinipes*
Curculionidae: Cossoninae



(259) *Phloeosinus cupressi*
Curculionidae: Scolytinae



(258) *Hylastes ater*
Curculionidae: Scolytinae



(260) *Platypus apicalis*
Curculionidae: Platypodinae

EXAMPLES OF SPECIES

[1] Rhysodidae
Fig. 101 *Rhyzodiastes proprius* (Broun)
A black, glossy, subparallel-sided beetle 6–7 mm long, living under bark or in wood of partly decayed logs. Known from Northland, Auckland, Waikato, and Great Barrier I.

[2] Carabidae: Cicindelinae
Fig. 102 *Neocicindela tuberculata* (Fabricius)
A conspicuously 'two-toned' tiger beetle 10–12 mm long, mostly dark with metallic green reflections and irregular lateral cream-coloured areas on elytra. Antennae and legs long and slender; eyes large and prominent; elytra with striae, closely punctate, and with a row of about 4 foveae near suture; mandibles large and sharp-pointed. Abundant in dry, open habitats such as clay banks, where it preys on other insects. Moves very swiftly, and takes to flight rapidly. Larvae live in burrows in exposed warm areas. Occurs on both main islands.

[2] Carabidae: Carabinae
Fig. 103 *Maoripamborus fairburni* Brookes
A large, black ground beetle 20–24 mm long, with slightly iridescent upper body sides. Head distinctly elongate, projecting in front of protruding hemispherical eyes; mandibles strong, broad. A predator of snails. Recorded mainly from Waipoua Forest, Northland.

[2] Carabidae: Migadopinae
Fig. 104 *Loxomerus nebrioides* Guérin
A medium-sized ground beetle 15–17 mm long, reddish dark brown or black with reddish-brown appendages. Pronotum narrowed posteriorly; elytra oval. Recorded from the Auckland Is.

[2] Carabidae: Scaritinae
Fig. 105 *Clivina basalis* Chaudoir
A moderately small, pedunculate ground beetle 6–8 mm long, dark brown to almost black with reddish appendages and basal half of elytra. A characteristic narrow waist between thorax and elytra. Ranging from central North I. to Spirits Bay in the north.

[2] Carabidae: Trechinae
Fig. 106 *Zecillenus alacris* (Broun)
A small ground beetle 4.0–5.5 mm long, brown with paler, yellowish-brown appendages and lateral elytra. Eyes large; posterior pronotum strongly narrowed; elytra with 2 posterolateral projections. Collected from under logs on the beach and from sand near a stream at Karekare and Whatipu, near Auckland.

[2] Carabidae: Harpalinae
Fig. 107 *Ctenognathus novaezelandiae* Fairmaire
A very agile, elongate, glossy black ground beetle 11–12 mm long. Antennae and legs thin; elytra regularly striate, fused; 2 prominent tactile setae above eye and a row on labrum; hind wings absent. Found under fallen branches and at the base of plants, feeding on other ground-dwelling arthropods. In coastal areas from Port Waikato north, and especially common on offshore islands.

[3] Dytiscidae: Hydroporinae
Fig. 108 *Liodessus plicatus* Sharp
An elongate-oval, slightly depressed, black beetle 2.5–2.7 mm long. Elytra strongly punctate, lacking striae; protarsi and mesotarsi expanded in male, and metatarsi with a fringe of swimming hairs. Primarily a pond dweller, inhabiting alpine tarns at 1700 m as well as lowland and temporary ponds, and even warm pools in the thermal region of Rotorua, and found in quiet reaches of streams. Adults have been observed in flight. Recorded from North Cape to Stewart I.

[3] Dytiscidae: Hydroporinae
Fig. 109 *Kuschelydrus phreaticus* Ordish
A small, subterranean diving beetle 1.5–1.6 mm long, narrowly elongate, subparallel-sided, brown. Hind legs and body, particularly laterally, with long, erect, fine setae; pronotum with sides arcuate. Collected from wells and bores in the northern part of the South I. *[Redrawn after Ordish 1976a]*

[4] Gyrinidae
Fig. 110 *Gyrinus convexiusculus* Macleay
A black, glossy, boat-shaped whirligig beetle 4.3–4.5 mm long. Antennae short, with segments co-adapted; hind legs paddle-shaped, with a fringe of long swimming hairs. Occurs on the surface of ponds, rowing rapidly over the water and preying on other insects. The divided eye (arrowed) enables it to see simultaneously above and below the surface. Most recently collected on the Ahipara Plateau, Northland.

[5] Hydrophilidae: Horelophinae
Fig. 111 *Horelophus walkeri* Orchymont
A weakly convex, elongate beetle 2.0–3.0 mm long. Body outline interrupted between pronotum and elytra; pronotal sides sinuate; antennae very long, with a loosely formed 3-segmented club. Described from 2 specimens collected at Reefton, and with subsequent records from Cawthron Park, Nelson, this unique species represents an endemic New Zealand subfamily. Specimens collected on rocks in the spray zone of waterfalls suggest that it may be semiaquatic.

[5] Hydrophilidae: Hydrophilinae
Fig. 112 *Enochrus tritus* (Broun)
An elongate-oval, yellowish-brown beetle 4.4–4.5 mm long. Maxillary palps longer than antennae; elytra punctate, not striate. An adventive Australian species occurring in New Zealand in small ponds; common in cattle troughs in the Kermadec Is. Adults and larvae feed on algae.

[5] Hydrophilidae: Sphaeridiinae
Fig. 113 *Rygmodus tibialis* Broun
A strongly convex, oval beetle 6.5–8.0 mm long, metallic black with legs, maxillary palps, and basal antennal segments paler and often with a reddish tinge; moderately to densely punctate. Antennae long, with a loose 3-segmented club. Originally described from Mt Arthur, northwest Nelson; we have seen specimens of presumably this species from L. Rotorua, Salisbury, and Mt Robert.

[6] Histeridae: Saprininae
Fig. 114 *Reichardtia pedatrix* (Sharp)
A robust, oblong, strongly convex, glossy black pill beetle 4.8–5.0 mm long. Elytra abbreviated, exposing last 3 segments of abdomen; legs stout, with numerous spines; front legs well adapted to burrowing. Occurs on sandy beaches, often under dead fish or birds, occasionally under seaweed. Recorded from Northland to Stewart I.

[6] Histeridae: Saprininae
Fig. 115 *Tomogenius latipes* (Broun)
An oval, convex, glossy black pill beetle 4.5–4.7 mm long. Antennae stout, bearing a compact club; elytra abbreviated apically, leaving pygidium exposed; forelegs flattened for digging,with approximately 6 teeth along outer edge, and other legs bearing stout bristles. At Omahuta found in a short-tailed bat roost in a hollow fallen kauri tree, on Great Barrier Island found in kingfisher nests. Adults and larvae probably feed on fly larvae in guano. Recorded from Omahuta State Forest to Codfish I. near Stewart I.

[7] Hydraenidae: Hydraeninae
Fig. 116 *Podaena latipalpis* Ordish
A small cascade beetle 1.9 mm long, reddish brown with paler clypeal border and humeral area of elytra. Maxillary palps long, reaching beneath eyes; elytra with 7th interstria bearing a low carina. Adults have been collected from October to June from streams in the North I.

[7] Hydraenidae: Ochthebiinae
Fig. 117 *Meropathus zelandicus* Ordish
A uniformly dark brown cascade beetle 2.5 mm long, with paler, dense, strongly recumbent setae on pronotum and elytra. Head and thorax with granulose microsculpture; elytra glabrous between microsculpture and setae. Occurs in litter, and is typically covered with debris amongst the setae. Recorded from the Chatham Is, Dunedin district, and Stewart I.

[8] Ptiliidae: Ptiliinae
Fig. 118 *Notoptenidium lawsoni* Matthews
An elongate-oval, convex feather-winged beetle 1.0–1.1 mm long, black with yellow legs and antennae. Prothorax with sides strongly curved; pronotum irregularly punctured; Occurs under decaying seaweeds on the shore. Recorded from the Auckland Is, Campbell I., and (extralimital) Macquarie I.

[9] Agyrtidae
Fig. 119 *'Necrophilus' prolongatus*
A moderately large, broadly oval, depressed beetle 9.0–10 mm long, dark brown with sides of pronotum and elytra yellowish brown, explanate. Protarsi and mesotarsi expanded in male; elytra striate; antennae with an indistinct 5-segmented club. Recorded from the North I.

[10] Leiodidae: Camiarinae
Fig. 120 *Inocatops elongellus* Broun
A small carrion beetle 2.5–2.9 mm long, reddish with whitish pubescence. Pronotum narrowed posteriorly, with a trans-verse basal impression; elytra oval in outline; antennae with a 4-segmented club, its 2nd segment narrower than the others. Found in leaf litter. Recorded from the Nelson area.

[10] Leiodidae: Coloninae
Fig. 121 *Colon hirtale* (Broun)
An oblong, moderately convex small carrion beetle 2.3–2.5 mm long, pubescent, dull dark brown, with legs and antennae red; antennal club darker, 4-segmented. Terminal segment of maxillary palps small and sharply pointed; head with a distinct neck. Widely distributed, and frequently caught in flight interception traps.

[11] Scydmaenidae: Scydmaeninae
Fig. 122 *Adrastia clarkei* (Franz)
An elongate-oval beetle 3.3–3.5 mm long, reddish brown, glossy, sparsely pubescent. Antennae 10-segmented; apex of elytra not fully covering abdomen; last segment of maxillary palp small; head with a neck, and a marked constriction between prothorax and abdomen forming a distinct 'waist'. Occurs in leaf litter. Recorded mostly from the South I. (originally found in the Routeburn Valley) and from the central North Island (Desert Road).

[12] Staphylinidae: Microsilphinae
Fig. 123 *Microsilpha litorea* Broun
A small beetle 2.2–2.9 mm long, dark brown with reddish tarsi and basosutural part of elytra. Sparsely pubescent; elytra covering most of abdomen; protibae strong, flattened, bearing teeth and spines; antennae with club 4-segmented. Known only from the beach at Port Chalmers, Dunedin, although most other species inhabit forests and have been caught mainly in flight interception traps.

[12] Staphylinidae: Omaliinae
Fig. 124 *Omaliomimus albipennis* (Kiesenwetter)
A medium-sized rove beetle 3.5 mm long, moderately convex and glossy, with head black, pronotum reddish-brown to black, elytra entirely yellow or black, and antennae with segments 1–5 yellowish brown, remainder darker. Occurs under decaying seaweeds on the shore. Recorded from the Auckland Is, Campbell I., and (extralimital) Macquarie I. *[Redrawn after Steel 1964.]*

[12] Staphylinidae: Proteininae
Fig. 125 *Silphotelus nitidus* Broun
A small beetle 1.3–1.6 mm long with body pale to dark reddish-brown, and sometimes with yellowish humeri and posterior elytral angles. Head with a punctiform fovea on either side; elytra covering nearly all of abdomen. Found amongst leaf mould. Recorded from the South I. *[Redrawn after Steel 1966.]*

[12] Staphylinidae: Pselaphinae
Fig. 126 *Sagola laminata* Broun
An elongate, slender, somewhat depressed beetle 2.2–2.3 mm long, glossy red, with elytra, antennae, palps, legs, and pubescence yellowish. A distinct 'waist' between prothorax and elytra; elytra leaving 5 segments of abdomen exposed, without striae but with characteristic postbasal foveae. A distinctive lamina on the underside of the head, just behind the mentum. Occurs in leaf litter, especially of sedges. Fairly common in the Auckland area.

[12] Staphylinidae: Phloeocharinae
Fig. 127 *Pseudophloeocharis australis* (Fauvel)
A small beetle 1.8–2.0 mm long, yellowish brown with head brown, or entirely brown. Abdomen bearing meshed microsculpture. Occurs on both main islands, and may be adventive in New Zealand since it is known also from Australia and New Caledonia.

[12] Staphylinidae: Tachyporinae
Fig. 128 *Sepedophilus* sp.
A small, brightly coloured beetle 1.8–2.1 mm long, reddish brown with head and posterior part of elytra dark brown, remainder of elytra yellowish, and abdomen yellowish posteriorly and brownish basally, bearing long protruding setae. *Sepedophilus* species all have a pubescent pronotum. They are common in forest litter, rotting logs, and fungi and occur on both main islands. There are numerous *Sepedophilus* species in New Zealand, several of them not yet named.

[12] Staphylinidae: Habrocerinae
Fig. 129 *Habrocerus capillaricornis* (Gravenhorst)
A medium-sized, flattened beetle 2.7–3.0 mm long, brown with forebody strongly glossy and abdomen moderately glossy. Distinct by its thin antennae with long setae and long, protruding abdominal setae. An adventive species, recorded from mid Canterbury.

[12] Staphylinidae: Aleocharinae
Fig. 130 *Aleochara hammondi* Klimaszewski & Crosby
A robust, narrowly oval beetle 5.0–7.5 mm long, strongly glossy, black with appendages and central part of elytra reddish brown. Like all species of *Aleochara* it has a distinct but minute pseudosegment terminating the maxillary and labial palps. *Aleochara* occurs on both main islands and the Kermadecs; this species is restricted to the South I.

[12] Staphylinidae: Scaphidiinae
Fig. 131 *Baeocera scutellaris* (Redtenbacher)
A strongly convex, highly glossy beetle 2.4–2.5 mm long, with elytra long, truncate apically, exposing small, pale red pygidium; antennae and legs also pale red. Found under loose bark of dead trunks and branches, under stones, or in moist leaf litter. Some scaphidiine larvae are associated with fungi. Recorded from the Poor Knights Islands to Southland.

[12] Staphylinidae: Piestinae
Fig. 132 *Parasiagonum hudsoni* (Cameron)
A subparallel, flattened beetle 6.0–8.0 mm long, dark brown with reddish legs. Head transverse, with antennae approximately as long as body; pronotum with anterior angles projecting; elytra grooved. Found under bark of karaka (*Corynocarpus laevigatus*), and probably saprophagous. Recorded from the Wellington area. *[Redrawn after Steel 1950a.]*

[12] Staphylinidae: Osoriinae
Fig. 133 *Nototorchus ferrugineus* (Broun)
An elongate, parallel-sided, reddish-brown beetle 3.4–3.5 mm long. Abdomen cylindrical, with tergites and sternites fused laterally; paratergites absent. Found in leaf litter and humus, most frequently under taraire-dominated vegetation in the north of the North Island. Recorded from Northland to Nelson.

[12] Staphylinidae: Oxytelinae
Fig. 134 *Carpelimus* sp.
A small, flattened, dark brown or black beetle 1.5–1.7 mm long; abdomen broadening apically except for conical apex. *Carpelimus* species are saprophages occurring in forest litter, but may be attracted to dung and carrion. They are often abundant, but little studied; three species are known to be adventive.

[12] Staphylinidae: Euaesthetinae
Fig. 135 *Agnosthaetus vicinus* (Broun)
A small, reddish beetle 2.8–3.0 mm long with a dark transverse spot in apical third of abdomen; forebody glossy and sparsely pubescent or naked; elytra extremely short; abdomen moderately glossy, with dense whitish pubescence. Like all New Zealand euaesthetines it is endemic, flightless, and inhabits forest litter. Recorded from the northern part of the South Island and the Waikato.

[12] Staphylinidae: Pseudopsinae
Fig. 136 *Pseudopsis arrowi* Bernhauer
A small, flattened, reddish-brown beetle 2.8–3.3 mm long. Head bearing a shallow depression laterad of middle; pronotum with 5 costae; elytra each with 2 longitudinal costae and 2 lateral longitudinal carinae; abdomen with slightly clubbed setae. Known from leaf litter in *Nothofagus* forest. *Pseudopsis* species occur mainly in forest litter and moss, and appear to be predators. Recorded from the Bay of Plenty and the Nelson area.

[12] Staphylinidae: Paederinae
Fig. 137 *Medon zeelandicus* (Redtenbacher)
A medium-sized, subparallel, reddish beetle 4.5–5.0 mm long, often with head and base of abdomen darker. Terminal segment of maxillary palps minute. Recorded from Foxton, North I. Paederinae occur in damp habitats in forests or near bodies of water, and are predators that employ pre-oral digestion.

[12] Staphylinidae: Staphylininae
Fig. 138 *Cafius litoreus* Broun
A large, glossy black beetle 11–13 mm long, with some segments of antennae and tarsi reddish, and pubescence yellowish. Abdomen coarsely punctured; tibiae covered with blunt spines. Unlike most *Cafius* species, head much larger in male than in female. Found under decaying seaweed, where both adults and the large, pale brown larvae are predators on littoral amphipods. Adults fly readily, especially in hot sunshine, and have been collected from October to March. Recorded widely from Cape Reinga to Dunedin.

[13] Lucanidae: Aesalinae
Fig. 139 *Ceratognathus parrianus* Westwood
A large, brown stag beetle 14–20 mm long, with purplish-black blotches on pronotum and elytra. Antennae not elbowed, with a 3-segmented setose club. Larvae are C-shaped grubs occurring in decaying wood of karaka and other trees. Adults are sometimes found in the larval habitat, and occur throughout the year. Widely distributed, and some-times flying to light.

[13] Lucanidae: Lucaninae
Fig. 140 *Paralissotes reticulatus* (Westwood), male
A large, dark brown or rarely reddish stag beetle 12–20 mm long. Head and pronotum with dull yellowish-brown, appressed scales arising from coarse punctures; elytra reticulated, with several narrow, elevated, non-squamose bands; mandibles each with a strong apical tooth, a small subapical dorsal and ventral tooth, and a broad bifurcate basal lobe. Adults and larvae are commonly found in decaying wood on the ground, and adults may also be found under bark of living trees, particularly *Nothofagus*. Recorded from both main islands.

[13] Lucanidae: Lucaninae
Fig. 141, 142 *Geodorcus auriculatus* (Broun)
A large, glossy, sexually dimorphic stag beetle 20–25 mm long. Elytra with erect, yellowish-brown scales arising from dense, coarse, circular punctures; head widest behind eyes. Males have the head expanded and mandibles bifurcate at the tips, with a dorsal tooth near the middle. Recorded from the Waikato and Coromandel areas.

[13] Lucanidae: Lampriminae
Fig. 143 *Dendroblax earlii* White
A chocolate-brown, glossy, heavily punctate stag beetle 17–28 mm long, with conspicuous fulvous hairs ventrally. Elytra each with 3 or 4 broad, longitudinal ridges; legs fossorial; antennal club segments chunky; mandibles triangular. The sole species of an endemic genus with close relatives in Australia, New Guinea, and Chile. Larvae live in soil and probably eat grass roots. Adults fly during the evening in spring and summer. Recorded from the Mokohinau Is in the north to Ben Lomond in the southern lakes.

[14] Trogidae
Fig. 144 *Trox scaber* (Linnaeus)
A medium-sized, predominantly fuscous carcass beetle 6.4–6.5 mm long, oval and convex, rugose. Antennae short and stout; legs slender, not obviously modified for digging. An adventive European species recorded mostly in the northern part of the North I., sometimes at light.

[15] Scarabaeidae: Aphodiinae
Fig. 145 *Acrossidius tasmaniae* (Hope)
A stout, glossy beetle 10–11 mm long, reddish brown to black, with appendages usually paler. Elytra each with 5 impressed striae; protibiae each with 3 large teeth, and other tibiae each with 1 larger and 1 smaller spine; antennae with a 3-segmented lamellate club. Accidentally introduced from south-eastern Australia, where it is a common pasture pest. Larvae live in tunnels in the soil, emerging to feed at night. They are unusual in feeding on grass leaves rather than roots, often dragging leaves into the tunnel for consumption. Adults fly to light on warm summer evenings. Recorded from the North I, especially in areas with light volcanic soil, and the South I. south of Mt Grey, Canterbury.

[15] Scarabaeidae: Aphodiinae
Fig. 146 *Phycochus graniceps* Broun
A small, strongly convex beetle 3.0–4.0 mm long, glossy reddish brown to black. Legs with broad, spinose tibiae and short tarsi modified for digging; head granulate frontally, with small eyes; elytra almost globose, weakly striated. Found in seaweed on beaches. Recorded from both main islands.

[15] Scarabaeidae: Scarabaeinae
Fig. 147 *Onthophagus granulatus* Boheman
A medium-sized beetle 5–8 mm long, with head and pronotum largely bronze-green and elytra pale fulvous mottled with dark brown. Elytral intervals with a row of prominent glossy granules, each with an erect bristle. An adventive Australian species often associated with cow and horse dung. Known in New Zealand since the 1870s, having probably arrived in stable manure with stock imported by early settlers. Occurs on both main islands, with most records from the South I.

[15] Scarabaeidae: Melolonthinae
Fig. 148 *Odontria giveni* Watt
A large, pear-shaped, pubescent beetle 13–15 mm long; head red-brown or piceous; pronotum and elytra reddish mottled with dark brown; scutellum dark brown; ventral

surface nacreous on coxae and sterna. Antennae in both sexes 3-lamellate. As in all chafers, the legs are adapted for digging. Adults are found on leaves of shrubs at night, and sometimes fly to artificial light. Larvae of most species of *Odontria* occur in forest soil, and occasionally in soil of native tussock grassland.One of a group of alpine forest forms ranging throughout the South I. and onto the ranges of the North I.

[15] Scarabaeidae: Melolonthinae
Fig. 149 *Costelytra zealandica* White
A moderately large beetle 9–10 mm long, brownish black to pale brown, with edge of clypeus and eyes darker; antennae and (usually) elytra testaceous; pronotum pale reddish brown to brown-black, and scutellum often reddish; ventral surface pale brown. Pygidium partly exposed, smooth and glabrous except for marginal bristles. Commonly known as the grass grub, a name more properly applied to the larvae, which live in soil feeding on the roots of grasses. Mature larvae pupate in the soil, usually in late August to late October, and the beetles emerge in November. On warm, still nights they fly, and alight on the leaves of various food plants such as turnip, plum, rose, apple, strawberry, and *Aralia spinosa*. After mating, usually on the food plants, females lay their eggs in moist soil. Larvae hatch in 16–21 days and pass through three instars lasting from November to the following September. Endemic to New Zealand, from North Cape to Bluff, but not common in Northland and Auckland, and not prevalent in native tussock grasslands. Causes most damage in the South I., especially in Otago and Southland.

[15] Scarabaeidae: Melolonthinae
Fig. 150 *Prodontria lewisi* Broun
A large, pale reddish-brown beetle 15–16 mm long; antennae 4-lamellate in male and 3-lamellate in female; clypeus and frons densely and coarsely punctate; pronotum strongly convex; elytra striate, strongly convex, truncate behind, with shoulders bearing a posterolateral depression. Known only from rough pastureland in a restricted area of Cromwell, Central Otago.

[15] Scarabaeidae: Dynastinae
Fig. 151 *Heteronychus arator* (Fabricius)
A moderately large, stout, convex, glabrous beetle 11–13 mm long, strongly glossy black. Middle and hind femora each with 2 strong spurs. Commonly known as the black beetle, this species was accidentally introduced from South Africa. Adults sometimes fly to light at night. Larvae feed on the roots of grasses, and may cause substantial damage to lawns and pastures. Widely distributed in warmer areas of the North I.

[15] Scarabaeidae: Dynastinae
Fig. 152 *Pericoptus truncatus* Fabricius
A large, stout beetle 21–30 mm long, dark brown, often chocolate brown medially. Legs broad, adapted for digging; pronotum in males bearing a blunt apical horn; pygidium exposed. Occurs in coastal areas, on sandy beaches above high water mark, where larvae may be found under logs. Recorded from the North Island and the Nelson area of the South I.

[16] Scirtidae
Fig. 153 *Amplectopus pallicornis* Broun
A small, elongate-oval, moderately pubescent, reddish-brown beetle 1.9–2.0 mm long, with antennae and legs yellowish. Ventral surface with oval depressions into which head, antennae, and legs can be folded; antennae with a regular 6-segmented club, and with proximal segments irregular in form; legs folding together like the blades of a pocket knife. Adults have been beaten from foliage of the tree fern *Dicksonia squarrosa* at Pelorus Bridge near Nelson. Originally found on Mt Pirongia and since collected at Waipoua Forest, Hunua Range, Mt Arowhana (Gisborne), Dawson Falls (Mt Egmont), and Takaka (Nelson).

[16] Scirtidae
Fig. 154 *Veronatus tricostellus* White
A moderately large, narrowly oval, slightly depressed beetle 9.0–10 mm long, pale brown with antennae and legs yellowish brown. Elytra with 6 curved longitudinal costae; upper surface with fine, decumbent pubescence; head usually strongly bent downwards; penultimate tarsal segment bilobed. Collected by beating shrubs. Widely distributed on both main islands.

[17] Eucinetidae
Fig. 155 *Eucinetus stewarti* (Broun)
A small, broadly oval, glossy black beetle 3.5–3.6 mm long. Head and pronotum sparsely punctate; elytra with cross-striations; antennae cylindrical, 11-segmented, the last segment black; metacoxae large, fused to mesosternum; legs slender, the hind legs largest, with small spines. Adults and larvae probably feed on slime moulds. Discovered at Boatmans near Reefton, and since found at Stratford; likely to prove widely distributed wherever slime moulds occur.

[18] Clambidae
Fig. 156 *Clambus domesticus* Broun
A minute, broadly oval beetle 1.0 mm long, pale to dark brown, strongly glossy, sparsely pubescent. Head very broad, deflexed beneath pronotum; antennae 8-segmented, with a 2-segmented setose club; legs slender, with tibiae lacking spurs. An adventive Australian species, fully winged, and commonly occurring in lawn clippings, garden prunings, compost, and litter in native forest.

[19] Buprestidae
Fig. 157 *Nascioides enysi* Sharp
A moderately large, somewhat depressed, bullet-shaped beetle 7–8 mm long, metallic green with 2 oblique yellow spots; males with frons reddish. Elytra pointed apically. Commonly known as the beech buprestid, the fully winged adults feed in summer on leaves of *Nothofagus*, and are a potential pest of beech forests.

[20] Byrrhidae: Byrrhinae
Fig. 158 *Liochoria huttoni* Pascoe
A moderately small, broadly oval, convex beetle 3.6–3.7 mm long, shining black with greenish reflections. Antennae inserted on sides of frons, with a 3-segmented club; elytra each with about 5 longitudinal rows of unconnected coarse punctures; abdominal sternites behind metacoxae with a large oval depression for reception of retracted hind legs. Adults are often found under stones surrounded by moss, usually associated with larvae, and have been observed feeding on alpine daisies (*Celmisia*). Recorded in the southern South I. from the Grampian Mountains (Mackenzie Basin) to the great block mountains of Central Otago, at altitudes from 350 m to over 3000 m.

[21] Dryopidae
Fig. 159 *Parnida agrestis* Broun
A moderately small, moderately glossy black beetle 3.9–4.0 mm long, covered with irregular yellow hairs. Antennae short, with a characteristic asymmetrical club; pronotum with a deeply impressed groove on either side near lateral margin. One of a number of terrestrial Dryopidae (the dryopids in other zoogeographical regions are mostly aquatic). Adults and larvae occur commonly together in leaf litter of *Nothofagus* forests.

[22] Elmidae: Larainae
Fig. 160 *Hydora picea* Broun
A moderately small, broad, slightly depressed, brownish-black beetle 3.4–3.5 mm long. Head narrow, with prominent eyes; antennae without a distinct club; posterior edges of pronotum sharp; elytra with rows of punctures; body clothed with fairly short pubescence. Widely distributed in riverbeds, on stones at the water's edge.

[23] Limnichidae: Limnichinae
Fig. 161 *Limnichus nigripes* Broun
A small, oval, convex, glossy black beetle 2.3–2.5 mm long, clothed with yellowish scale-like setae arranged in wavy patterns, the setae finer and hair-like on pronotum. Antennae with a small 2-segmented club, inserted on base of frons. Occurs under stones in streams and at the margin of rivers. Also found in terrestrial habitats in moist litter and under stones, but primarily an aquatic species. Recorded at Lowburn, just north of Cromwell, in the Motu R., Bay of Plenty, and in the Kereu Stm, East Cape.

[24] Heteroceridae: Heterocerinae
Fig. 162 *Heterocerus novaeselandiae* Charpentier
A moderately small, elongate, convex, brownish beetle 3.9–4.0 mm long, bearing numerous bristles. Antennae short and thick; elytra with oval, yellowish-brown spots; tibiae flattened and spinose, blackish-brown. The only species of heterocerid known from New Zealand, from a few widely scattered records.

[25] Ptilodactylidae: Anchytarsinae
Fig. 163 *Byrrocryptus urquharti* Broun
A moderately large, closely pubescent beetle 6–7 mm long, with body medium brown and legs and antennae yellowish. Antennae serrate; scutellum heart-shaped; hind margin of pronotum with blunt teeth forming a transverse comb. Adults have been collected between October and February. Larvae live in sand near the water's edge in river beds. Recorded from Auckland to mid Canterbury.

[26] Chelonariidae
Fig. 164a,b *Brounia thoracica* Sharp
A moderately large, narrowly oval, slightly glossy beetle 5–6 mm long, black with tarsi yellowish-red and elytra violet or purple-tinged; moderately densely punctate and pubescent. Head partially concealed from above; antennae with segments 6–10 each bearing a long, inwardly produced lobe; pronotum hump-shaped in lateral view. The only known specimens are the original two collected by Broun (locality unspecified) and another Malaise trapped at East Cape.

[27] Eucnemidae: Melasinae
Fig. 165 *Neocharis simplex* Sharp
A moderately small, elongate oval beetle 3.8–4.0 mm long, black with greyish pubescence. Antennae long, the 2nd and 3rd segments smallest; elytra without definite striae. Found on forest growth and in leaf litter and wood mould, and has been taken in Malaise traps. Recorded from Kaihu in Northland to Hump Ridge in Southland.

[28] Elateridae: Agrypninae
Fig. 166 *Thoramus wakefieldi* Sharp
A large, narrowly oval, blackish-brown click beetle 15–30 mm long. Sides of pronotum evenly curved anteriorly to blunt posterior angles; elytra each with about 5 striae; antennae slender; legs stout; metacoxae excavated posteriorly to receive retracted femur. One of our largest click beetles, quite variable in shape and size. Larvae are found in dead wood in forests, where they prey on larvae of other beetles such as cerambycids. Adults of this widely distributed species fly readily to light.

[28] Elateridae: Denticollinae
Fig. 167 *Amychus candezei* Pascoe
A large, brownish click beetle 16–23 mm long, variegated and variable in colour, resembling bark. Pronotum broader than long, rounded at sides, and with prominent posterior angles; elytra narrower than pronotum, tapering posteriorly; body surface moderately rough. Occurs in crevices in rocks and under logs and stones. Recorded from the islands of the Cook Strait and the Chathams, this endemic New Zealand species is considered to be endangered.

[29] Lycidae
Fig. 168 *Porrostoma rufipenne* (Fabricius)
A moderately large, soft-bodied, elongate, depressed beetle 9–10 mm long, black with elytra orange (often bright

red in living specimens). Antennae deeply serrate; elytra with indefinite longitudinal ridges and large punctures between them. Recorded from the North I., especially northern areas, and around Nelson in the South I.

[30] Cantharidae: Dysmorphocerinae
Fig. 169 *Asilis fulvithorax* Broun
A medium-sized, soft-bodied, fairly flat soldier beetle 4.8–5.0 mm long, black with pronotum bright orange. Antennae slender and slightly serrate, inserted on frons just before eyes. Adults may be beaten from foliage of various trees and shrubs, especially when in flower. Common in the North I. north of Waitomo, including the Hen and Chickens Is and Little Barrier.

[31] Derodontidae: Laricobiinae
Fig. 170 *Nothoderodontus gourlayi* Crowson
A small, broadly oval beetle 1.9–2.0 mm long, somewhat depressed, brownish to black. Head with characteristic depressions and with 2 ocelli, each next to margin of eye; eyes prominent, coarsely faceted; antennae with a 3-segmented club; elytra with deep striae. Adults have been collected from January to March. Discovered at Arthurs Pass, and reported from several localities between the Nelson area and Capleston, near Reefton.

[32] Jacobsoniidae
Fig. 171 *Saphophagus minutus* Sharp
A small, elongate-oval, depressed, reddish-brown beetle 1.9–2.0 mm long. Pronotum approximately heart-shaped, with a pronounced median depression and with coarse punctures; head less coarsely punctate; antennae straight, with a loose 3-segmented club; elytra without distinct striae, but with punctures arranged in somewhat irregular, curved, longitudinal rows; legs rather short and stout. Collected in the Nelson area, at Picton, and near Mt Cook.

[33] Nosodendridae
Fig. 172 *Nosodendron zealandicum* Sharp
A moderately small, oval, strongly convex, glossy black beetle 4.3–4.5 mm long, finely and closely punctate. Elytra with rows of large punctures. Widely distributed in the North I., and also recorded from the South I.

[34] Dermestidae: Megatominae
Fig. 173 *Trogoderma maestum* Broun
A small, broadly oval, slightly depressed beetle 2.9–3.0 mm long, black, covered with black and whitish recumbent hairs forming a characteristic pattern. Antennae of male bluntly serrate, those of female weakly clubbed. Adults may be found on flowers, and larvae on feathers and dead birds. Recorded from the north of the North I., as far south as Okauia near Matamata.

[35] Bostrichidae: Euderinae
Fig. 174 *Euderia squamosa* Broun
A moderately small, elongate beetle 4.0–5.0 mm long, brown, covered with white and brown scales. Antennae in males with a club consisting of 3 long branches, and in female simple, with club segments smaller and slightly asymmetrical. Described on the basis of a male and a female found near Whangarei Heads and at Tairua.

[35] Bostrichidae: Dinoderinae
Fig. 175 *Dinoderus minutus* (Fabricius)
A small beetle 2.0–3.0 mm long, dark brown with red elytra. Head with frons densely punctate; pronotum coarsely asperate anteriorly, densely punctate posteriorly; elytra irregularly punctate with short, erect setae. A pantropical pest species developing in bamboo, and sometimes in maize. Recorded from Auckland.

[35] Bostrichidae: Lyctinae
Fig. 176 *Lyctus brunneus* Stephens
A small to moderately large, brown beetle 2.0–7.0 mm long. Upper surface with brown decumbent pubescence; head and pronotum with coarse, shallow punctures; elytra striate, with fine punctation; pronotum slightly depressed medially; posterior margin of 4th ventrite with fine pubescence in both sexes. A cosmopolitan pest in a wide variety of timbers. Recorded from both main islands.

[36] Anobiidae: Anobiinae
Fig. 177 *Hadrobregmus magnus* (Dumbleton)
A medium-sized, reddish-brown beetle 7.0–8.0 mm long. Head concealed by prothorax; antennae with a 3-segmented club consisting of elongate and asymmetrical segments; prothorax constricted posteriorly near base; elytra with rows of punctures; most of body surface with short pubescence. Adults and larvae occur in old, partly decayed rimu logs and in rimu flooring and other timbers; they usually bore into wet timber. Widely distributed, from Northland to the Taieri Plains, Dunedin.

[36] Anobiidae: Ptininae
Fig. 178 *Ptinus speciosus* Broun
A small, broadly oval, spider-like beetle 2.3–2.4 mm long, with a deep brown and white stripe across elytra and additional white markings behind shoulders; body clothed with long yellow hairs. Head usually strongly deflexed and partially concealed from above; antennae without a club; legs and antennae long and slender; elytra much broader than prothorax. Adults occur in leaf litter. Widely distributed in the North I. and northern South I.

[37] Trogossitidae: Rentoniinae
Fig. 179 *Rentonidium costiventris* Crowson
A minute, oval, strongly convex, pale reddish-brown beetle 1.3 mm long. Antennae and legs slender; head broad; upper surface with fine pubescence; elytra without striae; 1 visible sternite with a median keel. Discovered in male flowers of "*Pinus insignis*" (probably in error for *P. radiata*) in Waipoua State Forest, Northland. Also collected in other North I. localities in forest leaf litter, and occurring as far south as Nelson.

[37] Trogossitidae: Lophocaterinae
Fig. 180 *Grynoma regularis* Sharp
A medium-sized, moderately convex, ventrally flat beetle 5.3–5.4 mm long, elongate oval with sides mostly parallel. Colour predominantly black; elytra with white marks variegated with pale red, coarsely punctate but not striate; long, whitish hairs covering most of dorsal surface; maxillary palps prominent, the last segment hatchet-shaped. Collected by beating forest foliage. Larvae are sometimes found under loose bark, where they probably feed on other insects; adults too are probably predacious. Widely distributed.

[37] Trogossitidae: Trogossitinae
Fig. 181 *Lepidopteryx nigrosparsa* (White)
A large, elongate, parallel-sided, slightly convex beetle 11–12 mm long, glossy greenish black. Head and pronotum with depressed areas bearing yellowish-white scales; elytra with 14 longitudinal keels. Adults have been found under bark and in the sheath of a fallen nikau palm leaf. Collected from September to April. Widely distributed, with records ranging from Little Barrier I. to Silverstream near Wellington.

[38] Chaetosomatidae
Fig. 182 *Chaetosoma scaritides* Westwood
A large, elongate, subparallel-sided beetle 13–14 mm long, coarsely punctate, black with pale red shoulders and elytral apex. Dorsal surface with long, erect hairs; antennae and legs slender; pronotum subquadrate, with a strongly glossy median elevation. Collected from under bark of logs and standing dead trees of various species. Widely distributed.

[39] Cleridae: Thanoclerinae
Fig. 183 *Metaxina ornata* Broun
A medium-sized, slightly flattened beetle 4.0–6.0 mm long, brown with whitish-yellow, sinuate, irregularly shape elytral spots. Dorsal surface with long, erect sparse setae; head and pronotum with longitudinally elongate punctures, and elytra with round ones. Originally described from Broken River, Canterbury. We have seen additional specimens from Dun Mountain, near Nelson, and an undetermined specimen of the same genus from Northland.

[39] Cleridae: Enopliinae
Fig. 184 *Phymatophaea violacea* (Fabricius)
A medium-sized, elongate-oval, slightly depressed beetle 6.5–7.0 mm long, mainly violet, with distinct yellow markings on elytra. Eyes prominent; antennae with an elongate and asymmetrical 3-segmented club; 2 tarsal segments strongly lobed; elytra coarsely punctate, without striae, clothed with long, protruding hairs. Adults occur in summer on flowering trees and shrubs, where they probably prey on other insects.

[40] Phycosecidae
Fig. 185 *Phycosecis limbata* (Fabricius)
A small, elongate-oval beetle 2.5-3.0 mm long, variably coloured, mostly dull black with elytral shoulders or entire elytra pale yellowish, or elytra appearing yellowish with various combinations of brown or black spots. Occurs on sandy beaches. Recorded from both main islands, the Chathams, and the Kermadecs.

[41] Melyridae: Dasytinae
Fig. 186 *'Dasytes' subcyaneus* Broun
A medium-sized, soft-bodied, elongate beetle 3.8–4.0 mm long, slightly depressed, metallic blue. Head without a distinct neck; eyes prominent; antennae filiform, without a club; elytra pubescent, without striae. Common on flowering shrubs, and when alerted takes to flight rapidly. Larvae live under loose bark of dead branches. Occurs on both main islands, but with most records from the South I.

[42] Nitidulidae: Nitidulinae
Fig. 187 *Platipidia asperella* Broun
A medium-sized, broadly oval, slightly depressed beetle 4.8–5.2 mm long, mostly dark brown, with pale irregular markings. Eyes strongly convex; head, pronotum, and elytra finely punctate; elytra without striae; male with hind femora expanded towards apex. Adults are found on tree trunks, especially with flowing sap, and sometimes in the base of fallen dead nikau palm leaves. Occurs on both main islands, but with most records from the South I.

[43] Monotomidae: Monotominae
Fig. 188 *Lenax mirandus* Sharp
A medium-sized, narrowly elongate, subparallel beetle 4.0–6.0 mm long, usually dark brown to nearly black, with appendages paler, usually rust-brown; glossy, with minute, sparse and inconspicuous pubescence. Head short, as broad as thorax, with 2 deep cavities behind each eye; labrum concealed; pronotum narrowly elongate, with front angles sharp and slightly produced, lateral carinae sharp, and with 2 rows of large, deep punctures in medial part of disc; elytra narrowly elongate, with 8 punctate grooves. Collected under bark in beech (*Nothofagus*) forests, and sometimes by beating forest growth. Widely distributed, especially in the South I.

[43] Monotomidae: Monotominae
Fig. 189 *Monotoma spinicollis* Aubé
A small beetle 2.1–2.2 mm long, entirely rust-brown, or dark brown with rust-brown edges and appendages. Head and pronotum with coarse, broad, dense punctation; head abruptly constricted behind, with protruding eyes; pronotum with anterior angles produced and lateral margin serrate; elytra shortened, with rows of punctures; pubescence short, inconspicuous, yellowish. Adults of this introduced European species are common in lawn clippings, garden litter, and compost, in paddocks where sheep shelter, and in chicken straw. Recorded from Auckland.

[44] Phloeostichidae: Agapythinae
Fig. 190 *Agapytho foveicollis* Broun
A moderately small, narrowly elongate beetle 3.0–3.2 mm

long, rust brown with dark brown spots and 2 pale, transverse spots on elytra. Moderately glossy, sparsely pubescent, with depressions on pronotum and elytra and with inconspicuous tubercles; antennae bead-like, with a weakly defined 3-segmented club. Adults have been collected from December to February. Originally taken at Routeburn, but also known from the Hollyford Vly, Balloon Hut (Mt Arthur Tableland, Nelson), Takaka Hill, Mt Robert (Nelson Lakes N.P.), upper Wairoa Vly, and Makarora.

[44] Phloeostichidae: Priasilphinae
Fig. 191 *Priasilpha obscura* Broun
A medium-sized, broadly oval, flattened beetle 4.7–5.0 mm long, narrowed posteriorly, blackish brown, coarsely punctate. Upper surface with greyish pubescence grouped in clumps on elytra; elytra without striae, slightly explanate; antennae with a distinct 3-segmented club; antennae and legs slender. Adults and larvae occur in leaf litter of beech (*Nothofagus*) forests. Widely distributed on both main islands.

[45] Silvanidae: Brontinae
Fig. 192 *Brontopriscus pleuralis* Broun
A moderately large, narrowly oval, flattened, brown beetle 7.5–8.0 mm long. Head slightly narrower than pronotum; antennae with scape extremely elongate, as long as 3 or 4 following segments combined; pronotum with deep indentations on lateral margins; elytra oval and flat laterally, with longitudinal rows of punctures; dorsal surface sometimes bearing irregular pieces of plant material adhering to sappy secretion. Adults and larvae occur under bark of dead tree trunks and branches of native trees. Common in most parts of the North I., with a few records from the South I.

[45] Silvanidae: Silvaninae
Fig. 193 *Oryzaephilus surinamensis* (Linnaeus)
A small, narrowly elongate beetle brown 2.8–3.2 mm long, often with rust-brown appendages; dorsal surface covered with short, yellow, recumbent hairs. Head elongate, with temples as long as diameter of eye; antennae with a 3-segmented club; pronotum with 6 teeth on either side; elytra with longitudinal rows of punctures. A cosmopolitan pest of stored products, adventive in New Zealand. Adults and larvae infest cereals, dried fruits, and oilseeds. Known from both main islands.

[46] Cucujidae
Fig. 194 *Platisus* sp.
A large, flat beetle 15–20 mm long, dark brown, with head and pronotum nearly black, and elytra uniformly dark brown or reddish apically, coarsely punctate. Head transverse, posteriorly slightly broader than pronotum; mandibles strong, curved, with inner teeth; antennae moniliform, with basal and 3rd segments strongly elongate and 2nd segment reduced and beadshaped; pronotum with serrate lateral margins. An endemic New Zealand species known only from the Three Kings Is.

[47] Laemophloeidae
Fig. 195 *Microbrontes lineatus* (Broun)
A small, flattened beetle 2.8–3.0 mm long, brown with a reddish tinge, slightly glossy, with inconspicuous short pubescence. Head elongate, with a median ridge and 2 lateral ridges; antennae with scape enlarged and asymmetrical, pedicel broadened apically, and remaining segments strongly elongate; pronotum broadest apically, with 2 sublateral ridges; elytra with 10 longitudinal ridges. Known from the North I. and Three Kings Is.

[48] Phalacridae: Cyclaxyrinae
Fig. 196 *Cyclaxyra impressa* Broun
A small, strongly convex beetle 2.0–2.2 mm long, glossy black with legs and antennae reddish chestnut. Head and elytra sparsely punctate; antennae with a 3-segmented club; elytra not striate. Presumably fungivorous, occurring in sooty moulds on *Nothofagus* and *Olearia*. Known from both main islands.

[49] Cavognathidae
Fig. 197 *Zeonidicola chathamensis* Watt
A small, elongate-oval, moderately depressed beetle 2.7–3.2 mm long, dark brown with legs and antennae reddish brown; surface relatively dull, with fine microsculpture. Head densely punctate; antennae with a loose 3-segmented club; pronotum with sides weakly angulate just behind middle; elytra elongate, widest at mid-length; wings vestigial; scutellum transverse; legs stout, with protarsi and mesotarsi (segments 1–4) expanded in male. Occurs in birds' nests on the Chatham Is.

[50] Cryptophagidae: Cryptophaginae
Fig. 198 *Thortus ovalis* Broun
A small, oval, convex beetle 1.7–1.8 mm long, reddish brown with shoulders of elytra and patches near elytral apex paler; most of upper surface with slender setae. Antennae with a loose 3-segmented club, their insertions depressed into an elevated surface and separated by a longitudinal carina; lateral carinae of prothorax without serration; elytra with fine punctation and without striae; wings absent. Occurs in leaf litter, especially in *Nothofagus* forests. Discovered at Boatmans near Reefton, and later found on Stephens I. and more widely on the western side of the South I.

[51] Languriidae: Xenoscelinae
Fig. 199 *Hapalips prolixus* (Sharp)
A medium-sized, narrowly elongate beetle 5.0–6.0 mm long, subparallel to slightly convex, yellowish-brown. Antennae with an elongate 3-segmented club; pronotum without a basal impression or groove; elytra with rows of punctures. Adults and larvae occur on dead leaf tissue of tree-ferns and nikau palm. Known from the North I. and the northern part of the South I.

[52] Erotylidae: Dacninae
Fig. 200 *Thallis polita* White
A medium-sized, elongate-oval, convex beetle 5.8–6.0 mm long, blackish-brown, strongly glossy. Head with prominent eyes and two deep grooves; antennae with a loose 3-segmented club; elytra with irregular longitudinal rows of fine punctures. Adults are found on bracket fungi and occasionally in leaf litter or under bark. Widely distributed in the North I.

[53] Bothrideridae: Anommatinae
Fig. 201 *Anommatus duodecimstriatus* (Müller)
A small, subparallel beetle 2.0–2.2 mm long, dorsally glossy, depigmented, pale brown, somewhat flattened, with short, sparse and inconspicuous setae. Head partially concealed by pronotum, distinctly narrower than apical pronotal margin; eyes reduced; antennae 10-segmented, with a large 1-segmented club; pronotum trapezoidal, with large, longitudinally elongate punctation; elytra with narrow epipleura, and with 6 rows of setose punctures on either side. Adults recorded from rotten wood buried in earth, under deeply buried stones, and from deep pitfall traps sealed off at the top. An introduced hypogeal European species, recorded from Lynfield, Auckland.

[53] Bothrideridae: Bothriderinae
Fig. 202 *Ascetoderes obsoletus* (Broun)
A medium-sized, elongate-oval, slightly depressed beetle 5.0–6.0 mm long, dark brown to black with most of surface coarsely punctate. Antennae inserted in front of eyes, with a 2-segmented club; pronotum with a medial impression; elytra striate; legs stout, the segments simple. Adults are occasionally found under bark of dead tree trunks. Collected November to March. Recorded from the Nelson area (several records) to Invercargill.

[54] Cerylonidae: Euxestinae
Fig. 203 *Hypodacnella rubriceps* (Reitter)
A small, oval, strongly convex, glabrous beetle 2.0–3.0 mm long, dark brown and glossy with appendages reddish. Head slightly inclined, narrower than pronotum; antennae 10-segmented with a 2-segmented round club, and pedicel and scape asymmetrical; pronotum trapezoidal, sinuate basally; elytra with fine punctures; abdomen with 1st ventrite bearing femoral lines; 5th ventrite with fine lateral expansions. Adults occur in leaf litter and other organic litter. Predominantly from the North I., but some records from the Nelson area.

[55] Endomychidae: Mycetaeinae
Fig. 204 *Mycetaea subterranea* (Fabricius)
A small, oval, hairy, reddish beetle 1.7–2.0 mm long, with sparse protruding hairs. Pronotum sinuate basally, with an impressed lateral line on either side; elytra elongate, with distinct shoulders. An adventive species, known as a minor pest in temperate regions, feeding on moulds in stores and cellars. Recorded from the Nelson area.

[55] Endomychidae: Holoparamecinae
Fig. 205 *Holoparamecus tenuis* Reitter
A small, elongate-oval, reddish-brown beetle 1.5–1.7 mm long. Antennae with a large, 2-segmented club; pronotum convex, restricted behind to a distinct 'waist', with a series of laterally elongate foveae forming a basal impression; elytra pubescent, without striae; legs slender, with tibial spurs. Associated with leaf litter under rotting logs and with fungi. Fairly common, and probably widely distributed.

[56] Coccinellidae: Coccinellinae
Fig. 206 *Coccinella leonina* Fabricius
A medium-sized, hemispherical ladybird 5.3–5.5 mm long, with many conspicuous, regular orange markings on a black background. Adults and larvae feed mostly on aphids occurring on grasses and tussock, but are known from a wider range of plants. Recorded widely over both main islands and from smaller islands close offshore, from near sea level to subalpine.

[57] Corylophidae: Sericoderinae
Fig. 207 *Anisomeristes sharpi* Matthews
A small, densely pubescent, glossy, bright orange beetle 1.2–1.4 mm long. Head concealed by front of pronotum; antennae 10-segmented, with a 3-segmented club; pronotum with hind angles strongly produced posteriorly; elytra without striae, slightly truncate, exposing part of pygidium; 2nd tarsal segment bilobed. Found on and under leaf litter at the base of sedges and flax, and in coastal cliff vegetation around Auckland.

[58] Corticariidae: Lathridiinae
Fig. 208 *Enicmus caviceps* Broun
A small, elongate-oval, glossy black beetle 1.9–2.0 mm long. Antennae straight, with a 3-segmented black club; elytral intervals convex, with intervals 3 and 5 costate posteriorly, and interval 7 costate throughout. Occurs in leaf litter at the base of sedges. Found frequently in the Auckland area, and apparently widely distributed.

[59] Mycetophagidae: Mycetophaginae
Fig. 209 *Triphyllus hispidellus* (Broun)
A small, oval, slightly depressed beetle 1.8–1.9 mm long, black with antennae and legs yellowish; fine, short black pubescence and paler-coloured spots on elytra. Antennae slender, with a 3-segmented club, the segments simple. Beaten or swept from manuka (*Leptospermum scoparium*) and other shrubs; also on rushes. Adults were originally discovered at Whangarei Heads, and later reported from The Noises Is, Mokohinau I., and several localities in the Nelson area.

[60] Archeocrypticidae
Fig. 210 *Archeocrypticus topali* Kaszab
A small, uniformly oval, finely pubescent beetle 2.7–3.5 mm long, dark brown to nearly black. Antennae with a 3-segmented club; prosternal process abruptly expanded apically. Introduced into New Zealand from South America.

[61] Cilidae: Cilnae
Fig. 211 *Cis zeelandicus* Reitter
A small, subcylindrical beetle 1.8–2.0 mm long, dark brown, with short bristles. Anterior margin of head with 2 blunt teeth; antennae with a 3-segmented, loosely formed club; pronotum broadly rounded anteriorly, approximately straight at base; elytra with confused rows of punctures. Adults and larvae are often found together in cylindrical tunnels in artists' shelf fungus (*Ganoderma applanatum*), but adults also occur in the forest canopy and less frequently in litter. A fairly common species, widely distributed.

[62] Melandryidae: Melandryinae
Fig. 212 *Hylobia nubeculosa* Broun
A medium-sized, elongate-oval beetle 4.3–4.4 mm long, orange-brown variegated with dark brown, with shorter and longer pubescence. Head bent under pronotum; antennae without a distinct club; hind legs stouter than the others, bearing long, minutely serrate tibial spurs; metacoxae large and flat. Adults may be found adhering to the underside of decaying logs, where larvae probably feed on fungi. Recorded from both main islands, from near sea level to montane habitats.

[63] Mordellidae: Mordellinae
Fig. 213 *Mordella antarctica* White
A large pintail beetle 13–17 mm long, black with characteristic white markings on elytra. Antenna slightly serrate; pronotum sinuate basally; elytra rounded posteriorly; last abdominal segment prolonged into a terminal spine. Adults occur frequently on flowering manuka (*Leptospermum scoparium*) or rata (*Metrosideros robusta*) in full sun, are very active and good jumpers, and take to flight readily when disturbed. Widely distributed.

[64] Rhipiphoridae: Pelecotominae
Fig. 214 *Rhipistena lugubris* Sharp
A medium-sized, elongate-oval, blackish-brown antlered beetle 6–8 mm long. Antennae lamellate in male; eyes kidney-shaped, partly surrounding base of antennae; pronotum with sides arcuate and base sinuate; elytra with rounded apices barely covering wings, non-striate, with definite longitudinal ridges. Adults have been collected by beating vegetation in summer; they fly very readily. Larvae apparently are predatory, in dead wood. Recorded from the North I. and the northern South I.

[65] Colydiidae: Colydiinae
Fig. 215 *Pristoderus antarcticus* White
A moderately large, broad, rather convex beetle 7.8–8.0 mm long, with most of surface bearing short bristles. Antennae with a 3-segmented club; lateral margins of pronotum with 4 prominent teeth; elytra mostly subparallel, with fairly irregular, longitudinally arranged elevations; abdominal sternites fully movable. Adults occur on standing dead tree trunks and sometimes under loose bark, often with moulds. Larvae found in association with adults are tentatively assigned to this species. Recorded from both main islands.

[65] Colydiidae: Colydiinae
Fig. 216 *Rhizonium antiquum* Sharp
A small, narrowly oval beetle 1.9–2.0 mm long, slightly depressed, with upper surface bearing dense and coarse punctures. Antennae with a loose 3-segmented club; basal antennal segment fully visible from above; elytra mostly subparallel; legs short. Adults occur in rachides of dead leaves of the tree fern *Cyathea dealbata,* and in decaying wood of broadleaved woody plants. We have seen specimens from the North I. only.

[66] Ulodidae
Fig. 217 *Syrphetodes marginatus* Pascoe
A moderately large, broadly oval beetle 8.0–9.0 mm long, slightly depressed, with integument brown, but variable in shape and colour; upper surface with patches of scales forming a variable pattern. Head partially concealed by pronotum; eyes almost circular; antennal insertions exposed; antennae slender, without a club; pronotum with front angles strongly produced anteriorly; elytra broad, much broader than pronotum. Adults may be found clinging to the underside of logs, but are difficult to spot because of their cryptic colour pattern. Larvae live in rotten logs. Recorded from the Coromandel to Mt Hope near Nelson.

[67] Chalcodryidae
Fig. 218 *Chalcodrya variegata* Redtenbacher
A large, glossy beetle 15–16 mm long, pale to dark green or greenish brown, often with metallic reflections, and brown spots on elytra, but colour pattern variable; underside dark greenish or brown; apex of femora, tibiae, and tarsi darkened; antennae pale brown; dorsal surface of head parallel to margins of eyes, pronotal sides, and disc of elytra with small patches of coarse yellowish pubescence. Antennae slender, lacking a club, with insertions exposed; vertex between eyes bearing an impunctate area; elytra subparallel for most of length; legs slender. Confined to high-rainfall forests, mostly *Nothofagus*. Recorded in the North I. from the central volcanic plateau and around Wellington, and in the South I. from Westland and Fiordland.

[68] Tenebrionidae: Lagriinae
Fig. 219 *Chaerodes trachyscelides* White
A medium-sized, robust, strongly convex beetle 6.5–8.6 mm long; colour pattern very variable, from unicolorous dark brown to tan with darker markings on pronotum and elytra. Protibiae strongly expanded anterolaterally, with tarsi subterminal; meso- and metatibiae with pairs of stout, blunt, peglike apical spines; metatarsi angled upwards and backwards – all modifications for moving on loose sand. Recorded from sandy coasts from the Far North to Stewart I., often under seaweed or other beach wrack.

[68] Tenebrionidae: Pimeliinae
Fig. 220 *Actizeta albata* Pascoe
A small, pale-coloured darkling beetle 2.8–3.0 mm long; upper surface covered with pale greyish-white scales. Head partly concealed by pronotum; eyes coarsely faceted; pronotum broad, with front angles broad and slightly produced anteriorly; elytra with striae; forelegs broadly expanded for digging, and hind legs bearing long bristles, an adaptation for walking on sand. Lives in loose sand on beaches throughout New Zealand.

[68] Tenebrionidae: Tenebrioninae
Fig. 221 *Mimopeus elongatus* (Brême)
A large, elongate-oval, moderately convex darkling beetle 11–15 mm long, black or reddish-black; upper surface closely punctate, the interstices between punctures variable; surface dull or glossy, with or without apparent microsculpture. Head with expanded margin below each eye forming a canthus; antennae with an indistinct 5-segmented club; pronotum transverse, the front angles produced, without striae; legs slender. Adults usually feed on dead vegetable debris, but in dry conditions feed on living plant tissue. Widely distributed, particularly in coastal localities under creeping coastal plants such as pohuehue. In Auckland and on some offshore islands common under stones in craters of extinct volcanoes.

[69] Prostomidae
Fig. 222 *Dryocora howitti* Pascoe
A medium-sized, elongate beetle 6.0–8.0 mm long, subparallel, depressed, usually reddish brown. Head with posteriorly produced lobes behind eyes; pronotum elongate; elytra faintly punctate-striate. Adults and larvae may be found in logs of rimu and hinau, in damp crevices between wood blocks in the moist, deep red stage of decay. Widely distributed.

[70] Oedemeridae: Oedemerinae
Fig. 223 *Thelyphassa lineata* (Fabricius)
A large, elongate-oval lax beetle 18–20 mm long, slightly depressed, with integument soft. Head produced in front of eyes; antennae long, pale yellowish brown, without a club, the segments subcylindrical, with scape fully exposed; pronotum with a dark median stripe; elytra with dark lateral longitudinal stripes, coarsely and closely punctate, with 2 indistinct longitudinal costae. Adults are found on flowers of native shrubs, where they probably feed on pollen and nectar. Occasionally they occur in rotten wood on the forest floor. Larvae live in wet rotten wood. Widely distributed, with records from Stewart I. and the Chathams.

[71] Pyrochroidae: Pilipalpinae
Fig. 224 *Techmessa concolor* Bates
A medium-sized, elongate, subparallel-sided beetle 5.0–6.0 mm long, slightly depressed, covered with fine pubescence. Head narrowed behind eyes, forming a broad neck; eyes prominent; antennae serrate; last segment of maxillary palp broadly triangular; pronotum small, subquadrate; elytra broad-shouldered, coarsely punctate, without striae. Found on forest growth in summer. Adults are pollen feeders, and larvae probably live under loose bark of dead branches. Widely distributed from Auckland to Southland.

[71] Pyrochroidae: Pilipalpinae
Fig. 225 *Exocalopus pectinatus* Broun
A medium-sized, elongate beetle 4.5–5.5 mm long, subparallel-sided with elytra slightly broadening posteriorly, glossy black, with fine pubescence. Head narrowed behind eyes, forming a moderately narrow neck; eyes prominent; maxillary palp with last segment broadly triangular; antennae serrate in female, pectinate in male; pronotum slightly transverse, with several impressions; elytra with prominent shoulders, coarsely punctate, without striae. Occurs in forested areas of Gisborne, Taupo, Taranaki, Wellington, and Nelson to Southland, mainly at higher altitudes.

[72] Salpingidae: Salpinginae
Fig. 226 *Salpingus bilunatus* Pascoe
A small, elongate-oval beetle 2.0–2.2 mm long, with a distinct 'waist' between pronotum and elytra, yellowish brown with 3 black spots on elytra, the spots variable in shape, and sometimes fused together. Antennae with a blackish 4-segmented club; pronotum with large, deep punctures; elytra without distinct striae, but with slightly irregular rows of coarse punctures. Adults frequently found by beating scrubby forest growth in summer. Widely distributed.

[72] Salpingidae: Inopeplinae
Fig. 227 *Diagrypnodes wakefieldi* Waterhouse
A moderately large, elongate, strongly depressed beetle 5.0–10 mm long, glabrous, pale brown with darker elytra. Head elongate behind small eyes; antennae filiform, with scape enlarged; pronotum strongly narrowed posteriorly, truncate apically; elytra shortened, slightly convex, with apex broadly rounded, leaving at least 4 abdominal segments exposed. Found with larvae, also very depressed, under loose bark of dead trunks and branches, feeding on decayed cambial tissues. Widely distributed, and recorded from the Chatham Is.

[73] Anthicidae: Anthicinae
Fig. 228 *Anthicus hesperi* King
A medium-sized ant beetle 3.5–4.0 mm long, black with orange-yellow elytral spots and posterior pronotum; pubescence sparse. Head subparallel behind eyes, then abruptly constricted into a narrow neck; eyes small; antennae without a club; maxillary palps with basal 2 segments small and cylindrical; pronotum narrowed posteriorly; elytra with pronounced shoulders, almost twice pronotal width; metacoxae separated by more than one coxal width. Recorded in Auckland from a paddock, heaped-up coarse prunings, and a stream bed in the bush. Also known from Nelson, and probably widely distributed.

[73] Anthicidae: Lagrioidinae
Fig. 229 *Lagrioida brouni* Pascoe
A medium-sized ant beetle 4.0–5.5 mm long, orange with reddish head, or head and pronotum brown with elytra mottled yellow and brown; legs and antennae yellow to orange; antennal club sometimes darker. Associated with coastal sand dunes, and may be found beneath beach debris. Recorded from both main islands, Stewart I., and the Chathams.

[73] Anthicidae: Lemodinae
Fig. 230 *Cotes crispi* (Broun)
A moderately small ant beetle 2.9–3.1 mm long; head, pronotum, and base of elytra reddish; remainder of elytra orange, with a brown transverse spot medially; appendages yellow, glossy; pubescence moderately dense and yellow. Head narrowly constricted behind eyes into a narrow neck; eyes large, protruding; antennae incrassate apically but without a distinct club; basal 2 segments of maxillary palp with small projections; pronotum constricted near base; elytra without distinct shoulders, less than twice pronotal width. Collected under *Phormium tenax*, *Astelia banksii*, and *Gahnia setifolia*. Originally described from Parau, and widely recorded in the North I.

[73] Anthicidae: Macratriinae
Fig. 231 *Macratria exilis* Pascoe
A medium-sized ant beetle 4.0–4.2 mm long, dark brown to nearly black with basal antennal segments and legs reddish brown; pronotum and elytra coarsely punctate. Head abruptly constricted behind eyes into a narrow neck; eyes large, protruding; antennae with a loosely formed, indistinct, 3-segmented club; maxillary palps with basal segments bearing triangular projections; pronotum oval, with base and apex broad; elytra with pronounced shoulders, almost twice pronotal width; metacoxae almost touching. Beaten from foliage in midsummer, and found on sedges. Recorded from near sea level around the North I.

[74] Aderidae
Fig. 232 *'Xylophilus' nitidus* Broun
A small, elongate-oval, slightly depressed beetle 1.9–2.0 mm long, black with legs and antennae yellowish, punctate, clothed with greyish recumbent hairs. Head strongly narrowed behind eyes into a distinct neck; eyes prominent, coarsely faceted; antennae slightly broadening apically, with terminal segment enlarged and oval; pronotum small, half of elytral width; elytra broad, with a depression behind shoulders, punctate but without striae; hind tibiae with sharp apical processes. Adults occur on foliage of *Meryta sinclairii* (Three Kings puka) and other shrubs, and one specimen was found in a robin's nest. Discovered at Northcote, Auckland, and subsequently recorded from Lynfield and from Lady Alice I., Hen and Chickens group.

[75] Scraptiidae
Fig. 233 *Nothotelus usitatus* (Broun)
A moderately small, elongate-oval leaping beetle 2.9–3.0 mm long, slightly depressed, with body soft and fragile, pubescent, pale yellow with dark brown markings on elytra. Head slightly transverse, deflexed; eyes C-shaped, partly surrounding antennal base; antennae filiform; maxillary palps with last segment broadly expanded; pronotum strongly transverse, with 2 small basal impressions; elytra with confused punctation, lacking striae; tibial spurs small, with minute pubescence. Frequently found on foliage and flowers in summer. Widely distributed on both main islands.

[76] Cerambycidae: Prioninae
Fig. 234 *Prionoplus reticularis* White
The heaviest New Zealand beetle, 40–50 mm long, though like most other wood-borers variable in size depending on the nutrition of the larva, dark brown with a reticulate yellowish pattern on elytra. Body elongate, somewhat depressed; antennae almost as long as body; pronotum with lateral margin bearing spines; ventral surface covered with dense pubescence; legs long and slender. Larvae attack mainly dead conifers, especially radiata pine and rimu, but are reported also from wattle; they require wood with a high moisture content. Adults do not feed, utilising fat reserves laid down by the larvae. Huhu grubs were once a significant food resource for Maori. Recorded from the Kermadec Is to Stewart I., often at light.

[76] Cerambycidae: Cerambycinae
Fig. 235 *Zorion* sp.
A small longhorn 6.0–7.0 mm long, reddish brown with yellowish spots on elytra, occurring on the Canterbury Plains. There are several endemic *Zorion* species in New Zealand, all small and strikingly colourful, pubescent or almost glabrous (e.g., blue with orange spots, orange with yellow spots), but because of their small size they are frequently overlooked. Adults can be found feeding in native flowers. Recorded from both main islands.

[76] Cerambycidae: Cerambycinae
Fig. 236 *Oemona hirta* (Fabricius)
A large, subcylindrical longhorn beetle 15–25 mm long, matt dark brown with scutellum and eyes orange. Antennae slender, as long as body or nearly so; pronotum with irregular transverse grooves; elytra without striae, covered with coarse brownish pubescence. Adults collected by beating forest growth during summer, or occasionally at light. Larvae attack many woody plants, boring into live wood of citrus trees (hence the common name 'lemon tree borer'), grape, and various native plants, especially rangiora. Recorded mostly from the northern half of the North I. and around Nelson in the South I.

[76] Cerambycidae: Lamiinae
Fig. 237 *Xylotoles costipennis* (Breuning)
A moderately large, narrowly oval, convex longhorn beetle 8.0–14 mm long, with prothorax cylindrical, subglabrous, pale brown to dark brown with patches of paler, yellowish pubescence on sides of pronotum and 4 narrowly elongate spots on elytra. Head oriented downwards; eyes strongly

emarginate; antennae longer than body, inserted in emargination of eyes; pronotum cylindrical; elytra with inconspicuous shoulders, broadest in basal half; legs stout. Recorded mainly from Auckland, Coromandel, and Northland.

[77] Chrysomelidae: Bruchinae
Fig. 238 *Bruchidius villosus* (Fabricius)
A small, ovate bean beetle 1.7–3.5 mm long, pubescent, slightly glossy. Head almost entirely concealed by pronotum; antennae with last 4 or 5 segments enlarged; pronotum semicircular anteriorly, sinuate basally and with pubescence forming sinuate patterns in medial part of disc; elytra broad and shortened, exposing pygidium, with distinct striae; metatibia with an inconspicuous posterior spine. Introduced from the United Kingdom for control of broom (*Cytisus scoparius*).

[77] Chrysomelidae: Chrysomelinae
Fig. 239 *Chrysolina hyperici* Forster
A medium-sized, broadly oval leaf beetle 5.0–7.0 mm long, metallic green or blackish metallic green. Head deeply inserted into prothorax; antennae short, broadly separated basally; pronotum transverse, slightly emarginate apically, sinuate basally, almost equal in width to elytra; elytra broad, rounded posteriorly, with fine, dense punctation and large, sparse punctures in double confused rows; legs stout, with all tibiae similarly developed. Introduced into New Zealand for biological control of St John's wort (*Hypericum*), and now established.

[77] Chrysomelidae: Galerucinae (Alticini)
Fig. 240 *Agasicles hygrophila* Selman & Vogt
A medium-sized, elongate-oval flea beetle 4.5–5.0 mm long, black with base of antennae yellowish red, and with longitudinal U-shaped whitish-yellow spots on elytra; upper surface densely punctate, the punctures confused. Antennae approximated basally; pronotum subquadrate, distinctly narrower than elytra; lateral margin of pronotum and medial margins of elytra subparallel; elytra with distinct shoulders; legs robust; metafemora swollen. A South American species introduced into New Zealand from Australia for biological control of alligator weed (*Alternanthera phylloxeroides*), and now well established in Northland.

[77] Chrysomelidae: Galerucinae (Galerucini)
Fig. 241 *Adoxia vulgaris* (Broun)
A medium-sized beetle 3.0–6.0 mm long, with head, pronotum, and elytra uniformly yellowish rust-brown, or head brown, pronotum orange-yellow, and elytra olive or yellowish brown with dark brown edges; appendages usually dark brown. Upper body moderately convex, glabrous or nearly so, densely punctate, the punctures fine; head and pronotum distinctly narrower than elytra. Collected from rotten branches (e.g., *Podocarpus*), inflorescences of rangiora (*Brachyglottis repanda*), and beaten from shrubs. Widely distributed across the North I. and northern South I.

[77] Chrysomelidae: Cryptocephalinae
Fig. 242 *Arnomus brouni* Sharp
A moderately small, subcylindrical beetle 2.5–3.5 mm long, rust brown with 6 apical antennal segments darker, and often darker head, legs, and body margins; densely and coarsely punctate. Eyes evenly convex; pronotum emarginated and without teeth; pygidium usually partly exposed. Collected by beating manuka (*Leptospermum scoparium*) in flower. Recorded from around Auckland, and in the Nelson area.

[77] Chrysomelidae: Eumolpinae
Fig. 243 *Eucolaspis brunnea* (Fabricius)
A medium-sized, elongate-oval beetle 4.8–5.0 mm long, yellowish brown but variable, ranging from dark brown to brownish-ochreous, usually with a blackish stripe down the suture and one on either side of elytra. Upper surface strongly punctate; antennae filiform. Common on manuka (*Leptospermum scoparium*), especially when flowering, and on the foliage of other native trees and shrubs. Bronze beetle larvae inhabit soil, especially under manuka. Widely distributed.

[78] Nemonychidae: Rhinorhynchinae
Fig. 244 *Rhinorhynchus rufulus* (Broun)
A small weevil 2.0–2.8 mm long, narrowly oval, rust brown to dark brown with moderately dense, decumbent, yellowish-grey pubescence. Head abruptly constricted in front of eyes into a narrow, apically flattened rostrum; antennae inserted in apical half of rostrum, straight, with a loose 3-segmented club; prothorax as long as wide or longer in male, as wide as long or slightly wider in female; elytra distinctly striate; hind wings well developed. Adults are associated with Podocarpacae, and larvae are pollen feeders in male inflorescences of podocarps. Recorded from the Far North to Stewart I.

[79] Anthribidae: Anthribinae
Fig. 245 *Sharpius venustus* (Broun)
A moderately small, elongate-oval fungus weevil 3.1–3.4 mm long, pubescent and scaled; integument black with brilliant cream and orange markings. Head with rostrum longer than wide, expanded apically; antennae straight, with a 3-segmented club, the basal segment symmetrical and segment 8 elongate and slightly narrowed apically; pronotum slightly longer or slightly shorter than wide, with transverse carina slightly curved and lateral carina short; pygidium rugose in male and puncto-asperate in female. Beaten from various native and introduced shrubs. Widely distributed on both main islands, from Rotoehu State Forest to Invercargill.

[79] Anthribidae: Choraginae
Fig. 246 *Dysnocryptus pallidus* Broun
A small, oval, pubescent fungus weevil 1.2–2.3 mm long, variegated reddish-brown and yellow, often with black or dark brown markings, rarely entirely black. Head with a short, broad rostrum; antennae straight, with a 3-seg-

mented club, the basal segment asymmetrical; pronotum wider than long, with transverse basal carina terminating abruptly at lateral margin, and lateral carina absent; elytra elongate, with striae containing large punctures. Adults have been collected from leaf litter and beaten from dead honeysuckle. Distributed in the southern part of the North I. and northeastern South I., including some offshore islands (Stephens I., D'Urville I., and Chetwode Is).

[80] Belidae: Belinae
Fig. 247 *Cyrotyphus tridens* (Fabricius)
A large, irregularly shaped weevil 10–13 mm long, pale brown, mostly covered with whitish and pink scales. Head and pronotum narrower than elytra and tapering anteriorly; head not constricted behind eyes, with rostrum moderately elongate, broad; eyes prominent; antennae straight, without a club; pronotum trapezoidal; elytra broad, tuberculate, narrowed subapically; tarsal segment 3 strongly lobed. Adults are frequently found in dead wood of many kinds. Recorded from the North I. and northern South I.

[81] Belidae: Aglycyderinae
Fig. 248 *Aralius wollastoni* (Sharp)
A moderately small, elongate, subparallel weevil 3.0–3.2 mm long, dull brown, pubescent. Head abruptly constricted behind eyes, with abrupt posterior angles; rostrum short, broad, shorter in females than in males; antennae straight, with a distinct 2-segmented club; pronotum approximately subquadrate; elytra striate-punctate; tarsi with 2nd segment strongly lobed. Adults and larvae may be found beneath bark of dead or dying branches of five-finger. Apparently widely distributed.

[81] Brentidae: Brentinae
Fig. 249 *Lasiorhynchus barbicornis* (Fabricius)
A very large, extremely narrowly elongate weevil 18–75 mm long (male; female 18–47 mm), punctate, with larger punctures on elytra; minute yellowish pubescence on head, pronotum, and elytra and additional brown and longer pubescence on rostrum, antennae, and tarsi. Body matt brown variegated with reddish-brown spots, in some specimens almost uniformly dark brown; rostrum extremely elongate, shorter in female than in male; antennae straight, inserted apically in males, medially in females; pronotum with a median sulcus; elytra constricted subapically in males, evenly tapering in females; tarsi long. Oviposition sites are prepared by females from October to March by chewing a cavity in the bark of dying or suppressed trees (kauri, pigeonwood, rewarewa, tawa, karaka) or logs. Newly hatched larvae bore radially into the wood, and enlarge the tunnel as they grow. Ambrosia fungi and yeast growing in the tunnels most likely serve as larval food. Recorded from the North I. and northern South I., mostly at lower altitudes.

[81] Brentidae: Apioninae
Fig. 250 *Neocyba metrosideros* (Broun)
A small, pyriform weevil 1.8-2.5 mm long, glossy reddish brown or brown to almost black with sparse, moderately long, yellowish-grey pubescence. Head and pronotum with meshed microsculpture; rostrum elongate, narrow; antennae slightly geniculate, inserted near middle of rostrum, with scape almost as long as remainder of antenna and club 3-segmented; pronotum narrower than elytra, slightly elongate and contracted anteriorly; elytra oval in outline, with coarsely punctate striae and convex interstices. Adults occur on foliage of pohutukawa (*Metrosideros excelsa*), and larvae live subcortically in branchlets. Recorded from Northland to Auckland and the Coromandel area, including The Aldermen, Mercury Is, Little Barrier I., Ohena I., Hen and Chickens Is, Coppermine I., and the Mokohinau Is.

[82] Curculionidae: Brachycerinae
Fig. 251 *Anagotus turbotti* (Spiller)
A large weevil up to 24 mm long, brown or reddish brown with whitish dorsal spots, well marked on middle and posterior elytra; ventral surface whitish. Elytra with large, cone-shaped posterior protuberances. Adults may be found in the branches of native trees (e.g., ngaio), where larvae are most likely wood-borers. Surviving only on rat-free offshore islands such as the Three Kings, Poor Knights, and Muriwhenau in the Hen and Chickens group.

[82] Curculionidae: Brachycerinae
Fig. 252 *Mandalotus miricollis* (Broun)
A medium-sized, narrowly oval weevil 4.0-7.0 mm long, matt brownish-grey, usually variegated with inconspicuous, small, irregularly shaped paler spots. Pronotum and particularly elytra with scattered elongate scales; rostrum broad, short; antennae strongly elbowed; pronotum as broad as elytra, with more or less distinct transverse wrinkles; elytra with longitudinal shallow ridges. Occurs on sandy beaches and coastal vegetation, though occasionally found in gardens in clusters of flax. Recorded in the Auckland area.

[82] Curculionidae: Curculioninae
Fig. 253 *Andracalles spurcus* (Broun)
A small, oval weevil 1.9–2.4 mm long, matt brown, with brown and paler brown projecting scales. Rostrum narrow, long; antennae distinctly geniculate; pronotum slightly narrower than elytra; elytra with scales forming irregular rows; legs stout, with projecting scales. Adults have been collected by beating *Astelia* sp. at dusk; also found on pohutukawa and in bryophytes in dense forest. Recorded from Northland, Auckland, and the Bay of Plenty.

[82] Curculionidae: Curculioninae
Fig. 254 *Myrtonymus zelandicus* Kuschel
A minute, narrowly elongate weevil 0.7–0.8 mm long, pale yellowish or reddish brown with appendages usually a shade paler. Rostrum moderately elongate, sparsely punctate; eyes completely reduced; pronotum longer than wide, variably and sparsely punctate; elytra flattened, with fine punctation forming obsolescent striae. As far as is known, this blind species is the smallest weevil in the world.

Consistently found around the fine rootlets of all native species of Myrtaceae, it occurs in the top 10 cm of soil during wetter conditions and at greater depth, 30–60 cm, during dry periods. Recorded from the northern North I.

[82] Curculionidae: Curculioninae
Fig. 255 *Stephanorhynchus lawsoni* Sharp
A small, distinctive weevil 3.2–4.8 mm long, characterised by its long, deeply constricted head, conical prothorax, tuberculate elytra, and extraordinarily long hind legs. These have strongly curved tibiae and femora with a large, rectangular tooth, enabling the weevil to clasp bunches of flower stamens and rake pollen towards the mouth. Common in Northland and the northern South I.

[82] Curculionidae: Cossoninae
Fig. 256 *Macroscytalus remotus* (Sharp)
A small, narrowly elongate weevil 2.5–3.0 mm long, glossy yellowish red or dark reddish brown; subglabrous, with inconspicuous short and erect setae. Rostrum long, broad, slightly expanding apically; antennae strongly geniculate; pronotum almost as broad as elytra, rounded laterally; elytra mostly subparallel, with angular basal angles and with distinct punctate striae. Beaten from various trees, and reared from larvae in *Coprosma macrocarpa*. First reported from Auckland.

[82] Curculionidae: Cossoninae
Fig. 257 *Xenocnema spinipes* Wollaston
A somewhat flattened and elongate weevil 3.0–4.8 mm long, with a short, broad rostrum, elongate prothorax, elytra with well marked striae and punctation, and heavy legs with strong teeth at the apex of the tibiae. Adults and larvae construct galleries under loose bark of *Agathis* and *Araucaria* species. Restricted in distribution by the availability of host trees, and hence recorded mostly from northern localities.

[82] Curculionidae: Scolytinae
Fig. 258 *Hylastes ater* (Paykull)
A medium-sized, narrowly elongate weevil 3.5–6.0 mm long, dark brown to black, rarely reddish brown; antennae and tarsi usually reddish brown. Pronotum elongate and densely punctate, the punctures round; elytral punctures round, and forming striae, with short inconspicuous pubescence. Found mainly in industrial timber and under bark of *Pinus radiata* logs. Recorded from both main islands, ranging from Waipoua State Forest to Otago.

[82] Curculionidae: Scolytinae
Fig. 259 *Phloeosinus cupressi* Hopkins
A small, moderately short weevil 2.8–3.0 mm long, subcylindrical with forebody slightly tapering anteriorly, subglabrous with inconspicuous short and erect setae, moderately glossy. Head largely concealed by pronotum from above; rostrum short and broad; pronotum narrowing anteriorly, as broad as elytra at base; elytra mostly subparallel, with deep, coarsely punctate striae. An adventive species recorded from Auckland on *Cupressus torulosa*.

[82] Curculionidae: Platypodinae
Fig. 260 *Platypus apicalis* White
A medium-sized, subcylindrical, narrowly elongate weevil 6–7 mm long, subparallel-sided, glossy reddish brown to dark brown. Rostrum very short; antennae weakly geniculate, with a broad club; pronotum slightly elongate, rectangular, shallowly emarginated mediolaterally; elytra subparallel, finely striate; tarsi long and slender, with basal segment strongly elongate. Adults are fully winged, and may be collected using Malaise traps. They bore into a wide range of native and exotic trees, making tunnels about 2 mm in diameter at right angles to the grain. These become infected with ambrosia fungi, on which the larvae feed. Occurs widely on both main islands and on the Chatham Is.

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APPENDIX 1: Endangered beetle species

[modified after Molloy *et al.* 1994]

A number of species are as yet undescribed, and are referred to by informal names or by 'sp.' Synonyms and superseded names are in parentheses.

- Seven species are listed in Category A (highest priority threatened species):

Geodorcus *(=Dorcus) auriculatus, G. ithaginis, G.* 'Moehau', ***Mecodema*** *costellum costellum, M. laeviceps,* ***Prodontria*** *bicolorata, P. lewisi*

- Ten species are listed in Category B (second priority threatened species):

Amychus *granulatus,* ***Anagotus*** *stephenensis, A. turbotti,* ***Hadramphus*** *spinipennis,* ***Heterexis*** *seticostatus,* ***Lyperobius*** *huttoni,* ***Megadromus*** 1 sp., ***Oregus*** *inaequalis,* ***Prodontria*** *grandis,* ***Zecillenus*** *(=Cillenum) tillyardi*

- Six species are listed in category C (third priority threatened species):

Amychus *candezei,* ***Anagotus*** *fairburni,* ***Hadramphus*** *stilbocarpae,* ***Mecodema*** *chiltoni,* ***Oclandius*** *laeviusculus,* ***Prodontria*** *modesta*

- Ten species are listed in Category X (species which have not been sighted for a number of years but which may still exist):

Hadramphus *tuberculatus,* ***Mecodema*** *costellum* 'spelles', *M. punctellum,* ***Megacolabus*** *sculpturatus,* ***Megadromus*** *antarcticus* 2 subspp., ***Pericoptus*** *nitidulus,* ***Prodontria*** 'Five Rivers', ***Stethaspis*** *convexa,* ***Thotmus*** *halli*

- Almost eighty species are assigned to Category I (species about which little information exists, but which are considered threatened):

Amychus 1 sp., ***Blosyropus*** *spinosus,* ***Brullea*** *antarctica,* carabid 'Kamo', ***Euconnus*** *microcilipes, E. paracilipes,* ***Holcaspis*** *falcis,* ***Lyperobius*** *carinatus,* ***Maorinus*** *hunuaeformis* + 1 sp., ***Maoripamborus*** *fairburni* + 1 sp., ***Mecodema*** *allani, M. angustulum, M. atrox, M. brittoni, M. costellum lewisi, M. costellum obesum, M. curvidens, M. dunense, M. dux, M. howitti, M. integratum, M. litoreum, M. minax, M. morio, M. nitidum, M. pavidum, M. pluto, M. proximum, M. pulchellum, M. quoinense, M. rex, M. strictum,* ***Megacolabus*** *bifurcatus, M. obesus,* ***Megadromus*** *capito (=bucolicus), M. compressus, M. fultoni, M. haplopus, M.* 'Omarama', *M. virens* + 5 spp., ***Metablax*** 1 sp., ***Mimopeus*** *parallelus,* ***Nesoptychias*** *simpliceps,* ***Neuraphaconnus*** *toronouii,* ***Nothaldonus*** *peacei,* ***Oclandius*** *cinnaraeus,* ***Paralissotes*** *mangonuiensis,* ***Paratorchus*** *alifer, P. flexuosus,* ***Pericoptus*** *frontalis,* ***Pheloneis*** *gratiosus,* ***Prodontria*** *patricki, P. regalis, P. setosa, P.* 'Twizel', ***Sciacharis*** *yakasensis,* ***Stephanorhynchus*** *insolitus,* ***Syrphetodes*** 1 sp., ***Tangarona*** *pensus,* ***Tychanopais*** *tuberosus,* ***Zeopoecilus*** 5 or 6 spp.

APPENDIX 2: Major entomological collections in New Zealand

AMNZ Auckland Institute & Museum
Private Bag 92-018, Auckland
Attn: Mr John W. Early, Curator of Entomology
Tel: +64 9 309 0443 Fax: +64 9 379 9956
Internet: early@akmus.org.nz

CMNZ Canterbury Museum
Rolleston Ave, Christchurch
Attn: Simon Pollard, Curator of Invertebrate Zoology
Tel: +64 3 366 8379 Fax: +64 3 366 8379
Internet: spollard@cantmus.govt.nz

FRNZ Forest Research Institute
Private Bag 3020, Rotorua
Attn: Roger Crabtree, Curator of Entomology
Tel: +64 7 347 5899 Fax: +64 7 347 5333
Internet: crabtrer@fri.cri.nz

LUNZ Entomology Research Museum
Dept of Entomology & Animal Ecology, P.O. Box 84, Lincoln University, Canterbury
Attn: Mr John W. M. Marris, Curator
Tel: +64 3 325 2811 Fax: +64 3 325 3844
Internet: marris@tui.lincoln.ac.nz

MONZ Museum of New Zealand Te Papa Tongarewa
Natural Environment Dept, P.O. Box 467, Wellington
Attn: Mr Ricardo L. Palma, Curator, Terrestrial Arthropods
Tel: +64 4 381 7361 Fax: +64 4 381 7310
Internet: ricardop@tepapa.govt.nz

NZAC New Zealand Arthropod Collection
Landcare Research, Mount Albert Research Centre, Private Bag 92-170, Auckland
Attn: Dr Trevor K. Crosby, Curator
Tel: +64 9 849 3660 Fax: +64 9 849 7093
Internet: crosbyt@landcare.cri.nz

OMNZ Otago Museum
P.O. Box 6202, Dunedin
Attn: Mr Anthony C. Harris, Curator of Zoology
Tel: +64 3 477 2372 Fax: +64 3 477 5993

Note. New Zealand beetles may be found in institutional and private collections around the world. For instance, the Broun Collection with its many primary type specimens is held at the Natural History Museum, London, and the Field Museum, Chicago, has extensive holdings of Staphylinidae and Leiodidae from New Zealand. Despite name changes affecting some institutions, the list of repositories published by Watt (1979c) is still a useful introduction.

APPENDIX 3

Key to tribes of Carabidae in New Zealand

[provided by J.F. Lawrence]

1 Clypeus broader than distance between antennal sockets; eyes large and protruding; protibia with 2 spurs terminal; lateral pronotal carinae absent or incomplete posteriorly ... **Cicindelini**
—Clypeus narrower than distance between antennal sockets; without other characters in combination ... 2

2(1) Metepimeron not visible between posterior edge of metepisternum and anterior edge of 1st ventrite ... 3
—Metepimeron visible as a lobe between metepisternum and 1st ventrite ... 5

3(2) Procoxal cavities closed behind; apical segment of maxillary palp slender and fusiform; length less than 15 mm ... **Migadopini**
—Procoxal cavities open behind; apical segment of maxillary palp more or less expanded and truncate apically; length more than 15 mm ... 4

4(3) Mandibles multidentate, smooth on upper surfaces; clypeus without setiferous punctures ...**Cychrini**
—Mandibles not toothed, rugose on upper surfaces; clypeus with a setiferous puncture at each anterior angle ... **Carabini**

5(2) Body pedunculate, with a distinct, narrow waist or peduncle between prothorax and elytra; scutellum entirely contained within peduncle, not forming a wedge between elytral bases ... 6
—Body not pedunculate, or if slightly so then scutellum extending behind peduncle and forming a wedge between elytral bases ... 7

6(5) Mesocoxal cavities open laterally, partly closed by mesepimeron ... **Clivinini**
—Mesocoxal cavities closed laterally by meeting of sterna ... **Broscini**

7(5) Mandibles with a setiferous puncture in concavity (scrobe) along outer edge ... 8
—Mandibles without a setiferous puncture in concavity (scrobe) along outer edge ... 11

8(7) Maxillary palp with terminal segment very small ... **Bembidiini**
—Maxillary palp with terminal segment usually about as long as penultimate segment ... 9

9(8) Elytra without an inner longitudinal ridge beneath apical edge; head with frontal furrows extending beyond posterior edge of eyes ... **Trechini**
—Elytra with an inner longitudinal ridge, its end visible beneath edge of elytron, level with apical end of epipleuron; head with frontal furrows not extending behind eyes ... 10

10(9) Maxillary palp with penultimate segment setose; male protarsi with 2 segments dilated and dentate on inner face ... **Zolini**
—Maxillary palp with penultimate segment glabrous; male protarsi unmodified, or only slightly so ... **Psydrini**

11(7) Elytra with apex rounded as a single curve, or acutely angled at apex; Abdominal apex usually concealed from above; cloration rarely yellow and black ... 12
—Elytra with apex transversely or obliquely truncate, exposing abdominal apex from above; coloration often yellow and black; body often flattened, or with prothorax elongate and narrow ... 15

12(11) Head with a single pair of supraorbital setiferous punctures ... **Harpalini**
—Head with 2 pairs of supraorbital setiferous punctures ... 13

13(12) Clypeus emarginate, with a pale membrane between clypeus and labrum (usually within emargination); mandibles characteristically bifurcate, with a large mesal tooth; labrum often deeply emarginate ... **Licinini**
—Clypeus not emarginate, without an obvious pale membrane between it and labrum ... 14

14(13) Elytra with an inner longitudinal carina, its apical end visible below lateral edge towards apex, causing end of epipleuron to appear twisted; carina sometimes concealed by lateral edge of abdomen, which fits into a groove between it and epipleural apex; mentum usually bifid at apex ... **Pterostichini**
—Elytra without an inner carina or, if present, not extending to lateral edge; mentum usually simple or with a single median apical tooth ... **Agonini**

15(11) Mentum supported on a projecting submentum; head not sharply constricted behind eyes; mandibles with hollow outer face; claws often pectinate ...**Lebiini**
—Without a projecting submentum; head sharply constricted behind eyes; mandibles without hollow outer face; claws simple ... **Pentagonicini**

APPENDIX 4: Distribution of collection records for beetle families in New Zealand

(Nth, North I.; Sth, South I.; Stw, Stewart I.; Ke, Kermadec Is; 3K, Three Kings Is; Ch, Chatham Is; Sn, The Snares Is; An, Antipodes Is; Bo, Bounty Island; Au, Auckland Is; Ca, Campbell I.).

Family	Nth	Sth	Stw	Ke	3K	Ch	Sn	An	Bo	Au	Ca
Aderidae	•	•	•		•	•					
Agyrtidae	•	•									
Anobiidae	•	•	•	•	•	•	•	•		•	•
Anthicidae	•	•	•		•	•					
Anthribidae	•	•	•		•	•	•		•	•	
Archeocrypticidae	•	•									
Belidae	•	•									
Bostrichidae	•	•									
Bothrideridae	•	•				•					
Brentidae	•	•			•						
Buprestidae	•	•									
Byrrhidae	•	•	•		•		•			•	•
Cantharidae	•	•									
Carabidae	•	•	•	•	•	•	•	•	•	•	•
Cavognathidae	•	•			•	•					
Cerambycidae	•	•	•	•	•	•		•			
Cerylonidae	•	•	•			•					
Chaetosomatidae	•	•				•					
Chalcodryidae	•	•	•								
Chelonariidae	•										
Chrysomelidae	•	•	•	•	•	•					
Ciidae	•	•	•		•	•					
Clambidae	•	•	•		•						
Cleridae	•	•	•	•	•	•					
Coccinellidae	•	•	•	•	•	•		•		•	•
Colydiidae	•	•	•	•	•	•				•	•
Corticariidae	•	•	•	•	•	•				•	•
Corylophidae	•	•	•	•	•	•		•			•
Cryptophagidae	•	•	•			•					
Cucujidae					•						
Curculionidae	•	•	•	•	•	•	•	•		•	•
Dermestidae	•	•		•		•					
Derodontidae		•									
Dryopidae	•	•									
Dytiscidae	•	•	•	•		•					
Elateridae	•	•	•	•	•	•					
Elmidae	•	•	•								
Endomychidae	•	•			•						
Erotylidae	•	•	•			•					

Family	Nth	Sth	Stw	Ke	3K	Ch	Sn	An	Bo	Au	Ca
Eucinetidae	•	•									
Eucnemidae	•	•	•			•					
Gyrinidae	•	•?									
Heteroceridae	•	•									
Histeridae	•	•	•	•	•	•					
Hydraenidae	•	•	•			•	•	•		•	•
Hydrophilidae	•	•	•	•	•	•	•	•	•	•	
Jacobsoniidae	•	•	•								
Laemophloeidae	•	•		•	•						
Languriidae	•	•	•								
Leiodidae	•	•	•		•	•	•			•	•
Limnichidae	•	•									
Lucanidae	•	•	•	•	•	•					
Lycidae	•	•									
Melandryidae	•	•	•		•	•	•	•		•	•
Melyridae	•	•	•		•	•					
Monotomidae	•	•									
Mordellidae	•	•	•			•					
Mycetophagidae	•	•			•	•					
Nemonychidae	•	•	•								
Nitidulidae	•	•	•	•		•					
Nosodendridae	•	•			•						
Oedemeridae	•	•	•	•		•					
Phalacridae	•	•	•								
Phloeostichidae	•	•									
Phycosecidae	•	•	•?	•		•					
Prostomidae	•	•									
Ptiliidae	•	•	•	•	•	•	•	•		•	•
Ptilodactylidae	•	•									
Pyrochroidae	•	•									
Rhipiphoridae	•	•									
Rhysodidae	•	•?									
Salpingidae	•	•	•	•	•	•	•	•	•	•	•
Scarabaeidae	•	•	•	•	•	•	•				
Scirtidae	•	•	•		•	•					
Scraptiidae	•	•	•			•					
Scydmaenidae	•	•	•		•	•					
Silvanidae	•	•		•							
Staphylinidae	•	•	•	•	•	•	•	•	?	•	•
Tenebrionidae	•	•	•	•	•	•	•	•	•	•	•
Trogidae	•										
Trogossitidae	•	•	•		•	•					
Ulodidae	•	•			•						

TAXONOMIC INDEX

Only coleopteran taxa are indexed, since other organisms mentioned in the text, e.g., host taxa, are largely derived from other published sources. Names are listed in a typographical hierarchy, as follows. CAPITALS: taxa above family level. **Bold**: the 82 families that occur in New Zealand. Normal: exotic families, family synonyms, subfamilies, tribes. *Italic*: genera, species. Page numbers on which a taxon is keyed out are suffixed 'k'. Bold type denotes the page on which a family is described, and italic the page on which a taxon is illustrated.

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Contributors should discuss their intentions with a member of the Invertebrate Systematics Advisory Group or with the Series Editor before commencing work; all necessary guidance will be given.

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Kua whakatūria tēnei rārangi pukapuka hei whakahauhau ki nga tohunga whai mātauranga kia whakātu i nga mea e pā ana ki nga kararehe o Niu Tīreni. He āhua tohunga tēnei rārangi pukapuka, engari, ko te hiahia kia mārama ai te tuhituhi, kia mōhio ai te maria ki nga tohu o ia ngārara, o ia ngārara, ā, kia whakārī i te mātauranga e pā ana ki a rātou.

Ko ēnei pukapuka *Fauna of New Zealand* kāore e pā ana ki nga kararehe moana, arā, ki nga ika, ki nga mātaitai rānei. E tino mōhiotia ana nga kararehe. Kei roto i nga pukapuka e kīa ana *Marine Fauna of New Zealand* nga tuhituhi e pā ana ki nga kararehe moana nga ika me nga mātaitai, hoki.

Tuhituhinga. Ko te tono ki nga tohunga kia tukua mai ā koutou pukapuka. E wātea ana te kohikohinga kararehe e kīa ana ko te New Zealand Arthropod Collection hei mātakitaki māu.

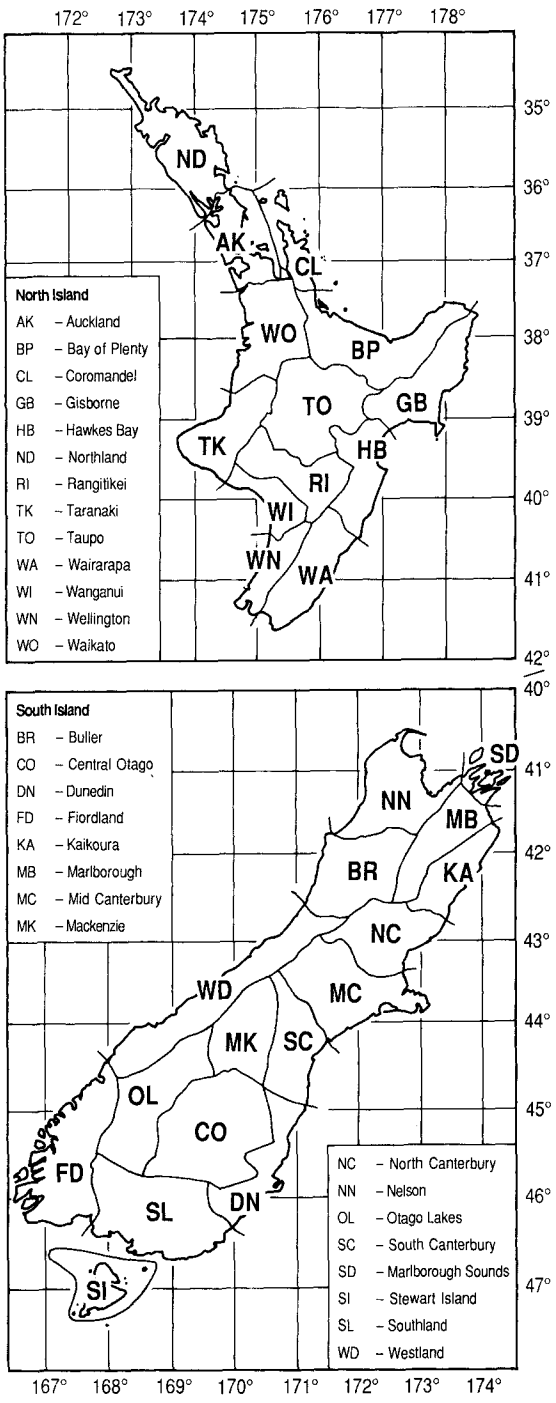
Me whākī ō koutou whakāro ki te mema o te kāhui tohutohu o *Fauna* e tika ana, ki te Etita rānei, i mua i te tīmatanga tuhituhi.

Nga kai-hoko pukapuka. Me tuhi ki te *Fauna of N.Z.*, Manaaki Whenua Press, Landcare Research, P.O. Box 40, Lincoln 8152, New Zealand.

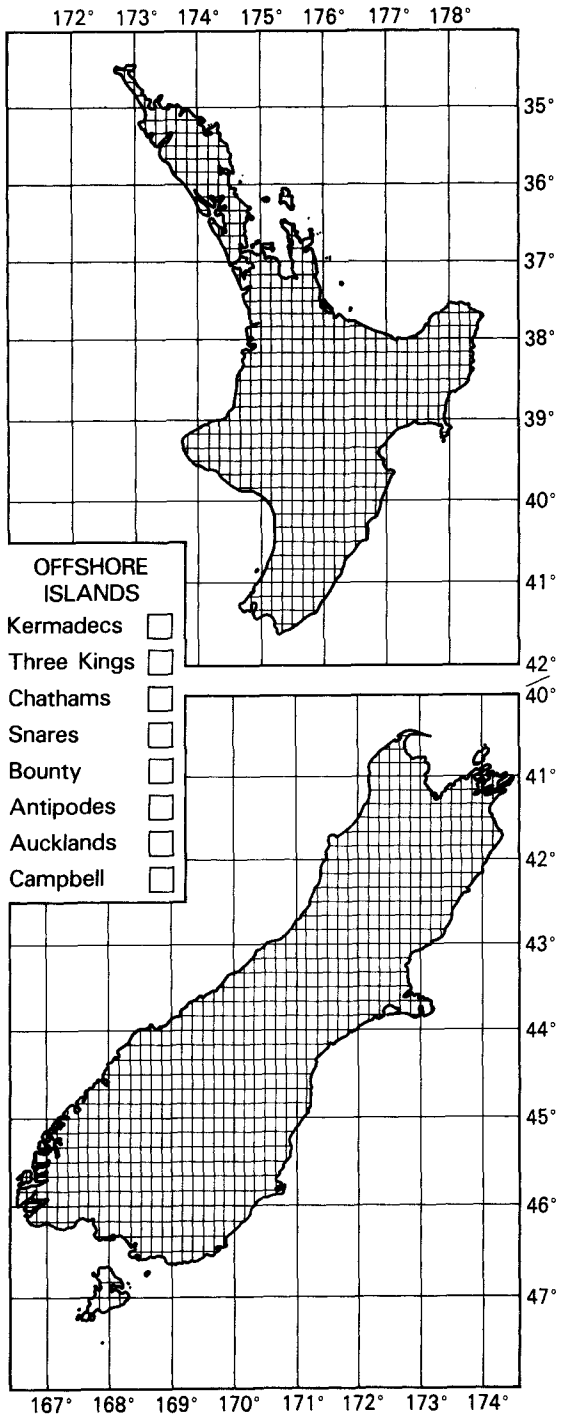
E rua nga tūmomo kai-hoko: 'A' – Kai-hoko tūmau; ka tukua ia pukapuka, ia pukapuka, me te kaute, i muri tonu i te tānga o taua pukapuka. 'B' – ka tukua nga pānui anake, a tōna wā, a tōna wā.

Te utu (tirohia te whārangi 198): Ko te kōpakitanga me te pane kuini kei roto i te utu. Me utu koutou e noho ana i Niu Tīreni me Āhitereiria ki nga tāra o Niu Tīreni. Ko ētahi atu me utu te whakaritenga i nga tāra Marikena.

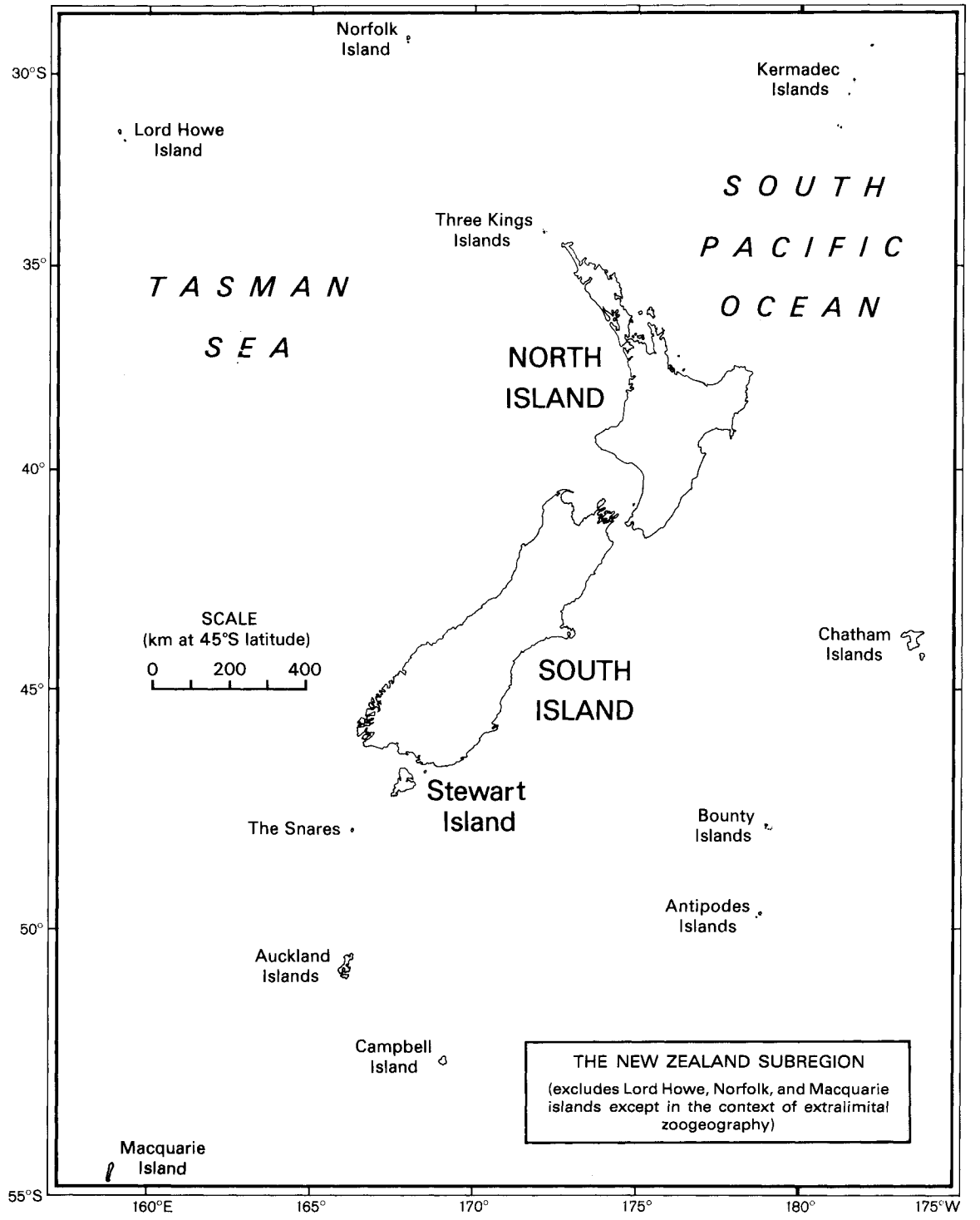
E toe ana nga pukapuka o mua. Mehemea e hiahia ana koe ki te katoa o nga pukapuka, tonoa mai kia heke iho te utu. E tekau pai hēneti te heke iho o te utu ki nga toa hoko pukapuka.



Area codes and boundaries used to categorise specimen locality data (after Crosby *et al.* 1976)



Base-map for plotting collection localities; this may be photocopied without copyright release


Norfolk Island
Kermadec Islands
Lord Howe Island
SOUTH PACIFIC OCEAN
Three Kings Islands
TASMAN SEA
NORTH ISLAND
SCALE
(km at 45°S latitude)
0 200 400
SOUTH ISLAND
Chatham Islands
Stewart Island
The Snares
Bounty Islands
Antipodes Islands
Auckland Islands
Campbell Island
THE NEW ZEALAND SUBREGION
(excludes Lord Howe, Norfolk, and Macquarie islands except in the context of extralimital zoogeography)
Macquarie Island
30°S
35°
40°
45°
50°
55°S
160°E
165°
170°
175°
180°
175°W

TITLES IN PRINT / PUNA TAITARA TAA

1 **Terebrantia** (Insecta: Thysanoptera) • *Laurence A. Mound & Annette K. Walker*
ISBN 0-477-06687-9 • 23 Dec 1982 • 120 pp. $29.95

2 **Osoriinae** (Insecta: Coleoptera: Staphylinidae) • *H. Pauline McColl*
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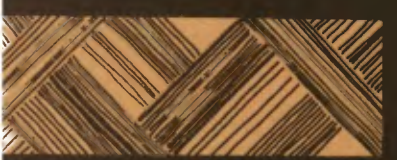

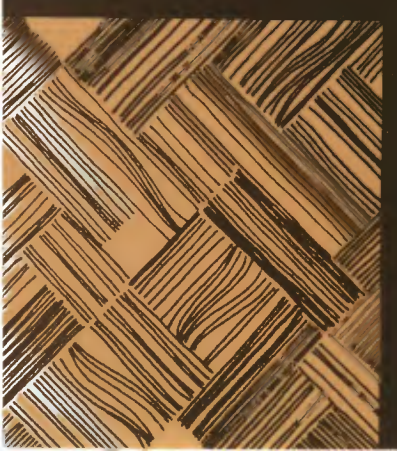

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