Drawings of New Zealand insects

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Contents

Introduction

This folio contains a selection of insect drawings done for the Systematics Group, Entomology Division, DSIR, at Mt Albert Research Centre, Auckland, where I have been working as biological illustrator since 1975. The staff of the Systematics Group carry out taxonomic research to describe and classify New Zealand's insects, and undertake specialist identification and fieldwork. They also maintain the internationally recognised New Zealand Arthropod Collection which, with about six million specimens, is the largest research collection of New Zealand insects in the world. Nearly all my drawings have been for their scientific publications; some have been published already, but many more await publication, especially in contributions of the new "Fauna of New Zealand" publication series.

Drawing for identification

The main purpose of these drawings is to provide an aid for identifying insects, the prime requirement being to show shape, proportions, pattern, and the different parts of the insect so clearly and accurately that it can be identified from the drawing. For this reason it is necessary to look at the insect as objectively as possible. There is no room for personal expression of how one feels about it, although empathy or a feeling for its form is necessary within the limits of accuracy to make the drawing convincing and life-like, and raise it above the impersonality of a diagram. This "feeling" need not necessarily be cultivated, as some involvement is inevitable. It is as if one visually feels the object as one draws it, the hand following the eye, so that one has the sensation of recreating it.

Although the drawings may look completely realistic they are not attempts to copy the appearance of the insect. They are really only abstractions, in that only selected features from the mass of detail which confronts the eye are depicted, this selection being based on what is needed for identification. Sometimes it is necessary to disregard surface features to show structures that may be only partially visible. When the selected features are converted into the absolute black and white of an ink drawing the drawing can look very different from the actual appearance of the insect. This is because drawing an insect is a form of communication like drawing a map, where various marks and symbols are used to represent the selected features. Line, for example, is a "symbol" used to represent the edge of a form. Edges exist in nature, but lines do not. It is impossible to show everything within the limitations of the drawing medium, just as it is impossible to make a complete verbal or written description.

Illustrations and written descriptions

Illustrations are usually used in conjunction with written descriptions for identification. Written descriptions can be used on their own, but illustrations are better because they give simultaneously all forms, dimensions, and relations between parts, whereas descriptions include only a selection of these features. Comparisons between species that may be almost impossible to describe in words may be easily shown pictorially. Illustrations also show not only what is known to be useful, but also much that might conceivably be useful — this is practically impossible in a written description.

Drawing and photography

Photography is sometimes used to produce illustrations for identification, although it is more difficult to achieve clarity of detail, especially at high magnification. Structures difficult to photograph due to lack of contrast can be easily shown in a drawing and important features emphasised. Drawings are also usually less expensive and more suitable for publication. However, photography is probably better for showing the behaviour of insects and their habitats. This whole subject is covered in "Photographing Insects" by Bruce B. Given (*Bulletin of the Entomological Society of New Zealand 6,* 1982).

Use of microscope

Because the details of an insect are difficult to see with the naked eye, I use a Wild M5 stereomicroscope with a drawing tube (camera lucida) attached. This latter device, comprising prism and mirror, allows you to "see" an image on the drawing paper, and enables proportions to be drawn accurately. However, the weta on Plate 22 was too large for the microscope and had to be drawn using a magnifying glass.

Drawing for publication

All my insect drawing are for publication, mostly in scientific journals. They are usually drawn two or three times larger than the published size, then photographically reduced for publication. Drawing them larger than final size enables detail to be drawn more accurately, and any imperfections that may be in the original are minimised in reduction. The drawing must be coarse enough to withstand reduction, as work which is too finely detailed in the original does not reproduce well. Most of the drawings in this folio are reproduced at the same size or slightly smaller than the originals, and the smaller reproductions opposite the main plates give some idea of how they would appear in the publication.

Most illustrations of insects done for scientific publications are in black and white. Colour is not often used, mainly because of the expense involved in publication and because in most cases colour is unnecessary for identification.

The drawings are done with black Indian ink on white illustration board. I usually use technical drawing pens with nibs of varying thicknesses as they are much easier to handle than dip pens while using a microscope. All my drawings are reproduced in publication by "line" reproduction, which gives greater clarity and contrast and is less expensive than "half-tone" reproduction. Black ink is used because it is suitable for line reproduction, whereas photographs, or a "grey" medium like pencil, must be reproduced by half-tone methods. Mid-tone values (the grey areas between black and white) for line reproduction have to be drawn as areas of black dots (stipple), fine black lines (hatching), or in some other form depending on the texture of the surface being drawn. These black dots or lines blend optically with the white paper to appear as a tone value or grey area. For dark tones time can be saved by reversing this process and drawing white ink lines or dots onto a black area to produce the same effect. This gives a cleaner drawing, more suitable for reproduction.

Scraperboard

In cases where the insect is dark and details like white hairs are to be shown I prefer to use scraperboard, a type of illustration board coated on one side with white chalk. Black ink is printed or drawn onto the surface and, when dry, scratched with a sharp tool like a scalpel to expose the white ground beneath. In this way very sharp dense white lines can be easily produced. Plates 3, 5, 19, and 20 are examples of work where scraperboard was used.

Drawing the insect

Most insects are drawn in dorsal (back) view as they are most commonly seen from this angle. This view is also usually the most convenient for identification. General shape, proportions, and any colour pattern can be shown clearly, and different insects can be easily compared when drawn from a consistent angle.

Adult insects are usually dry mounted, either with a pin through them or glued to a small piece of card through which a pin has been stuck. I set the insect up under the microscope by pressing this pin into a small rubber inclinable cup stage which, when tilted, enables the insect to be positioned at any angle under the microscope. As the insect is invariably twisted slightly it has to be re-positioned whenever a different part is drawn. I usually draw the head first, then the thorax and abdomen (these parts comprising the body), then add the legs and antennae ("feelers") in as natural a position as possible. If the antennae are very long (Plate 2), I usually draw them around the body to save space in publication. If a good insect specimen is unavailable a composite drawing can be done using two or three imperfect specimens.

I start by drawing lightly in pencil directly onto the illustration board, and when this is complete go over it in ink. The pencil lines are rubbed out later when the ink is dry. I ink in the outline first, then add surface detail and shading to show pattern and three-dimensional form. The latter can be shown either by shading away from a source of light which is on one side of the insect, or "sculpturally" by darkening the edges and leaving the middle white. I usually use a combination of both methods or whatever is most effective for the purpose. I normally draw with the source of light on the left as it is physically convenient for me being a right-hander to have the microscope lamp on the left-hand side of the microscope and the drawing on the right. Light from other directions can also be added to show form, particularly "reflected light", which is light thrown back onto the specimen from the opposite direction of the principal light source. If this is not visible on the specimen it can be invented in the drawing, not just to make it "look pretty", but to show the form as clearly as possible. Drawing an insect can be quite complex when form, pattern, and surface texture such as pits or hairs have to be drawn at the same time. Sometimes a compromise is necessary where, for example, shading to show form is sacrificed for the sake of showing colour pattern clearly.

A drawing of an insect takes about three days to do, depending on its complexity.

Acknowledgments

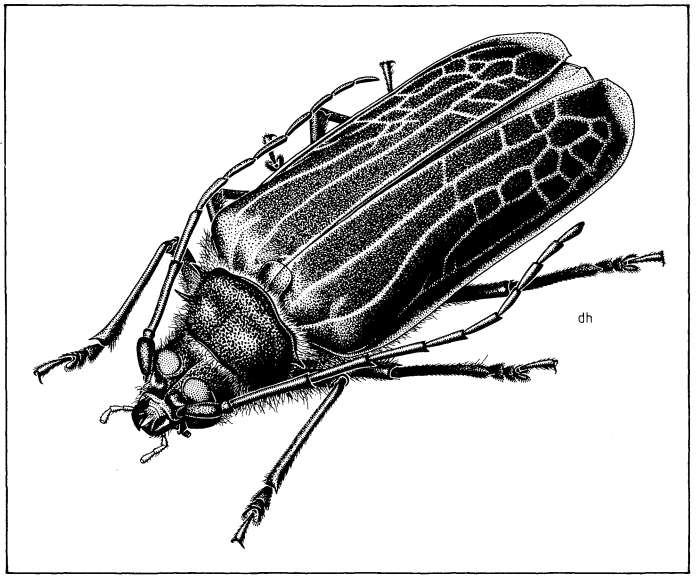
I would like to thank Dr T. K. Crosby for substantial help in preparation of this folio, and the following people in Entomology Division, DSIR, for information on the insects: Dr J. C. Watt (beetles and cat flea), Ms C. F. Butcher (planthoppers and treehopper), Mrs B. M. May (weevils and lacebug), Mr J. S. Dugdale (cicada and black mountain ringlet), Dr B. A. Holloway (Australian soldier fly and New Zealand bat-fly), Dr G. W. Ramsay (wetas), and Mr E. W. Valentine (native ant). I am also grateful to Mr P. G. McGregor, Ms C. F. Butcher, and Dr T. K. Crosby for their comments on the manuscript and suggestions included in the text.

Plate 1

Huhu beetle

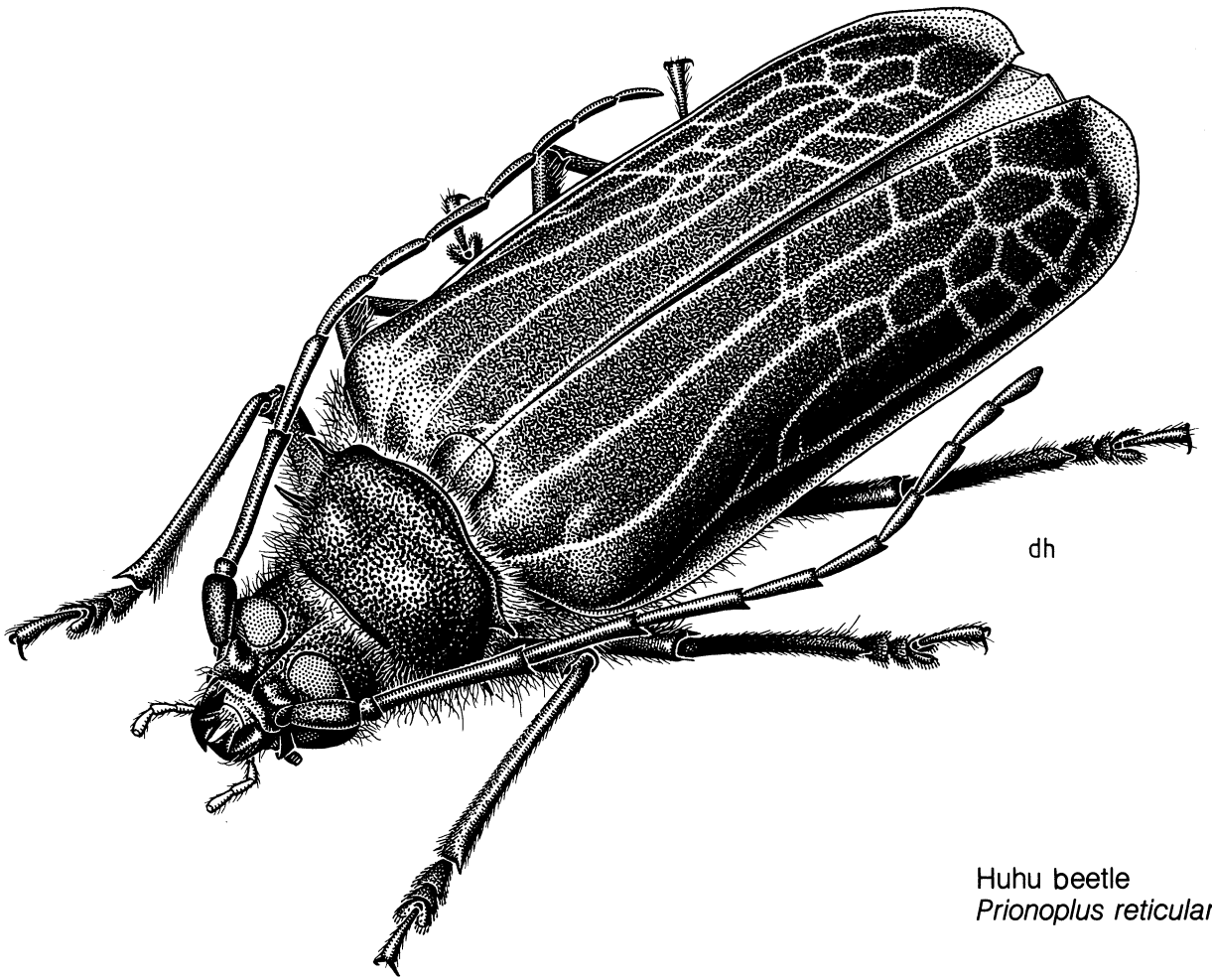
This common, easily recognised insect was drawn not so much for identification but as an illustration for publication covers, displays, etc. For this reason I chose a more natural position than the usual dorsal (back) view. White lines have been used in many places to separate different parts of the insect.

The drawing on the main plate is half the size of the original.



Prionoplus reticularis
White, 1846.
Coleoptera: Cerambycidae.
Huhu beetle.

The huhu is New Zealand's largest beetle, large females measuring up to 45 × 15mm. On some summer nights large numbers of huhus bombard lighted windows, especially near pine forests. The larva is an almost legless white grub which bores into recently dead trunks and logs of native conifers and *Pinus radiata*. The grub was a prized delicacy of the early Maori, and is still eaten by the more adventurous epicures (either raw or fried in butter). The huhu is generally beneficial in pine forests because it speeds the breakdown of waste logs and slash.



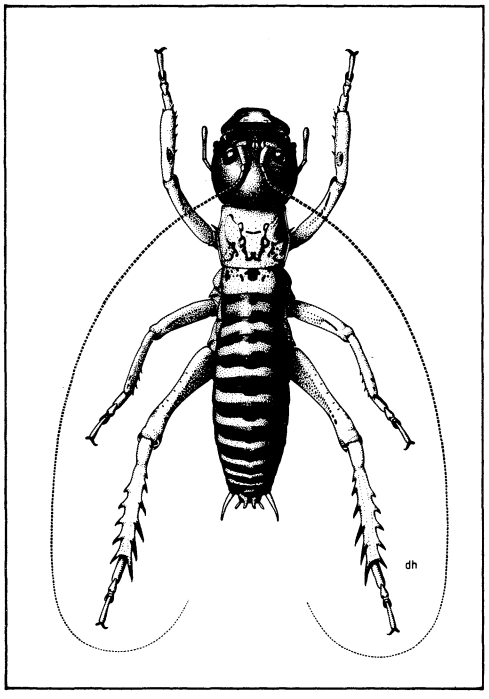
Huhu beetle
Prionoplus reticularis

Plate 2

Canterbury weta, male

In this drawing dot stipple only was used to show both colour pattern and three-dimensional form. The smooth surface of the body was indicated by varying the density of dots to give a uniform gradation from dark to light. When drawing insects in dorsal (back) view it is usual to arrange the legs and antennae symmetrically around the body. This is done mainly to save time, as legs and antennae drawn on one side can be traced and transposed to the other. The antennae are drawn around the insect to save space in publication.

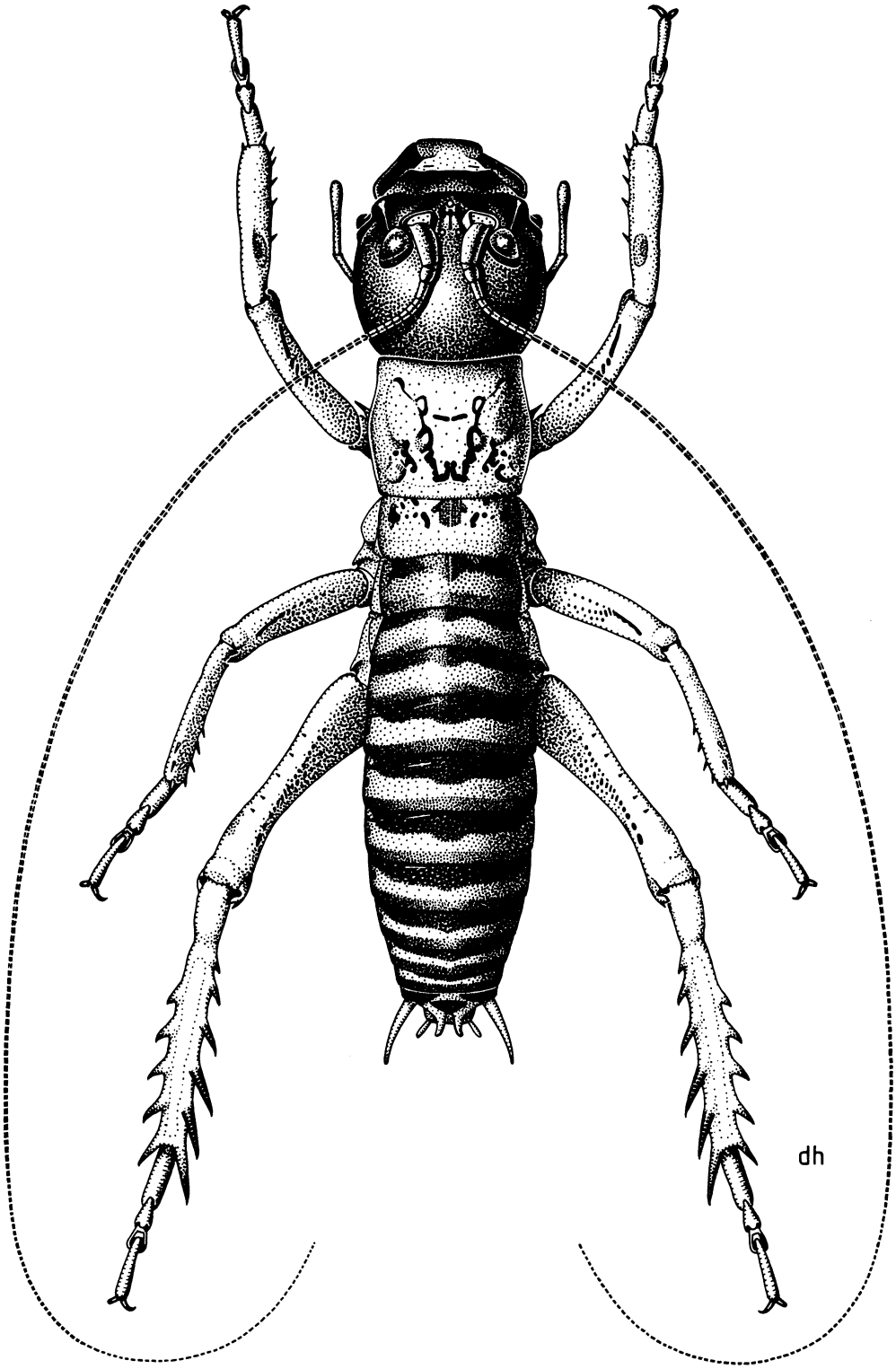
The drawing on the main plate is three-quarters the size of the original.



Hemideina femorata Hutton, 1897.
Orthoptera: Stenopelmatidae.
Canterbury weta.

Published in:
Entomological Society of N.Z.: Letter Card.

New Zealand wetas are found nowhere else in the world, although they have relatives overseas. This 50-mm long species is the common tree weta of the Canterbury province, and is found in bush remnants on the plains, Banks Peninsula, and in the foothills of the Southern Alps. It lives in holes and crevices of forest trees, and is nocturnal.



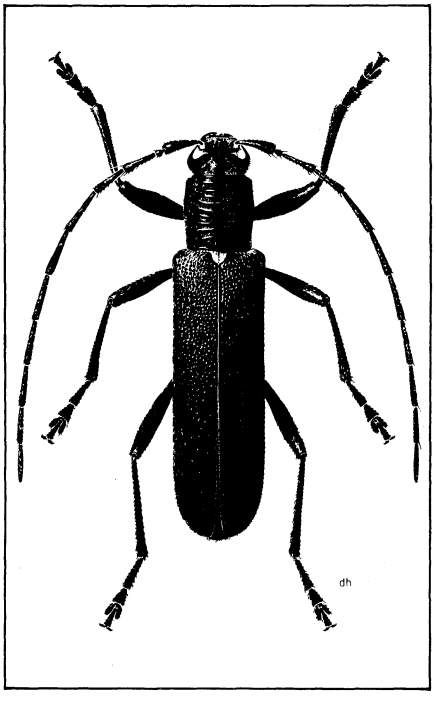
Canterbury weta
Hemideina femorata

Plate 3

Lemon tree borer

This insect was drawn on scraperboard. After being drawn in solid black, white lines and dots were scratched out to show surface hair, highlights, and other features. The highlights on the thorax (the part of the insect below the head) were placed in such a way as to indicate the ridges on the surface.

The drawing on the main plate is four-fifths the size of the original.



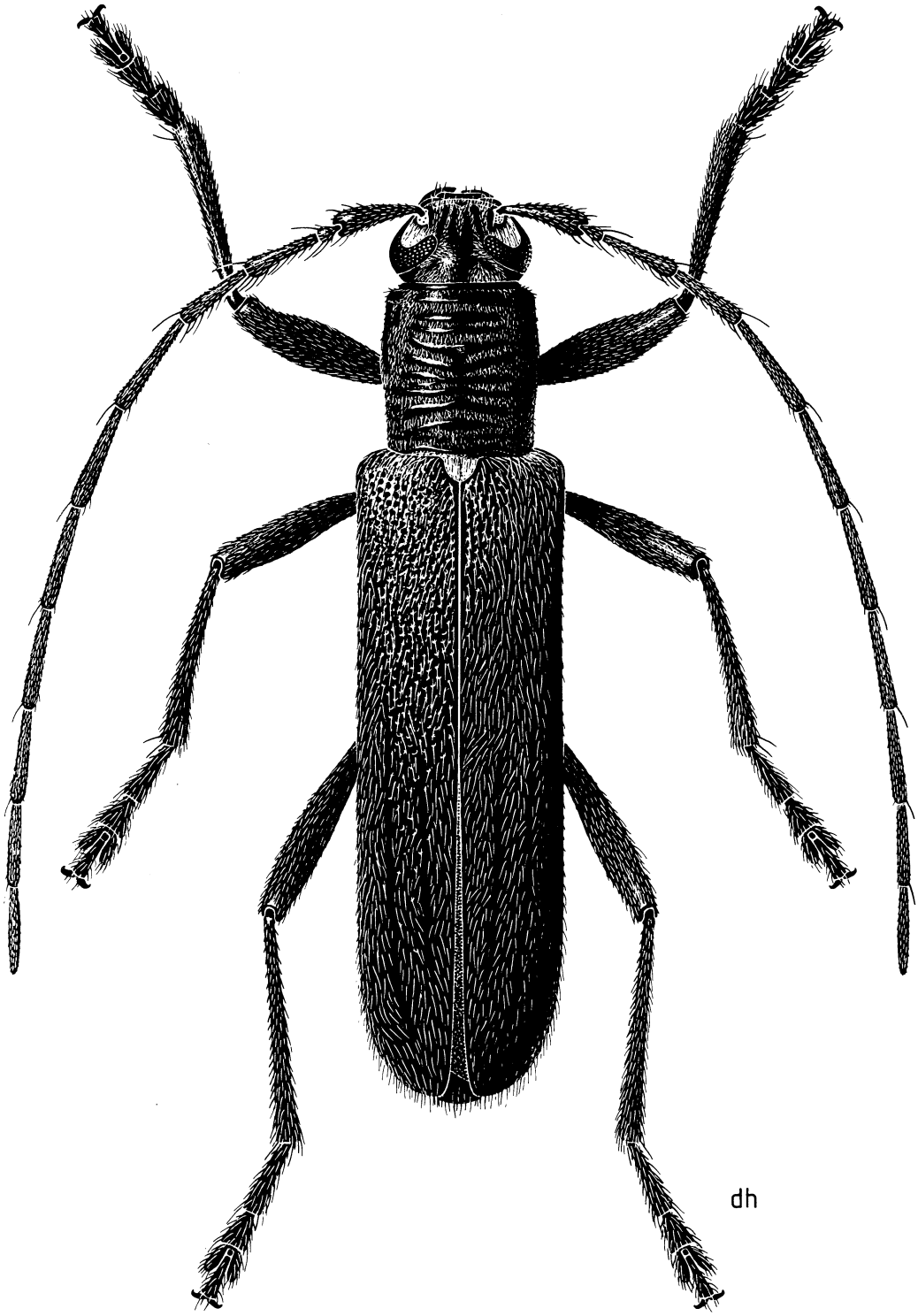
Oemona hirta (Fabricius, 1775).
Coleoptera: Cerambycidae.
Lemon tree borer.

Published in:

1. DSIR Entomology Division internal annual reports, 1979-81: Covers.
2. *New Zealand DSIR information series 105/33.* 1981. [J. R. Clearwater, Lemon tree borer, *Oemona hirta* (Fabricius), life cycle.]

The adult lemon tree borer (20mm long), a New Zealand native, is seen occasionally in spring and early summer. Its larva is an elongate, white, almost legless grub which bores into living wood of a very wide range of native and exotic small trees and shrubs. It is regarded as the most serious insect pest of citrus orchards. Females lay their eggs on pruning scars or dying twigs. Larvae may kill branches by girdling them, and may cause considerable damage to the tree by destructive tunnelling.

The lemon tree borer is one of the 35 species of New Zealand insects collected by the naturalists Banks and Solander on Captain Cook's first voyage in the "Endeavour" in 1769-71 and described by the Danish naturalist Johann Christian Fabricius in 1775. The original specimen on which the description was based is still at the British Museum (Natural History), London.



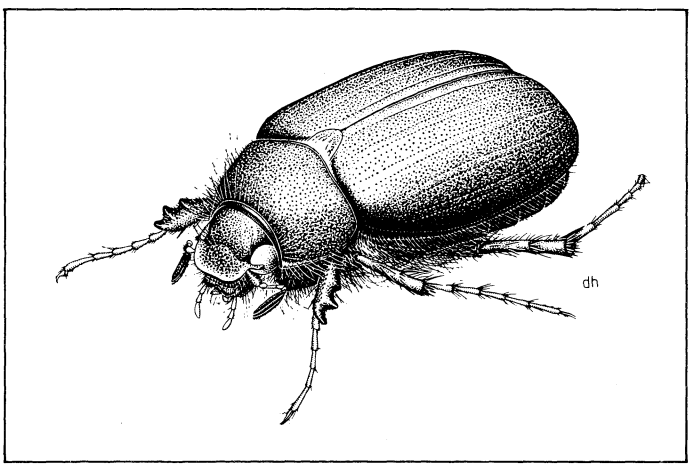
Lemon tree borer
Oemona hirta

Plate 4

Grass grub beetle

This common insect was drawn as an illustration for publication covers, displays, etc., rather than for identification. For this reason I chose a more natural position than the usual dorsal view. Obviously it would be difficult to determine the proportions of the main body parts accurately from an insect drawn in this position if its use was for identification. Black dots were used not only to show three-dimensional form, but also to show the many punctures (pits) in the surface.

The drawing on the main plate is the same size as the original.

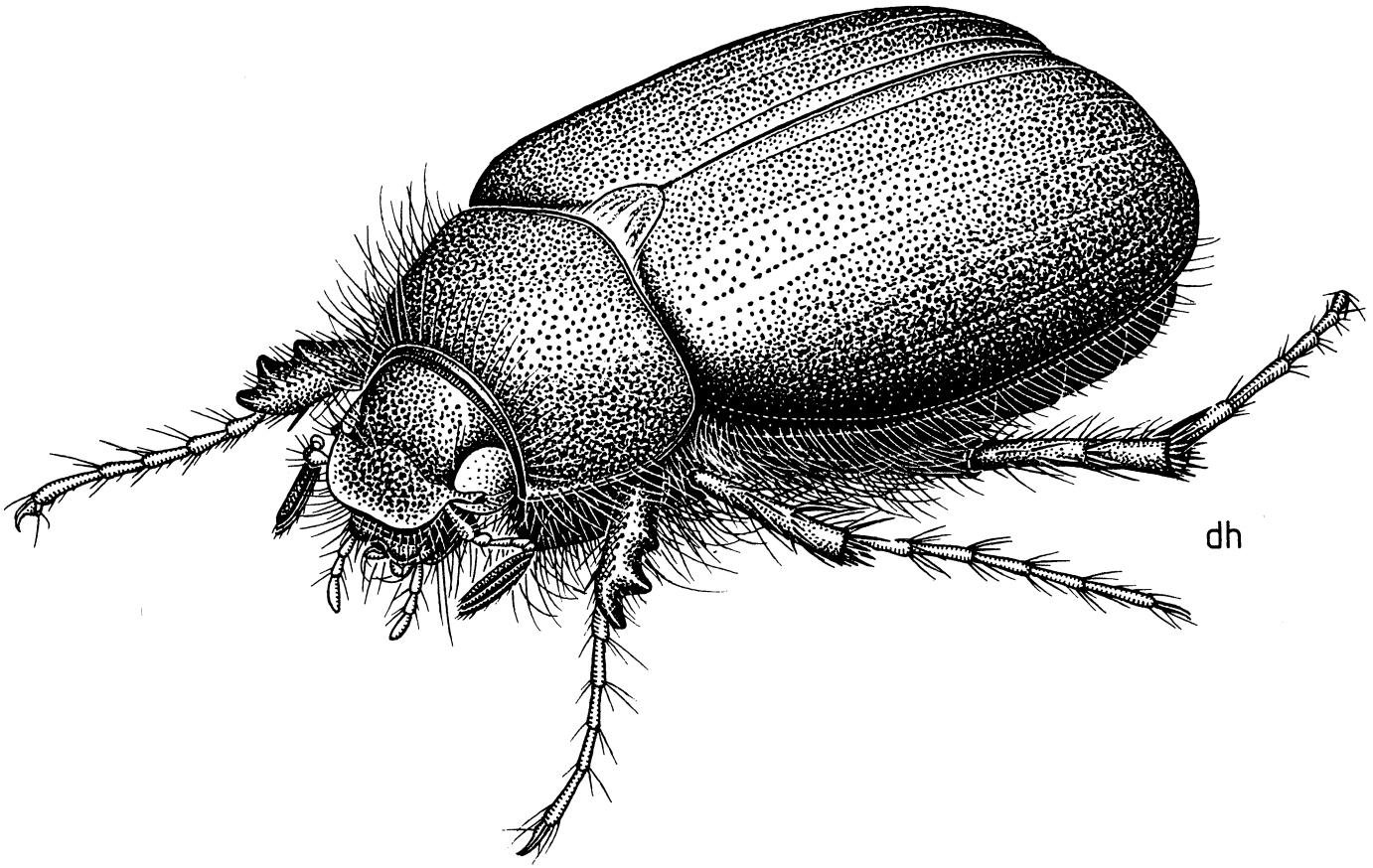


Costelytra zealandica (White, 1846).
Coleoptera: Scarabaeidae.
Grass grub beetle.

Published in:

1. *New Zealand entomologist 7(3),* 1982: Cover.
2. DSIR Entomology Division programme summaries for Chief Director's review, 1982: Cover.

This is probably the most serious pest of pastures in New Zealand. Adult beetles (10mm long) fly at dusk in late spring and early summer. Females lay their eggs in soil, and the white, C-shaped grubs feed on roots of grasses and other herbaceous plants. The life cycle normally takes one year, but can take two, especially in cold areas. The grass grub is one of the very few native beetles to adapt successfully to man-made environments.



Grass grub beetle
Costelytra zealandica

Plate 5

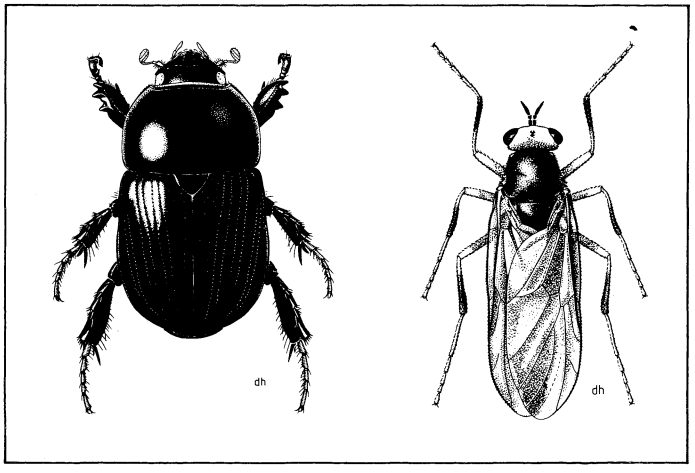
Black beetle and Australian soldier fly

Both insects on this plate are accidently introduced pests.

The black beetle has a smooth dark surface similar to the terrestrial "water" beetle on plate 16. As the insect is very dark, white lines and dots were used to separate the main body parts and show other features.

The wings of the Australian soldier fly appear opaque in some areas and transparent in others depending on what angle the light hits them. The light was placed at such an angle as to best show the undulations in the surface of the wings as well as a slight degree of transparency.

Each drawing on the main plate is four-fifths the size of the original.

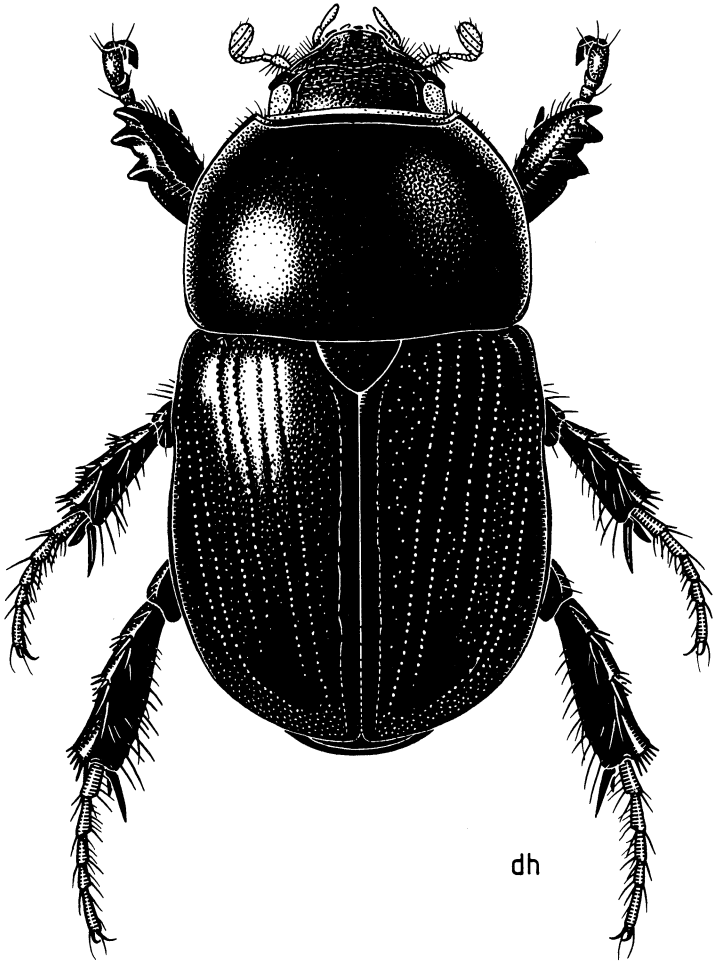


Heteronychus arator
(Fabricius, 1775).
Coleoptera: Scarabaeidae.
Black beetle.

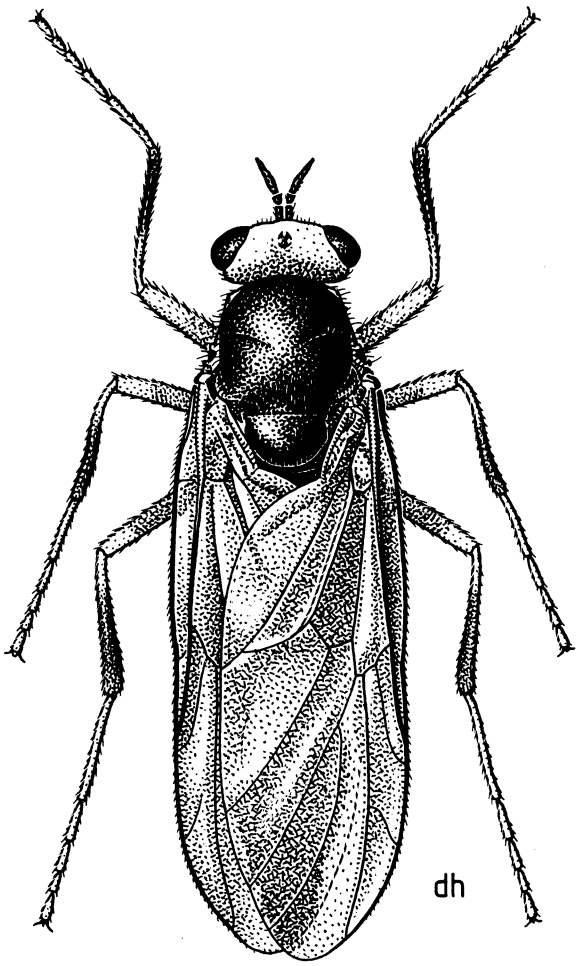
Inopus rubriceps
(Macquart, 1847).
Diptera: Stratiomyidae.
Australian soldier fly.

The black beetle, originally from Southern Africa, is a more serious pest of pastures than the native grass grub in the northern North Island, especially in free-draining soils. The grubs live in soil and feed on roots of a wide variety of pasture grasses and crops, including potatoes, kumaras, and maize. Adults (12mm long), which are present mostly during March to August, may damage the tops of these plants considerably.

The Australian soldier fly came to New Zealand from Australia in the 1930s and now occurs from just north of Auckland through to Te Kuiti, Rotorua, and Gisborne in the south. Large numbers of these smoky-winged, dull-black flies may be seen flying sluggishly over pastures or resting on grass stems during early or late summer. Their larvae feed on roots of grasses, weeds, and many horticultural plants, causing considerable damage. Adults are about 7mm long. Females are usually larger than males and have a distinctive dull-red area between the eyes.



Black beetle
Heteronychus arator



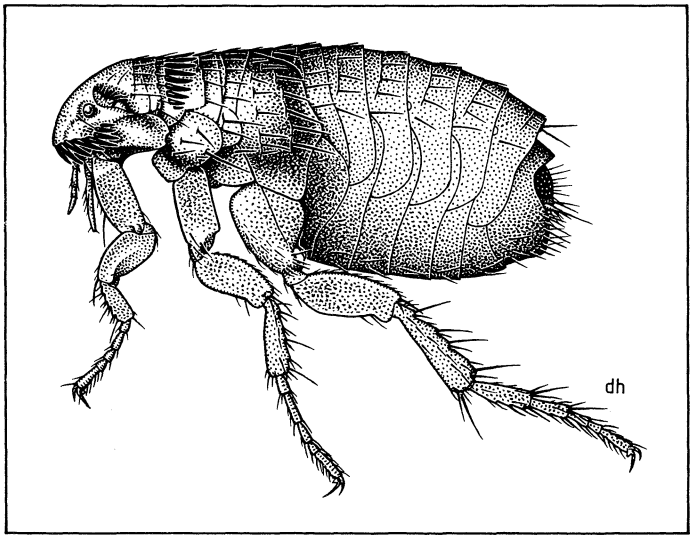
Australian soldier fly
Inopus rubriceps

Plate 6

Cat flea

This insect was drawn in lateral (side) view to show its characteristic features and shape. When drawing insects in this view it is usual to draw the legs on the nearest side only as the addition of legs on the other side would tend to obscure the shape of the ventral (under) side of the insect. White lines were left around some features to help define them.

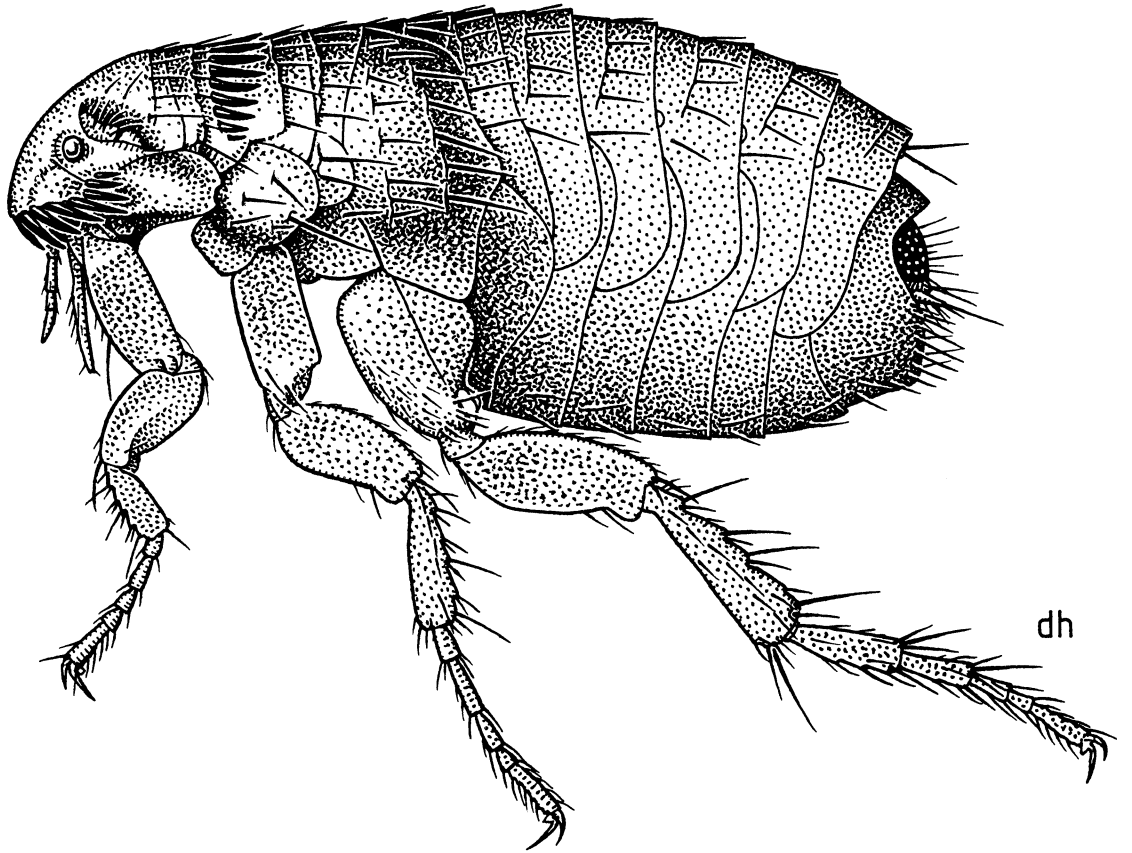
The drawing on the main plate is the same size as the original.



Ctenocephalides felis felis (Bouché, 1835).
Siphonaptera: Pulicidae.
Cat flea.

Drawn for Apex Cosmetic Co., aerosol spray can.

Despite unfounded statements to the contrary by cat-lovers, by far the commonest domestic flea in New Zealand is the cat flea. This introduced species (2mm long) can easily be distinguished from the larger human flea by the combs on the head and prothorax (and by its less painful bite!). Larvae of fleas are legless hairy grubs which live on dust and debris in cracks in the floor, and in nests, etc. Fleas can remain dormant in untenanted houses for long periods, but are quickly awakened to renewed activity by vibrations when the building is reoccupied, causing a "plague" of fleas.



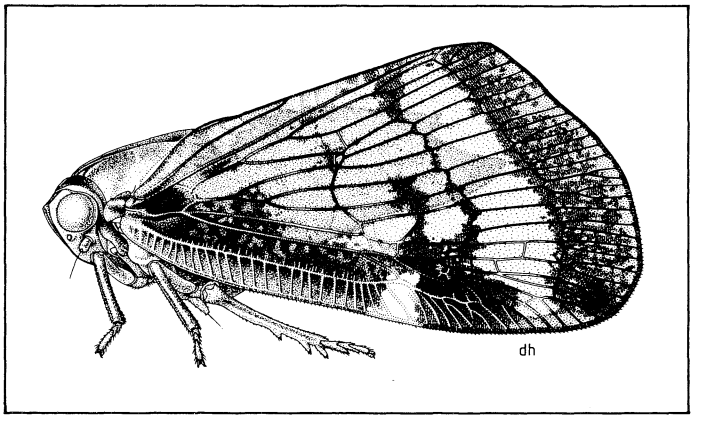
Cat flea
Ctenocephalides felis felis

Plate 7

Passionvine hopper

This insect was drawn in lateral (side) view because the characteristic shape and details of the wings are not so apparent when viewed from above. As the wing is transparent in the lightly coloured areas the silhouette of the body behind was drawn as an area of fairly dense dot stipple. A combination of line hatching and dot stipple was used for dark areas of the wing.

The drawing on the main plate is the same size as the original.

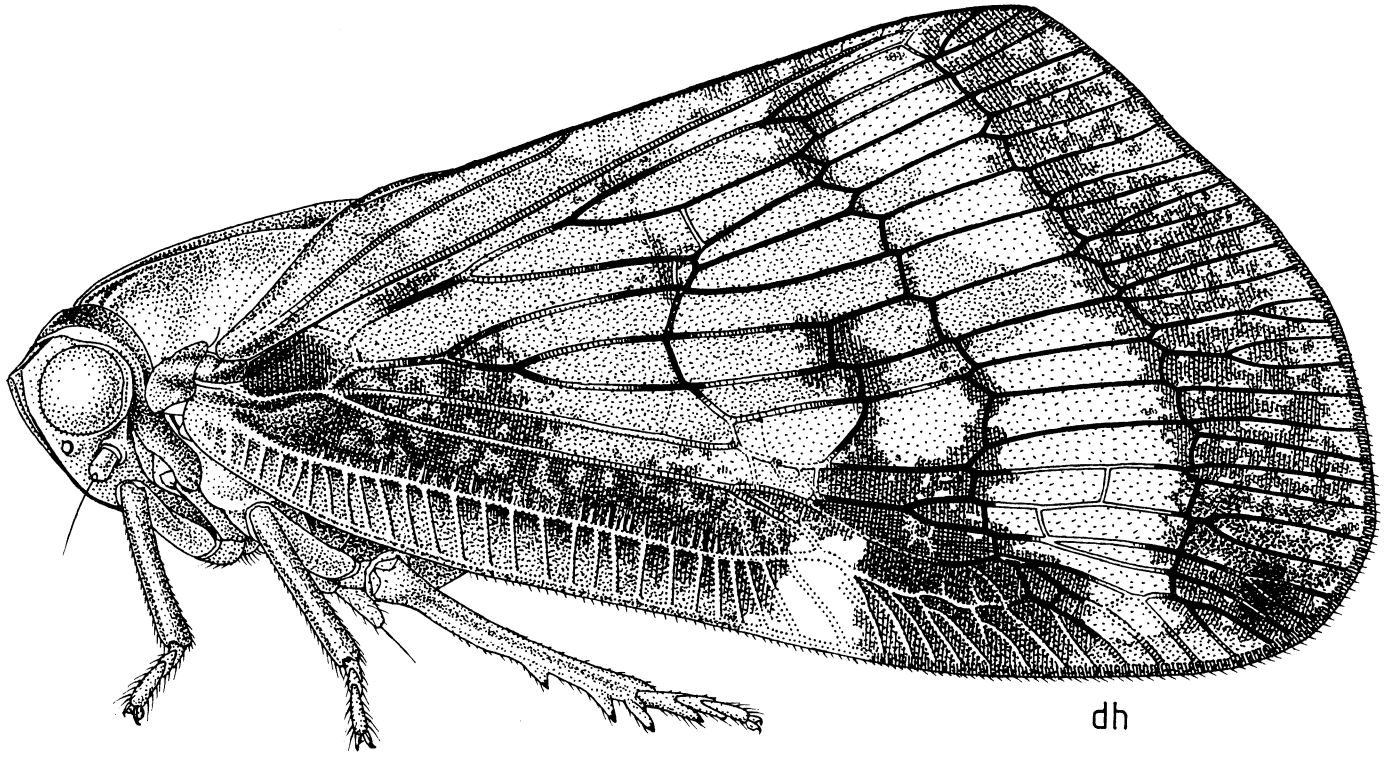


Scolypopa australis (Walker, 1851). Hemiptera–Homoptera: Ricaniidae. Passionvine hopper.

Published in:

1. *New Zealand entomologist 7(1):* 15. 1979. [Lewis L. Deitz and Desmond W. Helmore. Illustrated key to the families and genera of planthoppers (Homoptera: Fulgoroidea) from the New Zealand sub-region.]
2. *New Zealand DSIR information series 105/35.* 1981. [Lewis L. Deitz. Passionvine hopper, *Scolypopa australis* (Walker), life cycle.]

This insect pest was accidentally introduced from Australia over 100 years ago. It is rather moth-like in appearance with a body about 7mm long, often swarms on vegetation, and if disturbed can jump vigorously as well as fly. It occurs in the warmer areas of the North Island, being especially abundant in sheltered areas of North Auckland, and in Nelson and Marlborough in the South Island. It feeds by sucking the sap from many native and exotic plants, including passionfruit vines, berry fruits, citrus, and kiwifruit, and is occasionally involved in the production of poisonous honey in the Coromandel region when bees collect the toxic honeydew excreted by passionvine hoppers feeding on tutu shrubs.



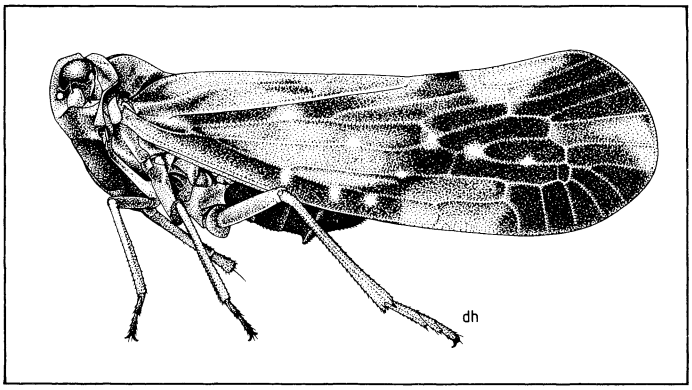
Passionvine hopper
Scolypopa australis

Plate 8

A treefern planthopper

This insect was drawn in the lateral view because the wing pattern and shape are not so apparent when viewed from above. Colour pattern on the wing was shown by varying the density of dot stipple.

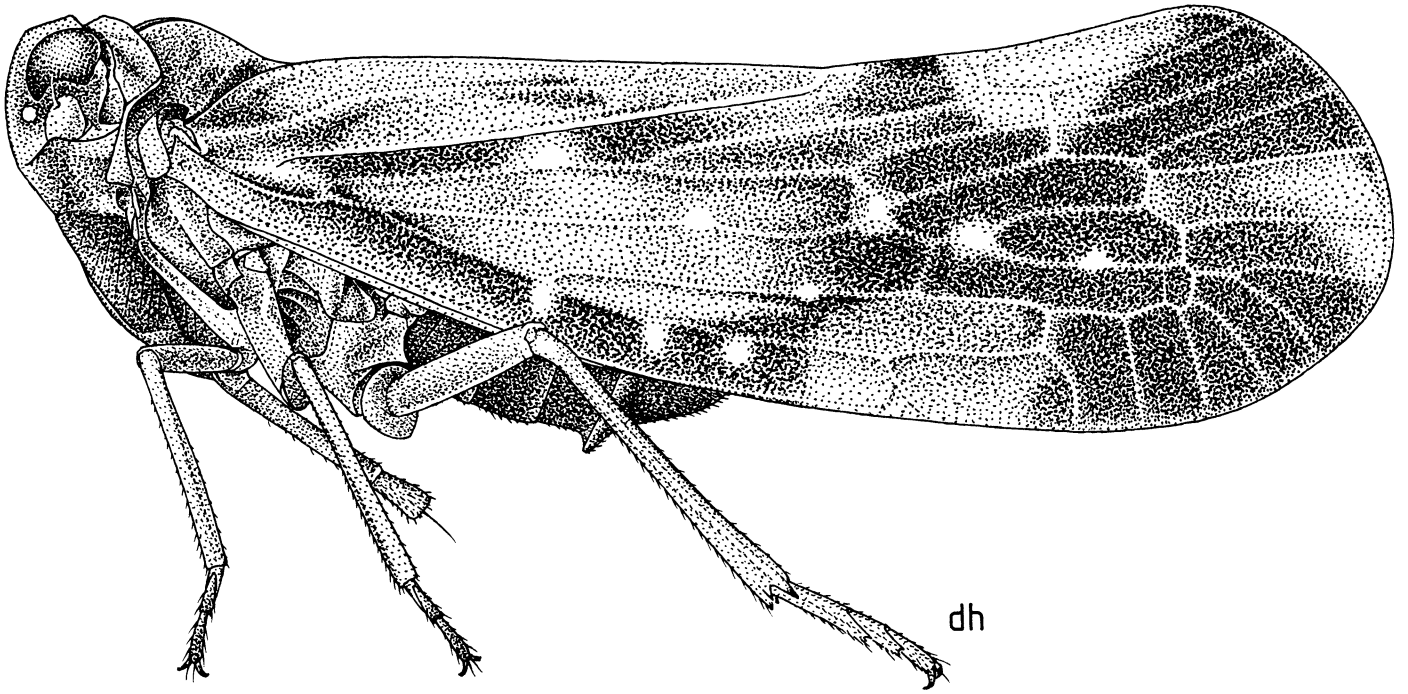
The drawing on the main plate is the same size as the original.



Eocenchrea maorica (Kirkaldy, 1909).
Hemiptera–Homoptera: Derbidae.
A treefern planthopper.

Published in:
New Zealand entomologist 7(1): 15. 1979. [Lewis L. Deitz and Desmond W. Helmore. Illustrated key to the families and genera of planthoppers (Homoptera: Fulgoroidea) from the New Zealand sub-region.]

This native insect (7mm long) is orange in colour with opaque yellowish wings mottled with dark brown, and is found on the underside of treefern fronds. Like the passionvine hopper it feeds by sucking sap from plants, and jumps vigorously when disturbed. Treefern hoppers feed on ferns and fungi, although more precise information is needed on host plants and the distribution of New Zealand species.



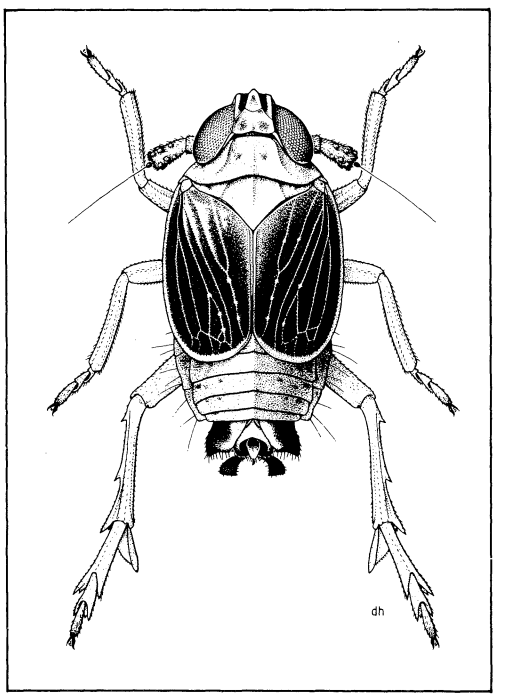
A treefern hopper
Eocenchrea maorica

Plate 9

A planthopper

When drawing insects for identification it is necessary to define all the parts clearly even though the divisions between them may be barely visible on the specimen. In this case black outlines have been drawn around all the pale parts and the wing veins have been left white to stand out against the dark background. Without these "exaggerations" the drawing would not be distinct enough for the purpose.

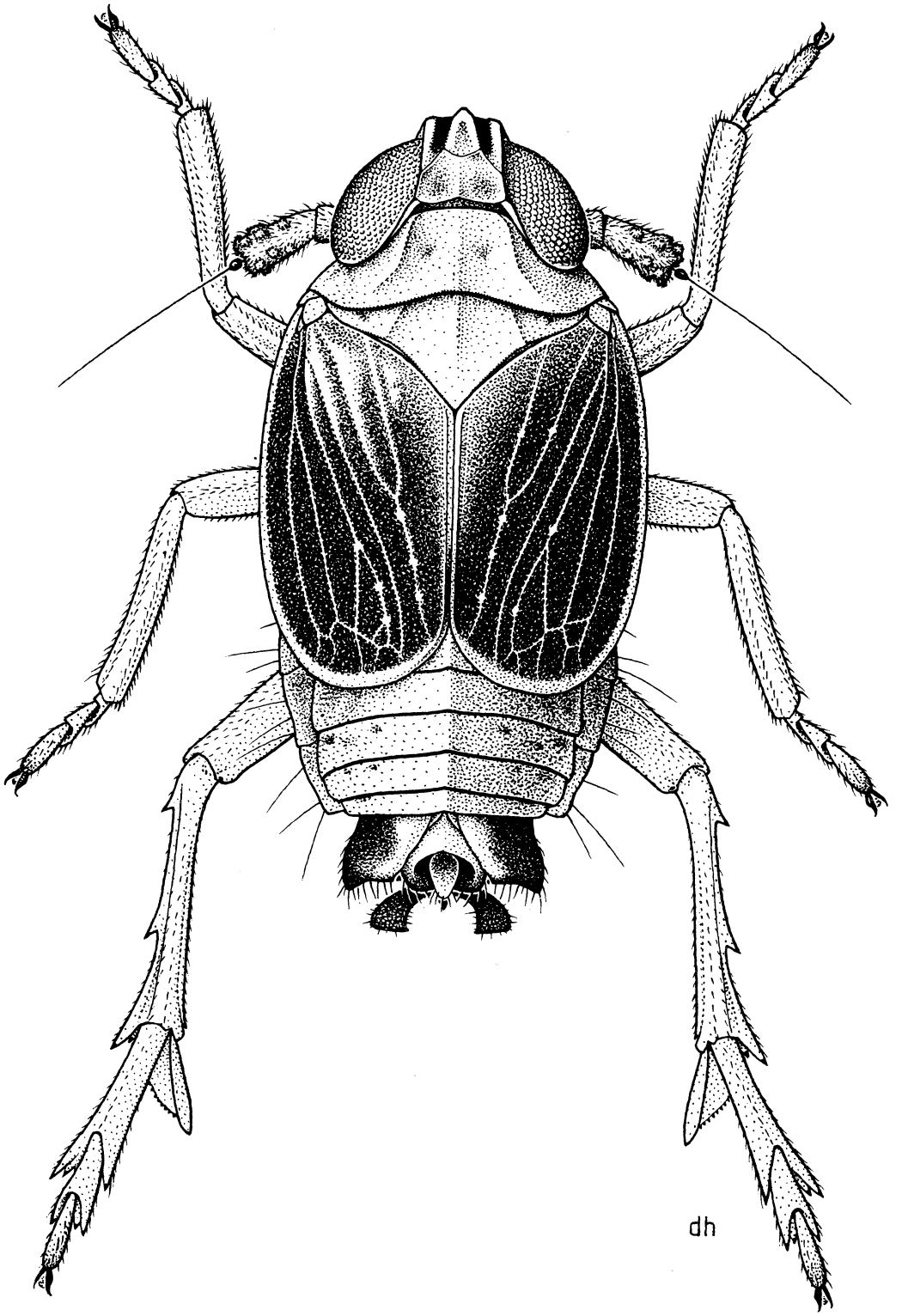
The drawing on the main plate is four-fifths the size of the original.



Sulix tasmani (Muir, 1923).
Hemiptera–Homoptera: Delphacidae.
A planthopper.

Published in:
New Zealand entomologist 7(1): 17. 1979. [Lewis L. Deitz and Desmond W. Helmore. Illustrated key to the families and genera of planthoppers (Homoptera: Fulgoroidea) from the New Zealand sub-region.]

This very small (2mm long) native insect is common on grasses, sedges, and rushes throughout New Zealand although it is not known on which particular plant it feeds. Like the passionvine hopper it feeds by sucking the sap from plants and jumps vigorously when disturbed. This specimen is a short-winged (brachypterous) individual.



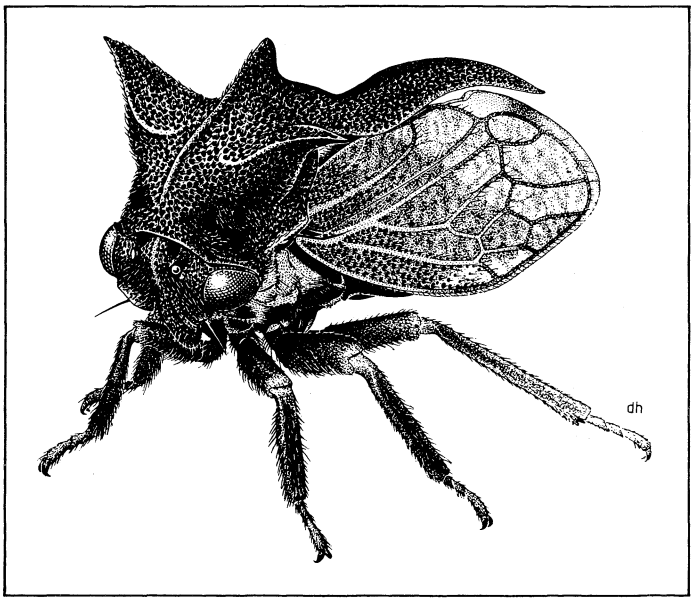
A planthopper
Sulix tasmani

Plate 10

A treehopper

This insect was drawn from this angle to show the sharp protuberances on the body that would not have otherwise been clearly visible from other angles. Surface texture of insects varies widely: in this case the surface is heavily punctured (pitted), with small hairs growing from each puncture.

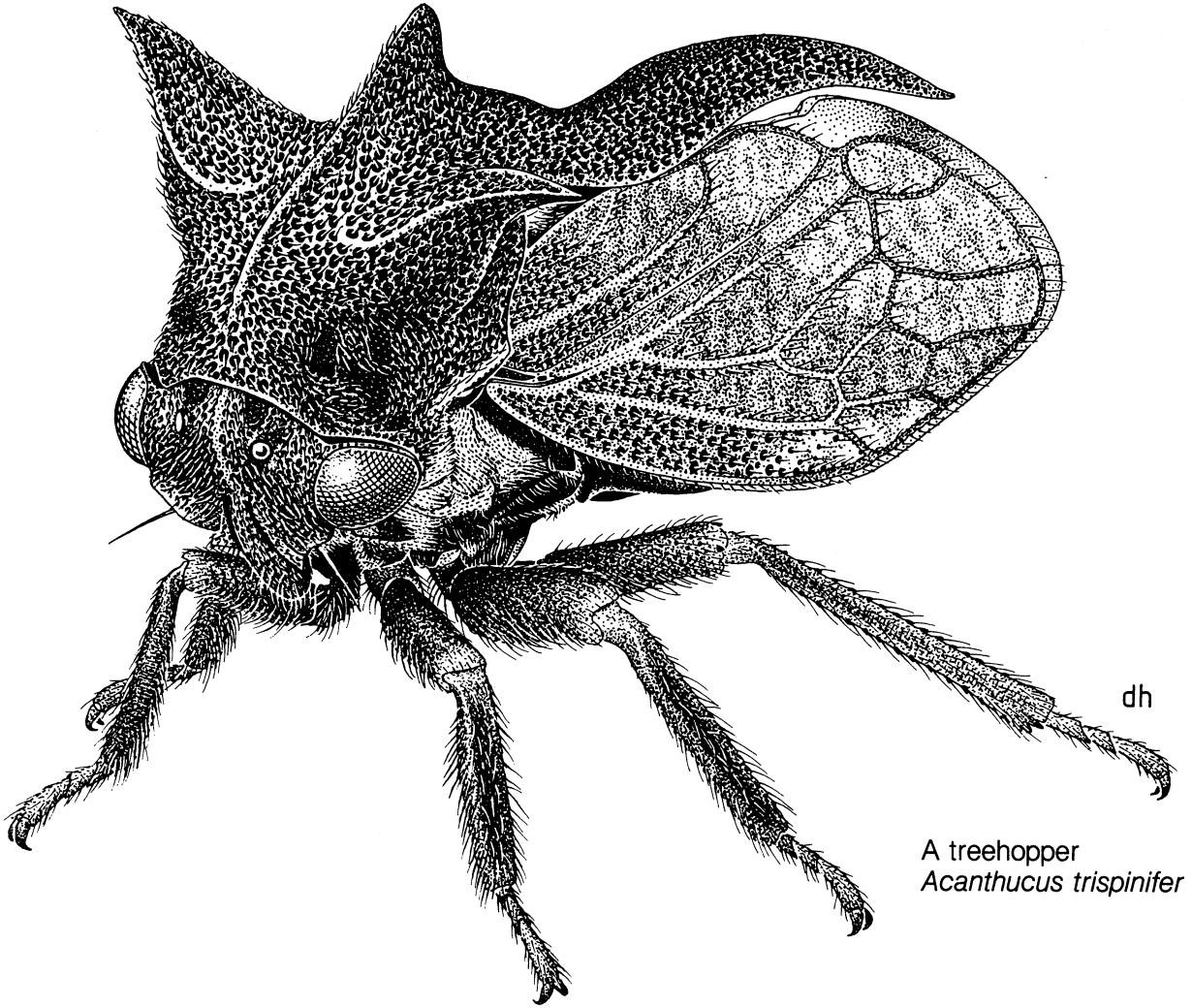
The drawing on the main plate is four-fifths the size of the original.



Acanthucus trispinifer (Fairmaire, 1846). Hemiptera–Homoptera: Membracidae. A treehopper.

Published in:
1. *New Zealand entomologist 7(1),* 1979: Cover.
2. Entomological Society of N.Z.: Letter Card.

Treehoppers were unknown in New Zealand until 1971, when populations of this spiny Australian species (5mm long) were discovered feeding on broom and *Cotoneaster* in Westland. Nymphs of other treehoppers overseas are attended by ants, but it is not known if this occurs with this species.



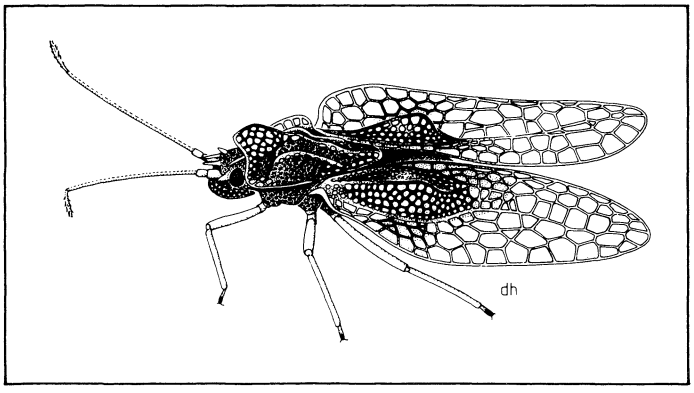
A treehopper
Acanthucus trispinifer

Plate 11

A lacebug

In this drawing a compromise was necessary between lateral (side) and dorsal (back) views to show simultaneously both body shape and wing pattern. This would not have been possible if only one of these views had been chosen.

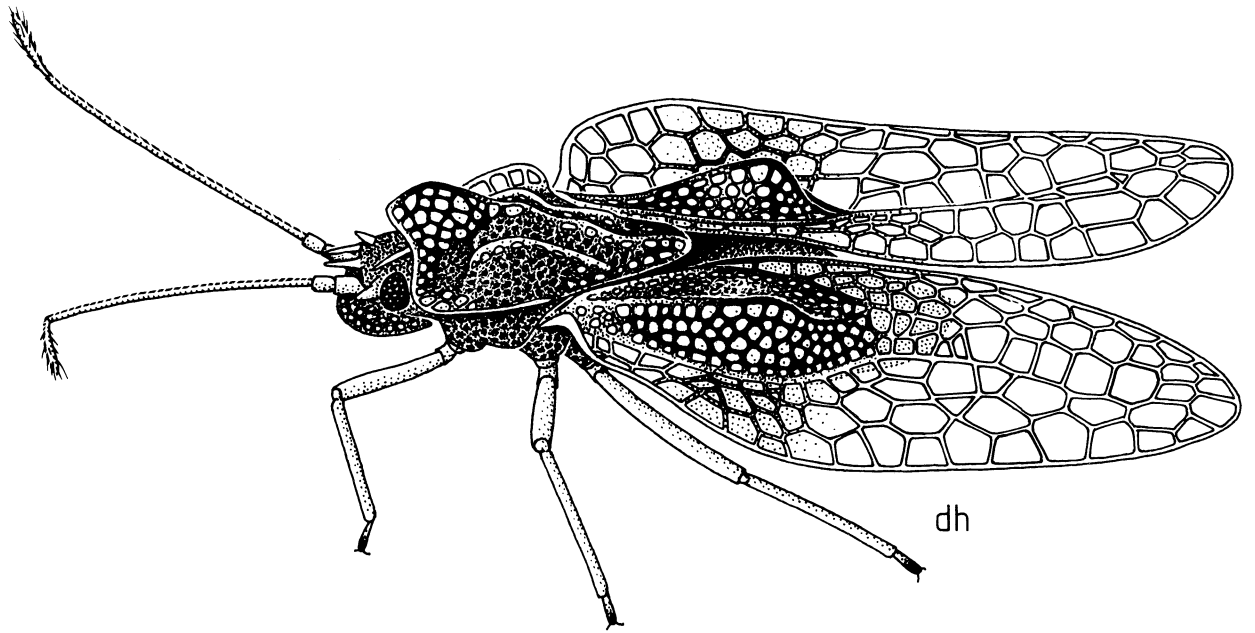
The drawing on the main plate is the same size as the original.



Tanybyrsa cumberi Drake, 1959. Hemiptera–Heteroptera: Tingidae. A lacebug.

Published in:
Journal of the Royal Society of New Zealand 7(3): 304. 1977. [Brenda M. May. The immature stages and biology of the lacebug *Tanybyrsa cumberi* Drake (Heteroptera: Tingidae).]

This small (2mm long) insect lives on *Astelia* plants and is the only native lacebug in New Zealand, its nearest relatives being found in Australia. Like other lacebugs it is somewhat inactive, although adults have occasionally been seen to flutter from one leaf to another when disturbed. This is probably the method of dispersal, helped by the wind. The nymphs are covered with minute star-shaped umbrellas of wax.



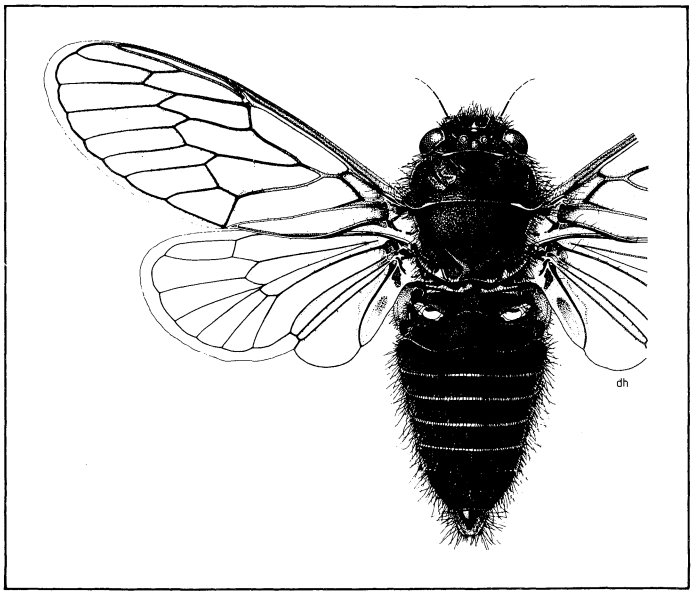
A lacebug
Tanybyrsa cumberi

Plate 12

High alpine cicada

Only one complete wing was drawn on this insect as this is all that is necessary for identification. The omission of the other also saves space in publication. The dull black body of this cicada accounts for the absence of any strong highlights. A light dot stipple was used to show the slight darkening of the forewing.

The drawing on the main plate is two-thirds the size of the original.

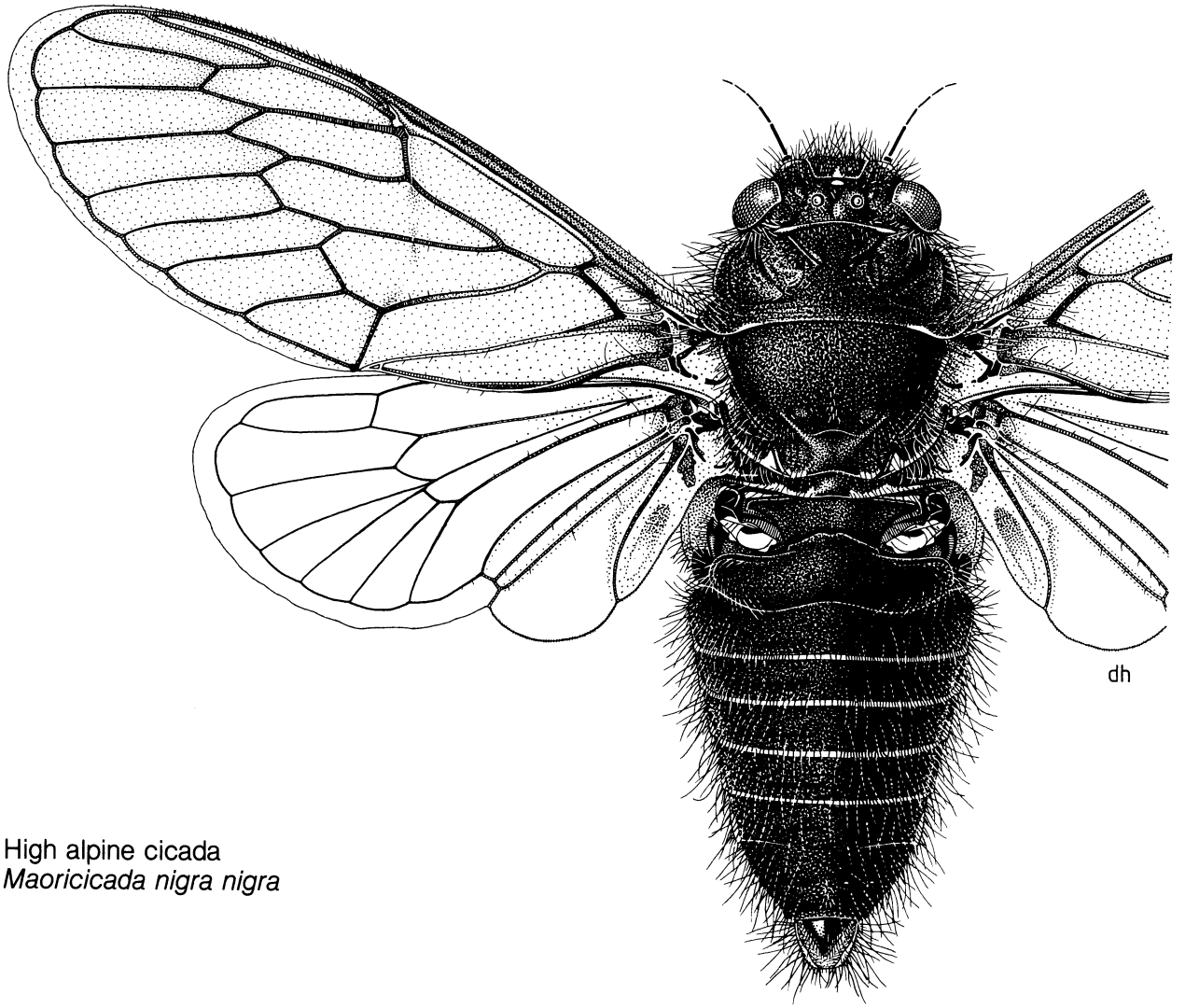


Maoricicada nigra nigra (Myers, 1921).
Hemiptera: Tibicinidae
High alpine cicada.

Published in:

1. *New Zealand journal of zoology 5(2):* 310. 1978. [J. S. Dugdale and C. A. Fleming. New Zealand cicadas of the genus *Maoricicada* (Homoptera: Tibicinidae).] (without wing).
2. Entomological Society of N.Z.: Letter Card.

Only in New Zealand are cicadas known to live in extreme alpine conditions. This species lives among herb communities associated with snow meltwater at altitudes of 1200-1600m from the Spenser Mts near Nelson southwards to North Fiordland. It is distinguished from other species by its small size (15mm long), deep black colour, and the male's soft rustling song.



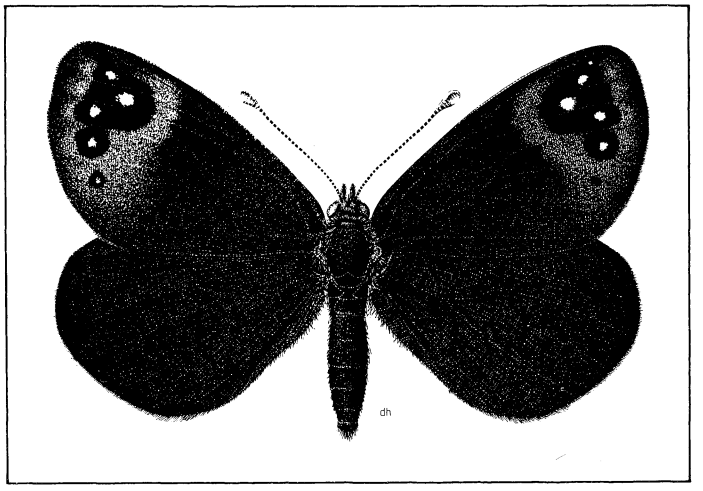
High alpine cicada
Maoricicada nigra nigra

Plate 13

Black mountain ringlet

In this drawing hatching (line shading) was used to show the texture of the sooty black wings. The wing veins were drawn slightly lighter with a shadow line added to the lower side to clarify them.

The drawing on the main plate is three-quarters the size of the original.

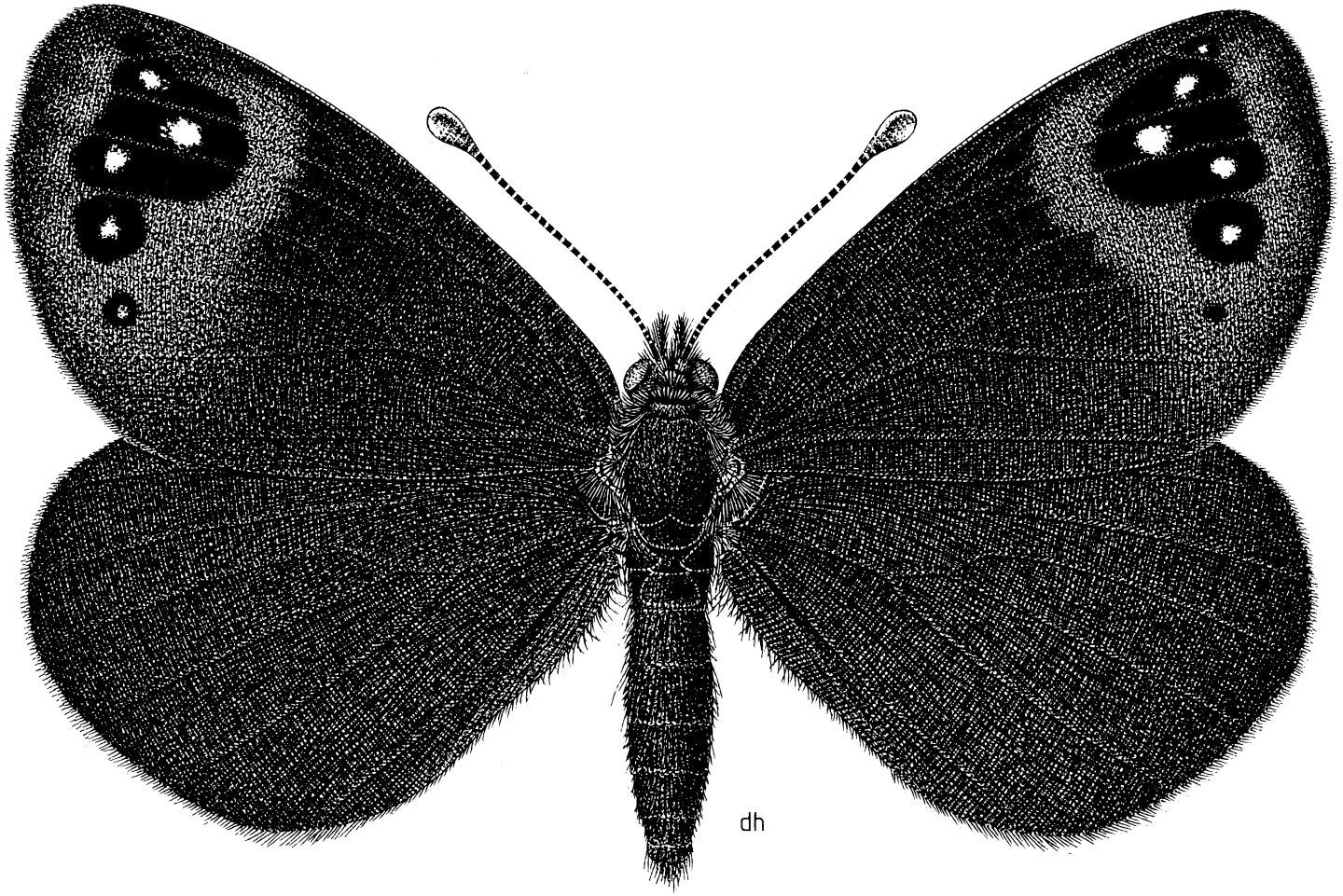


Percnodaimon pluto
(Fereday, 1872).
Lepidoptera: Nymphalidae.
Black mountain ringlet.

Published in:

1. *New Zealand alpine journal 31:* 91. 1978. [Annette Walker. New Zealand's hardiest native butterfly.]
2. Entomological Society of N.Z.: Letter Card.

This native alpine butterfly with a wing span of about 40mm is well adapted to the harsh environment of the New Zealand South Island mountains. On sunny days it may be seen fluttering and gliding over rocky screes and ridges, but when the sun disappears it alights and spreads its black wings to absorb heat from the warm rocks. In severe weather it shelters in rock crevices.



Black mountain ringlet
Percnodaimon pluto

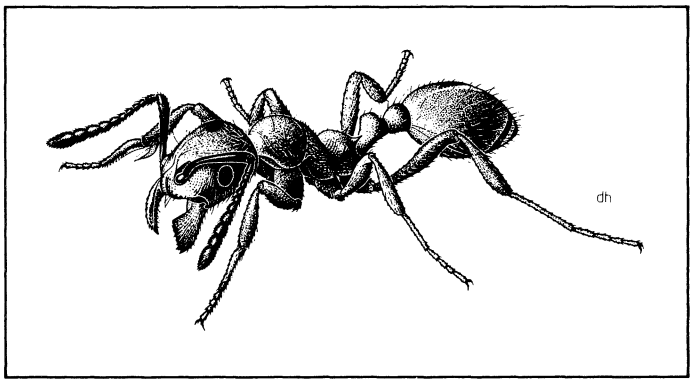
Plate 13

Plate 14

Striated ant

As this was drawn as an illustration for the cover of a scientific journal, I chose a more natural position than the usual dorsal view. White lines were left around some of the structures to help define them.

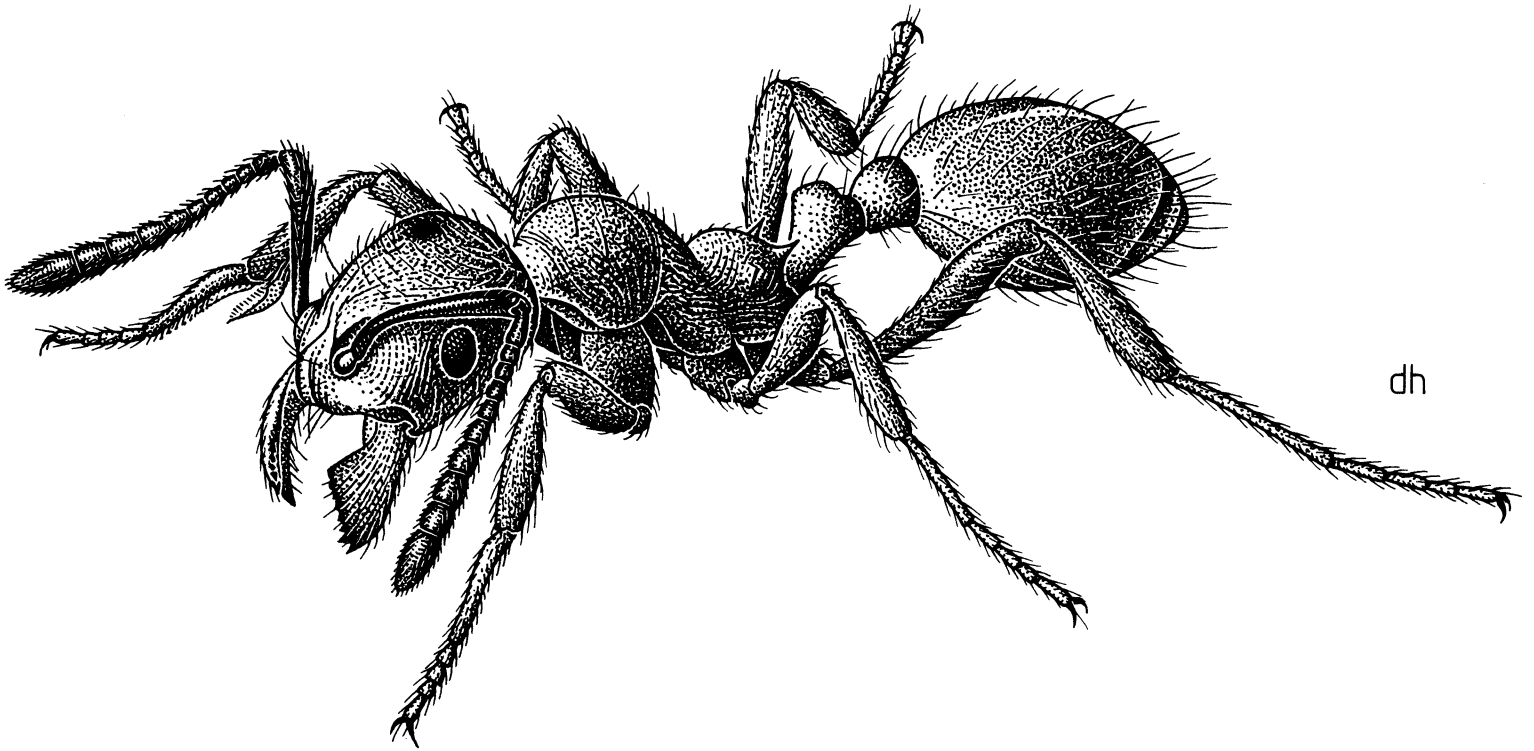
The drawing on the main plate is the same size as the original.



Huberia striata
(Smith, 1876).
Hymenoptera: Formicidae.
Striated ant.

Published in:
New Zealand entomologist 7(2), 1980: Cover.

There are only ten species of native ants, probably due to New Zealand's early isolation from other land masses. The familiar ant species in houses and gardens are in fact more recent introductions from other countries. Most of our native ants have close relatives in other parts of the world, but the genus *Huberia,* with two species, is unique to this country. The striated ant (5mm long) is distinguished by the pattern of ridges (striations) on its face and thorax (middle part of body) and erect spines on the last segment of the thorax. It is widespread, nesting on the ground under stones or in rotten logs on the forest floor.



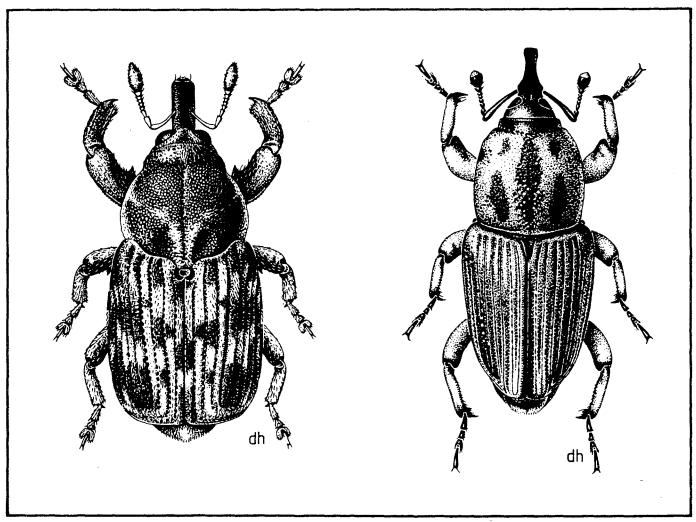
Striated ant
Huberia striata

Plate 15

Two introduced weevils

Drawing weevils can be quite complex, especially when their many punctures (pits), hairs or scales (broad hairs), colour patterns, bumps and hollows, as well as shading to show overall form need to be drawn at the same time. Sometimes I have to compromise and sacrifice some of the minor details for the more important features.

Each drawing on the main plate is the same size as the original.

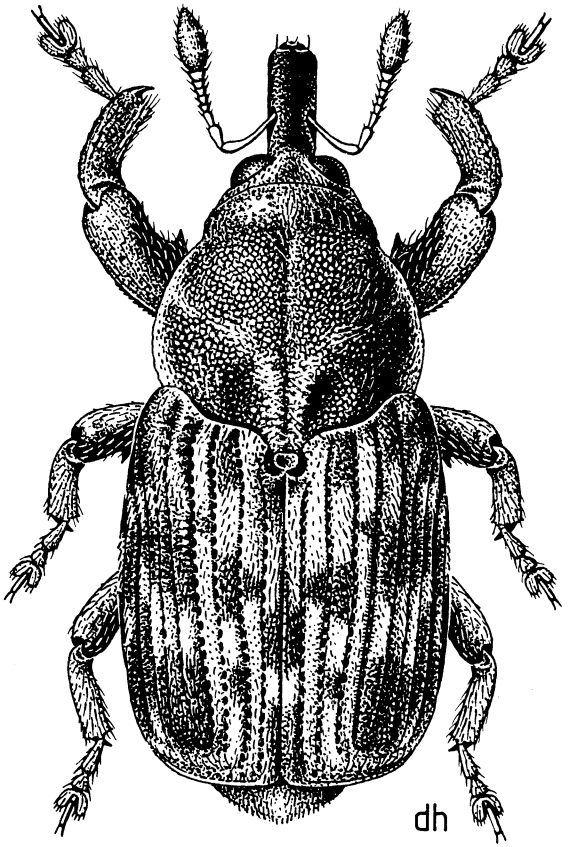


Saccolaemus narinus
(Pascoe, 1872).
Coleoptera: Curculionidae:
Magdalidinae.
A wattle weevil.

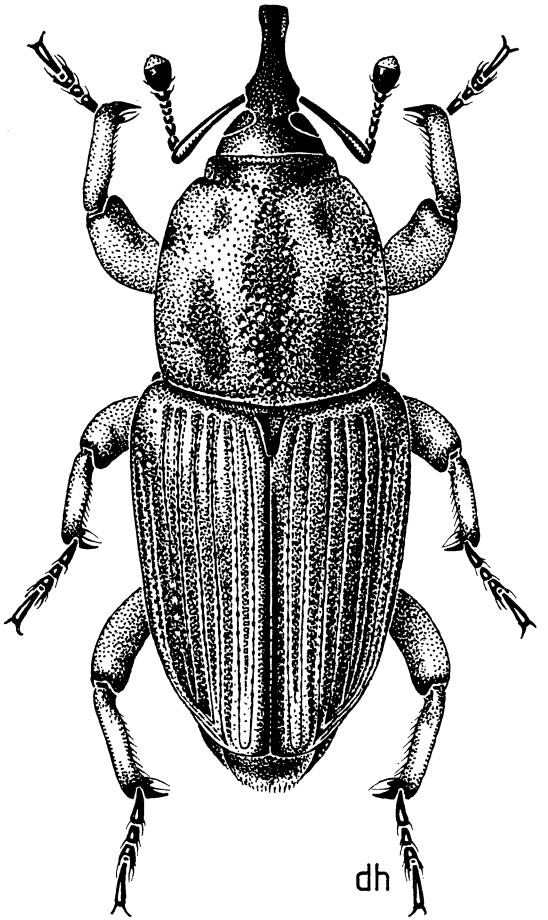
Sphenophorus brunnipennis
(Germar, 1824).
Coleoptera: Curculionidae:
Rhynchophorinae.
La Plata weevil

This wattle weevil (5mm long), a native of Australia, lives in the small dead branches of wattle trees and is common where wattles are found. It is most numerous in the north of New Zealand, and is not a pest.

The La Plata weevil probably came to New Zealand from Australia, even though it is originally from South America. It is associated with swampy places north of Auckland, where its larvae feed on grass roots and probably rushes. Adults (9mm long) have been found on sand dunes and beaches. It is not common.



A wattle weevil
Saccolaemus narinus



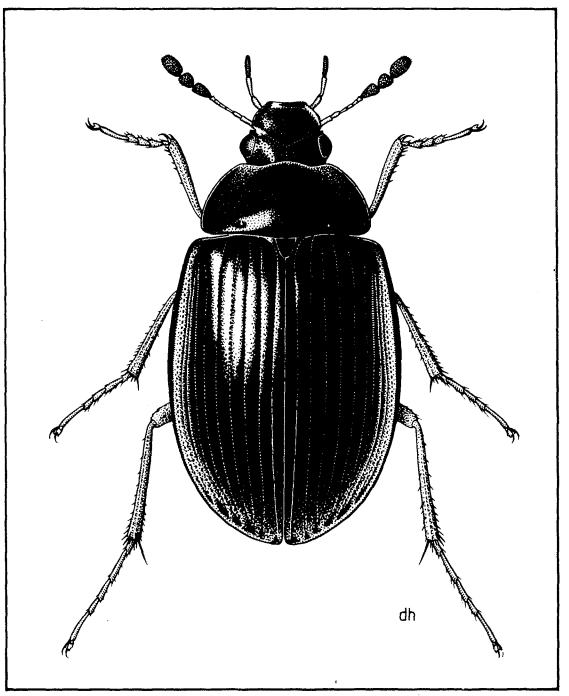
La Plata weevil
Sphenophorus brunnipennis

Plate 16

A terrestrial "water" beetle

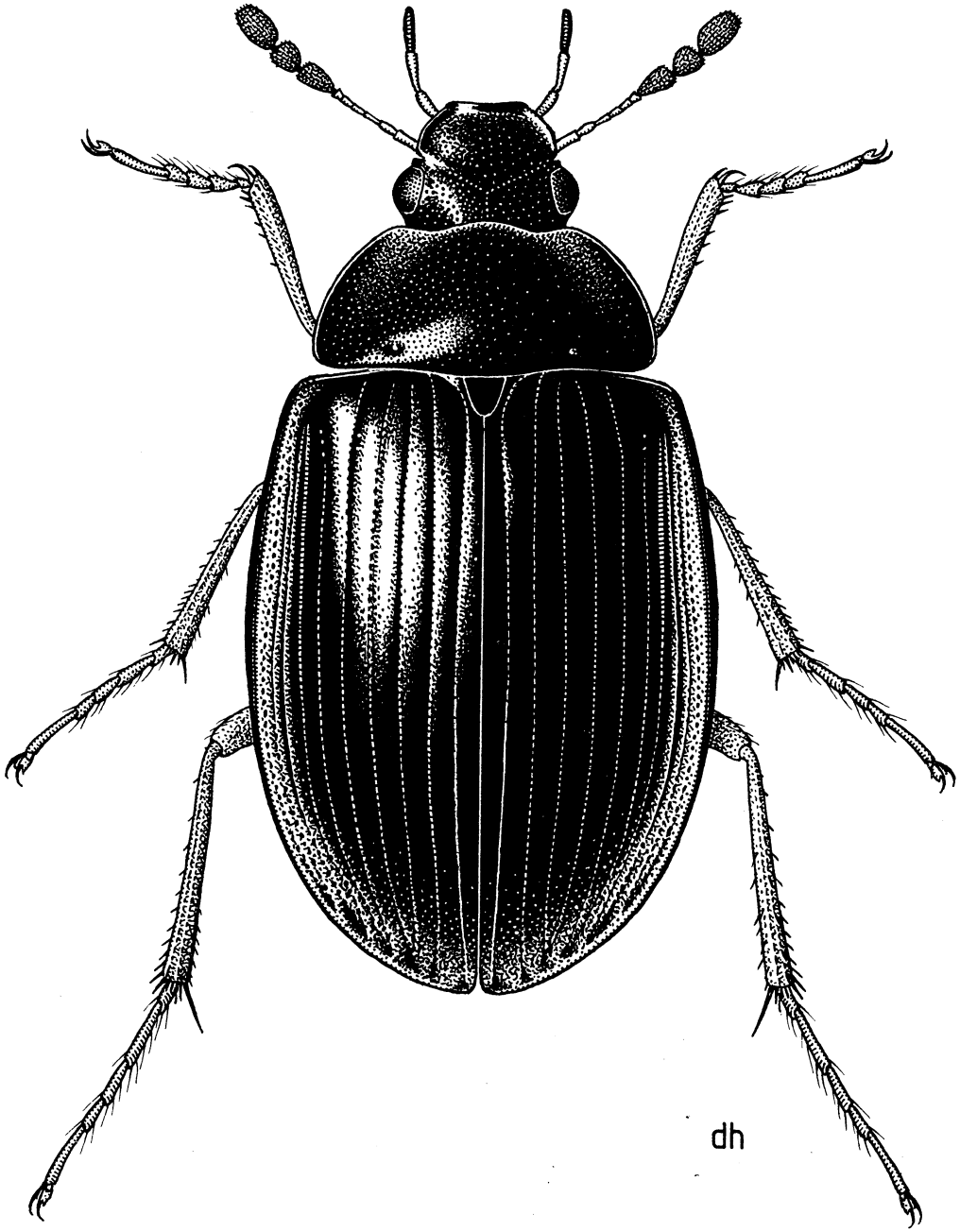
In the drawing of this smooth dark insect "reflected light" (the white area around the edges of the wing case or lower part of the insect) was exaggerated to show the form of the body. The use of light helps to show the types of surface — smooth surfaces reflecting light from more concentrated areas than textured surfaces where light reflection is more diffuse. Highlights were also placed in such a way as to show the ridges and other features. White dotted lines on the wing case indicate the hollows between the ridges. Although not clearly visible on the specimen except in the highlight area, it is necessary to draw details such as these to help describe the insect more fully.

The drawing on the main plate is the same size as the original.



Rygmodus tibialis Broun, 1893.
Coleoptera: Hydrophilidae.
A terrestrial "water" beetle.

This species is an example of a substantial number of native "water" beetles which, unlike their overseas relatives, live only on land. Larvae of *Rygomodus* species live in forest leaf litter, where they apparently feed on decaying leaves. Adults (7mm long) may be found on flowers of shrubs such as koromiko in late spring, and probably feed on pollen.



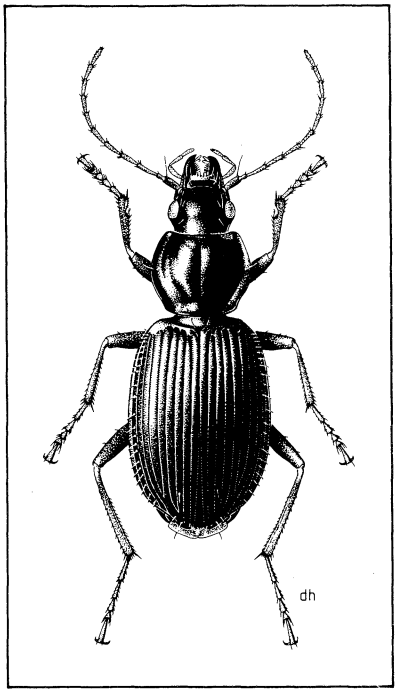
A terrestrial "water" beetle
Rygmodus tibialis

Plate 17

Coastal ground beetle

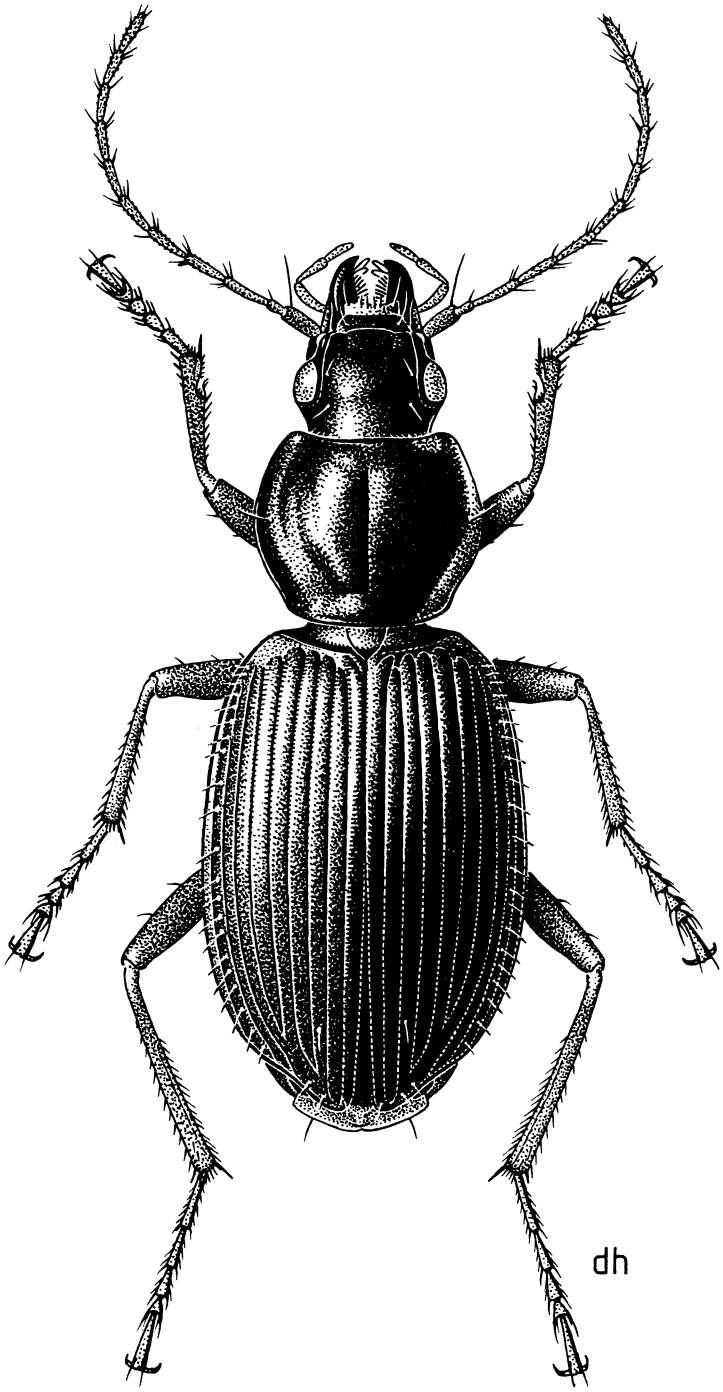
This insect is smooth and dark like the terrestrial "water" beetle (Plate 16). The setae drawn as white hairs on the body of the insect are important for identification, as their distribution may differ on related species with a similar appearance.

The drawing on the main plate is the same size as the original.



Ctenognathus novaezealandiae Fairmaire, 1842.
Coleoptera: Carabidae.
Coastal ground beetle.

This fast-running native beetle (12mm long) hides under stones and logs during the day. At night it can be seen on the ground, on rock outcrops, or climbing trees, searching for the small insects on which it preys. The species is common on rocky coasts and islands of the northern North Island, but never far from the shore. Similar-looking species live further inland. Larvae are active, long-legged creatures, living in leaf litter or rotten logs.



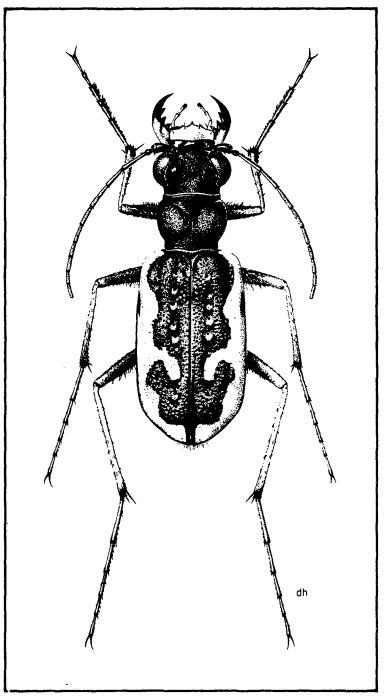
Coastal ground beetle
Ctenognathus novaezealandiae

Plate 18

Common tiger beetle

In this drawing dots and lines were used to show various surface textures and colour patterns.

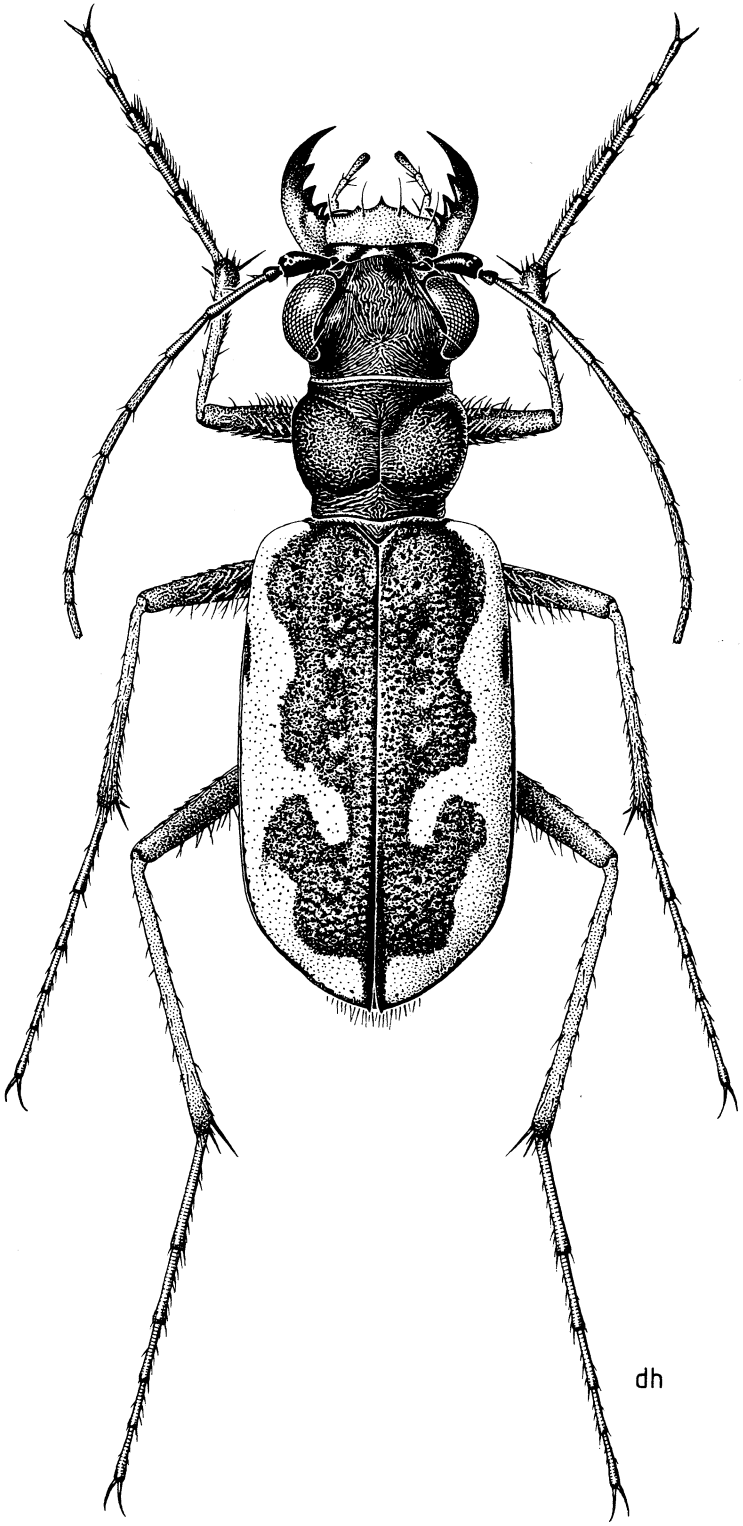
The drawing on the main plate is three-quarters the size of the original.



Neocicindela tuberculata (Fabricius, 1775).
Coleoptera: Cicindelidae.
Common tiger beetle.

This native species is common on clay banks and other bare areas. Unlike most native beetles, tiger beetles (12mm long) take to the wing very quickly, especially in hot sunshine. They are voracious predators on other insects. The larva (or pennydoctor) is an active, long-legged grub with long, sharp mandibles and two hooks on its back. It lives in a circular hole in a clay bank, supporting itself near the entrance by the hooks on its back, and snatching any insect venturing too close to the hole.

This tiger beetle species, like the lemon tree borer (Plate 3), was collected on Captain Cook's first voyage to New Zealand, and the original specimen is in the British Museum (Natural History), London.



Common tiger beetle
Neocicindela tuberculata

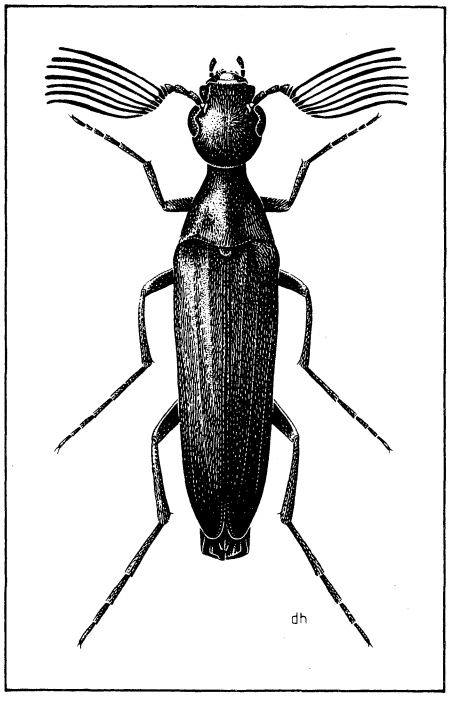
Plate 18

Plate 19

An antlered beetle

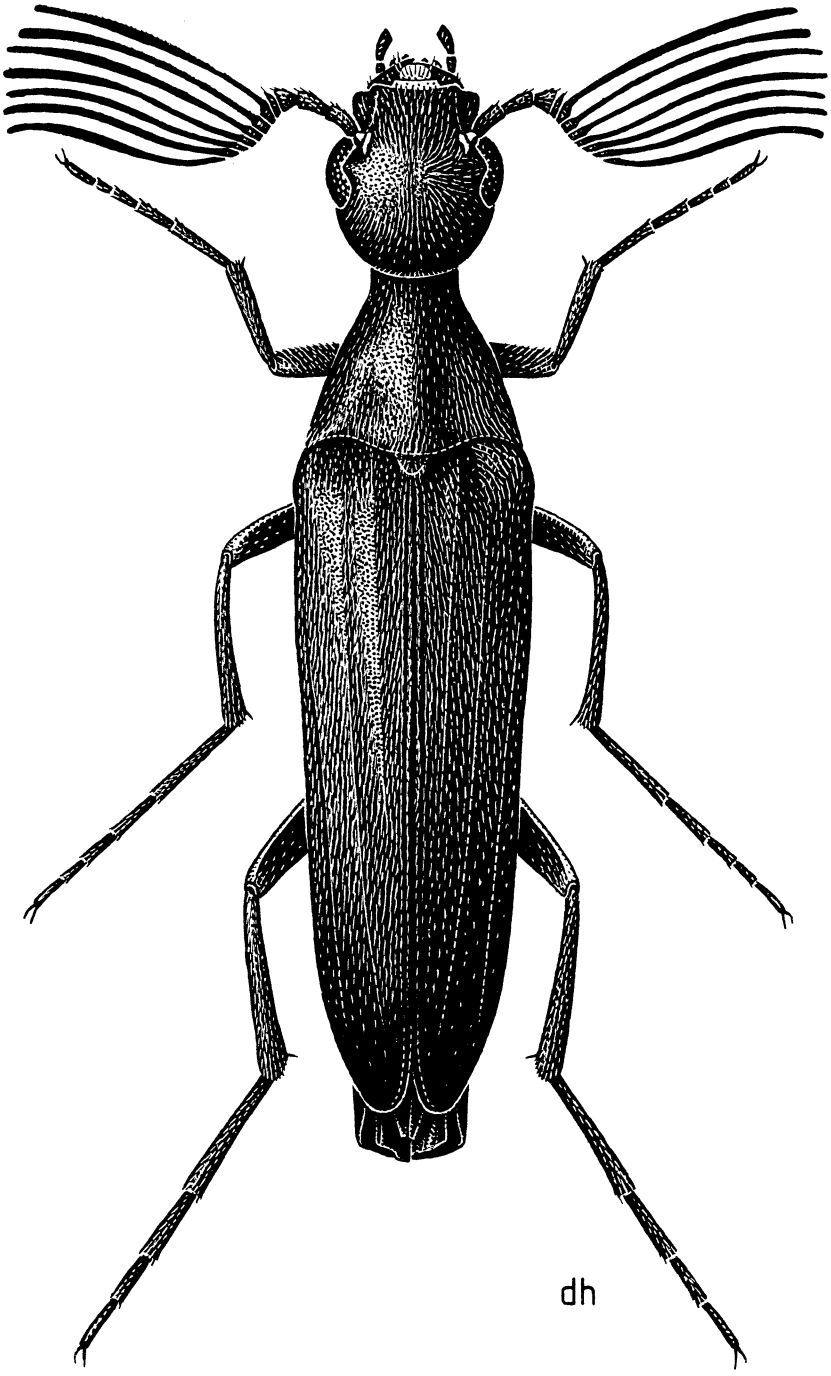
This insect was drawn on scraperboard. After being drawn in solid black, white lines and dots were scratched out to show form and surface texture, and white lines were used to define the main body parts of the insect. No attempt was made to draw the fine hairs on the antennae as they would not have shown up in reproduction.

The drawing on the main plate is the same size as the original.



Rhipistena lugubris Sharp, 1878.
Coleoptera: Rhipiphoridae.
An antlered beetle.

The very long processes on the antennae of male antlered beetles are covered with sense organs, and are used for locating females (females have shorter processes on their antennae). Antlered beetles are found in mid-summer in sunny situations in forest, where they take to flight very rapidly. Their larvae live in dead tree trunks and logs, and are external parasites on larvae of woodborers, such as the huhu. The three New Zealand species are uncommon or rare. This one is about 8mm long.



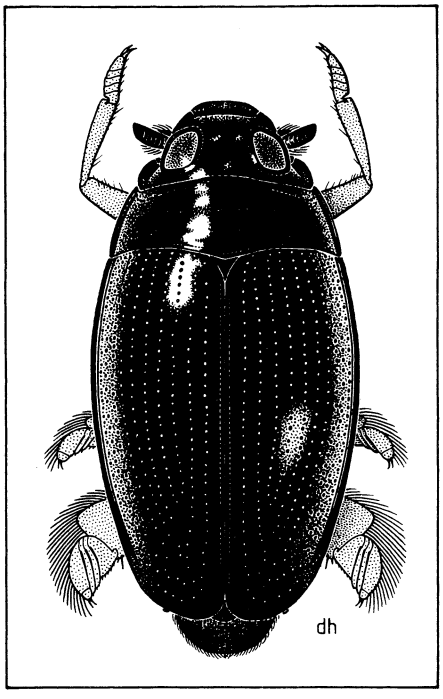
An antlered beetle
Rhipistena lugubris

Plate 20

Whirligig beetle

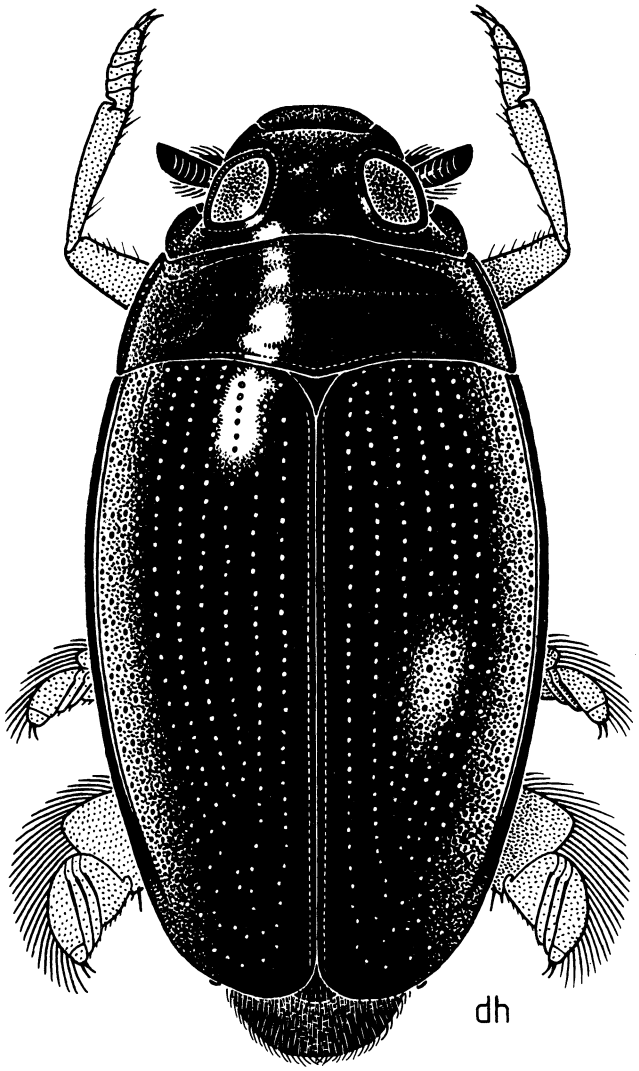
This insect is smooth and dark like the terrestrial "water" beetle (Plate 16). The row of white dots on the wing case or lower part of the insect represent punctures (pits). Although barely visible on the specimen it is necessary to show details such as these for identification.

The drawing on the main plate is the same size as the original.



Gyrinus convexiusculus Macleay, 1873.
Coleoptera: Gyrinidae.
Whirligig beetle.

This widespread Indo-Australian species occurs in a few ponds and lakes in the Waikato. The beetles (5mm long) are surface swimmers, using the flattened middle and hind legs as oars. The long front legs are used for catching prey. The eyes of whirligig beetles are each divided into two parts — the upper part is adapted to aerial vision, and the lower part to underwater vision. Larvae of whirligig beetles live underwater and obtain oxygen through long, feathery gills on the abdomen. Like the adults, they are predators.



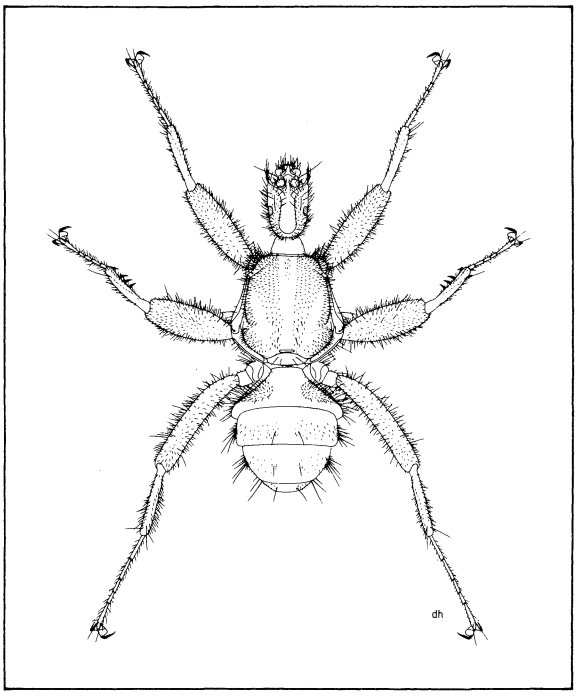
Whirligig beetle
Gyrinus convexiusculus

Plate 21

New Zealand bat-fly

As this insect was a significant new discovery for both the New Zealand and the world fauna, a fully detailed line drawing of this mature male was needed to show every structure and detail as clearly as possible. Shading to show three-dimensional form would have obscured much of the detail.

The drawing on the main plate is two-thirds the size of the original.

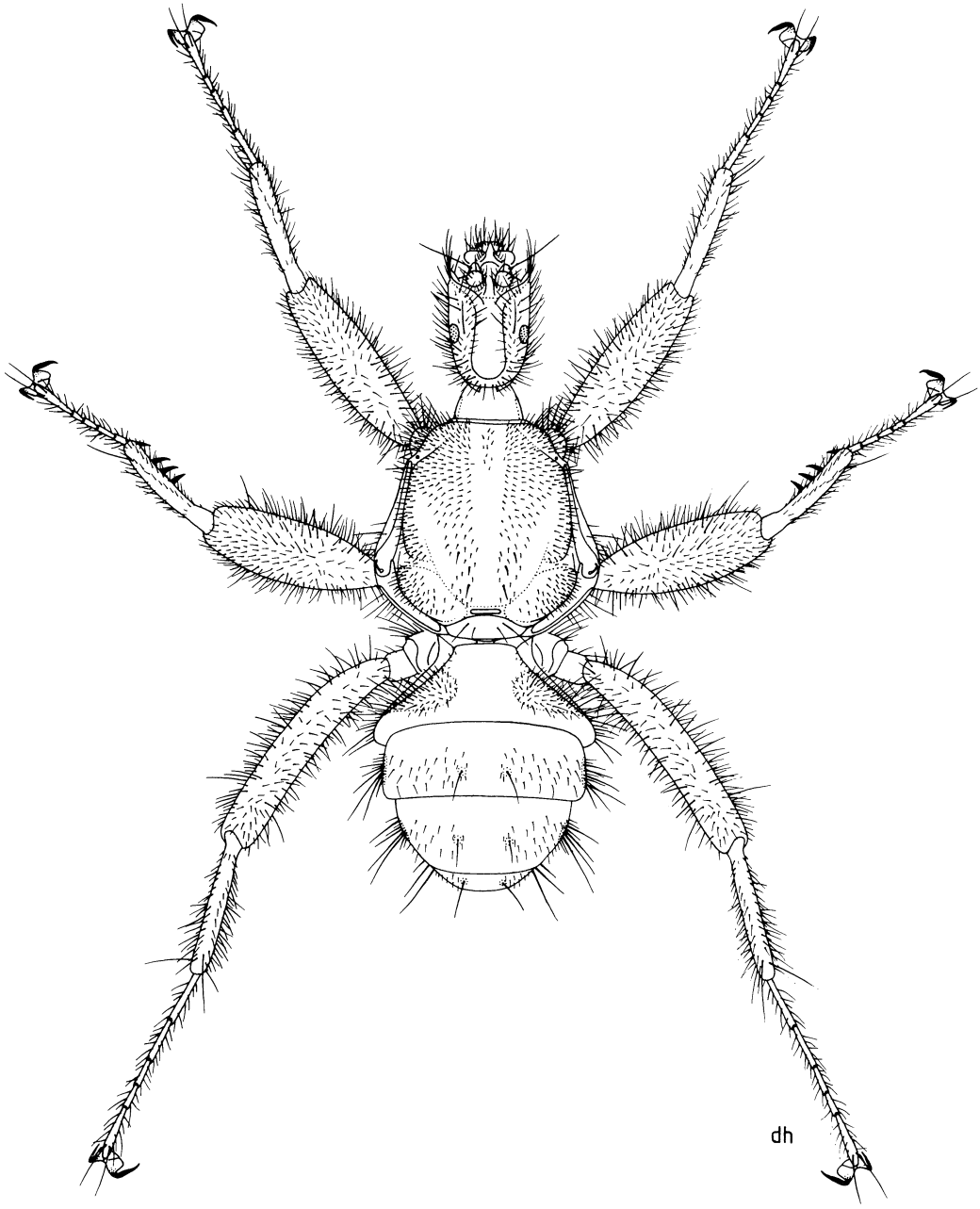


Mystacinobia zelandica Holloway, 1976.
Diptera: Mystacinobiidae.
New Zealand bat-fly.

Published in:

1. *New Zealand journal of zoology 3(4):* 282. 1976. [Beverley A. Holloway. A new bat-fly family from New Zealand (Diptera: Mystacinobiidae).]
2. Entomological Society of N.Z.: Letter Card.

This blind wingless fly (7mm long) is found only in the warm roosts of the New Zealand short-tailed bat, and is as unusual as the bat itself. A single roost inside a hollow tree may contain many thousands of these flies and their larvae. Although the flies have enormous claws that enable them to move about on bat fur, they feed on bat guano and not on bat blood as might be expected. Bat-flies need the 30 °C temperature of bat roosts throughout their life cycle to survive and depend on bats to transport them to new roosts at times when the bats abandon their established roost for a new hollow tree elsewhere.



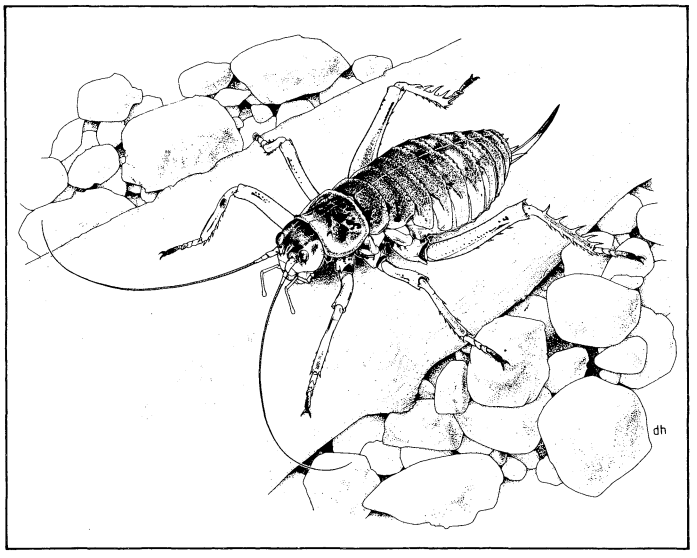
New Zealand bat-fly
Mystacinobia zelandica

Plate 22

Stephens Island weta, female

This drawing was done to show the insect in a natural environment, although care was also taken to illustrate its characteristic features for the purpose of identification.

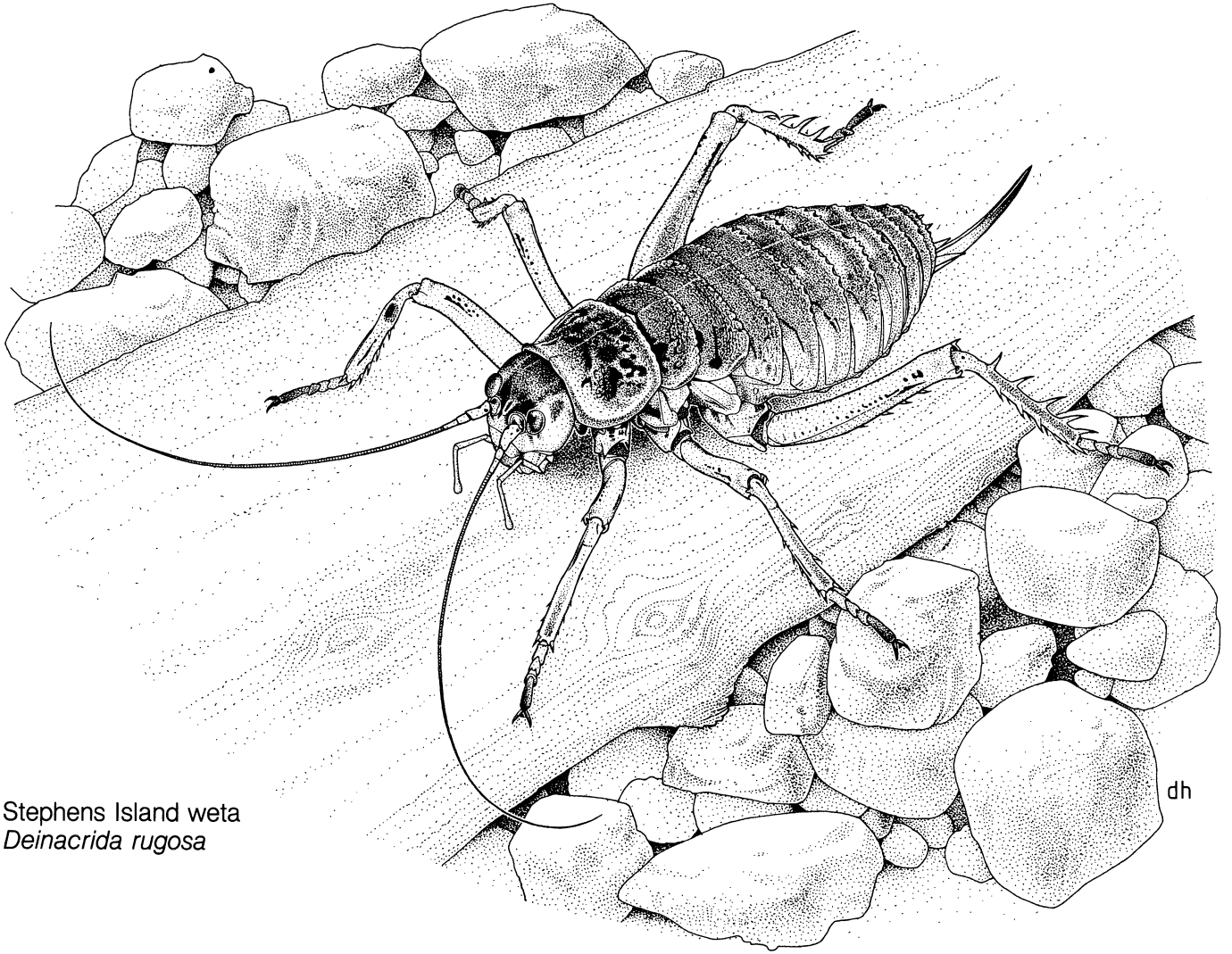
The drawing on the main plate is half the size of the original.



Deinacrida rugosa
Buller, 1871.
Orthoptera:
Stenopelmatidae.
Stephens Island weta.

Published in:
Entomological Society of N.Z.: Letter Card.

This is an endangered species which has legal protection. It is found on several offshore islands in the Cook Strait region, but only those that are rat-free. It is a stout, 60-mm long, ground-dwelling species and feeds mainly on foliage. Attempts have been made in recent years to establish it on Maud Island in the Marlborough Sounds.



Stephens Island weta
Deinacrida rugosa