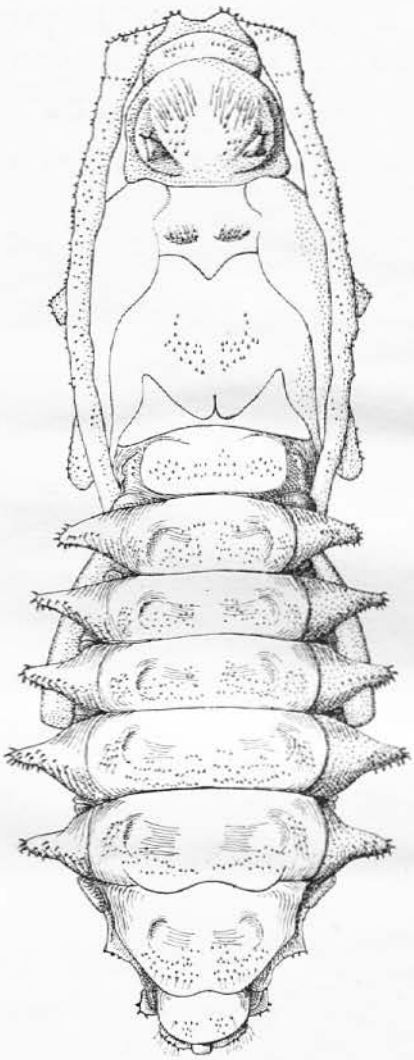

Diotimana undata (Pascoe). Pupa. Dorsal aspect.

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A MONOGRAPH OF THE IMMATURE STAGES OF AUSTRALASIAN TIMBER BEETLES (*CERAMBYCIDAE*)

BY

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(COMMONWEALTH INSTITUTE OF ENTOMOLOGY)

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PREFACE

SINCE the majority of insects are classified according to characters acquired in the adult stage, most published aids to insect identification have hitherto been based mainly on adult characters. The timber beetles, however, belong to a numerous assemblage of insects whose economic importance derives from the destructive activities of their larvae. In his series of monographs of the timber beetles of the world, of which this volume is the fourth, Mr. Duffy has aimed to produce a reliable guide to the recognition of the forms directly responsible for the damage, namely the immature insects found in the timber itself. Throughout this series the descriptions are based largely on first-hand studies by the author, who has himself prepared nearly all the text-figures. With the addition of detailed information on the biology of the species described, keys for their identification, and copious references to works already published, each volume contains all the ingredients of a standard work of reference for applied entomologists in this field. In this, the latest of the series, the author has ably maintained the high standards he established at the outset.

J. P. DONCASTER,
Keeper of Entomology

INTRODUCTION

THIS volume, the fourth of a series dealing with the immature stages of timber beetles on a regional basis, is devoted to the Australasian Region. For present purposes this region comprises Australia, New Zealand and certain Pacific islands such as the New Hebrides, New Caledonia, Fiji, Samoa and the Solomon Islands (Fig. 11). A few species from New Guinea have been included but only because they occur also in Australia. Gressitt (1959) has found that the LAMIINAE of New Guinea show a closer relationship to those of the Oriental Region than to Australia, although the PRIONINAE and CERAMBYCINAE, particularly the latter, show a closer affinity to Australia than do many other insect groups in New Guinea. In most regions, including New Guinea, the LAMIINAE greatly exceed the other subfamilies in representation, but in Australia the CERAMBYCINAE are more fully represented. Moreover, the subfamilies DISTENIINAE and LEPTURINAE are absent from Australia but present in New Guinea. For these reasons it is intended to include the species from New Guinea in the next volume, now in preparation, which is to deal with the Oriental Region.

In this volume the tested format of Volume I has again been adopted, with certain additional features. Keys are provided for the identification of larvae and pupae and deal with 77 genera and 100 species, and 39 genera and 44 species respectively. The greater part of this material has been described in detail and illustrated for the first time. In addition, bionomic observations and host plants are given for approximately 250 species. A summary of their economic importance and recommended control measures has also been included whenever this was possible.

In certain cases where a species is considered to be of economic importance or is unusually modified, a brief and usually illustrated description of the adult has been included, mainly for the guidance of field workers.

Despite the inevitable inadequacy of this work, it is hoped that a reliable basis for present reference and future expansion has been provided and that it should now be possible to identify reliably, larvae and pupae of most cerambycids likely to be causing damage in forests, timber yards and sawmills.

References to the immature stages and biology of Australasian cerambycids are widely scattered, and most of the larval descriptions are vague and quite inadequate by present-day standards. One notable exception, however, is Dumbleton's excellent paper (1957) which provides keys and illustrated descriptions to 20 species of cerambycid larvae from New Zealand. Useful bionomic observations were obtained from many sources but particularly from the numerous papers by Best, Brimblecombe, French, Froggatt and McKeown, whose publications are listed under "References" (p. 213). Most of the latter have been obtained from the *Coleopterorum Catalogus* of Junk and Schenkling (1912–1923), the *Review of Applied Entomology* and the *Zoological Record*. More than 400 references are listed but it should be pointed out that many of these refer to the notorious House Longhorn (*Hylotrupes bajulus* (Linnaeus)) so that, in view of the comparatively recent establishment of this pest in the Australasian Region, a fully comprehensive and up-to-date account could be provided.

Host plant names have been checked with Willis (1948), Howard (1951) and Kelsey and Dayton (1942).

All original figures of larvae, pupae and adults have been executed by the author with the aid of a Bausch and Lomb binocular dissecting microscope and a Leitz monocular microscope, both in conjunction with an Abbé *camera lucida*. Certain figures have been reproduced from the author's previous monographs, and a few other figures have been copied from other publications. In all these cases acknowledgement has been made in the legends.

The photographs, except where otherwise indicated, have been carefully prepared by Mr. R. W. Loosemore, Photographer, British Museum (Natural History).

Most of the wood samples photographed were sent on loan by Mr. G. B. Rawlings and Mr. E. S. Gourlay and original photographs of infested wood have kindly been provided by Dr. A. R. Brimblecombe and Mr. Rawlings.

In conclusion, the author wishes to express with pleasure and gratitude his indebtedness to the following persons for their kind co-operation in sending material on loan or as a presentation from their respective Institutions. Firstly, the author is most deeply indebted to Mr. K. M. Moore (Forestry Commission of N.S.W., Sydney) for collecting, rearing and sending on loan immature material representing many of the species dealt with in this volume; and for his unstinted help as a collaborator rather than only a collector, in so generously making available all his field notes and original observations, which have largely been incorporated in the text, with due acknowledgement, under the species concerned. Acknowledgement is also made to the Forestry Commission for its co-operation in time and equipment and in allowing Mr. Moore additional time in which to supplement his private efforts.

For further invaluable co-operation, the author is indebted to Dr. W. A. McDougall and Dr. A. R. Brimblecombe (Department of Agriculture and Stock, Brisbane) for the loan of the Department's entire collection of immature material (most of which had been collected through the years by Dr. Brimblecombe), and various photographs depicting characteristic damage.

From New Zealand the author has received valuable assistance from Mr. G. B. Rawlings and Mr. R. H. Milligan (New Zealand Forest Service, Forest Research Institute, Whakarewarewa, Rotorua) through their generous presentation of immature material (now incorporated in the National collection of the British Museum (N.H.)) and the loan of wood samples and photographs. A small but most useful collection of larvae, with wood samples and photographs was also received on loan from Mr. E. S. Gourlay (D.S.I.R., Entomological Department, Nelson). Thanks are also due to Dr. J. S. Edwards (University of Cambridge, Department of Zoology) for his kindness in allowing the author to quote from his excellent thesis on *Prionoplus*, only parts of which have so far been published (see "References", p. 213).

Thanks are also due to Mr. C. E. Chadwick (Department of Agriculture, Rydalmere, N.S.W.), Dr. P. B. Carne (C.S.I.R.O., Canberra), Mr. G. S. Dun (Department of Agriculture, New Britain), Dr. F. D. Morgan (Waite Agricultural Research Institute, Adelaide) and Mr. J. H. Ardley (Bubia Agricultural Station, Lae, New Guinea) for the loan of material, and to Mr. J. W. Armstrong (Cullingera, Nyngan, N.S.W.) for records of host plants.

Appreciation is also extended to Dr. A. J. Nicholson (formerly Director of the Division of Entomology, C.S.I.R.O., Canberra) for his kind and enthusiastic support when the preparation of this monograph was first considered.

The author is also grateful to the librarians of the Commonwealth Institute of Entomology and the British Museum (Natural History) for their help in locating obscure publications.

Finally the author wishes to acknowledge his indebtedness to Mr. E. O. Pearson, Director of the Commonwealth Institute of Entomology, for kindly permitting this research to be undertaken as part of official duties, and to Mr. R. G. Fennah, Assistant Director, for his sustained interest and advice.

AUSTRALASIAN CERAMBYCID LARVAE

FAMILY CHARACTERS

Form elongate, usually subcylindrical, occasionally cylindrical or rather strongly depressed. Cuticle thin, often rather leathery, especially on prothorax; never deeply pigmented or extensively sclerotised; usually greyish or milky white or pale testaceous and pubescent, especially on lateral regions.

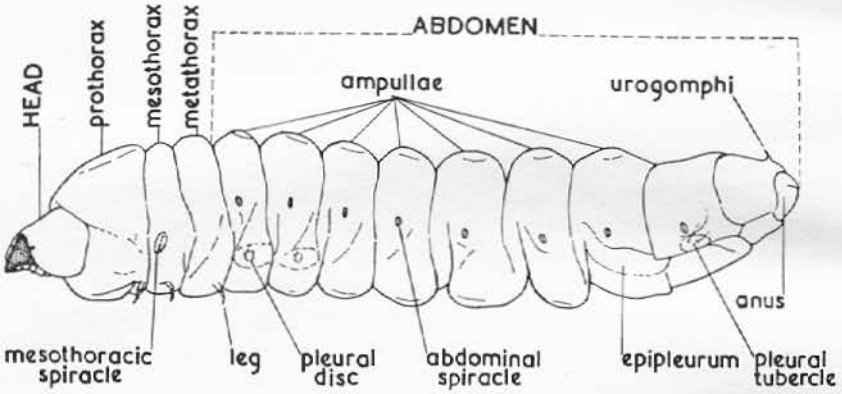

Fig. 1. Diagrammatic figure of a cerambycid larva. Lateral aspect. (Duffy, 1953a)

Head extensible, usually deeply invaginated into prothorax; occiput large, occipital foramen very large, ventral, and often divided into two portions by the tentorial bridge. Ventral surface with a broad, transverse bridge formed completely or mainly by the large hypostoma, the front margin of which is never strongly curved or retracted. Clypeus distinct, membranous, usually glabrous. Mandibles short, cutting edge either oblique or gouge-like, never with molar part or prostheca. Antennae usually strongly retractile with segment 2 usually bearing a tapering hyaline process; generally 3- but sometimes only 2-segmented (see p. 7); basal membrane often large and conspicuous. Maxillae protracted but compact; maxillary stipes movable only in one plane; maxillary articulating area distinct, generally fleshy. Labial palpi distinct, conical.

Prothorax large, with a wide collar; mesothorax, metathorax and abdomen narrower, never with hypopleural sclerites and always with a rectangular, sclerotised dorsal plate which is generally more or less glabrous but sometimes micro-pubescent, micro-spiculate or asperate.

Abdomen extended, dorsally, and usually ventrally, bearing fleshy ambulatory ampullae on segments 1–6 or 1–7; segment 9 often with a sclerotised plate or process (figs. 122, 127) or with rigid unsegmented urogomphi (fig. 32). Anal region nearly always trilobate, exserted, occasionally with a transverse cleft.

Legs often vestigial or absent; if present, then widely separated; never more than 4-segmented (excluding unguiculus).

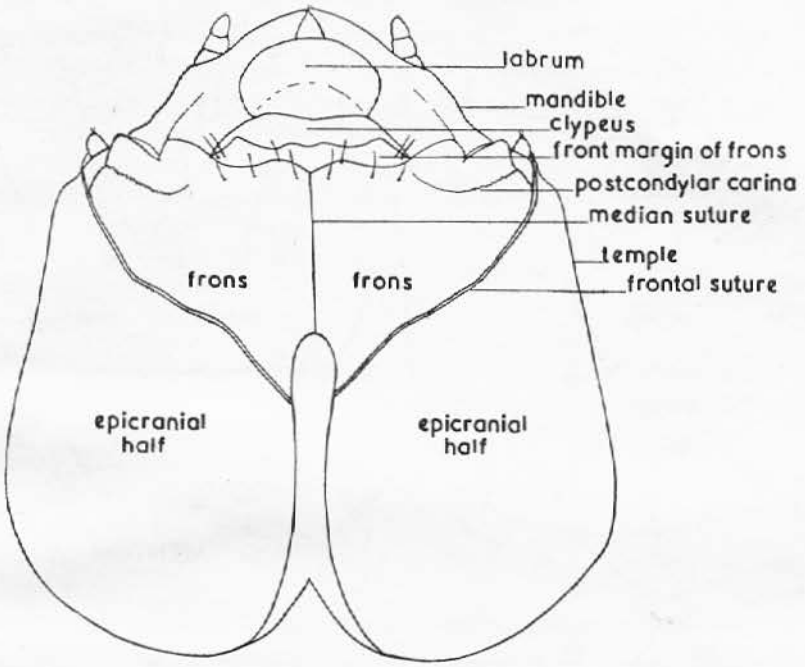

Fig. 2. Diagrammatic figure of a cerambycid larval head. Dorsal aspect. (Duffy, 1953a)

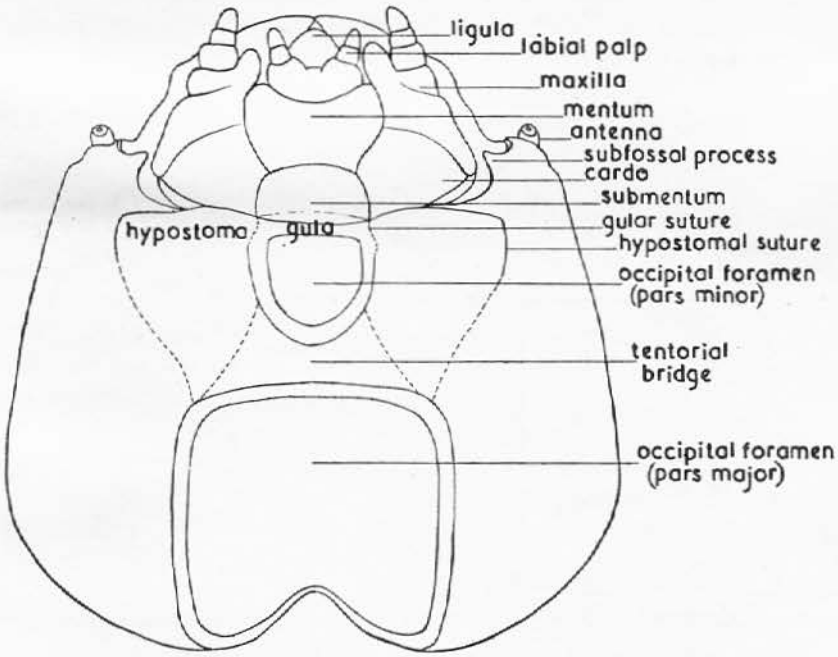

Fig. 3. Diagrammatic figure of a cerambycid larval head. Ventral aspect. (Duffy, 1953a)

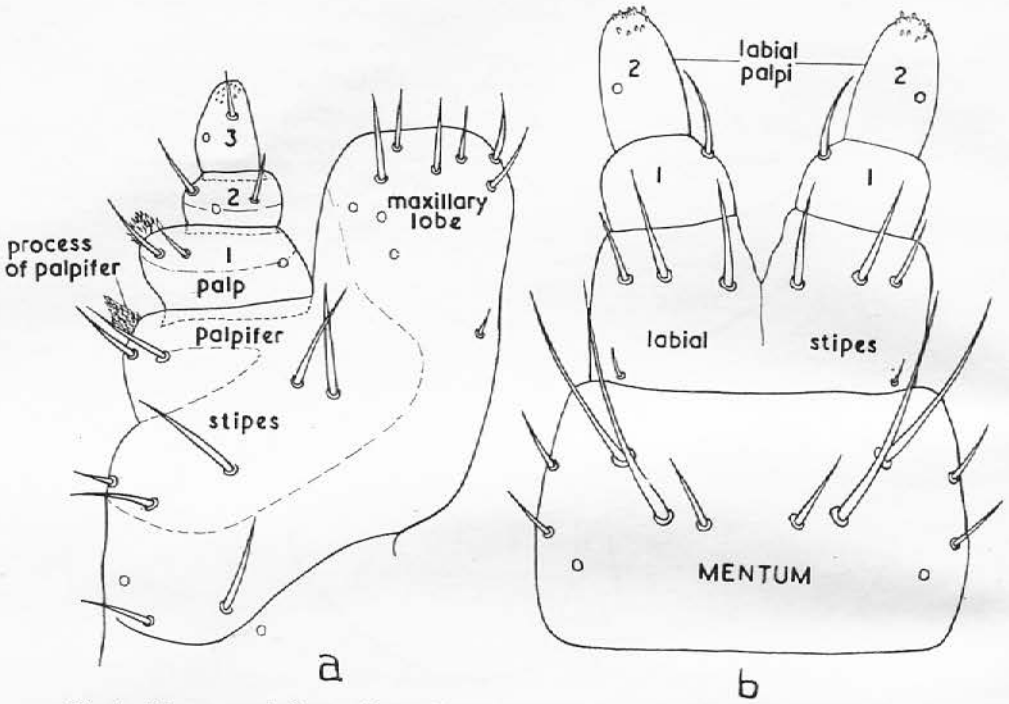

Fig. 4. Diagrammatic figure of ventral mouthparts of a cerambycid larva. Ventral aspect. (*a*) maxillary palp, (*b*) labial palpi. (Duffy, 1953a)

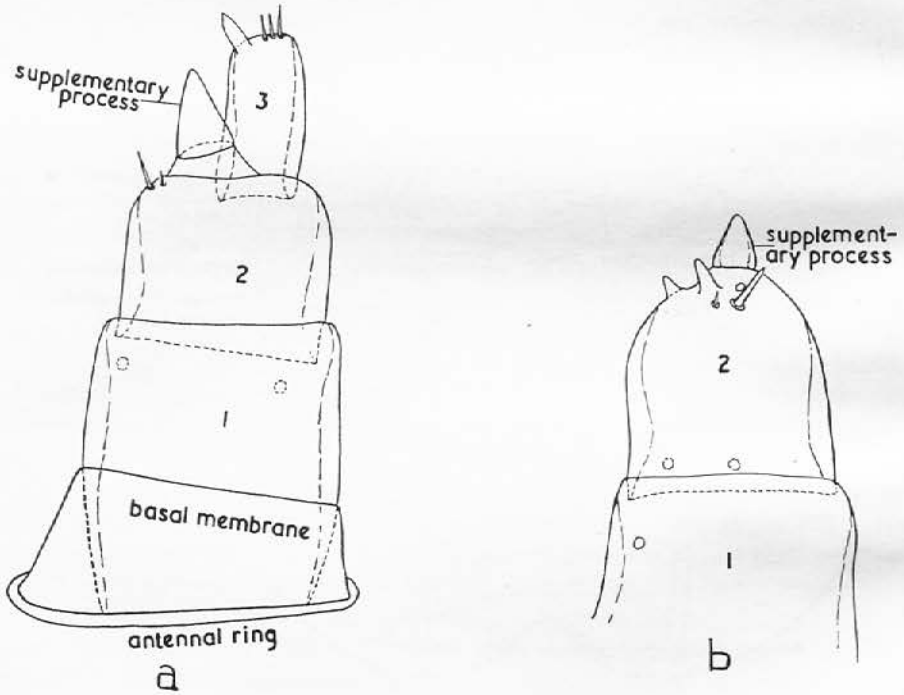

Fig. 5. Diagrammatic figure of (*a*) a 3-segmented and (*b*) a 2-segmented antenna of a cerambycid larva. Lateral aspect. (Duffy, 1953a)

Spiracles annular, bilabiate, with respiratory opening narrow[1]; lips membranous, clothed with setigerous tubercles; peritreme often with marginal chambers (fig. 41).

The morphology of cerambycid larvae has already been dealt with in the author's first volume (1953a), but for the benefit of those readers who are not fully acquainted with the terminology or to whom this work is not available, the following figures (figs. 1–8) are reproduced as a guide to the interpretation of the keys and descriptions.

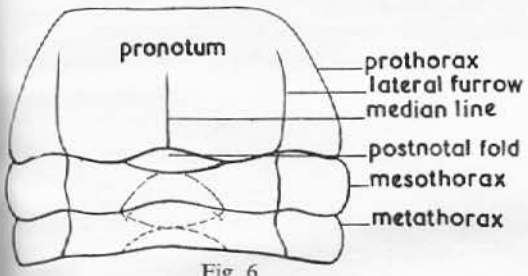

Fig. 6

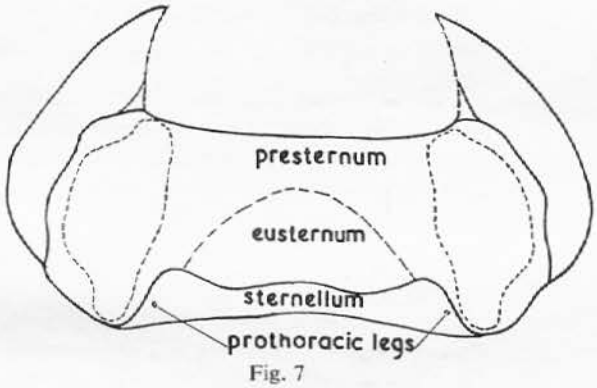

Fig. 7

Fig. 6. Diagrammatic figure of pro-, meso- and metathorax of a cerambycid larva. Dorsal aspect. (Duffy, 1953a)

Fig. 7. Diagrammatic figure of prothorax of a cerambycid larva. Ventral aspect. (Duffy, 1953a)

A brief explanation concerning the segmentation of the antenna is perhaps desirable. Owing to its small size, little use has been made of its diagnostic value until the present author's examination of this structure in the British species of this family. It was then found to be of major significance and has again been used to advantage in the present work. It is now evident that there are many genera and at least several tribes in which the antenna is only 2-segmented, the "third segment" being minute, hyaline, conical and devoid of setae (fig. 5b), and now regarded merely as a supplementary

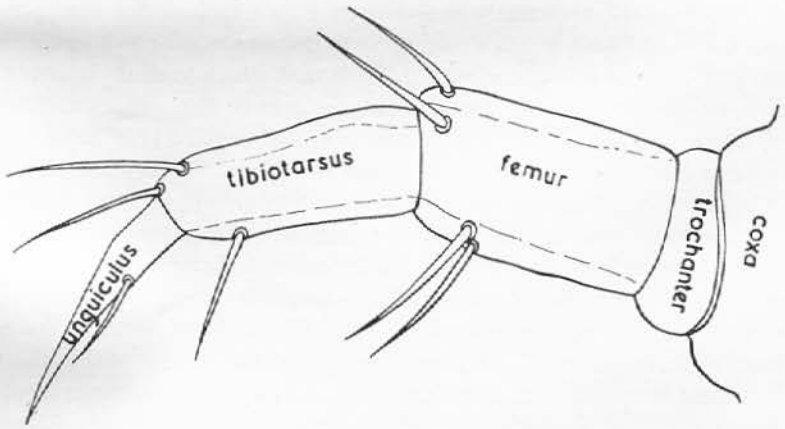

Fig. 8. Diagrammatic figure of leg of a cerambycid larva. Lateral aspect. (Duffy, 1953a)

[1] The spiracular peritreme is remarkably constant in form, the only notable exception so far encountered is in *Distichocera* (see p. 133).

process. It is in fact the presence or absence of the third segment which is of great diagnostic importance. This segment is invariably cylindrical, strongly sclerotised and setose apically, and is thus quite distinct from the accompanying supplementary process which is usually much shorter and is always tapering, hyaline and devoid of setae (fig. 5a). The third antennal segment is absent in certain tribes of the PRIONINAE, ASEMINAE, LEPTURINAE and LAMIINAE, but no reduction in segmentation has yet been found in the PARANDRINAE and CERAMBYCINAE.

KEY TO SUBFAMILIES

The following keys are based on mature or at least half-grown larvae. Scarcely anything is known of the earlier instars of Australasian species of this family, but a recent study of those of British species has shown that, in the majority of cases, first-instar larvae differ appreciably from those of later instars particularly in the structure of the antenna and spiracles and in the presence of egg-bursting spines. Moreover, such taxonomically useful characters as terminal processes and urogomphi are almost invariably undeveloped.

In the preparation of previous volumes, attempts have always been made to place the subfamilies and genera in a phylogenetic sequence rather than in an artificial order, and whenever this has proved to be at variance with the generally accepted sequence of adult classification, an explanation has been given under the appropriate subfamily, tribal or generic heading of the section dealing with descriptions and bionomics.

As in the case of the Neotropical region, the construction of these larval keys to Australasian cerambycids has proved to be much more difficult and complicated than was the case with those relating to the Palaearctic and Ethiopian regions. The selection of tribal characters in particular was often a complicated procedure, especially when it was found necessary to employ different combinations of the same or similar characters instead of using single fundamental characters. Consequently, although apparently satisfactory from the taxonomic standpoint, their phylogenetic significance may in some instances be questionable.

In the case of the apparently well-defined Phoracanthini, for example, no single character could be found which would serve to isolate the tribe as a whole; indeed this tribe has proved to be one of the most difficult with which to deal. It would appear to comprise two fairly distinct groups, one in which the genae and temples are broadly sclerotised and pigmented, protuberant and striated (*Phoracantha*, *Coleocoptus*), and the other in which the temples are smooth and feebly sclerotised. For the genus *Coptocercus* it has not been possible to find reliable generic characters, consequently the three species have had to be eliminated separately in the key to genera.

Perhaps the most inconvenient and disconcerting factor encountered in the present study was the large number of tribes of the CERAMBYCINAE in which larvae were found to possess three pairs of ocelli. In cerambycid larvae the presence of this number of ocelli has, with a few isolated exceptions, always been indicative of the tribe Cerambycini. But it has now been found that this character is present in one or more genera of the following tribes: Cerambycini (*Hoplocerambyx*, *Pachydissus*), Phlyctaenodini, Strongylurini, Molorchini (*Gastrosarus*), Uracanthini, Distichocerini, Stenoderini, Rhagiomorphini, Aphanasiini, Callidiopini, Callidiini (*Hylotrupes*) and Navomor-

phini. This condition could perhaps be attributed to early isolation, as a result of which there was no subjection to conditions inducing loss of ocelli.

Larvae of the Stenoderini have proved to be remarkably diverse and could only be eliminated in the key in several sections. No fundamental characters could be found peculiar to the Phlyctaenodini, consequently it was not possible to eliminate this group until the end of the key.

Larvae of many Australasian genera appear to be unusually homogenous and devoid of obvious and clear-cut characters. Moreover, some difficulty may be experienced in the interpretation of some of the characters used, particularly those relating to the ocelli, in which some of the apparently constant differences observed are difficult to appreciate without contrasting material.

The examination of larvae is best carried out in shallow glass receptacles filled with 80 per cent alcohol. It is often essential to examine critically the antennae or ventral mouthparts, in which case, if very small, they should be detached by means of a dissecting needle and made into a slide preparation. The technique adopted by the author was as follows. Firstly the dissected parts were transferred to 95 per cent and then to absolute alcohol, in both cases for periods varying from 15 to 60 minutes, according to size. This was followed by immersion in clove oil for approximately 24 hours. The dissected parts were then transferred to a slide, the superfluous fluid being absorbed by means of a piece of filter paper, and then covered with a few drops of Canada balsam on to which a cover glass was gently lowered, care being taken to ensure that the desired position of the dissected part was not disturbed. In the case of antennae this was not at all easy, for, being cylindrical, they tend to revolve. This may be discouraged by using a reasonably thick balsam and by slightly raising and lowering the cover glass from one side until the required position is obtained.

As a rule it is not necessary to remove the head capsule. The position of the tentorial cross-arm may be ascertained without dissection from the membranous connection between the anterior foramen and the prothorax; for example, in the ASEMINAE the gula is exposed or can be exposed merely by pushing back the front part of the prothorax, whereas in the PRIONINAE and CERAMBYCINAE a skinfold, which is attached to the front margin of the gula, is revealed when the prothorax is pushed back. In order to see whether the postero-lateral area of the head capsule is pigmented and sclerotised, the lateral area of the prothorax may easily be pressed back with a needle.

The dorso-external process of the palpifer, which is often concealed between the maxilla and the mandible, may easily be exposed by slightly raising the maxilla with a needle.

The critical examination of many larvae demands the temporary transference from spirit on to filter paper. By absorbing the excess fluid in this manner, minute structures such as pleural discs, asperities, spicules and setae become more conspicuous, as they are often indiscernible when the larva is wet. Care must be taken, however, not to keep the specimen out of spirit for more than a few minutes at a time, otherwise shrinkage and distortion will occur.

1. Legs absent or vestigial and mandible with an oblique cutting edge (figs. 118, 130). Head distinctly oblong, with sides parallel or converging posteriorly (fig. 130). Maxillae rigid, only movable from stipes; cardo, maxillary articulating area and submentum fused. Pleural tubercle often bearing a sclerotised pit at each extremity. [Occipital foramen undivided. At least six epistomal setae present. Pronotum and/or ampullae often asperate or spiculate.] . . . . . 5. LAMIINAE, p.17.

— Legs usually present and well developed (figs. 1, 23, 72), but if absent or vestigial, then mandible with a gouge-like cutting edge. Head transverse to subquadrate, with sides diverging posteriorly (figs. 27, 88). Maxillae movable; cardo, maxillary articulating area and submentum distinct. Pleural tubercle never with sclerotised pits 2

2. Occipital foramen divided into a small anterior and a larger posterior portion by the tentorial bridge which is in the same plane as the hypostoma (fig. 3). Ventral mouthparts attached to hypostoma by little more than width of gula. Maxillary palpifer with outer margin strongly rounded and protuberant (fig. 4a); maxillary lobe apparently borne on stipes. Epipleurum strongly protuberant on last three segments only. Four to six epistomal setae present. Postnotal fold usually present 3

— Occipital foramen not divided into two portions, as the tentorial cross-arm is internal. Ventral mouthparts attached to hypostoma for nearly its entire breadth. Maxillary palpifer with outer margin not strongly rounded and protuberant; maxillary lobe apparently borne on palpifer. Epipleurum slightly protuberant on all abdominal segments; seldom strongly protuberant on last three only, but if so, then tergite 9 with urogomphi. From six to twenty epistomal setae present. Postnotal fold absent. [Posterior emargination of head very shallow (fig. 30). Prothorax with pronotum velvety spiculate. Ampullae never tuberculate, usually micro-spiculate. Maxillary palp with segment 1 large, about twice size of segment 2. Prothoracic coxae widely separated. Unguiculus never with a basal seta. Tergite 9 with a pair of short, often blunt urogomphi (fig. 32). Ligula shorter than labial palpi. Antenna always with a strongly sclerotised, setose, third segment. General form subcylindrical. Predominantly in Coniferae.]
3. ASEMINAE (**Arhopalus syriacus** (Reitter)), p. 50.

3. Mandible with an oblique cutting edge (figs. 12, 27). Maxillae with palpi and lobes in same plane as cardo; lobe slender, subcylindrical and densely setose on inner margin. Legs present, well developed and at least as long as maxillary palpi; unguiculus stout and straight. Six or more epistomal setae present. Antenna (figs. 22, 27) with or without a sclerotised, setose, third segment. Clypeus wide (figs. 22, 27), filling space between dorsal articulations of mandibles. Front margin of frons with the lower boundary usually projecting over the clypeus and the upper boundary dentate or carinate (except Macrotomini (pars) and PARANDRINAE). Prothoracic coxae almost meeting medially. Pronotum sometimes asperate (fig. 13). Dorsal ampullae with two very distinct transverse impressions. Pleural discs present or absent 4

— Mandible with a gouge-like cutting edge. Maxillae with palpi and lobes curved upward against ventral surfaces of mandibles; lobe broad and flat, with inner margin glabrous or almost so (fig. 4a). Legs smaller, seldom as long as maxillary palpi and sometimes absent (fig. 91); unguiculus slender, usually flagelliform. Only four epistomal setae present. Antenna always with a strongly sclerotised, setose, third segment (figs. 5a, 98). Clypeus narrow, not filling space between dorsal articulations of mandibles (figs. 82, 88). Front margin of frons with lower boundary never projecting over clypeus and upper boundary never dentate or carinate (figs. 61, 88). Prothoracic coxae widely separated. Pronotum non-asperate (except certain Neotropical species). Dorsal ampullae with posterior transverse impression generally rather indistinct. Pleural discs present. [Palpifer and/or first palpal segment often with a dorso-external process (fig. 4a).].
4. CERAMBYCINAE, p. 11.

4. Posterior area of pronotum glabrous or micro-pubescent (asperate only in one Neotropical species). Postcondylar carina and subfossal process present (figs. 3, 22).

Front margin of frons with lower boundary usually projecting over clypeus (figs. 17, 27). Pleural discs present. Antenna sometimes with a strongly sclerotised, setose, third segment (fig. 27) . . . . . 9. PRIONINAE, p. 11.

— Posterior area of pronotum coarsely asperate (fig. 13). Postcondylar carina and subfossal process absent (fig. 12). Front margin of frons with lower boundary never projecting over clypeus. Pleural discs absent. Antenna always with a strongly sclerotised, setose, third segment (fig. 12). [Ocelli absent.] . . 1. PARANDRINAE (**Parandra** spp.), p. 30.

KEYS TO GENERA AND SPECIES

2. PRIONINAE

1. Antenna 2-segmented (fig. 20). Eusternum subcordate, glabrous. Macrotomini . 3
— Antenna 3-segmented (fig. 27). Eusternum triangular, finely spinulose or partly microspiculate 2
2. Abdominal ampullae coarsely spinulose (fig. 28). Eusternum finely spinulose. Lateral lobes of lower boundary of front margin of frons rather feebly produced (fig. 27). Anacolini . . . . . **Prionoplus reticularis** White, p.42.
— Abdominal ampullae glabrous. Eusternum partly microspiculate posteriorly. Lateral lobes of lower boundary of front margin of frons much more strongly produced. Callipogonini . . . . . **Cacodacnus planicollis** Blackburn, p. 42.
3. Presternum of prothorax with lateral areas bearing a group of about 20 conical tubercles which are sclerotised apically (fig. 23). Front margin of frons with upper boundary strongly produced anteriorly and protruding beyond lower boundary (fig. 22).
Olethrius insularis (Fairmaire), p. 38.
— Presternum of prothorax non-tuberculate. Front margin of frons with upper boundary not produced anteriorly beyond lower boundary (except for the dentate processes (figs. 17, 20)) 4
4. Head with front margin of frons with carina of upper boundary produced anteriorly into a pair of paramedian dentate processes (fig. 20); lower boundary with very large lateral, dentate processes (fig. 20) . **Agrianome** (s.g. **Agrianome**) **spinicollis** (Macleay), p. 36.
— Head with front margin of frons with carina of upper boundary not produced paramedially (fig. 17); lower boundary with dentate processes appreciably smaller (fig. 17) 5
5. Prothoracic presternum with a well defined antero-median area which is subtriangular, smooth, feebly but coarsely longitudinally strigose and with a distinct median longitudinal impression; this area strongly contrasting with the surrounding area which is coarsely rugulose (fig. 18). Abdominal segment 8 as long or as longer than segment 7.
Paroplites australis Erichson, p. 33.
— Prothoracic presternum entirely coarsely rugulose and without a distinct antero-median area contrasting with surrounding cuticle. Abdominal segment 8 shorter than segment 7.
Eurynassa australis (Boisduval), p. 39.

4. CERAMBYCINAE

1. Abdominal ampullae bearing numerous moniliform tubercles. Temple with a distinct postocular, vertical carina. Three pairs of subcontiguous ocelli present. Upper margin of antennal foramen dentate (fig. 35). Head capsule rectangular, with sides not or scarcely diverging behind middle 2
— Without these characters combined 3
2. Front margin of frons with a pair of conspicuous dentate processes (fig. 35); a simple dentate process present behind each dorsal mandibular condyle. Temples behind postocular carina pale testaceous. Tubercles of dorsal ampullae rather strongly sclerotised, pale ferruginous. Anal lobes bearing sparse, pale, silky setae. Spiracles with peritreme pale testaceous; marginal chambers absent.
Hoplocerambyx spinicornis (Newman), p. 56.

— Front margin of frons with processes less strongly developed. Temples behind postocular carina very broadly ferruginous. Tubercles of dorsal ampullae not sclerotised, pale testaceous. Anal lobes encircled with a fringe of short reddish setae, behind which are scattered longer setae (fig. 40). Spiracles with peritreme ferruginous; marginal chambers present . . . . . **Pachydissus sericus** Newman, p. 63

3. Hypostoma distinctly tuberculate, the anterior margin either longitudinally carinate or transversely striate. Genae protuberant, sclerotised and irregularly swollen around enclosed ocelli. Legs long, 4-segmented. One or three pairs of ocelli present. Hesperophanini 4

— Hypostoma without distinct irregularities (except *Blosyropus*, but then three pairs of subcontiguous ocelli present). Gena seldom shouldered or protuberant (except Phoracanthini and Stenoderini) and never irregularly swollen around ocellus . 5

4. One pair of ocelli present. Hypostoma longitudinally carinate anteriorly. Abdominal ampullae non-tuberculate . . . **Stromatium longicorne** Newman, p. 65

— Three pairs of ocelli present. Hypostoma transversely striate anteriorly. Abdominal ampullae tuberculate . . . . . **Phacodes,** p. 16

5. Abdomen with segment 8 distinctly broader than segment 7; segment 9 extremely short, less than half length of segment 8 (fig. 34). Ocelli absent. Abdominal ampullae micro-spiculate . . . . . Oemini. **Xystrocera globosa** (Olivier), p. 53

— Without these characters combined 6

6. Temple with one to three deep vertical impressions (connecting paired setal pores) behind ocellus, where it is broadly sclerotised and ferruginous (figs. 45, 48). Ocelli absent or one pair present . . . . . Phoracanthini (pars major) 7

— Temple without deep vertical impressions (and paired setal pores) and not as broadly sclerotised and pigmented. Ocelli absent or one to five pairs present . . . 10

7. One pair of large distinct ocelli present laterad and ventrad of antenna (fig. 45). Front margin of frons rather broadly pitchy to black 8

— Ocelli either greatly reduced or indistinct and placed well behind antennal foramen (figs. 48, 57). Front margin of frons less broadly pigmented, ferruginous . . 9

8. Ocellar lens large and broadly oval (fig. 45). Temples deeply impressed. **Phoracantha** (s.g. **Phoracantha**), p. 16

— Ocellar lens very narrow and slot-like. Temples rather feebly impressed but setal pores distinct . . . . . **Coptocercus rubripes** (Boisduval), p. 83

9. Ocellus with lens rather indistinctly defined (owing to strong sclerotisation of gena) and widely separated from antennal foramen (fig. 57). **Coptocercus abberrans** (Newman), p. 83

— Ocellus with lens greatly reduced, resembling in size and colour one of the setal pores on gena (fig. 48) . . . . . **Coleocoptus senio** Newman, p. 75

10. Lateral regions of prothorax with a large median area which is dull and micro-spiculate[1]. Ocelli absent or indistinct. Meso- and metasternum non-tuberculate. Phoracanthini (pars minor) 11

— Without these characters combined 13

11. Ocellus with pigmented spot visible through cuticle (there being no distinct lens) as a minute greyish blotch (fig. 58) . . **Coptocercus biguttatus** (Donovan), p. 84

— Ocelli absent or with pigmented spot indiscernible 12

12. Temple finely but distinctly rugoso-striate. Form slender; maximum breadth 4·1 mm. **Skeletodes tetrops** Newman and (or?) **Bethelium inscriptum** Pascoe, p. 95

— Temple smooth. Form more robust; maximum breadth 7·1 mm. **Epithora dorsalis** (Macleay), p. 85

13. Abdominal segments 5 and 6 much longer than segments 3 and 4 . . . 39

— Abdominal segments 5 and 6 not longer than segments 3 and 4 . . . 14

14. Meso- and metasternum tuberculate 15

[1] Only apparent when larval cuticle is dry.

— Meso- and metasternum usually non-tuberculate but if so then front margin of frons with a pair of rounded paramedian tubercles (*Stenopotes*) or strongly rugulose and subcarinate (*Bardistus*) or abdominal segment 10 bearing one or more tubercles (*Uracanthus*, *Scolecobrotus*) or anterior part of pronotum with three or four pairs of extremely coarse setae (*Rhinophthalmus*) 21

15. Posterior part of pronotum dull, micro-granulate, the front margin of this area (which strongly contrasts with the smooth, shining anterior part) produced into four lobes 27

— Posterior part of pronotum not micro-granulate 16

16. Abdominal segment 9 short, transverse. Apical segment of maxillary palp not longer than penultimate segment. Meso- and metasternum tuberculate . . . 17

— Abdominal segment 9 strongly elongate. Apical segment of maxillary palp distinctly longer than penultimate segment 24

17. Abdominal segment 10 rounded posteriorly 18

— Abdominal segment 10 obliquely truncate posteriorly 43

18. Sublateral areas of prosternum at most feebly sclerotised and bearing setae which are simple basally 19

— Sublateral areas of prosternum rather strongly sclerotised, dark testaceous, with scattered coarse setae, each arising from a large ferruginous basal disc, giving the prosternum a spotted appearance. Strongylurini (pars). . **Piesarthrius marginellus** Hope, p. 111

19. Posterior part of pronotum finely striate or rugulose. Head and abdominal segment 10 with very coarse bristly setae. One or three ocelli present. Front margin of frons very feebly sinuate . . . . . **Tryphocaria**, p. 16

— Posterior part of pronotum coarsely longitudinally or rugosely striate. Head and abdominal segment 10 with much finer setae. Three pairs of ocelli present. Meso- and metasternum each with two transverse rows of tubercles. Strongylurini (pars). 20

20. Front margin of frons strongly sinuate medially. Hypostoma with a transverse row of from four to six stout setae . . . . . **Coptopterus**, p. 16

— Front margin of frons not or scarcely sinuate medially. Hypostoma glabrous.
Citriphaga mixta Lea, p. 110

21. Posterior part of pronotum and prosternum both with the same characteristic, longitudinal striae. Front margin of hypostoma with two pairs of setae on each side. [Ocelli absent.] . . . . . Heteropsini. **Aridaeus thoracicus** (Donovan), p. 150

— Without these characters combined 22

22. Head capsule with sides very strongly rounded and widest at or just behind middle. Front margin of frons (and genae) bearing numerous long fine setae. One pair of ocelli present; pigmented spot large, elongate, black and very distinct. Molorchini, Phalotini and allied genera 23

— Head capsule with sides straight or feebly rounded and widest posteriorly. Front margin of frons without numerous long fine setae, except Uracanthini, but then three pairs of ocelli present and abdominal segment 10 usually bearing one or more tubercles. If only one pair of ocelli present, then pigmented spot never elongate 24

23. Mandible with basal half feebly sclerotised, testaceous. Abdominal ampullae covered with small moniliform tubercles . . . . . **Xystoena vittata** Pascoe, p. 132

— Mandible entirely strongly sclerotised, pitchy. Abdominal ampullae non-tuberculate but distinctly micro-granulate. [Cosmopolitan species.]
Gracilia minuta (Fabricius), p. 131

24. Legs absent. Ocelli absent. Form extremely slender (not exceeding 1·5 mm. in breadth). Mouthframe feebly sclerotised, testaceous. Genal setae long and curved. Stenoderini (pars minor) . . . . . **Syllitus araucariae** McKeown, p. 123

— Without these characters combined 25

25. Abdominal segment 10 bearing a conspicuous process (figs. 80, 91). Three pairs of ocelli present 26

— Abdominal segment 10 without a process 28

— Front margin of frons with processes less strongly developed. Temples behind postocular carina very broadly ferruginous. Tubercles of dorsal ampullae not sclerotised, pale testaceous. Anal lobes encircled with a fringe of short reddish setae, behind which are scattered longer setae (fig. 40). Spiracles with peritreme ferruginous; marginal chambers present . . . . . **Pachydissus sericus** Newman, p. 63

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5. Abdomen with segment 8 distinctly broader than segment 7; segment 9 extremely short, less than half length of segment 8 (fig. 34). Ocelli absent. Abdominal ampullae micro-spiculate . . . . . Oemini. **Xystrocera globosa** (Olivier), p. 53

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8. Ocellar lens large and broadly oval (fig. 45). Temples deeply impressed. **Phoracantha** (s.g. **Phoracantha**), p. 16

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— Sublateral areas of prosternum rather strongly sclerotised, dark testaceous, with scattered coarse setae, each arising from a large ferruginous basal disc, giving the prosternum a spotted appearance. Strongylurini (pars). . **Piesarthrius marginellus** Hope, p. 111

19. Posterior part of pronotum finely striate or rugulose. Head and abdominal segment 10 with very coarse bristly setae. One or three ocelli present. Front margin of frons very feebly sinuate . . . . . **Tryphocaria**, p. 16

— Posterior part of pronotum coarsely longitudinally or rugosely striate. Head and abdominal segment 10 with much finer setae. Three pairs of ocelli present. Meso- and metasternum each with two transverse rows of tubercles. Strongylurini (pars). 20

20. Front margin of frons strongly sinuate medially. Hypostoma with a transverse row of from four to six stout setae . . . . . **Coptopterus**, p. 16

— Front margin of frons not or scarcely sinuate medially. Hypostoma glabrous. **Citriphaga mixta** Lea, p. 110

21. Posterior part of pronotum and prosternum both with the same characteristic, longitudinal striae. Front margin of hypostoma with two pairs of setae on each side. [Ocelli absent.] . . . . . Heteropsini. **Aridaeus thoracicus** (Donovan), p. 150

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— Without these characters combined 25

25. Abdominal segment 10 bearing a conspicuous process (figs. 80, 91). Three pairs of ocelli present 26

— Abdominal segment 10 without a process 28

47. Abdominal segments 5 and 6 much longer than segments 3 and 4. Meso- and metasternum strongly tuberculate. Abdominal ampullae dull, micro-spiculate.
Megaceresium horni Heller, p. 91
— Abdominal segments 5 and 6 not or only slightly longer than segments 3 and 4. Meso- and metasternum non-tuberculate. Abdominal ampullae shining, glabrous.
Ceresium, p. 16
48. Abdominal segment 10 with a series of about 12 small, faintly pigmented, rounded tubercles (each bearing a coarse seta) around posterior margin (fig. 105). Front margin of frons feebly emarginate . . . **Navomorpha lineata** (Fabricius), p. 151
— Abdominal segment 10 without tubercles. Front margin of frons strongly emarginate (fig. 59) . . . . . **Oemona hirta** (Fabricius), p. 86

Phacodes

1. Genae unevenly swollen and with two strong protuberances.
P. longicollis Pascoe, p. 65.
— Genae more or less evenly swollen and without strong protuberances.
P. mirabilis McKeown, p. 64

Phoracantha

1. Ocellar lens elongate-oval, more than twice as long as median breadth (fig. 45). Front margin of hypostoma not or scarcely sinuate medially.
P. semipunctata (Fabricius), p. 69.
— Ocellar lens oval, less than twice as long as median breadth. Front margin of hypostoma strongly sinuate medially (fig. 47) . . . . . **P. recurva** Newman[1], p. 73.

Tryphocaria

1. Dorsal ampullae mainly transversely rugoso-striate. Posterior area of pronotum finely and evenly striate (fig. 51). Prothoracic setae coarsely annulate basally, giving the prothorax a spotted appearance (fig. 51). . **T. acanthocera** (Macleay), p. 76.
— Dorsal ampullae tuberculate. Posterior area of pronotum rugoso-striate. Prothoracic setae not so coarsely annulate basally 2
2. Three pairs of subcontiguous ocelli present. Ampullae very strongly tuberculate, the tubercles strongly protuberant and convex . . **T. solida** Blackburn, p. 81.
— One pair of large ocelli present. Ampullae rather feebly tuberculate, the tubercles rather depressed . . . . . **T. mastersi** Pascoe, p. 80.

Ceresium

1. One pair of ocelli present. Frons glabrous or almost so. Prothorax with proeusternum longitudinally striate as on posterior part of pronotum.
C. unicolor (Fabricius), p. 89.
— Three or four pairs of ocelli present. Frons bearing numerous (at least 50) setae. Prothorax with proeusternum not striate 2
2. Three pairs of subcontiguous ocelli present. Abdominal segment 9 not longer than segment 8. Spiracular peritreme subcircular . . **C. illidgei** Blackburn, p. 90.
— Four pairs of ocelli present, one pair being placed ventrally. Abdominal segment 9 distinctly longer than segment 8. Spiracular peritreme oval and placed obliquely.
C. australe Carter, p. 88.

Coptopterus

1. Abdominal segment 10 bearing a series of peg-shaped setose tubercles (fig. 73).
C. cretifer Hope, p. 108.
— Abdominal segment 10 bearing stout setae only 2

[1] Only two larvae of this species are available. It is possible that they may in fact prove to be atypical larvae of *P. semipunctata* (Fabricius).

2. Spiracles on abdominal segments 5–8 broadly oval . **C. thoracicus** Pascoe, p. 106.
— Spiracles on abdominal segments 5–8 round . . **C. decoratus** (McKeown), p. 108.

Uracanthus

1. Abdominal segment 10 bearing a single large spine-like process . . . 2
— Abdominal segment 10 bearing two long spine-like processes, the lower one being bifid apically (fig. 80) . . . . . **U. pallens** Hope, p. 115.
2. Spine-like process with four pairs of small conical tubercles placed laterally (fig. 79). **U. cryptophagus** Olliff, p. 114.
— Spine-like process without lateral tubercles but with two pairs of widely-separated, conical tubercles placed ventrally (fig. 78) . . **U. triangularis** Hope, p. 112.

Didymocantha

1. Genae slightly shouldered, distinctly sclerotised and pale ferruginous immediately behind ocelli (fig. 66). Ocelli each with a large black pigmented spot (fig. 66). **D. sublineata** (White) and **D. quadriguttata** Sharp[1], pp. 93, 95.
— Genae not shouldered; entirely pale testaceous. Ocelli with pigmented spots fragmentary and grey . . . . . **D. picta** Bates, p. 95.

5. LAMIINAE

1. Ventral front margin of head with a conical tubercle (subfossal process?) on acetabulum 2
— Ventral front margin of head without a conical tubercle on acetabulum . . 3
2. Sublateral impressions of pronotum slightly but distinctly diverging anteriorly. Frons almost completely ferruginous. Hypostoma microgranulate, dull, with at least four setae on each half of gula . . . . . Zygocerini. **Disterna,** p. 20.
— Sublateral impressions of pronotum sub-parallel or slightly converging anteriorly. Frons almost completely testaceous, except front margin. Hypostoma smooth, shining, with a single seta placed in a deep pore on each side of gula (fig. 125). Niphonini (pars). **Prosoplus torosus** Pascoe, p. 186.
3. Abdominal tergite 9 with a conspicuous longitudinal, keel-shaped carina (fig. 116). Abdominal ampullae without moniliform tubercles. **Ancita crocogaster** (Boisduval), p. 170.
— Abdominal tergite 9 without a longitudinal carina (except *Velora sordida* (Pascoe), but then abdominal ampullae with moniliform tubercles) 4
4. Antenna 3-segmented. Dorsal ampullae (except *Pterolophia*) generally with two conspicuous transverse furrows and two, three or four rows of moniliform tubercles. 5
— Antenna apparently 2-segmented. Dorsal ampullae if with two transverse furrows then seldom tuberculate (except in *Somatidia* and *Dihammus*) 14
5. Pronotum for the greater part covered with very coarse asperities (fig. 114); postnotal fold well developed, asperate. Epicranium bearing a distinct dentate tubercle behind antennal foramen. Legs distinctly visible with a ×15 lens. Anus a transverse cleft. Length up to at least 70 mm. Batocerini . . . . . **Batocera** spp., p. 167.
— Pronotum smooth, sparsely setose or micro-spiculate (micro-asperate in *Steirastoma*); postnotal fold, if developed, then non-asperate. Epicranium simple behind antennal foramen. Legs indiscernible 6
6. Anus a transverse cleft (fig. 113); lower lobe spinulose. Posterior part of pronotum dull, velvety micro-spiculate (fig. 112). Dorsal ampullae with four rows of moniliform tubercles. Monochamini (pars) . . . . . **Neoptychodes trilineatus** (Linnaeus), p. 164.

[1] No characters can be found whereby larvae of these two species can be distinguished, beyond the fact that the body integument of *D. sublineata* (White) is less shining and more finely reticulate in the material at hand.

— Anus trilobate; lobes non-spinulose. Posterior part of pronotum glabrous, shining (except *Olenecamptus bilobus* (Fabricius) and *Steirastoma* but then dorsal ampullae bearing 2–4 rows of moniliform tubercles) 7

7. Numerous (at least 12) long fine setae present on epistoma. Mandible strongly produced apically, the cutting edge straight (fig. 121). Ocellus very large. Abdominal tergite 9 with a conspicuous median spine near posterior margin.
Epicastini. **Dysthaeta anomala** Pascoe, p. 176.

— Six epistomal setae present. Mandible less strongly produced apically, the cutting edge sinuate. Ocellus smaller. Abdominal tergite 9 without a median spine (except *Pterolophia* but then spine minute) 8

8. Posterior part of pronotum dull, micro-spiculate. Dorsal abdominal ampullae with two rows of moniliform tubercles.
Dorcaschematini. **Olenecamptus bilobus** (Fabricius), p. 171.

— Posterior part of pronotum shining, glabrous (except *Steirastoma* in which it is micro-asperate). Dorsal abdominal ampullae usually with three or four rows of moniliform tubercles, but if with only two, then abdominal tergite 9 with a median spine . 9

9. Abdominal tegite 9 with a minute median spine near posterior margin. Antenna with segment 3 bearing an apical appendage.
Niphonini (pars). **Pterolophia camura** Newman, p. 188.

— Abdominal tergite 9 without a spine. Antenna with segment 3 without an apical appendage 10

10. Posterior part of pronotum micro-asperate. Dorsal abdominal ampullae each with four transverse rows of glabrous, moniliform tubercles.
Steirastoma stellio Pascoe, p. 197.

— Posterior part of pronotum glabrous 11

11. Hypostoma strongly rounded and convex in cross-section. Eight or more epistomal setae present. Pleural tubercles each with a single sclerotised pit. Abdominal tergite 9 with posterior margin subangulate medially or densely setose. Segment 3 of antenna strongly elongate. Niphonini (pars) 13

— Hypostoma plane or very feebly rounded in cross-section and with a distinct pair of setal pores. Six epistomal setae present. Pleural tubercles without sclerotised pits. Abdominal tergite 9 with posterior margin evenly rounded. Niphonini (pars) . 12

12. Segment 3 of antenna strongly elongate. Dorsal ampullae with three rows of tubercles.
Corrhenes paulla (Germar), p. 186.

— Segment 3 of antenna quadrate to slightly transverse. Dorsal abdominal ampullae with four rows of tubercles . . . . . **Penthea pardalis** Newman, p. 185.

13. Frons with a broad ferruginous, transverse band anteriorly; testaceous posteriorly. Frontal sutures indistinct. Form robust . . **Platyomopsis** and **Depsages,** p. 20.

— Frons entirely ferruginous. Frontal sutures pale, very distinct and strongly contrasting with the ferruginous frons. Form slender. [Abdominal tergite 9 rather densely setose posteriorly.] . . . . . **Zygrita diva** Thomson, p. 184.

14. Posterior part of pronotum covered with rather coarse asperities (fig. 110); eusternum glabrous, sparsely setose. Ampullae bearing four rows of spiculate, moniliform tubercles. Spiracular peritreme with a pair of rather large subcontiguous marginal chambers.
Monochamini (pars). **Dihammus,** p. 20.

— Posterior part of pronotum non-asperate (except Gleneini but then eusternum also asperate). Ampullae if spiculate, then non-tuberculate. Spiracular peritreme with marginal chambers more numerous and smaller or absent 15

15. Head capsule salient and almost entirely exposed, with frons and hypostoma entirely strongly sclerotised and ferruginous (fig. 118). Sublateral linear furrows of pronotum diverging anteriorly (fig. 119). Spiracular peritreme circular. 16

— Head capsule for its greater part retracted in pronotum; frons and hypostoma not entirely strongly sclerotised and ferruginous (almost so in *Tetroria* and *Zygocera*).

Sublateral linear furrows of pronotum subparallel or slightly converging anteriorly and not abruptly curved inwards. 17

16. Hypostoma rising posteriorly to form a semicircular ridge, with prominent shoulders laterally at mid-length (fig. 107). Pronotum with posterior margin broadly emarginate for median two-thirds; sublateral furrows linear. Dorcadionini.
Hexatricha pulverulenta (Westwood), p. 156.

— Hypostoma without a semicircular ridge, plane (fig. 118). Pronotum with posterior margin not emarginate medially; sublateral furrows abruptly curved inwards anteriorly (fig. 119) . . . . . Tmesisternini. **Temnosternus,** p. 20.

17. Abdominal tergite 9 with a longitudinal median carina (fig. 122).
Velora sordida (Pascoe), p. 179.

— Abdominal tergite 9 without a longitudinal carina 18

18. Abdominal tergite 9 with a pair of median subcontiguous spines (urogomphi?) near hind margin. Maxillary palpi 2-segmented. Pleural tubercles each with a single sclerotised pit. . . . . Pogonocherini. **Hybolasius genalis** Broun, p. 195.

— Abdominal tergite 9 without paired spines 19

19. Posterior part of pronotum dull, densely micro-spiculate or micro-pubescent. Sternellum of prothorax matt, micro-spiculate. Head usually rather strongly to very strongly depressed. Epipleurum strongly protuberant on at least segments 7 and 8; segments 7 and 8 distinctly broader than segment 6, parallel-sided and not or scarcely constricted intersegmentally. Pleural tubercles each with a pair of sclerotised pits. Head moderately to strongly elongate.
Acanthocinini. **Lagocheirus araneiformis** (Linnaeus), p. 198.

— Posterior part of pronotum never dull, micro-spiculate or micro-pubescent, though sometimes (Gleneini) bearing coarse asperities (fig. 134). Sternellum of prothorax shining, never micro-spiculate or micro-pubescent but sometimes (Gleneini) asperate. Head not strongly depressed. Epipleurum only slightly protuberant on all segments, segments 7 and 8 not being distinctly broader than segment 6; distinctly constricted intersegmentally. Pleural tubercles without sclerotised pits 20

20. Pronotum with sublateral impressions and asperities (fig. 134). Abdominal ampullae spiculate and non-tuberculate. Gleneini . . . **Glenea aluensis** Gahan, p. 202.

— Pronotum without sublateral impressions and asperities. Abdominal ampullae glabrous, each with two or more transverse rows of tubercles 21

21. Abdominal tergite 9 (fig. 126) with a small, transversely-oval sclerotised plate (bearing a minute spine) near hind margin . Ptericoptini. **Sybra alternans** Wiedemann, p. 191.

— Abdominal tergite 9 without a sclerotised plate but sometimes (*Tetroria*, *Somatidia*) with a median spine 22

22. Abdominal tergite 9 with a conspicuous spine. Dorcadionini (pars).
Somatidia antarctica (White), p. 155.

— Abdominal tergite 9 without a median spine (except *Tetroria* but then spine minute (fig. 128)) 23

23. Hypostoma entirely testaceous and smooth. Ocellus with a very large black, pigmented spot, strongly contrasting with surrounding pale testaceous cuticle. Spiracles without submarginal chambers. Tergite 9 without a median spine. Head capsule thick, scarcely depressed. . . . . Apomecynini. 24

— Hypostoma entirely ferruginous, micro-granulate. Ocellus with pigmented spot indistinct owing to sclerotisation of lens. Spiracles with submarginal chambers. Abdominal tergite 9 (at least in final instar) with a minute median spine near posterior margin (fig. 128). Head capsule rather strongly depressed . Estolini. **Tetroria cilipes** White, p. 193.

24. Dorsal abdominal ampullae with tubercles arranged in a row on each side of tranverse impression . . . . . **Ropica exocentroides** Pascoe, p. 189.

— Dorsal abdominal ampullae with moniliform tubercles irregularly arranged.
Apomecyna histrio (Fabricius), p. 190.

Disterna

1. Antenna minute but clearly 3-segmented; segment 2 bearing a hyaline process as well as the setose third segment. Tubercle on acetabulum obtusely conical.
D. plumifera (Pascoe), p. 177.
— Antenna 2-segmented; segment 2 bearing only a tapering, hyaline process. Tubercle on acetabulum acutely conical and much more prominent . **D. pumila** (Bates), p. 178.

Platyomopsis and Depsages

1. Abdominal tergite 9 with posterior margin conical medially and bearing numerous short bristly setae, which are much more conspicuous than those on preceding tergites.
P. egena (Pascoe), p. 180.
— Abdominal tergite 9 not conical medially and with sparse setae similar to those on preceding segments 2
2. Hypostoma bearing only a pair of deep setal pores 3
— Hypostoma bearing at least 12 scattered, shallow setal pores. Moniliform tubercles of dorsal ampullae mostly distinctly separated and strongly convex and protuberant.
Depsages solandri (Fabricius), p. 184.
3. Hypostoma testaceous. Temples behind ocellus testaceous. Moniliform tubercles of dorsal ampullae mostly contiguous and feebly protuberant.
P. nigrovirens (Donovan), p. 183.
— Hypostoma entirely ferruginous. Temples behind ocellus broadly ferruginous. Moniliform tubercles of dorsal ampullae mostly subcontiguous and strongly protuberant.
P. pulverulens (Boisduval), p. 181.

Dihammus

1. Pronotum with asperities becoming markedly elongate towards posterior margin (fig. 110) 2
— Pronotum with asperities becoming smaller but not elongate towards posterior margin 3
2. Hypostoma and front margin of frons very strongly transversely strigose. Mentum bearing at least six pairs of stout setae. Form very robust; maximum breadth (at prothorax) 14 mm. . . . . **D. australis** (Boisduval), p. 163.
— Hypostoma and front margin of frons at most faintly transversely striate. Mentum bearing one to three (usually two) pairs of fine setae.
D. holotephrus (Boisduval), p. 159.
3. Frons, except front margin, testaceous . . **D. argentatus** Aurivillius, p. 163.
— Frons entirely ferruginous **D. vastator** (Newman) and **D. mixtus** (Hope)[1], pp. 161, 164.

Temnosternus

1. Head capsule testaceous behind triangular frons. Spiracles with peritreme extremely thick . . . . . **T. planiusculus** White, p. 175.
— Head capsule entirely ferruginous. Spiracles with peritreme of average thickness . 2
2. Hypostoma bearing a longitudinal row of four to six setae on each side of gula.
T. imbilensis McKeown, p. 173.
— Hypostoma bearing a longitudinal row of two to three setae on each side of gula.
T. quadrituberculatus McKeown, p. 175.

[1] Only larval exuviae of this species are available.

AUSTRALASIAN CERAMBYCID PUPAE

FAMILY CHARACTERS

CERAMBYCID pupae may, in general, be characterised as follows: *Form.* Body closely resembling form of adult both in size and shape, and in the proportions of the cephalic and thoracic appendages. Secondary sexual differences in the adults, such as the proportions of certain appendages, are generally evident also in the pupae. *Cuticle* exarate, weakly to moderately strongly sclerotised but sometimes very strongly in parts (*e.g.* urogomphi, gin-traps, etc.); colour usually waxy or milky white to testaceous, but occasionally orange to brown; usually with scattered setae or spinose areas or combinations of each. *Head* nearly always strongly bent beneath prothorax so that the mouthparts extend posteriorly. Antennae extending at least as far as mesothorax (where they terminate between the front and middle femora), but generally much longer, extending to abdominal segments (sometimes as far as segment 7 or 8), where they are nearly always curved downwards beneath the body and arranged characteristically as follows: (i) slightly curved inwards and terminating near hind femora (*Diotimana*); (ii) more strongly curved inwards and crossed (Cerambycini (pars)); (iii) arranged in a single or several coils on top of each elytron (*Taeniotes*, *Batocera* (fig. 115)); directed anteriorly to terminate near front or middle coxae (*Coleocoptus*, *Phoracantha*); or (v) directed anteriorly for a considerable distance to terminate alongside or on top of head or strongly recurved and directed posteriorly to abdominal segment 7, where they are again recurved to terminate near apices of elytra. Elytra always glabrous (except Acanthocinini). *Abdomen* usually with nine movable segments, the tenth and occasionally the ninth being telescoped within the preceding segments; segments 7 and 8 usually more elongate than the preceding ones and sometimes considerably produced (Acanthocinini). Segments 7, 8 and 9 either continuous laterally or segments 8 and 9 explanate laterally; segment 9 often terminating in a vertical or horizontal spine or process (*Taeniotes*, *Dihammus*, *Batocera*) or with incurved (*Arhopalus*) or outwardly curved urogomphi. Paired paramedian gin-traps present in the Macrotomini and Callipogonini. Functional ampullae absent, although in certain herbaceous plant-feeding lamiids there are cushioned spinose areas which appear to be analogous to larval ampullae. *Legs* often with subapical setae on the femora and sometimes with one or two setae on the tarsi. *Spiracles* of mesothorax functional, large, oval and placed ventrolaterally; spiracles of abdominal segments 1–5 always functional, as are sometimes those on segments 6 or 6 and 7.

A study of the abdominal spiracles has shown them to be of little value as subfamily characters, and no satisfactory correlation between the number present and the pupal environment could be found. Although the number of functional spiracles appears to be constant in the subfamilies LEPTURINAE and ASEMINAE (in which they number five and seven pairs respectively), the number present in the species of the subfamilies CERAMBYCINAE and LAMIINAE varies interspecifically from five to seven pairs. In the PRIONINAE the number of functional spiracles is usually six, but in the PARANDRINAE

the seventh pair appear to be functional. The spiracular peritreme, as in many larvae, sometimes bears subcontiguous marginal chambers (Acanthocinini (pars)).

Sexual differences. Generally speaking, a transverse rectangular protuberance is present posterior to the eighth sternite in the male, whereas in the female this is represented by a pair of subcontiguous rounded lobes which often bear one or more pairs of setae. A secondary sexual characteristic is the proportion and arrangement of the antennae, which, in the male, are often considerably longer and more elaborately arranged.

A detailed account of the morphology of the pupa is not considered necessary as all the structures referred to in the keys and descriptions are indicated in the following figures (figs. 9, 10).

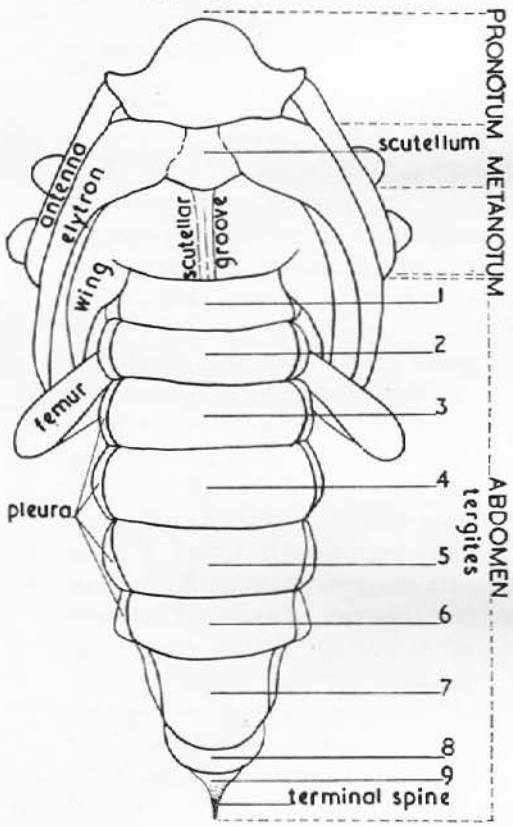

Fig. 9.

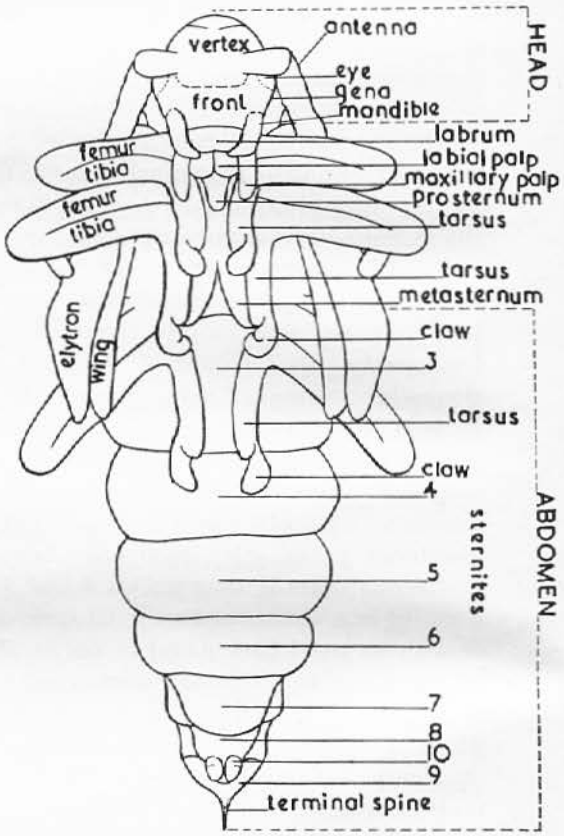

Fig 10.

Fig. 9. Diagrammatic figure of a cerambycid pupa. Dorsal aspect. (Duffy, 1953a)
Fig. 10. Diagrammatic figure of a cerambycid pupa. Ventral aspect. (Duffy, 1953a)

KEY TO SUBFAMILIES

In the following keys it has proved necessary, particularly in the case of subfamily diagnosis, to follow an artificial rather than a phylogenetic sequence and to use what are in fact adult characteristics instead of truly pupal ones, as the pupa presents

comparatively few characters other than those directly derived from the external structure of the contained imago. Indeed, it is only the various spines and setae, both simple and modified, and the arrangement rather than the form of the antennae which can be regarded as constituting truly independent pupal characters.

In contrast with the remarkable general uniformity of many of the Australasian cerambycid larvae, the pupae have proved to be strikingly diverse and often unusually elaborate in structure, the curious lateral abdominal processes in *Diotimana* (frontispiece) being but one example.

1. Head without conspicuous spines or setae (occasionally with a few scattered spinules or papillae) and abdominal spiracles with peritreme narrowly oval (fig. 16). Prothorax either with three pairs of lateral tubercles or none, never one pair only. Prosternum produced behind coxae into a rounded or truncate process. [Femora without spines or setae. Abdominal tergites sometimes with gin-traps. Functional spiracles present on abdominal segments 1–6 or 1–7; peritreme very thick.] 2
— Head usually bearing conspicuous spines or setae, but if without then abdominal spiracles broadly oval. Prothorax either with a single pair of lateral tubercles or none; never three pairs. Prosternum seldom produced beyond coxae, but if so, never simply rounded or truncate but either tapering or confluent with mesosternum (ASEMINAE) or enlarged into a T-shaped process (LAMIINAE (pars)) 3
2. Abdominal segment 9 bearing a pair of outwardly curved or divergent urogomphi (fig. 16). Antennae short, extending to between front and middle femora; segments subquadrate, moniliform (fig. 16), never serrate or pectinate. Pronotum without lateral tubercles and abdomen without gin-traps . 1. PARANDRINAE (**Parandra** spp.), p. 30.
— Abdominal segment 9 usually unarmed but occasionally either with incurved urogomphi or with a pair of short vertical tubercles. Antennae longer, extending at least to abdominal segment 1 and often recurved beneath body; segments elongate and sometimes serrate or pectinate. Pronotum often with lateral tubercles and abdomen often with gin-traps . . . . . 2. PRIONINAE, p. 24.
3. Antennae with several conspicuous spines at or near apex of basal segment, the remaining segments entirely micro-spiculate. Abdominal segment 9 bearing strongly incurved urogomphi (fig. 33), never with a vertical spine. Abdominal sternites 4–8 with paired sublateral groups of spines. Apices of femora with spines (each with a subapical seta). Functional spiracles present on abdominal segments 1–7.
3. ASEMINAE (**Arhopalus syriacus** (Reitter)), p. 50.
— Antennae without spines on basal segment, the remaining segments non-spiculate. Abdominal segment 9 without urogomphi; occasionally either with a vertical spine or carina. Abdominal sternites never with paired groups of numerous spines, but sometimes with two or three very small spines. Apices of femora usually glabrous or with setae only but if spinose, then each spine with a basal seta. Functional spiracles often restricted to segments 1–5 or 1–6 4
4. Head strongly bent beneath prothorax so that the vertex is totally or for the greater part concealed from above; vertex convex (sometimes dome-shaped); never flat or excavate between bases of antennae (fig. 106). Mandibles without setae (except in *Navomorpha* fig. 106). Clypeus without setae. Femora usually without setae (fig. 83). Pleura strongly protuberant. Abdominal segments 7, 8 and 9 continuous laterally. Eyes moderately convex (fig. 83). Maxillary palpi not tapering apically, often enlarged. Prosternum never produced behind coxae into a T-shaped process . . 4. CERAMBYCINAE, p. 24.
— Head less strongly bent beneath prothorax, so that the vertex is entirely or for the greater part visible from above; vertex between bases of antennae either deeply excavate or flat, never convex. Mandibles each with 1–6 or more setae near middle of outer face (fig. 111). Clypeus with several setae across base (fig. 111). Femora nearly always with subapical spines or setae, but if without, abdomen either cylindrical or parallel-sided or tergite 9

with a vertical spine. Pleura never strongly protuberant. Abdominal segment 8 or 9 obliquely explanate laterally, the latter often deeply divided beneath. Eyes at most feebly convex, generally flat (fig. 111). Maxillary palpi gradually to strongly tapering, never truncate or enlarged apically (fig. 111). Prosternum often produced beyond coxae into a T-shaped process . . . . . 5. LAMIINAE, p. 26.

KEYS TO GENERA AND SPECIES

2. PRIONINAE

1. Gin-traps (fig. 25) present on abdominal tergites 2–3, 3–4, 4–5 and 5–6. Tergites without paramedian tubercles 2
— Gin-traps absent (fig. 29). Tergites 4–7 each with a pair of paramedian, oval, slightly protuberant tubercles (fig. 29) . . . **Prionoplus reticularis** White, p. 42.
2. Spinules on tergites 2–4 coarse, ferruginous and rather numerous (fig. 25). **Eurynassa australis** (Boisduval), p. 39.
— Spinules on tergites 2–4 finer, testaceous and less numerous. **Agrianome spinicollis** (Macleay), p. 36.

4. CERAMBYCINAE

1. Pronotum with two pairs of very large tubercles, one pair of stout, anteriorly inclined, spine-like tubercles and a pair of strongly raised, rounded tubercles placed paramedially on disc. Head bearing a pair of small spine-like tubercles near inner margin of antennal tubercles. Mesonotum with a pair of paramedian, oval tubercles which are densely covered with anteriorly-inclined setae. Phlyctaenodini (pars). **Blosyropus spinosus** Redtenbacher, p. 99.
— Pronotum without these two kinds of tubercles. Head without spine-like tubercles near bases of antennal tubercles. Mesonotum without paired setose tubercles . . 2
2. Abdominal segments 2–6 each with a pair of large fleshy, elongate, tapering, lateral tubercles (frontispiece). Maxillary and labial palpi each bearing a stout spine-like tubercle apically . . Phlyctaenodini (pars). **Diotimana undata** (Pascoe), p. 100.
— Abdominal segments 2–6 without lateral protuberances. Maxillary and labial palpi without apical spine-like tubercles 3
3. Apices of femora bearing two or more stout spine-like setae . **Tessaromma**, p. 26.
— Apices of femora glabrous (except *Syllitus* but then only a single stout seta present). 4
4. Antennae with at least segment 3 produced into a spine-like tubercle on inner margin (fig. 49) and recurved but not crossed beneath body. Pronotum with a pair of raised tuberculate areas (each bearing numerous setose papillae) near base (fig. 49). Abdominal tergite 7 with a pair of tuberculate, spinose protuberances paramedially (fig. 49). [Femora strongly clavate.] . . . . . Phoracanthini 5
— Antennae with segments not produced into spine-like tubercles. Pronotum without paired sub-basal tuberculate areas (except *Stenopotes* but then pronotum extremely elongate). Abdominal tergite 7 without paired oval tuberculate areas . . . 9
5. Antenna with only segment 3 bearing a spine-like tubercle, which is strongly produced. Elytra without apical spine-like or dentate tubercles. [Pronotum non-tuberculate laterally.] . . . . . **Skeletodes tetrops** Newman, p. 95.
— Antenna with at least segments 3–5 bearing spine-like tubercles, which are less strongly produced (fig. 49). Elytra with apical spine-like or dentate tubercles (except *Trypho-caria*) 6
6. Pronotum without lateral tubercles. Elytra with apices sinuate and slightly twisted outwards . . . . . **Epithora dorsalis** (Macleay), p. 85.

— Prothorax bearing a small pair of lateral tubercles (fig. 49). Elytra with apices simply dentate or tuberculate 7

7. Pronotum very elongate, with front margin strongly rounded and bearing groups of fine pale setae (fig. 49). Vertex of head not visible from above.
Coleocoptus senio Newman and **Coptocercus biguttatus** (Donovan), pp. 75, 84.

— Pronotum quadrate, with front margin feebly rounded; bearing scattered short spines or coarse ferruginous setae, especially around front margin 8

8. Pronotum bearing several slightly curved spines near lateral margins. Apices of elytra produced into a robust, spine-like tubercle. [Pronotum with a pair of stout lateral tubercles.] . . . . . **Phoracantha semipunctata** (Fabricius), p. 69.

— Pronotum bearing coarse ferruginous setae near lateral margins or numerous short, straight, ferruginous spines on disc. Apices of elytra without a protuberant tubercle. Pronotum with lateral tubercles present or absent . . . **Tryphocaria**, p. 26.

9. Head and pronotum extremely elongate (fig. 83). Metanotum with two paramedian groups of stout setae which are inclined anteriorly (fig. 83).
Rhagiomorphini. **Stenopotes pallidus** Pascoe, p. 119.

— Head and pronotum not or only moderately elongate. Metanotum without two paramedian groups of stout, anteriorly-inclined setae 10

10. Apices of antennal tubercles produced outwardly into a pair of conical processes (fig. 106).
Navomorphini. **Navomorpha lineata** (Fabricius), p. 151.

— Apices of antennal tubercles without conical processes 11

11. Pronotum with two median, conical tubercles, one near posterior margin, the other near anterior margin (fig. 67) . . . Callidiopini (pars). **Didymocantha** sp., p. 94.

— Pronotum without a median tubercle on anterior and posterior margins . . 12

12. Abdominal tergites 1–6 devoid of spines. Antennae entirely and rather coarsely spiculate (fig. 87). Tergite 7 bearing a very small median spine (inclined anteriorly) near posterior margin. Stenoderini (pars) . . . . **Syllitus araucariae** McKeown, p. 123.

— Abdominal tergites 1–6 bearing numerous short spines or setose papillae. Antennae not spiculate 13

13. Abdominal tergites 7 and 8 broadly rounded posteriorly and bearing several very stout spines which are curved inwardly (fig. 74). Antennae long and recurved ventrally.
Coptopterus cretifer Hope, p. 108.

— Without these characters combined 14

14. Abdominal tergite 7 with a stout, vertical, median spine near posterior margin (fig. 86), or with a pair of paramedian, large, vertical tubercles (fig. 103). Hind femora extending posteriorly at least as far as abdominal segment 7 15

— Abdominal tergite 7 without a vertical spine or large vertical tubercles. Femora shorter, not extending beyond abdominal segment 5 16

15. Abdominal tergite 7 with a stout, vertical, median spine near posterior margin (fig. 86). Head with front bearing a pair of transversely oval tubercles (each with three stout setae arising from conical papillae) beneath antennal tubercles (fig. 85). Stenoderini (pars) . . . . . **Calliprason sinclairi** White, p. 122.

— Abdominal tergite 7 with a pair of stout paramedian, vertical tubercles (fig. 103). Head without transversely oval tubercles beneath antennal tubercles.
Heteropsini. **Aridaeus thoracicus** (Donovan), p. 150.

16. Head bearing groups of spines or setose papillae 17

— Head glabrous 18

17. Head (fig. 65) with vertex bearing a group of spines immediately above each antenna and along ventral margin of eyes. Sides of pronotum (fig. 65) with a pair of prominent spinulose tubercles near front margin . . . . .
Callidiopini (pars). **Curtomerus flavus** (Fabricius), p. 92.

— Head (fig. 93) with vertex bearing several pale setose papillae. Pronotum without lateral tubercles (fig. 93). [Abdominal tergite 7 with four or more anteriorly-inclined spines.] . . . . . Gracillini. **Gracilia minuta** (Fabricius), p. 131.

18. Abdominal tergite 8 with a longitudinal median groove on each side of which are numerous spines (fig. 100) . . Callidiini. **Hylotrupes bajulus** (Linnaeus), p. 136.
— Abdominal tergite 8 without a longitudinal median groove 19
19. Pronotum bearing numerous fine, pale setae, each arising from a conical papilla; disc transversely striate medially. Abdominal tergite 7 with four or more stout spines near posterior margin, which are curved anteriorly. Callidiopini (pars) . . . 20
— Pronotum without setae and papillae; disc smooth medially. Abdominal tergite 7 with all spines curved inwardly . Clytini. **Chlorophorus annularis** (Fabricius), p. 148.
20. Pronotum with lateral tubercles rounded and scarcely protuberant; disc feebly transversely striate. Length not exceeding 20 mm. . **Ceresium illidgei** Blackburn, p. 90.
— Pronotum with lateral tubercles conical and strongly protuberant; disc strongly transversely striate. Length up to 40 mm. . . . **Megaceresium horni** Heller, p. 91.

Tessaromma

1. Apices of elytra subtruncate and slightly sinuate . **T. undatum** Newman, p. 105.
— Apices of elytra attenuated . . . . . **T. sericans** Erichson, p. 106.

Tryphocaria

1. Pronotum bearing coarse ferruginous setae only; lateral tubercles long, attenuated and curved posteriorly. Spines on abdominal tergites very stout and mostly notched or truncate apically (fig. 52) . . . . . **T. acanthocera** (Macleay), p. 76.
— Pronotum bearing numerous scattered, short, ferruginous spines; lateral tubercles short, blunt and inconspicuous. Spines on abdominal tergites more slender and simple apically 2
2. Paired tubercles on abdominal tergite 7 slightly protuberant and each bearing 8 or more short spines (fig. 54). Tergite 8 bearing numerous spines as figured (fig. 54). **T. mastersi** Pascoe, p. 80.
— Paired tubercles on abdominal tergite 7 strongly protuberant and each bearing four stout spines (fig. 55). Tergite 8 bearing one pair of very stout spines and a few smaller spines as figured (fig. 55) . . . . . **T. solida** Blackburn, p. 81.

5. LAMIINAE

1. Abdominal tergite 9 produced into a long, vertical, spine-like process, which is sclerotised apically. Pronotum with a pair of stout lateral tubercles 2
— Abdominal tergite 9 seldom with a vertical spine-like process, but if so (*Tetroria*, *Dystaeta*, *Hybolasius*, *Somatidia*, *Temnosternus*), then process much shorter (fig. 128) 6
2. Antennae recurved ventrally but not coiled. Pronotum without lateral tubercles. [Tarsi without setae.] . . Dorcadionini. **Hexatricha pulverulenta** (Westwood), p. 156.
— Antennae arranged ventrally in one or more coils. Pronotum bearing a pair of stout lateral tubercles 3
3. Femora without setae. Monochamini (pars). **Neoptychodes trilineatus** (Linnaeus), p. 64.
– Femora with setae 4
4. Antennae arranged ventrally in two or more coils. Apical segment of tarsi each with a short seta (fig. 111) . . . . . Monochamini. **Dihammus**, p. 27.
— Antennae arranged ventrally in a single complete or almost complete coil. Apical segment of tarsi glabrous 5
5. Anterior coxae with a large fleshy, spine-like process. Hind femora with an acutely-produced, sub-basal tubercle. Elytra each with a large, elongate-oval, sub-basal tubercle. Abdominal tergites bearing numerous short spines. Zygocerini. **Disterna plumifera** (Pascoe), p. 177.
— Anterior coxae without a process. Hind-femora without an acutely-produced, sub-basal tubercle. Elytra without a sub-basal tubercle. Abdominal tergites 2–5 each bearing a transverse band of long dense setae . . Batocerini. **Batocera** spp., p. 167.

6. Pronotum very strongly transverse, at least twice as broad as long and with a pair of small, rounded, post-median, lateral tubercles. Tergite 8 with 6 or more stout inwardly-curved spines (fig. 120). [Abdominal tergite 9 with a small, stout, median, vertical spine.]
Tmesisternini. **Temnosternus imbilensis** McKeown, p. 173.
— Pronotum subquadrate or elongate. Abdominal tergite 8 without stout, inwardly-curved spines 7
7. Labrum strongly protuberant and with a very dense group of long, fine, erect setae across base. Front coxae bearing a large, stout, curved tubercle (fig. 124). Abdominal tergite 9 with posterior margin almost entirely covered with a row of short blunt spines.
Niphonini. **Platyomopsis,** p. 27.
— Labrum not strongly protuberant; glabrous or sparsely setose. Front coxae without tubercles. Abdominal tergite 9 with posterior margin glabrous or with longer, less numerous, spines 8
8. Abdominal tergite 9 with a small median spine. Pronotum setose only . . 9
— Abdominal tergite 9 without a median spine. Pronotum spinose and setose.
Apomecynini. **Ropica exocentroides** Pascoe, p. 189.
9. Pronotum with sides simple. Tarsi each with several setae.
Epicastini. **Dysthaeta anomala** Pascoe, p. 176.
— Pronotum with sides bearing a pair of stout rounded or truncate tubercles. Tarsi each with a single seta or glabrous 10
10. Abdominal tergites bearing setae only. Labrum glabrous. Length not exceeding 5 mm. [Tubercles of pronotum broadly rounded. Tarsi glabrous.]
Pogonocherini. **Hybolasius genalis** Broun, p. 195.
— Abdominal tergites bearing spinules (each with a sub-basal seta). Labrum bearing four setae. Length exceeding 10 mm. 11
11. Tubercles of pronotum conical. Tarsi each with a single seta.
Estolini. **Tetrorea cilipes** White, p. 193.
— Tubercles of pronotum feebly and broadly rounded.
Tarsi glabrous. Dorcadionini (pars). **Somatidia** spp., p. 155.

Dihammus

1. Front of head (between eyes) with a large well developed U-shaped impression. Setae on labrum golden brown, non-pigmented basally . **D. vastator** (Newman), p. 161.
— Front of head plane (fig. 111). Setae on labrum reddish brown, each arising from a ferruginous basal papilla which gives the labrum a spotted appearance (fig. 111). [Form very robust; maximum breadth 15 mm.] . **D. australis** (Boisduval), p. 163.

Platyomopsis

1. Spines on posterior margin of abdominal tergite 9 closely set (fig. 123), giving a serrated appearance . . . . . **P. egena** (Pascoe), p. 180.
— Spines on posterior margin of abdominal tergite 9 much less closely set.
P. pulverulens (Boisduval), p. 181.

DESCRIPTIONS AND BIONOMICS OF THE IMMATURE STAGES

THE general form of adults of this family is rather elongate, more or less flattened, subcylindrical and often somewhat narrowed posteriorly. Many species are well known for their cryptic coloration and mimicry of other beetles as well as bees, wasps, ants, crickets and so forth. Their characteristic antennae, which have gained them the name of "Longhorns", arise from conspicuous tubercles on the front of the head and are generally more or less filiform (occasionally pectinate, tufted or clubbed) and usually as long as, though often considerably longer than, the body. But this peculiarity by no means applies to them all. Another characteristic is the formation of the tarsi, which although always 5-segmented have, with few exceptions, segment 4 considerably reduced so that they appear to be only 4-segmented. Segment 3 is always strongly bilobed. In general structure many resemble members of the Chrysomelidae or "Leaf Beetles", from which they may usually be distinguished by the more elongate form, the reflexible antennae and the pubescent elytra; moreover, there is a tendency for the epimera of the metathorax to extend to the sides of the ventral segments, while in the latter family the first abdominal sternite is prolonged forwards at the sides to meet the metathorax.

The family Cerambycidae may conveniently be divided on immature characters into nine subfamilies, namely the ANOPLODERMINAE (larvae of which have recently been studied), PARANDRINAE, PRIONINAE, LEPTURINAE, OXYPELTINAE, DISTENIINAE, ASEMINAE, CERAMBYCINAE and LAMIINAE. Of these, only the following are represented in the Australasian region: PARANDRINAE, PRIONINAE, ASEMINAE, CERAMBYCINAE and LAMIINAE.

Although an attempt has been made to adhere as closely as possible to the sequence of tribal and generic classification as cited in the *Coleopterorum Catalogus* of Junk and Schenkling (1912–1923), a number of exceptions have had to be made. In each case, however, the original position has been indicated, together with a cross-reference to the proposed taxonomic position where reasons for the transference are discussed. In the interests of brevity, full synonomy has not been included except under exceptional circumstances or where it is considered there may be obvious confusion. Vernacular names have been given whenever possible.

The distribution given for each species comprises a list of countries arranged alphabetically under their respective regions, but it should be pointed out that these lists are not necessarily complete, for they are based mainly on collections in the British Museum (Natural History) and on various catalogues. They are, in fact, provided merely to give a general picture of distribution. The localities listed have been segregated into zoogeographical regions, namely Australasian and Oriental. The latter region is approximately north-west of a line extending from Eastern Java to the Celebes but, as pointed out in the introduction (p. 1), also includes New Guinea for the purposes of this present series of monographs (fig. 11).

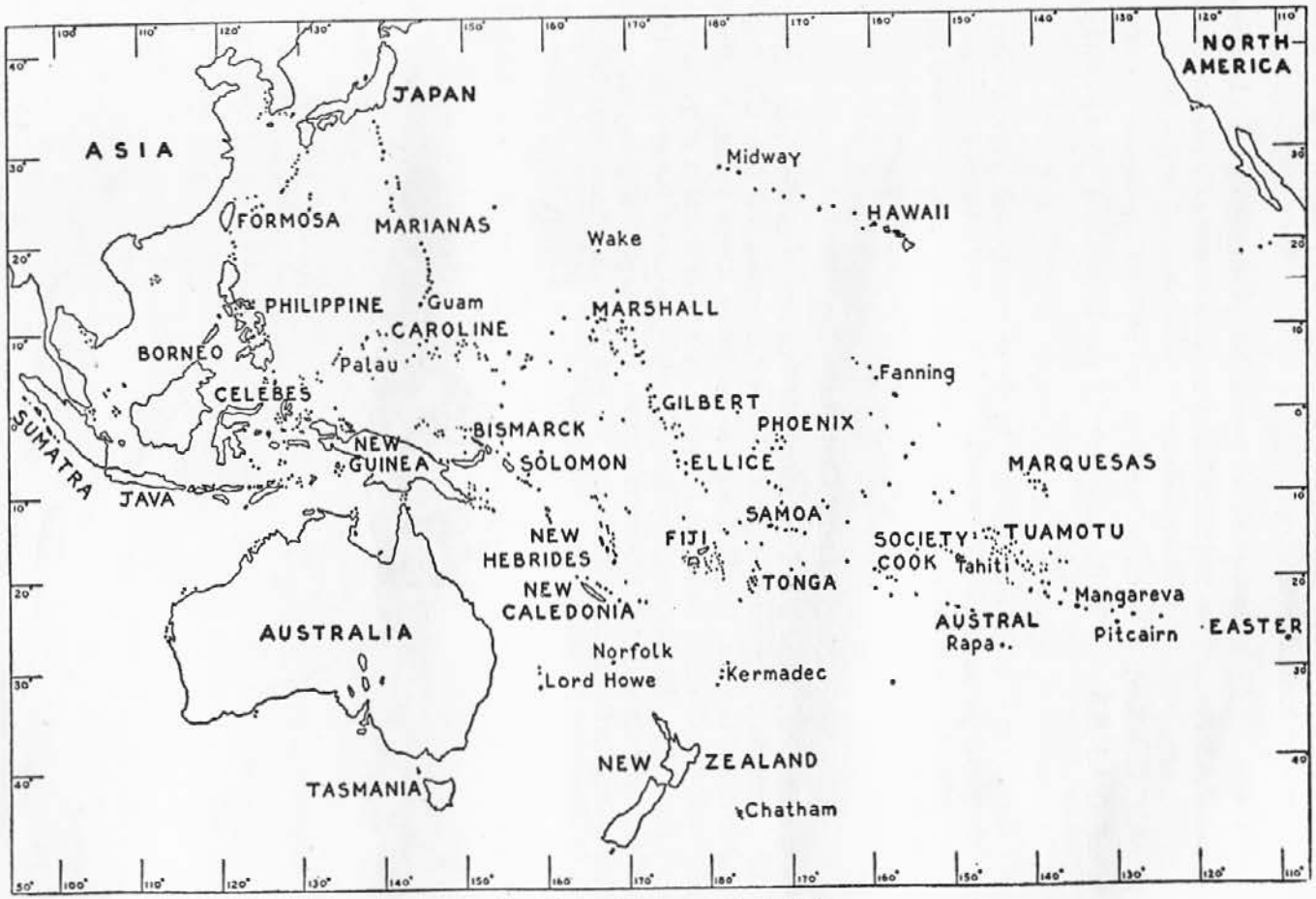

Fig. 11. Outline map of Australasia.

In listing the references to each species and the material examined, the following abbreviations have been adopted:

In coll. B.M.	In the collection of the British Museum (N.H.), London.
In coll. D.A.S.B.	In the collection of the Department of Agriculture and Stock, Brisbane.
In coll. F. C. N.S.W.	In the collection of the Forestry Commission, N.S.W.
In coll. D.A.N.S.W.	In the collection of the Department of Agriculture, N.S.W.

Leg.=collected by; E.A.J.D. leg.=collected by the author; E=egg, eggs; L=larva, larvae; P=pupa, pupae; I=imago, imagines (adults); Biol.=biology; Physiol.=physiology; Contr.=control; Fig.=figured or photographed; Paras.=parasites and/or predators.

1. PARANDRINAE

Larval Characters

Form cylindrical. *Head* with front margin of frons not projecting over clypeus (fig. 12). Antenna 3-segmented, segment 3 elongate, cylindrical (fig. 12). Post-condylar carina absent (fig. 12). Subfossal process absent. Ocelli absent. Maxillary palpifer with outer margin rounded. *Prothorax* with posterior area of pronotum asperate (fig. 13). *Abdomen* with ampullae coarsely spiculate or asperate (fig. 15); each dorsal ampulla with two transverse furrows, each ventral ampulla with one. Segment 9 long, extended; anal lobes glabrous and compact. Pleural discs absent. *Legs* with unguiculus imbricately spinose apically.

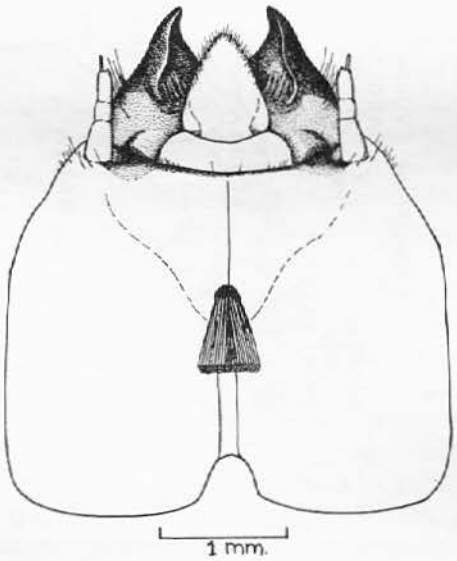

Fig. 12. *Paranda glabra* (Degeer). Mature larva. Head. Dorsal aspect.

Parandrini

Parandra spp.

Although the genus *Parandra* is represented by several species (e.g. *P. frenchi* Blackburn, *P. striatifrons* Fairmaire) in the Australasian region, no immature material is available and no bionomic data are to be found in the literature.

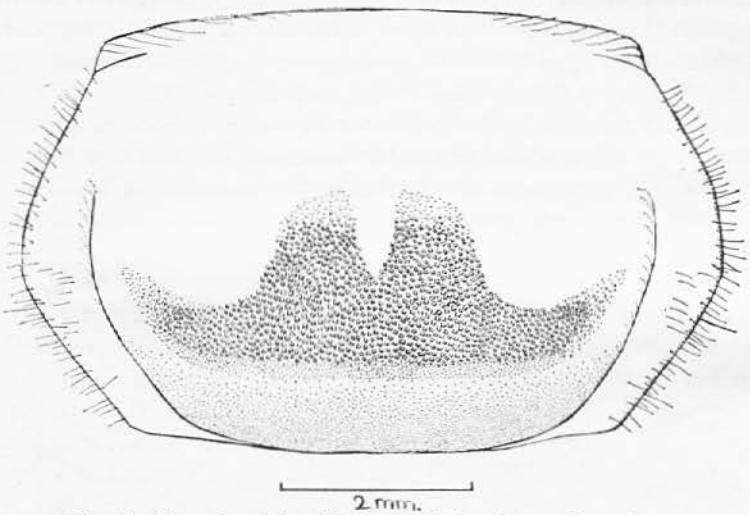

Fig. 13. *Parandra glabra* (Degeer). Mature larva. Pronotum.

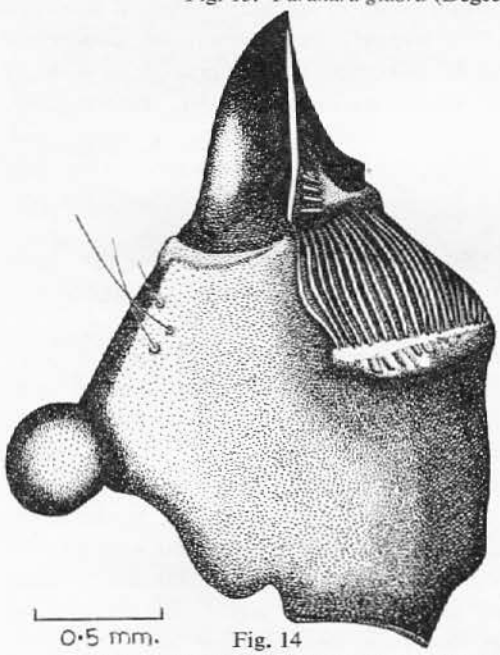

Fig. 14

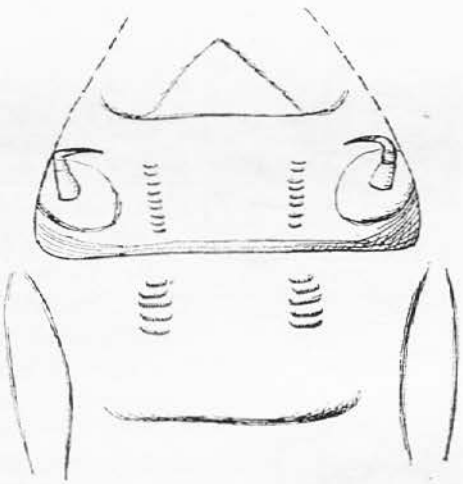

Fig. 15

Figs. 14–15. *Parandra glabra* (Degeer). Mature larva. Fig. 14. Left mandible. Dorsal aspect. Fig. 15. Posterior half of metathoracic sternite and anterior half of abdominal sternite 1, showing relative widths of asperities (semi-diagrammatic).

Mature larva. The following description is that of the South American *P. glabra* (Degeer), which should be essentially similar to those of Australasian species. Form cylindrical, rather robust, very slightly tapering posteriorly to abdominal segment 9. *Head* (fig. 12) slightly depressed, quadrate to slightly transverse, with sides rather strongly rounded. Gena and temple sparsely setose. Front margin of frons roundly declivous, almost straight. Antenna (fig. 12) long, fleshy, scarcely retractile; segment 2 the longest and bearing segment 3 and a supplementary process; segment 3 strongly elongate. Mandible (fig. 14) robust, wedge-shaped, pitchy, shining; apex acutely pointed, slightly curved downwards; molar area flattened into a striate trapezoidal plate. Clypeus trapezoidal, leathery, as wide at base as epistoma. Labrum elongate cordate, rather sparsely and coarsely setose apically. *Prothorax* with posterior area of pronotum (fig. 13), eusternum and lateral posterior angles of presternum bearing numerous transverse, ferruginous asperities; eusternum distinctly separated from presternum.

Eusternum and sternellum of mesothorax and sternellum of metathorax bearing rows of asperities which are sublinear and more strongly transverse than those on eusternum of prothorax. *Abdomen* with dorsal ampullae present on segments 1–7, each ampulla rather densely and coarsely spiculate. Segment 1 with eusternum bearing two paramedian longitudinal rows of from three to five transverse asperities which are much larger than those on thoracic segments (fig. 15); sternellum coarsely spiculate antero-laterally. Segments 2–7 with eusternum finely spiculate (less finely laterally) and sternellum coarsely spiculate. Pleural tubercles distinct and epipleura strongly protuberant on abdominal segments 7–9. Anal lobes compact, the dorsal lobe strongly protuberant. *Legs* pale testaceous, slender, rather long; unguiculus attenuated, imbricately spinose. *Spiracles* with peritreme broadly oval, rather thick; marginal chambers reduced. Length up to 46 mm.; maximum breadth (at prothorax) 8·5 mm.

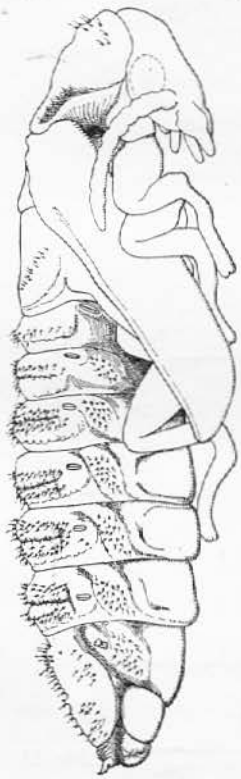

Fig. 16. *Parandra glabra* (Degeer). Pupa. Lateral aspect.

It is suspected that the carinate asperities on the metathoracic sternellum and on the eusternum of abdominal segment 1 act as a stridulatory organ.

Pupa. The following description is based on that of *P. glabra* (Degeer). *Head* (fig. 16) strongly bent beneath prothorax, quadrate, rounded, glabrous. Antennae rather thick, moniliform and short, extending to between front and middle legs, Labrum cordate, anterior margin rounded and bearing a few minute setae. *Pronotum* slightly transverse, broadest anteriorly; disc irregularly transversely striate, and with an oval shallow, median depression posteriorly; several short, stout, curved spines present around lateral margins. *Mesonotum* and scutellum prominent, fleshy and bearing a few minute scattered spinules. *Metanotum* with several small spines (roughly in a V-formation), the anterior two or three pairs much larger than

remainder; scutellar groove well defined. Elytra and wings extending to between abdominal segments 3 and 4. *Abdomen* with tergites 1–7, each bearing numerous short, rather stout, curved spines (each arising from a papillate base). Tergite 8 glabrous. Tergite 9 glabrous and with a pair of stout ferruginous urogomphi, which are widely separated at base and slightly converging posteriorly. Sternites glabrous. Pleura each bearing several slightly curved spines which are appreciably stouter than those on tergites, and which arise from larger conical papillae. *Legs* glabrous, with hind femora extending as far as abdominal segment 3, and hind tibiae almost at right angles to longitudinal axis of body. *Spiracles* present on abdominal segments 1–8, the eighth pair being partly closed and probably non-functional; peritreme narrowly oval, very thick, pale and appreciably raised above general level of cuticle.

References. None available.

2. PRIONINAE

Larval Characters

Form robust, subcylindrical and tapering posteriorly. *Head* usually quadrate to slightly transverse, seldom slightly elongate; widest behind middle; dorsal margins of epicranial halves fused behind frons, but sometimes separating near the base; tentorial cross-arm in same plane as hypostoma, forming a bridge behind it, which divides the occipital foramen into an anterior and a posterior portion. Front margin of frons strongly sclerotised, often abruptly sloping, with its lower boundary projecting over clypeus and its upper boundary dentate or carinate; six epistomal setae present. Clypeus thick, trapezoidal, as wide at base as front margin of frons. Labrum thick and lanceolate, cordate, transversely elliptical or orbicular. Mandibles wedge-shaped (fig. 27), cutting edge broadly emarginate; apex produced, acute. Ocelli present or absent. Antenna (figs. 17, 27) 2- or 3-segmented, conical, partly retractile; segment 2 barrel-shaped or cylindrical, obliquely truncate, hollowed at tip and often bearing a small third segment. Subfossal process and postcondylar carina present (fig. 17). Ventral mouthparts attached to hypostoma by slightly more than width of gula. Maxillae movable; cardo distinct; palpifer with outer margin rounded; lobe borne on stipes; maxillary palpi short, conical, robust, 3-segmented, segment 3 relatively short and cylindrical, blunt or conical, the tip being truncate and bearing a sensory impression. Ligula large, fleshy and densely covered with short stout setae. *Prothorax* with eusternum partially or entirely, and lateral zone distinct. *Abdomen* with dorsal ampullae with two transverse impressions; ventral ampullae with one. Epipleura protuberant on last three segments only; segment 9 large, elongate, extended. *Legs* distinct, stout, conical; unguiculus imbricately spinose. *Spiracles* of mesothorax protruding into prothorax; abdominal spiracles with small marginal chambers occasionally present.

First-instar larvae of this subfamily are exceptional in that they do not usually possess egg-bursting spines (see Duffy, 1953a, p. 16).

Macrotomini

Paroplites australis Erichson (=**servilis** Pascoe)

[The Banksia Longicorn]

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland, Tasmania, Victoria).

Host plants. *Banksia serrata* (Froggatt, 1907); *Banksia integrifolia* (Froggatt, 1893); *Quercus*, *Ulmus*, *Salix* (Froggatt, 1923); *Casuarina* (P.B. Carne); *Eucalyptus pilularis* (W. A. McDougall).

Mature larva (figs. 17–18). Form subcylindrical, very robust, slightly tapering posteriorly. *Head* (fig. 17) slightly depressed, subquadrate, with sides diverging posteriorly. Mouthframe strongly sclerotised, rugose, broadly pitchy. Front margin of frons obliquely sloping; upper boundary with a distinct transverse carina which is broadly divided medially into two halves, each half feebly crenulate; lower boundary produced laterally over clypeus. Postcondylar carina distinct, feebly serrate, pitchy. Subfossal process large, bluntly rounded apically. Antenna 2-segmented; segment 2 obliquely truncate apically. Three pairs of subcontiguous ocelli present; lens round,

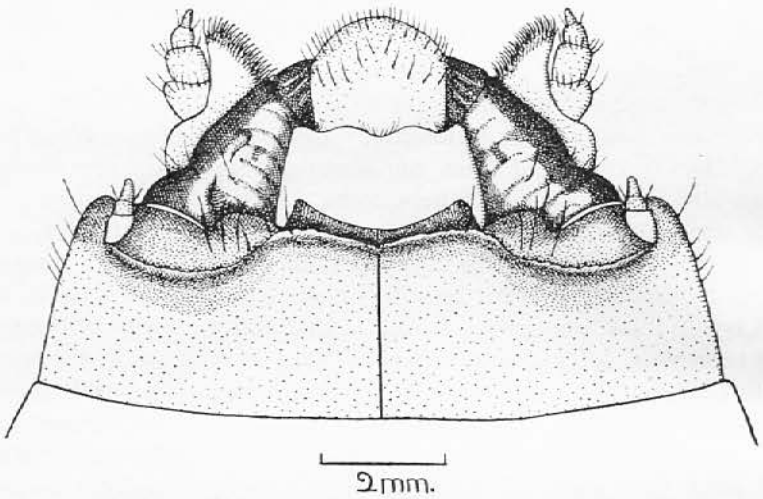

Fig. 17. *Paroplites australis* Erichson. Mature larva. Front part of head. Dorsal aspect.

strongly protuberant, pigmented spot indiscernible. Mandible very robust, pitchy, shining, with outer face microgranulate and bearing coarse bristly setae on basal half. Labrum cordate, entirely sclerotised and ferruginous (except for front margin) and fringed anteriorly with bristly setae. Maxilla with segment 3 of palp about two-thirds length of segment 2. Labial palpi with segments 1 and 2 subequal in length. Submentum with base flattened and obliquely sloping. *Prothorax* moderately depressed, obliquely inclined, about twice as broad as long; pronotum rectangular, delimited laterally by a pair of grooves; median cleaveage line shallow, indistinct; anterior area rugose, bearing a few scattered reddish setae; posterior area more coarsely rugose, with similar setae. Presternum (fig. 18) with a well defined antero-median area which is subtriangular, smooth, feebly but coarsely longitudinally strigose and with a distinct median longitudinal impression. Eusternum subcordate, glabrous. *Mesonotum* and *metanotum* glabrous. *Abdomen* with ampullae on segments 1–7 each with two distinct transverse furrows, feebly rugose and glabrous. Pleural discs indiscernible. Anus trilobed, each lobe bearing a few fine setae. *Legs* 3-segmented, at least as long as maxillary palpi; unguiculus attentuated, imbricately spinose. *Spiracles* with peritreme

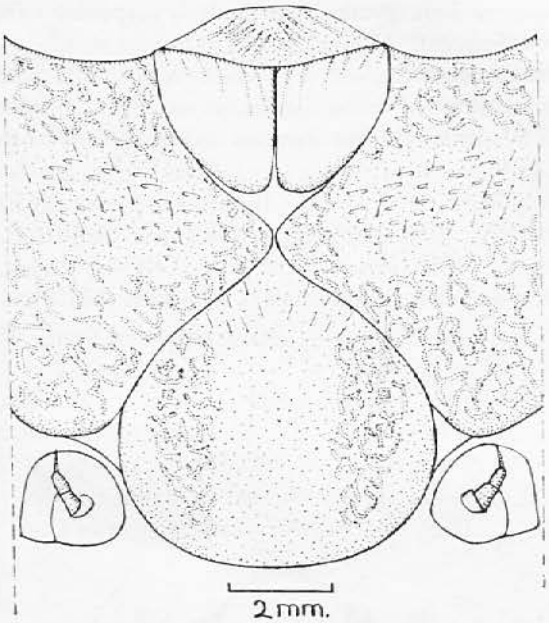

Fig. 18. *Paroplites australis* Erichson. Mature larva. Median area of prosternum.

broadly oval, thick, and slightly raised above general level of cuticle. Length up to 90 mm.; maximum breadth (at prothorax) 18 mm.

Egg (fig. 19). Fusiform, with one end slightly more attenuate than the other; both ends subtruncate to bluntly rounded apically. Chorion light brown and covered with longitudinal, shallow, punctate, ridge-like convolutions. Length 4·9 mm.; breadth 1·8 mm.

Biology. Larvae tunnel in the stems of the host plant, packing the gallery behind them with wood fragments, and pupating at the end of the gallery, usually near the bark (McKeown, 1944). Nearly all old *Banksia* trees are tunnelled through the trunks and main branches and in heavy wind storms, the fallen branches show how severely they have been honeycombed. A honeysuckle tree from the Botanic Gardens once yielded over 30 beetles (Froggatt, 1923).

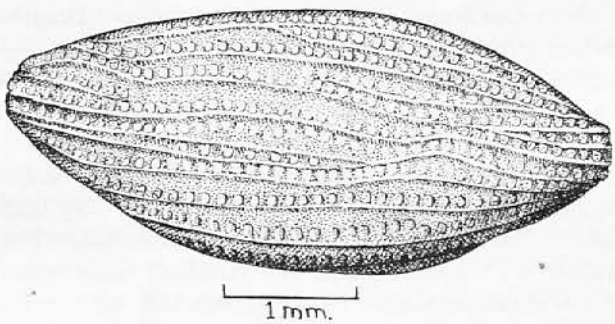

Fig. 19. *Paroplites australis* Erichson. Egg.

Economic importance. This species is particularly responsible for the final destruction of *Banksia* trees (Froggatt, 1923).

Material studied. 1 L, Australia, New South Wales, Merricumbene Ck., 17 m. S.E. of Araluen, from trunk of living *Casuarina* sp., P.B. Carne leg., in coll. B.M.; 1 L, Australia, N.S.W. Sydney, from *Banksia serrata*, W. W. Froggatt leg., in coll. D.A.N.S.W.

References. Dumbleton, 1957 (L fig., Biol.); Froggatt, 1893 (L, I, Biol.), 1907 (Biol.), 1923 (L fig., P. fig., I fig., Biol. fig.); McKeown, 1944 (Biol.).

Agrianome (s.g. **Agrianome**) **spinicollis** (Macleay)

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland), Lord Howe I.

Host plants: *Kentia* sp., *Citrus* sp. (Lea, 1916); *Delonyx regia*, *Grevillea robusta* (A. R. Brimblecombe); *Schinus molle* (J. W. Armstrong); *Angophora intermedia*, *Eucalyptus acmenioides*, *E. saligna* (K. M. Moore).

Mature larva (Pl. I, fig. 3 and fig. 20). Similar to that of *Paroplites australis* Erichson but differing as follows. *Head* (fig. 20) with front margin of frons with the carina of

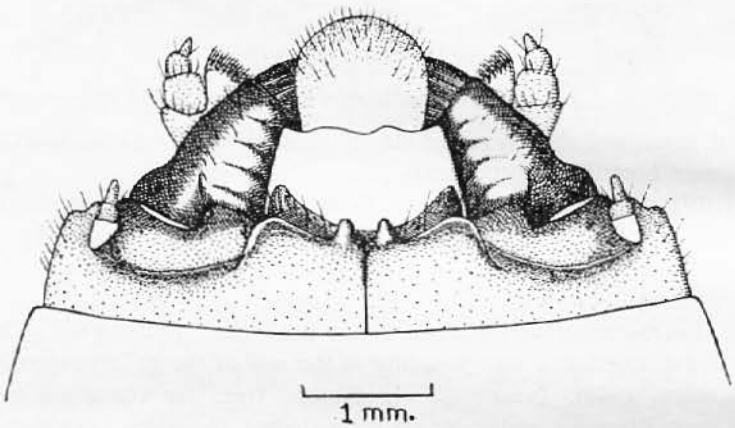

Fig. 20. *Agrianome spinicollis* (Macleay). Mature larva. Front part of head. Dorsal aspect.

upper boundary produced anteriorly into a pair of paramedian dentate processes; lower boundary with much larger, lateral, dentate processes. Length up to 100 mm.; maximum breadth (at prothorax) 28 mm. (usually under 20 mm.).

Pupa. Head salient, not concealed from above by prothorax; vertex strigose, with a median longitudinal furrow. Mandible short, very robust, rugulose, with several minute scattered setae on outer face. Antennae thick, extending as far as abdominal segment 2, where they are curved downwards and inwards almost to meet between apices of elytra. *Pronotum* strongly transverse, with sides very feebly rounded, the hind angles angulate; disc transversely strigose and bearing numerous scattered setose papillae. *Mesonotum* with similar striae and papillae; scutellum very prominent, fleshy, papillate. *Metanotum* transversely strigose and with a fleshy subconical, papillate tubercle near each anterior angle. Elytra and wings extending as far as

abdominal segment 4. *Abdomen* with tergites rugose and bearing numerous scattered, ferruginous spinules; gin-traps present on segments 2–3, 3–4, 4–5 and 5–6; each consisting of two transverse labiate protuberances. Sternites with spinules smaller and less numerous. *Legs* with hind femora extending as far as abdominal segment 4. *Functional spiracles* present on abdominal segments 1–6, the seventh pair being closed and probably non-functional; peritreme narrowly oval, pale and rather thick. Length up to 60 mm.; breadth 24 mm.

Egg (fig. 21). Fusiform, with one end more bluntly tapering; both ends subtruncate and carinate apically. Chorion dark brown and rather densely covered with

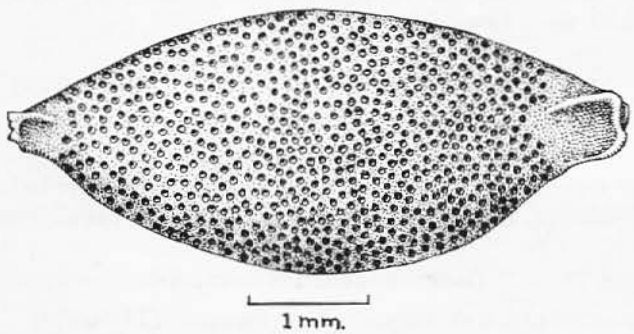

Fig. 21. *Agrianome spinicollis* (Macleay). Egg.

large, round, deep, regularly placed punctures. Length 4·1 mm.; breadth 1·7 mm.

Biology. Larvae of this species are known as "witchetty grubs". On Lord Howe Island, according to Lea (1916a), numerous adults may be taken at night on the trunks of various trees. The larvae make large galleries and eject great quantities of frass. The galleries eventually become exposed through the action of other insects and fungi, and the large hollows so formed are often found to be occupied by a large phasmid (*Karabidion australe* Montr.). Larvae are often extracted from rotten logs by the islanders and used as fish-bait.

The following observations have been made by K. M. Moore. Apparently growing trees only are attacked by this species, though larvae may continue to develop in logs. The life-cycle occupies at least two years, possibly three to four years. The vertical larval galleries occur close together, deep in the timber to the centre of the tree. Injured areas on bases of trunks are susceptible to attack. A cross-section of a tree trunk may show numerous holes, varying in size, filled with either loose or firmly packed excreta. Larvae of various instars may be found together in the same area of a tree. Larvae work in subcontiguous galleries, usually along the grain of the wood, but occasionally across the grain for short distances. Owing to their habit of tunnelling deep into a tree, larvae can survive intense bush-fires, even though the log or tree has been considerably affected by the fire. Larvae taken from *E. saligna* are predominantly pink in colour, apparently due to the colour of the timber; those from *E. acmenioides* are pale brown, while from *Angophora intermedia* they are cream in colour. Pupation occurs in cells surrounded by coarse strips of wood which are finer than those in the cells of *Eurynassa australis* (Boisduval). Adults emerged from reared specimens during

December, but others have been collected during January and February.

Material studied. 1 L, 1 P, Australia, New South Wales, Lisarow, 30. iii. 1957, from *Eucalyptus acmenioides* (dead), K. M. Moore leg., in coll. F.C.N.S.W.; 3 L, 16.vi.1956, from *Angophora intermedia*, 1 P, Ourimbah, 19.xi.1957, from *Eucalyptus acmenioides* (living), K. M. Moore leg., in coll. F.C.N.S.W. 1 L, Australia, Queensland, Brisbane, i.1936, A. R. Brimblecombe, leg., in coll. D.A.S.B.; 2 P, Australia, Queensland, Brisbane, 11.xi.1940, from *Grevillea robusta*, A. R. Brimblecombe leg., in coll. D.A.S.B.; 1 L, Australia, Queensland, Forest Hill, 31.xii.1929, A. R. Brimblecombe leg., in coll. D.A.S.B.

References. Aurivillius, 1917 (L fig.); Brimblecombe, 1956 (L fig., P fig.); Lea, 1916a (L fig., Biol. fig.); Lepesme, 1947 (Biol.).

Agrianome (s.g. **Agrianome**) **fairmairei** (Montrouzier)

Distribution. AUSTRALASIAN REGION: Australia (Queensland).

Host plant: *Clusia pedicellata* (Lucas, 1880).

Biology. All stages of this beetle are eaten by the native population.

References. Distant, 1904 (Biol.); Duffy, 1953a (Biol.); Lucas, 1880 (Biol.).

Olethrius insularis (Fairmaire)

Distribution. AUSTRALASIAN REGION: New Zealand, Fiji, Samoa.

Host plant: *Cocos nucifera* (Lepesme, 1947).

Mature larva (figs. 22–23). Similar to that of *Agrianome spinicollis* (Macleay) but differing as follows. *Head* (fig. 22) with front margin of frons with upper boundary strongly produced anteriorly and protruding beyond lower boundary. *Prothorax* with presternum bearing about 20 conical tubercles (which are sclerotised apically) on lateral areas (fig. 23). Length up to 100 mm.; maximum breadth (at prothorax) 21 mm.

Biology. In Samoa larvae of this species are consumed as food by the natives (Netolitzky, 1920).

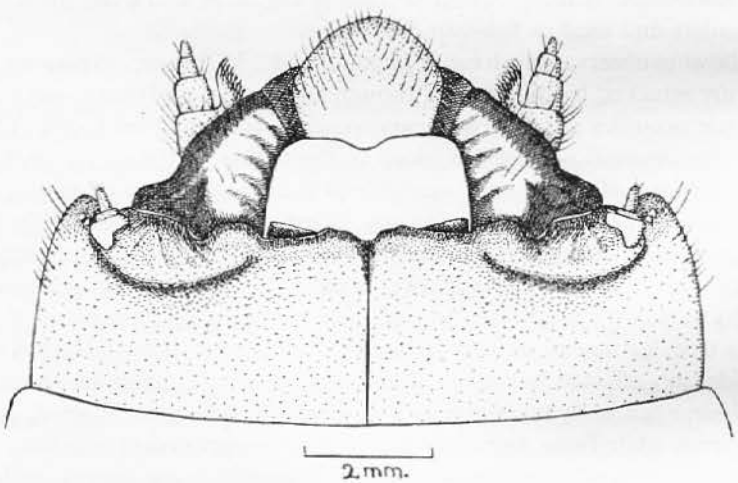

Fig. 22. *Olethrius insularis* (Fairmaire). Mature larva. Front part of head. Dorsal aspect.

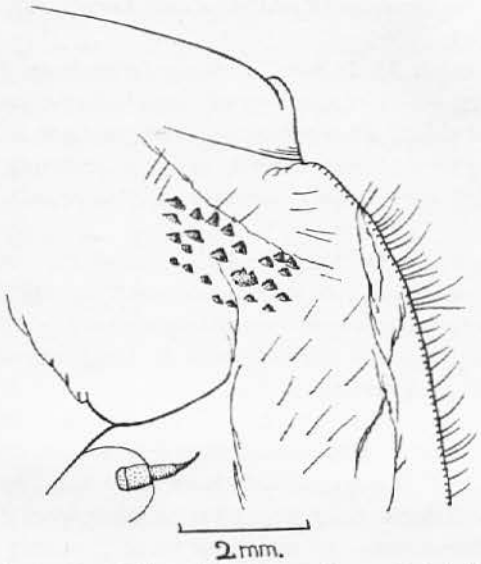

Fig. 23. *Olethrius insularis* (Fairmaire). Mature larva. Left half of prosternum.

Material studied. 1 L, Samoa, Upolu, Afiamalu, 19.vii.1940, O. H. Swezey and E. C. Zimmerman leg., in coll. B. P. Bishop Mus.; 1 L, Samoa, in coll. B. M.

References. Duffy, 1953a (Biol.); Lepesme, 1947 (Biol.); Netolitzky, 1920 (Biol.); Zacher, 1913 (L fig., P fig.).

Olethrius carolinensis (Matsushita)

Distribution. AUSTRALASIAN REGION: Western Caroline Is. (Palau, Yap).

Host plant: *Ceiba* (Gressitt, 1956).

Reference. Gressitt, 1956 (L fig., P fig., I fig., Biol).

Olethrius tyrannus J. Thomson

Distribution. AUSTRALASIAN REGION: Australia, Fiji, New Caledonia, New Hebrides, Solomon Is., Woodlark. ORIENTAL REGION: New Guinea.

Host plants: *Cocos nucifera* (Froggatt, 1911); *Theobroma* (Risbec, 1937).

Biology. Eggs are deposited in batches beneath the bark of dead or dying trees. For this reason this species is not regarded as a serious pest. According to Risbec (1937), mature larvae excise a disc of bark before pupating, a habit which is more characteristic of certain LAMIINAE and which should be verified.

References. Cohic, 1953 (Biol.); Froggatt, 1911 (L fig., Biol.); Lepesme, 1947 (Biol.); Risbec, 1937 (E fig., L fig., P fig., I fig., Biol. fig.).

Eurynassa australis (Boisduval) (=**odewahni** Pascoe)

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, North Queensland, South and West Australia, Tasmania).

Host plants: *Acacia decurrens* (K. M. Moore); *Eucalyptus punctata*, *E. squamosa*, ?*Casuarina glauca* (Cox, 1906).

Adult (fig. 24). Length 35–58 mm. Entirely ferruginous to pitchy. *Head* with antennae filiform, short, not extending beyond basal half of elytra. *Prothorax* strongly transverse, subparallel-sided; sides explanate, with margins irregularly serrate; disc with a smooth shining area of characteristic design contrasting with the surrounding area which is matt and very densely punctate. Elytra rugose, with apicies broadly rounded.

Mature larva. (Pl. X, fig. 1). Very similar to that of *Paroplites australis* Erichson but differing as follows. *Prothorax* with presternum entirely coarsely rugulose and without a distinct antero-median area contrasting with surrounding cuticle. *Abdomen* with segment 8 distinctly shorter than segment 7. Length up to 90 mm.; maximum breadth (at prothorax) 22·5 mm.

Pupa (fig. 25). Very similar to that of *Agrionome spinicollis* (Macleay) but differing as follows. *Abdomen* with spinules on tergites 2–4 coarse, ferruginous and rather numerous (fig. 25). Size larger; length up to 54 mm.; breadth 21 mm.

Biology. Larvae and pupae have recently been taken from dead and rotting areas in the bases of *Acacia decurrens*. All trees were large, probably six to eight years old, some having fallen and were in contact with moist soil. Some larvae were taken from roots below ground-level. Adults emerge during December to February. The larval stage is at least two years in duration most probably four years. The pupal stage lasts

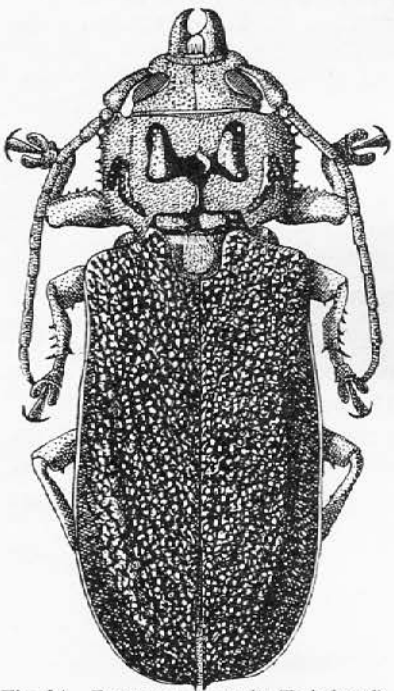

Fig. 24. *Eurynassa australis* (Boisduval). Adult.

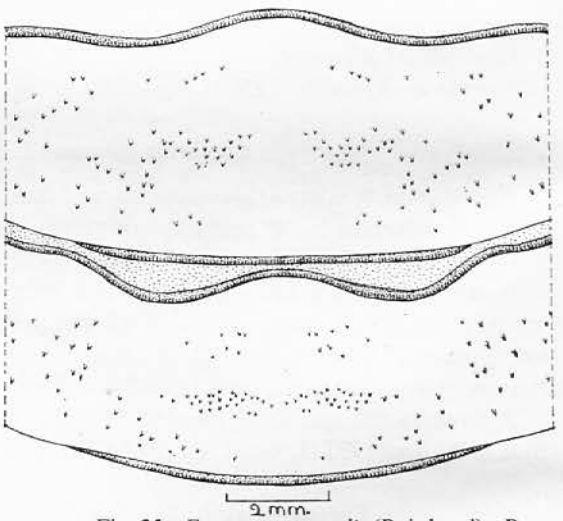

Fig. 25. *Eurynassa australis* (Boisduval). Pupa. Median area of tergites 3 and 4.

about two months. Galleries formed during the final instar are filled with coarse excreta. Pupation occurs in or near the roots of standing trees, the cells being lined with coarse strips of wood (K. M. Moore). Cox (1906) records finding a larva in April, 1902, which became an adult in October 1904, but growth was probably retarded through the drying out of the wood. McKeown (1944) states that the beetles, when handled, emit a strong musk-like odour.

According to Lumholtz (1889), the aborigines used to hack out these larvae from tree-trunks, and sometimes eat them alive. Usually they were placed on red-hot ashes where they at once become brown and crisp—"the fat fairly bubbled in them while they were being thus prepared". After being turned over once or twice they are ready for eating. "If a larva is broken in two", he continues, " it will be found to consist of a yellow and tolerably compact mass rather like an omelette. In taste it resembles an egg, but it seemed to me that the best kind (i.e. *Eurynassa*), which has the flavour of nuts, tasted even better than a European omelette. The natives always consumed the entire larva, while I usually bit off the head and threw aside the skin, but my men always consumed my leavings with great gusto. They also ate the beetles as greedily as the larvae, simply removing the hard wings before roasting them."

Material studied. 4 L, 1 P, Australia, New South Wales, Lisarow, 17.x.1956, from *Acacia decurrens*, K. M. Moore leg., in coll. F.C.N.S.W.

References. Cox, 1906 (L, Biol.); Duffy, 1953a (Biol.); Lumholtz, 1889 (Biol.); McKeown, 1944 (L fig., I fig., Biol.); Tepper, 1887 (Biol.).

Cnemoplites edulis Newman

Distribution. AUSTRALASIAN REGION: Australia (South Australia, Victoria).

Host plants: *Eucalyptus* spp. (Tepper, 1887).

Biology. Larvae of this species were consumed as food by the aborigines. They are said to taste of fresh almonds.

References. Duffy, 1953a (Biol.); Netolitzky, 1920 (Biol.); Tepper, 1887 (Biol.).

Cnemoplites princeps Gahan

Distribution. AUSTRALASIAN REGION: Australia (Queensland).

Egg. Fusiform, with ends subtruncate or bluntly rounded. Chorion light brown, dull, and micro-granulate. Length 3·2; breadth 1·8.

References. None available.

Archetypus frenchi (Blackburn)

Distribution. AUSTRALASIAN REGION: Australia (Queensland).

Host plant: *Araucaria cunninghamii* (Illidge, 1924).

Reference. Illidge, 1924 (Biol.).

Xixuthrus costatus (Montrouzier)

Distribution. AUSTRALASIAN REGION: Solomon Is., Woodlark.

Host plant: *Cocos nucifera* (Froggatt, 1911).

References. Candèze, 1868 (Biol.); Froggatt, 1911 (L fig., I fig., Biol.); Lepesme, 1947 (Biol.); Lever, 1934 (Biol.).

Xixuthrus heros Heer (Pl. XI, fig. 3)

Distribution. AUSTRALASIAN REGION: Fiji.

Reference. Candèze, 1868 (L fig.).

Xixuthrus microcerus (White)

Distribution. AUSTRALASIAN REGION: Australia (Northern Territory), Celebes, Solomon Is., Moluccas (Kei Is.). ORIENTAL REGION: Ceram, Java, Sumatra, New Guinea.

Reference: Heller, 1904 (L. P fig.).

Callipogonini

Cacodacnus planicollis Blackburn

Distribution. AUSTRALASIAN REGION: Australia (Queensland, South Australia, Victoria).

Host plant: *Pinus radiata* (F. D. Morgan).

Mature larva. Similar to that of *Prionoplus reticularis* White from which it differs as follows. *Head* with front margin of frons with upper boundary bearing a pair of strongly projecting paramedian lobes; lower boundary with lateral lobes much more strongly produced. Subfossal process obtusely conical. Submentum plane, with anterior margin acutely produced medially and strongly sclerotised. *Prothorax* with proeusternum partly micro-spiculate. *Abdomen* with ampullae glabrous. Length up to 52 mm.; maximum breadth (at prothorax) 16 mm.

Material studied. 4 L, 6 I, South Australia, Aldgate, 16.ii.1961, from *Pinus radiata*, F. D. Morgan leg., in coll. B.M.

References. None available.

Anacolini

Prionoplus reticularis White

[The Huhu Beetle]

Distribution. AUSTRALASIAN REGION: New Zealand.

Host plants: *Pinus radiata* (Miller, 1925); *Dacrydium cupressinum Agathis australis*, *Podocarpus spicatus*, *P. dacrydioides* (Broun, 1879); *Larix decidua*, *Pseudotsuga douglasii* (Kelsey, 1947); *Podocarpus ferrugineus*, *Dacrydium intermedium*, *Pinus* spp., including *P. taeda*, *P. laricio* and *P. pinaster*, *Cupressus macrocarpa*, *Beilschmeidia tawa*, (Edwards, 1959); ?*Quercus* sp. (Thomson, 1922).

Adult (fig. 26). Length 26–48 mm. Head and thorax dark brown and covered with dense woolly setae. Antennae dark brown, with segments 3–10 each with a long apical spine, segment 11 compressed. *Prothorax* short, transverse, much narrower than elytra, with a pair of long slender, lateral spines. *Elytra* elongate, broadly rounded apically, margined and of a lighter colour, with three longitudinal, yellowish veins connected by nervures, forming an irregular and asymmetrical reticulation; apices abruptly reflexed.

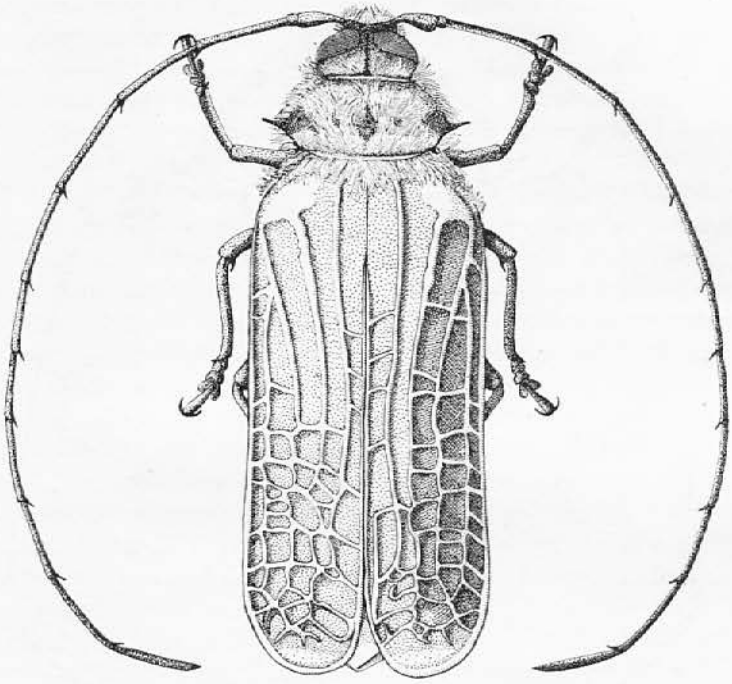

Fig. 26. *Prionoplus reticularis* White. Adult.

Mature larva (figs. 27–28). Form subcylindrical, very robust, slightly tapering posteriorly. *Head* (fig. 27) slightly depressed, subquadrate, with sides diverging posteriorly. Mouthframe strongly sclerotised, rugose, broadly pitchy. Front margin of frons obliquely sloping; upper boundary with a distinct transverse carina which is broadly divided medially into two halves, each half sinuate and often feebly bi- or trilobed; lower boundary with a pair of broadly triangular lobes projecting over each side of clypeus. Postcondylar carina distinct, serrate. Subfossal process large, acutely conical. Antenna 3-segmented; segment 3 elongate, cylindrical, about half length of segment 2. Three pairs of subcontiguous ocelli present, which are usually partly or entirely obscured by the heavy sclerotisation of the genae. Mandible very robust, pitchy, shining, with outer face strongly rugoso-striate and bearing numerous fine setae on basal half. Labrum cordate, entirely sclerotised and ferruginous and fringed anteriorly with bristly setae. Gula extremely short, with sutures diverging to meet anterior portion of occipital foramen. Maxilla with segment 3 of palp about two-thirds length of segment 2. Labial palpi with segments 1 and 2 sub-equal in length. Submentum with base flattened and obliquely sloping. *Prothorax* moderately depressed, obliquely inclined, about twice as broad as long; pronotum rectangular, delimited laterally by a pair of grooves; median cleavage line shallow, indistinct; anterior area rugose, bearing numerous scattered reddish setae, posterior area coarsely vermiculately rugose. Eusternum distinct, triangular, finely spinulose. *Mesonotum* and *metanotum* finely spinulose. *Abdomen* with ampullae on segments 1–7 each with two

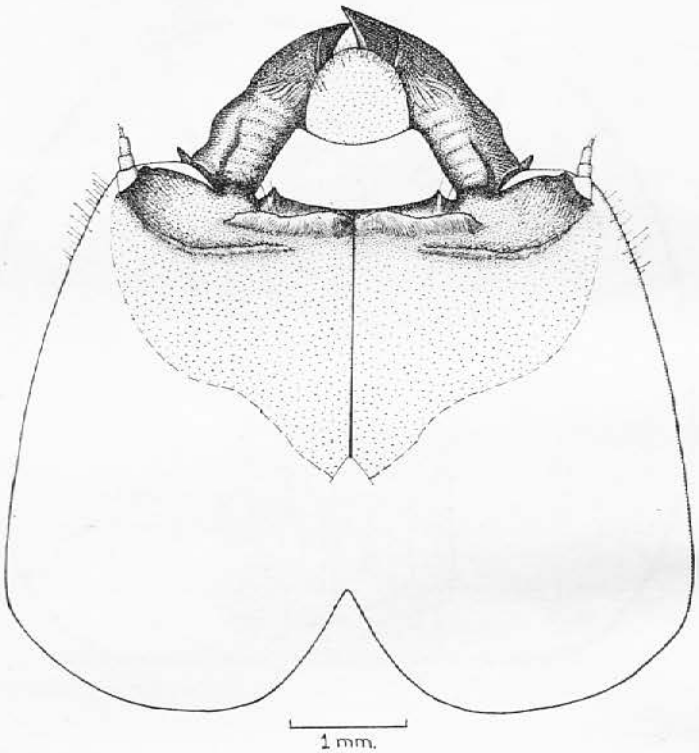

Fig. 27. *Prionoplus reticularis* White. Mature larva. Head. Dorsal aspect.

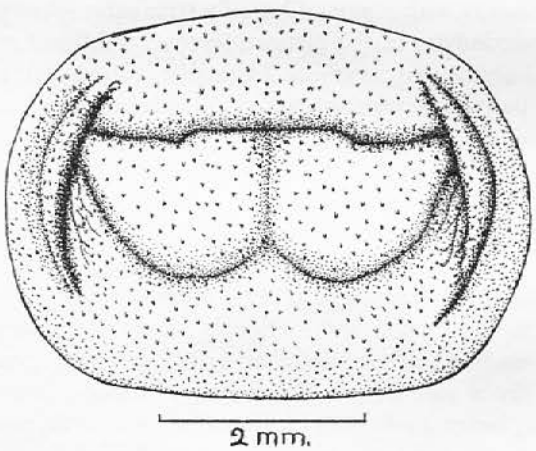

Fig. 28. *Prionoplus reticularis* White. Mature larva. Ampulla of abdominal tergite 6.

distinct transverse furrows, rugose and coarsely spinulose (fig. 28). Tergite 8 finely spinulose, tergite 9 scarcely or not spinulose. Pleural discs indistinct. Anus trilobed, each lobe bearing a few pale, long, fine setae. *Legs* 4-segmented, well developed, at least as long as maxillary palp; unguiculus attenuated, imbricately spinose. *Spiracles* with peritreme broadly oval, thick, and slightly raised above general level of cuticle. Length up to 48 mm.; maximum breadth (at prothorax) 7 mm.

Pupa (Pl. II, figs. 1 and 2, and fig. 29). *Head* salient, not concealed from above by prothorax, mouthparts directed ventrally; glabrous except for a few scattered minute, pale setae; mandibles extending ventrally, very robust, with several short pale setae on outer face. Antennae thick, extending as far as abdominal segment 4, where they are recurved ventrally to terminate alongside hind tarsi. *Pronotum* strongly transverse, with sides bearing a pair of short stout tubercles; numerous short, inconspicuous setae present; middle of disc feebly transversely striate, glabrous. *Mesonotum* glabrous or almost so; scutellum very prominent, fleshy, glabrous. *Metanotum* with scattered spinules and a pair of sublateral, bluntly conical tubercles; scutellar groove coarsely transversely striate. *Abdomen* with tergites 1–8 covered with rather coarse scattered, ferruginous spinules; tergites 4–7 each with a pair of paramedian oval, slightly protuberant tubercles (fig. 29); tergite 9 bearing a pair of very stout conical tubercles. Sternites glabrous. *Legs* with hind femora extending to between abdominal segments 2 and 3 and placed almost at right angles to longitudinal axis of body. *Functional spiracles* present on abdominal segments 1–6; peritreme thick, rather narrowly oval and slightly raised above general level of cuticle. Length up to 34 mm.; maximum breadth 18 mm.

First-instar larva. According to Dumbleton (1957), the front margin of the frons is simple and the postcondylar carina absent in this instar. Edwards (personal communication) has observed the following differences. Mandibular and lateral abdominal setae relatively longer, and terminal setae shorter than in those of later instars. Abdominal segments 1–6 each bearing a pair of backwardly directed triangular spines (accompanied by a short seta) sublaterally. Abdominal segment 9 transverse (as in *Prionus coriarius* (Linnaeus) (Duffy, 1953a)). Spiracles biforous, bicameral.

Egg. Fusiform. Chorion white, unsculptured, Length 3·0 mm.; breadth 1·2 mm. (Dumbleton, 1957).

Biology. This prionid is a widely distributed and familiar member of the New Zealand beetle fauna. Although it has been recorded throughout the main islands,

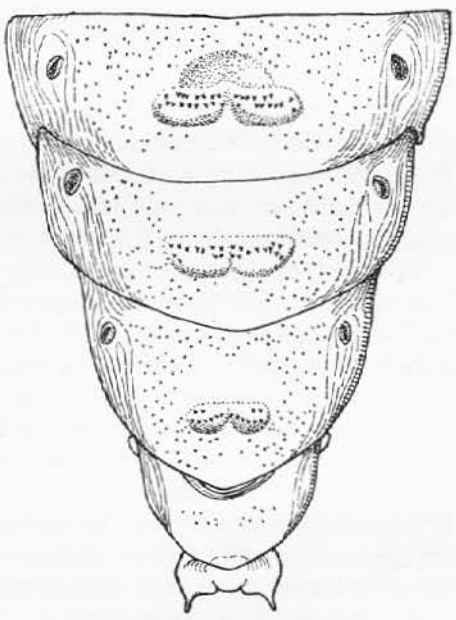

Fig. 29. *Prionoplus reticularis* White. Pupa. Abdominal tergites 5–9.

there are no published records of its occurrence on the outlying islands. Before European settlement, this species was exclusively associated with podocarp and kauri forest, but with the introduction and subsequent widespread planting of exotic conifers, it has been quick to extend its range wherever the new hosts appeared and is now a characteristic member of exotic conifer forest wherever dead wood of a diameter exceeding three or four inches is present.

This species is reported to attack fourteen species of gymnosperms and two species (one being questionable) of angiosperms, all of them as dead wood, though not necessarily in decayed condition. The cessation of sap secretion appears to set the early limit to colonisation of wood. As a primary coloniser, rapidly reducing logs to frass, producing habitats for secondary colonisers and admitting water to the log, *P. reticularis* White must be regarded as a major influent in New Zealand forests.

Eggs are deposited in groups, usually numbering between 10 and 50 (though up to 100 may be found in a single batch), in cryptic sites, typically in slits or cracks in the bark of fallen wood. They are united by a clear secretion which hardens on drying, anchoring the eggs to the substratum. The egg groups may support growths of black and green phycomecete fungi but these do not affect their viability. They are, however, very susceptible to desiccation and collapse within a few hours at low humidity. Fertile eggs are more resistant to desiccation than are unfertilised eggs. The incubation period at 20± 2°C. and relative humidity c. 80% is 23± 2 days. The hatching percentage was between 94 and 98 in egg batches collected in the field.

An estimate of two and three years as the duration of the larval period for the majority of larvae is in agreement with the estimates of Broun (1879) and Dumbleton (1957), but under adverse conditions the larval period may be greatly prolonged. Half-grown larvae were kept two and a quarter years without food, during which time they underwent four moults to successively smaller sizes, and resumed feeding when provided with pine wood. Under conditions of low humidity and starvation, *Prionoplus* larvae readily undergo prothetelic moults, in which leg and wing buds are produced. Using Bodenheimer's Progression Factor, the number of instars found for *Prionoplus* was found to be 13. This figure, however, almost certainly exceeds the actual minimum number of instars since the larva is able to more than double its weight between moults.

The short establishment gallery made by the first-instar larva usually extends about two millimetres into the wood, perpendicular to the surface. The larva then turns into the longitudinal axis of the wood, and there it forms a wider gallery where the first ecdysis takes place. Subsequent behaviour is extremely variable and depends on three main factors, namely (1) the diameter of the log, (2) the state of decay and (3) the degree of previous attack. In sound timber and recently fallen logs the gallery is linear and fairly superficial. The more advanced the decay, and the greater the previous attack, the more tortuous and irregular are the galleries. The heartwood is the last to be attacked, and development appears to be retarded when this is eaten, for the larvae are almost invariably small and deficient in fat body. The gallery (Pl. III, fig. 1) behind the larva is completely filled with loosely packed frass as the larva advances and all wood fragments that are gnawed off are eaten. The mature larva moves to a superficial position, more frequently in the upper part of the log, before the pupal cell is

excavated. The construction of this ovoid cavity envolves a method of employing the mandibles in a manner quite different from that in feeding behaviour, for the larva successively pinches the mandibles along groups of tracheids from the head of the gallery backwards. The fragments so formed are torn from the wall in short slivers resembling wood waste as used for packing, and measuring about 3 cm. by 1 mm. These are pushed behind with a characteristic sideways movement of the head and body. This process is repeated throughout a period of 12 to 24 hours, until the gallery behind it is packed and a chamber is formed in which the larva can move freely. When the plug is complete, the walls are lined with fine wood "flour" obtained from the last frass to be voided when the gut is finally emptied. The pupal cell (Pl. II, figs. 1 and 2) is completed in one to three days and the larva then enters the prepupal phase and pupates about 10 to 15 days later. The pupa lies ventral surface uppermost on the flattened last larval cuticle which forms a "cushion". After 24 hours pigment is visible in the tips of the mandibles and terminal spines. By the fourth day the cuticle has become deep yellow and the cuticular asperities dark brown. Between the 20th and the 25th day there is a rapid increase in pigmentation. The eyes pass through deepening shades of blue grey, indigo and black; concurrently the head capsule, thorax and extremities become light ochreous and the mandibles blacken. Pigmentation does not then advance further until after eclosion on about the 25th day. From about the fifth day of the pupal stadium the abdomen is occasionally oscillated in a regular manner at the rate of about eight oscillations per second for periods up to five seconds. This behaviour is evoked by disturbance, but also occurs spontaneously at irregular intervals.

After eclosion, the adult may remain inactive for three to five days before attempting to emerge from the wood. It normally leaves through the roof of the chamber at one end, not necessarily using the old larval gallery. The emergence hole of *Prionoplus* is easily recognised as characteristically ovoid with cleanly incised borders and axes of 2–3 cm. × 1–1·5 cm.

It is in the larval stage only that *P. reticularis* overwinters, and mature, non-feeding larvae are to be found throughout the winter months. These larvae resume activity about mid-August and prepare their pupal cells. First pupae are to be found late in September and there is a rapid increase in their numbers as October advances. Adults begin to emerge in mid-November and the emergence rate increases through December, whence a fluctuating level persists until early February. Numbers then decline rapidly until mid-March, only isolated individuals then being found up to mid-May. This species is nocturnal, the daylight hours being spent under debris or wedged deeply into furrows of bark on trunks. When disturbed they can seldom be induced to fly. First flights are made shortly after dusk. The onset of flight activity appears to be governed to some extent by sky light intensity, for it is delayed on lightly overcast evenings when the sky remains bright longer than on clear nights; it is also delayed when a full moon has risen before sundown on a clear night.

Specimens captured at light traps are mostly males. The majority of females arrive at traps in the early part of the flight-activity period and their catch is at a minimum during the peak of male activity. Direct observation indicates that this reflects a sexual difference in activity pattern; females emerge from their daylight refuges early

in the activity period and remain relatively sedentary, as may be expected when a male assembling mechanism is operating. This difference in activity pattern also accounts for the small percentage of females caught at light traps.

A characteristic display behaviour is evoked whenever the adult is molested. Contact with the antennae, mouthparts, legs, thorax or elytra brings a response. The head is thrust forward and the mandibles are opened to their full extent. The antennae are flailed and the head raised and lowered. Any object touching the mandibles is instantly seized on and strongly held. Further excitation brings the beetle to a higher straight-limbed stance, which is unstable and usually causes the insect to overturn.

High intensity display between individuals may lead to combat. Preliminary grappling with the fore legs leads to a tight clutching of the partners, one individual usually being thrown on its back. The mandibles seize on any object coming within their compass, even if it is one of the beetle's own appendages, and sections of antennae, palpi and tarsi are frequently lost in this way. Old males taken in the field are often found to be badly mutilated as a result of these encounters.[1] A bout may last as long as 30 to 40 seconds, after which the opponents leave the site, usually taking to flight.

Mating activity usually occurs between 10 p.m. and 1 a.m. In a successful mounting the male approaches the female from behind and to one side, gripping the thorax with fore and mid legs and the hind femora with his hind tarsi. An apparently inactive period follows, interrupted by occasional titillation of the female's dorsal surface with the male's mandibles and maxillary palpi, accompanied by the twitching of the antennae of both partners. This continues for up to 15 minutes before the female extends and retracts the ovipositor. Shortly after the male flexes the pygidium to the ventral surface of the slightly everted ovipositor. During evagination of the elongate flagellum the antennae of both partners continually twitch. Coitus may last up to 12 minutes but successful fertilization can occur within 12 to 15 seconds. It is not known whether one mating is sufficient to fertilize all eggs, but females with few eggs remaining may be found in copula. Females captured in the field immediately after mating did not oviposit on the same night but usually did so after one to three nights.

When about to oviposit, the female moves over the stump or log seemingly at random, with its antennae in a characteristic transverse position with the distal quarter turned down on to the substratum. The distal part of the ovipositor is extended, the subterminal lobes making contact with the surface. During this period of site selection the abdomen and antennae continually twitch. When the antennae move into a crevice, the female turns about and inserts the extending ovipositor. Accompanied by convulsive contraction of the abdomen, and antennal twitching, one egg at a time passes through the ovipositor. The eggs are deposited as an irregular single layer. Egg counts made on the oviducts of 20 newly emerged females gave extremes of 240 and 398, with a mean of 330. The immature stages of this species are subject to attack by a muscardine fungus (? *Beauvaria* sp.) (Edwards, 1961a, and personal communication). For additional information the various papers published by Edwards (see "References") should be consulted.

Larvae of this species are the *huhu* or *tungahaere* of the Maoris, who not only ate

[1] In this connection it is interesting to refer to self dismemberment observed in adults of *Arhopalus ferus* (Mulsant) (see Duffy 1953 a, p.30)

them but used them for fishing bait. Pupae were known as *tataka* (Miller, 1955). The adult is readily attracted to light and Hudson (1892) states that this propensity frequently leads it on summer evenings to invade ladies' drawing rooms, when its sudden and noisy arrival is apt to cause much needless consternation amongst the inmates.

Economic importance. Hudson (1892) states that this prionid often severely damages sound timber and that posts, rails and rafters of houses are infested but Kelsey (1947) and Dumbleton (1957) point out that although this insect is becoming increasingly troublesome in sound timbers it is only because the latter have been in contact with damp wood, soil or decaying structures. Records of attack to sound timber come mainly from the west coast of the South Island where there is a high humidity for the greater part of the year. It appears that although larvae can survive in perfectly sound wood, they must commence their galleries in decaying wood.

Parasites. A mymarid egg parasite of this species has been recorded by Edwards (*in lit.*).

Natural enemies. The only native predator appears to be the morepork (*Ninox novaezelandiae* Gmel.), which was seen to take adult *Prionoplus* from branches at night. The introduced white backed magpie (*Gymnorhyna hypoleuca* Gould) takes adults at dawn when their activity periods overlap. But the major predator is the introduced hedgehog (*Erinaceus europaeus* L.). Gut contents of hedgehogs killed in the neighbourhood of emergence cages were composed almost entirely of fat body and recognizable parts of male *Prionoplus* but away from the cages *Prionoplus* ova predominated in the gut contents (Edwards, 1961a). Marples (1942) records this beetle from the gut contents of the little owl (*Athene noctua*).

Material studied. 6 L, 2 P, New Zealand, from *Pinus radiata*, G. B. Rawlings leg., in coll. B. M.

References. Broun, 1879 (L, P, Biol.); Clark, 1932 (Biol.); Duffy, 1953a (Biol.), 1954 (Biol.); Dumbleton, 1957 (E, L fig., P, Biol.); Edwards, 1959 (Biol.), 1961a (I fig., Biol. fig.), 1961b (E fig., L fig., P fig.), 1961c (Biol. fig.); Hudson, 1892 (L fig., P fig., I fig., Biol.), 1934 (E Biol.); Kelsey, 1947 (L fig., I fig., Biol. fig.); Marples, 1942 (Biol.); Miller, 1925 (L fig., I fig., Biol. fig.), 1955 (L fig., I fig., Biol.); Morgan, 1960b (Biol.); Rawlings, 1953 (Biol.); Tillyard (L fig., P fig., Biol.).

Sceleocantha glabricollis Newman

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland, Tasmania, Victoria).

Host plant: *Acacia cunninghamii* (Illidge, 1922).

References: Froggatt, 1923 (Biol.); Illidge, 1922 (Biol.).

Phaolus metallicus (Newman)

[The Metallic Violet Longicorn]

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland, South Australia, Tasmania, Victoria).

Host plant: *Acacia decurrens* (Froggatt, 1902a).

Reference. Froggatt, 1902a (Biol.).

Rhiphidocerus australasiae Westwood

Distribution. AUSTRALASIAN REGION: Australia (Queensland).

Host plants: *Araucaria cunninghamii, Fagus moorei* (Illidge, 1924).

References. Aurivillius, 1917 (L fig.); Illidge, 1924 (Biol.).

Sceleocantha gigas (Carter)

Distribution. AUSTRALASIAN REGION: Australia (New South Wales).

Biology. Males of this species have the palpi enlarged into open-ribbed, basket-like organs and fly swiftly like cockchafers over dew-covered grasslands (Tillyard, 1926).

References. Linsley, 1959 (Biol.); Tillyard, 1926 (Biol.).

3. ASEMINAE

Larval Characters

Form subcylindrical, with caudal urogomphi. *Head* transverse, with posterior margin nearly straight or, at most, very slightly emarginate; dorsal margins of epicranial halves fused behind frons almost to base and rounded behind; tentorial cross-arm internal, in a plane at right angles to hypostoma (the occipital foramen not apparently divided); front margin of frons never projecting or carinate. Epistoma never produced over clypeus; at least ten epistomal setae present. Clypeus trapezoidal, as broad at base as epistoma. Labrum transverse, semicircular to cordate. Mandibles wedge-shaped, with cutting edge oblique, broadly emarginate and apex acutely produced; outer face bearing numerous setae. Ocelli present or absent. Antennae frail, short, strongly retractile and 3-segmented; antennal foramen distinctly open to frontal suture. Ventral mouthparts attached to hypostoma for nearly its entire breadth. Maxillae movable, cardo visible; maxillary articulating area swollen; palpifer bearing lobe and with outer margin straight. *Prothorax* with transverse and sublateral grooves very distinct; posterior region either glabrous or micro-spiculate; eusternum distinct, triangular; presternum and epipleurum fused; coxal lobe small, opposite sternellum. *Abdomen* with ampullae either glabrous or dull, micro-spiculate, never tuberculate and with two lateral impressions on each side; regions bearing spiracles distinctly defined, elliptical; epipleurum protuberant on segments 7, 8 and 9 only; segment 9 with a pair of urogomphi; pleural discs absent. *Legs* moderately long, slender. *Spiracles* of mesothorax not protruding into prothorax; abdominal spiracles with two or more small marginal chambers.

Asemini

Arhopalus (=**Criocephalus**) **syriacus** (Reitter)

Distribution. AUSTRALASIAN REGION: Australia (New South Wales). Introduced from Syria?

Host plant: *Pinus radiata* (K. M. Moore).

Mature larva (figs. 30–32). Form rather robust, slightly depressed anteriorly. *Head* (fig. 30) depressed, transverse, widest behind middle, with sides moderately strongly round smooth, orange-testaceous, shining, moderately strongly sclerotised. Genae testaceous, with rather dense, long reddish setae, which are distributed beyond level of posterior end of frontal sutures. Frontal sutures distinct as pale lines, each extending

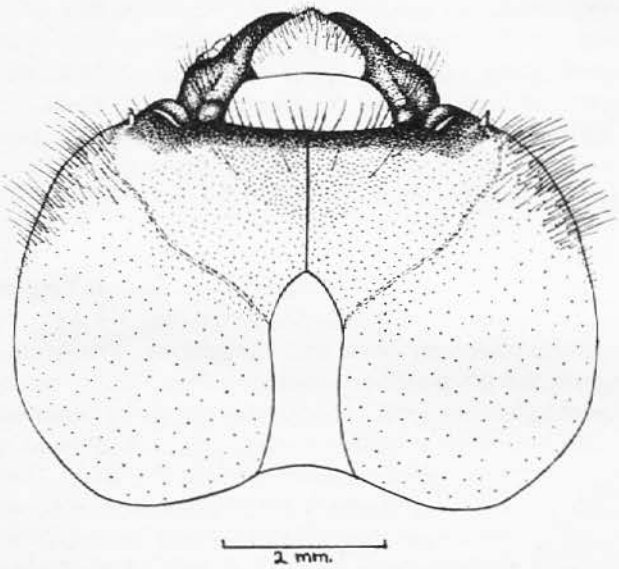

Fig. 30. *Arhopalus syriacus* (Reitter). Mature larva. Head. Dorsal aspect.

to a gap in antennal ring; median adfrontal suture complete and very distinct. Mouthframe strongly sclerotised, pitchy. Frons with front margin very slightly curved and roundly declivous; at least 16 epistomal setae present. Antenna with segment 2 bearing a conical supplementary process, which is as long as, or slightly longer than, its basal width; segment 3 very elongate. Mandible pitchy, shining, with a transverse group of numerous setae across basal half; inner part of dorsal surface with a large oblique plate. Labrum cordate, about as long as wide; ferruginous, with

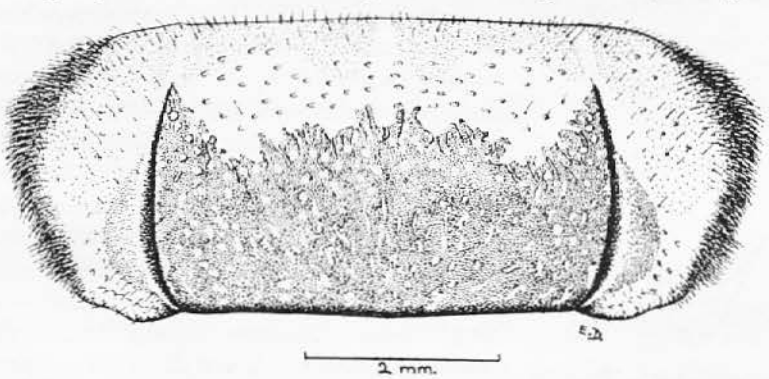

Fig. 31. *Arhopalus syriacus* (Reitter). Mature larva. Prothorax. Dorsal aspect.

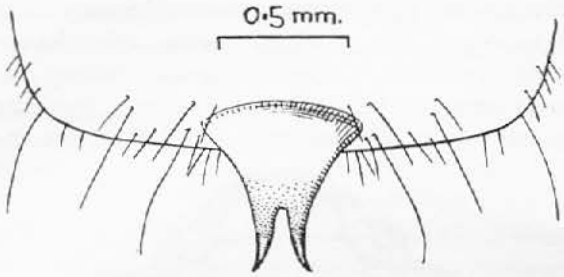

Fig. 32. *Arhopalus syriacus* (Reitter). Mature larva. Urogomphi. Dorsal aspect.

numerous short setae apically and with a few longer setae medially. Ocelli absent. Gula narrow, testaceous, with sutures not raised; hypostomal plates large, trapezoidal, ferruginous, with anterior margin thick and pitchy. Ventral mouthparts fleshy; apical segment of maxillary palpi about half as long as second, and as long as apical segment of labial palpi; lobe slender, cylindrical. *Prothorax* (fig. 31) depressed, trapezoidal, widest in front; lateral setae very dense and ferruginous. Pronotum sparsely setose, pale and shining anteriorly; posteriorly orange-yellow, finely micro-spiculate, with numerous interspaced glabrous spots. Eusternum and sternellum finely micro-spiculate and setose. *Abdomen* with ampullae on segments 1–7. Pleural tubercle broadly oval and bearing about five setae. Urogomphi (fig. 32) of tergite 9 long, attenuated, subcontiguous basally, strongly sclerotised and arising from a protuberant conical tuberculate base. *Legs* distinct, 3-segmented; unguiculus very long, attenuate and imbricately spinose. *Spiracles* of prothorax large, about twice as broad as those on abdominal segment 1; obsolescent metathoracic spiracle visible; abdominal spiracles with peritreme broadly oval, and with at least six small contiguous chambers on posterior margin. Length up to 25 mm.; maximum breadth (at prothorax) 6·5 mm.

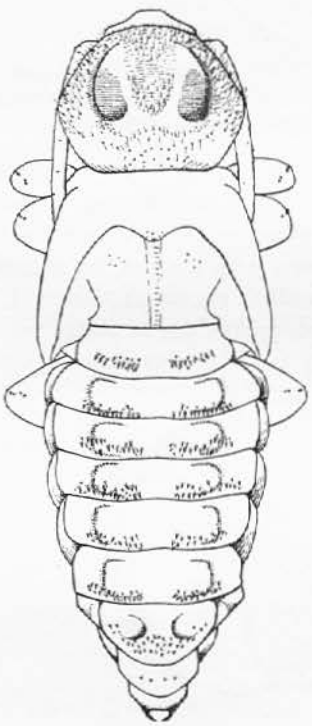

Fig. 33. *Arhopalus syriacus* (Reitter). Pupa. Dorsal aspect.

Pupa (fig. 33). *Head* bent beneath pronotum which almost conceals it from above; quadrate, with sides strongly rounded, rugose, and with at most a few small pale spines and setae. Antennae transversely rugose, densely spiculate, and with 4–6 rather stout ferruginous spines near apex of basal segment only; extending to just beyond middle of metathorax, where they are curved downward to terminate near the front coxae. Labrum triangular, transversely rugose and glabrous. Maxillary palpi spiculate and with a few fine pale setae. *Pronotum* very slightly transverse, with sides strongly rounded, and disc with two paramedian striated areas (often in the form of depressions); with

scattered pale papillae of varying length. *Mesonotum* glabrous or almost so; scutellum rather broad, fleshy and with a few fine setae. *Metanotum* with a papillate area on each side of scutellar groove, each papilla being equipped with a spine-like seta. Elytra and wings extending as far as abdominal segment 4. *Abdomen* with tergites 1–6 each bearing four transverse groups of long straight spines near hind margin. Tergite 7 with a transverse group of scattered spines and tergite 8 with only a few spines. Tergite 9 rather short, glabrous and terminating in a pair of urogomphi, which are widely separated, slender and strongly curved inward. Sternites with lateral groups of spines, except the last three, which are glabrous. *Legs* with several ferruginous spines near apex of each femur; hind femora with a large basal tubercle, almost at right angles to longitudinal axis of body and extending to between abdominal segments 2 and 3. Functional spiracles present on abdominal segments 1–7; peritreme broadly oval, moderately thick and slightly raised for anterior half. Length up to 23·2 mm.; maximum breadth 7·1 mm.

K. M. Moore has recently informed the author that this species has now become well established along the coast of New South Wales where it infests fire-damaged trees of *Pinus radiata*.

Material studied. 25 L, 8 P, 1 I, Australia, New South Wales, Moss Vale, reared at Lisarow, 15.xi.1958, K. M. Moore leg., in coll. F.C.N.S.W.

4. CERAMBYCINAE

Larval Characters

Form subcylindrical. *Head* transverse to subquadrate, wider behind middle; dorsal margins of epicranial halves fused for some distance behind frons; tentorial bridge (i.e. cross-arm) in same plane as hypostoma, the occipital foramen thus apparently divided into an anterior and a posterior portion. Epistoma not produced over clypeus (except in a few tropical species); four epistomal setae present. Clypeus narrow, not as wide at base as epistoma and never filling space between dorsal articulations of mandibles. Labrum small, narrow, usually more or less circular. Antennae salient, rarely entirely retractile; distinctly 3-segmented. Mandible short, trapezoidal, with cutting edge gouge-like, never with apex of dorsal angle produced. Ocelli absent, or one, two or three pairs present. Maxillae movable; cardo distinct; maxillary articulating area swollen. Ventral mouthparts attached to hypostoma by little more than width of gula; maxillae with palpi and lobes curved upwards against ventral part of mandibles; palpifer small, with outer margin strongly rounded; lobe borne on stipes and often setose on inner margin; labial palpi narrowly separated at base. *Prothorax* having presternum and epipleurum often fused but sometimes distinctly separated; eusternum rarely distinctly defined. Postnotal fold usually present. *Abdomen* having elliptical region surrounding spiracle protruding and well defined; epipleurum protuberant only on last three segments; pleural discs present. *Legs* small or absent. *Spiracles* of mesothorax not protruding into prothorax.

Oemini

Xystrocera globosa (Olivier)

Distribution. AUSTRALASIAN REGION: Australia (Northern Territory), ORIENTAL REGION: Southern Asia, China, India, Burma, Java, Philippine Is., Seychelles, Celebes.

MADAGASCAN REGION: Madagascar, Rodriguez, Mauritius. PALAEARCTIC REGION: Egypt. NEOTROPICAL REGION: Caribbean (Puerto Rico).

Host plants: *Acacia catechu*, *A. modesta*, *Acrocarpus fraxinifolius*, *Albizia falcara*, *A. lebbeck*, *A. lucida*, *A. odoratissima*, *A. procera*, *Bauhinia acuminata*, *Bombax malabaricum*, *Grewia tiliifolia*, *Xylia xylocarpa* (Beeson, 1941); *Theobroma* (De Haan, 1933); *Acacia mollissima* (Miwa, 1939); *Albizia chinensis*, *Adenanthera pavonina*, *Acacia confusa*, *Cassia glauca*, *Prunus persica* (Gressitt, 1942); *Parkia speciosa* (L.G.E. Kalshoven).

Mature larva (fig. 34). *Head* trapezoidal. Genae strongly shouldered. Temples narrowly ferruginous ventrad of antennae and bearing numerous short bristly setae. Sclerotisation of mouthframe ferruginous and narrowly interrupted beneath antennae. Antenna with segment 2 about one and one-half times as long as basal width; supplementary process conical, about one-fourth length of segment 3. Mandibles short, broad, entirely pitchy. Labrum transversely oval, with anterior margin very densely fringed with short pale setae. Ocelli indiscernible, probably absent. Hypostoma with front margin broadly and very strongly sclerotised and very faintly transversely striate; sutures distinct, slightly incurved. Gula slightly raised; sutures concave, distinct. Maxillary palpi with segment 3 not longer than segment 2; dorso-external process of palpifer distinctly attenuated. Labial palpi with segment 2 shorter than segment 1. *Prothorax* transverse, slightly wider posteriorly, with numerous short, very pale setae and interspersed glabrous spots on lateral margins; pronotum with median cleavage line distinctly impressed; anteriorly testaceous, shining; median area rather coarsely punctate and bearing short setae; posteriorly finely and closely longitudinally striate. Prosternum with a pair of triangular, shining, slightly rugose areas. *Abdomen* with ampullae dull, reticulate, rugose and micro-spiculate; strongly bilobed, especially those on posterior segments. Pleura micro-pubescent, with a few longer setae. *Legs* distinctly 4-segmented, pale (Duffy, 1953b). The characteristic broadening of abdominal segment 8 and the shortening of segment 9 is shown in fig. 34. Length up to 44 mm.; maximum breadth (at prothorax) 7·1 mm.

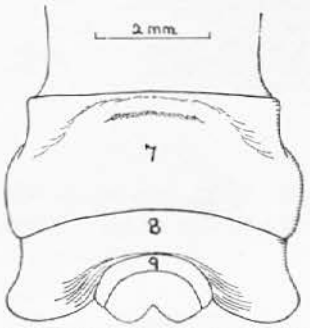

Fig. 34. *Xystrocera globosa* (Olivier). Mature larva. Outline of posterior part of abdomen showing caudal truncature. Dorsal aspect.

Pupa. No pupae of this species are available but Gardner (1927) gives the following description. "Antennae long, recurved near the 7th abdominal segment, the apical joint reaching to near the head in the male. Pronotum with a number of soft, erect papillae, each papilla with a short cephalad seta. Abdominal tergites 1–6 without papillae or setae; 7th tergite with a posterior group of papillae similar to those on the pronotum but smaller; 8th tergite with a slight median posterior projection and a few papillae."

Biology. The following account has been abstracted from that by Beeson (1941). "The larval tunnels run in the inner bark mainly but also groove the sapwood superficially. In trees with thick bark a heavy infestation reduced more than half the thick-

ness of the bark to dust so that the bark readily separated from the wood. The prepupal tunnel is made at a right angle or an obtuse angle to the surface of the sapwood and then turns downwards or upwards to terminate in a pupal chamber parallel to the long axis of the log. The chamber is lined throughout with a fine deposit of calcium carbonate, very thin, so that the inequalities and minor projections on its walls are hardly concealed; the lining is white, with some yellowish discoloration, especially at the lower end where the larval exuviae rest. The upper end is closed by a thin, smooth, ellipsoidal dome of calcium carbonate about $\frac{1}{4}$ inch high and $\frac{7}{16}$ inch wide. The calcium carbonate is produced in two of the four Malpighian tubules. The pupal period lasts about three weeks.

"The digestive juice of the larvae contains amylase, saccharase and maltase but does not contain cellulase and consequently it does not digest cellulose. There are no mycetocytes in any part of the body. The principal food supply is from other carbohydrates and soluble sugars in the sapwood. The heartwood of *Albizia lebbeck* contains only small traces of starch and sugar and this fact explains why the larval tunnels do not penetrate the heartwood.

"Emergence occurs in every month of the year but mainly in May, June and September. The larval life is variable and in some individuals of the same brood may develop in less than a year."

According to Coquerel (1848) larvae of this species are eaten by natives in Madagascar. Gressitt (1942) states that adults are nocturnal and may be attracted to lights. In China there are two or three generations a year.

Parasites. Hymenoptera: *Sclerodermus immigrans* Bridw. (Thompson, 1943).

Economic importance. In Egypt this species has been reported to cause severe damage to *Albizia lebbeck*, which is extensively used for ornament and shade. Sometimes felled timber is attacked, but the resulting adults are much smaller in size (Willcocks, 1909).

Control. Gressitt (1942) recommends that infested dead trees or logs should be disposed of promptly or the bark should be removed and the larvae destroyed (the latter method will not necessarily result in exterminating those in the pupal stage). For living trees, infested branches should be trimmed off and destroyed and the bark removed from affected areas of the trunks, the larvae killed and the wood treated with tar. Rau (1939) recommends the injection of a 10 per cent solution of paradichlorobenzene under the bark. Willcocks (1909) suggests the covering of all wounds in the bark with tar, the felling of heavily infested trees and the immersion of all cut logs in water for several months.

Material studied. 1 L, Hawaii, Honolulu, 11.vi.1945, from "monkey-pod" tree, in coll. U.S.N.M.

References. Anderlind, 1888 (Biol.); Beeson, 1919a (Biol.), 1941 (Biol.); Beeson and Bhatia, 1939 (I fig., Biol. fig.); Clainpanain, 1917 (Biol.); Coquerel, 1848 (I fig., P fig., Biol.); De Haan, 1933 (Biol.); Duffy, 1953a (Biol.), 1953b (L, P, Biol.), 1957 (L fig., P, I, Biol.); Gardner, 1927 (L, P fig.); Gressitt, 1942 (L fig., P fig., Biol. fig.); Hoffmann, 1934 (Biol., Contr.); Kalshoven, 1951 (Biol.); Kolbe, 1888 (Biol.); McKeown, 1940 (Biol.); Mansour and Mansour Bek, 1934a (L fig., Physiol.), 1934b (Physiol.); Miwa, 1939 (Biol.); Mühlmann, 1954 (Biol.); Petroff, 1920 (Biol.); Rau,

1939 (Biol.); Schiödte, 1876 (L fig.); Stebbing, 1914 (I fig., Biol. fig.); Thompson, 1943 (Paras.); Ultée, 1931 (Biol.); Willcocks, 1909 (L fig., P fig., I fig., Biol., Contr.).

Xystrocera virescens Newman

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland, South Australia, Victoria).

Host plants: *Acacia linifolia, A. decurrens, A. baileyana* (Illidge, 1922).

References. Froggatt, 1923 (Biol.); Illidge, 1922 (Biol.).

Nungena binocularis McKeown

Distribution. AUSTRALASIAN REGION: Australia (New South Wales).

Host plant: *Callitris* (McKeown, 1942).

Biology. The larval tunnels are broad and shallow and mostly subcortical (McKeown, 1942).

Reference. McKeown, 1942 (Biol.).

Cerambycini

Larval Characters

Head rectangular or only slightly narrowed anteriorly; posteriorly straight or only very slightly emarginate. Three pairs of ocelli present. Labrum transverse. Ligula wide. Labial palpi distinctly separated. Palpifer and segment 1 of maxillary palp each with a small rounded process; lobe with several stout setae on inner margin. *Prothorax* with eusternum triangular (the apex often being fused with presternum); hypopleurum distinct, triangular; postnotal fold present. *Abdomen* with dorsal ampullae having two distinct transverse furrows. *Legs* distinctly 4-segmented. *Spiracles* sometimes with distinct marginal chambers.

Hoplocerambyx spinicornis (Newman) (Pl. XI, fig. 4)

Distribution. AUSTRALASIAN REGION: Palau Is. ORIENTAL REGION: Assam, India, Burma, Malaya, New Guinea, Sumatra, Borneo, Philippine Is., Malacca, Indo-China. PALAEARCTIC REGION: Afghanistan.

Host plants: *Duabanga sonneratioides, Hevea brasiliensis, Parashorea robusta, Pentacme suavis, Shorea assamica, S. obtusa, S. robusta* (Beeson and Bhatia, 1939).

Mature larva (figs. 35–36). Form elongate, subcylindrical, robust. *Head* (fig. 35) with temples smooth, testaceous, glabrous, except for a protuberant ferruginous ridge or carina immediately behind ocelli. Frons testaceous, with front margin broadly ferruginous to pitchy and produced sublaterally into a pair of dentate processes; a pair of similar processes present behind each dorsal mandibular condyle. Antennal foramen with upper margin produced into a dentate process. Three pairs of distinct

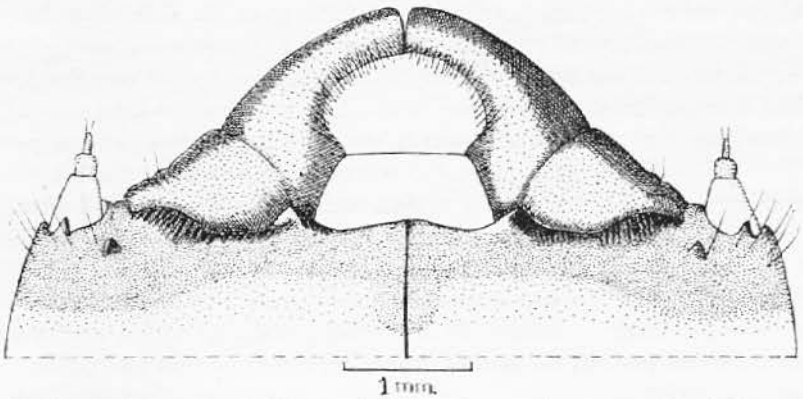

Fig. 35. *Hoplocerambyx spinicornis* (Newman). Mature larva. Front part of head. Dorsal aspect.

subcontiguous ocelli present, arranged in a vertical row laterad and ventrad of antenna; lens, round convex, strongly protuberant; pigmented spot indistinct. Hypostoma smooth testaceous, with front margin narrowly ferruginous; gula broad with sutures subparallel. Antenna with segment 3 about 2/3 length of segment 2; supplementary process about 1/5 length of segment 3. Labrum broadly subcordate, with anterior margin subangulate medially; bearing numerous stout pale setae around margins. Maxilla with segment 3 of palp about half length of segment 2; labial palp with segment 2 about half length of segment 1. *Prothorax* rectangular, lateral margins impressed and distinct posteriorly; posterior area of protonum vermiculately rugulose. Eusternum triangular, bearing moniliform tubercles posteriorly. *Mesonotum* non-tuberculate, *metanotum* with four transverse rows of moniliform tubercles. *Abdomen* (fig. 36) with each dorsal ampulla with two transverse furrows, along which small, widely separated, moniliform tubercles are arranged in four transverse rows; ventral ampullae bilobed and with only a single transverse furrow; the larger tubercles rather strongly sclerotised and pale ferruginous. Anus tri-lobed, each lobe with a fringe of short fine hairs. Epipleurum strongly protuberant on segments 7–9. Pleural discs present on segments 1–3; small, depressed, subcircular. *Spiracles* with peritreme narrowly oval, pale and slightly raised above general level of cuticle. Length up to 90 mm.; maximum breadth (at prothorax) 18 mm.

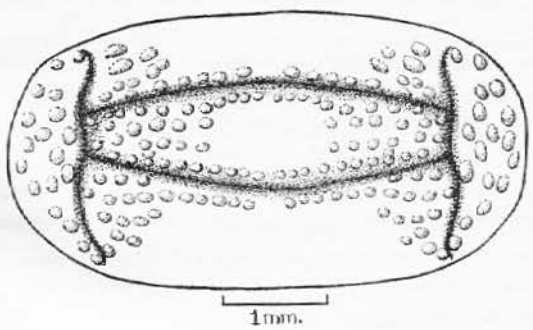

Fig. 36. *Hoplocerambyx spinicornis* (Newman). Mature larva. Abdominal ampulla of tergite 6.

Pupa. No material available. Gardner (1925) gives the following description. "Yellow-white. Length 30–60 mm. Antennae recurved under body, with joints 3 to 7 angulately produced at the apex internally, the production largest on joint 3, in male longer than body, in female shorter than body. Labrum about as long as wide, with a median depressed line; narrowed towards the apex. *Pronotum* with a prominent lateral blunt projection on each side; the posterior margin with a short prominent fleshy prominence on each side of the median line; with a few scattered setae. *Mesothorax* with a transverse stridulatory area indicated; with a posterior median fleshy tubercle which is slightly bilobed at the apex. *Abdomen* with tergite 1 with a few asperities; tergites 2 to 7 with fairly dense transverse bands of small castaneous asperities near the posterior margin, each asperity associated with a seta; anterior to this band are a few patches of smaller asperities; tergite 9 with two fleshy rugulose projections; posterior to sternite 8 is, in the male a transverse rectangular lobe and in the female two contiguous rounded lobes."

Biology. "Although the beetles are active in the daytime, particularly afternoon, they avoid direct sunshine by sheltering in shady places; but when it is cloudly or light rain is falling they often take to flight and cover comparatively long distances. They run actively up and down trees and frequently assemble in large numbers on a suitable tree for mating. After sunset they are to be found resting in crevices and other secluded places but if stimulated they soon become active; they have even been attracted to trees felled as late as ten o'clock at night.

"The beetles feed readily on the bark of sal, particularly the inner living bark which has been exposed as a result of mechanical injury. When gorged on sap they appear to be intoxicated and are unable to stand or fly. Fresh sap is readily detected and beetles have been known to fly a distance of a quarter of a mile, within five minutes of flying upwind, to freshly felled trees. Fermented sap a week or more old is not nearly so attractive. Water appears to be a necessity and without it the adult life is reduced by ten days or more.

"Rival males are ferocious fighters and antennae and other appendages are frequently bitten off. A bite from the powerful mandibles will draw blood from the human finger. In captivity large males have been observed to monopolise several females, driving off smaller males rather as a stag or boar does. Both sexes stridulate when alarmed or molested and, when courting, the male sometimes stands still and raises his body to the full extent of his legs and stridulates by raising and depressing the prothorax.

"Before the act of copulation the male mounts the female, clasping her humeri with the claws of his front tarsi, pressing his mandibles between the base of the antennae of the female and grasping her hind legs with his middle legs. It is in this position that the male is carried about on the female's back until she halts with exserted ovipositor and accepts the exserted aedeagus of her mate. Although coitus lasts only a few seconds the male usually remains mounted for some time. Copulation is frequently repeated after each period of oviposition" (Beeson, 1941).

The maximum duration of adult life in captivity has been recorded as 49 and 38 days for the male and female respectively. Arid conditions and temperatures exceeding 85°F. considerably shorten the beetle's life, excesses resulting in loss of control of

direction, rigidity of appendages and finally death due to desiccation. On the other hand high atmospheric humidities appreciably increase adult life. The graph below (fig. 37) shows the zones of maximum life of *H. spinicornis* at different combinations of temperature and humidity. From this it will be seen that low humidities are unfavourable to adult longevity of both low and high temperatures and that high temperatures, by speeding up metabolism, reduce the length of life proportionately. Temperatures around 80°F. and relative humidities between 88 and 98 per cent constitute the most favourable atmospheric conditions for this beetle.

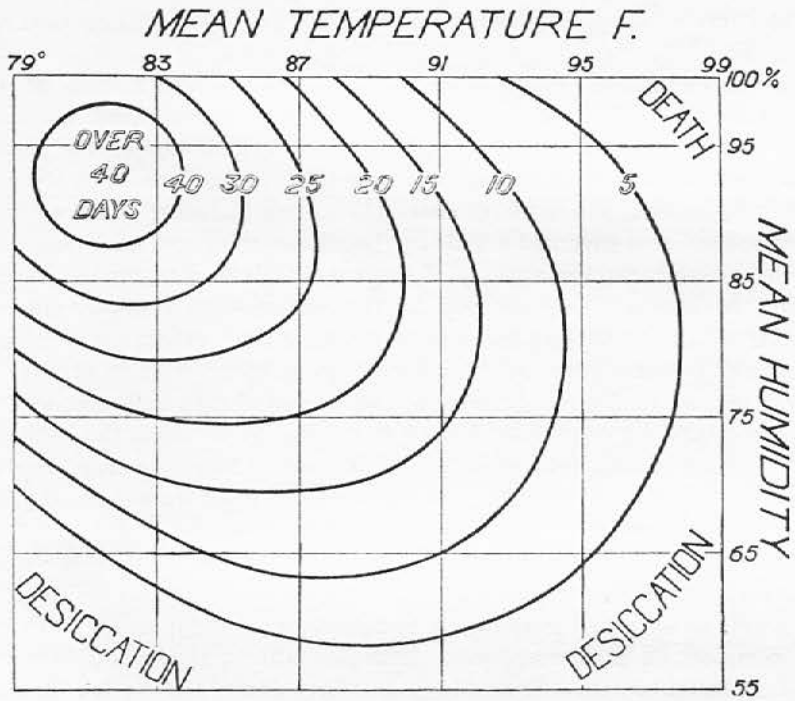

Fig. 37. Graph showing the zones of maximum adult life of *H. spinicornis* (Newman) at different combinations of temperature and relative humidity. Mean temperature during life in degrees Fahrenheit is the mean of the daily maxima and minima; mean relative humidity percentages during life as measured by a continuous recording hygrograph. Note that low humidities are unfavourable to the continued existence of the beetle at both low and high temperatures, and that in dry air the beetle dies through desiccation. High temperatures, by speeding up metabolism, reduce the length of life proportionately. The most favourable atmospheric conditions are at temperatures round about 80°F. and at relative humidities of 88 to 98 per cent (Beeson, 1941).

Eggs are deposited seven to nine days after the first fertilisation. Although numerous eggs may be laid without subsequent fertilisations, copulation sometimes takes place repeatedly during active life. The maximum number of eggs known to have been deposited by an individual is 468 and the maximum oviposition period observed is 30 days. Eggs are deposited singly deep in cracks and crevices in the bark, particularly on the underside of logs or the shady side of a tree's bole or branches.

Above a humidity of 75 per cent (at the most favourable temperature) over 200 eggs may be laid and the possible maximum increases with increasing humidity but between 90 and 100 per cent there is a slight decrease. The optimum combination of relative humidity and air temperature conducive to fecundity is the same as that already given for longevity. In other words, the humidity-temperature combinations producing a progressive variation in longevity also produce a progressive variation in fecundity in the same direction but not directly ovoportional. Thus the maximum number of eggs possible for a life zone may be laid by an individual whose actual life is less than the maximum possible for a given humidity-temperature combination. The greatest total number of eggs from a female to be recorded is 465 at 91 per cent relative humidity and 82·7°F.

The normal incubation period varies from 3 to 7 days with a mode of 4 days. Exposure to dry air for 3 or 4 hours is sufficient to inhibit germination. On the other hand very wet conditions make the eggs susceptible to fungoid attack. The percentage of eggs hatching under normal atmospheric conditions varied from 75 to 100 per cent and is generally between 80 and 90 per cent. The success or failure of a brood and the progress of epidemics is governed mainly by the ratio of the population density of the borer to the resin-production capacity of the tree. Isolated first-instar larvae when boring into the bark are overwhelmed by the exudation of resinous sap. But if numerous larvae are penetrating the bark at the same time, exudation of resin is not copious enough to overwhelm each larva and thus many are able to survive.

Infested trees are readily recognizable by the patches of resin on the bark. In cases of prolonged attack the exudation may be so copious as to cause the formation of pendent stalactites of solid resin often a foot or more in length, with corresponding stalagmites on the ground beneath. The exudation of resin from a healthy sal tree may cause a mortality of 85 to 100 per cent in first-instar larvae.

Unlike the adult, the larva can withstand considerable loss of body moisture and survive for several weeks before succumbing. In the dry season shortly before pupation the larva is able to withstand exposure to moderately dry conditions for short periods and still complete its metamorphoses. Saturated atmospheric conditions can be tolerated for several months. Atmospheric humidity during the dry season does not affect the rate of development of the immature stages sufficiently to accelerate or retard appreciably the date of eclosion but effective temperature has a decided influence in this respect.

The initial date of emergence and the rate of emergence of the first 60 to 70 per cent of the total annual population of *H. spinicornis* (Newman) is influenced by the initial date of the preliminary showers of the monsoon and by the quantity of monsoon rainfall in June and July; the earlier and more abundant the rains, the earlier and quicker the emergence. Presumably the effect of rainfall is through the moisture-content of the wood containing the pupal cells. At Dehra Dun the earliest recorded emergence is 7th June and the latest 23rd September. The rate of emergence is affected by the rate of precipitation, but is not directly proportional to it. The relationship of the three variables—emergence-percentage, accumulated rainfall and date are shown in fig. 38. The zones of probable emergence apply only to the weather conditions at Dehra Dun. Emergence in Assam and Bengal, for example, occurs

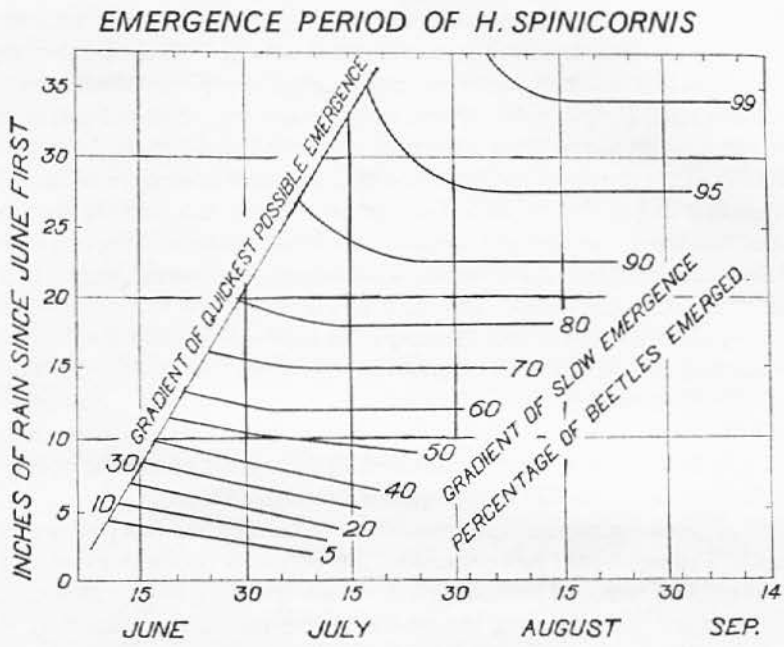

Fig. 38. Correlation of the number of inches of rain falling since June 1st., the date and the percentage of the total annual population of beetles of *H. spinicornis* (Newman) emerged. The zones of emergence-percent reach the quickest possible rate in the gradient on the left, and the slowest recorded rate in the gradient on the right. From this graph one may read off the percentage of the population that may be expected to have emerged on a given date with a given amount of rainfall since June 1st. (Beeson, 1941).

earlier because of the earlier rains. As the monsoon precipitation does not fall at a uniform rate, emergence does not occur uniformly, for each shower brings out only a fraction of the total population and during a short rainless period emergence ceases. A typical graph of emergence is shown in fig. 39. A much more comprehensive and detailed account of the biology of this species has been given by Beeson and Bhatia (1939). Larval galleries are shown on Plate IX, fig. 1.

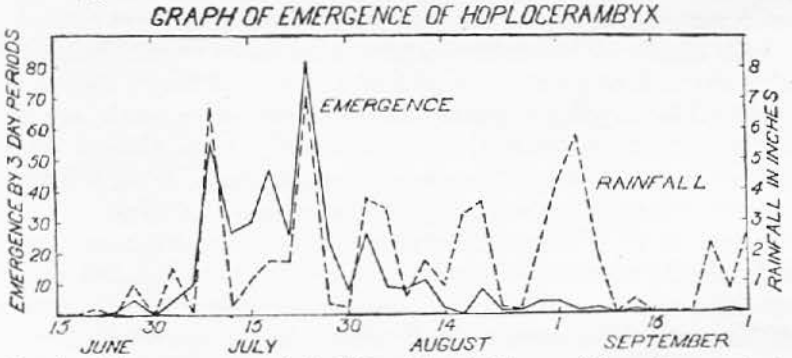

Fig. 39. Graph of the emergence period of *H. spinicornis* (Newman) from *Shorea robusta*, showing percentages of the total annual population of beetles emerging at 3-day intervals correlated with the rainfall for the same period by 3-day intervals. Note that the emergence does not start until the first monsoon showers occur and that the subsequent subsidiary peaks of beetle emergence coincide with peaks of rainfall (Beeson, 1941).

Economic importance. Normally the trees which are infested with this cerambycid are dead, dying or felled, and healthy standing trees are not attacked unless there is an epidemic and the beetles are so numerous that there are insufficient dead trees available. A few decades ago, *H. spinicornis* (Newman) was not regarded as being particularly injurious, but now, as the result of a series of severe epidemics in the United Provinces and Central India, it is considered to be one of the most serious pests of Indian forests. The average loss due to this beetle in Government forests has recently been estimated to be about two annas per acre per annum. In a small epidemic affecting eight square miles of forest in the United Provinces, 45,000 trees amounting to nearly a million cubic feet of timber were killed. The most serious epidemic to be recorded affected five forest divisions of the Central Provinces, an Indian State and much private land. It was found that on 150,000 acres of sal forest, timber valued at Rs. 7,50,000 had been destroyed. The following year the attack had spread to five and a half million trees. The total number of trees attacked over the whole infested area was estimated at about seven million. Before this epidemic was checked, four years of control operations and an expenditure of Rs. 1,25,800 were required (Beeson, 1941).

Control. Preventive measures recommended for combating this pest are essentially silvicultural. Felling should be confined to the period between October and March. The bark should be removed immediately from all branches, butts, offcuts, etc. which are likely to be left lying around, except during the monsoons when they should be utilised as traps and later burned before the hot weather.

Regular patrols should be carried out to ensure that all standing sal trees that show signs of infestation are felled and converted. Remedial measures that should be taken during an epidemic are (1) enumeration of infested trees, (2) disposal of infested trees and (3) the collection of beetles at trap-trees. Enumeration should be carried out so that a clear picture of the incidence and extent of the outbreak is obtained during its initial stages. This should be started about December so that the trees which die during the cold weather are not missed. Infested trees should be classified by girth-classes and types of attack. It should then be decided what proportions of these infested trees are to be extracted, converted or burned. Heavily infested trees should receive priority.

Decortication must be carried out before the young larvae have entered the sapwood, which is usually by November. Otherwise the wood must be burned. Stumps should be decorticated at once, irrespective of the date of felling.

Trees selected for trapping purposes should be unsound, injured by fire or wind or infested. Logs about three feet in girth and with a high proportion of sapwood are the most attractive. The felling of trap-trees should be started at the beginning of the emergence period and continued throughout the peak of emergence. Traps should be located where attacked trees and felling refuse are most abundant. Two to four days after felling, the trap-trees should be cross-cut into small logs and billets. Later on they should be cross-cut again and the bark partially stripped or bruised to produce fresh sap. Traps should be inspected daily and the beetles destroyed (Beeson, 1941).

Material studied. 2 L, Assam, Saro Hills, 15.xi.1903, from *Shorea robusta*, E. Stebbing leg., in coll. B.M.

References. Ahmad, 1935 (Biol.); Atkinson, 1927 (L fig., P fig., I fig., Biol. fig.);

Beeson, 1916 (Biol.), 1919a (Biol. fig.), 1919c (Biol.), 1921 (Biol.), 1922 (Biol.), 1924a (Biol.), 1924b (Biol.), 1927 (Biol.), 1928a (Contr.), 1928b (Biol.), 1930a Biol.), 1930b (Biol.), 1935a (Biol.), 1935b (Biol.), 1941 (L fig., P fig., Biol. fig., Contr.), Beeson and Bhatia, 1939 (Biol. fig.), Beeson and Chaterjee, 1925 (Biol. fig.); Benskin, 1927 (Biol.); Duffy, 1953a (Biol.); Gardner, 1925 (E fig., L fig., P fig.); Garthwaite, 1940 (Biol.); Muir, 1929 (Biol. fig.); Stebbing, 1906 (Biol.), 1914 (E fig., L fig., P fig., I fig., Biol. fig.); Watts, 1928 (Biol.).

Hoplocerambyx inhirsutus (Matsushita) (=**brevispinis** Gressitt)

Distribution. AUSTRALASIAN REGION: Western Caroline Is. (Palau).
Host plants: *Ceiba*, *Ficus*? (Gressitt, 1956).
Reference. Gressitt, 1956 (L fig., I fig., Biol.).

Pachydissus sericus Newman

[The Silvery Longicorn; the Silvery Brown Longicorn]

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland, South Australia, Victoria).

Host plants: *Acacia longifolia* (Froggatt, 1893); *Acacia decurrens* (French, 1911).

Mature larva (figs. 40–41). Similar to that of *Hoplocerambyx spinicornis* (Newman) but differing as follows: *Head* with front margin of frons less strongly dentate: temples behind postocular carina very broadly ferruginous. *Abdomen* with tubercles of dorsal ampullae not sclerotised, pale testaceous. Anal lobes (fig. 40) encircled by a

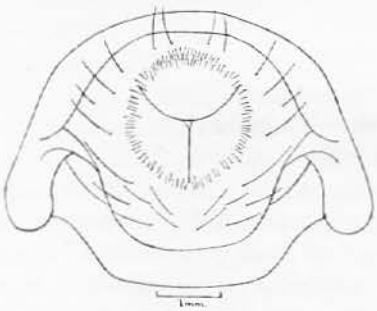

Fig. 40. *Pachydissus sericus* Newman. Mature larva. Abdominal segments 9 and 10. Caudal aspect.

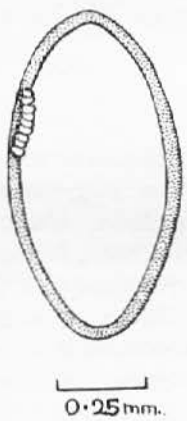

Fig. 41. *Pachydissus sericus* Newman. Mature larva. Peritreme of abdominal spiracle showing marginal chambers.

fringe of short reddish setae, behind which are scattered longer setae. *Spiracles* with peritreme ferruginous; marginal chambers present (fig. 41). Length up to 39·8 mm.; maximum breadth (at prothorax) 11·1 mm.

Biology. Eggs are deposited in the bark under which the young larvae feed. As the larvae mature they penetrate the sapwood and later bore deeply into the heartwood

(Froggatt, 1923). Galleries are usually numerous and subcontiguous in the one area of the same tree. Pupation occurs deep in the wood, usually near the centre of the tree. Adults have been collected from August to January (K. M. Moore).

Economic importance. This species is often responsible for serious damage to several species of wattles, particularly when they have reached maturity and are beginning to die back. The long-leaved wattles, once so plentiful around Sydney, were killed off by this longicorn (Froggatt, 1923).

Material studied, 1 L, Australia, New South Wales, North Head, 9.viii.1957, from burnt *Acacia* sp., K. M. Moore leg., in coll. F. C. N. S. W.; 1 L (exuviae), Lion Is., 31.v.1957, from *Acacia longifolia*, K. M. Moore leg., in coll. F.C.N.S.W.

References. French, 1911 (L fig., P fig., I fig., Biol. fig., Contr.); Froggatt, 1893 (L, I Biol.), 1902a (I fig., Biol.), 1923 (Biol.), 1927a (Biol.); Gallard, 1916 (Biol.).

Pachydissus picipennis Germar

Distribution. AUSTRALASIAN REGION: Australia (South Australia).

Host plants: *Eucalyptus* spp. (Tepper, 1887).

Biology. Larvae are to be found under the loose bark of the host trees from September to November.

Reference. Tepper, 1887 (Biol.).

Pachydissus magnus McKeown

Distribution. AUSTRALASIAN REGION: Australia (New South Wales).

Host plant: *Acacia pendula* (McKeown, 1940).

References. McKeown, 1940 (Biol.), 1947 (Biol.).

Hesperophanini

Phacodes mirabilis McKeown

Distribution. AUSTRALASIAN REGION: Australia (Queensland).

Host plant: *Argyrodendron trifoliolatum* (A. R. Brimblecombe).

Mature larva. Head subquadrate, somewhat wider behind middle. Gena broadly sclerotised, ferruginous and strongly and more or less evenly swollen around ocelli. Hypostoma with front margin transversely striate and feebly tuberculate or swollen; gula broad, with sutures raised. Three pairs of ocelli present; lens round, convex; pigmented spot rather indistinct. Antenna strongly protuberant, with a long basal membrane. Labrum very densely fringed with fine setae. Maxilla with segment 3 of palp shorter than segment 2. *Prothorax* with anterior area of pronotum orange-yellow; posterior area rather finely longitudinally striate. Postnotal fold present. Eusternum not distinctly delimited, setose, with an oblique linear impression on each side. *Abdomen* with ampullae tuberculate. *Legs* well developed, 4-segmented. *Spiracles* with peritreme rather broadly oval, testaceous. Length up to 40 mm.; maximum breadth (at prothorax) 9 mm.

Material studied. 3 L, 1 I, Australia, Queensland, Yarraman, 20.x.1960, from *Argyrodendron trifoliolatum*, A. R. Brimblecombe leg., in coll. D.A.S.B.

References. None available.

Phacodes longicollis Pascoe

Distribution: AUSTRALASIAN REGION: Australia (Queensland).

Host plant: *Argyrodendron trifoliolatum* (A. R. Brimblecombe).

Mature larva (fig. 42). Very similar to that of *P. mirabilis* McKeown from which it may be distinguished by the more strongly swollen and protuberant gena (fig. 42).

Material studied: 1 L (exuviae), 1 I, Australia, Queensland, Yarraman, 25. viii.1960, from *Argyrodendron trifoliolatum*, A. R. Brimblecombe leg., in coll. D.A.S.B.

References. None available.

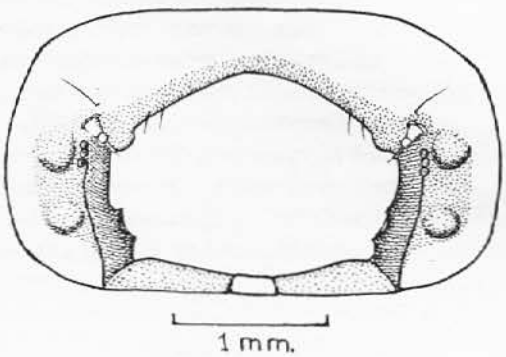

Fig. 42. *Phacodes longicollis* Pascoe. Mature larva. Mouthframe.

Phacodes marmoratus Blackburn

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, South Australia).

Host plant: *Acacia decurrens* (K. M. Moore).

Biology. Larvae feed in the sapwood but pupate deeper in the wood. Adults emerge in October and November (K. M. Moore).

References. None available.

Stromatium longicorne Newman (=**asperulum** White)

Distribution. AUSTRALASIAN REGION. Australia (imported). ORIENTAL REGION: Assam, Burma, Siam, China, Borneo, Philippine Is., Celebes, New Guinea.

Host plants: *Cassia fistula.* Stebbing's record of this species from living *Tectona* is erroneous (Beeson and Bhatia, 1939); *Shorea* (K. M. Moore).

Mature larva (fig. 43). *Head* subquadrate, somewhat wider behind middle, the posterior margin with a very slight median emargination; shouldered behind antennae. Genae with setae fine and sparse. Front margin of frons rounded, feebly emarginate medially, faintly transversely strigose and pale ferruginous. Hypostoma (fig. 43) with front margin pale ferruginous and with 4–6 widely spaced longitudinal carinae on each side of gula; gula very broad, with sutures raised. One pair of ocelli present; lens large, oval; pigmented spot indiscernible. Antennae strongly protuberant, with a long basal membrane; segment 2 elongate, about one and one-half times as long as segment 3; segment 3 slightly tapering apically, about four times as long as basal width. Labrum subquadrate, very densely fringed anteriorly with very fine setae. Maxilla with segment 3 of palp much shorter than segment 2. *Prothorax* with pronotum subrectan-

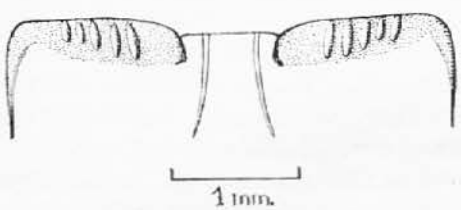

Fig. 43. *Stromatium longicorne* Newman. Mature larva. Hypostoma.

gular, with anterior area orange-yellow; posterior area rather finely longitudinally striate. Postnotal fold present. Eusternum not distinctly delimited, shining, rugulose, with an oblique linear impression on each side. *Abdomen* with ampullae non-tuberculate, rather coarsely micro-granulate. *Legs* well developed, 4-segmented. *Spiracles* with peritreme rather broadly oval, pale testaceous. Length up to 31·2 mm.; maximum breadth (at prothorax) 9·6 mm.

Biology. Oviposition occurs at night. The incubation period is eight to twelve days and the larval period two to three years (Yashiro, 1940).

Economic importance. This species has been reported as a borer of furniture in the Netherlands Indies, Java and Sumatra (Beeson and Bhatia, 1939). A larva and adult were recently found in skirting (*Shorea* sp.) from a house in New South Wales (K. M. Moore).

Material studied. 1 L, 1 I, Australia, New South Wales, 16.v.1956, from imported *Shorea* sp., G. Boyle leg., in coll. F.C.N.S.W.

References. Beeson and Bhatia, 1939 (Biol.); Duffy, 1953a (Biol.); Kalshoven, 1939 (L, Biol., fig.); Stebbing, 1914 (Biol.); Yashiro, 1940 (Biol. fig.).

Ochrocydus huttoni Pascoe

Distribution. AUSTRALASIAN REGION: New Zealand.

Host plants: *Leptospermum* spp. (Hudson, 1934); *Leptospermum scoparium* (G. B. Rawlings), *Nothofagus solandri* (Dumbleton, 1957).

Mature larva. No material available. Dumbleton (1957) gives the following description. "Form stout, cylindrical, length up to 60 mm. Colour creamy yellow. Body covered with short castaneous setae and sparse longer and stouter hairs. *Head* sub-quadrate, sides sub-parallel, slightly wider behind mid-length. Occipital foramen with sides sub-parallel, widest anteriorly. Mandible normal. Labrum slightly wider than long. Maxillary palp longer than femur plus tibia, process on palpifer and basal joint of palp, last joint about half as long as 2nd and slightly shorter than last joint of labial palp. Labial palp with joints subequal. Epistoma slightly emarginate. Antennae partially retractile, first and second joints subequal, 3rd half length of 2nd. Three ocelli. Genal setae sparse and stout. Hypostoma with two or three setae on each side. *Thorax.* Pronotum transverse but not twice as wide as long, beset with dense stout setae across anterior margin and sparser setae behind the notal spots, which are prominent and castaneous. Notal plate white posteriorly. Two or three setae in posterior angles of pronotum. Post-notal fold present. Metanotum with X-shaped suture. Presternum fused with epipleurum and with eusternum. Legs well developed, 4-jointed. *Abdomen* with neither pleural tubercles nor discs evident. Ampullae broad, sub-tuberculate, contrasting with the integument owing to the minute and dense pigmented spinules with which they are beset. Spiracles large, oval. Three anal lobes. Hind-intestine without sclerotised thickening of intima."

Pupa (Pl. III, fig. 2). No material available. Dumbleton (l.c.) gives the following description. "Form as in adult. *Head* with a few poorly developed setae, six small setae on front, two on clypeus, one on mandible and none on gena. Pronotum with a median group of setae anteriorly and scattered setae on disc. *Mesonotum* with sparse small setae. *Metanotum* with sparse small setae posteriorly. First abdominal segment

with a posterior row of setigerous spines and three or four on each side of median line anteriorly. Segments 2–6 with a more or less complete oval ring of setigerous spines formed by the joining of the anterior and posterior rows, and a group of three or four setae on each side at mid-length. Seventh with a number of setigerous spines forming a rough ring. Eighth with five or six setigerous spines. Femora, tibiae and elytra without setae. Trochanters without processes."

Biology. Larvae tunnel in living trees, making a vertical gallery, which is oval in cross-section and widest radially. Frass is periodically ejected through frass-ejection or "aeration" holes. The galleries are discoloured with a black fungus. The larva pupated head upwards. Adults emerge over a long period (G. B. Rawlings).

Larvae and pupae have been taken in September. This species causes extensive damage to timber and living beech trees by tunnelling between the bark and wood and excavating galleries over $\frac{1}{2}$ an inch in diameter. When about to pupate the larvae prepare a vertical chamber which is about five inches long and which opens into a horizontal passage to the outside. Both ends of the pupal chamber are blocked by very coarse shreds of wood (Pl. VIII, fig. 1). Infested trees may be detected by the presence of emergence holes in the bark and often an accumulation of frass at the base of the tree. Isolated trees are commonly attacked (Dumbleton, 1957).

References. Dumbleton, 1957 (E, L fig., P, Biol.); Hudson, 1892 (Biol.), 1934 (Biol.); Morrison, 1933 (L, P, Biol.).

Liogramma zelandica (Blanchard)

Distribution. AUSTRALASIAN REGION: New Zealand.

Host plant: *Quercus* (Dumbleton, 1957); *Dacrydium cupressinum* (Hudson, 1934).

Mature larva. No material available. Dumbleton (1957) gives the following description. "Form cylindrical, body tapering posteriorly, length 15 mm. Colour white. Body setae light coloured, fine. *Head* transverse, widest posteriorly, slightly emarginate on posterior dorsum. Occipital foramen widest behind mid-length. Mandible short, stout, not constricted before rounded apex. Labrum sub-circular, wider than long, densely setose anteriorly. Maxillary palpi with process on palpifer and smaller one on 1st joint. Last joints of maxillary and labial palps sub-equal. Maxillary palp longer than femur plus tibia. No setae on maxillary sclerite, many on labial palpifer and mentum. Epistoma not emerginate. One ocellus. Genae distinctly shouldered, genal setae sparse and slender. Hypostoma with two or three setae. *Thorax.* Pronotum nearly twice as wide as long. Anterior half setose, posterior half striate, notal spots light castaneous. Mesonotum with transverse line. Presternum setose, fused with epipleurum anteriorly. Eusternum with two smooth, glabrous plates each with a rugose pigmented spot anteriorly. Legs well-developed, 4-jointed. *Abdomen.* Pleural discs not evident. Ampullae alutaceous, moderately protuberant. Spiracles oval. Three anal lobes. Hind intestine without sclerotised thickening of intima."

Pupa. No material available. Dumbleton (1957) gives the following description. "Pronotum beset with pigmented spines and setae, most dense along the anterior margin, sparser along the lateral margins; a transverse line of spines anterior to mid-length; posterior half of disc glabrous. Meso- and metathorax glabrous except for

sparse short setae. First abdominal segment with single spine at mid-length on the lateral margin. Segments 2–6 with backwardly directed spines and setae forming an almost continuous line along the posterior margin, sparsely setose anteriorly, enclosing a transverse, oval, glabrous area in the middle of the segment. Pleural margins with three or four long setae. Seventh segment with a transverse row of three or four spines anteriorly, two larger hooked lateral spines inwardly directed behind mid-length, four or five large forwardly directed spines in a transverse line posteriorly. Eighth segment with two large hooked spines posteriorly, directed forward and inward."

Biology. Larvae, pupae and adults have been taken from dead branches of the host plant in January. This species has also been reported infesting Rimu flooring in Nelson (Dumbleton, 1957).

References. Dumbleton, 1957 (L fig., Biol.); Hudson, 1934 (Biol.).

Oebarina ceresioides Pascoe

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, South Australia).

Host plant: *Eucalyptus bicolor*? (J. W. Armstrong).

References. None available.

Phoracanthini

Larval Characters

Head rather depressed, with sides rather strongly diverging posteriorly. Genae shouldered; temples without postocular carinae. Front margin of frons evenly rounded, upper boundary distinct. Antennal foramen with upper boundary not raised or produced. Mouthframe entirely sclerotised beneath antennae. Antennae salient. Labrum cordate. Ocelli absent, or one or two pairs present. Hypostoma with front margin transversely striate; sutures very short. Gular sutures well defined, raised. Process of palpifer indistinct. *Prothorax* depressed, moderately setose, lateral regions with scattered glabrous spots; postnotal fold present; presternal plates absent. *Abdomen* with ampullae microscopically alutaceous, glabrous. Pleural discs indistinct. Anal lobes sparsely setose. *Legs* short, but clearly 4-segmented; femur and tibiotarsus strongly sclerotised; unguiculus flagelliform, usually feebly sclerotised and imbricately tuberculate or spinose.

Larvae of this tribe appear to fall into two groups, one in which the genae and temples are broadly sclerotised, ferruginous, protuberant and striated (*Phoracantha*, *Coleocoptus*), and the other in which the temples are smooth and feebly sclerotised. It should be stressed that the larval keys apply mainly to final or penultimate instars and not necessarily to earlier instars, which, in certain species of the Phoracanthini, differ appreciably from those of later instars.

The extent of sclerotization and the number of impressions on the genae and temples have usually constituted reliable diagnostic characters in many groups previously studied, but in the Phoracanthini these characters are rather confusing and unreliable.

In the genus *Coptocercus* it has not been possible to find reliable generic characters, consequently the three species here discussed have had to be eliminated separately in the key to genera. *Coptocercus aberrans* (Newman) and *C. biguttatus* (Donovan) are so diverse that were it not for the fact that they had both been reared in isolation, the author would have regarded them as belonging to different genera. Larvae of *C. aberrans* vary intraspecifically; some have distinct ocelli and feebly developed genal tubercles, while in other individuals the ocelli are indiscernible and the genal tubercles are strongly protuberant.

Phoracantha semipunctata (Fabricius)

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, North West Australia, Queensland, South Australia, Victoria); New Zealand. ORIENTAL REGION: New Guinea. ETHIOPIAN REGION: South Africa (Cape Province, Orange Free State, Pretoria). MADAGASCAN REGION: Mauritius, Rodriguez. PALAEARCTIC REGION: Cyprus, Egypt, Israel, Palestine. NEOTROPICAL REGION: South America (Argentina, Chile, Uruguay).

Although of Australian origin, this species has now become widely distributed through commerce and is now established in South Africa, New Zealand, South America and the Middle East.

Host plants: *Eucalyptus* spp., especially *E. globulus* and *E. viminalis;* it has also been recorded from *E. longifolia*, *E. robusta*, *E. saligna*, *E. diversicolor*, *E. sideroxylon*, *E. leucoxylon*, *E. salubris*, *E. tereticornis*, *E. triantha* and *E. creba* (Tooke, 1935a). In Israel it attacks *E. camaldulensis* (Bytinski-Salz and Neumark, 1953), and in South America *E. viminalis* (Bosq, 1940) and *E. globulus* (Molinari, 1923). In Australia it has been recorded from *E. oleosa* and *E. gracilis* (Tepper, 1887), and Moore (personal communication) has cited the following: *Syncarpia laurifolia*, *Angophora intermedia*, *Eucalyptus microcorys*, *E. saligna*, *E. longifolia*, *E. grandis*, *E. maculata*, *E. acmenioides*, *E. resinifera*, *E. piperita*, *E. pilularis* and *E. camaldulensis*. Brimblecombe has recently obtained larvae from *E. phaeotricha*.

Adult (fig. 44). Entirely reddish brown, except elytra, which has a straw-coloured transverse median band and an apical spot. *Head* with antennal segments 3–7 strongly spined apically on inner angle: extending

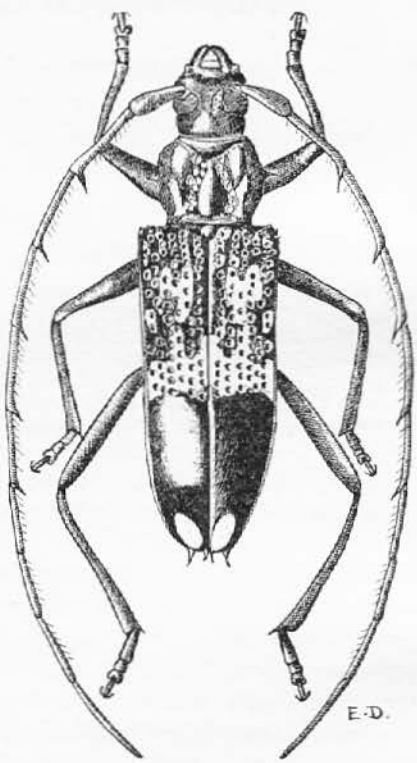

Fig. 44. *Phoracantha semipunctata* (Fabricius). Adult.

to at least as far as elytral apices in female, and well beyond apices in male. Eyes coarsely faceted. *Prothorax* slightly elongate, with sides bearing a pair of median spine-like tubercles. Middle coxal cavities closed externally. *Elytra* very coarsely punctured for basal half; apical half-smooth; apices with outer and sutural angles strongly spined. Length 16–30 mm.

Mature larva (fig. 45). Form robust and rather strongly depressed. *Head* slightly transverse (maximum head-width 6·5 mm.). Temples (fig. 45) with the broad ferruginous band behind antenna rather protuberant and bisected by a well defined vertical impression on each side of which are one or two shallower impressions. Mouthframe broadly pitchy. Labrum semicircular. One pair of ocelli present laterad and ventrad of antenna; lens large, elongate-oval; pigmented spot indistinct. Hypostoma ferruginous, with front margin more darkly so, and very feebly transversely striate; gular sutures strongly raised. Maxilla with segment 3 of palp cylindrical, as long as segment 2. Labial palpi with segment 2 cylindrical, as long as segment 1. *Prothorax* with conspicuous scattered dark, glabrous spots on lateral regions; posterior part of pronotum very finely longitudinally striate. *Abdomen* with ampullae micro-reticulate, glabrous, non-tuberculate. *Legs* with unguiculus slender, flagelliform and imbricately tuberculate. *Spiracles* with peritreme oval, thin, pale, testaceous, without marginal chambers and not raised above general level of cuticle. Length up to 32 mm.; maximum breadth (at prothorax) 10·5 mm.

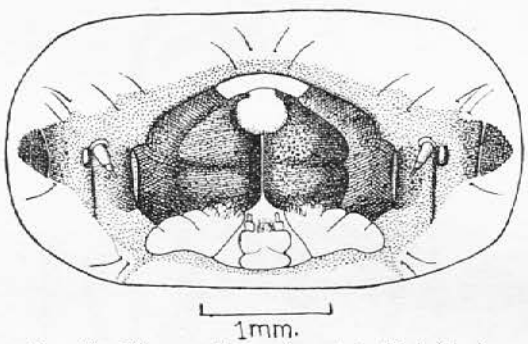

Fig. 45. *Phoracantha semipunctata* (Fabricius). Mature larva. Head. Frontal aspect.

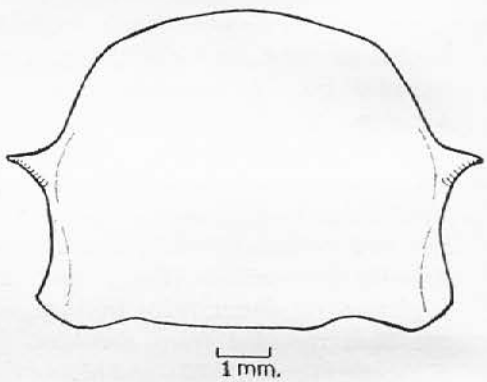

Fig. 46. *Phoracantha semipunctata* (Fabricius). Pupa. Pronotum.

Pupa (fig. 46). *Head* with vertex dome-shaped, smooth, glabrous and partly visible from above; front feebly rugose, glabrous. Antennae with segments 3–6 (at least) strongly pectinate at apex of inner margin, extending to between abdominal segments 3 and 4, where they are strongly recurved to terminate between the middle and front coxae. Eyes feebly convex, glabrous. *Pronotum* (fig. 46) quadrate, with front margin feebly rounded; bearing scattered, short, curved testaceous spines, especially around front angles; lateral tubercles acute and strongly produced. Mesonotum transversely striate, glabrous; scutellum slightly protuberant and glabrous. *Metanotum* smooth and bearing a few minute spines on each side of scutellar groove, which is distinct. Elytra and wings extending as far as abdominal segment 4, the former with an apical spine-like tubercle. *Abdomen* with tergites 1–6 each with paired

oval areas bearing about six to eight short stout spines. Tergite 7 elongate, with a pair of oval tubercles each bearing four to six stouter spines which are inclined anteriorly. Tergite 8 elongate, with two groups of about four or more slender spines which are inclined posteriorly. Tergite 9 extremely short, bearing a few short stout spines. Sternites glabrous. *Legs* with femora clavate; hind femora with a tuberculate process near base; extending to abdominal segment 5. *Functional spiracles* present on abdominal segments 1–5; peritreme broadly oval, moderately thick and slightly raised above general level of cuticle. Length up to 25 mm.; maximum breadth 6 mm.

Egg. Form elongate, subcylindrical, spindle-shaped. Chorion pale yellow, soft, gelatinous. Length 2·6 mm. (Tooke, 1935a).

Biology. Oviposition takes place on dead or sickly trees and cut logs, especially felled timber with the bark on. The eggs are deposited beneath the thin strips of dry bark which are loosely attached to the smooth green bark of the boles and main branches. The incubation period is from ten to fourteen days. The larvae feed for about four to six months subcortically, making regular galleries which are packed tightly with frass; these may either extend for several feet in a straight line or twist and turn radially in all directions (Pl. VIII, fig. 3). When mature, the larvae bore obliquely into the wood, where they pupate at a depth of several inches from the surface. The pupal period lasts about ten days. Emergence (in South Africa) occurs from September to April (Tooke 1935a). According to Lepesme (1950) many first-instar larvae are killed by the copious flow of "gum."

The habits of this species in Palestine, as recorded by Bytinski-Salz and Neumark (1953), have been summarised as follows. The beetles are chiefly active during the night, hiding in daytime under the bark or in crevices. Longevity of the adult is about 40 days in summer and up to 180 days during the colder season. Oviposition occurs practically uninterruptedly from March to November and eggs are deposited in batches of 10 to 110 (average 43·5). The maximum number of eggs laid by a single captive female was about 300.

The following observations have been recently made by K. M. Moore. *Angophora intermedia*, with its thick, rough bark which remains attached for many months after the tree is felled, is particularly susceptible to attack by this species. Desiccation of the log is resisted by the thick bark, which also protects the eggs and young larvae during very hot weather. The amount of starch contained in the sapwood of billets sawn from different trees of *A. intermedia*, and on which the specimens were reared, was a considerable factor in the growth-rate and comparative sizes attained by the larvae, and consequently the adults; although moisture may also be a contributing factor in their development.

After dusk during the months of September to April, up to 40 pairs of adults occurred together on one log. In warmer weather, adults were observed to oviposit less than four hours after a tree was felled. Adults have been collected during all months of the year. Active adults have not been observed in the field at night when the temperature was below 60°F.

Oviposition may continue for some weeks on a log, or on the branches down to approximately 6 in. in diameter, the smaller branches usually being attacked by smaller species such as *Coptocercus* spp. When selecting oviposition sites on a log the

paired adults move about with the anterior tarsi of the male attached to the anterior half of the female's elytra, and they pause at irregular intervals to copulate and for the female to oviposit. Females were seldom found without the males during these observations. Oviposition occurs on all parts of a log, but the portion in contact with the ground, or the shady side, are preferred in the field. A total of 62 developed eggs were dissected from one female.

More than 50 larval galleries have been found to radiate from the one centre of oviposition, although adults sometimes lay eggs singly. Many larvae at an early stage penetrate the sapwood and work parallel to the grain of the wood, usually as deep as half an inch below the surface of the log, thus apparently escaping attack by parasites, although predators are able to attain some degree of control of larvae in the timber by displacing the firmly packed excreta and working along the galleries.

When about to pupate, the larvae feeding in the cambium area cut oval holes in the sapwood and heartwood for varying depths, often to three inches below the surface. In the bark, opposite the pupal cell, larvae also cut an oval hole for varying distances toward the outer bark surface, apparently to facilitate the emergence of the adult. The period from the completion of the pupal cell to pupation is variable, and apparently dependent on the time of year or weather conditions during that time. Many larvae overwinter during that stage. The duration of the life-cycle is variable and may be as short as 117 days during December to March. Under optimum conditions it is possible for three generations of this species to be reared in one year, although this is unlikely to occur in the field. Adults may be found in the field during all months of the year, and generations of this species overlap considerably. Eleven adults collected in the field were used in rearing experiments and fed on partly-candied honey. One lived for 9 days, and one for 53 days, the average life being 36·75 days.

Predators. Coleoptera: *Pelonium amoenum* Guér. and *Temnochilia steinheili* Reitter (De Santis, 1945).

Economic importance. P. semipunctata (Fabricius) often causes considerable damage to sickly trees, irrespective of age, and felled timber; but dry wood, even with the bark intact, is not attacked (Duffy, 1953a).

It is interesting to note that, according to Bytinski-Salz and Neumark (l.c.), standing living trees are attacked and often completely girdled in Palestine. Trees up to twelve years old usually succumb to attack owing to the complete destruction of the cambium and phloem, but older trees, which are not entirely girdled, may survive the primary attack, but are weakened and therefore attacked with preference by later generations.

Brain (1929) suggests that this species was probably introduced in Africa in wooden sleepers from Australia about 1896. It was first found about 1900 in blue gum trees growing along a railway line near Cape Town. Lounsbury (1918) states that it has been transported far and wide throughout the Union by traffic of *Eucalyptus* logs which are used as mine props. A. J. E. Orion has informed the author that this insect is a serious pest of *Eucalyptus* in Mauritius.

Introduced trees of *Eucalyptus* species, especially *E. globulus*, growing in parks and other open places in the Argentine have been infested by this species in the past (Molinari, 1923).

Control. Tooke (l.c.) suggests the placing of trap trees (trees of little economic value) in clearings during the emergence period; these should subsequently be burned. Stripping the bark off trees as soon as they are felled and allowing the timber to dry out as soon as possible discourages oviposition.

An effective method of protecting *Eucalyptus* poles against attack by this species has been described by Neumark (1953). It consists of the impregnation, immediately after felling, by injecting an aqueous solution of zinc chloride into the sapwood under a pressure of five atmospheres by capping one end of the cut pole. At this pressure the speed of flow averages 1 litre per 102 seconds in poles 6·5–20·3 feet long and containing 0·4–4·3 cubic feet of sapwood. *Phoracantha* larvae were found not to enter the bark or wood of poles containing 0·4 lb. zinc chloride per cubic foot sapwood, and it has been shown that poles containing 1 lb. per cubic foot should have an average life of at least twenty-two years.

Material studied. 12 L, Australia, New South Wales, Lisarow, 29.iii–4.viii.1957, from *Angophora intermedia*, K. M. Moore, leg., in coll. F.C.N.S.W. 3 L, 1 P, 1 I, Orange River Colony, from *Eucalyptus*, in coll. B. M.

References. Anon, 1958 (Biol., Contr.); Brain, 1929 (Biol.); Bosq, 1934 (Biol.), 1940 (Biol.); Bruch, 1918 (L fig., Biol.); Bytinski-Salz, 1952 (Biol., Contr.); Bytinski-Salz and Neumark, 1953 (Biol., Contr.); De Santis, 1945 (L fig., P fig., Biol., fig., Contr.); Duffy, 1953a (E, L, P, Biol., Contr.), 1957 (E, L fig., P, I fig., Biol., Contr.), 1960 (E, L fig., P, I fig., Biol., Contr.); Lepesme, 1950 (Biol.); Lounsbury, 1918 (L fig., I fig., Biol. fig.); Molinari, 1923 (Biol.); Mühlmann, 1954 (Biol.); Neumark, 1953 (Biol., Contr.); Schiödte, 1876 (L); Tepper, 1887 (Biol.); Tooke, 1928 (Biol., Contr.), 1935a (L fig., Biol,, Contr.), 1943 (Biol.), 1949 (Biol.).

Phoracantha recurva Newman

[The Yellow Longicorn; the Yellow Phoracantha]

Distribution. AUSTRALASIAN REGION: Australia (widely distributed, including Central Australia, New South Wales, North West Australia, Queensland, South Australia, Victoria); New Zealand. ORIENTAL REGION: New Guinea. ETHIOPIAN REGION: South Africa (introduced).

Host plants: *Eucalyptus* spp., including *E. nova-anglica* and *E. camaldulensis* (Froggatt, 1923); *Eucalyptus maculata* and *E. intermedia* (A. R. Brimblecombe).

Mature larva (fig. 47). Extremely similar to that of *P. semipunctata* (Fabricius) from which it may be distinguished by the broadly oval or subcircular ocellar lens and the strongly sinuate front margin of the hypostoma (fig. 47). Length up to 44 mm., maximum breadth (at prothorax) 9·5 mm.

Egg. Froggatt (1923) gives the following description: " . . . pale yellow, elongate, spindle-shaped in form but flattened on the upper and lower surface when deposited (as is usually the case) in a shallow depression between the dry scaly and green bark. They are composed of a soft

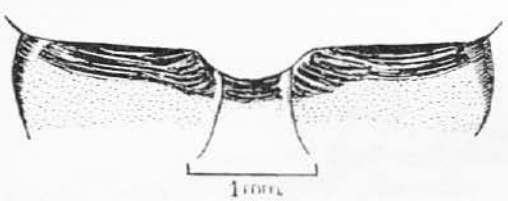

Fig. 47. *Phoracantha recurva* Newman. Mature larva. Front part of hypostoma.

gelatinous matter without any definite structure or skin and a very large percentage appear to be infertile or shrivelled up by the heat without any larvae emerging. The average length of each egg is about one-tenth of an inch. Before the emergence of the larvae the eggs swell out and are almost cylindrical in form."

Biology. The larval habitat is in the trunk and main branches. The young larvae feed for about six months under the bark, where they make irregular galleries which are tightly packed with frass; a single gallery may be several feet in length. When nearly mature the larva tunnels into the sapwood and then, usually, into the heartwood, where it pupates several inches from the surface (Froggatt, 1923).

There is apparently one generation of this species each year, but considerable overlap of emergences of adults occurs. Adults have been taken in the field during July, October, November and March (K. M. Moore).

Parasites. Hymenoptera: *Iphiaulax rubriceps* Frogg,. *I. phoracanthae* Frogg. and *I. morleyi* Frogg. (Froggatt, 1923).

Predators. Coleoptera: *Trogodendron fasciculatum* Schreiber.

Economic importance. Similar to preceding species.

Material studied. 2 L, Australia, Stapleton, 26.i.1937, from *Eucalyptus maculata*, A. R. Brimblecombe leg., in coll. D.A.S.B.

References. Brimblecombe, 1956 (I fig., Biol.); Clark, 1938 (Biol.); Duffy, 1953a (E, Biol.), 1957 (E, Biol.); French, 1911 (Biol.); Froggatt, 1916 (I fig., Biol. fig., Paras. fig.), 1923 (E, I fig., Biol.); McKeown, 1944 (Biol.); Miller, 1925 (I fig., Biol. fig.); Pierce, 1917 (Biol.); Schiödte, 1876 (L fig.); Tepper, 1887 (Biol); Tillyard, 1926 (Biol.); Tooke, 1949 (Biol.); Wakefield, 1874a (Biol.).

Phoracantha punctata (Donovan) (=**quinaria** Newman) (=**fallax** Pascoe)

Distribution. AUSTRALASIAN REGION: Australia (Central Australia, New South Wales, Queensland, South Australia, Tasmania, Victoria), New Zealand.

Host plants: *Acacia homalophylla* (Duffy, 1953a); *Acacia mollissima* (Dixon, 1908); *Acacia decurrens* (Gallard, 1916); *Eucalyptus leucoxylon* (Tepper, 1887).

Biology. Larvae are to be found beneath dry bark in October and November.

References. Best, 1881 (Biol.); Dixon, 1908 (Biol.); Duffy, 1953a (Biol.); Gallard, 1916 (Biol.); Illidge, 1922 (Biol); Tepper, 1887 (Biol.).

Phoracantha tricuspis Newman (=**Xypeta gigas** (Hope))

[The Dark Brown Phoracantha; the Yellow Box Borer]

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, South Australia, Victoria), New Zealand (introduced).

Host plants: *Eucalyptus melliodora*, *E. viminalis* (French, 1911); *Eucalyptus robusta* (Tepper, 1887).

Biology. Larvae infest dead or dying trees. After feeding subcortically, they later penetrate the heartwood in which they excavate large flat cells several inches in diameter; in these they remain for several years. Adults are usually found sheltering under loose bark (Froggatt, 1893).

References. Duffy, 1953a (Biol.); French, 1911 (I fig., Biol. fig.); Froggatt, 1893 (L, Biol.), 1907 (Biol.), 1923 (Biol.); Tepper, 1887 (Biol.).

Coleocoptus senio (Newman)

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Northern Territory, Queensland, South Australia, Victoria, Western Australia); New Zealand, Fiji (introduced). ORIENTAL REGION: New Guinea.

Host plant: *Syncarpia laurifolia* (Duffy, 1953a).

Mature larva (fig. 48). Form rather slender and depressed. *Head* slightly transverse. Temples with the broad ferruginous area behind antenna rather protuberant and with two or three vertical impressions which connect paired setal pores (fig. 48). Front margin of frons narrowly ferruginous. Antenna with segment 3 rather stout, cylindrical, about twice as long as basal width and less than half length of segment 2; supplementary process very small and conical. Labrum slightly transverse. Ocelli indiscernible. Hypostoma with front margin ferruginous; sutures ferruginous, very short. Maxilla with segment 3 of palp slightly shorter than segment 2. *Prothorax* with lateral regions micro-pubescent and with rather inconspicuous, scattered, glabrous spots. Posterior part of pronotum very finely longitudinally striate. *Abdomen* with ampullae microscopically alutaceous or reticulate and glabrous. *Legs* with unguiculus scarcely sclerotised, slender, flagelliform, imbricately tuberculate. Length up to 25 mm.; maximum breadth (at prothorax) 6·5 mm.

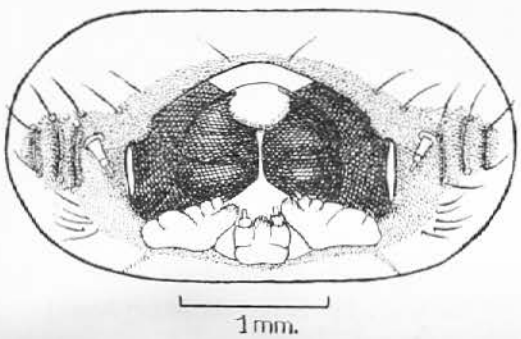

Fig. 48. *Coleocoptus senio* (Newman). Mature larva. Head. Frontal aspect.

Pupa (fig. 49). *Head* strongly elongate; vertex not visible from above, dome-shaped, smooth and glabrous; front feebly rugose and glabrous; clypeus with a transverse impression at base. Antennae with segments 1–4 (at least) pectinate at apex of inner margin only, extending as far as abdominal segment 3 or 4, where they are strongly recurved to terminate between the front and middle coxae. Eyes feebly convex, glabrous. Labrum trapezoidal, front margin not angled and sometimes with a few minute setae. Maxillary palpi slightly broadened and rounded apically. *Pronotum*

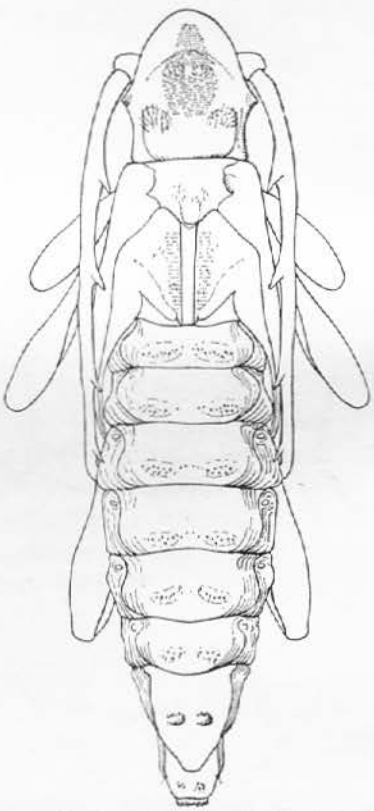

Fig. 49. *Coleocoptus senio* (Newman). Pupa. Dorsal aspect.

very strongly elongate, with front margin strongly rounded and sides bearing a pair of acutely pointed tubercles; disc transversely striate and with two groups of minute setae near middle; basal half with a pair of paramedian, raised, oval areas bearing numerous slightly longer setae. *Mesonotum* almost smooth, with two groups of minute setae; scutellum moderately protuberant and glabrous. *Metanotum* transversely striate on each side of scutellar groove and bearing a few minute scattered setae; scutellar groove very distinct. Elytra and wings extending as far as abdominal segment 4. *Abdomen* with tergites 1–6 each with paired, slightly raised, oval areas bearing about six short stout spines. Tergite 7 elongate, with a pair of tuberculate protuberances each bearing about four to six stouter spines which are inclined forward. Tergite 8 elongate, with two groups of about four more slender spines inclined posteriorly. Tergite 9 extremely short and bearing a few short stout spines. Sternites glabrous. Pleura rather strongly protuberant, rugose, glabrous. *Legs* with femora clavate; hind femora each with a tuberculate process near base; extending to between abdominal segments 5 and 6. *Functional spiracles* present on abdominal segments 1–5 but vestigial pairs present on segments 6–8; peritreme broadly oval, moderately thick and rather strongly raised above general level of cuticle. Length 16–20 mm.; maximum breadth 3·75 mm.

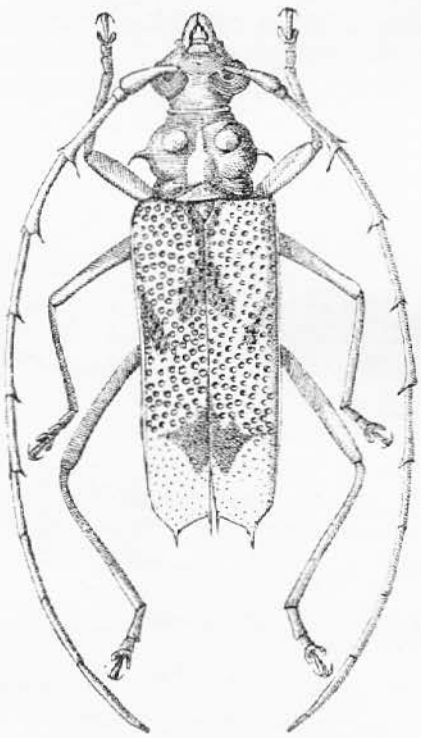

Fig. 50. *Tryphocaria acanthocera* (Macleay). Adult.

Material studied. 3 L, 3 P, 1 I, Fiji, Lautoka, 10.xii.1945, in *Syncarpia* from New South Wales, R. A. Lever leg., in coll. B. M.

References. Duffy,1953a (L, P fig., Biol.); Lever, 1946 (Biol.).

Tryphocaria acanthocera (Macleay)

(=**hamata** (Newman))

(=**Phoracantha acanthocera** (Hope))

[The Bull's Eye Borer; the Marri Borer]

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, South and West Australia, Victoria).

Host plants: *Eucalyptus calophylla, E. gomphocephala, E. patens, E. redunca* var. *elata, E. ficifolia, E. jacksoni. E. calophylla* is the preferred host (Clark, 1925); *Angophora lanceolata, Agathis robusta, Eucalyptus punctata, E. paniculata, E. grandis* (A. R. Brimblecome); *Eucalyptus saligna,E.propinqua E. acmenioides* (K. M. Moore).

Adult (fig. 50). Length 30–45 mm. Head and prothorax ferruginous. Elytra straw-coloured and with ferruginous markings as figured. *Head* with antennal segments 3–7 strongly spined apically on inner angle and, in male, extending well beyond elytral apices. Eyes coarsely facetted. *Prothorax* with sides bearing a pair of median spine-like tubercles, which are strongly curved posteriorly. Elytra very coarsely and densely punctuate for about basal two-thirds; apices with outer and sutural angles strongly spined.

Mature larva (fig. 51). Form elongate, rather robust, scarcely depressed. *Head* with temples smooth and testaceous. Mouthframe, including genae, broadly ferruginous. One pair of large ocelli present; lens rather strongly convex, pigmented spot indiscernible. Hypostoma broadly ferruginous anteriorly, finely transversely strigose.

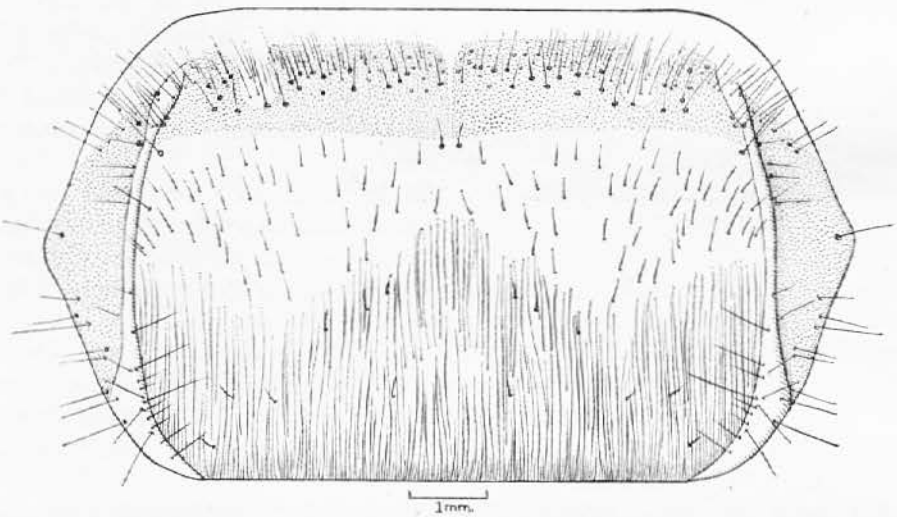

Fig. 51. *Tryphocaria acanthocera* (Macleay).
Mature larva. Prothorax. Dorsal aspect.

Maxilla with segment 3 of palp appreciably shorter than segment 2. *Prothorax* with pronotum (fig. 51) bearing anteriorly numerous coarse, bristly, ferruginous setae which are mostly coarsely annulate basally giving the pronotum a spotted appearance; posteriorly finely and evenly longitudinally striate. *Meso-* and *metaterga* and *sterna* tuberculate. *Abdomen* with ampullae transversely rugoso-striate. *Legs* well developed, longer than maxillary palpi. *Spiracles* with peritreme broadly oval, pale, without marginal chambers. Length up to 70 mm.; maximum breadth (at prothorax) 12 mm.

Larvae of this genus differ appreciably from those of *Phoracantha* in having smooth testaceous temples, very coarse, bristly cephalic, thoracic and abdominal setae, tuberculate meso- and metasterna and the apical segment of the maxillary palp distinctly shorter than the penultimate segment.

Pupa (fig. 52). Rather similar to that of *P. semipunctata* (Fabricius) but distinguishable as follows. *Pronotum* bearing numerous coarse ferruginous setae only; lateral

tubercles long, attenuated and curved posteriorly (fig. 52). Scutellum bearing a few stout setae. *Abdomen* with spines on tergites very stout and mostly notched or truncate apically. Tergite 7 with spines not inclined anteriorly. *Legs* with femora not clavate. Length up to 37 mm.; maximum breadth 11·5 mm.

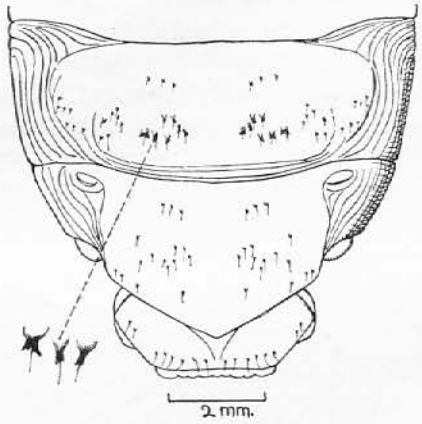

Fig. 52. *Tryphocaria acanthocera* (Macleay). Pupa. Tergites 7–9.

Egg. Elongate-oval, subcylindrical, about one-quarter of an inch long. Chorion greenish white, soft (Clark, 1925).

Biology. Although closely related to *Phoracantha*, larvae of this genus have quite different feeding habits. Those of the former genus prefer dying or dead trees and feed mainly subcortically or in the sapwood, whereas those of *Tryphocaria* prefer living trees and feed mainly in the heartwood. Trees in all stages of growth are attacked but young trees about one foot in diameter are preferred.

On hatching, the larva eats its way through the bark in a spiral direction, gradually working into the sapwood, through which it bores until strong enough to penetrate the heartwood. It then bores upward in an erratic course, at times penetrating the sapwood. By the time it is full grown, it has tunnelled through eight to twelve feet of wood. At this stage it bores completely through the sapwood and sometimes through the bark, and excavates a broad channel about 18 in. long between the heartwood and the bark, completely cutting away the sapwood at the top of this groove it makes a typical "ear-shaped" excision, resembling a bull's eye (Pl. VI, fig. 2), in the centre of which it tunnels again into the heartwood, but this time in a downward direction for a distance of nine to twelve inches, forming a large pupal cell. In so doing, wood fibres are packed tightly behind the larva, thus solidly plugging the entrance.

The pupal cell is prepared during April and May but pupation does not take place until October or November. Adults emerge during December and January. The life-cycle is about two years in duration. For some inexplicable reason, the larva sometimes makes what appears to be a false pupal cell, usually only a few inches from the entrance to the real pupal cell. The pupal cell is usually at least 15 ft. above ground level, often much higher (Clark, 1925).

Brimblecombe (1956) maintains that larvae of this species are responsible for extensive gum veins, gum pockets, gum rings and external bleeding. But according to Clark (l.c.) this is not the case, as many badly affected trees have been found to contain no traces of larvae; moreover, some trees infested with *Tryphocaria* larvae have been completely free from gum veins.

The following observations have been made by K. M. Moore. Multiple areas of damage are made by each individual larva in the sapwood; these may vary from three to five in number, each being from 6 in. to 14 in. in length and 2 in. to 6 in. in width and

about half an inch deep. It is considered possible that a larva may take a whole season to excavate each area of damage. This damage may occur from three to forty-five feet above ground-level, and each is joined by a single tunnel made by the larva in the heartwood, extending from the upper portion of the lower area to the base of the next area to be constructed higher up the trunk. The various areas of damage are usually within 12 in. of each other measured vertically on the trunk, the total vertical length of multiple area of damage being up to 48 in. The dead, cracked bark of smooth-barked *Eucalyptus* spp. or the rough bark of other species, is retained over the damaged areas for some years, thus tending to hold the excreta of the larva within the damaged area under the bark (fig. 53).

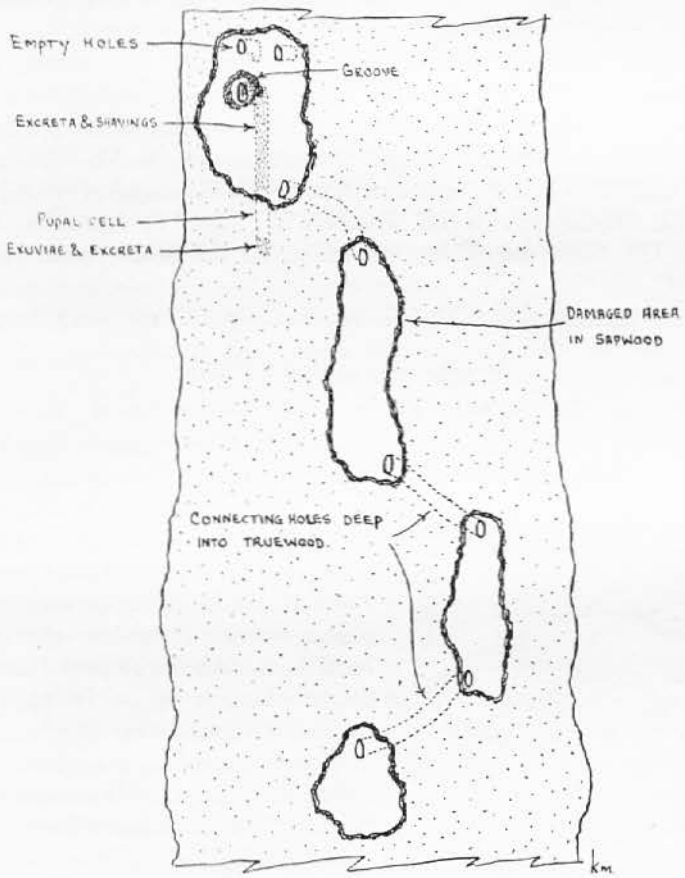

Fig. 53. Damage caused by larvae of *T. acanthocera* (Macleay) to sapwood of *Eucalyptus saligna*, with dead bark removed (K. M. Moore).

The higher areas of damage are not necessarily directly above the previous area, but may occur at angles of 90° or more to it; for example, if the original area of damage faces south, the next area may be on or beyond the eastern or western aspect of the tree-trunk. When the last and highest area of damage is constructed, a raised

prominence of sapwood is retained in the upper central portion of the area, the larva then gnawing either partly or completely around it, thus forming a narrow groove which may be very shallow or up to half an inch deep. In the centre of this prominence the larva constructs an oval hole which penetrates horizontally for about an inch before turning downwards for 4 in. to 14 in., and in which the larva pupates. Spaced around or above the groove, which more or less encircles the raised prominence, as many as three short horizontal holes may sometimes be constructed; these may sometimes be turned downward for short distances. The purpose of these "dummy" holes was not determined. Only two larvae were parasitised out of about 35 examined, and no parasites were reared. Adults emerged from November to January.

Economic importance. Damage by this species is of considerable economic importance. It attacks only growing trees, from saplings about 20 ft. in height to the largest trees. The bark of most trees is eventually capable of occluding the damaged areas, and large logs often show typical damage many inches below the surface. Sawn boards may thus be weakened or rendered useless, or they are degraded because of insect damage. Some logs are a complete economic loss (K. M. Moore).

Material studied. 6 L, 2 P, Australia, New South Wales, Lisarow, x.1956, from *E. saligna*, K. M. Moore leg., in coll. F.C.N.S.W.; 1 L, 2 P, Australia, N. Aramara, 25.vii.–27.ix.1939, from *Angophora lanceolata*, A. R. Brimblecomb eleg., in coll. D.A.S.B.

References. Brimblecombe, 1956 (L fig., Biol. fig.); Clark, 1925 (I fig., Biol. fig.).

Tryphocaria mastersi Pascoe

[Master's Longicorn, Master's Gum Borer]

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Victoria).

Host plants: *Eucalyptus maculata*, *Acacia* sp. (A. R. Brimblecombe); *Eucalyptus amygdalina*, *E. globus* (French, 1909).

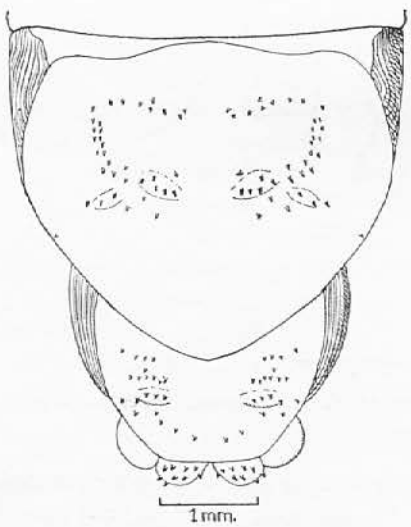

Fig. 54. *Tryphocaria mastersi* Pascoe. Pupa. Tergites 7–9.

Mature larva. Similar to that of *T. acanthocera* (Macleay) but differing as follows. *Prothorax* with posterior area of pronotum rugoso-striate; setae less coarsely annulate basally. *Abdomen* with ampullae feebly tuberculate. Length up to 36 mm.; maximum breadth (at prothorax) 11 mm.

From *T. solida* Blackburn it differs in having only one pair of ocelli and the abdominal ampullae much less strongly tuberculate.

Pupa (fig. 54). Similar to that of *T. acanthocera* (Macleay) but differing as follows. *Pronotum* bearing numerous short, scattered, ferruginous spines; lateral tubercles short, bluntly rounded, inconspicuous. *Abdomen* with spines on tergites more slender and simple apically. Length up to 31 mm.; maximum breadth 9 mm.

Biology. The larva tunnels in a spiral direction under the bark; it then bores into the top portion of the stem, above which the stem eventually snaps off, carrying the enclosed larva with it. The larva finally pupates in the snapped-off stem (Pl. VII, fig. 4). Adults emerge during January and February. The eggs are yellowish and covered with a sticky secretion. Many larvae and pupae are killed by a fungal growth in the wood. Adults have lived three weeks in confinement without food and a captive female laid 35 eggs (French, 1909).

Economic importance. This species is particularly destructive to *Eucalyptus amygdalina* saplings and has proved fatal to several trees, especially *E. globulus* in Melbourne Public Gardens (French, 1909).

Control. Infested branches should be removed and burned. Adults may be collected at night by attracting them with lamps (French, 1909).

Material studied. 1 L, Australia, Brisbane, 6.x.1940, A. R. Brimblecombe leg., in coll. D.A.S.B.; 1 L, 1 P, Australia, Stapleton, 3.iii.1938, from *Eucalyptus maculata*, A. R. Brimblecombe leg., in coll. D.A.S.B.

References. Brimblecombe, 1956 (Biol.); French, 1909 (E fig., L fig., P fig., I fig., Biol. fig., Contr.); Froggatt, 1923 (Biol.).

Tryphorcaria solida Blackburn (=**Phoracantha synonyma** Newman)

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland).

Host plants: *Eucalyptus propinqua, E. resinifera, E. microcorys, E. micrantha* (A. R. Brimblecombe); *Eucalyptus saligna, Angophora intermedia* (K. M. Moore).

Mature larva. Similar to that of *T. acanthocera* (Macleay) but differing as follows. Form less robust. *Head* with three pairs of sub-contiguous ocelli. *Prothorax* with posterior area of pronotum rugoso-striate; setae less coarsely annulate basally. *Abdomen* with ampullae very strongly tuberculate, the tubercles strongly protuberant and convex.

Pupa (fig. 55). Similar to that of *T. acanthocera* (Macleay) but differing as follows. *Pronotum* bearing numerous scattered, short, ferruginous spines; lateral tubercles short, bluntly rounded and inconspicuous *Abdomen* with spines on tergites more slender and simple apically.

From *T. mastersi* Pascoe it may be distinguished by the number and arrangement of spines on tergites 7 and 8 (fig. 55).

Biology. This species attacks living and apparently healthy trees of all sizes, and duration of the life cycle is usually about two years. Attack is often initiated at the site of old branch-stubs or at sites of injury on trees of 4 in. or more in diameter. The single, more or less circular area of damage in the sapwood may be up to 8 in. in

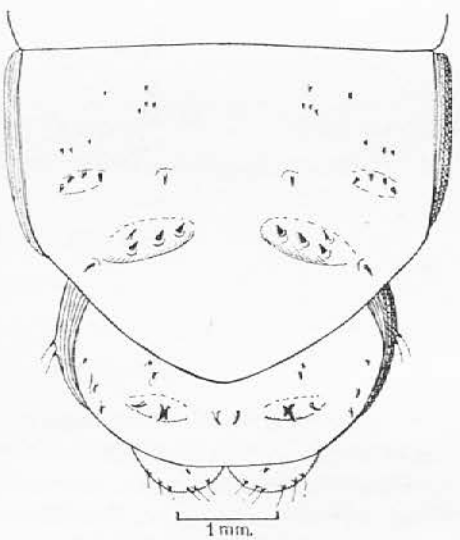

Fig. 55. *Tryphocaria solida* Blackburn. Pupa. Tergites 7–9.

diameter, with a depth of about half an inch (fig. 56). The bark (Pl. VI, fig. 1) is not retained on the tree trunk over the damaged area as is the case with *T. acanthocera* (Macleay). Larvae construct two, three or four holes into the heartwood before attaining maturity. The lowest hole, which is the entrance to the pupal cell, is usually situated about two-thirds of the way up the damaged area, and after penetrating horizontally for about one-half to one inch, turns down vertically, usually in the heartwood. There is no raised prominence or groove around the entrance to the pupal cell.

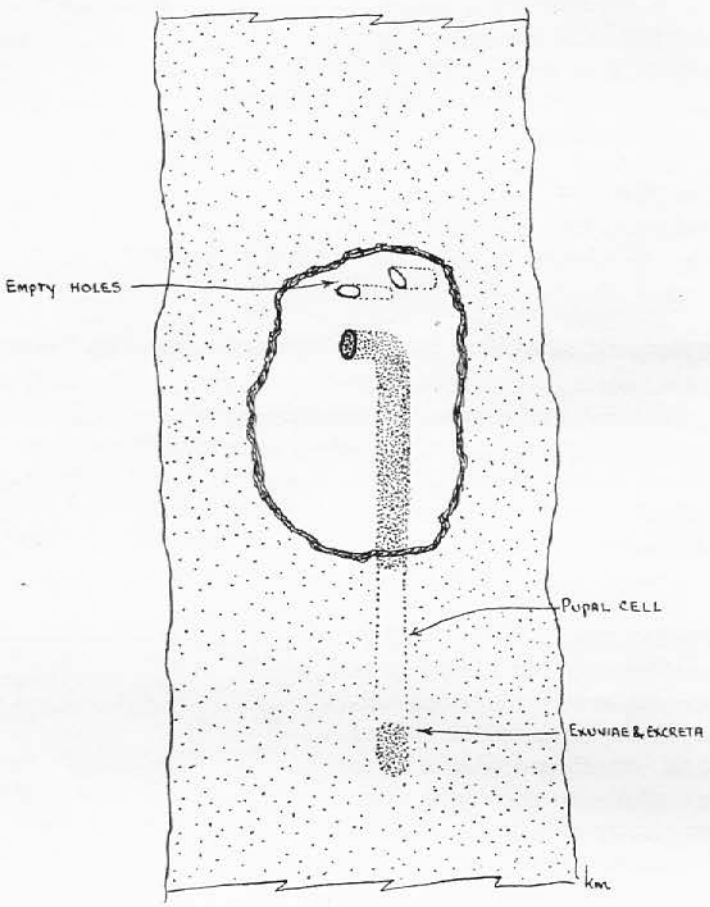

Fig. 56. Damage caused by larva of *T. solida* Blackburn to sapwood of *Eucalyptus saligna* (K. M. Moore).

Seven separate areas of damage have been found to occur on a single sapling about 25 feet in height. Adults have been collected from December to March (K. M. Moore).

Economic importance. Larvae have been found tunnelling in living saplings of *Eucalyptus micrantha* (A. R. Brimblecombe).

Material studied. 1 L, Australia, Queensland, Pechey, 5.iii.1937, from *Eucalyptus propinqua*, A. R. Brimblecombe leg., in coll. D.A.S.B.; 1 L, same locality, 3.ix.1941,

from *Eucalyptus micrantha*, A. R. Brimblecombe leg., in coll. D.A.S.B.; 1 P, Australia, Queensland, Byfield, xi.1938, from *Eucalyptus microcorys*, A. R. Brimblecombe leg., in D.A.S.B.; 6 L, Australia, New South Wales, Lisarow, 4.xi–2.xii.1956, from *Eucalyptus saligna*, K. M. Moore, leg., in coll. F.C.N.S.W.

References. None available.

Coptocercus rubripes (Boisduval)

Distribution. AUSTRALASIAN REGION: Australia (Queensland, South Australia, Tasmania, Western Australia), New Zealand (introduced).

Host plants: *Eucalyptus obliqua*, *E. odorata* (Tepper, 1887); *Syncarpia*, *Crataegus* (Clark, 1938).

Mature larva. Similar to those of *Phoracantha* spp. from which it differs as follows. *Head* with temples rather feebly impressed. Ocellus with lens narrow and slot-like. Length up to 26 mm.; maximum breadth (at prothorax) 7·1 mm.

Biology. Larvae tunnel subcortically but later pupate in the solid wood. Adults emerge from September to November. Only sickly or dying trees are attacked (Dumbleton, 1957).

Material studied. 1 L, 1 I, Australia, Canberra, Ainslie, 6.viii.1950, from *Eucalyptus*, P. B. Carne leg., in coll. D.A.S.B.

References. Clark, 1938 (Biol.); Dumbleton, 1957 (L fig., Biol); Tepper, 1887 (Biol.).

Coptocercus aberrans (Newman)

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland).

Host plants: *Eucalyptus citriodora* (A. R. Brimblecombe); *Angophora intermedia* (K. M. Moore).

Mature larva (fig. 57). Similar to that of *C. rubripes* (Boisduval) but differing as follows. *Head* (fig. 57) with ocellus indistinctly defined (owing to strong sclerotisation of gena) and widely separated from antennal foramen. Length up to 21 mm.; maximum breadth (at prothorax) 7·5 mm.

Biology. Larvae occur in the bark, between the bark and sapwood and in the sapwood. Attack was usually found to occur around branch-stubs or the forks of

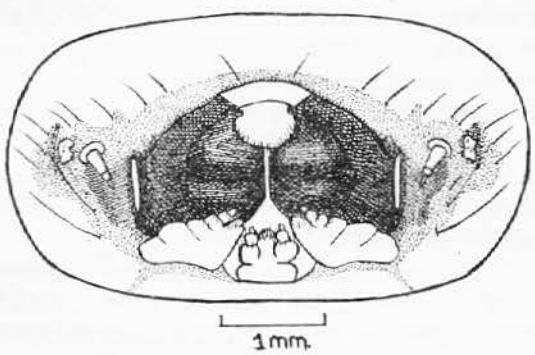

Fig. 57. *Coptocercus aberrans* (Newman). Mature larva. Head. Frontal aspect.

branches. Adults have been collected in the field during March, May, October and November (K. M. Moore).

Material studied. 13 L, Australia, New South Wales, Lisarow, 29.iii.4.–viii.1957, from *Angophora intermedia* billets, K. M. Moore leg., in coll. F.C.N.S.W.

References. None available.

Coptocercus biguttatus (Donovan)

Distribution. AUSTRALASIAN REGION: Australia (New South Wales).
ORIENTAL REGION: Moluccas, New Guinea.

Host plant: *Angophora intermedia* (K. M. Moore).

Mature larva (fig. 58). Markedly different from other species of this genus. *Head* (fig. 58) with temples pale testaceous, smooth, without impressions. One pair of ocelli present well behind antennal foramen; pigmented spot visible through cuticle (there being no distinct lens) as a minute greyish blotch (fig. 58). Length up to 21·8

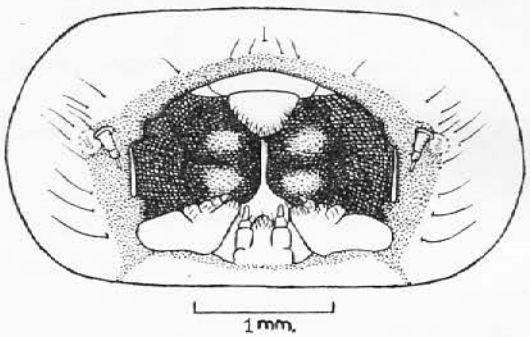

Fig. 58. *Coptocerus biguttatus* (Donovan).
Mature larva. Head. Frontal aspect.

mm.; maximum breadth (at prothorax) 5·6 mm. *Pupa.* No constant chaetotaxic differences are evident between the pupa of this species and that of *Coleocoptus senio* Newman.

Biology. Larvae work either in the bark, between the bark and the sapwood or in the sapwood. At 98 days after infestation of some billets, larvae were found to be pinkish cream in colour, and some had attained a length of 17 mm. Attack was plentiful and oviposition occurred principally around branch-stubs or forks of branches. Pupae were taken during October from $\frac{1}{8}$ in. to $\frac{1}{4}$ in. below the surface of the sapwood or in the bark. There is apparently only one generation of this species each year, and the time taken from oviposition to pupation was 280 days. Adults have been collected from November to May (K. M. Moore).

Material studied. 25 L, Australia, New South Wales, Lisarow, 29.iii–4.viii.1957, from *Angophora intermedia* billets, K. M. Moore leg., in coll. F.C.N.S.W.; 12 P, same locality, 2.x.1957, from *Angophora intermedia*, K. M. Moore leg., in coll. F.C.N.S.W.

References. None available.

Epithora dorsalis (Macleay)

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland, South Australia, Tasmania, Western Australia).

Host plant: *Angophora intermedia* (K. M. Moore).

Mature larva. Rather similar to that of *Skeletodes tetrops* Newman but differing as follows. *Head* with temples quite smooth. Ocelli very indistinct. *Prothorax* with anterior part orange-testaceous. Length up to 33·2 mm.; maximum breadth (at prothorax) 7·1 mm.

Pupa. Similar to that of *Coleocoptus senio* Newman but differing as follows. *Pronotum* without lateral tubercles. Elytra with apices sinuate and slightly twisted outwards. Length up to 22 mm.; maximum breadth 6·5 mm.

Biology. There is apparently one generation of this species each year, but emergences overlap considerably because of the varying times of commencement of each generation. Adults have been collected during November to April (K. M. Moore).

Material studied. 2 L, 2 P, 1 I, Australia, New South Wales, Lisarow, 4.viii.1957, from *Angophora intermedia*, K. M. Moore leg., in coll. F.C.N.S.W.

References. None available.

Skeletodes tetrops Newman

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland).

Host plants: *Citrus sinensis*, *C. medica*, *Flindersia xanthoxyla*, *F. australis* (A. R. Brimblecombe); *Gerijera parviflora* (J. W. Armstrong).

Mature larva. Head with mouthframe feebly sclerotised, pale ferruginous; temples pale testaceous and finely vertically rugoso-striate. One pair of ocelli present; lens rather indistinct, pigmented spot indiscernible. Hypostoma pale testaceous, finely transversely rugoso-striate. Maxilla with segment 3 of palp cylindrical, appreciably longer than segment 2. *Prothorax* with lateral regions with a large median area which is dull and micro-spiculate or micro-pubescent; posterior part of pronotum micro-granulate; anterior part pale testaceous. *Abdomen* with ampullae micro-granulate, glabrous, non-tuberculate. *Legs* pale, about as long as maxillary palp. *Spiracles* with peritreme broadly oval, pale testaceous, without marginal chambers. Length up to 14 mm.; maximum breadth (at prothorax) 4·1 mm.

Pupa. Similar to that of *Coleocoptus senio* Newman but differing as follows. *Head* with vertex only partly visible from above. Antenna with only segment 3 bearing a spine-like tubercle, which is very strongly produced. *Pronotum* with sides non-tuberculate. Elytra without a spine-like apical tubercle. *Legs* with hind femora without a spine-like, sub-basal tubercle. Length up to 12 mm.; maximum breadth 4·1 mm.

Biology. Adults have been collected during March, June and from July to November. When at rest, they spread out their legs, with their antennae pointing straight out in front and thus superficially resembling a large tipulid. The subcortical larval galleries are shown on Pl. V, fig. 1.

Material studied. 1 L, 1 P, 1 I, Australia, Gayndah, 23.viii.1951, from *Citrus sinensis*, A. R. Brimblecombe, leg., in coll. D.A.S.B.; 1 L, 1 P, 1 I, Australia, New South Wales, Balgowlah, 10.vi.1952, from *Citrus*, E. Starr leg., in coll. F.C.N.S.W.;

9 L, Australia, New South Wales, Lisarow, 7.v.1957, from *Citrus*, K. M. Moore, leg., in coll. F.C.N.S.W.

Reference. Froggatt, 1894 (Biol).

Atesta dixoni Oke

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, South Australia, Victoria).

Host plant: *Eucalyptus camaldulensis* (J. W. Armstrong).

References. None available.

Atesta bifasciata (Pascoe)

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland, Victoria).

Host plant: *Eucalyptus melliodora* (Dixon, 1908).

Biology. Adults emerge from December to February (Best, 1882).

References. Best, 1882 (Biol.); Dixon, 1908 (Biol.).

Callidiopini

Oemona hirta (Fabricius) (=**villosa** Fabricius)

[The Lemon-tree Borer]

Distribution. AUSTRALASIAN REGION: New Zealand.

Host plants: *Cassinia leptophylla, Senecio rotundifolia* (Hudson, 1934); *Brachyglottis repandra* (G. B. Rawlings); *Ulex, Citrus* (Dumbleton, 1957); *Olearia laxiflora* (E. S. Gourlay); *Albizia pyncnantha, Hakea saligna, Cyphomandra betacea, Cytisus proliferus, Dahlia imperialis, Aleurites fordii, Populus, Dodonea viscosa, Salix caprea, Prunus amygdalus, Pyrus malus, Ribes grosularia* (Miller, 1925); *Aristotelia serrata* (Cottier, 1938); *Leptospermum scoparium, L. ericoides* (Worley, 1929); *Melicytus ramiflorus* (Cunningham and Myers, 1921); *Betula verrucosa, Salix fragilis, S. babylonica, Acacia melanoxylon, Ulex europeaus, Cestrum elegans, Alnus glutinosa, Edwardsia microphylla, Cytisus laburnum, Ulmus racemosa, Coprosoma* (N. Z. Forest Research Institute records).

Mature larva (figs. 59–60). Form rather robust, subcylindrical, tapering posteriorly. *Head* (fig. 59) subquadrate, very slightly wider posteriorly, with sides almost straight. Genae rather broadly ferruginous, bearing a few stout setae. Front margin of frons broadly ferruginous and very strongly emarginate medially. Mouthframe broadly ferruginous and not interrupted beneath antennae; two pairs of epistomal setae present. Antennae with segment 3 elongate, about half length of segment 2. Mandible broad, stout, with basal part ferruginous, with a deep longitudinal median impression on outer face. Three pairs of distinct ocelli present in a row laterad and ventrad of antenna; ocellar lens strongly protuberant, pigmented spot distinct. Hypostoma with front margin smooth, broadly ferruginous, sutures slightly incurved. Gula rather broad, with concave sutures. Maxilla with segment 3 of palp about half

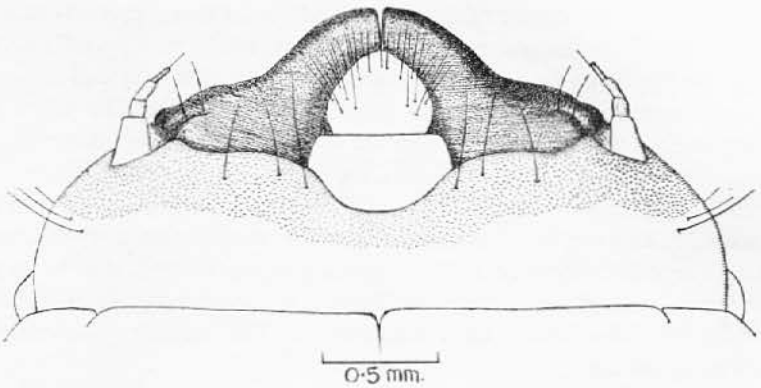

Fig. 59. *Oemona hirta* (Fabricius). Mature larva. Anterior part of head. Dorsal aspect.

length of segment 2; dorso-external process of palpifer slightly more than half length of segment 3; labial palpi with second segment almost as long as first. *Prothorax* with anterior third smooth, ferruginous; posterior half testaceous, rather coarsely longitudinally striate; median cleavage line deeply impressed. Eusternum distinct, strongly transverse, glabrous, except for antero-median area bearing six coarse setae. *Abdomen* with dorsal ampullae feebly rugose, glabrous, non-tuberculate; posterior transverse impression and median furrow distinct. Segment 10 obliquely truncate posteriorly (fig. 60); anus trilobed, each lobe bearing several coarse ferruginous setae. Pleural discs indiscernible. *Legs* well-developed, 3-segmented. Spiracles with peritreme very thick and broadly oval. Length up to 30 mm.; maximum breadth (at prothorax) 8 mm.

Biology. There are two main types of damage, the first being noticed about December, when the young tips of twigs about the thickness of a pencil begin to die off. If these are split open, a larva will be found boring in the centre of the wood. The other type of injury is that caused to larger branches, where the presence of larvae is indicated by the presence of frass. Larvae actually bore in living wood, working longitudinally along it or else around it. The whitish waxy eggs are deposited in crevices and cut surfaces or on small twigs. These hatch in a few days and the larvae burrow down the centre of the twigs. The larva usually works towards the main trunk, and frequently, when it reaches wood about half an inch in diameter, makes galleries round the branch, ring-barking it and thus causing it to break off.

Apparently the larva cannot develop in dead dry wood but it seems to thrive in dead wood which is exposed to rain. The larva

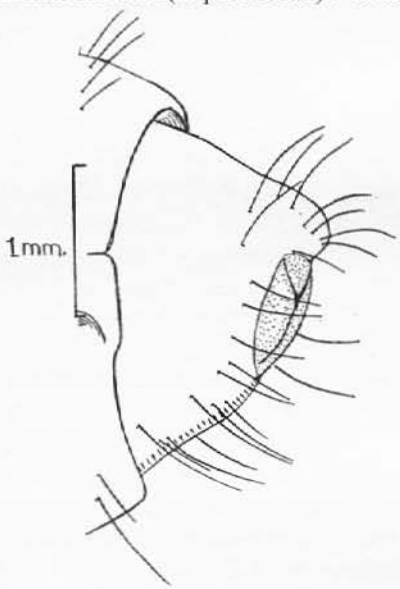

Fig. 60. *Oemona hirta* (Fabricius). Mature larva. Abdominal segments 9 and 10. Lateral aspect.

tunnels directly down the centre of the branch but in so doing constructs a series of frass ejection holes every few inches. Before pupating, the larva tears off thin pieces of wood and packs them into two tight plugs about half an inch long and one inch or so apart; in the compartment so formed it pupates (Pl. I, fig. 2). The pupal period is about three weeks in duration. Adults are nocturnal and are attracted to light. December is the main emergence period (Cottier, 1938).

Worley (1929) gives an interesting account of the occurrence of Manuka manna on small branches and trunks of Manuka (*Leptospermum*) infested with larvae of this cerambycid. The manna is to be found extruding from frass-ejection holes made by the larvae. When freshly exuded it is in the form of a viscous syrup thicker than honey, which later chrystallises into a hard white mass. This manna was known to the Maoris and early settlers.

Parasites. The parasitic fungus *Cordyceps Aemonae* Lloyd. Parasitised larvae have been found with their heads towards the surface of the log. It is apparently necessary for the stromata to make their way through about 5 mm. of solid wood before coming to the surface; frequently, however, they follow the old larval galleries until they come to an opening at the exterior (Cunningham and Myers, 1921).

Control. Young twigs found to be infested should be cut back below the point where the larva has been located and then burned. In the case of larger branches, carbon disulphide should be injected into the galleries and the entrances plugged with soap, wax or putty. All infested wood should be cut back to healthy tissue and the wound treated with a suitable dressing. This insect should also be eliminated from alternate host plants in the vicinity of the orchard (Cottier, 1938).

Material studied. 3 L, New Zealand, Whoha, 4.iii.1950, from *Brachglottis repandra*, G. B. Rawlings leg., in coll. F.R.I.; 4 L, New Zealand, Nelson, 23.vii.1956, from *Olearia laxiflora*, E. S. Gourlay leg., in coll. D.S.I.R., Nelson.

References. Broun, 1896 (Biol.), 1897 (Biol.); Cottier, 1938 (L fig., I fig., Biol. fig., Contr.); Cunningham and Myers, 1921 (L fig., I fig., Biol. fig.,); Dumbleton, 1937 (Biol.), 1957 (L fig., P, Biol.); Evans, 1952 (Biol.); Hudson, 1934 (L fig., P fig., I fig., Biol.); Miller, 1925 (L fig., P fig., I fig., Biol. fig.), 1955 (Biol.); Morgan, 1960 (Biol.); Worley, 1929 (Biol. fig.).

Ceresium australe Carter

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland, Victoria).

Host plant: *Pultenaea stipularis* (C. E. Chadwick).

Mature larva (fig. 61). Form strongly elongate, rather slender, cylindrical. *Head* (fig. 61) subquadrate, with sides feebly rounded, genae sparsely setose. Frons bearing at least 50 scattered ferruginous setae; front margin rather broadly and strongly sclerotised, ferruginous, and strongly emarginate medially. Mouthframe completely and strongly sclerotised beneath antennae. Antenna with segment 2 short and strongly transverse. Labrum cordate, with numerous long, ferruginous setae. Three pairs of distinct, subcontiguous ocelli present in a straight row laterad and ventrad of antenna; one pair of ocelli present beneath these, placed ventrally; ocellar lens strongly protuberant, pigmented spot very distinct. Hypostoma smooth, ferruginous anteriorly

and bearing a row of 2–6 pale setae; sutures curved. Gula rather broad, with sutures raised. Maxilla with segment 2 of palp strongly elongate, much longer than segments 1 or 3. Labial palpi with segment 2 slightly shorter than segment 1. *Prothorax* with

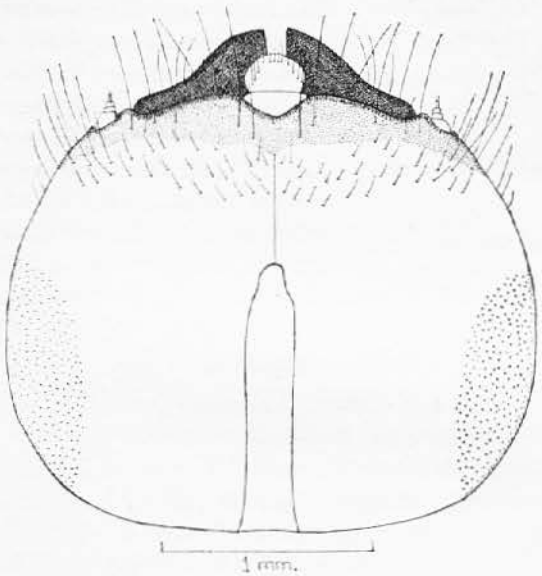

Fig. 61. *Ceresium australe* Carter. Mature larva. Head. Dorsal aspect.

pronotum smooth, testaceous and bearing numerous reddish setae anteriorly; posterior part milky white, glabrous and coarsely longitudinally striate. Presternum and eusternum bearing numerous scattered reddish setae, the latter subtriangular. *Abdomen* with each dorsal ampulla glabrous, bilobed and tuberculate, each lobe with a deep longitudinal impression. Segment 9 cylindrical, distinctly longer than segment 8, posterior half bearing numerous coarse reddish setae. Anal lobes similarly setose. Pleural tubercles oval, distinct. *Legs* well developed, as long as maxillary palpi. *Spiracles* with peritreme rather broadly oval, moderately thick and placed obliquely instead of vertically. Length up to 42 mm.; maximum breadth (at prothorax) 5 mm.

Material studied. 2 L, Australia, New South Wales, Middlecore Pt., 4.ii.1956, from stems of *Pultenaea stipularis*, C. E. Chadwick leg., in coll. B. M.

References. None available.

Ceresium unicolor (Fabricius)

Distribution. AUSTRALASIAN REGION: Solomon Is., New Hebrides, Fiji, Tonga, Samoa, Marquesas, Henderson I., Bonin Is., N. Mariana Is., S. Mariana Is., Palau, Truk, Ponapa, Kuasie, Gilbert Is., Tahiti. ORIENTAL REGION: New Guinea. ETHIOPIAN REGION: Kenya (imported). MADAGASCAN REGION: Mauritius (introduced). HAWAIIAN REGION: Hawaii (introduced?).

Host plants: ?*Hybiscus tiliacea* (Fairmaire, 1850); *Artocarpus*, *Sapindus*, *Cordia*, *Casuarina* (Gressitt, 1956); *Pipturus*, *Acacia* (Duffy, 1953b); *Heritiera littoralis* (Duffy, 1957).

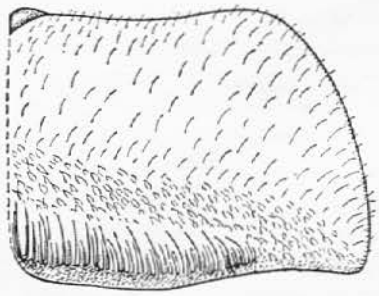

Fig. 62. *Ceresium unicolor* (Fabricius). Mature larva. Left half of prosternum.

Mature larva (fig. 62). Similar to that of *C. australe* Carter, but differing as follows. *Head* with frons almost glabrous. One pair of ocelli present. *Prothorax* with proeusternum (fig. 62) longitudinally striate as on posterior part of pronotum. *Abdomen* with dorsal and ventral ampullae very strongly protuberant on segments 1–6; segments 4–7 strongly elongate. Length up to 25 mm.; maximum breadth (at prothorax) 4·1 mm.

Material studied. 1 L, Africa, Kenya, 1954, under bark of *Heritiera littoralis* (imported), J. C. M. Gardner leg., in coll. B. M.

References. Duffy, 1953b (L fig., Biol.), 1957 (L, Biol.); Fairmaire, 1850 (Biol.); Gressitt, 1956 (Biol.).

Ceresium illidgei Blackburn[1]

Distribution. AUSTRALASIAN REGION: Australia (Queensland).

Host plant: *Callitris glauca* (A. R. Brimblecombe).

Mature larva. Similar to that of *C. australe* Carter but differing as follows. *Head* with segment 2 of antenna elongate. Ventral pair of ocelli absent. Maxilla with segment 2 of palpi shorter than segment 1. *Prothorax* with posterior part of pronotum very finely striate. *Abdomen* with dorsal ampullae not bilobed and each with a single deep transverse impression. Segment 9 not longer than segment 8. *Spiracles* subcircular, with peritreme thick. Length up to 25 mm.; maximum breadth (at prothorax) 4·5 mm.

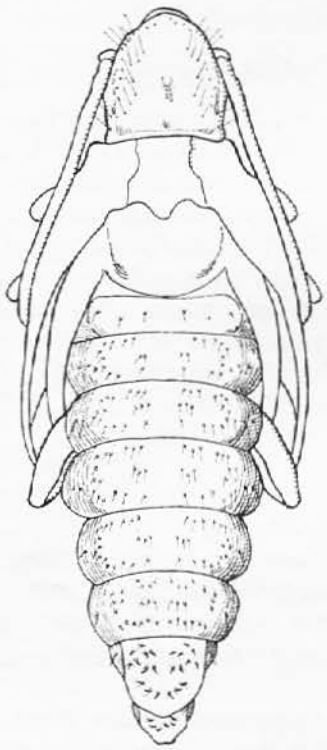

Fig. 63. *Ceresium illidgei* Blackburn. Pupa. Dorsal aspect.

Pupa (fig. 63). Head with vertex visible from above, glabrous; front glabrous. Antennae extending to between abdominal segments 1 and 2, where they are recurved ventrally to terminate near midcoxae. Eyes strongly convex, glabrous. Labrum subtriangular, glabrous. *Pronotum* subquadrate, with front margin strongly rounded, sides feebly rounded, the lateral tubercles scarcely portuberant; disc feebly transversely striate medially; numerous fine setae (each arising from a minute papilla) present, especially near front and lateral margins. *Mesonotum* and *metanotum* smooth and glabrous or almost so; scutellar groove smooth and shallow. *Abdomen* with tergites 1–6 each with groups of short ferruginous spines arranged more or less in three transverse rows and in groups of two to four. Tergite 7 with sides converging posteriorly, the

[1] The status of this species is questionable.

hind margin stouter than those on preceding segments, and also a row of 4–6 much stouter, anteriorly-curved spines (each arising from a basal tubercle) near posterior margin. Tergite 8 bearing about eight smaller spines. Segment 9 retracted into segment 8. Sternites bearing a few fine pale setae sublaterally. Pleura moderately protuberant. *Legs* with hind femora extending to abdominal segment 4 and lying parallel to longitudinal axis of body. *Functional spiracles* present on abdominal segments 1–6, but vestigial pairs present on segments 7 and 8; peritreme rather narrowly oval, thick, and with posterior half appreciably raised above general level of cuticle. Length up to 17 mm.; maximum breadth 6 mm.

Biology. The larval galleries are shown on Plate VI, fig. 5.

Material studied. 2 L, 2 P, 2 I, Australia, Queensland, Dalby, 4.xii.1938, from *Callitris glauca*, A. R. Brimblecombe leg., in coll. D.A.S.B.

References. None available.

Ceresium flavipes (Fabricius) (=**simplex** Gyllenhal)

Distribution. AUSTRALASIAN REGION: Australia, New Zealand, Norfolk I., Lord Howe I., Solomon Is., Cocos or Keeling Is. ORIENTAL REGION: New Guinea, India, Ceylon, Burma, Nicobar Is., Andeman Is., Malaya, Philippine Is., Sumatra, Java, Thailand, China, Formosa, Ryukyu Is. MADAGASCAN REGION: Madagascar, Mauritius, Rodriguez. NEOTROPICAL REGION: Mexico, Tahiti, Manila.

Host plants: India: *Casuarina equisetifolia* (Beeson and Bhatia, 1939); *Citrus* (Shiraki *et al*, 1933). Tahiti: *Artocarpus* (Fairmaire, 1850).

Biology. In India this species has an annual life-cycle and emerges in June.

Economic importance. According to Stebbing (1914), attack by this beetle is fatal to living trees but this has not since been verified.

References. Beeson, 1941 (Biol.); Beeson and Bhatia, 1939 (Biol.); Fairmaire, 1850 (Biol.); Gressitt, 1951 (Biol.); Shiraki *et al*, 1933 (Biol.); Stebbing, 1914 (Biol.).

Megaceresium horni Heller

Distribution. AUSTRALASIAN REGION: Solomon Is. ORIENTAL REGION: New Guinea.

Host plant: *Theobroma* (F. R. McKillop).

Mature larva. Rather similar to that of *Ceresium australe* Carter but differing as follows. Form more strongly elongate. *Head* with setae much coarser and bristly. Antenna with segment 2 elongate. Ventral pair of ocelli absent. Meso- and metasternum coarsely tuberculate. *Abdomen* with ampullae strongly tuberculate, bilobed, dull and micro-spiculate. Segments 5 and 6 much longer than segments 3 and 4; segments 8 and 9 subequal in length. *Spiracles* with posterior part of peritreme lined with numerous marginal chambers. Length up to 53·9 mm.; maximum breadth (at prothorax) 7·1 mm.

Pupa. Similar to that of *Ceresium illidgei* Blackburn but pronotum with lateral tubercles conical and strongly protuberant; disc strongly transversely striate. Length up to 40 mm.; maximum breadth 13 mm.

Material studied. 2 L, 1 P, New Guinea, Bougainville Is., Arawa Plantation, ix.1956, from *Theobroma* branches, F. R. McKillop leg., in coll. B. M.

Curtomerus flavus (Fabricius) (=**Cylindera flava** Aurivillius)

Distribution. AUSTRALASIAN REGION: Bonin Is., Marquesas, Tahiti. HAWAIIAN REGION: Hawaiian Is. ETHIOPIAN REGION: St. Helena. PALAEARCTIC REGION: British Isles (imported). NEARCTIC REGION: U.S.A. (Florida). NEOTROPICAL REGION: Mexico, Caribbean (Bahamas Is., Cuba, Grenada, Guadeloupe, Jamaica, Puerto Rico (including Mona I.), St. Croix, St. Vincent), South America (British Guiana).

Host plants: *Acacia decurrens*, *A. farnesiana*, *Eucalyptus*, *Datura*, *Pimenta officinalis* (Duffy, 1953b); *Xylosma*?, *Cocos*?, *Nicotiana* (Gressitt, 1956); *Bucida buceras*, *Casuarina equisetifolia*, *Coccolobis uvifera* (Martorell, 1945).

Mature larva (fig. 64). *Head* transverse, with sides diverging posteriorly. Genae with numerous long, pale, slightly curved setae. Front margin narrowly pitchy. Labrum transversely oval. Ocelli absent. Hypostoma with front margin narrowly ferruginous; sutures indistinct; some long fine setae present on each side of gula, which is distinctly raised. Maxillary and labial palpi with apical segment longer than penultimate. *Prothorax* with posterior half of pronotum dull, milky white and finely granulate; front margin of prosternum (fig. 64) with a row (interrupted medially) of about thirty small, elongate, brownish tubercles; proeusternum dull, milky white and finely granulate. *Abdomen* with ampullae granulate and glabrous. *Legs* small, slightly longer than segment 3 of maxillary palp. Length up to 16 mm.; maximum breadth (at prothorax) 4·2 mm.

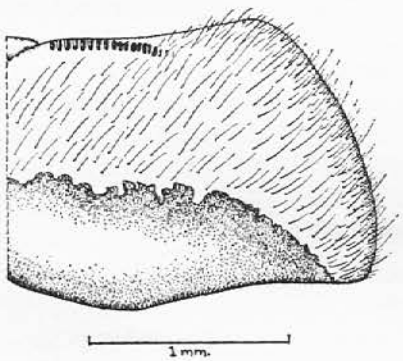

Fig. 64. *Curtomerus flavus* (Fabricius). Mature larva. Left half of prosternum.

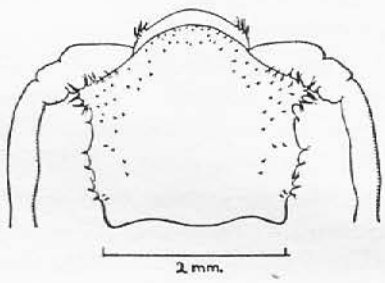

Fig. 65. *Curtomerus flavus* (Fabricius). Pupa. Head and prothorax. Dorsal aspect.

Pupa (fig. 65). Head with vertex, which is visible from above, bearing a group of spines immediately above each antenna. Eyes strongly convex, with a row of spines along ventral margin. *Pronotum* with a pair of prominent spinose, lateral tubercles near front margin. *Abdomen* with spines on tergites 1–6 mostly directed anteriorly. Tergite 7 with numerous scattered, short spines. Tergite 8 with about six short spines. *Legs* with femora strongly clavate; hind femora extending as far as abdominal segment 5. Functional spiracles present on segments 1–5, but vestigial pairs present on

segments 6 and 7; peritreme broadly oval and moderately thick. Length 8–11 mm.; maximum breadth 3·1 mm.

Biology. In Puerto Rico, adults of this species are commonly eaten by the introduced toad, *Bufo marinus* (Wolcott, 1951).

Material studied. 8 L, 1 P, 1 I, Honolulu, v.1928, from *Acacia decurrens*, O. H. Swezey leg., in coll. B.P. Bishop Mus., Honolulu; 9 L, 3 I, Oahu, Niu Valley, 30.ix.1928, from guava, O. H. Swezey leg., in coll. B. P. Bishop Mus., Honolulu.

References. Anonymous, 1916 (Biol.); Duffy, 1953a (L fig., P fig., Biol.), 1953b (L fig., P fig., Biol.), 1960 (L fig., P fig., Biol.); Gressitt, 1956 (Biol.); Martorell, 1945 (Biol.); Schiödte, 1876 (L fig.); Wolcott, 1936 (Biol.), 1941a (Biol.), 1951 (Biol.).

Didymocantha sublineata (White)

Distribution. AUSTRALASIAN REGION: New Zealand.

Host plants: *Leptospermum* (Dumbleton, 1957); *Nothofagus* (Hudson, 1934); *Nothofagus menziesii* (R. H. Milligan).

Mature larva (fig. 66). Form elongate, subcylindrical, slightly tapering posteriorly. *Head* (fig. 66) transverse, widest posteriorly. Frons rather broadly sclerotised, pale ferruginous, with a row of 6–8 fine setae; genae slightly shouldered and ferruginous behind ocelli. Three pairs of ocelli present; lens strongly convex; pigmented spots entirely black and very conspicuous. Labrum transverse, rounded anteriorly. Hypostoma narrowly ferruginous anteriorly, with four or more setae on each side of gula. Maxillary palpi with segments 2 and 3 subequal in length; process of palpifer well-developed. Antenna with segment 3 about half length of segment 2. *Prothorax* with

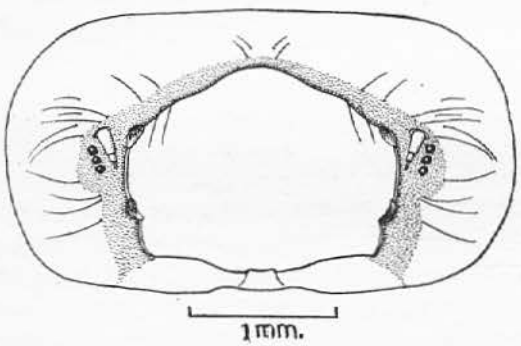

Fig. 66. *Didymocantha sublineata* (White). Mature larva. Mouthframe.

pronotum finely longitudinally striate on posterior half. Eusternum not clearly defined, sparsely setose, rugulose. *Legs* 4-segmented, well developed, pale ferruginous. *Abdomen* with ampullae alutaceous, feebly protuberant, glabrous. Tergite 9 without a sclerotised process. Anus tri-lobed, each lobe sparsely setose. *Spiracles* with peritreme moderately thick and broadly oval, the eighth pair being much larger than the seventh pair, and as large as the mesothoracic pair. Length up to 18 mm.; maximum breadth (at prothorax) 4·1 mm.

Biology. The larvae at first make broad shallow galleries along the surface of the sapwood but later enter the wood to pupate. The pupal cell shows a characteristic radial sculpturing. Adults probably emerge in the spring (Dumbleton, 1957).

Parasite. Diptera. Tachinidae. *Perrissina* sp. (J. S. Dugdale).

Material studied. 3 L, New Zealand, State Forest 90, South of Taupo-Napier highway, c. 20 m. east of Tapo, from *Nothofagus menziesii*, 10.iv.1959, R. H. Milligan leg., in coll. B. M.

References. Dumbleton, 1957 (L fig., Biol.); Hudson, 1934 (Biol.).

Didymocantha sp.

Distribution. AUSTRALASIAN REGION: New Zealand.

Host plant: *Nothofagus fusca* (G. B. Rawlings).

Pupa (fig. 67). *Head* with vertex visible from above; entirely smooth and glabrous; antennae extending as far as abdominal segment 3 where they are recurved ventrally to terminate alongside head. *Pronotum* (fig. 67) with sides feebly rounded and bearing a pair of blunt lateral tubercles; a pair of conspicuous median, conical tubercles present, one near anterior margin, the other near posterior margin. *Meso-* and *metanotum* with a few inconspicuous setae. Elytra and wings extending to between abdominal segments 4 and 5. *Abdomen* with tergites 1–6 each with numerous short ferruginous spines; tergite 7 with numerous longer, stouter spines, those across posterior margin being strongly recurved anteriorly; tergite 8 with a pair of minute, paramedian spines; segment 9 retracted in segment 8. Sternites glabrous. Pleura moderately protuberant. *Legs* glabrous; hind femora placed obliquely to longitudinally axis of body. *Functional spiracles* present on abdominal segment 1–6; peritreme broadly oval, pale, rather thick and slightly raised above general level of cuticle. Length up to 17 mm.; maximum breadth 5·75 mm.

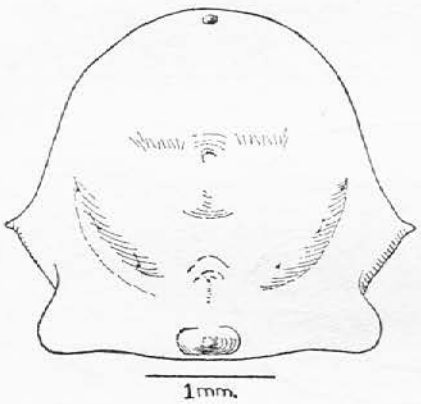

Fig. 67. *Didymocantha* sp. Pupa. Pronotum.

Material studied. 1 P, New Zealand, State Forest 90, nr. L. Taupo, 28.ii.1956, from *Nothofagus fusca*, G. B. Rawlings leg., in coll B.M.

Didymocantha novica Blackburn

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Victoria).

Host plant: *Eucalyptus camaldulensis*? (J. W. Armstrong).

References. None available.

Didymocantha obliqua Newman

[The Slender Grey Longicorn]

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, S. Queensland).

Host plant: *Acacia decurrens* (Froggatt, 1902a).

Biology. Adults have the curious habit, when molested, of letting their antennae droop down on either side and then stretching out their legs, ready to drop to the ground if further provoked (Froggatt, 1923).

References. Froggatt, 1902a (Biol.), 1923 (Biol.).

Didymocantha picta Bates

Distribution. AUSTRALASIAN REGION: New Zealand.

Host plants: *Nothofagus solandri* (Dumbleton, 1957); *N. menziesii* (R. H. Milligan).

Mature larva. Similar to that of *D. sublineata* (White) from which it differs as follows: *Head* with genae not shouldered, entirely pale testaceous. Ocelli with pigmented spots fragmentary and grey. Length up to 20 mm.; maximum breadth (at prothorax) 4·25 mm.

Material studied. 3 L, New Zealand, State Forest 90, south of Taupo-Napier highway, c. 20 m. east of Taupo, from *Nothofagus menziesii*, 10.iv.1959, R. H. Milligan leg., in coll. B. M.

References. Dumbleton, 1957 (L fig., Biol.); Morgan, 1960b (Biol.).

Didymocantha quadriguttata Sharp

Distribution. AUSTRALASIAN REGION: New Zealand.

Host plant: *Nothofagus solandri*, v. *cliffortioides* (R. H. Milligan).

Mature larva. Indistinguishable from that of *D. sublineata* (White) except that the body integument is slightly more strongly shining owing to the coarser micro-reticulation but this may be because these larvae are of a later instar.

Material studied. 3 L, 1 I, New Zealand, South Island, Hanmer State Forest, 17.viii.1959, from *Nothofagus solandri* v. *cliffortioides*, R. H. Milligan leg., in coll. B. M.

Reference. Morgan, 1960b (Biol.).

Bethelium inscriptum Pascoe

Distribution. AUSTRALASIAN REGION: (Australia, Queensland).

Host plant: *Siphonodon australe* (A. R. Brimblecombe).

Mature larva. In the present material available, this larva appears to be indistinguishable from that of *Skeletodes tetrops* Newman except for the fact that in the former the mouthframe is brown instead of ferruginous. On the other hand the pupae are quite distinct. This suggests that in the case of one of these species, probably the former, the material has been mixed.

Biology. Larvae have been found tunnelling under the bark of logs felled early in the year. Both larvae and pupae were present at the time of collection in August. Pupation occurred just within the wood and the pupal period varied from 18 to 22 days (A. R. Brimblecombe).

Material studied. 4 L, 2 P, 6 I, Australia, Queensland, Yarraman, 23.viii.1960, from *Siphonodon australe*, A. R. Brimblecombe leg. in coll. D.A.S.B.

References. None available.

Bethelium signiferum (Newman)

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland, South Australia, Tasmania, Victoria); New Zealand (introduced).

Host plant: *Acacia decurrens* (Froggatt, 1894).

Biology. Adults emerge during October and November from infested twigs of the dead host (Froggatt, 1894).

Reference. Froggatt, 1894 (I, Biol.).

Bethelium cleroides (White) var. **mundum** Blackburn

Distribution. AUSTRALASIAN REGION: Australia (New South Wales).

Host plant: *Eucalyptus nova-anglica* (Froggatt, 1919).

Biology. Larvae of this species girdle twigs and small branches and it is a common sight in some districts to find the ground beneath the host trees strewn with infested twigs and branchlets. An almost clean cut is made by the larva inside the wood, so that practically every gust of wind results in a fresh shower of detached branchlets (Froggatt, 1916).

Reference. Froggatt, 1916 (L fig., I fig., Biol. fig.).

Bethelium spinicorne Blackburn

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Victoria).

Host plant: *Acacia* (J. W. Armstrong).

References. None available.

Adrium artifex (Newman)

Distribution. AUSTRALASIAN REGION: Australia (Victoria).

Host plants: *Eucalyptus microcorys, E. phaeotricha* (A. R. Brimblecombe).

References. None available.

Eburilla sericea (White)

Distribution. AUSTRALASIAN REGION: New Zealand.

Host plant: *Thuya plicata* (Dumbleton, 1957).

Mature larva. No material available. Dumbleton (1957) gives the following description. "Form elongate, slender, body tapering posteriorly. Colour white. Integument thin, beset with minute spinules. Body setae slender and light coloured. Length 11 mm. *Head* transverse, sides diverging posteriorly to mid-length, thence subparallel, widest posteriorly. Mandible short, stout, trapezoidal. Labrum subcircular, unpigmented, with sparse setae. Maxillary palp 3-jointed, palpifer and 1st joint with minute processes, third joint as long as second joint of labial palp. Epistoma not emarginate in the middle. Frontal sutures not evident, median line present. Ocelli absent. Genae not shouldered, with dense moderately stout setae. Hypostoma without setae.

"*Thorax.* Pronotum not twice as wide as long. Notal spots and alar plates pale yellow. Anterior half of pronotum setose, posterior half glabrous except for a few setae along the posterior margin. Post-notal fold absent. Metanotum without X-

shaped lines. Presternum setose, fused with epipleurum. Eusternum with a transverse smooth glabrous plate posteriorly. In the median line at the anterior margin of this plate is a slightly rugose pigmented area. Legs vestigial, reduced to small tubercles bearing four small setae.

"*Abdomen.* Pleural discs not evident. Ampullae not prominent, finely granulate. The ventral ampulla on the 7th abdominal segment has a well defined fold at the anterior margin. Spiracles sub-circular. Sclerotised thickening of the intima of hind-intestine present."

Biology. Adults emerge in April. The larvae tunnel subcortically, entering the wood to pupate (Dumbleton, 1957).

Parasites. Hymenoptera: *Mesostenus albopictus* Smith (Dumbleton).

Reference. Dumbleton, 1957 (L fig., Biol.).

Ectosticta eburata (Pascoe) (=**Bethelium mundum** Blackburn)

[The Branch-cutting Longicorn]

Distribution. AUSTRALASIAN REGION: Australia (New South Wales), New Zealand.

Host plant: *Eucalyptus nova-anglica* (Froggatt, 1923).

Biology. Larvae of this species have the habit of gnawing off small branches about as thick as a man's finger, so that a sudden gust of wind will dislodge numerous detached branchlets. In some districts (e.g. New England) the ground beneath the *Eucalytpus* trees has been strewn with branchlets for several years in succession. In the case of most girdling species, the larvae remain in the main standing part of the branch, but in this species the larvae tunnel right into the centre of the portions later to be amputated (Froggatt, 1923).

Control. Where trees are valuable for shelter, the numbers of beetles could effectively be reduced by gathering and burning the infested, amputated branchlets each season. Infested branchlets can readily be detected by the presence of dead brown leaves (Froggatt, 1923).

References. Clark, 1938 (Biol.); Froggatt, 1916 (L fig., I fig., Biol. fig.), 1923 (L fig., I fig. Biol. fig.); Miller, 1925 (I fig., Biol.).

Ectosticta cleroides White

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Victoria).

Host plant: *Eucalyptus* sp. (J. W. Armstrong).

References. None available.

Gelonaetha hirta (Fairmaire)

Distribution. AUSTRALASIAN REGION: Tahiti, Mariana Is., Society Is., HAWAIIAN REGION: Hawaiian Is., ORIENTAL REGION: India, Ceylon, Burma, Thailand, Philippine Is.

Host plants: *Anogeissus latifolia, Berrya ammonilla, Dipterocarpus* sp., *Grewia* sp., *Heritiera fomes, Tectona grandis* (Beeson and Bhatia, 1939).

Mature larva. No material available. Gardner (1927) gives the following description. "Head capsule deltoid, narrowing anteriorly, with the anterior margin narrowly

castaneous. Epistoma slightly concave, smooth. Anterior margin of frons with a few pits, otherwise smooth. Hypostomal margin smooth. Gula longer than broad, the sutures subparallel. Genae with a few short setae. Ocelli absent. Antennae prominent, the terminal joint about three-fourths the length of second joint. Labrum small about one-third as wide as epistoma, slightly wider than long. Maxillae with wide mala; maxillary palpifer with a small sub-globose and setose process.

"Pronotum subrectangular, anteriorly shining and testaceous, coarsely punctured towards the middle; the posterior zone is very finely reticulate-striate and shagreened posteriorly. Eusternum with a sub-circular glabrous area on each side of the median line; each of these areas is shining and coarsely pitted on about its anterior half but the posterior half has a markedly different appearance due to a finely reticulate, matte and sinuately margined zone which extends across the base of the eusternum. The presternal area, which is not distinctly defined, with numerous moderately long, silky hairs. The lateral areas of prothorax with similar moderately long hairs and without any short pubescence. Legs small but distinct. Abdominal ampullae not tuberculate, smooth. Abdomen laterally with fine longish hairs. Length of larva about 19 mm."

Biology. The subcortical larval galleries of this species are shallow, meandering and interlacing, and are packed with fine wood particles. Pupation takes place not more than one inch deep in the sapwood, the cell having a transverse slit across the top and bottom ends, which are closed with fibres. There are two emergence periods a year, one from March to June and the other from September to December. The normal biannual cycle of a minimum of four and a half months, however, is sometimes prolonged in dry wood from one to two years (Beeson and Bhatia, 1939).

References. Atkinson, 1931 (Biol.); Beeson and Bhatia (1939 (Biol); Beeson, 1941 (Biol.); Gardner, 1927 (L flg., Biol.).

Paphora modesta Pascoe

Distribution. AUSTRALASIAN REGION: Australia (South Australia).

Host plant: *Eucalyptus oleosa* (Tepper, 1887).

Reference. Tepper, 1887 (Biol.).

Sisyrium tripartitum (Pascoe)

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, South Australia).

Host plant: *Eucalyptus camaldulensis* (J. W. Armstrong).

References None available.

Aphanasiini

Aphanasium australe (Boisduval)

Distribution. AUSTRALASIAN REGION: Australia (New South Wales); New Zealand (introduced).

Host plant: *Hakea acicularis* (Froggatt, 1895).

Mature larva. Larvae presumed to be of this species appear to be very similar to those of the Phlyctaenodini and are devoid of any outstanding characteristics. Accord-

ing to Froggatt (1895), the ninth abdominal tergite bears a stout median spine, but in the present material there is no evidence of this; it is possible, however, that the larva possesses a spine only in the final and, perhaps, penultimate instars and that the present larvae are not fully mature. From that of *Blosyropus spinosus* Redtenbacher, it may be distinguished as follows. *Head* with frons smooth, testaceous behind front margin. Hypostoma smooth, glabrous. *Prothorax* vermiculately rugose and faintly striate posteriorly. *Abdomen* with ampullae micro-granulate. Length up to 22 mm.; maximum breadth (at prothorax) 6·1 mm.

Biology. Several larvae usually bore into the shrub at one place, causing the branches to wither and break off. Somtimes almost a dozen larvae will tunnel in a single branch, gnawing out parallel galleries but never touching. The dying foliage is noticeable in January, infestation causing the limbs to swell and to become covered with a gummy exudation. Adults start to emerge at the beginning of November (Froggatt, 1895).

Material studied. 2 L, Australia, New South Wales, Rookwood, from *Hakea* in coll. D.A.N.S.W.

References. Froggatt, 1895 (L, I, Biol.), 1907 (Biol.).

Phlyctaenodini

Blosyropus spinosus Redtenbacher

[The Spined Blosyropus]

Distribution. AUSTRALASIAN REGION: New Zealand.

Host plants: *Pinus radiata*, *Metrosiderus*, *Nothofagus*, *Beilschmedia* (G. B. Rawlings); *Dracophyllum traversii*, *Nothofagus fusca* (Morgan, 1960b).

Mature larva (fig. 68). Form elongate, rather robust, subcylindrical, slightly tapering posteriorly. *Head* subquadrate, with sides diverging posteriorly. Mouthframe strongly sclerotised and broadly pitchy. Frons rugose, ferruginous, pitchy anteriorly; front margin strongly emarginate. Genae rugose, almost glabrous; temples sparsely setose. Antenna 3-segmented. Mandible robust, the basal half ferruginous and bearing several short setae on outer face. Labrum transversely oval, strongly sclerotised, ferruginous and densely fringed with short, bristly, golden setae. Clypeus wide, trapezoidal, completely filling space between dorsal articulations of mandibles. Three pairs of subcontiguous ocelli present; lens round, convex, strongly protuberant, pigmented spot very distinct. Hypostoma (fig. 68) strongly sclerotised, ferruginous, with

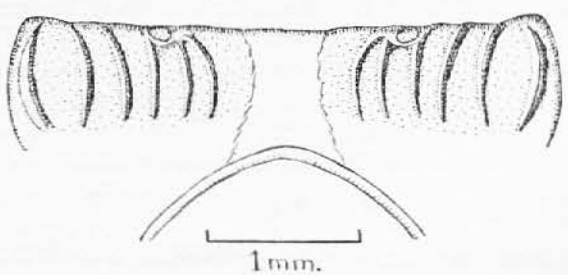

Fig. 68. *Blosyropus spinosus* Redtenbacher. Mature larva. Hypostoma.

five or six coarse, strongly raised, longitudinal, slightly curved carinae on each side of gula; sutures ferruginous, incurved; gula broad, with sutures slightly raised. Maxilla with segment 3 of palp about half length of segment 2. *Prothorax* with pronotum coarsely setose, ferruginous anteriorly; posteriorly testaceous and very feebly but coarsely longitudinally striate. *Abdomen* with dorsal ampullae each with two very distinct transverse impressions, glabrous, non-tuberculate. Anal lobes each with two or three fine setae. *Spiracles* with peritreme broadly oval and with several subcontiguous marginal chambers on posterior half. Length up to 40 mm.; maximum breadth (at prothorax) 12 mm.

Pupa. Head with vertex visible from above, glabrous; front with several setae and a long spine-like tubercle near inner margin of each antennal tubercle. Clypeus and labrum sparsely setose. Mandible robust, bearing a few minute scattered setae. Antennae extending to between abdominal segments 2 and 3, where they are recurved beneath body to terminate alongside maxillary palpi. Eyes feebly convex, glabrous.

Pronotum with sides bearing a pair of very stout, spine-like tubercles, which are inclined anteriorly; disc with a pair of paramedian, large, bun-shaped tubercles. *Mesonotum* and *metanotum* each with a pair of paramedian, oval, slightly raised areas bearing dense setae which are inclined anteriorly. Elytra with wings extending as far as abdominal segment 5. *Abdomen* with tergites 2–6 each bearing paired, transverse groups of scattered, short, stout spines; tergites 7 and 8 with a pair of oval protuberances near posterior margin (each bearing two to four much stouter spines) and several small spines along lateral margins and on disc; tergite 9 extremely short. Sternites glabrous or almost so. *Legs* glabrous, with hind femora extending to abdominal segment 5. *Functional spiracles* present on segments 1–5; peritreme thick, broadly oval, the posterior margin bearing numerous subcontiguous chambers. Length up to 24 mm.; maximum breadth 10 mm.

This species was originally placed in the LEPTURINAE but later transferred to the CERAMBYCINAE. The examination of the larva and pupa has shown this species to be a true cerambycine.

Biology. Morgan (1960b) gives the following information. Adults have been taken in June, from dead "grass trees" (*Dracophyllum*), in the tops of which the eggs are deposited. Tunnelling proceeds downward until the large pupal cell is constructed in the base of the stem, at or slightly below, ground level. These cells open to the outside but are blocked by a loose plug of coarsely chewed wood. Emergence begins in late August, though emergence from *Nothofagus* has been observed as late as February.

Material studied. 2 L, 1 P, 1 I, New Zealand, Whoka, G. B. Rawlings leg., in coll. B. M.

References. Miller, 1925 (I fig., Biol.); Morgan, 1960b (Biol.).

Diotimana(=Diotima) undata (Pascoe)

[The Hoop Pine Longicorn]

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland).
Host plants: *Araucaria cunninghamii, A. excelsa* (Olliff, 1888).

Mature larva (fig. 69). Similar to that of *Blosyropus spinosus* Redtenbacher, from which it differs as follows. *Head* with sides less strongly diverging posteriorly; front margin of frons not emarginate; declevity strongly swollen and broadly rounded longitudinally, with a pair of feebly raised but distinct oval tubercles paramedially; temples bearing numerous coarse bristly setae. One pair of ocelli present; lens sclerotised, indistinct, pigmented spot indiscernible. Hypostoma non-carinate, glabrous. *Abdomen* with ampullae micro-spiculate. Anal lobes each with numerous setae. *Spiracles* with peritreme broadly oval, without marginal chambers. Length up to 32 mm.; maximum breadth (at prothorax) 9 mm.

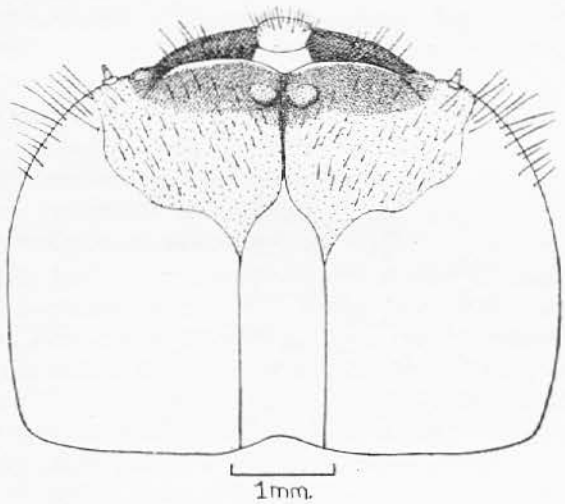

Fig. 69. *Diotimana undata* (Pascoe). Mature larva. Head. Dorsal aspect.

Pupa (frontispiece). *Head* with vertex visible from above, spinose; front with a row of four spinules (each with a sub-basal seta) immediately beneath antennal tubercles and a pair of paramedian setae immediately behind clypeus. Clypeus and labrum sparsely setose. Mandible robust, bearing numerous scattered spinules. Antenna with basal segments bearing numerous spinules, which are largest on the basal tubercles; long, extending as far as abdominal segment 2, where they are strongly recurved ventrally to terminate alongside middle of front femora. Maxillary and labial palpi strongly elongate, each bearing an apical spine-like tubercle. *Pronotum* with sides very feebly and bluntly tuberculate; disc transversely striate and spinulose medially and with a pair of sub-lateral, large, fleshy, curved protuberances (bearing several stout spines). *Abdomen* with segments 2–6 each produced laterally into a pair of elongate, tapering, fleshy, spinulose tubercles; dorsal ampullae bearing numerous spinules. Sternites 5–8 each with a pair of sub-lateral, protuberant areas being numerous spines. *Legs* with femora and tibiae bearing numerous scattered spinules; hind femora extending to abdominal segment 5. *Functional spiracles* present on abdominal segments 1–6; peritreme narrowly oval, without marginal chambers. Length up to 23·5 mm.; maximum breadth 8·75 mm.

Egg (Pl. VII, fig. 5 and fig. 70). Fusiform, depressed, with ends produced and cylindrical. Chorion orange-testaceous, smooth, shining, except ends which are dull yellowish white and granulate. Length 2·75 mm.; breadth 1·25 mm.

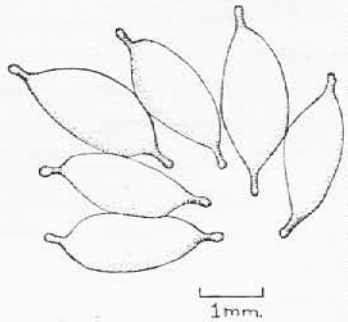

Fig. 70. *Diotimana undata* (Pascoe). Eggs.

Biology. Larvae of this species are to be found feeding subcortically in hoop pine timber throughout the greater part of the year, particularly in crowns and stumps left by timber cutters or in trees blown over by winds, or where a standing dead tree remains in the forest with its bark attached. Eggs are deposited in or on the surface of dead rough bark. Until nearly mature the larvae feed subcortically; they then enter the wood making a characteristic key hole like gallery, the entrance to which is plugged with a mass of coarse, torn shreds of wood, which is sometimes merely a loose mass of filaments in front of, or surrounding it, and frequently becomes detached when the bark is torn off the decaying log. The gallery turns downward; the upper section, which is narrowest, is packed with cemented wood dust, forming a protective barrier in front of the broader open chamber below, which is from $1\frac{1}{2}$ to $\frac{1}{4}$ of an inch in diameter, and is 3 inches or more in length. This chamber (Pl. VII, fig. 1) is occupied by the larva for sometime before it pupates (Froggatt, 1927b). Emergence holes of this species are shown on Pl. VI, fig. 3, and the adult on Pl. XI, fig. 1.

Economic importance. These larvae play an important part in the disintergration of the decaying wood of the hoop pine logs which would normally take a very long time to turn into wood mould on the forest floor (Froggatt, 1927b).

Material studied. 1 L, 1 P, Australia, Queensland, Imbil., vii.1936, from *Araucaria cunninghamii*, A. R. Brimblecombe leg., in coll. D.A.S.B.

References. Brimblecombe, 1945 (Biol.), 1956 (E. fig.); Froggatt, 1925 (L fig., P fig., I fig., Biol. fig.), 1927b (L fig., P fig., I fig., Biol. fig.); Olliff, 1888 (Biol.).

Ambeodontus tristis (Fabricius) (Fig. 71)

[The Two-toothed Longicorn]

Distribution. AUSTRALASIAN REGION: Australia (introduced), New Zealand.

Host plants: *Podocarpus spicatus*, *P. totara*, *P. dacrydioides*, *Dacrydium cupressinum* and *Cupressus macrocarpa* (G. B. Rawlings).

Mature larva. Similar to that of *Blosyropus spinosus* Redtenbacher but differing as follows. Form rather slender. Frons smooth and pale ferruginous anteriorly, with front margin scarcely sinuate. Genae bearing numerous pale setae. One pair of indistinct ocelli present; lens very indistinct, pigmented spot large, pale grey. Hyposto-ma non-carinate. *Prothorax* with pronotum pale testaceous anteriorly, finely longi-tudinally striate posteriorly. *Spiracles* with marginal chambers absent. Length from 13–26 mm.; maximum breadth (at prothorax) 4·9 mm.

Pupa. No material available. Dumbleton (1957) gives the following description. "Form as in adult. Head with two setae on each side between the antennal bases,

three across the front, one on each side near base of labrum and three small setae on each side near apex of labrum. One seta on mandible, none on gena. Pronotum with four setae in a row across the anterior margin, none on the lateral margin. A group of setae on each side of the median line about mid-length, scattered setae posterior to these. Mesonotum with a group of about 20 setae posteriorly on each side of the median line. Abdomen with segments 1–6 with a single posterior row of pigmented

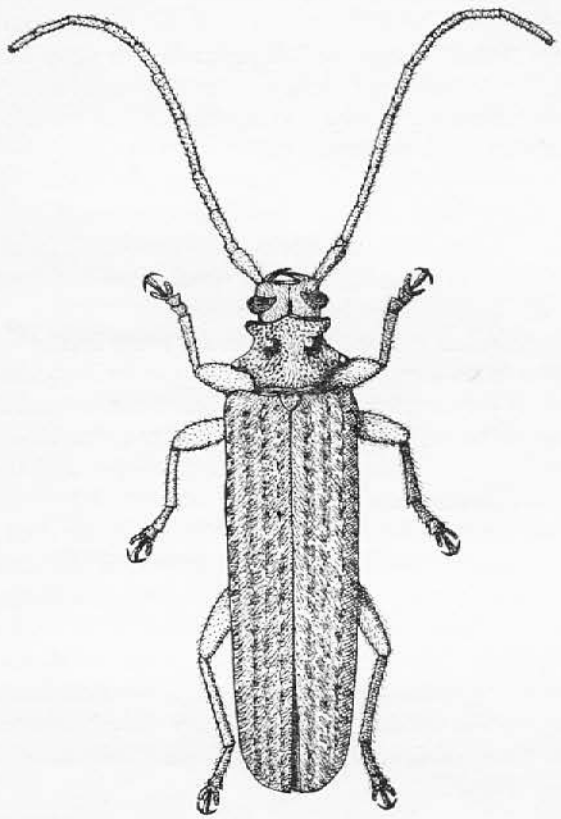

Fig. 71. *Ambeodontus tristis* (Fabricius). Adult.

setigerous spines, 7th with six or seven recurved setigerous pigmented spines posteriorly on each side, 8th with four or five pigmented spines on each side at mid-length and about four pigmented setigerous spines on each side of the posterior margin. Femora with one or two pigmented spines near distal end. Elytra with sparse setae on apical half."

Egg. Ovoid, 1·8 mm. long, yellowish, with smooth shell (Dumbleton, 1957).

Biology. This species has a life-cycle of at least three years and deposits its eggs in cracks, crevices and joints under slight projections or on the surface of roughly sawn wood. Larvae make faint markings with their mandibles round the walls of their galleries. In emerging from their pupal cells, the beetles leave oval-shaped holes with

a major axis of from 1/5–1/3 of an inch. The emergence period is from February to June (Smith and Forbes, 1944).

Although this native species normally lives in dead forest trees, it has of recent years extended its depredations to milled timber. The eggs are frequently laid in batches and the punctures made to receive them may be clearly seen with a low power lens. The galleries run parallel to the grain and may extend for many feet, joists, studs, flooring, etc., being reduced to powder in severe infestations. Larvae pack their galleries tightly behind them with wood dust, and the delicate markings made by the larval mandibles are clearly visible. Before pupation, the larva excavates a cell more or less at right angles towards the surface. The destructiveness of this beetle was clearly demonstrated when the flooring and joists from a considerable portion of a nine-roomed house had to be replaced (Miller, 1925).

Parasite. Hymenoptera: *Doryctes ambeodonti* Muese. (Muesebeck, 1941).

Economic importance. Both the heart-wood and sap-wood of various timbers are frequently infested with larvae of this species, and seasoned as well as recently milled timber are attacked (Pl. VIII, fig. 2). As the larval stage can sometimes exceed five years in duration, the damage done is considerable.

Control. This species has a strong preference for rimu, and as this wood is used for the heavier structures in buildings it is difficult to treat them successfully owing to the shallow penetration of preservatives; moreover, the resinous heartwood is also readily attacked, which is even more resistant than sapwood to preservative penetration. The application of an oil-soluble preservative is recommended and treatment should be undertaken between February and July (Kelsey, 1947).

Spiller (1952) describes an experiment in which newly hatched larvae were transferred to grooves cut in test blocks of *Podocarpus dacrydioides* that had been treated with boric acid and were examined twelve months later. Loadings of 0·092 per cent or more boric acid were found to be lethal, but loadings of 0·046 per cent did not prevent survival and growth. The average weight of the larvae declined as the loadings increased, and by plotting one against the other, a hypothetical minimum toxic loading of about 0·066 per cent was obtained. The larvae are therefore rather more susceptible to boric acid than those of *Lyctus brunneus* (Steph.) and rather less than those of *Anobium punctatum* (Deg.).

Material studied. 3 L, 1 I, New Zealand, from *Dacrydium cupressinum* timber in a building, in coll. B. M.

References. Anonymous 1942 (Contr.), 1943 (Contr.), 1950 (Biol.), 1952 (Contr.); Cawthron Institute, 1939 (Biol.); Clark, 1934 (not seen); Dumbleton, 1957 (E, L fig., P, Biol.); Hudson, 1934 (Biol.); Kelsey, 1947 (L fig., I fig., Biol. fig., Contr.); Miller, 1925 (E fig., L fig., I fig., Biol. fig.), 1955 (Biol. fig.); Muesebeck, 1941 (Biol., Paras.); Smith and Forbes, 1944 (I fig., Biol. fig.); Spiller, 1952 (Contr.).

Baridstus cibarius Newman

[The Bardee or Bardé]

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Western Australia).

Host plant: *Xanthorrhoea* (Tillyard, 1926).

Mature larva. Similar to that of *Blosyropus spinosus* Redtenbacher from which it differs as follows. *Head* with only one pair of ocelli. Hypostoma non-carinate. *Abdomen* with anal lobes much more strongly protuberant. Length up to 40 mm.; maximum breadth (at prothorax) 10 mm.

Biology. This beetle was a favourite food of the aborigines who called it "Bardé"; adults as well as larvae and pupae were consumed. White (1841) gives the following account extracted from the manuscript of Captain Grey. "It is found in the Xanthorhea. The grubs are white, have a fragrant aromatic flavour and form a favourite article of food amongst the natives. They are eaten either raw or roasted, and frequently form a sort of dessert after native repasts. The presence of these grubs in a grass-tree is thus ascertained. If the top of one of these trees is observed to be dead, the natives give it a few sharp kicks with their feet, when, if it contains any 'Bardé', it begins to give way; if this takes place, they push it over, and breaking the tree in pieces with their hammers, extract the 'Bardé.' "

Material studied. 25 L, 2 I, W. Australia, from stems of *Xanthorrhoea*, in coll. B. M.

References. Duffy, 1953a (Biol.); Tillyard, 1926 (Biol.); White, 1841 (I fig. Biol.).

Agapanthida pulchella White

Distribution. AUSTRALASIAN REGION: New Zealand.
Host plant: *Dacrydium cupressinum* (Hudson, 1934).
Reference. Hudson, 1934 (Biol.).

Phlyctaenodes pustulosus Newman

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, South Australia, Tasmania, Victoria).
Host plant: *Eucalyptus obliqua* (Evans, 1943).
References. Best, 1882 (Biol.); Evans, 1943 (Biol.).

Leptachrous strigipennis (Westwood)

Distribution. AUSTRALASIAN REGION: New Zealand.
Host plant: *Elaeocarpus dentatus* (Hudson, 1934).
Reference. Hudson, 1934 (Biol.).

Pseudosemnus retifer Lacordaire (=**Ambeodontus retifer** Lacordaire)

Distribution. AUSTRALASIAN REGION: New Zealand.
Host plant: *Dacrydium cupressinum* (Hudson, 1934).
Reference. Hudson, 1934 (Biol.).

Tessarommatini

Tessaromma undatum Newman

Distribution. AUSTRALASIAN REGION: Australia (Queensland, South Australia, Tasmania, Victoria); New Zealand (introduced).

Host plants: *Eucalyptus* spp. (Duffy, 1953a); *Eucalyptus rostrata* (Tepper, 1887); *Eucalyptus viminalis*, *E. macarthuri* (Clark, 1938); *Eucalyptus melliodora* (Best, 1882); *Eucalyptus dalrympleana*, *E. saligna* (K. M. Moore).

Mature larva. Similar to that of *Blosropus spinosus* Redtenbacher but differing as follows. *Head* with front margin of frons smooth, pale ferruginous. One pair of distinct ocelli present. Hypostoma non-carinate. *Abdomen* with ampullae micro-granulate. *Spiracles* with marginal chambers absent. Length up to 16 mm.; maximum breadth (at prothorax) 5·1 mm.

Pupa. Similar to that of *Blosyropus spinosus* Redtenbacher but differing as follows. *Head* without spine-like tubercles. Antennae terminating alongside eyes. *Pronotum* with lateral tubercles shorter and not inclined anteriorly. *Meso-* and *metanotum* without paired, oval, raised areas but with similar setae. Elytra with apices subtruncate and slightly sinuate. Femora each with two or three stout apical setae. *Functional spiracles* without marginal chambers. Length up to 17 mm.; maximum breadth 5 mm.

Biology. Adults are found mostly in the galleries when the bark has dried and commenced to crack freely, but still requiring force to wrench it off (Tepper, 1887). Larvae work either below or in the bark of felled *Eucalyptus* spp., and pupate either in or below the bark (Pl. IV, figs. 2 and 3). Adults emerge during spring or autumn (K. M. Moore).

Material studied. 4 L, 8 P, 2 I, New Zealand, Whoka, 7.iii.1956, from *Eucalyptus*, in coll. F.R.I.

References. Best, 1882 (Biol.); Clark, 1938 (Biol.); Duffy, 1953a (Biol.); Tepper, 1887 (Biol.).

Tessaromma sericans (Erichson)

Distribution. AUSTRALASIAN REGION: Australia (Queensland, Tasmania), New Zealand (introduced).

Host plant: *Maba fasciculosa* (A. R. Brimblecombe).

Pupa. Similar to that of *T. undatum* Newman but differing as follows. Elytra with apices attenuated. Length up to 18 mm.; maximum breadth 4·5 mm.

Material studied. 2 P, Australia, Queensland, Imbil, 23.iii.1937, A. R. Brimblecombe leg., in coll. D.A.S.B.

References. None available.

Strongylurini

Coptopterus (=**Strongylurus**) **thoracicus** (Pascoe)

[The Pittosporum Tree Borer or Pittosporum Longicorn]

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland, Victoria).

Host plants: *Melia azedarach* (A. R. Brimblecombe); *Melia composita*, *Pittosporum revolutum*, *P. undulatum* (Froggatt, 1895); *Pittosporum eugenioides* (Froggatt, 1923); *Schinus molle*, *Prunus persica*, *Sterculia rupestris* (W. H. Haseler).

Mature larva (fig. 72). Form subcylindrical, rather robust, slightly tapering posteriorly. *Head* subquadrate, with sides almost straight and slightly diverging posteriorly; frontal sutures indiscernible; front margin of frons rather broadly and strongly sclerotised and strongly sinuate medially (as in fig. 59). Temples broadly ferruginous behind ocelli and bearing several bristly setae. Labrum transversely oval, bearing numerous coarse, bristly setae. Antenna with segment 3 very elongate, more than three times as long as basal width and at least two-thirds length of segment 2; supplementary process very short. Three pairs of subcontiguous ocelli present; lens large, strongly convex, pigmented spot distinct. Maxilla with segment 3 of palp less than half length of segment 2. Labial palp with segments 1 and 2 in length. Hypostoma testaceous, except for front margin which is rather broadly ferruginous; a transverse row of four to six coarse setae present on each of gula; gula broad, with sutures raised. *Prothorax* with anterior part of pronotum bearing numerous scattered, ferruginous setae; posterior part milky white and coarsely longitudinally striate. *Meso-* and *metathorax* with sternites each bearing two transverse rows of large moniliform

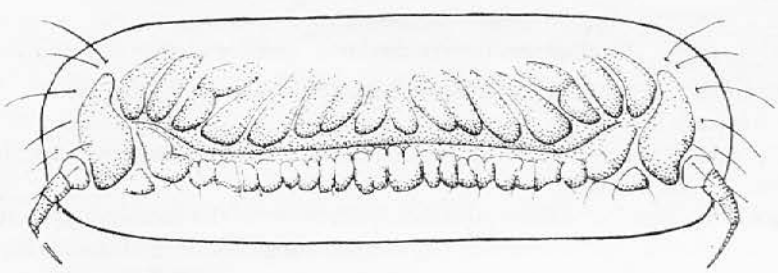

Fig. 72. *Coptopterus thoracicus* (Pascoe). Mature larva. Mesosternum.

tubercles (fig. 72). *Abdomen* with each dorsal ampulla coarsely tuberculate, glabrous and strongly bilobed, especially on segments 4–7. Anal lobes sparsely setose. Pleural discs indistinct. *Legs* 3-segmented, as long as maxillary palp. *Spiracles* with peritreme testaceous, moderately thick, broadly oval and without marginal chambers. Length up to 40 mm.; maximum breadth (at prothorax) 9 mm.

Biology. Larvae of this species girdle and amputate branches of living host trees (Froggatt, 1907). Eggs are deposited in the bark of branches. The larva gnaws its way into the centre of the stem but it usually gnaws round in a circle under the bark first. It then tunnels down the centre of the branch for a distance of several feet. As the wood dries, the branch snaps off at the circular cut, and it is quite usual to see many of the larger shrubs with their leading branches amputated in this manner. During its activities, the larva often comes to the surface and a small quantity of fine wood dust is ejected. Adults emerge early in December (Froggatt, 1923).

Material studied. 2 L, Australia, Queensland, Oakview, 17.i.1936, from *Melia azedarach*, A. R. Brimblecombe leg., in coll. D.A.S.B.; 2 L, Australia, New South Wales, Croydon, from *Pittosporium revolutum*, W. W. Froggatt leg., in coll. D.A.N.S.W.

References. Froggatt, 1895 (L, I, Biol.), 1907 (L fig., I fig., Biol.), 1902b (L fig., I fig., Biol. fig.), 1923 (L fig., I fig., Biol. fig.); Pierce, 1917 (Biol.).

Coptopterus (=Strongylurus] decoratus McKeown

Distribution. AUSTRALASIAN REGION: Australia (Queensland, South Australia).

Host plants: *Araucaria cunninghamii* (McKeown, 1940); *Ficus stenocarpa*, *Casaurina suberosa* (A. R. Brimblecombe).

Mature larva. Similar to that of *S. thoracicus* Pascoe from which it may be distinguished by the abdominal spiracles, which are round, and its smaller size. (Length 29 mm.; maximum breadth (at prothorax) 6·5 mm.

Biology. The larval galleries are shown on Plate V, fig. 2.

Material studied. 1 L, 1 I, Australia, Queensland, x.1937, from *Araucaria cunninghamii*, A. R. Brimblecombe leg., in coll. D.A.S.B.

Reference. McKeown, 1940 (Biol.).

Coptopterus (=Strongylurus) scutellatus Hope

Distribution. AUSTRALASIAN REGION: Australia (Victoria).

Host plant: *Aster ramulosus* (Dixon, 1908).

Coptopterus (=Strongylurus) cretifer Hope

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Victoria, Western Australia).

Host plants: *Exocarpos cupressiformis* (Dixon, 1908); *Casuarina* spp., including *C. torulosa* (K. M. Moore).

Mature larva (fig. 73). Distinguishable from those of the remaining species of this genus by the presence of a series of peg-shaped tubercles on abdominal segment 10 (fig. 73). Length 39 mm.; maximum breadth (at prothorax) 8·5 mm.

Pupa (fig. 74). *Head* with vertex visible from above, dome-shaped, smooth,

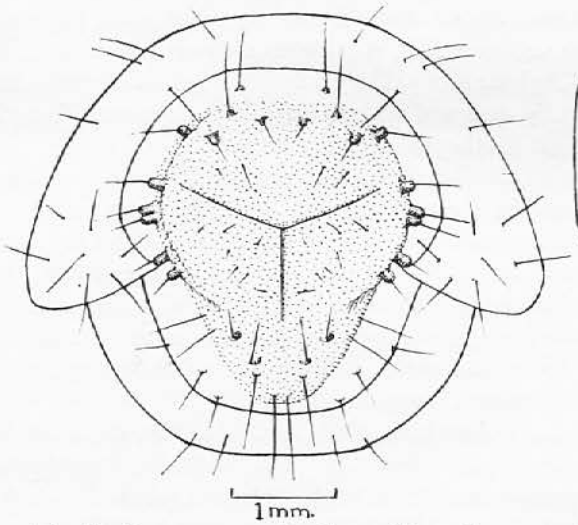

Fig. 73. *Coptopterus cretifer* Hope. Mature larva. Abdominal segments 9 and 10. Caudal aspect.

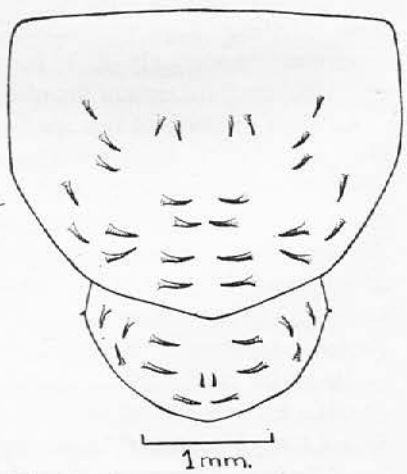

Fig. 74. *Coptopterus cretifer* Hope. Pupa. Abdominal tergites 7 and 8.

glabrous; front smooth, glabrous. Antennae filiform, extending as far as abdominal segment 2, where they are recurved ventrally to terminate alongside sides of head. Eyes strongly convex, glabrous. *Pronotum* quadrate, with sides scarcely rounded and bearing a small pair of median tubercles; disc bearing scattered fine setae especially around front and lateral margins. *Meso-* and *metanotum* with three to six pairs of fine setae. Elytra and wings extending to abdominal segment 4. *Abdomen* with segments 1–6 bearing scattered, short, ferruginous spines (each with an apical seta); tergite 7 subtriangular, with hind margin strongly rounded; disc bearing several large spines which are strongly curved inwards (fig. 74); tergite 8 similar; segments 9 and 10 concealed beneath tergite 8. Sternites with a few fine, sublateral setae. Pleura each bearing three long fine setae. *Legs* glabrous; hind femora extending almost to abdominal segment 5 and lying obliquely to longitudinal axis of body. *Functional spiracles* present on abdominal segments 1–6; peritreme narrowly oval, rather thick, and strongly raised above general level of cuticle. Length up to 25·9 mm.; maximum breadth 7·9 mm.

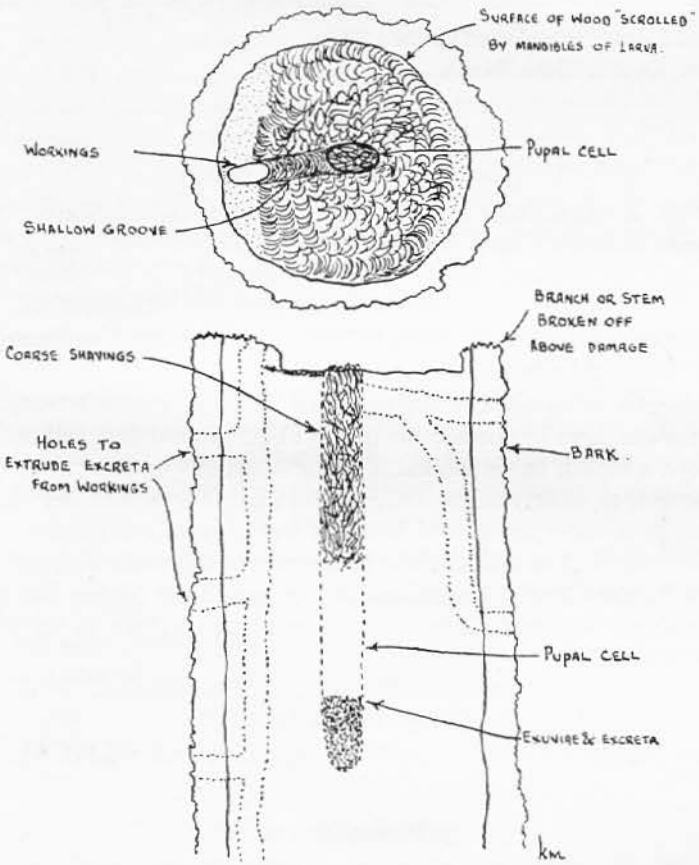

Fig. 75. Damage caused by larva of *C. cretifer* Hope in stem of *Casuarina torulosa* (K. M. Moore).

Biology. Larvae have been reared from *Casuarina* stems and branches approximately 2 in. to 4 in. in diameter. Damage may occur an inch or two above ground-level in the basal area of young trees, or up to 15 feet in older trees. Branches or stems often break off above the area of damage made by the last-instar larvae. There does not appear to be a consistent pattern for the early stages of damage. Initial damage is mainly in the sapwood, larvae later penetrating to the centre of the stem or limb where they pupate (fig. 75). Several openings made by the larvae from the inner workings often penetrate to the surface of the outer bark, and excreta is sometimes extruded through them. Adults have been collected during October and November (K. M. Moore).

Material studied. 3 L, 2 P, Australia, New South Wales, Lisarow, 11.xi.1956–12.vii.1957, from *Casuarina torulosa*, K. M. Moore leg., in coll. F.C.N.S.W.

Reference. Dixon, 1908 (Biol.).

Coptopterus (=Strongylurus) scutellatus (Hope)

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Victoria).

Host plant: *Aster ramulosus* (Dixon, 1908).

Reference. Dixon, 1908 (Biol.).

Citriphaga mixta Lea

[The Native Lime-Tree Borer]

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland).

Host plant: *Atlantia glauca* (Froggatt, 1923); *Eremocitrus glauca* (W. A. McDougall).

Mature larva. Very similar to those of *Coptopterus* but distinguishable by the non-sinuate front margin of the frons and the glabrous hypostoma. Length up to 28 mm.; maximum breadth (at prothorax) 5·9 mm.

Biology. Eggs are deposited in the bark a few inches above the ground. The active feeding stage of the larva has been estimated at about ten months, and the pupal stage as lasting from a month to six weeks. The larva tunnels up the centre of the stem, forming a large open gallery often straight ahead for four or five feet; but where, as sometimes happens, there are several larvae at work, they form parallel galleries and riddle the whole stem. The action of the larvae caused a considerable gumming of the damaged wood; often large, clear lumps of gum are found on the disc of the stem, and even running in a liquid state down the excavated gallery in the centre of the branch (Froggatt, 1923).

Material studied. 1 L, Australia, Queensland, Goondiwindi, from *Eremocitrus glauca*, vi.1960, W. A. McDougall leg., in coll. D.A.S.B.

References. Froggatt, 1919a (L fig., P fig., I fig., Biol. fig.), 1923 (L fig., P fig., I fig., Biol. fig.).

Lygesis mendica Pascoe

[The Slender Grey-haired Longicorn]

Distribution. AUSTRALASIAN REGION: Australia (New South Wales).

Host plant: *Acacia decurrens* (Froggatt, 1907).

Biology. Adults emerge from August to November from infested twigs of the dead host (Froggatt, 1894).

References. Froggatt, 1894 (L, Biol.), 1902a (Biol.), 1907 (Biol.), 1923 (Biol.).

Piesarthrius marginellus Hope

[The Acacia Borer or Feather-horned Longicorn]

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland, Victoria, Western Australia).

Host plants: *Acacia longifolia*, *A. decurrens*, *A. mollissima* (Froggatt, 1893).

Mature larva. Only larval exuviae are available of this species which apparently differs from larvae of *Coptopterus* at least in having sclerotised presternal plates bearing coarse setae arising from ferruginous basal rings. From the exuviae it could not be determined with certainty whether the posterior part of the pronotum was striate or smooth, though the latter seems more likely.

Biology. Eggs are deposited in the crevices in the bark or in the wood, and when hatched, the young larvae commence to bore into the tree, frequently killing it outright (French, 1900). Larvae bore and pupate in the centre of branches of *Acacia* and can be easily reared from infested wood, although adults are seldom found on the host plant, for as soon as they emerge, they crawl up to the top of the tree and cling to the twigs (Froggatt, 1907). According to Illidge (1922), the larva cuts off the twig just above the gallery; occasionally it cuts itself off below and falls to the ground. Adults emerge during mid-December and at Rose Bay, hundreds of branches and young saplings are cut off annually (Froggatt, 1893).

Parasite. The chief parasite is *Aulacus apicalis* (Evaniidae), larvae of which feed on the longicorn larvae, enveloping them with their silken cocoons (Froggatt, 1923).

Control. Infested branches should be promptly sawn off and burned (French, 1900).

Material studied. 1 I and larval exuviae, Australia, New South Wales, Cheltenham, 9.i.1958, from *Acacia*, C. E. Chadwick leg., in coll. D.A.S.B.

References. Best, 1881 (Biol.); French, 1900 (L fig., P fig., I fig., Biol. fig., Contr.); Froggatt, 1893 (L, I, Biol.), 1907 (Biol.), 1923 (Biol.); Illidge, 1922 (Biol.); Pierce, 1917 (Biol.).

Piesarthrius frenchi (Blackburn)

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland).

Host plants: *Diospyros cargillia*, *Acacia* spp. (Tillyard, 1926).

Reference. Tillyard, 1926 (Biol.).

Uracanthini

Scolecobrotus westwoodi Hope

[The Rough-shouldered Longicorn]

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, South Australia, Victoria, Western Australia).

Host plants: *Eucalyptus melliodora* (Best, 1898); *Eucalyptus gummifera*, *E. gracilis* (Froggatt, 1923).

Mature larva (fig. 76). Very similar to those of *Uracanthus* species from which it may be distinguished by the feebly trilobed or tridentate caudal process, beneath which is a single pair of conical tubercles. Abdominal ampullae strongly tuberculate. Length up to 35 mm.; maximum breadth (at prothorax) 6·1 mm.

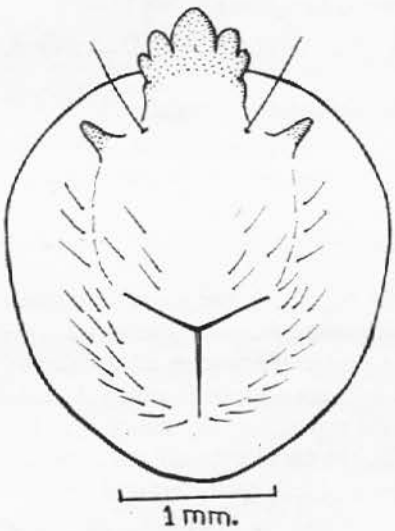

Fig. 76. *Scolecobrotus westwoodi* Hope. Mature larva. Abdominal segment 10. Caudal aspect.

Biology. In the case of *E. corymbosa*, the larva enters the stem about one foot above level, boring its way upward, hollowing out the branches, then tunnelling downward, finally gnawing right round the top of the stem just where it first entered. It thus kills the bush, which when touched, snaps off at the gnawed ring. The larva, having fed downward through the centre below the fractured top, usually pupates in the bottom of the gallery situated just a few inches above the ground (Froggatt, 1894, 1923). Adults are usually found upon *Leptospermum* in November. According to Best (1882, 1898), larvae infesting *E. melliodora* may be found in fallen branches, the ends of which are gnawed away and plugged with wood fibres. The larval galleries, unlike those of *Phoracantha* species are kept quite clear of frass.

Material studied. 3 L, Australia, New South Wales, Botany, 7.ix.1892, from *Eucalyptus gummifera*, in coll. D.A.N.S.W.

References. Best, 1882 (Biol.), 1898 (Biol.); Dixon, 1908 (Biol.); Froggatt, 1894 (L, I, Biol.), 1898 (Biol.), 1923 (Biol.).

Uracanthus triangularis Hope

[The Triangular-marked Banksia Beetle or the Triangular-marked Longicorn]

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland, South Australia, Tasmania, Victoria, Western Australia).

Host plants: *Acacia decurrens* and various shrubs (Froggatt, 1907); *Banksia integrifolia* (French, 1900); *Acacia longifolia* (Best, 1880); *Eriostemon lanceolatus*, *Boronia pinnata* (Froggatt, 1893); *Acacia pycnantha*, *A. mollissima* (Best, 1920).

Adult (fig. 77). Length 18–34mm. *Head*, prothorax and elytra covered with coarse light-brown pubescence, except for glabrous dark-brown lateral and apical areas on the latter, as figured. *Head* with antennae not extending as far as elytral apices. *Prothorax* with disc transversely strigose. Elytra with both apical angles strongly spined.

Mature larva (fig. 78) . Similar to that of *U. cryptophagus* Olliff in possessing a single caudal, spine-like process. The conical tubercles, however, instead of being placed laterally on the spine-like process, are placed beneath it some distance apart (fig. 78).

Biology. Eggs are deposited in the smaller branches of the host tree. Larvae have the curious habit of cutting off to the shape of a stock ready to receive a scion the top of small branches; usually there is a small amount of wood dust protruding from the upper portion of the V-shaped cut, which is a useful indication of the presence of larvae (French, 1900). Adults emerge from September to December, although they eclode as early as June. They are to be found on the leaves and flowers of *Eucalyptus* and *Leptospermum* species. When handled, they stridulate audibly and attempt to force their way between the fingers (French, 1900, Tepper, 1887).

Control. French (1900) suggests in the case of infested orchard and avenue trees the use of a steam sprayer, by means of which sulphur or carbolic acid in vaporized form and as hot as possible, can be forced into holes in the bark.

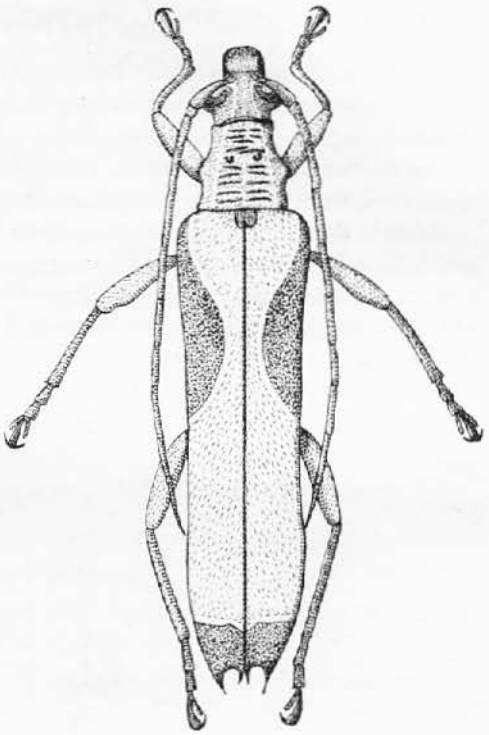

Fig. 77. *Uracanthus triangularis* Hope. Adult.

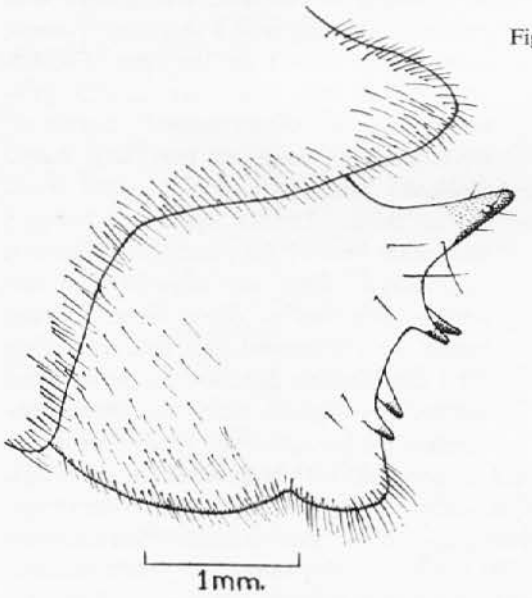

Fig. 78. *Uracanthus triangularis* Hope. Mature larva. Abdominal segment 10. Lateral aspect.

Material studied. 2 L, Australia, New South Wales, Rose Bay, W. W. Froggatt leg., from *Eriostemon lanceolatus*, in coll. D.A.N.S.W.

References. Best, 1882 (Biol.), 1920 (Biol.); French, 1900 (L fig., P fig., I fig., Biol. fig., Contr.); Froggatt, 1893, (L, Biol.), 1898 (Biol.), 1920a (Biol.), 1907 (Biol.), 1923 (Biol.); Gallard, 1916 (Biol.); McKeown, 1944 (Biol.); Pierce, 1917 (Biol.); Tepper, 1887 (Biol.).

Uracanthus cryptophagus Olliff

[The Great Orange Tree Borer or the Citrus Branch Borer]

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland).

Host plants: *Citrus* spp. including *C. australasica* and *C. sinensis* (A. R. Brimblecombe).

Adult. Similar in form to *U. triangularis* Hope (fig. 77) but with prothorax and elytra uniformly yellowish brown, the latter longitudinally striate.

Mature larva (fig. 79). Form elongate, subcylindrical, rather slender. *Head* with genae broadly ferruginous and bearing several long curved setae. Front margin of frons broadly ferruginous. Mandible smooth, pitchy, with several short setae on basal half of outer face. Labrum subcircular, fringed anteriorly and laterally with coarse setae. Three pairs of subcontiguous ocelli present; lens small, round, convex, pigmented spot very distinct. Hypostoma smooth, glabrous, narrowly ferruginous anteriorly. Gular sutures slightly raised. Maxilla with segment 3 of palp about half length of segment 2. *Prothorax* with pronotum pale ferruginous and sparsely setose anteriorly; posteriorly pale testaceous, very coarsely longitudinally striate and slightly protuberant. *Abdomen* with dorsal ampullae glabrous, with a single transverse furrow and feebly and rather coarsely tuberculate. Tergite 9 truncate and densely and coarsely setose posteriorly. Segment 10 strongly sclerotised, ferruginous and produced dorsally into a very large conical spine-like process, from the sides of which project four pairs of smaller, conical processes (fig. 79); Anus ventral. *Legs* well developed, as long as maxillary palpi. *Spiracles* with peritreme broadly oval, rather thick. Length up to 45·5 mm.; maximum breadth (at prothorax) 7 mm.

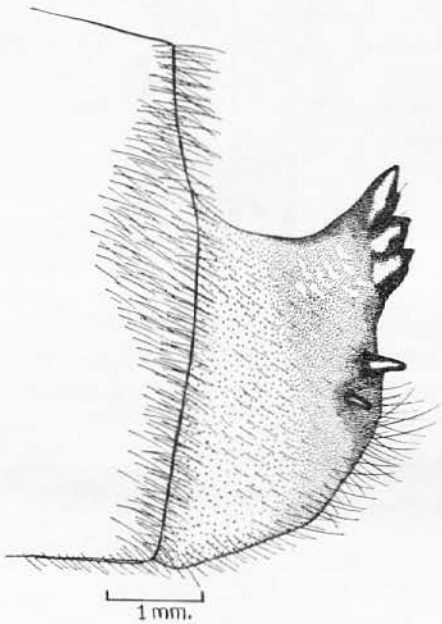

Fig. 79. *Uracanthus cryptophagus* Olliff. Mature larva. Abdominal segment 10. Lateral aspect.

Biology. Eggs are deposited in the smaller branches of *Citrus* trees. Larvae tunnel up the central pith channel, often for a considerable distance. Sometimes the mature larva gnaws round the branch beneath the bark, thereby weakening it and causing it ultimately to fall to the ground. Larvae tunnel into both branches and trunk and in them make a series of frass-injection holes. A larval gallery may often be traced from a main limb into several smaller branches, and it has been estimated that a mature larva can have tunnelled from 15 to 18 feet (excluding ring-barking). When mature, the larva prepares an irregular cell varying from approximately 1 to 4 in. in diameter, usually within a rather stout branch; it is beneath this cell that ring-barking has usually

taken place. One larva was observed to have made nine ejection holes. The beetle usually emerges at the lower end of the cell by way of the opening to the bark which has been enlarged by the larva for this purpose (Olliff, 1892).

Economic importance. This species has been recorded destroying orange trees in New South Wales (French, 1900). Its original host was apparently the finger lemon (*Citrus australasica*) but it has since caused serious damage in orange orchards (Froggatt, 1923).

Control. Brimblecombe (1943) recommends efficient cultivation, manuring and pruning. Pruning cuts on the larger branches should be sealed with a grafting wax or crude petroleum jelly. Infested branches may be treated by injecting the uppermost frass-injection hole with carbon bisulphide, the remaining holes being sealed with soap.

Material studied. 2 L, Australia, Queensland, Flaxton, 9.v.1924, from *Citrus*, in coll. D.A.S.B.; 1 L, Australia, Queensland, Mackay; ix. 1960, from *Citrus sinensis*, A. R. Brimblecombe leg., in coll. D.A.S.B.

References. Brimblecombe, 1943 (E fig., L fig., Biol. fig., Contr.); French, 1900 (Biol.); Froggatt, 1898 (Biol.), 1907 (Biol.); 1919a (Biol.), 1923 (Biol.), 1927a (Biol.); Olliff, 1892 (L fig., P fig., I fig., Biol. fig.); Pierce, 1917 (Biol.); Veitch, 1938 (L fig., I fig., Biol., Contr.).

Uracanthus pallens Hope

Distribution. AUSTRALASIAN REGION: Australia (Tasmania, New South Wales).

Host plant: *Callitris hugelii* (K. M. Moore).

Mature larva (fig. 80). Similar to that of *U. cryptophagus* Olliff, but differing as

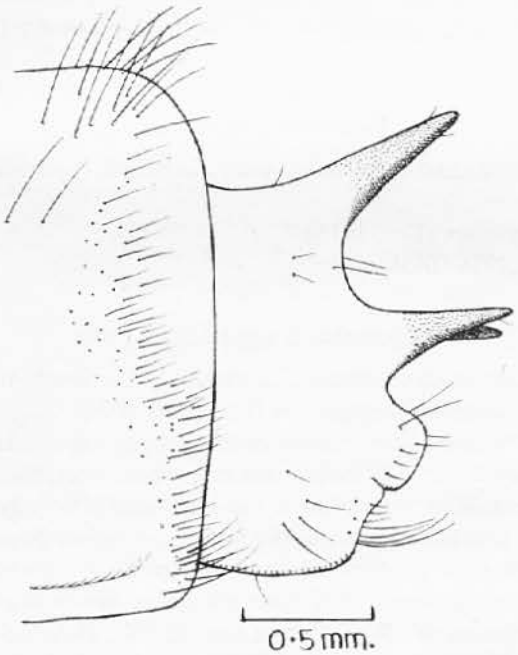

Fig. 80. *Uracanthus pallens* Hope. Mature larva. Abdominal segment 10. Lateral aspect.

follows. *Abdomen* with segment 10 (fig. 80) bearing two long, spine-like processes, the lower one being bifid apically.

Biology. Larvae attack and kill the upper half of young regeneration (up to 5 ft. in height) of the host plant. Attack appears to be initiated near the tip of the stem, the larvae then working below the bark in a single channel longitudinally, to about half-way down the stem from ground-level, where the stem is girdled by the larvae. Tops of plants break off readily at this point, and sometimes fall to the ground, the larvae working in the dead tops. Larvae also work in the centre of the stems for the length of the dead portion, and the small branchlets are also invaded for short distances (K. M. Moore).

Economic importance. Larvae are responsible for killing the tops of regeneration of the host plant throughout the western districts of New South Wales (K. M. Moore).

Material studied. 8 L, Australia, New South Wales, ix.xii.1959, from *Callitris hugelii*, K. M. Moore leg. in coll. F.C.N.S.W.

References. None available.

Uracanthus bivittata Newman

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland, South Australia, Victoria, Western Australia).

Host plants: *Ulex* (French, 1900); *Acacia longifolia* (Pierce, 1917); *Pultenaea stipularis* (C. E. Chadwick); *Helichrysum ferrugineum* (McKeown).

Biology. Adults are to be found during November feeding on *Leptospermum scoparium*.

References. Best, 1882 (Biol.), French, 1900 (Biol.), 1911 (Biol.); Pierce, 1917 (Biol.).

Uracanthus albatus Lea

Distribution. AUSTRALASIAN REGION: Australia (South Australia, Victoria, Western Australia).

Host plant: *Acacia* sp. (Lea, 1916).

Reference. Lea, 1916 (Biol.).

Uracanthus froggatti Blackburn

Distribution. AUSTRALASIAN REGION: Australia (New South Wales).

Host plant: *Lasiopetalum ferrugineum* (Froggatt, 1894).

Mature larva. Only very small larvae of this species are available. On these there is no caudal armature but it is probable that this is characteristic only of later instars.

Biology. Larvae feed in the stems of the host, completely hollowing them for a considerable length, and usually cutting the branch off before pupating, and forming a cell at the end of the gallery. Adults emerge in April.

Material studied. 3 L (immature), Australia, New South Wales, Rose Bay, from *Lasiopetalum ferrugineum*, W. W. Froggatt leg., in coll. D.A.N.S.W.

References. Blackburn, 1894 (Biol.); Froggatt, 1894 (L, I, Biol.).

Uracanthus loranthi Lea

Distribution. AUSTRALASIAN REGION: Australia (Victoria).
Host plant: *Loranthus* (Lea, 1916b).
Reference. Lea, 1916b (Biol.).

Uracanthus maleficus Lea

Distribution. AUSTRALASIAN REGION: Australia (Tasmania).
Host plant: *Corylus* (Lea, 1917).
Reference. Lea, 1917 (I fig., Biol.).

Uracanthus pertenuis Lea

Distribution. AUSTRALASIAN REGION: Australia (South Australia, Tasmania, Victoria, Western Australia).
Host plants: *Loranthus* sp., *Acacia armata* (Lea, 1916b).
Reference. Lea, 1916b (Biol.).

Uracanthus simulans Pascoe

Distribution. AUSTRALASIAN REGION: Australia (South Australia, Victoria, Western Australia).
Host plants: ?*Olearia* (French, 1900); *Acacia longifolia* (Pierce, 1917); *Banksia australis, Helichrysum ferrugineum, Acacia* sp. (French, 1911).
Biology. Adults emerge during December and April (French, 1911).
Control. All infested branches should be burned. Adults may be collected at night by attracting them with artificial light (French, 1911).
References. Best, 1882 (Biol.); French, 1900 (Biol.), 1911 (L fig., P fig., I fig., Biol. fig., Contr.); Pierce, 1917 (Biol.).

Uracanthus strigosus Pascoe

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, South Australia, Victoria).
Host plants: *Helichrysum ferrugineum, Acacia* (French, 1911).
Reference. French, 1911 (Biol.).

Uracanthus acutus Blackburn

[The Apricot Longicorn]

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Victoria).
Host plants: *Acacia dealbata, A. mollissima* (Dixon, 1908); *Amygdalus persica, Armeniaca vulgaris* (Froggatt, 1898).
Biology. Larvae at first bore towards and then into the heartwood, but later tunnel right round beneath the bark, causing the latter to wither and die, and finally break off (Froggatt, 1898).
Economic importance. Perfectly healthy fruit trees are often attacked by this species.
References. Dixon, 1908 (Biol.); Froggatt, 1898 (I fig., Biol.).

Rhinophthalmus sp.

Distribution. AUSTRALASIAN REGION: Australia (Queensland).

Host plant: *Niemeyera chartacea* (A. R. Brimblecombe).

Mature larva (fig. 81). The following description is incomplete owing to the desiccated condition of the only available larva. *Head* with sides strongly rounded; front margin of frons bearing several very long setae. Three pairs of subcontiguous ocelli present; pigmented spot very distinct, black. Hypostoma smooth, narrowly ferruginous anteriorly. *Prothorax* with posterior area of pronotum glabrous, milky white and with a few coarse longitudinal striae; anteriorly bearing three or four pairs

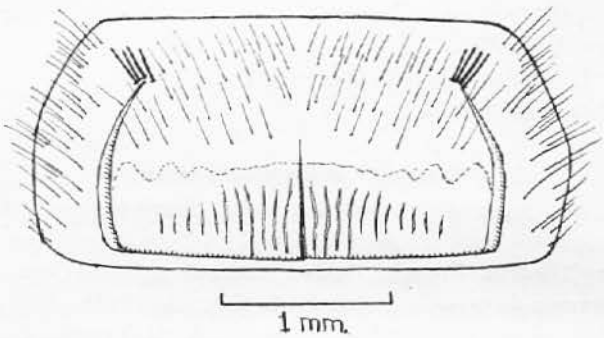

Fig. 81. *Rhinophthalmus* sp. Mature larva. Pronotum.

of very coarse bristly setae (fig. 81) which strongly contrast with the surrounding much finer setae *Abdomen* with ampullae bearing moniliform tubercles. Segments 9 and 10 without processes.

Material studied. 1 L, 2 I, Australia, Queensland, Yarraman, 20.x.1961, from *Niemeyera chartacea*, A. R. Brimblecombe leg., in coll. D.A.S.B.

Rhinophthalmus modestus Blackburn

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Victoria).

Host plant: *Acacia pendula* (J. W. Armstrong).

References. None available.

Rhinophthalmus nasutus (Shuckard)

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland, Victoria).

Host plants: *Acacia longifolia* (Froggatt, 1894; *Acacia mollissima, A. baileyana* (Dixon, 1908).

Biology. Adults emerge towards the end of November (Froggatt, 1894).

References. Dixon, 1908 (Biol.); Froggatt, 1894 (I, Biol.), 1923 (Biol.).

Rhagiomorphini

Stenopotes pallidus Pascoe

Distribution. AUSTRALASIAN REGION: New Zealand.

Host plant: *Pinus radiata* (Gourlay, 1951); *Podocarpus totara*, *P. ferrugineus*, *Dacrydium cupressinum*, *Larix* (Morgan, 1960b).

Mature larva (fig. 82). Form subcylindrical, slender, tapering posteriorly. *Head* strongly transverse, with sides feebly rounded and widest posteriorly. Front margin of frons broadly ferruginous, swollen, with a pair of paramedian rounded tubercles; gena with a distinct rounded tubercle immediately above antenna; bearing a vertical row of

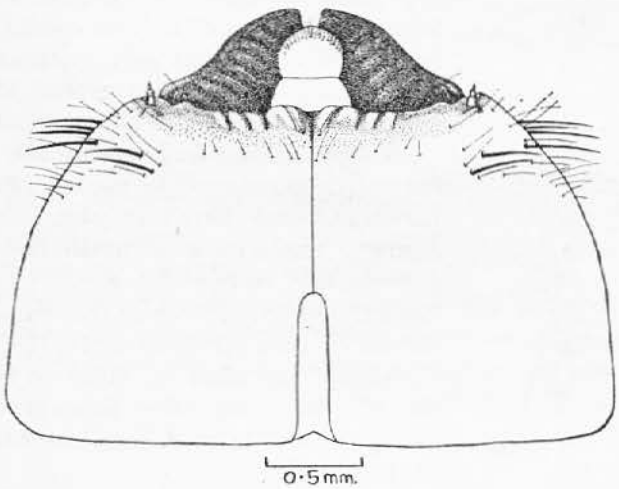

Fig. 82. *Stenopotes pallidus* Pascoe. Mature larva. Head. Dorsal aspect.

about six extremely coarse setae which strongly contrast with the numerous remaining, much finer setae. Antenna 3-segmented; segment 2 strongly transverse, segment 3 elongate. Mandible smooth, with basal part ferruginous. Labrum cordate, densely fringed anteriorly with pale stiff setae. Three pairs of subcontiguous ocelli present. Hypostoma smooth and pale testaceous. Maxilla with segment 3 of palp elongate, as long as segment 2. Labial palpi with segment 2 as long as segment 1. *Prothorax* with pronotum smooth, pale, glabrous, faintly longitudinally striate on posterior fourth; median cleavage line faintly impressed; eusternum feebly defined smooth, glabrous. *Abdomen* with dorsal ampullae faintly rugulose, non-tuberculate, each with a pair of distinct transverse impressions; segment 9 attenuated, about one and one-half time as long as segment 8. *Legs* rather small, 4-segmented. *Spiracles* with peritreme broadly oval, testaceous, and feebly sclerotised, and bearing several subcontiguous marginal chambers on posterior half. Length up to 21 mm.; maximum breadth (at prothorax) 5 mm.

Pupa (fig. 83). Form extremely elongate, slender. *Head* entirely concealed from above by pronotum, extremely elongate; vertex glabrous, front with a group of stout setae beneath each antennal tubercle. Antennae extending as far as abdominal segment

4, where they are strongly recurved ventrally to terminate alongside sides of head. Eyes strongly convex. Mandibles each with two or three minute, pale setae on apical half of outer face. *Pronotum* extremely elongate, with a pair of paramedian, setose tubercles, one pair small and placed medially, the other large and placed sub-basally. *Meso-* and *metanotum* each with a pair of paramedian tubercles bearing a group of stout, anteriorly-inclined setae. Elytra and wings extending to abdominal segment 4. *Abdomen* with tergites 1–8 each bearing a pair of paramedian tubercles near posterior margin, each tubercle bearing a transverse row of spinules (each with a fine basal seta). Sternites glabrous. Pleura moderately protuberant. *Legs* with hind femora lying almost parallel to longitudinal axis of body. *Functional spiracles* present on adbominal segments 1–7; peritreme broadly oval, thin, slightly raised above general level of cuticle. Length up to 18 mm.; maximum breadth 4·75 mm.

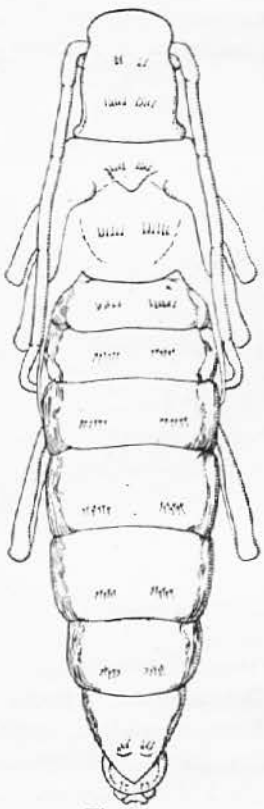

Fig. 83.
Stenopotes pallidus Pascoe.
Pupa. Dorsal aspect.

Biology. Larvae feed subcortically in dying trees, but enter the sapwood to pupate. (Rawlings, 1953). Larvae and adults have been taken from dead *Pinus* in January. The larvae make broad shallow, subcortical galleries, later entering the wood to a depth of up to one inch to pupate, blocking the exit hole with coarse shreads of wood (Dumbleton, 1957).

Adults may often be taken on flowers of white rata at night or beaten from forest growth in day-time during the months of January to March (Hudson, 1934).

Morgan (1960b) has made the following observations. "Earliest recorded emergences were in late September, though most adults emerge between early December and late January. Mating has been observed on three trunks during the evening and eggs are deposited in bark crevices under the raised edges of the bark. The incubation period ranges between 15 and 26 days, most hatching occurring in 18–21 days. The larvae feed for some time in the phloem/cambial tissues of dying, dead and recently felled trees. They enter the wood about half-way through larval development, becoming wood-borers. Their tunnels are packed tightly with frass. Pupal chambers are constructed in the wood and open to the inner bark. The pupal and teneral adult period ranges between 27 and 32 days. Development from egg to adult takes about 14 months, so that overlapping broods may occur in this species. The spring laid eggs apparently produce adults in the summer about 14 months after oviposition, and late summer and autumn eggs give rise to adults in the spring 18–20 months later.

Material studied. 12 L, 2 P, 1 I, New Zealand, Wheki, S. F. 15.i.1956, from *Pinus radiata*, G. B. Rawlings leg., in coll. B. M.

References. Dumbleton, 1957 (L fig., Biol.); Gourlay, 1951 (Biol.); Hudson, 1934 (Biol.); Morgan, 1960b (Biol.); Rawlings, 1953 (Biol.).

Tritocosmia latecostata Fairmaire

[The Cypress Longicorn]

Distribution. AUSTRALASIAN REGION: Australia (New South Wales).

Host plant: *Callitris glauca* (A. R. Brimblecombe).

Biology. The larval galleries are shown on Pl. VII, fig. 2.

Economic importance. Larvae make galleries in the sapwood which, as the tree grows, become incorporated in the heartwood. Attack by successive generations spoil most of the timber for commercial use (Brimblecombe, 1956).

Reference. Brimblecombe, 1956 (Biol. fig.).

Stenoderini

Pseudocalliprason marginatum (White)

Distribution. AUSTRALASIAN REGION: New Zealand.

Host plant: *Ixerba brexioides* (G. B. Rawlings).

Mature larva (fig. 84). Form moderately robust, subcylindrical, slightly tapering posteriorly. *Head* (fig. 84) subtrapezoidal, with sides straight and widest posteriorly. Gena shouldered, ferruginous, and with a distinct dentate process immediately above

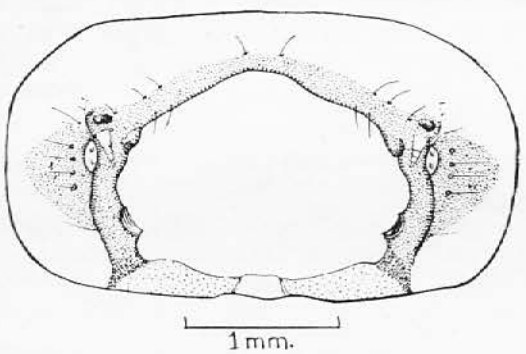

Fig. 84. *Pseudocalliprason marginatum* (White). Mature larva. Mouthframe.

antennal foramen; temple with a vertical row of three to four setal pores immediately behind ocelli. Mouthframe broadly and completely sclerotised and ferruginous. Mandible broad, with basal part ferruginous, longitudinal median impression shallow. Two pairs of large subcontiguous ocelli present laterad and ventrad of antenna; ocellar lens oval, strongly protuberant, pigmented spot distinct. Hypostoma smooth, ferruginous anteriorly, sutures incurved. Gular region with a pair of strongly raised, rather thick sutures. Maxilla with segment 3 of palp about half length of

second; process of palpifer almost as long as palpal segment 3. Segment 2 of labial palpi about half length of segment 1. *Prothorax* ferruginous anteriorly; posterior part feebly and coarsely longitudinally striate, median cleavage line indistinct. Eusternum semicircular, sparsely setose. *Abdomen* with dorsal ampullae rugose, feebly tuberculate glabrous; posterior transverse impression and median furrow distinct. Segment 9 attenuated, at least one and one-half times as long as segment 8. Anal lobes sparsely setose. Pleural discs indiscernible. *Legs* well developed, 4-segmented.

Spiracles with peritreme pale, moderately thick and subcircular. Length up to 22 mm.; maximum breadth (at prothorax) 6 mm.

Biology. Larvae tunnel beneath the bark and later in the wood. A curious crescentic excavation is made in the bark by the larva before pupation, which probably facilitates the emergence of the adult (G. B. Rawlings).

Material studied. 7 L, New Zealand, Mangowera Gorge, 23.i.1949, from *Ixerba brexoides*, G. B. Rawlings leg., in coll. F.R.I.

References. None available.

Calliprason sinclairi White

Distribution. AUSTRALASIAN REGION: New Zealand.

Host plants: *Hedycarya arborea* (Hudson, 1934); *Podocarpus ferrugineus* (G. B. Rawlings).

Mature larva. Similar to that of *Pseudocalliprason marginatum* (White) from which it differs as follows. *Head* with genae without a dentate process immediately above antenna. Three pairs of subcontiguous ocelli present, which are placed on a protuberant ridge on the gena. Length up to 16 mm.; maximum breadth (at prothorax) 4 mm.

Pupa (figs. 85–86). *Head* (fig. 85) with vertex not concealed from above by pronotum, glabrous; front with a pair of transversely oval tubercles (each with three stout setae arising from conical papillae) beneath antennal tubercles (fig. 85). Antennae extending as far as abdominal segment 3, where they are recurved ventrally to terminate alongside front tarsi. *Pronotum* elongate, with sides bearing a pair of stout

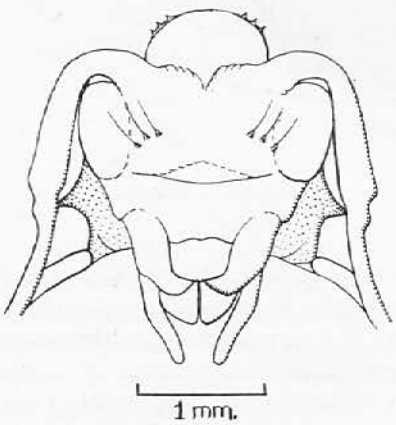

Fig. 85. *Calliprason sinclairi* White. Pupa. Head. Ventral aspect.

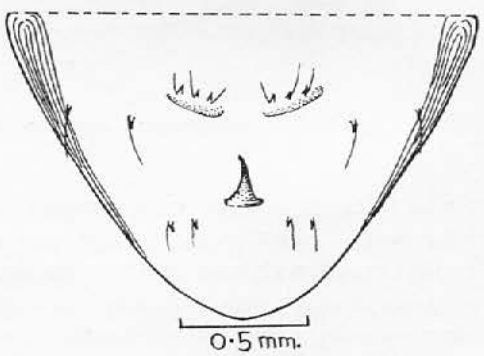

Fig. 86. *Calliprason sinclairi* White. Pupa. Abdominal tergite 7.

medial tubercles; several conical setose papillae present near anterior and posterior margins. *Mesonotum* and *metanotum* each with a few fine setae. *Abdomen* with tergites 1–6 each with several short stout spines arranged more or less in a row near posterior margin, anterior to which is a median row of about six much smaller spines. Tergite 7 (fig. 86) with a stout vertical spine arising from a basal tubercle near posterior margin. Tergite 8 with a row of three small spines on disc; sternites glabrous. *Legs* glabrous; hind femora long, extending to between abdominal segments 7 and 8. *Functional spiracles* present on segments 1–6; peritreme broadly oval, thick and appreciably raised above general level of cuticle. Length up to 11 mm.; maximum breadth 4 mm.

Biology. Adults may be beaten from forest growth from December to February (Hudson, 1934).

Material studied. 2 L, 1 P, 2 I, New Zealand, 28.xi.1949, from *Podocarpus ferrugineus*, G. B. Rawlings leg., in coll. B.M.

Reference. Hudson, 1934 (Biol.).

Stenocentrus (=**Stenoderus**) **suturalis** (Olivier)

[The Stinking Longhorn]

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, South Australia, Tasmania, Victoria, Western Australia).

Biology. Adults may be found abundantly on flowers of *Eucalyptus*, *Leptospermum* and *Melaleuca* in October and November. They take readily to flight when disturbed. This is probably the most abundant Australian cerambycid, and during December and January it literally swarms in some districts and hundreds of specimens may sometimes be obtained by beating a single branch. Flowers of *Senecio gunniana* and *Bursaria spinosa* are also attractive to this species. When molested, the beetle secretes a fluid of pungent odour resembling tar (Tepper, 1887).

Reference. Tepper, 1887 (Biol.).

Syllitus araucariae McKeown

Distribution. AUSTRALASIAN REGION: Australia (Queensland).

Host plant: *Araucaria cunninghamii* (Brimblecombe, 1945).

Mature larva. Form subcylindrical, extremely slender, slightly tapering posteriorly. *Head* trapezoidal (with sides almost straight), and widest posteriorly. Mouthframe feebly sclerotised, testaceous; genae bearing numerous long, fine, curved setae. Ocelli absent. Hypostoma entirely testaceous, with sutures straight. Maxilla with palp 3-segmented. *Prothorax* with pronotum smooth and glabrous. *Abdomen* with dorsal ampullae rather strongly protuberant (but not bilobed) and finely micro-granulate. Tergite 9 without a sclerotised process. Anal lobes compact. *Legs* absent. *Spiracles* minute, with peritreme pale, broadly oval. Length up to 8mm.; maximum breadth (at prothorax) 1·3 mm.

Pupa (fig. 87). *Head* with vertex visible from above, smooth, with a minute setose papilla near base of each antenna; front with an oblique row of three fine setae beneath base of each antenna. Antennae covered with rather coarse spicules and extending to between abdominal segments 2 and 3, where they are recurved ventrally

to terminate alongside sides of head. Eyes very strongly convex and protuberant. Labrum and clypeus glabrous. *Pronotum* elongate, with front margin and basal half of sides strongly rounded; bearing numerous very fine, pale setae, mainly along margins; basal half of disc with a pair of parallel, sublateral carinae. *Mesonotum* and *metanotum* bearing a few fine pale setae. Elytra and wings extending to abdominal segment 4. Abdomen with tergites 1–6 bearing a few minute pale setae only. Tergite 7 with a pair of paramedian anteriorly-curved spines near posterior margin; tergite 8 with two pairs of slightly shorter spines. Segment 9 retracted in segment 8. Sternites with a few pale setae. *Legs* with hind femora extending to abdominal segment 4; femora each with a single stout apical seta. Length up to 6·9 mm.; breadth 1·4 mm.

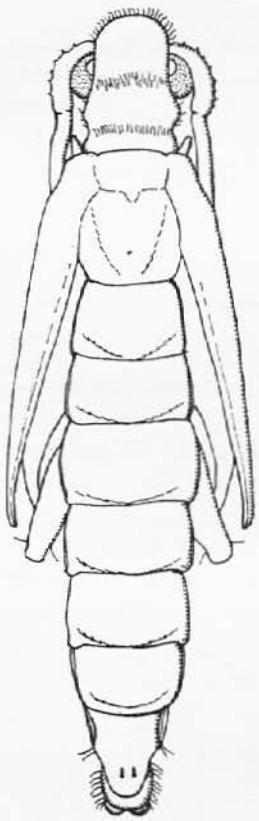

Fig. 87. *Syllitus araucariae* McKeown. Pupa. Dorsal aspect.

Although this genus has been placed in the Stenoderini on the basis of adult characters, both the larva and pupa of *S. araucariae* McKeown are not at all typical of this tribe, and, on account of their lack of ocelli and legs and their slender form, they could readily be included in the Molorchini but for the shape of the head capsule.

Biology. Larvae infest only dying or sickly trees (Brimblecombe, 1945).

Material studied. 1 L, 2 P, 2 I, Australia, Queensland, Yarraman, 10.xi.1942, from *Araucaria cunninghamii*, A. R. Brimblecombe leg., in coll. D.A.S.B.

References. Brimblecombe, 1945 (Biol.); McKeown, 1938 (Biol.).

Syllitus grammicus (Newman)

[The Slender-lined Longicorn]

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Northern Territory, Queensland, South Australia, Tasmania, Victoria).

Host plants: *Acacia decurrens* (Froggatt, 1894).

Biology. Larvae make narrow irregular galleries along the smaller branches of the host plant and are common in dead wood up to the middle of December (Froggatt, 1894). Adults prefer to assemble on flowers of *Bursaria* and *Myoporum*. When molested they give off a very acrid fluid of an extremely unpleasant taste (Tepper, 1887), which, according to Tillyard (1926), resembles carbolic acid.

References. Froggatt, 1894 (I, Biol.), 1902a (Biol.), 1923 (Biol.); Tepper, 1887 (Biol.); Tillyard, 1926 (Biol.).

Syllitus parryi Pascoe

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, South Australia).

Host plant: *Pittosporom phylliraeoides* (Tepper, 1887).
Reference. Tepper, 1887 (Biol.).

Syllitus sinuaticosta McKeown

Distribution. AUSTRALASIAN REGION: Australia (Queensland).
Host plant: *Cassinia* sp. (McKeown, 1938).
Reference. McKeown, 1938 (Biol.).

Macronini

Macrones rufus Saunders

Distribution. AUSTRALASIAN REGION: Australia (New South Wales).
Host plant: *Eucalyptus saligna* (K. M. Moore).

Mature larva (fig. 88). Form elongate, subcylindrical, rather robust. *Head* (fig. 88) with sides subparallel, widest posteriorly; temples testaceous behind ocelli and bearing several long ferruginous setae. Frons with anterior half rather densely setose, there being at least three pairs of extra coarse setae amongst numerous much finer setae, some of which are very long and slightly curved; front margin broadly sclerotised and

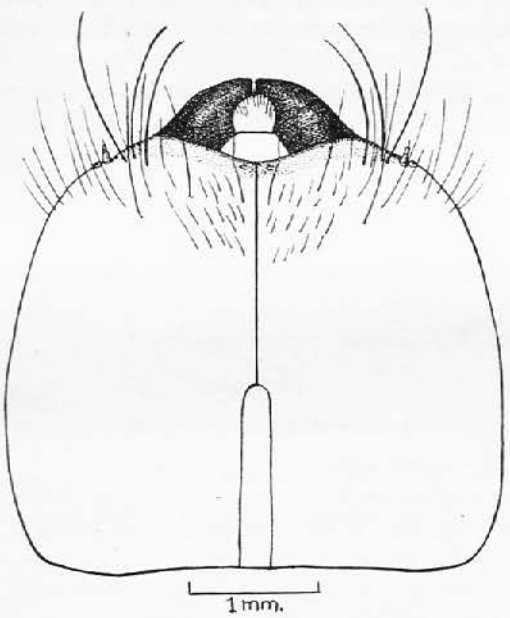

Fig. 88. *Macrones rufus* Saunders. Mature larva. Head. Dorsal aspect.

ferruginous and strongly sinuate medially. Antenna with segment 2 very short, transverse. Mandible with several fine setae on middle of outer face. Three pairs of subcontiguous ocelli present arranged in a straight row laterad and ventrad of antenna;

ocellar lens round, convex; pigmented spot distinct. Hypostoma smooth, testaceous with front margin pale ferruginous and a transverse row of 12 or more short setae; gula broad, with sutures distinct, raised. Ventral front margin of head with a slightly curved carina (subfossal process) on acetabulum. Apical segments of maxillary and labial palpi appreciably longer than penultimate segments. *Prothorax* with pronotum pale ferruginous anteriorly, with several very long, coarse setae and numerous finer, shorter, scattered setae; posterior part milky white, coarsely longitudinally striate, glabrous; presternum sclerotised, pale ferruginous and coarsely transversely to obliquely strigose. *Meso-* and *metasternum* with two transverse rows of moniliform tubercles (as in *Coptopterus*). *Abdomen* with dorsal ampullae with rather flattened tubercles, glabrous. Segment 9 strongly elongate, about twice length of segment 8; segments 9 and 10 bearing numerous coarse, straight, bristle-like setae; anal lobes with a few fine short setae. *Legs* 4-segmented, testaceous. *Spiracles* with peritreme broadly oval, thin, pale ferruginous, without marginal chambers. Length up to 41 mm.; maximum breadth (at prothorax) 7·5 mm.

Biology. Larvae have been found only in dead branches approximately two to three inches in diameter of growing *E. saligna*. Galleries are comparatively wide and shallow, and only a thin shell of wood remains between the outer surface of the sapwood and the gallery. Galleries extending along the branches in the sapwood may be up to six feet in length. Excreta in the galleries is alternately powdery and packed and then granular and loose. Adults emerged during November and December at Lisarow (K. M. Moore).

Material studied. 1 L, Australia, New South Wales, Lisarow, 24.xi.1956, from *Eucalyptus saligna*, K. M. Moore leg., in coll. F.C.N.S.W.

References. None available.

Macrones exilis Newman

Distribution. AUSTRALASIAN REGION: Australia (South Australia, Tasmania).

Biology. Adults occur on flowers of shrubby *Eucalyptus*, *Leptospermum* and *Melaleucas* species.

Reference. Tepper, 1887 (Biol).

Aphneopini

Zorion minutum (Fabricius)

Distribution. AUSTRALASIAN REGION: New Zealand.

Host plants: *Sequoia gigantea*, *Crataegus*, *Ulmus* (Dumbleton, 1957); *Nothofagus menziesii*, *Sequoia sempervirens*, *Acacia dealbata*, *Alnus rubra*, *Litsea calicaris* (N.Z. Forest Research Institute records).

Mature larva. No material available. Dumbleton (1957) gives the following description. "Form small, slender, cylindrical, tapering posteriorly. Length 7 mm. Colour white. Body setae slender, light coloured. Head transverse, widest posteriorly subtruncate behind. Posterior foramen transverse, widest at mid-length. Mandible short, stout, not constricted before rounded apex. Labrum transverse, nearly twice as wide as long. Maxillary palpi 2-jointed, second joint longer than first. Palpifer with small process. Labial palp with second joint shorter than 2nd joint of maxillary palp.

Epistoma not emarginate in middle. Two ocelli. Genal setae sparse and fine. Hypostoma without setae. *Thorax*. Pronotum twice as wide as long, posterior third striate, anterior, two-thirds setose, notal spots pale yellow. Metanotum without X-shaped lines. Presternum setose, fused with epipleurum. Eusternum not well defined, setae sparser. Legs vestigial. *Abdomen*. Pleural discs not evident. Ampullae finely granulate, not prominent. Spiracles oval. Hind-intestine with sclerotised thickening of intima."

Pupa. No material available. Dumbleton (1957) gives the following description. "Form as in adult. Head with three setae on each side of front below antennal insertion, one on each side below antennal insertions, two on each side of clypeus and one or two on mandible. Gena with three or four setae. Prothorax with about eight setae across anterior margin, a row of six across disc before mid-length, and one on each side posterior to mid-length. Mesothorax with one seta on each side. Metathorax with one seta on each side. First abdominal segment with one seta on each side. Segments 2–6 with about eight small pigmented setigerous spines posteriorly, 7th with two larger paramedian spines posteriorly and about five smaller ones on each side. Last segment with one or two spines on each side anteriorly, a row of about five at mid-length, and two pigmented spines at the posterior angle on each side with two smaller ones anterior to these. Femora with one or two setae at distal end. Elytra and tibiae without setae."

Biology. Pupation takes place in September and adults emerge early in November. The adults, which closely resemble the clerid *Phymatophaea ignea* Broun, are commonly found on flowers (Dumbleton, 1957). Thomson (1927) states that adults are frequently found on the flower panicles of *Rubus australis*.

References. Dumbleton, 1957 (L fig., P, Biol.); Thomson, 1927 (Biol.).

Zorion guttigerum (Westwood)

Distribution. AUSTRALASIAN REGION: New Zealand.

Host plant: *Phormium tenax* (leaf petioles) (Dumbleton, 1957).

Mature larva. Apparently indistinguishable from that of *Z. minutum* (Fabricius) (Dumbleton, 1957).

Reference. Dumbleton, 1957 (L, Biol.).

Bimiini

Bimia bicolor White (=**femoralis** Saunders)

[The Bimia Longicorn, the Apple-gum Borer or the Apple-gum Bimia]

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, South Australia, Victoria, Western Australia).

Host plants: *Eucalyptus stuartiana* (French, 1909); *Eucalyptus gomphocephala* (Newman, 1922); *Eucalyptus melliodora*?, *E. rostrata*? (Best, 1881); *Eucalyptus saligna* (K. M. Moore).

Mature larva (fig. 89). Form very elongate, cylindrical and rather robust. *Head* (fig. 89) with sides subparallel, widest posteriorly; temples ferruginous behind ocelli

and bearing numerous long ferruginous setae. Frons with front margin broadly sclerotised and ferruginous and bearing several stout sublateral setae and a pair of paramedian setae. Behind the latter is another pair of similar setae placed near the posterior margin and partly covered by the pronotum (fig. 89)[1]. Antennae with segments 2 and 3 elongate, about twice as long as broad. Mandible with a pair of stout setae near middle of outer face. Two pairs of large subcontiguous ocelli present[2], the upper pair about twice as large as the lower pair; lens large, convex, pigmented spot very distinct. Behind these ocelli are two pairs of vestigial ocelli with

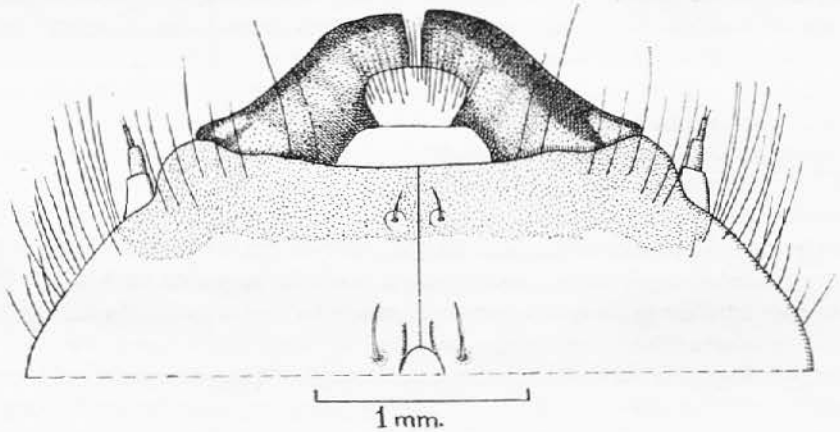

Fig. 89. *Bimia bicolor* White. Mature larva. Front part of head. Dorsal aspect.

distinct pigmented spots but feebly developed lenses. Hypostoma with anterior margin slightly swollen paramedially, narrowly ferruginous, glabrous; gula broad, with sides strongly diverging posteriorly. Apical segments of maxillary and labial palpi at least as long as penultimate segments. *Prothorax* rather densely setose anteriorly, posterior part very coarsely and longitudinally striate; prosternum rather densely setose. *Meso-* and *metasternum* non-tuberculate, sparsely setose. *Abdomen* with ampullae obliquely strigose, non-tuberculate. Segments 9 and 10 more densely and coarsely setose than preceding segments. *Legs* 4-segmented, pale ferruginous. *Spiracles* with peritreme thin, broadly oval, without marginal chambers. Length up to 50 mm.; maximum breadth (at prothorax) 6·5 mm.

Biology. Attack occurs in living trees of *E. saligna*. Branches of approximately $2\frac{1}{2}$" to 5" in diameter are infested on the proximal half and the damaged area is about 3" in diameter, more or less round, extending about $\frac{1}{16}$" into the sapwood. The bark does not adhere over the damaged area, and an oval hole is present near the centre of the damaged area. The larva moves to the centre of the branch and works longitudinally, pupating in the vicinity of the damage. The larva, when living, is bright reddish orange (K. M. Moore).

[1] This is the first instance known to the author, of setae being present near the posterior margin of the frons.

[2] It is possible this could be a malformation and that normally there are three pairs of equal size present.

Material studied. 1 L, Australia, New South Wales, Lisarow, 15.ix.1960, from *Eucalyptus saligna*, K. M. Moore leg., in coll. F.C.N.S.W.

Control. All weak and dying trees should be removed and burned (French, 1909).

References. Best, 1881 (Biol.); French, 1909 (E fig., L fig., P fig., I fig., Biol. fig., Contr.); Froggatt, 1923 (Biol.); Newman, 1922 (Biol.).

Akiptera waterhousei Pascoe

Distribution. AUSTRALASIAN REGION: Australia (South Australia, Victoria).

Host plant: *Eucalyptus stuartiana* (French, 1909).

Reference. French, 1909 (Biol.).

Molorchini

Gastrosarus nigricollis Bates

[The Laurel Gastrosarus]

Distribution. AUSTRALASIAN REGION: New Zealand.

Host plants: *Nothofagus*, *Leptospermum scoparium*, *Crataegus* (Dumbleton, 1957); *Prunus laurocersaus*, *Quercus*, *Betula verrocosa* (Miller, 1925); *Leptospermum scoparium*, *Leucopogon fasciculatus*, *Pomaderris phylicaefolia* (N.Z. Forest Research Institute records).

Adult (fig. 90). Length 14–16 mm. Head, prothorax and antennae glabrous, black. Elytra glabrous, orange-testaceous, the apices darker and with a purplish lustre. *Head* with antennae slightly longer than body in male and shorter in female. *Prothorax* with pronotum smooth, shining and with a pair of blunt lateral tubercles. Elytra with both apical angles spined.

Mature larva (figs. 91–92). Form extremely slender, cylindrical, slightly tapering posteriorly (fig. 91). *Head* quadrate, with sides feebly rounded. Genae bearing several very long, fine, pale, anteriorly inclined setae. Front margin of frons emarginate medially. Mouthframe rather broadly sclerotised, ferruginous, smooth. Antenna with segment 3 about two-thirds length of segment 2. Mandible typically cerambycine. Labrum suborbicular, bearing several rather long, pale setae. Three pairs of subcontiguous ocelli present; lens small round, protuberant, pigmented spot distinct. Hypostoma smooth, with three or four fine setae on each side of gula; gular sutures distinct. Apical and penultimate segments of labial and maxillary palpi

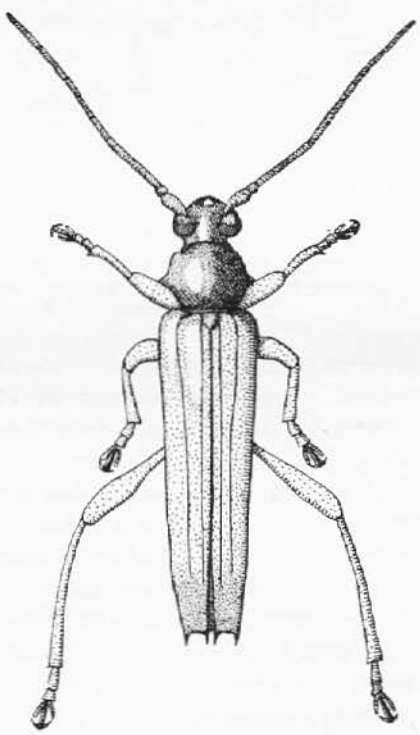

Fig. 90.
Gastrosarsus nigricollis Bates. Adult.

subequal. Submentum distinctly longitudinally striate. *Prothorax* with pronotum slightly transverse; anterior area pale, setose, posterior area longitudinally striate, glabrous. A slightly protuberant, micro-pubescent area present between presternum and epipleurum. *Abdomen* (fig. 91) with segments 4–7 with extremely long intersegmental skin; dorsal ampullae strongly protuberant, bilobed, finely micro-granulate;

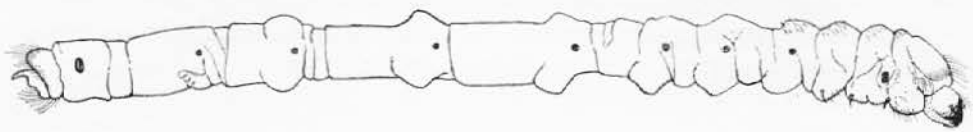

Fig. 91. *Gastrosarsus nigricollis* Bates. Mature larva. Lateral aspect.

ventral ampullae similar, except the one on segment 7, which is scarcely protuberant and bears a deep transverse impression. Segment 9 densely fringed with setae and truncate posteriorly. Segment 10 bearing dorsally a fleshy horn-like process (fig. 92). *Legs* well developed, 4-segmented. *Spiracles* of abdomen with peritreme broadly oval, thin, pale, those on segment 8 being larger than the prothoracic pair (fig. 91). Length up to 27 mm.; maximum breadth (at prothorax) 2·5 mm.

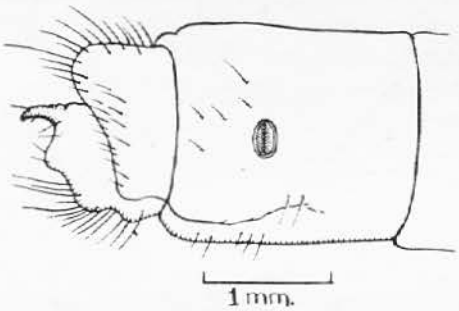

Fig. 92. *Gastrosarus nigricollis* Bates. Mature larva. Abdominal segments 8–10. Lateral aspect.

Apart from the long intersegmental skin of the abdominal segments, this larva appears to posses no features characteristic of the Molorchini, or even the closely related Obriini, Graciliini or Psebiini. The head capsule is quadrate, with sides feebly rounded and not sclerotised and pigmented postero-laterally. Three pairs of ocelli are present and the legs are well developed. The unusual modification of abdominal segments 9 and 10 has previously only been observed in the LAMIINAE and is so far unique in the CERAMBYCINAE. Moreover the eighth pair of abdominal spiracles is appreciably larger than those of the mesothorax a feature previously unknown in any cerambycid larva.

Pupa. No material available. Dumbleton (1957) gives the following description. "Form as in adult. Colour yellow. Head (front and clypeus) with a few small setae. Pronotum with a band of small setae across disc anterior to mid-length and about six setae in posterior angle on each side. Mesonotum with four or five setae on each side. Metanotum with about six setae on each side of posterior half. First abdominal segment with a transverse band of setae and poorly developed spines. Segments 2–6 with sparse small spines; 7th with spines more strongly developed, a group of three or four on each side anteriorly, 5 or 6 in a median group posteriorly and two lateral on each side. Femora, tibiae and elytra without setae. No process on trochanter."

Biology. Adults emerge in mid-September. Eggs deposited in the laboratory were

affixed to the surface of the bark. The larvae tunnel down the centre of the small branches but later construct a circular gallery which so weakens the branch that it may break (Dumbleton, 1957). Milligan (in lit.) states that the green stems of *Leptospermum* are first girdled and then hollowed out at the centre. The galleries often extend into the lateral twigs, which are cut off terminally in a characteristic manner.

Adults mimic the spider wasp *Salius wakefieldi* (Hudson, 1934).

Material studied. 3 L, New Zealand, State Forest, 90, 2.x.1957, from *Leptopermum scoparium*, R. H. Milligan leg., in coll. B. M.

References. Dumbleton, 1957 (E, L fig., P, Biol.); Hudson, 1934 (Biol.); Miller, 1925 (I fig., Biol.).

Omotes erosicollis Pascoe

Distribution. AUSTRALASIAN REGION: Australia (Victoria).

Host plant: *Eucalyptus melliodora* (Dixon, 1908).

Reference. Dixon, 1908 (Biol.).

Gracilia minuta (Fabricius)

[Das Weidenböckchen; the Powder-keg Longicorn]

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Tasmania), New Zealand (introduced from Europe but now well established). PALAEARCTIC REGION: British Isles, Canary Is., Europe, Madeira, North Africa, Japan; NEARCTIC REGION: U.S.A. (including Buffalo, New York, Syracuse). NEOTROPICAL REGION: South America (Argentina, Uruguay).

Host plants: *Rubus*, *Rosa canina*, *Corylus* (Duffy, 1946c); *Aesculus*, *Betula*, *Quercus* (Reineck, 1919); *Crataegus* (Judeiche and Nitsche, 1889); *Rhamnus alternus*, *Ceratonia siliqua* (Peyerimhoff, 1919); *Ulmus*, *Ficus*, *Citrus aurantium*, *Malus pumila* (Villiers, 1946); *Corylus* (Froggatt, 1903).

Mature larva. Form subcylindrical, extremely slender. *Head* strongly transverse, widest just behind middle, testaceous, shining. Genae with numerous long setae which are curved backwards. Antenna minute, conical, 3-segmented; segment 2 transverse and bearing a supplementary process. One pair of distinct ocelli present, pigmented spot very distinct. *Prothorax* depressed, about three times as broad as long; pronotum very closely and finely longitudinally striate posteriorly. *Abdomen* with ampullae strongly protuberant, bilobed. *Legs* minute. Length up to 9 mm.; maximum breadth (at prothorax) 1·9 mm.

Pupa (fig. 93). *Head* with vertex visible from above, smooth, and with about six papillae (each with a long, fine, subapical seta) on each side of disc; front with two or three minute setae near base of each antenna. Clypeus with a transverse impression at base. Antennae extending as far as abdominal segment 4, where they are strongly recurved to terminate near front coxae. Eyes moderately convex, with a stout seta near mesal margin.

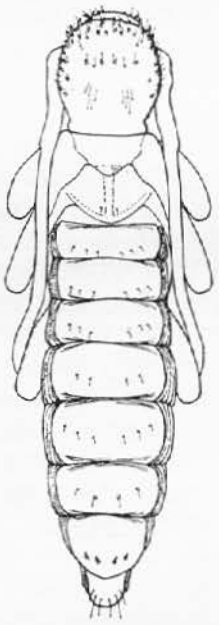

Fig. 93. *Gracilia minuta* (Fabricius). Pupa. Dorsal aspect.

Labrum triangular, glabrous. *Pronotum* bearing numerous long pale papillae (each with a long, fine, basal seta) along front and lateral margins and two groups of fine setae near base. *Mesonotum* smooth and usually glabrous; scutellum moderately protuberant. *Metanotum* smooth, but sometimes with two or three minute setae. Elytra and wings extending to abdominal segment 3. *Abdomen* with tergites 1–6 with a transverse row of from four to six short papillae (each with a fine seta). Segment 9 retracted in segment 8, and not visible from above. Sternites glabrous or almost so. Pleura slightly protuberant, each with fine paired setae. *Legs* with hind femora extending as far as abdominal segment 4 and lying almost parallel to longitudinal axis of body. *Functional spiracles* present on abdominal segments 1–7; peritreme round, very thin and inconspicuous, but slightly raised above general level of cuticle. Length 3·5–7 mm.; maximum breadth 1·3 mm.

Biology. The larval habitat is in dead dry stems, branches and twigs. Nests of the ant *Formica rufa* have been known to be composed of twigs infested with larvae of this species (Bouillon, 1859). According to Kaufmann (1948), this species has been known to breed in old shoe leather.

The larvae make irregular longitudinal galleries under the bark. During March or April they pupate either head upwards or head downwards in the sapwood or pith channel. The pupal cell is similar to those of *Molorchus* species. Sometimes pupation takes place in the bark, if it is thick. Adults emerge from May to July.

Froggatt (1903) describes how a number of hazel hoops were so badly infested by this species that the powder kegs in one of the hulks in a harbour were falling to pieces.

Parasites. Hymenoptera. *Cleonymus depressus* F. (Lichtenstein, 1919).

Economic importance. This species has on occasions caused extensive damage to wickerwork (Hinks, 1930), rustic work, wooden hoops and casks, etc. Infestation often continues until the wood is almost completely reduced to powder. According to Fowler and Donisthorpe (1913), this species has been known to infest osiers grown at Lulworth Cove by fisherman for making lobster pots.

Material studied. 12 L, 3 P, England, Surrey, Ashtead, 21.iv.1946, in dead stem of *Rubus*, E. A. J. Duffy leg., in coll. B.M.

References. Beutenmuller, 1896 (Biol.); Bouillon, 1859 (Biol.); Bosq, 1942a (Biol.); Calliol, 1914 (Biol.); Della Beffa, 1931 (L, P, Biol. fig.); Duffy, 1946c (Biol.), 1953a (L, P fig., Biol. fig.), 1957 (Biol.), 1960 (L, P fig., Biol.); Emden, 1939–1940 (L); Faggioli, 1948–1949 (I fig., Biol. fig.); Fowler and Donisthorpe, 1913 (Biol.); Froggatt, 1903 (I fig., Biol.); Henricksen, 1914 (L); Hinks, 1930 (Biol.); Judeich and Nitsche, 1889 (Biol.); Lepesme, 1944 (I fig., Biol.); Lichtenstein, 1919 (Paras); Nördlinger, 1880 (Biol.); Perris, 1887 (L, P, Biol.); Peyerimhoff, 1919 (Biol.); Reineck, 1919 (Biol.); Sandahl, 1892 (Biol.); Schiödte, 1876 (L fig.); Schmitt, 1843 (L); Verhoeff, 1892 (Biol.); Villiers, 1946 (I fig., Biol.); Xambeu, 1898–1902 (L, P, Biol.); Zacher, 1943 (L fig., I fig., Biol., Contr.), 1944 (E, Biol.).

Phalotini

Xystoena vittata Pascoe

Distribution. AUSTRALASIAN REGION: Australia (Queensland).

Host plant: *Cupressus* sp. (K. M. Moore).

Mature larva. Form subcylindrical, very slender, slightly tapering posteriorly. *Head* strongly transverse, widest just behind middle, with sides strongly rounded. Front margin of frons and genae bearing numerous very long, fine, straight setae. Mandible with basal half feebly sclerotised, testaceous. Antennae minute, conical. Labrum transversely oval One pair of ocelli present; lens inconspicuous, pigmented spot extremely distinct, large, elongate, black. *Prothorax* with posterior part of pronotum embossed, rather coarsely longitudinally striate. Eusternum micro-reticulate, glabrous. *Abdomen* with ampullae covered with very small moniliform tubercles. *Legs* minute but clearly 3-segmented. Length up to 5·1 mm.; maximum breadth (at prothorax) 1·2 mm.

Material studied. 3 L, Australia, New South Wales, Burwood, 15.ii.1957, from *Cupressus* sp., K. M. Moore leg., in coll. F.C.N.S.W.

References. None available.

Phalota tenella Pascoe

Distribution. AUSTRALASIAN REGION: Australia (Queensland).

Host plant: *Acacia* sp. (Illidge, 1922).

Reference. Illidge, 1922 (Biol.).

Hesthesini

Hesthesis cingulata (Kirby)

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, South Australia, Tasmania, Victoria, ?Western Australia).

Host plant: *Eucalyptus* sp. (roots) (Carter, 1928).

References. Best, 1881 (Biol.); Carter, 1928 (Biol.).

Hesthesis plorator Pascoe

Distribution. AUSTRALASIAN REGION: Australia (South Australia, Tasmania, Victoria).

Host plant: *Leptospermum scoparium* (roots) (Carter, 1928).

References. Best, 1881 (Biol.); Carter, 1928 (Biol.).

Distichocerini

Distichocera maculicollis Kirby

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Victoria).

Host plants: *Kunzea corifolia* (Froggatt, 1893); *Kunzea capitata* (Froggatt, 1923).

Mature larva (figs. 94–95). Form subcylindrical, rather robust. *Head* widest posteriorly. Mouthframe broadly ferruginous, with front margin of frons strongly sinuate medially. Genae sparsely setose. Three pairs of subcontiguous ocelli present. Temples narrowly ferruginous behind ocelli. Hypostoma smooth, with front margin rather broadly ferruginous. *Prothorax* with posterior part dull and coarsely microspiculate, the front margin of this area (which strongly contrasts with the smooth shining anterior part) produced anteriorly into four lobes (fig. 94). *Abdomen* with

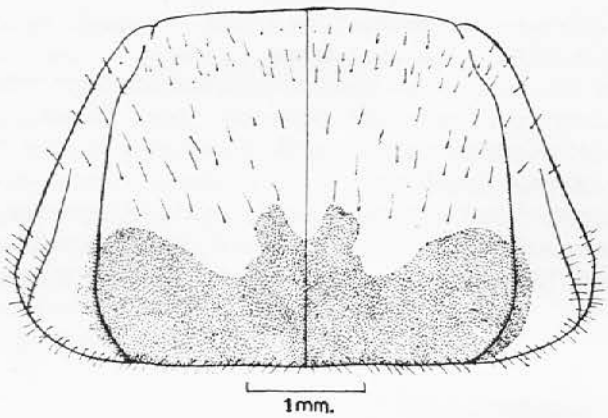

Fig. 94. *Distichocera maculicollis* Kirby. Mature larva. Prothorax. Dorsal aspect.

ampullae subtuberculate and finely microgranulate. Setae on segments 9 and 10 appreciably coarser than those on preceding segments. *Legs* well-developed, 5-segmented. *Spiracles* with peritreme crescentic or subreniform (fig. 95) and covered with a membrane. Length up to 30 mm.; maximum breadth (at prothorax) 8·1 mm.

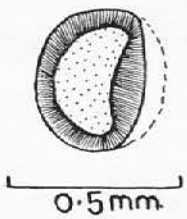

Fig. 95. *Distichocera maculicollis* Kirby. Mature larva. Peritreme of abdominal spiracle.

The peculiar crescentic or subreniform spiracles of this larva make it readily distinguishable from all other cerambycid larvae so far described.

Biology. Commencing under the bark, the larvae excavate irregular galleries backwards and forwards, finally hollowing out several large, parallel chambers towards the centre of the stem, in one of which it pupates. Adults assemble to feed on flowers of *Angophora cordifolia* late in December (Froggatt, 1893, 1923).

Material studied. 2 L, Australia, New South Wales, Watson's Bay, from *Kunzea corifolia*, W. W. Froggatt leg in coll. D.A.N.S.W.

References. Froggatt, 1893 (L, I, Biol.), 1907 (Biol.), 1923 (Biol.)

Distichocera macleayi Newman

[Macleay's Longicorn or Feather-horned Yellow-box Borer]

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland, Victoria).

Host plants: *Eucalyptus stuartiana, E. melliodora, E. viminalis* (French, 1911).

Biology. Adults are to be found in early summer on the flowers of the angophoras and eucalypts (Froggatt, 1923).

Control. Dead and dying branches should be burned (French, 1911).

References. French, 1911 (L fig., P fig., I fig., Biol. fig., Contr.); Froggatt, 1913 (Biol.); Pierce, 1917 (Biol.).

Distichocera thomsonella White

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, South Australia).

Host plants: *Loranthus pendulus* (Dixon, 1908); ?*Bursaria spinosa* (Best, 1881).

References. Best, 1881 (Biol.); Dixon, 1908 (Biol.).

Pytheini

Omophaena taeniata Pascoe

Distribution. AUSTRALASIAN REGION: Australia (Tasmania, Victoria).

Host plant: *Eucalyptus melliodora* (Dixon, 1908).

Reference. Dixon, 1908 (Biol.).

Pempsamacra carteri McKeown

Distribution. AUSTRALASIAN REGION: Australia (Queensland).

Host plant: ?*Melaleuca* sp. (McKeown).

Reference. McKeown, 1942 (Biol.).

Typhocesini

Typhocesis macleayi Pascoe

Distribution. AUSTRALASIAN REGION: Australia (Queensland).

Host plant: ?*Pleiogynium solandri* (Duffy, 1953a).

Reference. Duffy, 1953a (Biol.).

Callidiini

Larval Characters

Form robust and of a contracted appearance. *Head* subtrapezoidal, widest well behind middle, with three pairs, one pair or no ocelli. Mandible with a deep longitudinal impression on outer face. Maxilla with lobe glabrous on entire inner margin; process of palpifer nearly as long as or longer than segment 3 of maxillary palp. Antenna with segments 1 and 2 quadrate to strongly elongate. Gula distinct, raised. *Prothorax* densely setose laterally, the setae being more or less equal in length; pronotum not more than twice as wide as long; median cleavage line incomplete (except *Hylotrupes bajulus*) though often deep; posterior half lightly reticulate (except *H. bajulus*) and with some rather coarse longitudinal striae. Postnotal fold present. Sternum with two paramedian or one median oval, glabrous area, the eusternum not clearly defined (except *H. bajulus*). *Abdomen* with ampullae broad, often finely reticulate, with a distinct but shallow, longitudinal, median impression; posterior transverse impression incomplete (except *H. bajulus*). Pleural discs distinct on segments 3–6 (except *H. bajulus*); each disc a deep pore surrounded by a reticulate area. *Legs* 2- or 3-segmented, at least as long as maxillary palp; segments more or less globular, unguiculus imbricately spinose.

Hylotrupes bajulus (Linnaeus)

[The House Longhorn; the European House Borer; the Old House Borer; the Porter Hylotrupes; the Italian Beetle; der Hausbock; der Hausbockkäfer; der Balkenbock; de Grosser Holzwurm; le Capricorne domestique; le Capricorne des Maisons]

Distribution. AUSTRALASIAN REGION: Australia (Queensland), New Zealand; ORIENTAL REGION: China; ETHIOPIAN REGION: South Africa (Cape Province); PALAEARCTIC REGION: British Isles, Europe, Scandinavia, Iceland, Italy, Middle East, North Africa (Algeria, Egypt, Morocco, Tunisia), Asia Minor, Siberia; NEARCTIC REGION: U.S.A.; NEOTROPICAL REGION: South America (Argentina).

Host plants: *Pinus*, *Picea*, *Abies* and, occasionally, *Pseudotsuga taxifolia*. Feytaud (1939) states that this species is not entirely confined to conifers, since *Populus*, *Alnus*, *Corylus*, and even *Quercus* have been infested by it. Chobaut (1904) records it from *Genista scorpius*, Riley (1880) from *Conium maculatum* and Caillol (1914) from *Tamarix*. Petroff (1920) has found specimens in branches of *Acacia nilotica* in Egypt. Conifers, however, are undoubtedly its preferred hosts and in South Africa, at least, it has never been found in any others. The following Coniferae have been found to be infested in South Africa. *Pinus canariensis*, *P. caribaea*, *P. halepensis*, *P. palustris*, *P. maritima*, *P. pinea*, *P. ponderosa*, *P. radiata*, *P. sylvestris*, *P. taeda* and possibly *Pseudotsuga taxifolia* (Tooke, 1949).

Milligan (1961) has recently shown experimentally that the sapwood of rimu (*Dacrydium cupressinum*) is susceptible to infestation by this longhorn.

It should also be mentioned that there have been several reports, mainly from France, of this species infesting *Quercus* (Benoit and Jacquoit, 1953), and it would appear possible that some strains of *H. bajulus* (Linnaeus) have become resistant to oak sapwood. As, however, the present author (1954) has recently found oak to be infested by other species hitherto associated exclusively with Coniferae, this is perhaps not so surprising as it first seemed.

Mature larvae have recently been extracted by the author from a seasoned walnut candelabra imported from Italy at least six years ago. This appears to be the first time that infestation with this species has been observed in *Juglans* and is the only case of hardwood infestation actually seen by the author.[1]

The larval galleries (Pl. IV, fig. 1) are totally different from those in softwood, being shallow, broad, slot-like in cross-section and more characteristic of those made by buprestids. The frass is finer, more granular and less abundant. The larvae, although possessing all the characteristics of *H. bajulus* larvae from softwood, are atypical and upon superficial examination could easily be regarded as being of a different genus. The mouthframe is considerably more strongly sclerotised and more darkly pigmented, and the pronotal "spots" are orange-testaceous instead of pale testaceous. There were two adult emergence holes as well as two mature larvae in the candelabra, so it seems quite evident that this species can successfully mature in hardwood.

[1] A larva has since been examined from a beech table leg in which it had been feeding for at least seven years. It possessed the same atypical characteristics as the one found in walnut.

Adult (fig. 96). Colour varying from testaceous to castaneous, sometimes almost pitchy, particularly the pronotum. *Head* with antennae short, not extending beyond

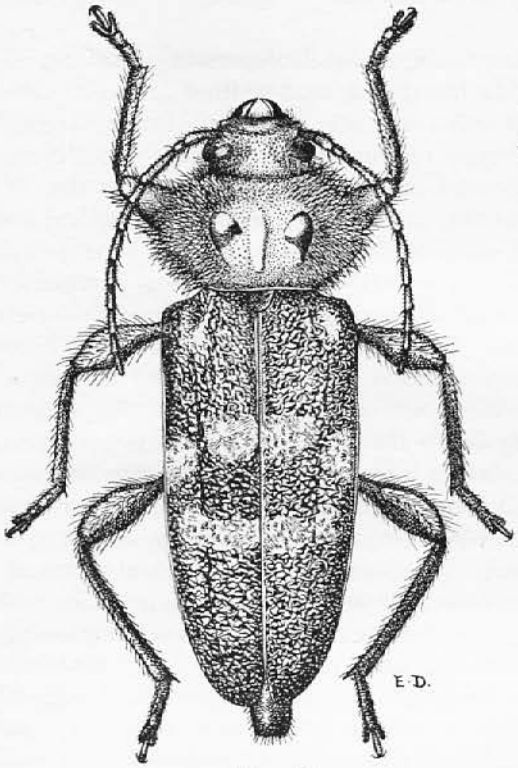

Fig. 96

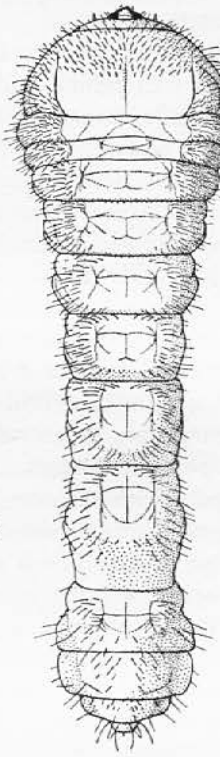

Fig. 97

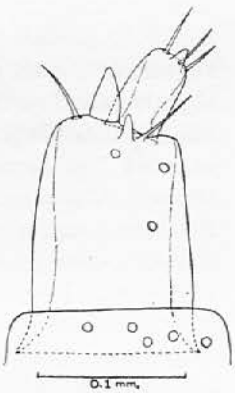

Fig. 98

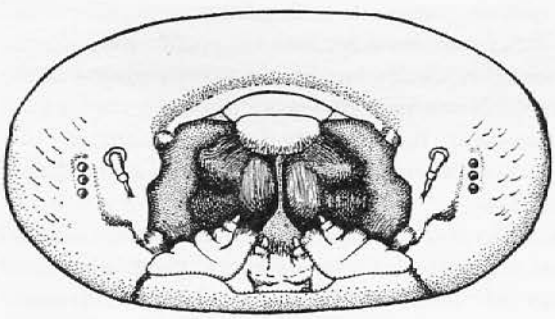

Fig. 99

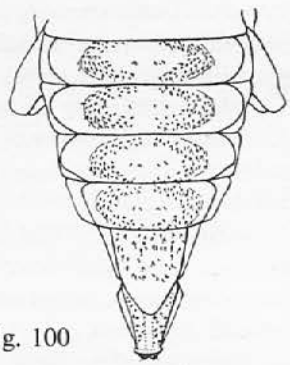

Fig. 100

Figs. 96–100. *Hylotrupes bajulus* (Linnaeus). Fig. 96. Adult. Fig. 97. Mature larva. Dorsal aspect. Fig. 98. Mature larva. Apical part of antenna. Lateral aspect. Fig. 99. Mature larva. Head. Frontal aspect. Fig. 100. Pupa. Posterior part of abdomen. Dorsal aspect.

basal third of elytra. *Prothorax* transverse, with sides strongly rounded and bearing dense, outstanding pubescence; disc with a pair of paramedian, shining, glabrous tubercles. Anterior coxal cavities rounded and open posteriorly. *Elytra* depressed, rugose, with an interrupted band of pale pubescence before middle, often forming four distinct patches. Length 14–20 mm.

Mature larva (figs. 97–99). Form rather robust, slightly depressed. *Head* (fig. 99) subtrapezoidal, widest well behind middle (maximum head-width 4·25 mm.). Gena somewhat shouldered, pale, smooth, and with a few short, pale setae. Front margin of head pale, ferruginous, rugose; front margin of frons rather swollen. Mouthframe completely, though rather weakly sclerotised beneath antennae. Antenna (fig. 98) testaceous, with segment 2 three times as long as segment 3, which is cylindrical and twice as long as broad; supplementary process rather attenuated, at least two thirds as long as segment 3. Mandible broad, with basal part ferruginous; apical part pitchy, shining, and with a deep longitudinal, median impression. Labrum fleshy, transversely oval, and with numerous long, fine setae. Epipharynx setose only on sides. Three distinct ocelli present close together in a straight row laterad and ventrad of antenna[1] (fig. 99); ocellar lens strongly protuberant, pigmented spot distinct. Hypostoma rugose, with front margin not or scarcely darker than remainder. Gula rather broad, slightly raised, with concave sutures. Maxilla with lobe entirely glabrous on inner margin; maxillary palp with segment 3 shorter than segment 2 and shorter than segment 2 of labial palpi; dorso-external process of palpifer slightly shorter than segment 3 of maxillary palp. Labial palpi with segments 1 and 2 equal in length. *Prothorax* rectangular, depressed, with numerous long, fine setae; posterior half smooth, shining, with a few irregular coarse striae; median cleavage line deeply impressed. Eusternum distinct, triangular, shining, rugose and almost glabrous. *Abdomen* (fig. 97) with dorsal ampullae shining, coarsely rugose (even subtuberculate) with posterior transverse impression distinct; median furrow rather shallow. Anal lobes sparsely setose. Pleural discs indistinct or absent. *Legs* with femur wider than long; femur and tibio-tarsus testaceous; unguiculus ferruginous for at least apical two-thirds and strongly imbricately spinose. *Spiracles* with peritreme broadly oval, very thin and pale. Length up to 24 mm.; maximum breadth (at prothorax) 7·5 mm.

Although there seems no doubt that this species has been correctly placed in the Callidiini according to adult and pupal characters, the larva does not conform at all satisfactorily to what would appear to be the true larval characteristics of this tribe. On the other hand, larvae of certain other species of *Hylotrupes* approximate much more closely to the tribal characters.

First-instar larva (fig. 101). Cuticle milky white, waxy. Egg-bursting spines situated in pairs dorso-laterally on abdominal segments 1–8; spines short, stout, blunt and becoming larger posteriorly. Spiracles biforous. Length up to 1·2 mm.; maximum breadth 0·65 mm.

Pupa (fig. 100). *Head* quadrate, glabrous. *Mesonotum* with several long, fine, pale setae directed backward on each side of scutellum, which is depressed. *Metanotum* with numerous similar setae on each side of scutellar groove which is slightly depressed. Elytra and wings extending to abdominal segment 4. *Abdomen* with tergites 1–6 each with short ferruginous spines (each bearing a fine basal seta) arranged in a transverse

[1] Behind these, three widely separated, vestigial ocelli are usually visible.

row along anterior and posterior margins and in a broad semi-oval group near each lateral margin. Tergite 7 very elongate and strongly tapering posteriorly; anterior two-thirds with numerous scattered, slightly stouter spines directed posteriorly; posterior third glabrous. Tergite 8 elongate, subparallel-sided and bearing numerous

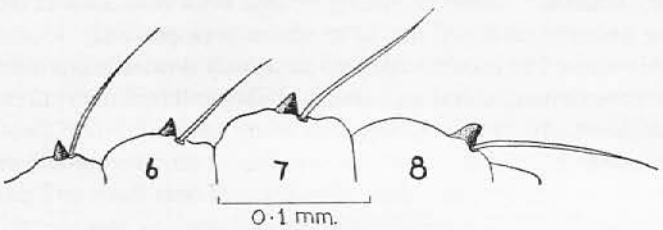

Fig. 101. *Hylotrupes bajulus* (Linnaeus). First-instar larva. Egg-bursting spines of abdominal segments 5–8. Dorsal aspect.

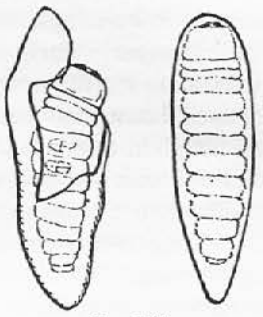

Fig. 102. *Hylotrupes bajulus* (Linnaeus). Eggs. showing emerging larvae.

spines on each side of a longitudinal median groove. Tergite 9 extremely short, rugose, slightly bilobed, each lobe bearing a fine setae. Sternites smooth and glabrous. Pleura protuberant, rugose, glabrous. *Legs* with hind femora extending as far as abdominal segment 4. *Functional spiracles* present on abdominal segments 1–5; peritreme broadly oval, moderately thick and slightly raised above general level of cuticle. Length 14–25 mm.; maximum breadth 7 mm.

Egg (fig. 102). Form elongate, spindle-shaped, very variable in outline but one pole usually more attenuated than the other. Chorion white, dull, smooth. Length 1·2–2 mm.; breadth 0·5 mm.

According to Widner (1936b), eggs laid at the beginning of the oviposition period are much more slender than those laid later on.

Biology. The eggs are deposited in batches in cracks and crevices about 0·2–9·6 mm. wide; rough surfaces are preferred. Estimates of the maximum number of eggs laid by a single female are extremely variable; Ekstein (1935a) records 200, Kaufmann (1936) 300 and Becker (1942a) 400, although estimates by most other authors lie between 30 and 100. The incubation period is usually from one to three weeks. Steiner (1937) found that the shortest period was 5·9 days at 31·5°C [89°F.] and 90–95 per cent humidity, and that the longest period was 48 days at 16·6°C [62°F] and 18 per cent humidity. The upper temperature limit for incubation was 101·66°F at which all eggs were killed, irrespective of humidity. Increased humidity accelerated development but with 100 per cent humidity many eggs were killed by moulds. The most favourable humidity was 90–95 per cent, which is understandable when it is remembered that this species flourishes in maritime regions. High temperatures (31·5°C [89°F] and 26·3°C [79°F] reduced mortality by accelerating development and retarding the growth of moulds. Tooke (1949) maintains that *H. bajulus* (Linnaeus) can exist and breed under a wide range of humidities and that the effect of low humidity is to lengthen the in-

cubation period of the eggs and to shorten the life of both sexes. Becker (1942a) found that oviposition could be induced experimentally by treating wooden blocks with the terpines α-pinene and β-pinene or an oil (turpentine) containing them.

The larval habitat is generally in the sapwood and, to a lesser extent, the heartwood of dry, seasoned, coniferous timber such as telegraph posts, fencing and structural timbers in buildings, especially those of roofs and attics. Infestation usually starts in the attic (particularly around a chimney) and gradually spreads downward. In an infestation recently seen by the author, however, the entire first floor of a 25-year old council house had become infested and yet the attic above was perfectly sound. Although in recent years this insect has become adapted to a truly domestic environment, there is no doubt that the original habitat was, and probably still is in many areas confined to woodland and forest. In South Africa, according to Tooke and Scott (1944), this species breeds in old logs and stumps and even in dead branches high up on living trees. It has also been found breeding in a dead standing tree near Paris and also recently in an old pine stump in England.

After emerging from the egg, the first-instar larva usually crawls about for a short period before starting to enter the wood. The larval galleries, which extend parallel to the grain of the wood, are tightly packed with fine powdery particles of wood and frass; the frass is characteristic, being in the form of short cylinders, which, according to Eckstein (1936a), later break up into approximately two spherical portions (probably due to desiccation). In heavy infestations the wood is almost entirely reduced to tightly packed powder, only a thin "veneer" of sound wood and sometimes a central core of heartwood being left untouched. Often the skin-like "veneer", which is about 0·5 mm. thick, splits or bursts under the pressure of the frass, and it is only under these circumstances or through the emergence of adults that frass is ejected. It is due to the unusual absence of tell-tale "boring dust" that infestations are so difficult to detect, although blister-like swellings on the surface of the wood indicate that it is or has been infested. The larvae feed mainly in the sapwood and infestation decreases as soon as the heartwood is reached. There are several instances recorded in literature of both larvae and adults of this species boring through metal sheeting covering wooden structures and even lead cables (Horn, 1933, 1934; Laing, 1919, 1920; Westwood, 1839). After tunnelling for several years and causing considerable damage, the larva usually bores to just beneath the surface of the wood and then turns back to excavate a pupal cell often at some depth and usually parallel to the grain of the wood.

Although intracellular micro-organisms are known to occur in the gut of many species of cerambycid larvae, they are apparently absent in that of *H. bajulus* (Linnaeus). According to Mansour (1934), *Hylotrupes* larvae are able only to digest seasoned wood through their ability to secrete cellulase, a cellulose-splitting enzyme. Falck (1930) has found through a comparative analysis of the frass and sound timber that larvae remove about 21 per cent of the total cellulose and hemicellulose content of seasoned coniferous wood. Parkin (1940) suggests that although *Hylotrupes* appears to be confined to coniferous wood, the enzymes present in the larval gut would apparently enable it to digest deciduous wood with equal facility. Kaltwasser (1941a) discovered that larvae were able to develop satisfactorily in deciduous wood and in coniferous heartwood, providing such substances as resin, which are harmful to them, were first

removed. This was corroborated by Becker (1944), who found that larvae could survive in deciduous wood providing the latter was first soaked for 24 to 48 hours in 1 or 5 per cent sodium hydroxide, and then for 17 days in distilled water. The larvae increased somewhat in weight—probably due to the removal of pentosans.

Numerous experiments have been made in an attempt to accelerate larval growth. Schuch (1937a) has shown that some constituent of the cell contents of the wood is necessary to rapid growth, since larvae increase in weight more rapidly when feeding in the outer sapwood than in the inner zone or in the heartwood. The same author (1937c) has shown experimentally that larval growth at a given temperature increases with a rise in humidity, and at a given humidity with a rise in temperature. Becker (1938a) observed considerable acceleration of growth in larvae which had been inserted in wood impregnated with peptone solution. The same author maintains that albumin, which is present in dead wood in minute quantities, is essential for larval growth, and that increased amounts of it greatly accelerate their development, thereby reducing the amount of wood destroyed. Gösswald (1939) accelerated larval development through increasing the nutritive value of pine by impregnating blocks under pressure with a 5 per cent suspension of diastase; this was more satisfactory than with peptone or other ferments. Later, Kaltwasser (1941), by adopting a similar technique, succeeded in reducing the total larval period to fourteen months.

Becker (1949b) has shown that young larvae with initial weights of up to about 25 mg. increased their weight more quickly at higher temperatures and older ones at lower and that young larvae responded less to fluctuating temperatures, as might be encountered in a building, than older ones. In experiments conducted over a ten-month period, a reduction in temperature and humidity for one week each month favoured larval development and reduced mortality. Measurement of individuals showed that there was no correlation between the length of females and the size of their eggs or the weight of the larvae from them after feeding for six months. Mortality was high among eggs incubated at 28°C [82·4°F] and 35 per cent relative humidity, but after the larvae that hatched had fed for four months under favourable conditions, all were as heavy as the heaviest larvae from eggs kept at optimum humidity (97 per cent). When first-instar larvae were placed between blocks of pine sapwood and pine heartwood or wood of deciduous trees, the pine sapwood was definitely preferred.

Results are also given by Becker (1949b) of experiments carried out at 28°C and 97 per cent relative humidity to test the nutritional value of diastase and various proprietary preparations of peptone. The degree to which they promoted growth varied according to the age of the larvae, but the addition to the wood of 1·7 per cent of its weight of peptones resulted in average increases in weight, after 70 days feeding, up to about 25 times as great as that in the controls. Glucose, brewers' yeast and vitamins B_1 and B_2 added to the peptone increased its effect in the order given, glucose being neutral or negative and vitamin B_2 doubling the rate of growth.

Further nutritional experiments were later carried out by Rasmussen (1956a, 1956b). Results showed that the nutritional value of the media (i.e. pine veneer or filter paper impregnated with different concentrations of peptone, with or without yeast extract) increased with the concentration of peptone and was improved by the addition of yeast; both effects were much less apparent in the case of filter paper and mortality

was higher. There was a tendency for the larvae to prefer the highest concentration of peptone. In further tests, only filter paper impregnated with peptone and yeast was used, and cholesterol was added for comparison. When it was absent, the larvae did not increase their growth rate with increasing concentrations of peptone and showed signs of nutritional deficiency, but these symptoms did not appear when cholesterol was present, and a later test showed it to be an essential growth factor for first-instar larvae. For further information on the effect of cholesterol and vitamins B_1 and B_2 on *Hylotrupes* larvae, the reader is referred to the more recent papers (1957a, 1957b, 1958) by Rasmussen.

The mature larvae tunnel to a point just beneath the surface and then turn back and pupate at some depth, although sometimes the larva itself penetrates to the exterior and plugs the orifice with frass before turning back to pupate. The time of pupation is extremely variable in this species as its environment is subject to considerable changes in atmospheric conditions. Usually it takes place in the spring, although sometimes it occurs in the autumn or even in the winter. The pupal period is of two to three weeks' duration. Eckstein (1928) states that adults remain in their pupal cells for five to seven months after eclosion before attempting to emerge, whereas certain other authors contend that adults do not always attempt to emerge, and have been known to copulate and oviposit in excavated portions often deep in the wood. According to Tooke (1949) the emergence period in South Africa begins in November, the peak of emergence being from December to January. Males tend to live considerably longer than females. In European countries adults usually eclode during June and July. The duration of the life-cycle varies considerably but would seem usually to be between three and four years, although Tooke (1949) has shown in South Africa development is usually considerably accelerated. Dürr (1956) has recently found the duration of the larval and pupal stages to be 182 days shorter in *Pinus radiata* than in *P. pinaster*, and 537 days shorter in very recently felled wood than in seasoned timber. Records of from six to eleven years are not uncommon and there are several accounts of prolonged larval life, notably by Bayford (1938), who discusses a larva estimated to be at least seventeen years old.

Parasites Hymenoptera. *Cryptus minator* Grav., *C. seticornis* Ratz., *Ephialtes manifestator* L. (Reineck, 1919); *Doryctes leucogaster* Nees (Xambeu, 1898–1902); *Ephialtes tuberculatus* Frc. (Rudow, 1912); *Rhoptrocentrus* sp. (Thompson, 1943). *Predators.* Coleoptera. *Opilo domesticus* (L.) (Steiner, 1938).

Economic importance. Although originally a forest insect, this beetle has now become one of the few truly domestic species, and the material damage it causes in many countries to structural timbers, especially roofs and rafters, is enormous. Linnaeus (1758) who first described this longhorn, must have been aware of its destructive nature, since he gave it the specific name "bajulus", which means "nuisance" or "trouble causer". Although first recorded from Algiers, it has since spread to many parts of the world and caused severe damage. During the past thirty years damage has increased considerably, and many costly measures have been adopted in combating this species on the Continent. In 1935 over a million marks were spent on control measures in Hamburg alone. In Sweden hundreds of houses have been severely infested, while in Denmark buildings have been insured against attack. In certain districts in Germany before the war, assurance companies levied an increase in

premium to cover the risk of infestation (Fisher, 1938). The final statistics of a survey of buildings in Germany discussed at a meeting in 1938 of the Association for the Scientific Advancement of measures against *H. bajulus*, showed that infestation had been recorded in 41·46 per cent of the 132,377 buildings examined and that the percentage in some districts was 70 to 80. Another survey of the same year revealed that the attics of about 40 per cent of all German houses were infested. Although the establishment of this species in South Africa is comparatively recent (probably not more than 50 years), large-scale infestation has already taken place. According to Tooke (loc. cit.), infestation of buildings in South Cape Town may prove to be nearly 90 per cent.[1] It has been calculated that an infested house would collapse within 25 to 30 years providing the insect could spread undisturbed. In England the possibility of this species spreading and causing extensive and serious damage cannot be lightly disregarded. Already breeding has increased in a number of buildings, and infestations have recently been recorded from Surrey, Essex and Sussex (Duffy, 1949b). Hickin (1947a) gives an account of the infestation of a 40-year-old house in Camberly (Surrey), and points out that if infested timber has been used in its construction, the insect must have maintained itself for at least four, or more probably, eight generations.

This recent increase is apparently due to forms of construction which promote exceptionally warm conditions in roof spaces during the summer months. This not only accelerates larval development but causes the wood to crack, thus providing additional oviposition sites. But by far the greatest cause is the widespread use of fast-grown, imperfectly seasoned softwoods as roof timbers. Although the rafters become air-dried, they still contain an appreciable quantity of water, and where the humidity is highest, the damage, owing to the accelerated growth of the larvae, is greatest. Another contributing factor to the recent increase of this insect is the selection of timbers more closely related to the strain involved than was previously the case, with the result that they break up more readily (Larsson, 1945). The recent succession of hot summers, at least on the Continent, may also have caused an increase in the population of this insect.

According to Schuch (1939) and Dürr (1954), recently built houses are most liable to attack, there being comparatively little damage to timber over fifty years old, but Topp and Jensen-Storch (1927) have estimated that structural timbers are not usually damaged until they are about twenty or thirty years old. Trägårdh (1927) is of the same opinion and later (1940) states that liability to infestation appears to increase with the age of roofs up to forty or seventy years, after which it remains constant, and that no houses less than twenty-five years of age are infested in Stockholm, Sweden. The considerable amount of damage that can be caused by only a few larvae is explained by the long larval period. When this insect is well established, it appears that infestation is more likely to spread through adults flying to fresh sites than by the importation of infested timber. In England, adults have recently been observed to be extremely active in hot sunny weather and to engage frequently in short, rapid, wheeling flights around infested houses; this clearly demonstrates the ease with which this longhorn is able to spread of its own accord (Duffy, 1954). In certain districts on

[1] For further details of the severity of infestation in South Africa, see the comprehensive accounts by the National Building Research Institute (1950) and Dürr (1954).

the Continent telegraph posts have been heavily attacked (Blair, 1947), and Donisthorpe (1947) records the emergence of this beetle from telegraph posts and fences in Surrey, England. In South Africa (Tooke, 1949), attack is by no means confined to roof timbers, for the beetle readily attacks flooring, doors, window frames, picture rails and even "deal" furniture. Imported packing cases, too, have recently been found to be infested and the danger of *Hylotrupes* spreading by this means should not be overlooked. Recently a large quantity of *Pinus maritima* was imported from Europe for building purposes in Australia: this timber has since proved to be infested and *Hylotrupes* is now established in yet another country (Brimblecombe, 1953; Duffy 1954). Recently the Queensland Government have undertaken the fumigation with methylbromide of some 2,300 houses in efforts to exterminate this insect, and in one suburb of Brisbane it is already established in prefabricated houses which were imported from France in 1950. It is conceivable that a similar situation may arise in Victoria, because several thousand precut houses have been imported since the war. The possibility of this pest infesting standing *Pinus* trees now being grown in Queensland and even the native pines (i.e. *Araucaria* spp.) should be given serious consideration.

Although this species would appear to flourish mainly in maritime climates, recent experiments in South Africa (Tooke, 1949) have proved that eggs will hatch at a constant humidity of 10 per cent, and that larvae are capable of completing their development under Pretoria conditions where the moisture content of the wood drops as low as 6 per cent and does not rise above 9 per cent. Hence the spread of *Hylotrupes* into inland countries is by no means improbable.

So far as South America is concerned, infestation until now appears to be confined to the Argentine. Gemignani and Rodríguez (1940) record damage to floor boards of a house in Buenos Aires and state that *H. bajulus* (Linnaeus) was originally introduced into Argentina in pine battens and that damage by this species is now of common occurrence. Hayward's statement (1941) that various buildings in Argentina (Concordia) have been heavily infested corroborates this.

Control. In cases where structural timbers have become very heavily infested they should be removed and burned, as even if it were possible to kill off the larvae they would be a source of danger, having become weakened through the larval damage. As a treatment for floors which are only moderately infested, Feytaud (1939) suggests the removal of the most heavily attacked boards and either the introduction of a volatile fluid into holes drilled at intervals in the remaining boards or the application of a solution of paradichlorobenzene in carbon tetrachloride[1] by means of a stiff brush. For major infestations Jensen-Storch and Henriksen (1932) found that the application of carbon bisulphide[1] at the rate of 25 fluid ounces per 1,000 cubic feet completely killed off the larvae and that hydrocyanic acid gas[2] produced by Zyklon B at the rate of 30 ounces per 1,000 cubic feet proved quite effective in summer though less so in winter owing to the reduction in larval respiration. Hahmann (1932) experimented with the application of dry heat produced by a generator of the type commonly used for drying out newly built houses. After one hour an air-temperature of 80°–87°C. [176°–188°F.]

[1] It is now thought inadvisable to use carbon tetrachloride as the health hazard is too great.
[2] Both these methods are now considered too dangerous to adopt.

was attained, which later rose from 88°–100°C. [190·4°–212°F), at which it was maintained for seven hours. All larvae and adults were killed inside the beams in which temperatures of 63°–74°C. [145·4°–165·2°F] were recorded.

According to Eckstein (1936b) a proprietary liquid known as "Imprägnier Lasolineum H" killed larvae in telegraph posts to a depth of 4 inches; it acts as both a contact and a respiratory poison. Kaltwasser (1941b), however, maintains that larvae are not harmed by boring short distances through heavily impregnated wood. A comprehensive account of chemical preventive and eradication measures for combating *Hylotrupes* is South Africa in given by Tooke (loc. cit.) to which the reader is referred.

Sieke (1936) described an electrical sound detector designed to amplify the rhythmic sound produced by larvae scraping off thin wooden shavings with their mandibles. This apparatus has proved useful in the examination of treated timber to ascertain the efficiency of insecticides. It is sometimes necessary to warm the timber to induce feeding.

Trägårdh (1937) maintains that infestation is commonest through adults flying from place to place on sunny days and recommends the placing of gauze over open windows in attics.

As a result of experiments with certain essential oils, Becker (1942a) suggests that they could be used to induce oviposition in a given place to prevent extensive oviposition on other timber.

Experiments have recently been carried out by Krough and Tooke (1946) in which the efficacy of pentachlorophenol as a timber preservative against borers has been tested. In Australia, it has been recommended (Brimblecombe, 1953) that infested timbers either be removed and destroyed or given a liberal application of 5 per cent pentachlorophenol in dieseline oil.

Dürr (1954), after very thorough investigations concerning the relative toxicity of wood preservatives and insecticides to *H. bajulus* (Linnaeus), recommends either 5 per cent zinc naphthenate in power paraffin or 3 per cent zinc naphthenate + 2 per cent pentachlorophenol in power paraffin. It was later found, however, that white spirit or a 50:50 mixture of white spirit and power paraffin was more effective as a solvent for metallic naphthenates, especially if the wood is to be painted after treatment. Both these solutions can be applied by immersing the seasoned timber in the solution for 10–15 minutes. The toxicity of the α-, β, γ- and δ-isomers of hexachlorocyclohexane towards eggs and larvae of *H. bajulus* (L.) has recently been determined by Becker (1962b.) The γ-isomer proved to be by far the most effective, although rather surprisingly the α-isomer follows, inferior by the factor 10 to 2000, according to the testing conditions. The δ- and, even more distinctly, the β-isomer proved to be considerably less efficient.

Jacquoit (1949) described the technique for using a high-frequency "pistol" for the descruction of *Hylotrupes* larvae in structural timbers and Bruel *et al.* (1960) have discussed the destruction of larvae in small sections of timber by means of a very high-frequency electric field.

There appears to have been no serious attempt at biological control measures, although Deckert (1929b) states that the large-scale breeding of the predacious clerid *Opilo domesticus* (L.) has been considered. Despite earlier assumption, blue-stained

timber (i.e. timber attacked by the fungus *Ceratostomella*) is not protected against attack by *Hylotrupes* (Steiner, 1939) but White (1962) has since shown experimentally that the presence of blue stain in Scots pine significantly reduces its nutritional value to *Hylotrupes* larvae.

According to Tooke (loc. cit.), the possibilities of complete and effective control in South Africa (especially the Western Cape) are even less hopeful than in European countries. It is due to the fact that this insect breeds as readily in dead timbers out of doors as in structural timbers indoors. Hence, whatever efforts are made in eradicating this pest from buildings, there will always remain a high population breeding "wild" in and around forested areas and constituting a constant threat to housing. The task of clearing such large areas of stumps and dead branches "in situ" is humanly impossible. In view of this constant threat to houses and property in South Africa, the Department of Agriculture has issued certain regulations, which enforce the treatment of all coniferous timbers in those areas where the beetle is known to exist at the owner's own expense, unless special exemption be granted by the Minister. Any person failing to comply with the requirements imposed by these regulations may be liable to a fine not exceeding 20 pounds or to imprisonment with or without hard labour for a period not exceeding two months.

Material studied. 7 L, Germany, nr. Berlin, K. Eckstein leg., in coll. B. M.; 14 L, 1 P, England, Essex, nr. Grays, vii.1949, in infested floorboards, E. A. J. D. leg., in coll. B. M.; 1 L, London, Balham, vi.1955, from infested crate, E. A. J. D. leg., in coll. B. M.

References. Altum, 1881 (Biol.), 1886 (Biol.), 1923 (Biol.); Bakke, 1960 (Biol. fig.); Barbey, 1913 (Biol. fig.); Bayford, 1938 (Biol.); Becker, 1938a (Biol.), 1938b (Contr.), 1941 (Biol., Contr.), 1942a (Biol.), 1942b (Physiol.), 1942c (Biol.), 1944a (L, Biol, Physiol.), 1944b (not seen), 1947 (Physiol.), 1949a (L, Biol., Physiol), 1949b (L, Biol., Physiol.), 1950a (Contr.), 1950b (Physiol.), 1953 (E, Biol.), 1954 (Biol.), 1962a (Biol., Physiol)., 1962b (Physiol., Contr.), 1962c (Biol., Physiol.); Blair, 1947 (Biol.); Blanc, 1907 (Biol.); Boas, 1923 (Biol. fig.); Bosq, 1934 (Biol.), 1942a (Biol.); Bouthery, 1879 (Biol.); Brammanis, 1944 (Biol., Contr.); Brèthes, 1922a (Biol.), 1922b (Biol.); Brimblecombe, 1953 (L fig., I fig., Biol. fig., Contr.), 1956 (I fig., Biol. fig.); British Museum (Natural History), 1954 (L fig., I fig., Biol.); Bruel *et al.*, 1960 (Contr.); Buchner, 1953 (Physiol.); Burmeister, 1865 (Biol.); Butovitsch, 1939 (Biol.); Caillol, 1914 (Biol.); Craighead, 1923 (L, Biol.), 1950 (Biol. fig., Contr.); Davies and Canovan, 1953 (Biol.); Deckert, 1928a (Biol.), 1928b (Biol.), 1929a (Biol.), 1929b Biol.), 1930 (Biol.), 1933 (Biol.); Della Beffa, 1931 (Biol. fig.); Department of Scientific and Industrial Research, 1938 (L fig., Biol. fig., Contr.); Donisthorpe, 1947 (Biol.); Duffy, 1949 (Biol. fig.), 1953a (E fig., L fig., P fig., Biol. fig., Contr.), 1954 (Biol)., 1957 (E fig., L fig., P fig., I fig., Biol. fig., Contr.), 1960 (E fig., L fig., P fig., I fig., Biol. fig., Contr.); Dürr, 1951 (L, Physiol., Contr.), 1956 (E fig., L fig., P fig., I fig., Biol.); Eckstein, 1920a (Biol.), 1920b (Biol.), 1921 (Biol.), 1926 (Biol.), 1928 (Biol.), 1929 (Biol.), 1932a (Biol.), 1932b (Biol.), 1934 (Biol.), 1935 (Biol.), 1936a (L, Biol. fig.), 1936b (Contr.), 1936c (Biol.); Eckstein and Butovitsch, 1931 (Biol.); Emden, 1939–1940 (L fig.); Escherich, 1923 (Biol. fig.); Falck, 1930 (Biol.), 1933 (Biol.); Feytaud, 1939 (Biol., Contr.); Finkenbrink, 1940 (Biol.); Fisher,1938 (insurance), 1945 (Biol.),

1949 (L fig., Biol. fig., Contr.); Fisher and Harris 1949 (Biol.); Forest Products Research Laboratory, 1952 (Biol.); Franzke, 1936 (Biol.); Germignani and Rodríguez, 1940 (I fig., Biol. fig., Contr.); Girard, 1881 (Biol.); Grosswald, 1939 (Biol.); Guse, 1893 (Biol.); Hahmann, 1932 (Contr.); Hayward, 1941 (Biol); Heeger, 1857 (E fig., L fig., P fig., Biol.); Heidenreich, 1939a (Biol. fig., Contr.), 1939b (Biol., Contr.); Heitz, 1927 (Biol.); Henriksen, 1914 (L fig.); Henry, 1907 (Biol., Contr.), 1909 (Biol.); Herzig, 1941 (Contr.); Hespeler, 1934 (Biol.), 1939 (Contr.); Hickin, 1947 (Biol.), 1957 (Biol.); Horn, 1933 (Biol.), 1934 (Biol.); Houlbert and Monnot, 1908 (L fig., Biol.); Jacquiot, 1949 (Contr.), 1950 (Biol.); Jarvis, 1947 (Biol.); Jensen, 1931 (Biol.), 1933 (Biol.); Jensen-Haarup and Henricksen, 1914 (L fig.,); Jensen-Storch, 1932 (Biol. fig.); Jensen-Storch and Henriksen, 1932 (Contr.); Judeich and Nitsche, 1889 (Biol.); Kaltwasser, 1941a (Biol.), 1941b (Biol., Contr.); Kaufmann, 1936 (Biol.), 1938 (Contr.) Kaufmann and Schuch, 1938 (Biol.); Korting, 1957 (Contr.), 1960 (Biol., Contr.); Krough and Tooke, 1946 (Contr.); Kunike, 1936 (L fig., Biol. fig.); Laing, 1919 (Biol.), 1920 (Biol.); Lakowitz, 1937 (Biol. fig.); Larsson, 1945 (Biol. fig.); Larsson and Gígja, 1959 (Biol.); Lepesme, 1944 (L fig., I fig., Biol.); Määr, 1933a (Biol.), 1933b (Biol.), 1933c (Biol.), 1935 (Biol.); Mansour, 1934 (Biol.); Mansour and Mansour-Bek, 1934a (Biol.), 1937 (Biol.); Mateus, 1952 (Contr.); Miller, 1925 (Biol.); Milligan, 1961 (L fig., I fig., I fig., Biol. fig.); Moll, 1926 (Biol.); Morris and White 1959 (Biol., Contr.); Nordlinger 1848 (Biol); Nüsslin, 1905 (Biol.); Parkin, 1934 (Biol.), 1940 (Biol.); Pavel, 1886 (Biol.); Perris, 1856 (L fig.), 1877 (L); Petroff, 1920 (Biol.); Peyerimhoff, 1919 (Biol.); Rasmussem, 1956a (L, Physiol. fig.), 1956b (L, Physiol. fig.), 1957a (Biol., Physiol.), 1957b (Biol., Physiol.), 1958 (Biol., Physiol.); Reineck, 1919 (Biol.); Riley, 1880 (Biol.); Rudow, 1912 (Biol.); Ruiz Castro, 1943 (Biol.); Saalas, 1923 (Biol.); St. George, 1957 (Biol.); Saraiva, 1954 (not seen), 1957a (E fig., L fig., Biol. Contr.), 1957b (Contr.) 1957c (Biol.); Schedl, 1935 (Biol.); Scheel, 1930 (Biol.); Schiödte, 1876 (L fig.); Schlottke and Becker, 1942 (Physiol.); Schmidt, 1951 (L fig., I fig., Biol. fig.), 1958 (L fig., Biol.); Schmitz, 1926 (Biol.); Schomann, 1936 (Biol.); Schuch, 1937a (Biol. Contr.), 1937b (Biol., Contr.), 1937c (Biol., Contr.), 1938 (Physiol.), 1939 (Biol.); Schultze-Dewitz, 1957 (Physiol.); Schultze and Becker, 1942 (Contr.); Schwartz, 1935 (Biol.); Schwedrfeger, 1932 (Biol.); Sieke, 1936 (Contr. fig.); Snyder, 1927 (Biol. fig.); Steiner, 1937 (Biol. fig.), 1938 (Biol.), 1939a (Contr.), 1939b (Contr.); Steyer, 1928a (Biol.), 1928b (Biol.); Tame and Snelling, 1954 (Biol.); Technau and Behrenz, 1958 (Biol.); Thompson, 1943 (Paras.); Tooke, 1949 (Biol., Contr.); Tooke and Scott, 1944 (Biol.); Topp and Jensen-Storch, 1927 (Biol.); Trägårdh, 1927 (Biol.), 1937 (Contr.), 1939 (Biol. fig.), 1940 (Biol.), 1947 (Biol.); Villiers, 1946 (I fig., Biol.); Vité, 1953 (L fig., I fig., Biol.); Wiedner, 1936a (Biol. fig.); 1936b (E fig., L fig., P fig., Biol.); Westwood, 1839 (Biol.); White, 1954 (Biol.); 1958 (Biol.), 1959 (Biol., Contr.), 1962 (Contr. fig.); Wichmaud, 1931 (Biol. fig.); Xambeu, 1898–1902 (L, P, Biol.); Zilling, 1925a (Biol.), 1925b (Biol.); Zumpt, 1947 (Biol., Contr.).

Callidium rufipenne Motschulsky

Distribution. ORIENTAL REGION: China, Formosa; PALAEARCTIC REGION: Japan, Korea.

Host plants: *Cryptomeria japonica*, *Chamecyparis obtusa*, *Abies* (Gressitt, 1951).

Ecomonic importance. This species infests several coniferae of commercial value in Japan and is already established in Formosa. Timber infested with this species has recently been imported into New Zealand and it is conceivable that this beetle could become established, particularly in *Pinus radiata*, if imported in sufficient numbers.

Reference. Gressitt, 1951 (Biol.).

Clytini

Larval Characters

Form robust, contracted, rather strongly tapering, but last two or three segments conspicuously enlarged. *Head* trapezoidal, slightly widened posteriorly. Gena hardly ever shouldered, setae present. One, two or three pairs of ocelli present. Labrum quadrate to transverse, fleshy. Mandible without a deep longitudinal impression on outer face. Hypostoma usually either rugose or longitudinally striate. Subfossal spine usually absent. Dorso-external process of palpifer much shorter than segment 3 of maxillary palp. *Prothorax* with distinct proalar plates and short lateral setae; pronotum slightly enclined anteriorly, glabrous or velvety pubescent, seldom striate, although often longitudinally rugose; median cleavage line absent or impressed. Eusternum indistinctly defined, marked by two round, glabrous, shining areas. *Abdomen* with ampullae broad, oval, flat and with two lateral and one transverse impressions (often indistinct). Pleural discs indistinct, sometimes reticulate. *Legs* absent or very small; femur wider than long.

Chlorophorus annularis (Fabricius)

Distribution. AUSTRALASIAN REGION: Australia (imported), Micronesia (Bonin Is., S. Mariana Is.); HAWAIIAN REGION: Hawaiian Is.; ORIENTAL REGION: India, Assam, Ceylon, Burma, Java, Thailand, New Guinea, Malaya, Indochina, China, Hainan I, Formosa, Philippine Is., New Guinea; PALAEARCTIC REGION: Japan.

Host plants: India: *Bambusa* sp., *Dendrocalamus strictus*, *Shorea robusta*, *Tectona grandis* (Beeson and Bhatia, 1939) China: *Sinocalamus*, *Spondias*, *Sinobambusa gibbosa* (Gressitt, 1942); *Gossypium*, *Liquidambar formosana* (Shiraki *et al*, 1937).

Mature larva. Head entirely milky white except mouthframe; gena gradually narrowed up to mouthframe, smooth, with a few pale setae. Antenna with segment 3 at least two-thirds as long as segment 2, cylindrical, slightly tapering apically and more than three times as long as basal width. One pair of ocelli present; lens feebly convex, pigmented spot indistinct. Hypostoma with front margin scarcely darker than remainder. Maxillary palpi with segment 3 distinctly longer than segment 2. *Prothorax* with posterior part of pronotum feebly longitudinally striate, median cleavage line distinctly impressed. *Abdomen* with ampullae finely rugose, glabrous; median longitudinal furrow rather broad and deep. *Legs* vestigial, less than half length of maxillary palp. *Spiracles* with peritreme rather narrowly oval, thin and pale testaceous. Length up to 23 mm.; maximum breadth (at prothorax) 4 mm.

Pupa. Head with vertex visible from above, smooth, glabrous. Eyes strongly convex, glabrous. Labrum triangular, glabrous. *Pronotum* slightly elongate, with sides

moderately rounded, with papillae or ferruginous tubercles. Elytra and wings extending to abdominal segment 3. *Abdomen* with tergites 1–6 each with a transverse group of short spines; tergite 7 with all spines curved inwardly. Length 7–15 mm.; breadth 4·5 mm.

Biology. Oviposition occurs on cut bamboo which has already lost a certain amount of sap. The first-instar larvae bore into the tissues of the walls of the bamboo, making irregular excavations which are packed with powdery wooden particles and frass. The galleries are not delimited by the nodes. The mature larva excavates a cell in the wood in which it pupates. Adults emerge from May to September, but principally in June (Duffy, 1953a).

Parasites. Hymenoptera: *Eurytoma xylotrechie* Ferr. (Ferrière, 1933); *Doryctes bistriatus* Kieff., D. *brevipetiolus* Kieff., *D. picticeps* Kieff., *D. strioliger* Kieff., *D. tristriatus* Kieff., *Duportia cincticornis* Kieff., *Paraglypta tubigera* Kieff., *Promiscolus sequistriatus* Kieff., *Sclerodermus domesticus* Latr. (Thompson, 1943).

Economic importance. This species is primarily a borer of dry bamboo. Owing to its particular type of habitat, development is often considerably retarded, with the result that emergence often occurs long after the bamboo has been utilised in the construction of furniture, etc. (Duffy, 1953b). Saalas (1941) gives an account of a consignment of ski-staffs which were found to be infested with larvae of this species. In India the bamboo structure of thatched roofs and field telegraph posts are frequently extensively attacked (Stebbing, 1914).

Control. Stebbing (1914) recommends the following treatment. Immerse the bamboos in water for five days (this causes a gelatinous exudation and renders the bamboo more highly absorbent), and then allow to dry in a covered shed for several days. When quite dry, they should then be soaked in crude petroleum ("Rangoon oil") for forty-eight hours. This procedure, he maintains, gives complete protection. Craighead (1950) recommends fumigation or heat-treatment.

Material studied. 8 L, 1 P, no data, in coll. F. P .R. L.; 4 L, 1 I, Australia, New South Wales, 5.vii.1956, from bamboo from China, in coll. F.C.N.S.W.

References. Beeson, 1941 (Biol.), Beeson and Bhatia, 1939 (Biol.; Craighead, 1950 (Biol. fig., Contr.); Duffy, 1953a (L, P, fig. Biol.), 1953b (L, P fig., Biol., Contr.); Ferrière, 1933 (Paras.); Gardner, 1927 (L); Gressitt, 1942 (Biol.), 1951 (Biol.), 1956 (Biol.); Maxwell-Lefroy, 1909 (Biol.); Mukaikawa, 1922 (Biol.); Newman, 1946 (Biol.); Saalas, 1941 (Biol. fig.); Stebbing, 1914 (Biol.); Thompson, 1943 (Paras.).

Xylotrechus australis (Laporte & Gory)

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland), Lord Howe I; ORIENTAL REGION: Aru, Amboyna, Bouru, Ceram, Kaioa, New Guinea, Philippine Is., Sarawak, Singapore, Ternate I.

Host plants: *Gmelina leichardtii, Argyrodendron trifoliolatum, Acacia aulacocarpa, Hemicyclia australasica, Tarrietia peralata, Loranthus pendulus, Vitex lignum-vitae* (A. R. Brimblecombe).

Biology. The larval galleries are shown on Pl. VI, fig. 6.

References. None available.

Heteropsini

Aridaeus thoracicus (Donovan)

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland).
Host plants: *Pyrus malus*, *Cryptocarya glaucescens* (A. R. Brimblecombe).

Mature larva. Head with mouthframe thick, broadly ferruginous; genae gradually narrowed up to mouthframe. Ocelli absent. Hypostoma with front margin ferruginous and bearing two pairs of long setae on each side, which project well beyond margin. *Prothorax* with anterior part pale ferruginous and rather densely setose; posterior part milky white and finely longitudinally striate; prosternum similarly striate. *Abdomen* with ampullae non-tuberculate, finely micro-granulate. *Legs* well-developed, pale. *Spiracles* with peritreme thick, pale, rather broadly oval. Length up to 27 mm.; maximum breadth (at prothorax) 4·9 mm.

Pupa (fig. 103). *Head* with vertex visible from above, dome-shaped, glabrous; front smooth, glabrous, clypeus with a deep transverse impression at base, glabrous. Antennae extending as far as abdominal segment 3, where they are recurved ventrally to terminate near apices of middle tibiae. Eyes feebly convex, glabrous. Labrum cordate, glabrous. *Pronotum* with sides non-tuberculate; disc transversely strigose and bearing numerous scattered, very fine setae. *Meso-* and *metanotum* with a few similar setae. Elytra and wings extending as far as abdominal segment 4. Abdomen with tergites 1–6 with paired, transversely-oval tuberculate areas, each bearing short, stout, ferruginous spines. Tergite 7 acutely produced posteriorly and bearing a pair of large, stout, paramedian, vertical tubercles; segment 8 elongate, subcylindrical, with a pair of smaller tubercles. Segment 9 very short. Sternites glabrous. *Legs* with hind femora extending as far as abdominal segment 7 and lying parallel to longitudinal axis of body. *Functional spiracles* present on segments 1–7; peritreme rather narrowly oval and slightly raised above general level of cuticle. Length 26 mm.; maximum breadth 9·5 mm.

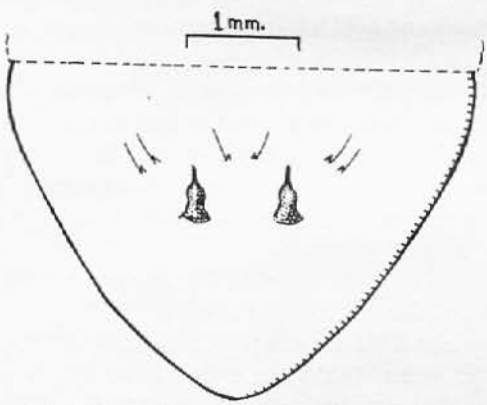

Fig. 103. *Aridaeus thoracicus* (Donovan). Pupa. Abdominal tergite 7.

Material studied. 1 P, 1 I, Australia, Sunnybank, 12.x.1941, from *Pyrus malus*, A. R. B. leg., in coll. D.A.S.B. 1 L, 1 P, Australia, New South Wales, N. Sydney, xii.1936, from Pepper tree, in coll. D.A.N.S.W.

Tragocerini

Tragocerus lepidopterus (Schreibers)

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Victoria).
Host plant: *Eucalyptus paucifolia* (Best, 1920).

Biology. Larvae feed in the roots of the host probably for at least three or four years (Best, 1920).

Reference. Best, 1920 (Biol.).

Coptommatini

Coptonima variegatum (Fabricius)

[The Tawa Longhorn]

Distribution. AUSTRALASIAN REGION: New Zealand.

Host plant: *Beilschmeidia tawa* (Miller, 1925); *Edwardsia tetraptera* (Gourlay, 1960).

References. Gourlay, 1960 (Biol.); Miller, 1925 (I fig., Biol.).

Navomorphini

Navomorpha lineata (Fabricius)

Distribution. AUSTRALASIAN REGION: New Zealand.

Host plants: *Pseudotsuga taxifolia*, (G. B. Rawlings); *Pinus radiata* (Hudson, 1934); *Cryptomeria japonica* (Dumbleton, 1957).

Adult (fig. 104). Length 11–18 mm. Head black; prothorax and elytra ferruginous, glabrous and shining, except for longitudinal bands of dense white pubescence as figured. *Head* with antennae not extending beyond middle of elytra. *Prothorax* without lateral tubercles. Elytra strongly tapering posteriorly.

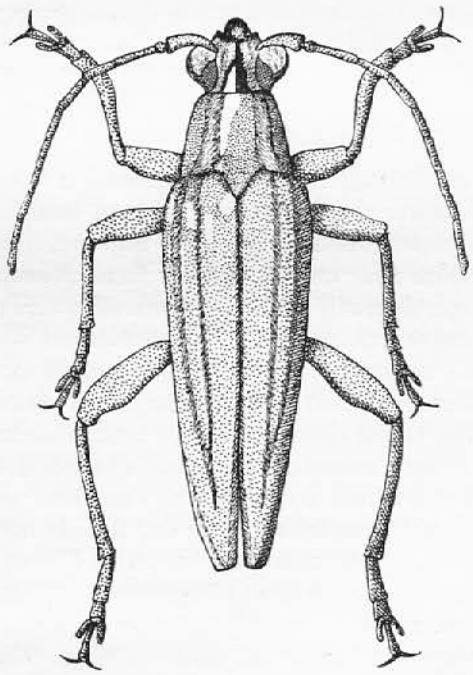

Fig. 104. *Navomorpha lineata* (Fabricius). Adult.

Mature larva (fig. 105). Similar to that of *Oemona hirta* (Fabricius) but differing as follows. Form more slender. *Head* with front margin of frons feebly sinuate. *Abdomen* (fig. 105) with segment 10 bearing a series of about twelve small, faintly pigmented rounded tubercles (each with a coarse seta) around posterior margin. Length up to 38 mm.; maximum breadth (at prothorax) 5 mm.

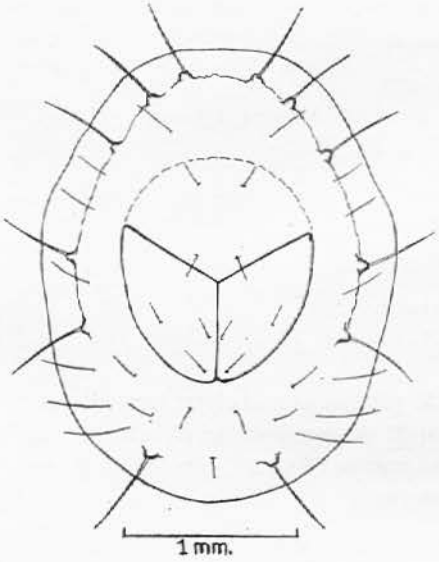

Fig. 105. *Navomorpha lineata* (Fabricius). Mature larva. Abdominal segment 10. Caudal aspect.

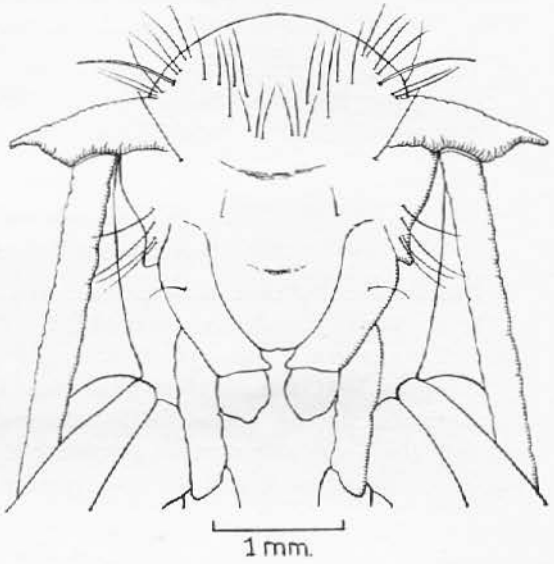

Fig. 106. *Navomorpha lineata* (Fabricius). Pupa. Head. Ventral aspect.

Pupa (fig. 106). *Head* elongate, triangular, concealed from above by pronotum; front with numerous coarse setae, especially around bases of antennal tubercles; apices of antennal tubercles produced outwards into a conical process. Mandibles each with about five setae near middle of outer face. *Pronotum* bearing numerous coarse, ferruginous setae, especially across front margin where they arise from minute papillae; lateral tubercles absent. *Meso-* and *metanotum* each with about six finer setae. *Abdomen* with tergites 1–6 each with numerous scattered, short, stunted spines; tergite 7 with much larger spines, those near posterior margin being strongly curved anteriorly and tuberculate basally; tergite 8 with a pair of large paramedian, incurved spines. *Legs* glabrous, hind femora extending as far as abdominal segment 5 and placed slightly obliquely to longitudinal axis of body. *Functional spiracles* present on abdominal segments 1–6; peritreme broadly oval and slightly raised above general level of cuticle. Length up to 29 mm.; maximum breadth 5·5 mm.

Egg. Length 2·2 mm.; width 0·9 mm.; elongate-ovoid, white. Chorion with close-set papillae (Dumbleton, 1957).

Biology. Eggs are deposited under bud scales on twigs. The larvae bore down the twigs to branches which they finally girdle, causing them to break off. Larvae fre-

quently remain in the standing part of the branches which is usual for a species which girdles (G. B. Rawlings).

Adults emerge in November, December and January. There is evidence that *Pseudotsuga* and *Cryptomeria* trees bearing oviposition scars of the cicada *Melampsalta cingulata* (Fabricius) are particularly susceptible to attack. Larve tunnel down the centre of living branches up to one inch in diameter (Pl. X, fig. 3) and before pupating often construct a circular gallery round the branch which so weakens it that it is easily broken by the wind. Pupation takes place in a chamber plugged at both ends with shredded wood (Dumbleton, 1957). Only living wood is infested.

Material studied. 2 L, 2 P, New Zealand, 16.iii.1949, G. B. Rawlings leg., in coll. F.R.I.

References. Dumbleton, 1937 (Biol.), 1957 (E, L fig., P, Biol.); Hudson, 1934 (Biol.); Morgan, 1960 (Biol.); Mühlmann, 1954 (Biol.).

Navomorpha sulcata (Fabricius)

[The Pine Longhorn]

Distribution. AUSTRALASIAN REGION: New Zealand.

Host plants: *Pinus radiata* (Rawlings, 1953); ?*Aristotelia serrata* (Hudson, 1934); *Pyrus malus*, *Prunus* (Miller, 1922).

Mature larva. No material available. Dumbleton (1957) gives the following description.

"Length up to 19 mm. Body cylindrical, but tapering posteriorly from prothorax. Body setae moderately stout and castaneous. Colour white. Head transverse. Anterior foramen twice as wide as long. Posterior foramen with sides straight and sub-parallel, widest about mid-length. Mandible of normal cerambycine type. Maxillary palp slightly longer than femur plus tibia. Palipfer with process and smaller process on 1st joint of palp. One or two setae on maxillary sclerite. Epistoma with two setae. Margin or epistoma slightly emarginate. Frontal setae normal. Three ocelli. Genae shouldered, with distinct blunt tubercle caudad of antenna and dorsad of ocelli. Genal setae sparse and fine. Hypostoma with two or three setae. Thorax. Pronotum twice as wide as long. Metanotum with X-shaped lines. Presternum and epipleurum fused. Presternum and apex of eusternum setose. Base of eusternum with two indistinct smoother and shining plates. Legs 4-jointed, well-developed. Prothoracic spiracle with comb on posterior margin. Abdomen. Pleural tubercles present. Pleural discs not evident. Ampullae coarsely tuberculate, not projecting. Spiracles oval. No sclerotised thickening of hind-intestine."

Pupa. No material available. Dumbleton (l.c.) gives the following description. "Form as in adult, but with conical process directed laterad from distal end of first joint of antenna. Head with long setae; six on each side of vertex behind antenna, about seven on each side of front between antennae, four on gena, two on each side of clypeus and two or three on mandible. Pronotum with long setae across anterior margin, across disc before mid-length and in posterior angles. Mesonotum with two setae on each side. Metanotum with one or two small setae. First segment of abdomen almost unarmed except for two or three faint spines. Spines increasing in number and

size on segments 2–6. Seventh with about six recurved spines on each side. Eighth with two recurved points at mid-length and one at each posterior angle. Femora, tibiae and elytra without spines, trochanters without processes. Similar to pupa of *N. lineatum*, which has more spines on segment 7 and lacks the prominent spines on segment 8."

Egg. Length 1·5 mm., ovoid, micropylar end more rounded, white, chorion papillose (Dumbleton l.c.).

Biology. Larvae have been taken from dead branches of the host; pupae were present in May and adults emerged in July and oviposited in August. The larval galleries extend under the bark and also in the wood (Dumbleton, 1957). According to Hudson (1934), adults emerge between October and January but Miller (1922) states that August is the month in which emergence reaches its peak.

The female makes small holes in the bark of twigs and branches in which eggs are deposited. Larvae frequently tunnel subcortically but also penetrate the heartwood. Young larvae are often found in terminal shoots in which they devour all but the bark. When mature, the larva blocks its gallery in front and behind with plugs of shredded wood and then pupates. The beetle, on emerging, makes its way to the bark through which it escapes by an oval hole (Miller, l.c.). Thomson (1927) states that adults are frequently to be found on the flower panicles of *Rubus australis*.

Control. In order to reduce infestation, branches containing larvae and pupae should be cut off and burned before August. In the case of large branches, the injection of carbon bisulphide into the gallery is recommended (Miller, l.c.).

References. Clark, 1932 (Biol.); Dumbleton, 1937 (Biol.), 1957 (E, L fig., P, Biol.); Hudson, 1934 (Biol.); Miller, 1922 (L fig., P fig., I fig., Biol. fig., Contr.), 1925 (L fig., I fig., Biol., fig.); Mühlmann, 1954 (Biol.); Rawlings, 1953 (Biol.); Thomson, 1927 (Biol.).

Navomorpha stictica Broun

Distribution. AUSTRALASIAN REGION: New Zealand.

Host plant: ?*Plagianthus betulinus* (Hudson, 1934).

Biology. Adults emerge between December and February (Hudson, 1934).

Reference. Hudson, 1934 (Biol.).

5. LAMIINAE

Larval Characters

Head elongate, with sides parallel or converging posteriorly; dorsal margins of epicranial halves behind frons fused for their entire length; tentorial cross-arm internal, at right-angles to hypostoma (i.e. occipital foramen not divided). Mandible elongate, with cutting edge oblique and apex rounded. Lower boundary of frons not produced over clypeus; six (occasionally more) epistomal setae present. Clypeus trapezoidal, wide, filling space between mandibles. Labrum transverse to cordate. Ocelli, if present never more than two pairs (although there may be one to three vestigial ocelli comprising a pigmented spot without a distinct lens), usually one pair only. Gula usually broad. Maxillae rigid (only movable from stipes); cardo, maxillary articulating area

and submentum fused and attached for entire distance between ventral articulations of mandibles; palpifer large, distinct, bearing lobe, and with outer margin straight; process of palpifer absent. Antennae very short and retractile, 2- or 3-segmented. *Prothorax* having presternum and epipleurum usually distinctly separated; eusternum sometimes indistinct. Postnotal fold absent. *Abdomen* with region surrounding spiracle not protruding; epipleurum protuberant on from three to all segments; pleutal discs absent; hypopleurum small; coxal lobe large. *Legs* absent or occasionally present, but then vestigial. *Spiracles* of mesothorax protruding into prothorax.

Dorcadionini

Somatidia antarctica (White)

Distribution. AUSTRALASIAN REGION: New Zealand.

Host plants: *Pinus radiata* (Rawlings, 1953); *Larix* (Dumbleton, 1957); *Melicytus ramiflorus*, *Carpodetus serratus* (Hudson, 1934); *Dacrydium cupressinum* (R. H. Milligan); *Podocarpus spicatus*, *P. dacrydioides* (Morgan, 1960b).

Mature larva. Form elongate, cylindrical, tapering posteriorly. *Head* elongate, widest at mid-length, behind which it is slightly constricted, with sides converging; antennal foramen open posteriorly; frons broadly ferruginous; genae ferruginous behind ocelli; six epistomal setae present. One pair of ocelli present; lens large, round, strongly convex, pigmented spot greyish, moderately distinct. Hypostoma very pale ferruginous, with two or three setae on each side of gula. Antenna 2-segmented, segment 2 bearing a tapering, hyaline process. Labrum strongly traversely oval, with dense, short setae anteriorly. Maxilla with segment 3 of palp longer than segment 2. Mentum distinct from submentum. *Prothorax* with posterior half of pronotum faintly but coarsely longitudinally striate. Eusternum distinct, sparsely setose. *Abdomen* with tubercles of ampullae confusedly arranged, not in two distinct rows. Trgite 9 bearing a conspicuous median spine near posterior margin. Anus tri-lobate. Epipleurum protuberant on all segments. Pleural tubercle without sclerotised pits. *Legs* vestigial. Spiracles with peritreme broadly oval and with several subcontiguous marginal chambers on posterior half. Length up to 12 mm.; maximum breadth (at prothorax) 2·25 mm.)

Pupa. Head with vertex visible from above, rounded between antennal tubercles and with a pair of long setae; front with 12–14 shorter setae. Clypeus and labrum each with a row of four similar setae. Mandibles each with a pair of setae. Antennae extending as far as abdominal segment 3, where they are recurved ventrally to terminate alongside middle femora. Eyes glabrous. *Pronotum* with lateral tubercles feebly and broadly rounded; disc and margins with numerous scattered, bristly setae. *Mesonotum* with a row of about 12 fine setae. Elytra and wings extending as far as abdominal segment 4 or 5. *Abdomen* with tergites 2–6 each with a transverse row of short, stout spinules (each with a sub-basal seta), the paramedian pair being appreciably stouter. Tergite 9 produced medially into a long slender, spine-like process. Sternites each with a pair of sublateral setae. *Legs* with femora each bearing four to six stout setae; hind femora extending to abdominal segment 5; tibiae more or less at right-angles to longitudinal axis of body. *Functional spiracles* present on abdominal

segments 1–6; peritreme oval, thick, pale. Length up to 8·1 mm.; maximum breadth 3·9 mm.

Biology. Emergence of adults starts in late December, continuing to early February. Eggs are deposited in the roughened bark of *Dacrydium* and other softwoods and hatch in 14–20 days. The larvae feed within the bark scales and pupate at the end of their galleries in late October and November. The pupal period to the moult averages about 16 days, and adult development continues for 5–8 days (Morgan, 1960b).

Material studied. 6 L, 1 P, New Zealand, Rotorua, 23.xi.1959, from decaying plank of *Dacrydium cupressinum*, R. H. Milligan leg., in coll. B. M.

References. Dumbleton, 1957 (L fig., Biol.); Hudson, 1934 (Biol.); Morgan, 1960a (Biol.), 1960b (Biol.); Rawlings, 1953 (Biol.).

Somatidia simplex Broun

Distribution. AUSTRALASIAN REGION: New Zealand.

Host plant: *Melicytus ramiflorus* (Hudson, 1934).

Reference. Hudson, 1934 (Biol.).

Hexatricha pulverulenta (Westwood)

Distribution. AUSTRALASIAN REGION: New Zealand.

Host plants: *Pinus radiata* (Clark, 1932); *Nothofagus* (Dumbleton, 1937); *Nothofagus menziesii*, *N. truncata* (Morgan, 1960b).

Mature larva (fig. 107). Form rather slender, slightly depressed and tapering posteriorly. *Head* (fig. 107) elongate, slightly depressed, with sides subparallel and abruptly constricted for posterior fourth; frontal sutures very distinct, antennal foramen very narrowly open posteriorly. Mouthframe strongly and very broadly sclerotised and ferruginous, the frons entirely so; six epistomal setae present. Mandible slender, about twice as long as basal width, with cutting edge broadly emarginate.

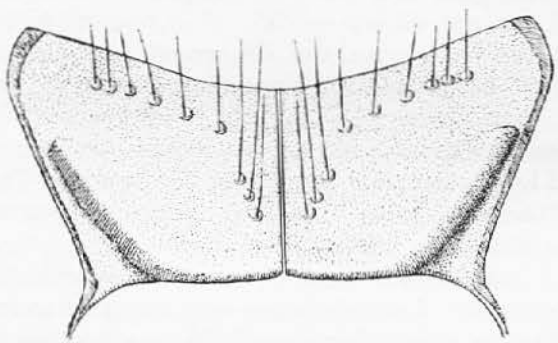

Fig. 107. *Hexatricha pulverulenta* (Westwood). Mature larva. Hypostoma.

One pair of ocelli present; lens small, round, pigmented spot indistinct owing to sclerotisation of lens. Hypostoma entirely strongly sclerotised and ferruginous; numerous very long setae present immediately behind anterior margin and on each side of gula; rising posteriorly to a semi-circular ridge, with prominent shoulders

laterally; sutures extending to posterior margin; gular region indicated by a thin pale cleavage line. Antenna minute, 2-segmented; segment 2 bearing a conical hyaline process. Labrum transversely oval, rather densely setose anteriorly. Maxilla with segment 3 of palp almost as long as segment 2; labila palp with segment 2 about two-thirds length of segment 1. Mentum distinct from submentum. *Prothorax* ferruginous anteriorly; posteriorly glabrous and very faintly longitudinally striate; eusternum distinct, triangular, sparsely setose. *Metanotum* with two rows of moniliform tubercles. *Abdomen* with each dorsal ampulla bearing paired groups of irregularly-arranged, shining, glabrous, moniliform tubercles; ventral ampullae with two transverse rows of tubercles. Tergite 9 without a sclerotised process. Anus tri-lobed and sparsely setose. Epipleurum protuberant on all segments. Pleural tubercles without sclerotised pits. *Legs* vestigial, consisting of a minute setose tubercle. *Spiracles* with peritreme circular; posterior half lined with numerous subcontiguous marginal chambers. Length up to 35 mm.; maximum breadth (at prothorax) 5 mm.

Pupa (fig. 108). *Head* with vertex concealed from above by pronotum, feebly excavate and bearing setae which all arise from papillate bases as follows: three pairs around bases of antennal tubercles, six pairs on front, three pairs on genae, three pairs on clypeus and two pairs on mandible. Antennae extending to between abdominal segments 3 and 4, where they are strongly recurved ventrally to terminate alongside mandibles. Eyes feebly convex, glabrous. Labrum bearing three to four setae. *Pronotum* without lateral tubercles; a row of setiferous papillae along anterior margin, a small subcircular area of setigerous spinules on disc; antero-lateral margins feebly tuberculate, bearing setigerous papillae; posterior angles bearing scattered setigerous papillae. *Mesonotum* with a semi-circular group of setigerous papillae posteriorly. *Metanotum* with four to six setigerous papillae on each side of scutellar groove. *Abdomen* with ampullae on tergites 2–6 each with two transverse rows of stout spines (each with a subapical seta). Tergites 7–8 with similar scattered spines. Tergite 9 bearing a large median, vertical, spine-like tubercle (which is slightly curved anteriorly), on each side of which are several stout, thorn-like spines each bearing a subapical seta. *Legs* with femora each bearing at least 12 long setae (each arising from a papillate base; tibiae and tarsi glabrous; hind segment extending to abdominal segment 7; tibiae placed obliquely to longitudinal axis of body. *Functional spiracles* present on segments 1–7; peritreme circular, thick, and strongly raised above general level of cuticle. Length up to 20 mm.; maximum breadth 6 mm.

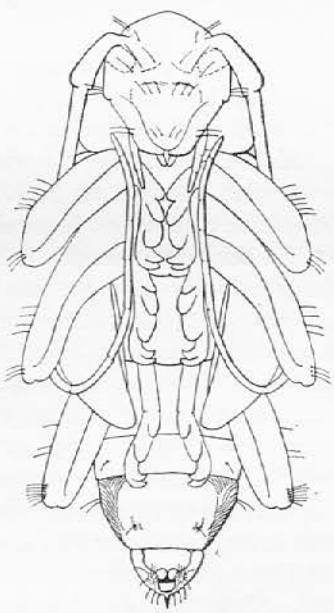

Fig. 108. *Hexatricha pulverulenta* (Westwood). Pupa. Ventral aspect.

Egg. Length 3 mm.; width 1 mm.; white, chorion unsculptured (Dumbleton, 1957).

Biology. Eggs are deposited in the bark of dying trees (sometimes in *Sirex* oviposition punctures). The larvae tunnel subcortically, pupating in the wood

(Pl. IX, figs. 2 and 3) (G. B. Rawlings).

Pines are attacked when recently dead. The female beetle gnaws an oviposition pit 2–3 mm. deep in the bark, inserts its ovipositor and deposits an egg between the bark and the wood. Usually only one egg is laid but occasionally as many as four have been found. When the bark is more than one quarter of an inch thick, the beetle chooses a fissure in the bark in which to prepare the oviposition pit. After the egg has been deposited, the pit is sealed with a secretion. Eggs laid under laboratory conditions hatched within 19 days; they have been found in the field from October to April. The young larvae make shallow, subcortical galleries. Pupation may occur in a shallow subcortical cell formed of coarse shreds of wood or in a vertical chamber 1–2 in. deep in the wood. Pupae have been collected from mid-November to the end of February. The pupal period is about 30 days. The adult emerges through an irregular oval hole in the bark. Adults have been found from October to April and, at least in captivity, feed on pine bark (Dumbleton, 1957).

According to Morgan (1960b), this species has either a one- or a two-year life-cycle from a single oviposition.

Parasites. The cocoons of the ichneumon *Mesostenus albopictus* Smith have been found in the larval galleries (Dumbleton, 1957).

Material studied. 5 L, 1 P, New Zealand, Whoka, 17.ii.1956, from *Pinus radiata*, G. B. Rawlings leg. in coll. F.R.I.

References. Clark, 1932 (Biol.); Dumbleton, 1957 (E, L fig., P., Biol.); Jeffreys, 1939 (L fig., P fig., I fig., Biol.); Miller, 1955 (Biol.); Morgan, 1960b (Biol.); Rawlings, 1953 (Biol.).

Xyloteles griseus (Fabricius)

[The Fig Longhorn]

Distribution. AUSTRALASIAN REGION: New Zealand.

Host plant: *Ulmus* and numerous native and exotic trees; also sometimes found in mummied apples (Dumbleton, 1957).

Mature larva. No material available but Dumbleton (l.c.) gives the following description. Length up to 15 mm. Cylindrical, tapering posteriorly. Colour white. Body setae castaneous. Head elongate, widest at mid-length, tapering and slightly constricted behind mid-length, half as deep as wide. Mandible long, slender, cutting edge oblique, molar part not angulate, two setae on outer face. Clypeus trapezoidal. Labrum transverse, rounded anteriorly, pigmented on posterior half. Maxillary palp three-jointed, last joint longer than second. Second joint of labial palp slightly shorter than first. Three or four setae at base of labial palpifer. Mentum not very distinct, with one large and one or two smaller setae on each side. Epistoma straight, with three setae. Front entirely pigmented, with six or seven setae anteriorly on each side. Antennae retractile, antennal ring bisected by frontal suture. One ocellus. Hypostoma flat, with five or six setae on each side. Thorax. Pronotum transverse, nearly twice as wide as long, not separated anteriorly from pro-alar area, posterior area feebly striate, notal spots, not distinct. Eusternum not well defined, setose. Legs vestigial. Spiracles oval. Abdomen. Epipleurum protuberant on last six or seven segments. Pits not evident on pleural tubercles. No caudal spine. Spiracles sub-circular. Ampullae with two rows of tubercles.

Pupa. No material available but Dumbleton (l.c.) gives the following description. Form as in adult. Head with the following setae; six setae around antennal insertion, six across clypeus, two on mandible, none on labrum and gena. Pronotum with a row of six setae across anterior margin and a row across disc anterior to mid-length with a median group of five or six posterior to this and about twelve setae in posterior angles. Mesonotum with three setae on each side and metanotum with three or four on each side. A single row of short setigerous, pigmented spines posteriorly on abdominal segments one and two. Segments three to six with anterior and posterior rows. Seventh with a group of three setae on each side at one-third length and 16–18 setae across posterior half. Eighth segment with three setae on each side near anterior margin, posterior margin with a median pigmented process directed dorsad and two pigmented spines on each side. Femora with a number of setae on distal half. Tibiae without setae. Small processes on trochanters.

Biology. Larvae, pupae and adults have been found in dead branches of *Ulmus* in December. Adults emerge in December and early January. The female gnaws a pit through the bark to receive each egg. Larvae feed subcortically but enter the wood to pupate (Dumbleton, 1957).

References. Dumbleton, 1937 (Biol.), 1957 (L fig., P, Biol.).

Psilocneia brouni Bates

Distribution. AUSTRALASIAN REGION: New Zealand.

Host plant: ? *Nothofagus* (Hudson, 1934).

Reference. Hudson, 1934 (Biol.).

Ceraegidion horrens Boisduval

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Victoria).

Reference. French, 1889 (Biol.).

Microtragus mormon Pascoe

Distribution. AUSTRALASIAN REGION: Australia (S. Australia).

Biology. Adults are nocturnal and may be found during the summer concealed under stones or among tufts of sedge.

Reference. Tepper, 1887 (Biol.).

Mesolita pascoei v.d. Poll

Distribution. AUSTRALASIAN REGION: Australia (New South Wales).

Host plant: Tree-fern (Lea, 1918–21).

Reference. Lea, 1918–21 (Biol.).

Monochamini

Dihammus holotephrus (Boisduval)

Distribution. AUSTRALASIAN REGION: Australia (Queensland), New Hebrides, W. Samoa, Woodlark I.

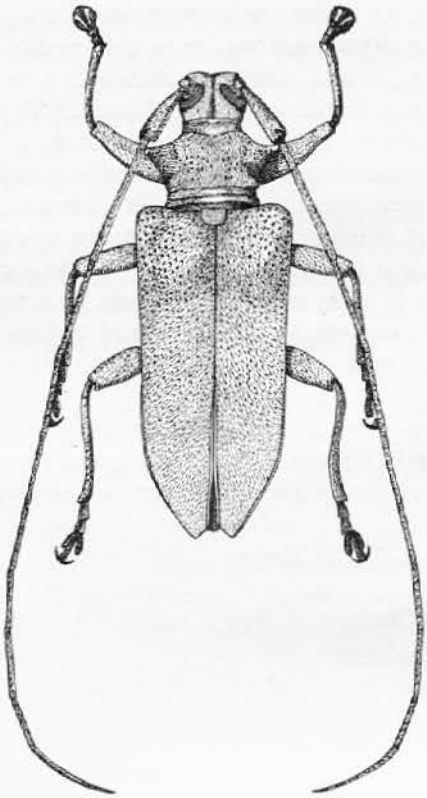

Fig. 109.
Dihammus holotephrus (Boisduval). Adult.

Host plant: *Theobroma cacao* (Dumbleton 1951).

Adult. (fig. 109). Length 20–32 mm. Entirely light brown except elytra which in unbraided specimens are mottled with darker brown spots. *Head* with antennae more than three times as long as body in male and about twice as long as body in female. *Prothorax* with a pair of stout spine-like lateral tubercles; disc with a pair of slightly raised, oval paramednia tubercles and with numerous coarse punctures as figured (fig. 109).

Mature larva (fig. 110). *Head* elongate, rather strongly depressed, widest at anterior third, with sides rather strongly converging posteriorly. Frontal sutures rather indistinct; antennal foramen closed posteriorly. Frons entirely ferruginous except front margin which is rather more pitchy; bearing eight or more setiferous pores; six epistomal setae present. One pair of ocelli present; lens large, oval,strongly convex, pigmented spot distinct. Hypostoma flat, entirely ferruginous, with a pair of setal pores alongside gular sutures. Clypeus glabrous. Labrum transversely oval, fringed with coarse setae. Antenna 2-segmented. Maxilla with palpal segment 3 about two-thirds length of segment 2. Labial palpi

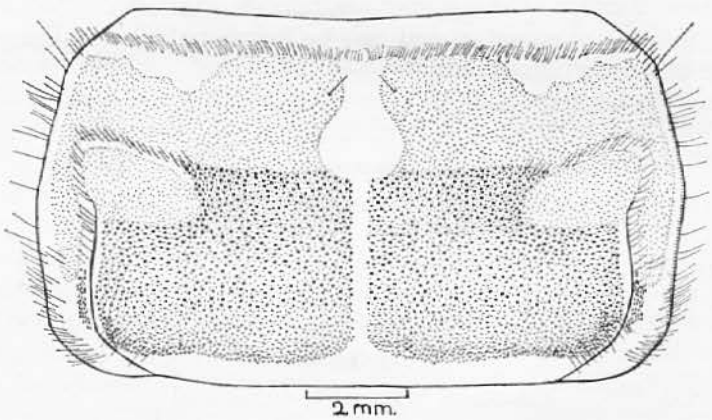

Fig. 110. *Dihammus holotephrus* (Boisduval). Mature larva. Prothorax. Dorsal aspect.

with segment 2 about half length of segment 1. Mentum distinct from submentum. *Prothorax* (fig. 110) with anterior part of pronotum testaceous to pale ferruginous, glabrous and fringed anteriorly with setae; posterior area rather densely covered with coarse asperities which are larger towards sublateral grooves; postnotal fold absent. Eusternum and sternellum glabrous. *Metathorax* dorsally with two transverse rows of microspiculate moniliform tubercles. *Abdomen* with each dorsal ampulla with two transverse furrows and four transverse rows of microspiculate, moniliform tubercles. Tergite 9 without a sclerotised process. Epipleurum slightly protuberant on all segments; pleural tubercle each with a pair of sclerotised pits. Anus trilobed. *Legs* minute but visible with a X15 lens. *Spiracles* with peritreme broadly oval, rather thick, pale and with a conspicuous pair of sub-contiguous marginal chambers on posterior half. Length up to 41 mm.; maximum breadth (at prothorax) 8·1 mm.

Biology. According to Risbec (1937), the larval period lasts several years. The larva feeds under the bark until almost mature and then penetrates the wood, making a gallery at right-angles to the bark. When the centre of the heartwood is reached, it then tunnels vertically in order to prepare the pupal cell. In the New Hebrides this insect is a serious pest of *Theobroma*.

Material studied. 2 L, 1 I, Samoa, Saanapu, 23.ix.58, from *Theobroma*, L. J. Dumbleton leg., in coll. B. M.

References. Cohic, 1953 (?); Dumbleton, 1951 (Biol.); Risbec, 1937 (I fig., Biol. fig., Contr.).

Dihammus vastator (Newman) (=**fistulator** Aulmann)

[The Buff-coloured Fig Longicorn; the Passion Vine Longicorn Beetle; the Fig-tree Longicorn Beetle]

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland, S. Australia, Victoria), Lord Howe I., Samoa, Kangaroo I; ORIENTAL REGION: Philippine Is.

Host plants: *Ficus*, *Wistaria* (Froggatt, 1930); ?*Cassinia aculeata*, ?*Helichrysum ferrugineum* (French, 1919a); *Agathis robustra* (A. R. Brimblecombe); *Pinus halepensis*, *Pinus radiata*, *Araucaria*, *Cedrela australis*, *Cymbidium* (Anonymous, 1940); *Flindersia australis*, *Laportea gigas*, *Maba fasciculosa* (A. R. Brimblecombe); *Ficus* is the preferred host.

Mature larva. Very similar to that of *D. holotephrus* (Boisduval) but distinguishable by the pronotal asperities which are smaller and not elongated towards posterior margin.

Pupa. *Head* with vertex entirely visible from above, rather shallowly excavated and bearing two pairs of setae near base of each antennal tubercle; front bearing numerous setae, base of clypeus with two pairs of setae. Antenna extending to abdominal segment 3 where they are incurved ventrally and each arranged in two or more coils on top of each elytron. Eyes feebly convex. Mandibles each with two stout setae near middle of outer face. Labrum bearing two groups each of about 10 setae. *Pronotum* with a pair of very prominent lateral tubercles; disc with a pair of obliquely set, ridge-like tubercles, each bearing a group of about 25 setae. *Mesonotum* with a pair of similar but smaller setose tubercles; scutellum protuberant. *Metanotum* with two similar groups of setae which do not arise from a tubercle. Elytra and wings extending

as far as abdominal segment 4. *Abdomen* with tergites 2–6 each with a pair of paramedian, transversely-oval tubercles each bearing numerous long stout setae. Segment 9 short, produced dorsally into a long, vertical, spine-like process, which is sclerotised apically; ventrally it is deeply divided and spinose. Sternites glabrous or almost so. Pleura scarcely protuberant. *Legs* with a transverse row of short stout setae near apex of each femur; hind femora extending to abdominal segment 4; tibiae placed obliquely to longitudinal axis of body. *Functional spiracles* present on segments 1–6; peritreme rather broadly oval, moderately thick and slightly raised above general level of cuticle. Length up to 21 mm.; maximum breadth 6·5 mm.

Biology. Females lay their eggs singly on the rough bark of *Ficus* and then cut an irregular circle in the bark, about ½ in. in diameter, around each egg. On hatching, the larva penetrates the bark, and later, the sapwood. The circular pieces of bark eventually die and fall out, leaving round pits and exposing the sapwood. In the case of vines, the larvae may tunnel upward in the stems for three or four feet before pupating. At times they tunnel down through the main roots and as many as 51 larvae have been found in the base of a single passion vine. The pupal cell is prepared in a small cavity just under the bark, at the end of the larval gallery. Sometimes the presence of larvae can be detected by the frass and gnawed wood, mixed with exuding gum, which forms lumps along the infested stem. Adults start to emerge in September (Anonymous, 1940).

In Australia this species has proved to be quite a serious pest of the passion vine. Oviposition occurs during the months of October to December. Eggs appear to be deposited singly in or upon the bark near the ground. In many cases only one larva feeds in each stem but in the swollen bases of larger vines, up to five larvae have been obtained. The larvae feed upward through the central portion of the stem for a distance of three or four feet before preparing their pupal cells (Froggatt, 1919b). A pupal cell in *Araucaria* is shown on Plate V, fig. 3.

Control. Heavily infested branches should be cut off and burned. All injured or loose bark should be scraped away and the surface painted with bluestone paint. A small quantity of carbon bisulphide may be injected into the holes and the latter then plugged with wax or soap. The painting of trunks or branches of trees or vines with bluestone paint in the spring is also beneficial as it discourages oviposition. The formula for this paint is: Copper sulphate 1½ lb., lime 1 lb., water 2 gals. The copper sulphate should be dissolved in approximately 1 gallon of water, the lime broken down with the remainder and then poured into the solution. Iron or galvanised iron vessels should not be used for mixing (Anonymous, 1940). Froggatt (1919b) suggests the painting of vine stems with a lime and sulphur wash from October to January. Dead, dying or fallen trees should be removed. French (1919a) recommends spraying the vines with tar-impregnated water to prevent oviposition. This may be prepared as follows. Boil 1 lb. of coal tar in 2 galls. of water, and, while hot, add from 50–100 gallons of water, then strain before using.

Material studied. 1 L, 1 P, Australia, Queensland, Imbil, 2.ii.1938, from *Agathis robusta*, A. R. Brimblecombe leg., in coll. D.A.S.B.; 2 L, Australia, Queensland, Taromeo, 15.i.1944, from *Pinus halepensis*, A. R. Brimblecombe leg., in coll. D.A.S.B.; 1 L, Australia, Queensland, Benarkin, 15.i.1944, from *Pinus radiata*, A. R. Brimblecombe leg., in coll. D.A.S.B.

References. Anonymous 1940 (L fig., P fig., I fig., Biol., Contr.); Evans, 1952 (Biol.); French, 1919a (L fig., P fig., I fig., Biol. fig., Contr.); Froggatt, 1919b (L fig., P fig., I fig., Biol. fig.), 1923 (L fig., P fig., I fig., Biol. fig.), 1930 (Biol. fig.); McKeown, 1944 (L fig., I fig., Biol.); Mühlmann, 1954 (Biol); Ultée, 1916 (Biol.).

Dihammus argentatus (Aurivillius)

Distribution. AUSTRALASIAN REGION: Australia (New South Wales).

Host plants: *Aster glandulosus* (Dixon, 1908); *Eupatorium* (A. R. Brimblecombe).

Mature larva. Similar to that of *D. holotephrus* (Boisduval) from which it may be distinguished by the asperities near the posterior margin of the pronotum which are not elongate. From *D. vastator* (Newman) it differs apparently only in having the frons less strongly sclerotised and testaceous.

Material studied. 1 L, Australia, New South Wales, Mullumbimby, 11.iii.1953, from *Eupatorium* A. R. Brimblecombe leg., in coll. D.A.S.B.; 3 L, Australia, New South Wales, Mullumbimby, viii.1951, from roots of *Eupatorium*, in coll. D.A.N.S.W.

Reference. Dixon, 1908 (Biol.).

Dihammus australis (Boisduval)

Distribution. AUSTRALASIAN REGION: Australia (Queensland); ORIENTAL REGION: New Guinea, Aru Is., Saylee, New Mecklenberg.

Host plant: *Terminalia kaernbachii*, (J. H. Ardley).

Mature larva. Similar to that of *D. holotephrus* (Boisduval) but differing as follows. *Head* with hypostoma and front margin of frons very strongly transversely strigose. Mentum bearing at least six pairs of stout setae. Length up to 50 mm.; maximum breadth (at prothorax) 14 mm.

Pupa (fig. 111). Similar to that of *D. vastator* (Newman) but distinguishable as follows. *Head* with front plane between eyes. Labrum with setae reddish brown, each arising from a ferruginous basal papilla, which gives the labrum a spotted appearance. Length up to 35 mm.; maximum breadth 15 mm.

Biology. The larval galleries, which in Bubia were no longer than 6 ins. by $\frac{1}{3}$ to $\frac{1}{2}$ in. ascend for about one-third of their length and then follow the long axis of the tree.

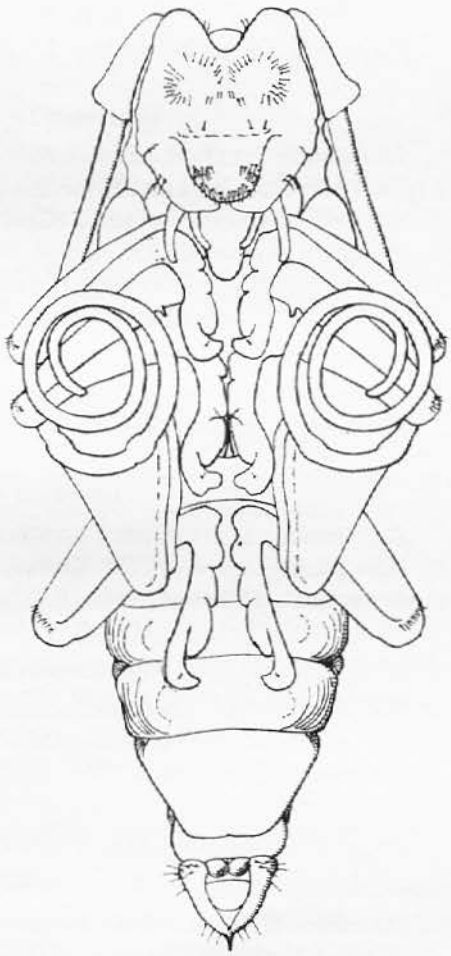

Fig. 111. *Dihammus australis* (Boisduval). Pupa. Ventral aspect.

This species often infests *Theobroma* but ranks only as a minor pest (J. H. Ardley).

Material studied. 4 L, 2 P, 1 I, New Guinea, Bubia Agricultural Station, Lae, 25.ii.1960, from *Terminalia kaernbachii*, J. H. Ardley leg., in coll. B. M.

Reference. Lucas, 1879 (Biol.).

Dihammus mixtus (Hope)

Distribution, AUSTRALASIAN REGION: Australia (North Australia, Queensland).

Host plant: *Excaecaria agallocha* (A. R. Brimblecombe).

Mature larva. Only larval exuviae of this species are available. Similar to that of *D. holotephrus* (Boisduval) but with pronotal asperities not elongate towards posterior margin. From *D. argentatus* (Aurivillius) it is distinguishable by its entirely ferruginous frons, but no differences are apparent between it and *D. vastator* (Newman).

Material studied. 2 L (exuviae), Australia, Queensland, Tin Can Bay, 10.iii.1942, from *Excaecaria agallocha*, A. R. Brimblecombe leg., in coll. D.A.S.B.

References. None available.

Dihammus fasciatus (Montrouzier)

Distribution. AUSTRALASIAN REGION: Australia, Solomon Is., Caroline Is., (Caroline Atolls, Truk, Kusaie), Lord Howe I., Woodlark I.; ORIENTAL REGION: New Guinea.

Host plant: *Artocarpus altilis* (Gressitt, 1956).

Reference. Gressitt, 1956 (Biol.).

Dihammus magneticus auripilis (Matsushita)

Distribution. AUSTRALASIAN REGION: Micronesia (Western Caroline Is., Palau).

Host plant: *Artocarpus altilis* (Gressitt, 1956).

Reference. Gressitt, 1956 (Biol.).

Karadinia nubila McKeown

Distribution. AUSTRALASIAN REGION: Australia (Queensland).

Host plant: *Acacia* sp. (McKeown, 1942).

Reference. McKeown, 1942 (Biol.).

Niptohammus korolensis Matsushita

Distribution. AUSTRALASIAN REGION: Caroline Is.

Host plant: *Mangifera indica* (Dumbleton, 1951).

References. Dumbleton, 1951 (Biol.); Pemberton, 1954 (Biol.).

Neoptychodes (=**Ptychodes**) **trilineatus** (Linnaeus)

[The Three-lined Fig-tree Borer]

Distribution. AUSTRALASIAN REGION: Society Is. (Tahiti); NEARCTIC REGION: U.S.A. (California, Louisana, Texas); NEOTROPICAL REGION: Mexico, Central America, Caribbean, South America.

Host plants: *Ficus*, *Alnus*, *Morus* (Craighead, 1923); *Ficus carica* (Dumbleton, 1954); *Chlorophora tinctoria* (F. Peña). Fairmaire (1850) mentions *Spondias dulcis* and *Inocarpus edulis* being attacked in Tahiti.

Mature larva (figs. 112–113). Similar to those of *Dihammus* species but differing as follows. *Head* with antennae 3-segmented. Pronotum with posterior area micro-

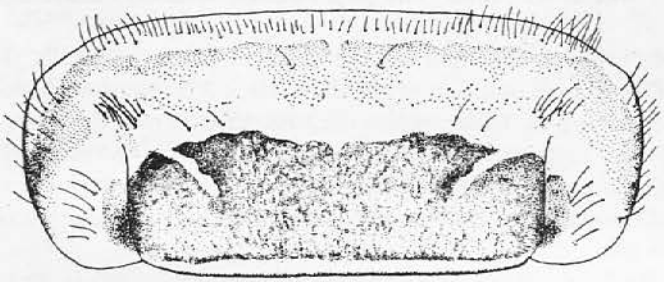

Fig. 112. *Neoptychodes trilineatus* (Linnaeus). Mature larva. Prothorax. Dorsal aspect.

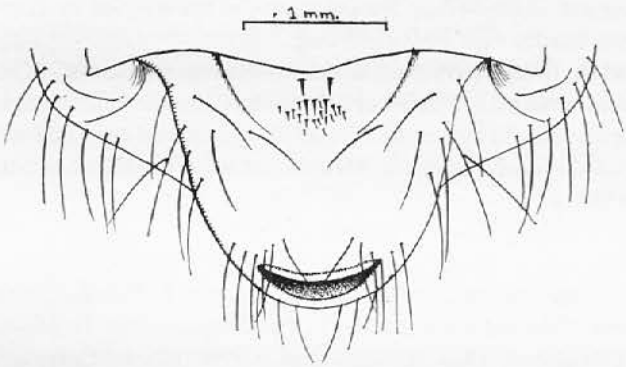

Fig. 113. *Neoptychodes trilineatus* (Linnaeus). Mature larva. Abdominal segment 10. Ventral aspect.

spiculate (fig. 112). *Abdomen* with segment 10 with a group of five to eight short spines behind lower anal lobe and anus a transverse cleft (fig. 113).

Pupa. Very similar to those of *Dihammus* species from which it may be distintinguished by the absence of setae on the femora. Length up to 27 mm.; maximum breadth 8·5 mm.

Egg. Form elongate, subcylindrical. Chorion white (sometimes faintly yellowish or greenish), more or less patterned like the grain of the fig-wood. Length 3·52 mm.; breadth 0·91 mm. (Horton, 1917).

Biology. The eggs are deposited in the bark of the larger branches or trunk of partly dead or decaying trees. Prior to oviposition the female makes a double transverse incision in the bark to a depth of 0·125–0·25 in. Sometimes two or three eggs are placed in the same incision. About 100–184 eggs are laid by a single adult. The incubation period is about five days. The first-instar larva usually devours most of the egg-

shell before boring into the bark. Several days later the larva enters the sapwood and bores towards the heartwood, tightly packing the gallery with frass and debris. Within six months the larva is usually mature and has tunnelled near to the surface ready for pupation. The pupal cell is formed by enlarging the end of the larval gallery; it is completely lined within with wooden particles and frass which have been glued together with a secretion. The pupal period lasts on an average twenty-four days.

Generations are irregular, and emergence takes place practically throughout the whole year. The average duration of the life-cycle is 3·5 months (Horton, 1917).

In an infested log of *Chlorophora tinctoria* (about two or three months old), larvae were found to have tunnelled their way into the sapwood, while still comparatively young, up to a distance of about two inches. Emergence takes place at the distal end of the pupal cell through a neat round hole, around which a circular disc of bark had been gnawed away (F. Peña).

Predators. In Trinidad larvae of the elaterid *Semiotus ligneus* (L.) have been found in infested logs.

Economic importance. This species causes considerable damage to certain trees, especially *Ficus carica*. Abraised or diseased parts of the tree are most prone to attack, healthy green trees hardly ever being infested.

Control. Horton (l.c.) recommends the following measures. Keep trees in as perfect condition as possible. Whenever a branch is broken off, the stump should be smoothed down and painted with a mixture of five parts coal-tar and one part creosote. Two or three coats should be applied. Heavily infested branches or trunks should be cut down and burned.

Material studied. 1 L, U.S.A., Louisiana, Franklin, 5.x.1927, from *Ficus*, J. B. Miller leg., in coll. U.S.N.M.; 8 L, 1 P, U.S.A., New Oreleans, 24. viii.1899, from *Ficus*, L. M. Harris leg., in coll. U.S.N.M.; 6 L, 4 P, 4 I, Trinidad, South West District, vii.1957, from *Chlorophora tinctoria*, F. Peña leg., in coll. B. M.

References. Craighead, 1923 (L, fig., Biol.), 1950 (Biol., Contr.); Duffy, 1953a (L fig., P, Biol., Contr.), 1960 (E, L fig., P, Biol., Contr.); Dumbleton, 1954 (Biol.); Fairmaire, 1850 (Biol.); Horton, 1917 (E fig., L fig., P fig., Biol. fig., Contr.); Le Beau, 1938 (Biol. Contr.); Risbec, 1946 (E fig., L fig., Biol.); Ritchie, 1918 (Biol.).

Pelargoderus (=**Nanyohammus**) **arouensis** Thomson

Distribution. AUSTRALASIAN REGION: Australia, Aru; ORIENTAL REGION: New Guinea.

Host plant: *Theobroma cacao* (Dumbleton, 1951).

References. Dumbleton, 1951 (Biol.); Dun, 1951 (Biol.).

Pelargoderus (=**Nanyohammus**) **luteosparsus** (Matsushita)

Distribution. AUSTRALASIAN REGION: Micronesia (Western Caroline Is., Palau).

Host plants: *Theobroma cacao*, *Artocarpus altilis* (Gressitt, 1956).

Reference. Dumbleton, 1951 (Biol.); Gressitt, 1956 (Biol.); Pemberton, 1954 (Biol.).

Agniini

Callipyrga turrita Newman

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland).

Host plants: *Flindersia oxyeyana* and *F. xanthoxyla* (A. R. Brimblecombe); *Gerijera parviflora* (J. W. Armstrong).

References. None available.

Batocerini

Larval Characters

Head with antennal foramen closed posteriorly. One pair of ocelli present. Gular sutures indistinct. *Prothorax* with posterior area of pronotum coarsely asperate. Postnotal fold well developed, asperate.

Abdomen with pleural tubercles each with a pair of sclerotised pits. Segment 9 without a sclerotised process. Anus a transverse cleft.

Batocera boisduval (Hope) (Pl. XI, fig. 2)

[The Great Fig Tree Longicorn]

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland, S. Australia), Aru, Kei Is., New Mecklenburg, Solomon Is., Woodlark I.; ORIENTAL REGION: New Guinea.

Host plants: *Ficus macrophylla, F. australis* (French, 1911, Froggatt, 1923).

Mature larva. No material available. The following is a description of a closely related African species, *B. wyllei* Chevrolat (fig. 114), which it should closely resemble. *Head* elongate, rather strongly depressed, widest at anterior third and strongly converging posteriorly. Frontal sutures indistinct; antennal foramen closed behind; mouthframe extremely strongly and very broadly sclerotised, pitchy; frons pitchy anteriorly, ferruginous posteriorly and with numerous setiferous pores; six epistomal

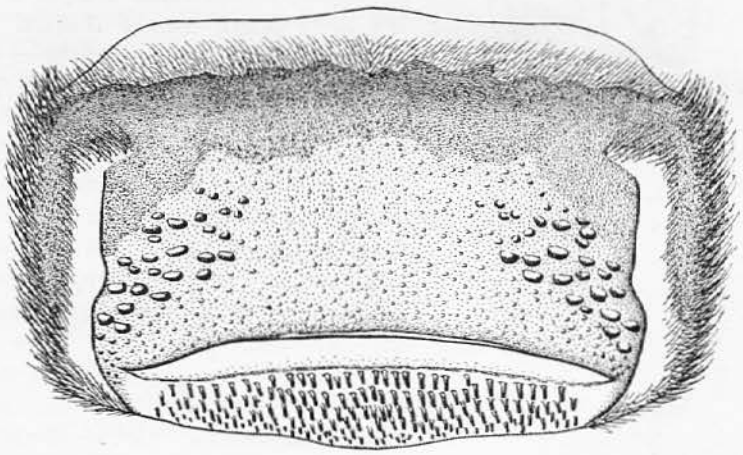

Fig. 114. *Batocera wyllei* Chevrolat. Mature larva. Prothorax. Dorsal aspect.

setae present. One pair of ocelli present; lens round, feebly convex, pale, sharply contrasting with surrounding sclerotised cuticle; pigmented spot indistinct. Hypostoma flat, ferruginous, with a few transverse rugae; sutures distinct, curved; gular region undefined. Clypeus bearing a few lateral setae. Labrum transversely oval, bearing coarse setae. Antenna 3-segmented; basal membrane long, fleshy; segment 2 about twice as long as basal width; segment 3 small but distinct, slightly elongate and bearing a few apical setae; supplementary process about half length of segment 3. Maxilla with segment 3 of palp conical, much shorter than segment 2. Labial palpi with segment 2 much shorter than segment 1. Mentum distinct from submentum. *Prothorax* (fig. 114) with pronotum ferruginous and smooth except for front margin, which is narrowly testaceous with a transverse fringe of short dense setae; posterior two-thirds extremely coarsely asperate, the asperities transverse and larger towards lateral grooves; postnotal fold well developed, bearing about five transverse rows of elongate, subcylindrical, subvertical asperities. Prosternum with a pair of lateral, sclerotised, ferruginous plates; eusternum, sternellum and lateral plates nearly as coarsely asperate as median part of pronotum. Mesonotum and metanotum non-asperate, densely setose laterally, the latter with two transverse rows of tubercles. *Abdomen* with each dorsal ampulla bearing two transverse furrows and four rows of moniliform, spiculate tubercles. Tergite 9 unarmed. Epipleurum slightly protuberant on all segments; pleural tubercles bearing two long, coarse setae and numerous shorter setae, each with a pair of large sclerotised pits. Anus a transverse cleft. *Legs* minute but visible with a X15 lens.

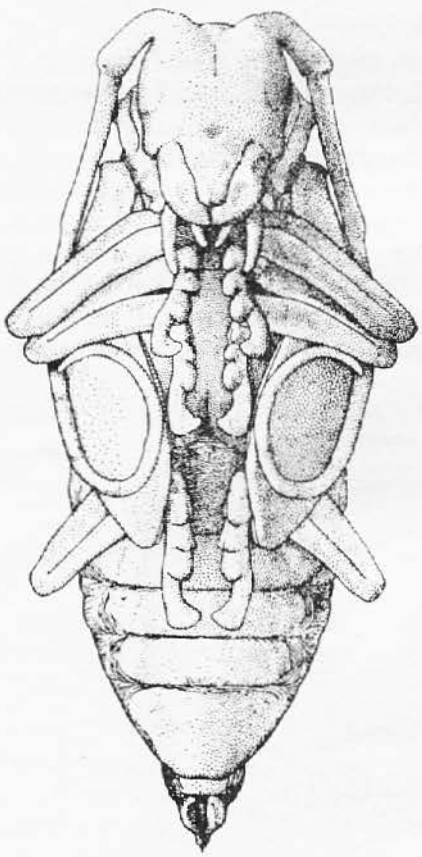

Fig. 115. *Batocera* sp. Pupa. Ventral aspect.

Spiracles broadly oval, without marginal chambers. Length up to 115 mm.; maximum breadth (at prothorax) 23 mm.

Pupa. No material available. The following is a description of that of *B. wyllei* Chevrolat, the figure (fig. 115) being that of an unknown species of this genus. *Head* with vertex entirely visible from above and shallowly excavate between bases of antennae; front with numerous scattered short ferruginous setae. Clypeus with a shallow transverse impression and bearing four to six setae across base. Antennae extending to between abdominal segments 2 and 3, where they are strongly curved downward and each arranged in a single coil on top of each elytron. Eyes plane, glabrous. Mandibles very robust and each with about twenty stout setae near middle of outer face. Labrum

bearing numerous stout ferruginous setae along front and lateral margins. *Pronotum* with disc bearing a pair of paramedian groups of stout setae and sides with a pair of stout tubercles. *Mesonotum* almost glabrous; scutellum very strongly protuberant and setose. *Metanotum* with a pair of paramedian oval discs which are densely covered with coarse ferruginous setae; scutellar groove rather indistinct. Elytra and wings extending to abdominal segment 4. *Abdomen* with tergites 1–4 each with a transverse band (interrupted medially) of closely set stout setae on posterior half. Tergites 5 and 6 with these areas smaller and less conspicuous. Tergite 7 faintly transversely striate, sparsely setose. Tergite 8 extremely short and glabrous. Tergite 9 short and produced dorsally into a long, vertical, spine-like process which is strongly sclerotised and attenuated apically; ventrally it is deeply divided and densely covered with coarse, blunt, pitchy spines. Sternites glabrous. Pleura scarcely protuberant. *Legs* with a transverse row of fine setae near apex of each femur; hind femora extending to abdominal segment 4. *Functional spiracles* present on abdominal segments 1–5; peritreme thick, narrowly oval and raised above general level of cuticle. Length up to 70 mm.; maximum breadth 23 mm.

Biology. Adults usually oviposit only on trunks and branches of damaged or recently fallen trees. They may be collected by cutting down fig trees and waiting for them at twilight, when they come down to feed upon the bark (French, 1911). An account of the curious habits of the W. African *Batocera wyllei* Chevrolat has already been given (Duffy, 1957).

References. French, 1911 (L fig., P fig., I fig., Contr.); Froggatt, 1907 (I fig., Biol.), 1923 (Biol.); Illidge, 1922 (Biol.); McKeown, 1944 (Biol.); Pierce, 1917 (Biol.).

Batocera nebulosa Bates

Distribution. AUSTRALASIAN REGION: Australia, Fiji, New Hebrides. ORIENTAL REGION: New Guinea.

Host plant: *Theobroma cacao* (Dumbleton, 1951).

References. Dumbleton, 1951 (Biol.); Dun, 1951 (Biol.).

Batocera oceanica Schwarzer

Distribution. AUSTRALASIAN REGION: Micronesia (Western Caroline Is., Palau).

Host plant: ? *Artocarpus* (Gressitt, 1956).

References. Gressitt, 1956 (L, Biol.).

Batocera wallacei Thomson

Distribution. AUSTRALASIAN REGION: Australia (North Queensland), Aru, Dorey, Cape York.

Reference. Rainbow, 1889 (L, P).

Rosenbergia megalocephala v.d. Poll.

Distribution. AUSTRALASIAN REGION: Australia (North Queensland).; ORIENTAL REGION: New Guinea.

Host plant: *Ficus* (Froggatt, 1907).

Biology. This large insect breeds in the fig trees in the forests of North Queensland where its presence may be detected by the number of small branches scattered beneath, which have been cut off with their powerful mandibles.

References. Froggatt, 1907 (Biol.); Pierre, 1917 (Biol.).

Ancitini

Ancita (=Hebecerus) crocogaster (Boisduval)

[The Small Grey Longicorn]

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland, Victoria).

Host plants: *Acacia falcata* (Froggatt, 1893); *Acacia decurrens* (Best, 1881); *Acacia mollissima, A. dealbata* (Dixon, 1908).

Mature larva (fig. 116). The following description is incomplete owing to the desiccated condition of the specimen.

Head with mouthframe rather broadly ferruginous; hypostoma smooth. One pair of ocelli present; lens large, pigmented spot distinct. Antenna probably 3-segmented.

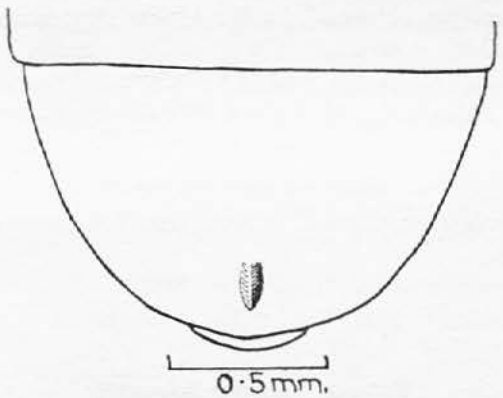

Fig. 116. *Ancita crocogaster* (Boisduval). Mature larva. Abdominal segment 9. Dorsal aspect.

Abdomen with ampullae non-tuberculate. Tergite 9 bearing a conspicuous longitudinal, keel-shaped carina (fig. 116). Length up to 11 mm. (?).

Biology. Larvae of this species feed and pupate in dead branches of the host plant. Sometimes larvae remain over two years in the infested wood, although normally their life-cycle is probably about 12 months. The emerging beetles feed upon the young branchlets, and are often plentiful in the early summer months (Froggatt, 1923).

Material studied. 1 L, Australia, New South Wales, St Mary's, from *Acacia falcata*, W. W. Froggatt leg., in coll. D.A.N.S.W.

References. Best, 1881 (Biol.); Dixon, 1908 (Biol.); Froggatt, 1893 (L, I, Biol.), 1902a (Biol.), 1923 (Biol.); Gallard, 1916 (Biol.).

Ancita (=Hebercerus) marginicollis (Boisduval)

[The White-cheeked Longicorn]

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland, Victoria).

Host plants: *Acacia decurrens* (Best, 1881); *Acacia mollissima, A. dealbata* (Dixon, 1908).

Biology. Adults feed on the bark of wattles. Eggs are deposited in the bark on the smaller branches in dead or dying wood. The young larvae feed on the sapwood, in which they tunnel in an irregular manner, finally pupating in a small oval chamber at the end of the gallery.

References. Best, 1881 (Biol.); Dixon, 1908 (Biol.); Froggatt, 1902a (I fig., Biol.), 1923 (Biol.).

Ancita (=Hebecerus) australis (Boisduval)

[The Dark-grey Longicorn]

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland, S. Australia, Victoria).

Host plants: *Acacia* spp. (Tepper, 1887); *Acacia dealbata* (Dixon, 1908); *Acacia decurrens* (Best, 1881).

References. Best, 1881 (Biol.); Dixon, 1908 (Biol.); Froggatt, 1902a (Biol.), 1923 (Biol.); Tepper, 1887 (Biol.).

Ancita (=Hebecerus) cristata (Pascoe)

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland).

Host plant: *Acacia pendula* (J. W. Armstrong).

Ancita (=Hebecerus) niphonoides (Pascoe)

Distribution. AUSTRALASIAN REGION: Australia (Queensland).

Host plants: *Acacia* spp. (Illidge, 1922).

References. Froggatt, 1923 (Biol.); Illidge, 1922 (Biol.).

Dorcaschematini

Olenecamptus bilobus (Fabricius)

Distribution. AUSTRALASIAN REGION: Australia (Queensland); ORIENTAL REGION: India, Ceylon, East Indies, Siam, Burma, China, Malacca, Andeman Is., Celebes, Seychelles, New Guinea; MADAGASCAN REGION: Mauritius.

Host plants: *Artocarpus blumei, A. chaplasha, A. hirsuta, A. integer, Bauhinia, Ficus benghalensis, F. carica, F. elastica, F. glomerata, F. infectoria, F. laccifera, F. regligiosa, F. roxburghii, F. rumphii, F. tjakela, Litsea polyantha, Mangifera indica, Morus indica* (Beeson and Bhatia, 1939); *Ficus lacor, F. retusa* (Gressitt, 1942).

Adult (fig. 117). Length 12–20 mm. Head, prothorax and elytra covered with yellowish brown pubescence, the latter with oval areas of white pubescence as figured. *Head* with antennae long and slender; scape swollen and asperate and third segment several times as long as scape. *Prothorax* elongate and transversely strigose.

Mature larva. No material available. Gardner (1927) gives the following description. "Head capsule depressed, with sides diverging slightly to near middle and constricted on posterior half. Gula distinct, elevated, narrow posteriorly. Hypostoma raised into a posterior transverse ridge. Without distinct ocelli. Antennal ring not bisected by frontal suture. Posterior zone of pronotum velured, with a nearly straight anterior margin. Abdominal ampullae with only one distinct transverse line dorsally, the tubercles smooth, somewhat irregular and arranged for the most part in two transverse lines. No caudal spine. Anus trilobed. Spiracles small, broadly oval. Length of larva about 23 mm. Body slender and elongate."

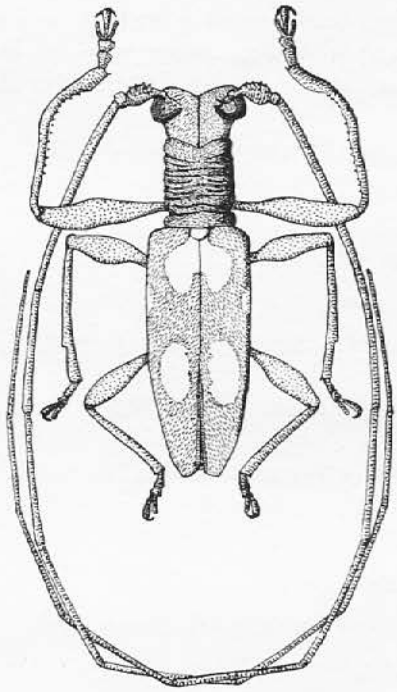

Fig. 117.
Olenecamptus bilobus (Fabricius). Adult.

Pupa. No material available. Gardner (l.c.) gives the following description. "Thoracic tergites with sparse short scattered setae. Abdominal tergites with scattered sharp spinules. Caudal segment with an erect, slightly curved spine."

Biology. Adults are active by day and feed by gnawing the green bark of shoots or by eating holes in the blade of large leaves such as those of *Ficus religiosa.* In North India the life-cycle is annual with an extended emergence period from May to November; a portion of the brood may be prolonged to the second year, but if the wood dries out considerably, these belated individuals do not survive (Beeson and Bhatia, l.c.). Dammerman (1931) gives the life-cycle as being only two months.

According to Gressitt (1942) the larval galleries extend through both the bark and the sapwood, the pupal cell, which is long and curved, being in the solid wood. Adults are active both during the daytime and at night and are attracted to artificial light.

Economic importance. Olenecamptus bilobus (Fabricius) mainly attacks species of *Ficus*, breeding in dead wood, but also attacking living branches. It is an occasional pest of cultivated fig.

Control. Gressitt (1942) suggests the burning of dead branches and infested living parts, or the extraction of larvae from the latter. Also the killing of mating adults on branches at night.

References. Beeson, 1941 (Biol.); Beeson and Bhatia, 1939 (Biol.); Dammerman, 1913 (Biol.); Duffy, 1957 (L, P, Biol., Contr.); Gardner, 1927 (L fig., P, Biol.), 1931 (L); Gressitt, 1942 (Biol.); Maxwell-Lefroy, 1909 (Biol.).

Homonoeini

Caroliniella aenescens aenescens Blair

Distribution. AUSTRALASIAN REGION: Micronesia (Eastern Caroline Is., Caroline Atolls, Truk, Kusaie).

Host plant: *Cocos nucifera* (Gressitt, 1956).

Biology. Gressitt (1956) gives the following account. "The larva bores in petioles and midribs of living coconut palms, and the adult feeds within fronds just emerging from the bud. Oakley states, for Nomwin, that adults feed in restricted areas between the midribs of two coconut fronds just emerging from the bud. Usually about three adults feed together on the tender tissue of the bud, which does not appear to be materially damaged. Individuals are apparently present in most young palms about six metres tall, but are difficult to capture without destroying the bud. . . . Clarke (Kusaie) noted that one or more larvae appeared to have started where a rat had chewed the base of a petiole, then continued tunnelling for a metre along the midrib."

Reference. Gressitt, 1956 (L, Biol.).

Tmesisternini

Temnosternus imbilensis McKeown

Distribution. AUSTRALASIAN REGION: Australia (Queensland).

Host plant: *Araucaria cunninghamii* (McKeown, 1940).

Mature larva (figs. 118–119). *Head* moderately depressed with sides straight, gradually converging posteriorly and slightly constricted for posterior fourth. Frontal sutures distinct; antennal foramen open posteriorly; entire head capsule strongly sclerotised and ferruginous and salient, being almost completely exposed (fig. 118). Frons smooth, slightly more strongly sclerotised anteriorly; six epistomal setae present. One pair of ocelli present; lens small, round, protuberant, pigmented spot indistinct. Hypostoma at least half as long as broad, entirely ferruginous, with a longitudinal row of about six setae (each in a rather deep pore) on each side of gula which is slightly raised. Hypostomal sutures straight, parallel. Antenna 2-segmented. Maxilla with palpal segments 2 and 3 subequal in length. Labial palp. with segment 2 shorter than segment 1. Mentum distinct from submentum. Labrum transversely oval, fringed anteriorly with pale bristly setae. *Prothorax* with sublateral furrows of pronotum slightly diverging anteriorly and then abruptly curved inwards (fig. 119); disc smooth, glabrous but areas around posterior margin and sublateral furrows narrowly and rather coarsely striate; eusternum smooth and rather sparsely setose. *Abdomen* with dorsal ampullae covered with numerous moniliform glabrous tubercles, and with a deep

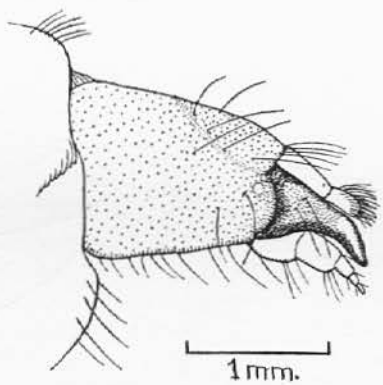

Fig. 118.
Temnosternus imbilensis McKeown. Mature larva. Head. Lateral aspect.

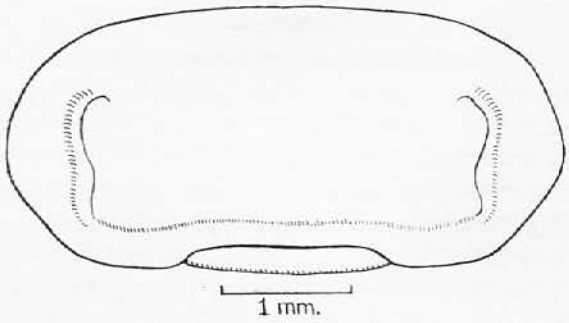

Fig. 119. *Temnosternus imbilensis* McKeown. Mature larva. Outline of prothorax. Dorsal aspect.

median, longitudinal furrow, a posterior, transverse, V-shaped furrow, and a pair of deep curved sublateral furrows; ventral ampullae each with a single transverse furrow. Segments 9 and 10 sparsely setose, the former without a sclerotised process. Epipleurum slightly protuberant on posterior segments. Pleural tubercles each with a pair of sclerotised pits. *Legs* absent. *Spiracles* with peritreme round and lined with subcontiguous marginal chambers on posterior half. Length up to 20 mm.; maximum breadth (at prothorax) 4·9 mm.

Pupa (fig. 120). *Head* with vertex almost entirely concealed from above by pronotum; shallowly excavate and bearing four to six long setae around bases of antennal tubercles; front with two or three similar setae near inner margin of eyes; base of clypeus with six similar setae; labrum with 10–12 smaller setae. Antennae extending as far as abdominal segment 4, where they are strongly recurved ventrally to terminate alongside head, touching or almost touching base of third antennal segment.

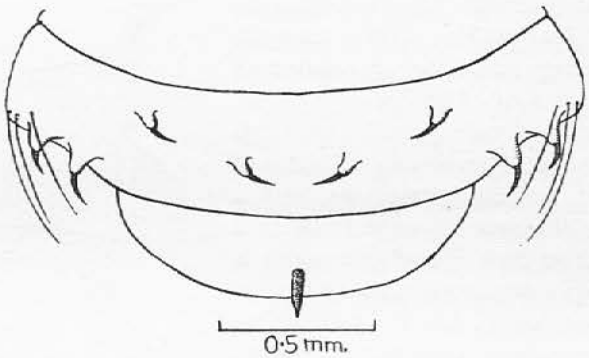

Fig. 120. *Temnosternus imbilensis* McKeown. Pupa. Abdominal tergites 8 and 9.

Eyes feebly convex, glabrous. Mandibles each with a pair of stout setae. *Pronotum* very strongly transverse (at least twice as broad as long) and with a pair of small, rounded, postmedian, lateral tubercles; bearing numerous long, scattered setae, especially along front margin and around basal angles. *Mesonotum* with one or two pairs of minute setae. *Metanotum* with a pair of converging rows of stouter setae. Elytra and wings extending to abdominal segment 5. *Abdomen* with tergites 1–6 each

bearing numerous short stout spines arranged more or less in two transverse rows. Tergite 7 subquadrate, slightly tapering posteriorly and bearing numerous much stouter spines curved inwards. Tergite 8 with six or more stout, inwardly-curved spines. Tergite 9 with a stout, median, vertical spine (fig. 120). Sternites each bearing a transverse row of slender, widely separated setae. Pleura moderately protuberant. Legs with femora bearing about 12 stout setae (each arising from a basal papilla) around apex; tibiae and tarsi glabrous; hind femora extending to between abdominal segments 4 and 5; tibiae placed almost at right-angles to longitudinal axis of body. *Functional spiracles* present on abdominal segments 1–6; peritreme subcircular, rather thick and appreciably raised above general level of cuticle. Length up to 12·2 mm.; maximum breadth 6 mm.

Biology. The pupal cell is shown on Plate V, fig. 4.

Material studied. 3 L, 2 P, 2 I, Australia, Queensland, Imbil, xi.1942, from *Araucaria cunninghamii*, A. R. Brimblecombe leg., in coll. D.A.S.B.

References. Brimblecombe, 1945 (Biol.); McKeown, 1940 (Biol.).

Temnosternus planiusculus White

Distribution. AUSTRALASIAN REGION: Australia (New South Wales).

Host plant: *Agathis robusta* (A. R. Brimblecombe).

Mature larva. Similar to that of *T. imbilensis* McKeown but differing as follows. *Head* testaceous behind triangular ferruginous frons. *Abdomen* with spiracles with peritreme extremely thick. Length up to 15 mm.; maximum breadth 4·5 mm.

Material studied. 1 L, Australia, Queensland, Imbil, 18.xii.1937, from *Agathis robusta*, A. R. Brimblecombe leg., in coll. D.A.S.B.

Temnosternus quadrituberculatus McKeown

Distribution. AUSTRALASIAN REGION: Australia (Queensland).

Host plant: *Baloghia lucida* (A. R. Brimblecombe).

Mature larva. Extremely similar to that of *T. imbilensis* McKeown and apparently distinguishable only by the presence of not more than three pairs of setae on the hypostoma.

Material studied. 1 L (exuviae), 1 I, Australia, Queensland, Yarraman, 23.vii.1960, from *Baloghia lucida*, A. R. Brimblecombe leg., in coll. D.A.S.B.

References. None available.

Enicodini

Eurychaena fragilis Bates

Distribution. AUSTRALASIAN REGION: New Zealand.

Host plant: *Cyathea dealbata* (Hudson, 1934).

Reference. Hudson, 1934 (Biol.).

Epicastini

Dysthaeta anomala Pascoe

[The Marbled Longicorn]

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Moreton Bay, Queensland).

Host plants: *Araucaria cunninghamii* (Froggatt, 1923).

Mature larva (fig. 121). Form subcylindrical, rather robust, slightly tapering posteriorly. *Head* slightly depressed, with sides irregularly constricted behind middle; frontal sutures very indistinct, antennal foramen closed posteriorly. Mouthframe moderately strongly sclerotised, ferruginous, with at least 12 epistomal setae. Gena bearing numerous long, fine, silky setae. Mandible robust, with apical half acutely produced, the cutting edge straight (fig. 121). One pair of ocelli present; lens, large, oval, strongly protuberant, pigmented spot distinct. Hypostoma plane, testaceous, with front margin ferruginous; bearing numerous erect ferruginous setae which are regularly distributed over entire area; gula indiscernible. Antenna minute, 3-segmented, segment 3 slightly elongate, and slightly longer than supplementary hyaline process. Clypeus glabrous, with sides strongly rounded. Labrum cordate, ferruginous, fringed anteriorly with a pair of bristly setae. Maxilla with segment 3 of palp about two-thirds length of segment 2. Labial palpi with segment 2 about two-thirds length of segment 1. Mentum distinct from submentum. *Prothorax* entirely testaceous, sparsely setose; posterior area vermiculately rugose, with a pair of shallow, sublateral depressions; prosternum with eusternum sparsely setose. *Abdomen* with each dorsal ampulla slightly bilobed and with two rows of large moniliform, glabrous, shining tubercles. Tergite 9 bearing a stout median spine posteriorly. Anus trilobed, sparsely setose. Epipleurum strongly protuberant on last three segments only. Pleural tubercles each with a pair of sclerotised pits. *Legs* vestigial, consisting of a minute setose tubercle. *Spiracles* with peritreme subcircular, thin, pale. Length up to 20 mm.; maximum breadth (at prothorax) 6·5 mm.

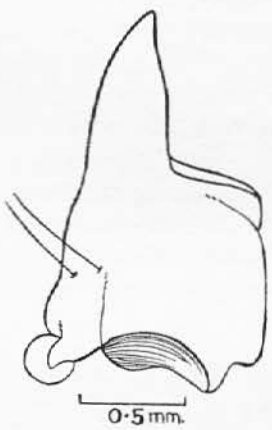

Fig. 121.
Dysthaeta anomala Pascoe.
Mature larva.
Outline of left mandible.

Pupa. Head with vertex partly visible from above and bearing several fine pale setae and rather deeply and narrowly excavate between antennal tubercles; front with numerous long fine setae, except for a median transverse, glabrous area. Clypeus with two pairs of slightly stouter setae. Labrum fringed on all margins with fine setae. Mandibles each with at least four setae on middle of outer face. Eyes feebly convex, glabrous. Antenna extending to between abdominal segments 2 and 3 where they are strongly recurved ventrally to terminate on top of front tibiae. *Pronotum* with sides broadly margined, straight, slightly converging posteriorly, bearing numerous very fine setae. *Meso-* and *metanotum* with similar setae. Elytra and wings extending to

abdominal segment 4. *Abdomen* with tergites 1–6 bearing numerous short spines arranged more or less in two transverse bands. Tergite 7 with scattered, slightly larger spines. Tergite 8 with a transverse row of slightly larger spines. Tergite 9 with similar spines and a much larger, stout, median, vertical spine. Sternites each with a few fine setae sublaterally. *Legs* with femora covered with a subapical group of spinules each with a very long basal seta; tarsi each with several setae; all femora more or less at right-angles to longitudinal axis of body; hind femora extending to between abdominal segments 3 and 4. *Functional spiracles* present on abdominal segments 1–6; peritreme broadly oval, thin, pale, and slightly raised above general level of cuticle. Length up to 21 mm.; maximum breadth 8 mm.

Material studied, 7 L, 1 P, Australia, Queensland, Imbil, 29.i.1957, from *Araucaria cunninghamii*, A. R. Brimblecombe leg., in coll. D.A.S.B.

Reference. Froggatt, 1923 (Biol.).

Zygocerini

Disterna plumifera (Pascoe)[1]

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland).

Host plants. *Citrus medica* (A. R. Brimblecombe); *Alstonia constricta, Sterculia lurida* (Hardy, 1946). *Pinus patula, P. taeda, Cedrela australis, Pyrus malus* (K. M. Moore).

Mature larva. Form subcylindrical, rather robust, slightly tapering posteriorly. *Head* slightly depressed, with sides slightly converging posteriorly. Frontal sutures rather indistinct; antennal foramen open posteriorly. Mouthframe moderately strongly sclerotised, ferruginous; six epistomal setae present. Gena with two or three setae. Front margin of frons pale ferruginous, with a transverse row of eight fine setae. One pair of ocelli present; lens large, round protuberant, pigmented spot distinct. Hypostoma very feebly convex in cross-section, pale ferruginous, with a setal pore on each side of gula (as in *Prosoplus* (fig. 125)) which is denoted by a faintly impressed line. Antenna minute, 3-segmented; segment 3 elongate, slightly longer then supplementary hyaline process. Clypeus glabrous. Labrum transversely oval, fringed anteriorly with pale bristly setae. Ventral front margin of head with a conical tubercle (subfossal process?). *Prothorax* with pronotum entirely testaceous, sparsely fringed with setae anteriorly, posteriorly finely rugoso-striate, sublateral impressions diverging anteriorly; prosternum with eusternum indistinctly defined, bearing scattered setae. *Abdomen* with each dorsal ampulla bearing rather large, glabrous moniliform tubercles arranged more or less in three transverse rows. Tergite 9 without a sclerotised process. Anus trilobed, without a sclerotised process. Epipleurum strongly protuberant on all segments. Pleural tubercles without sclerotised pits. *Legs* vestigial, consisting of a minute setose papilla. *Spiracles* with peritreme round or subcircular, rather thick, pale and without marginal chambers. Length up to 30 mm.; maximum breadth (at prothorax) 6 mm.

[1] Recently placed in the genus *Paradisterna* (see Breuning, S., 1959, *Bull. Ann. Soc. ent. Belg.* **95**: 81).

Pupa. *Head* with vertex visible from above and bearing 12 pairs of stout setae at bases of antennal tubercles; rather deeply and broadly excavate between bases of antennal tubercles; front with a pair of paramedian spinules immediately beneath antennal tubercles and three or four pairs of setae. Clypeus with two pairs of very stout basal setae, labrum with about four very fine setae. Mandibles each with a pair of stout setae near middle of outer face. Eyes feebly convex, glabrous. Antennae extending to between abdominal segments 2 and 3, where they are strongly recurved ventrally to form a single, almost complete coil. *Pronotum* with sides stoutly tuberculate; disc with numerous scattered spinules. *Meso-* and *metanotum* each with several scattered spinules. Elytra each with a large, elongate-oval, sub-basal tubercle; elytra and wings extending to abdominal segment 4. *Abdomen* with tergites 1–6 bearing numerous short spines arranged more or less in two transverse rows, those of the anterior row being distinctly smaller. Tergite 7 with scattered, slightly larger spines. Tergite 8 with a few fine setae. Segment 9 short and produced dorsally into a long vertical, spine-like process which is sclerotised apically. Sternites with a few fine inconspicuous setae. *Legs* with femora bearing a transverse row of fine setae subapically; hind femora extending to abdominal segment 5. *Functional spiracles* present on abdominal segments 1–6; peritreme broadly oval, thin, pale. Length up to 12 mm.; maximum breadth 5 mm.

Biology. This species is found in the dead wood of growing trees. Reared adults emerged during October to December (K. M. Moore).

Parasite. Diptera. *Trichopsidea oestracea* (Hardy, 1946).

Material studied. 1 L, 1 P, Australia, Queensland, Murgon, 20.xi.1935, from *Alstonia constricta*, A. R. Brimblecombe leg., in coll. D.A.S.B.; 5 L, 2 P, 2 I, Australia, Queensland, Brisbane, 25.x.1933, A. R. Brimblecombe leg., in coll. D.A.S.B.; 1 L, 1 I, Australia, Queensland, Imbil, 16.xii.1943, from *Pinus patula*, A. R. Brimblecombe leg., in coll. D.A.S.B.; 1 L, Australia, Queensland, Imbil, 16.xii.1943, from *Pinus taeda*, A. R. Brimblecombe leg., in coll. D.A.S.B.; 30 L, 1 P, Australia, New South Wales, Lisarow, 13.iv.–4.viii.1957, from *Pyrus malus*, K. M. Moore leg., in coll. F.C.N.S.W.

Reference. Hardy, 1946 (Biol.).

Disterna pumila (Pascoe)

Distribution. AUSTRALASIAN REGION: Australia (New South Wales).

Host plant: *Cedrela australis* (K. M. Moore).

Mature larva. Similar to that of *D. plumifera* (Pascoe) from which it may be distinguished as follows. *Head* with tubercle on acetabulum acutely conical and much more prominent. Antenna 2-segmented. Length up to 23·1 mm.; maximum breadth 4·5 mm.

Biology. Adults and larvae were found in debilitated or dead branches from three-eighths to three inches in diameter on both hosts. Adults taken in August, November, December and March (K. M. Moore).

Material studied. 3 L, Australia, New South Wales, Jilliby, 29.viii.1956, from *Cedrela australis*, in coll. F.C.N.S.W.

References. None available.

Velorini

Velora sordida (Pascoe)

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland).
Host plant: *Millettia megasperma* (A. R. Brimblecombe).

Mature larva (fig. 122). Similar to that of *Hexatricha pulverulenta* (Westwood), but differing as follows. *Head* with frontal sutures indistinct; antennal foramen closed posteriorly. Hypostoma plane, glabrous. *Abdomen* with tergite 9 bearing a longitudinal

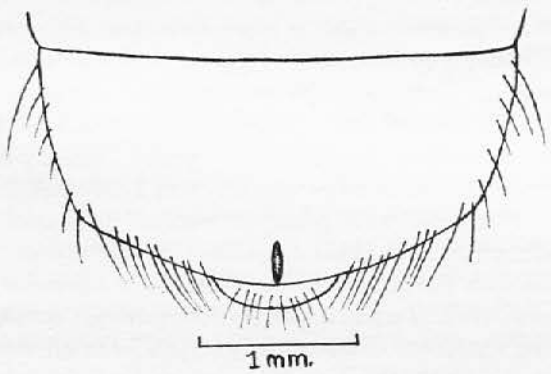

Fig. 122. *Velora sordida* (Pascoe). Mature larva. Abdominal tergite 9.

median carina (fig. 122). Epipleurum strongly protuberant on segments 7–9 only. Length up to 14 mm.; maximum breadth (at prothorax) 5 mm.

Material studied. 2 L, 1 I, Australia, Queensland, Imbil, 11.xii.1937, from *Millettia megasperma*, A. R. Brimblecombe leg., in coll. D.A.S.B.

Probatodes plumula (Newman)

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland, S. Australia, Tasmania, Victoria).
Host plant: *Acacia* (Froggatt, 1923).
References. Froggatt, 1923 (Biol.).

Niphonini

Larval Characters

Head moderately depressed; antenna 3-segmented; antennal foramen closed posteriorly. One pair of ocelli present. Hypostoma usually with anterior region steeply sloping down to anterior margin, the front margin in a lower plane than the hind margin or with a pair of setal pores. *Prothorax* with pronotum and sternellum devoid of asperities and spicules. *Abdomen* with tergite 9 either with urogomphi or unarmed. Pleural tubercles without or with only one pair of sclerotised pits. Anus trilobate.

Platyompsis egena (Pascoe) (=**neglecta** Pascoe)

[The Grey Ringbarker]

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, N. Australia, Queensland, Sydney).

Host plants: *Acacia longifolia* (Froggatt, 1893); *Pentaceras australe*, *Acacia pendula* (J. W. Armstrong); *Cedrela australis*, *Wistaria*, *Morus* (K. M. Moore); *Maba fasciculosa* (A. R. Brimblecombe).

Mature larva. Head moderately depressed and strongly elongate. Frontal sutures distinct, antennal foramen open posteriorly. Mouthframe moderately strongly and broadly sclerotised, ferruginous; eight or more epistomal setae present. One pair of ocelli present, lens convex, protuberant. Hypostoma entirely ferruginous, strongly convex in cross section. Three or more setae present on each side of gular region (denoted by a thin pale cleavage line). Antenna 3-segmented, with a well-developed hyaline, supplementary process. Maxilla with segment 3 acutely conical, about two-thirds length of segment 2. Labial palpi with segment 2 only half length of segment 1. Clypeus glabrous. *Prothorax* with posterior part of pronotum glabrous, faintly longitudinally striate; eusternum indistinctly defined, sparsely setose. *Abdomen* with each dorsal ampulla with glabrous, shining, moniliform tubercles arranged more or less in three transverse rows. Tergite 9 with posterior margin subangulate and conical medially, and bearing numerous coarse, bristly setae whitch are much coarser, darker and more conspicuous than those on preceding tergites. Epipleurum strongly protuberant on all segments; pleural tubercle with only a single (lower) sclerotised pit. Anus tri-lobate. *Legs* absent. *Spiracles* broadly oval, peritreme thin, without marginal chambers. Length up to 43 mm.; maximum breadth (at prothorax) 6·5 mm.

Pupa (figs. 123–124). *Head* with vertex entirely visible from above and bearing numerous fine setae arising from papillate bases; front with numerous similar setae. Antennae extending as far as abdominal segment 3 where they are recurved ventrally to terminate in a single coil on top of each elytron. Mandibles long, slender, each with a pair of setae near middle of outer face. Labrum thick, fleshy, strongly protuberant

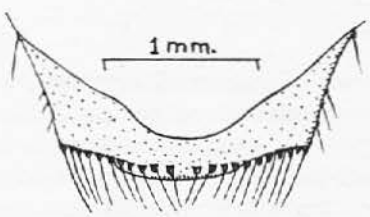

Fig. 123. *Platyomopsis egena* (Pascoe). Pupa. Abdominal tergite 9.

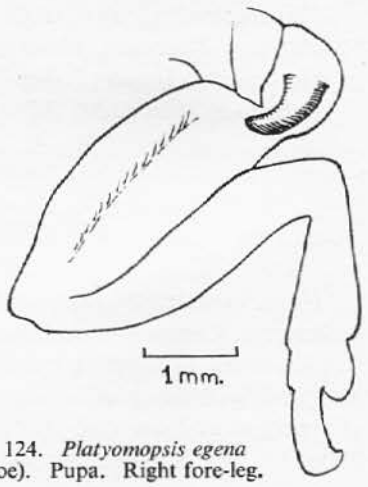

Fig. 124. *Platyomopsis egena* (Pascoe). Pupa. Right fore-leg.

and with a transverse row of dense erect setae across front margin and base. *Pronotum* with numerous scattered, ferruginous spicules (each with a basal seta) across front margin; disc with a broad, rather deep, longitudinal, median furrow. *Mesonotum* and *metanotum* with numerous smaller spinules. Abdomen with tergites 1–8 each with numerous, scattered, rather stout spines (each with a basal setae); tergite 9 extremely short, with posterior margin almost entirely covered with a row of closely-set, blunt spines, giving it a serrated appearance (fig. 123). Sternites each with a few sublateral spinules. Pleura moderately strongly protuberant and each with several stout spines. *Legs* with front coxae bearing a large, stout, curved tubercle (fig. 124), femora with several scattered, long, fine setae, especially along margins; hind femora extending to between abdominal segments 3 and 4; hind tibiae at right-angles to longitudinal axis of body. *Functional spiracles* present on abdominal segments 1–6; peritreme rather narrowly oval, thin, very strongly raised above general level of cuticle. Length up to 22 mm.; maximum breadth 7 mm.

Biology. Adults emerge in December and are usually found clinging to branches and feeding on the bark of their host plants. Before ovipositing, the beetle girdles the branch with several deep rings, above which it gnaws several circular little flaps of bark in a horse-shoe shape without detaching them, and then deposits an egg under each flap. If, however, the beetle finds a decaying or broken branch, it dispenses with the girdling process and lays its egg at once. The larva feeds in the stems of *Acacia*, eating out the wood in irregular tunnels; it pupates in the end of the last one (Froggatt, 1923).

Material studied. 3 L, 1 P, 1 I, Australia, Queensland, Oak View, 18.i.1936, from *Pentaceras australe*, A. R. Brimblecombe leg., in coll. D.A.S.B.; 8 L, 12 P, Australia, New South Wales, Sydney, St. Ives, iii.1959, from *Wistaria*, P. Cook leg., in coll. F.C.N.S.W.; 6 L, Australia, Sydney, 8.iii.1959, from *Wistaria*, K. M. Moore leg., in coll. F.C.N.S.W.

References. Froggatt, 1893 (L, I, Biol.), 1907 (Biol.), 1923 (Biol.).

Platyomopsis pulverulens (Boisduval)

(=**Probatodes piliger** (Mackeay))

Distribution. AUSTRALASIAN REGION. Australia (New South Wales, Queensland, Tasmania, Victoria).

Host plants: *Wistaria*, *Eugenia* sp., *Acacia penninervis*, *Cajanus indicus* (A. R. Brimblecombe); *Acacia longifolia* (Froggatt, 1923).

Mature larva. Similar to that of *P. egena* (Pascoe) but differing as follows. *Abdomen* with tergite 9 not conical medially; bearing sparse setae similar to those on preceeding segment. Length up to 33 mm.; maximum breadth (at prothorax) 8·5 mm.

Pupa. Similar to that of *P. egena* (Pascoe) from which it differs as follows. *Abdomen* with spines on posterior margin of tergite 9 much less closely set. Length up to 29 mm.; maximum breadth 9 mm.

Material studied. 2 L, 2 P, Australia, Queensland, Upper Pilton, 15.x.1936, from *Wistaria*, A. R. Brimblecombe leg., in coll. D.A.S.B.

References. Froggatt, 1923 (Biol.); Illidge, 1922 (Biol.).

Patyomopsis albocincta (Guérin Méneville)

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland, Victoria).

Host plants: *Acacia longifolia* (Froggatt, 1923); *Viminaria denudata* (Froggatt, 1893); *Casuarina* saplings (Illidge, 1922); *Acacia mollissima* (Dixon, 1908).

Biology. Adults feed on the young shoots of *Viminaria denudata* and girdle or ring-bark the branches by gnawing several broad, irregular bands round it; it then deposits its eggs singly in small pits gnawed in the bark above the girdles, and generally deposits three or four eggs in each branch. The larvae feed in the soft woody stems, eating the centre out of small branches and pupating in the tips (Froggatt, 1893).

References. Dixon, 1908 (Biol.); Froggatt, 1893 (L, I, Biol.), 1923 (Biol.); Illidge, 1922 (Biol.).

Platyomopsis angasi (Pascoe)

Distribution. AUSTRALASIAN REGION: Australia (S. Australia).

Host plant: *Melaleuca uncinata* (Tepper, 1887).

Reference. Tepper, 1887 (Biol.).

Platyomopsis morata (Pascoe)?

Distribution. AUSTRALASIAN REGION: Australia (Queensland, Port Curtis).

Host plant: *Apophyllum anomalum* (J. W. Armstrong).

Platyomopsis modesta (Blackburn)

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, S. Australia).

Host plant: *Acacia oxycedrus* (Dixon, 1908).

Reference. Dixon, 1908 (Biol.).

Platyomopsis obliqua (Donovan)

Distribution. AUSTRALASIAN REGION: Australia (Central Australia, New South Wales, Queensland, S. Australia, Victoria, Western Australia).

Host plant: *Eucalyptus* spp. (J. W. Armstrong).

Platyomopsis vicaria (Pascoe)

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland).

Host plants: *Acacia* spp. (Illidge, 1922).

References. Froggatt, 1923 (Biol.); Illidge, 1922 (Biol.).

Platyomopsis pubiventris (Pascoe)

Distribution. AUSTRALASIAN REGION: Australia (Kangaroo Is., New South Wales, S. Australia).

Biology. Adults are to be found in November on the branches and leaves of the broom tea-tree (*Melaleuca uncinata*).

Reference. Tepper, 1887 (Biol.).

Platyomopsis variolosa (Pascoe)

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland, Victoria).

Host plants: *Acacia* spp. (Illidge, 1922); *Acacia decurrens* (K. M. Moore).

Biology. This species attacks young growing plants of *A. decurrens* the larvae working usually singly in the centre of stems about $\frac{1}{2}$–$\frac{3}{4}$ in. in diameter. Frass is ejected through holes made by the larva in the stem, and collects in heaps at the base of the plants. Adults gnaw patches (apparently for oviposition sites) on the bark of the stems of young plants.

References. Froggatt, 1923 (Biol.); Illidge, 1922 (Biol.).

Platyomopsis vestigialis (Pascoe)

[The Buff-coated Longicorn]

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, S. Australia, Victoria).

Host plant: *Acacia decurrens* (Froggatt, 1902).

Biology. This beetle probably lays its eggs in the bark and girdles the twig like most of the members of this genus, which are typical stem girdlers. In the early summer months the freshly emerged beetles can be found clinging tightly to the young branchlets (Froggatt, 1923).

References. Froggatt, 1902a (Biol.), 1907 (I fig., Biol.), 1923 (Biol.).

Platyomopsis nigrovirens (Donovan)

[The Green-striped Longicorn]

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland, Victoria).

Host plants: *Acacia juniperina*, *A. longifolia* (Froggatt, 1893); *Acacia decurrens* (Best, 1881); *Pittosporum revolutum*, *P. undulatum* (Froggatt, 1895).

Mature larva. Similar to that of *P. pulverulens* (Boisduval) but differing as follows. *Head* with temples behind ocellus testaceous. Hypostoma entirely testaceous. *Abdomen* with moniliform tubercles of dorsal ampullae mostly contiguous and feebly protuberant.

Biology. The larva infests the upper branches of *A. juniperina*, at first hollowing out small twigs, but later feeding down the main stems which are cut off beneath the bark and later fall away (the hole in the stem below is plugged with frass). The larva then tunnels downwards making a straight gallery, at the bottom of which it pupates. Twigs of *A. longifolia* are also infested, pupation taking place at the extremity of the broken twig. Adults are to be found in December and January feeding on the bark of young shoots of *Acacia longifolia* (Froggatt, 1893).

Material studied. 2 L, Australia, New South Wales, Manly, from *Acacia juniperina*, W. W. Froggatt leg., in coll. D.A.N.S.W.

References. Best, 1881 (Biol.); Froggatt, 1893 (L, I, Biol.), 1895 (Biol.), 1907 (I fig., Biol.), 1923 (Biol.).

Depsages solandri (Fabricius) (=**Platyomopsis solandri** (Fabricius))

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland). Host plants: *Xanthorrhoea* spp.

Mature larva. Extremely similar to those of *Platyomopsis* species but apparently differing only in possessing numerous (at least 12) setal pores on the hypostoma. Length up to 26 mm.; maximum breadth (at prothorax) 6·5 mm.

Biology. Larvae infest the flower stalks of the host plant, often cutting them right through and causing the upper halves, beneath which they pupate, to fall off. Adults emerge from October to December and both feed and oviposit on the flower stalks (Froggatt, 1894).

Material studied. 1 L, Australia, New South Wales, Botany, from *Xanthorrhoea*, W. W. Froggatt leg., in coll. D.A.N.S.W.

References. Froggatt, 1894 (L, I, Biol.), 1907 (Biol.).

Zygrita diva Thomson

[Lucerne Crown Borer]

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, North West Australia, Queensland).

Host plants: *Sesbania*, *Crotalaria*, *Medicago sativa*, *Glycine max* (Jarvis and Smith, 1946).

Mature larva. Similar to those of *Platyomopsis* species from which it differs as follows. Form more slender. *Head* with frons entirely ferruginous. Frontal sutures pale, very distinct and strongly contrasting with ferruginous frons. Abdomen with tergite 9 rather densely setose posteriorly. Length up to 22 mm.; maximum breadth (at prothorax) 4.5 mm.

Biology. Larvae bore in the lower portions of the stems of the host plants (Pl. VII, fig. 3). Development is slow and three to four months may elapse before larvae are mature. Pupating takes place in an oval cavity at the end of the larval gallery. It is unlikely that there is more than one generation a year. In the case of *Sesbania* and *Crotalaria*, larvae develop principally in the stem, though the lower part of the gallery may extend below ground level (Jarvis and Smith, l.c.).

Economic importance. This borer is present in many fields of lucerne, though the damage it causes seldom attracts attention until it has assumed serious proportions.

Control. Outbreaks are rarely sufficiently serious to warrant insecticidal control measures. Where comparatively large areas are affected, it is best to plough the lucerne out and to sow another crop in the farm rotation than to attempt reseeding the bare patches.

Material studied. 3 L, Australia, Queensland, Darling Downs, 9.iv.1941, in stems of soya bean plants, H. Jarvis leg., in coll. D.A.S.B.; 2 L, Australia, Queensland, Home Hill Station, 6.iv.1925, in lucerne stem, in coll. D.A.S.B.

Reference. Jarvis and Smith, 1946 (L fig., P fig., I fig., Contr.).

Rhytiphora rosei Olliff

Distribution. Australia (New South Wales).
Host plant: *Acacia pendula* (J. W. Armstrong).
References. None available.

Rhytiphora rugicollis (Dalman)

Distribution. AUSTRALASIAN REGION: (New South Wales, Queensland, Victoria).
Host plant: *Acacia longifolia* (Dixon, 1908).
Reference. Dixon, 1908 (Biol.).

Rhytiphora rubeta Pascoe

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland, S. Australia, Victoria).
Host plant: *Acacia* (Illidge, 1922).
Biology. Larvae cause swellings in the main stems and larger branches (Illidge, 1922).
References. Froggatt, 1923 (Biol.); Illidge, 1922 (Biol.).

Rhytiphora polymita Pascoe

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland).
Host plant: *Acacia* (Illidge, 1922).
References. Froggatt, 1923 (Biol.); Illidge, 1922 (Biol.).

Penthea pardalis (Newman)

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland, S. Australia).
Host plant: *Acacia cunninghamii* (A. R. Brimblecombe).
Mature larva. Rather similar to those of *Platyomopsis* but differing as follows. *Head* with six epistomal setae present. Hypostoma feebly convex in cross-section, narrowly ferruginous anteriorly, and with a conspicuous pair of setal pores on each side of gula (as in *Prosoplus*, fig. 125). Antenna with segment 3 quadrate to slightly transverse. *Prothorax* with eusternum triangular and rather densely setose. *Abdomen* with each ampulla bearing four distinct rows of moniliform tubercles. Tergite 9 with posterior margin not angulate medially, setae long and fine. Pleural tubercles without sclerotised pits. *Legs* vestigial. Length up to 21·8 mm.; maximum breadth (at prothorax) 5·9 mm.
Material studied. 2 L, Australia, Queensland, Sunnybank, 27.vi.1940, from *Acacia cunninghamii*, A. R. Brimblecombe leg., in coll. D.A.S.B.
References. Froggatt, 1923 (Biol.); Illidge, 1922 (Biol.).

Penthea intricata Pascoe

Distribution. AUSTRALASIAN REGION: Australia (S. Australia).
Host plant: *Acacia fimbriata* (A. R. Brimblecombe).

Biology. Adults (Pl. VI, fig. 4) erode the bark of young *Eucalyptus crebra* trees (A. R. Brimblecombe).

References. None available.

Penthea solida Pascoe

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland).

Host plant: *Acacia* roots (Illidge, 1922).

References. Froggatt, 1923 (Biol.); Illidge, 1922 (Biol.).

Penthea vermicularia (Donovan)

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland), W. Australia).

Host plants: *Acacia* spp. (McKeown, 1944); *Acacia decurrens* (Gallard, 1916).

References. Gallard, 1916 (Biol.); McKeown, 1944 (Biol.).

Corrhenes paulla (Germar)

Distribution. AUSTRALASIAN REGION: Australia (S. Australia, Queensland).

Host plant: *Xanthium pungens* (W. A. McDougall).

Mature larva. Very similar to that of *Penthea pardalis* Newman but differing as follows. *Head* with segment 3 of antenna strongly elongate. *Abdomen* with dorsal ampullae with only three often incomplete rows of tubercles. Length up to 16 mm.; maximum breadth (at prothorax) 3·9 mm.

Material studied. 1 L, Australia, Queensland, Goondiwindi, vi.1960, from *Xanthium pungens*, W. A. McDougall leg., in coll. D.A.S.B.

References. None available.

Prosoplus torosus (Pascoe)

Distribution. AUSTRALASIAN REGION: Australia (Queensland, S. Australia).

Host plant: *Caesalpinia ferrea* (A. R. Brimblecombe).

Mature larva (fig. 125). This larva shows close affinities to the Zycocerini, closely resembling *Disterna plumifera* (Pascoe), from which it differs as follows. *Head* with frons almost completely testaceous, except front margin which is narrowly ferruginous. Hypostoma smooth, shining, with a single seta placed in a deep pore on each

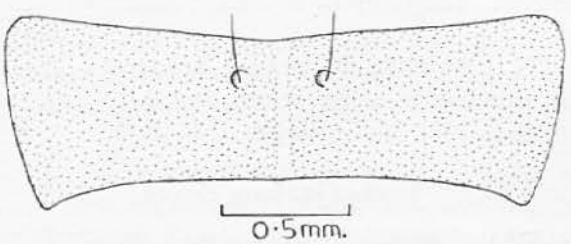

Fig. 125. *Prosoplus torosus* (Pascoe). Mature larva. Hypostoma.

side of gula (fig. 125). *Prothorax* with sublateral impressions of pronotum subparallel or slightly converging anteriorly. Length up to 20 mm.; maximum breadth (at prothorax) 4·5 mm.

Material studied. 3 L, 2 I, Australia, Queensland, Brisbane, iii.1956, from *Caesalpinia ferrea*, A. E. Brimblecombe leg., in coll. D.A.S.B.

Prosoplus woodlarkianus (Montrouzier)

Distribution. AUSTRALASIAN REGION: Australia (Queensland), Woodlark I.
Host plant: *Alstonia constricta* (Hardy, 1946).
Parasite. Diptera. *Trichopsidea oestracea* (Hardy, 1946).
Reference. Hardy, 1946 (Biol.).

Prosoplus banki (Fabricius)

Distribution. AUSTRALASIAN REGION: Australia (N. Australia, N. W. Australia); HAWAIIAN REGION: Hawaiian Is.; ORIENTAL REGION: Indonesia, Philippine Is.

Host plants: *Agave sisalana*, *Leucaena glauca* (Gressitt, 1956); *Cajanus indicus*, *Euphorbia*, *Crotalaria*, *Prosopis*, *Capparis*, *Erythrina*, *Citrus* (Duffy, 1953b); *Hibiscus* (W. A. McDougall).

Mature larva. Head moderately depressed, elongate, with sides slightly diverging to middle, then strongly converging posteriorly and abruptly constricted at posterior third; frontal sutures indistinct; antennal foramen open behind. Frons smooth, testaceous, with eight setiferous pores near front margin; six epistomal setae present. One pair of ocelli present; lens rather strongly protuberant, pigmented spot indistinct. Hypostoma ferruginous (front margin more darkly so), slightly convex; one pair of distinct setiferous pores present; sutures distinct, slightly incurved. Gular region with a pale median, ventral cleavage line. Antenna 3-segmented, segment 2 bearing a minute, hyaline, conical, supplementary process; segment 3 subquadrate. Maxilla with segment 3 of palp about as long as segment 2. Labial palpi with segment 2 about two-thirds as long as segment 1. *Prothorax* with pronotum very faintly striate and glabrous. *Abdomen* with each dorsal ampulla with a single transverse furrow and two transverse rows of glabrous, moniliform tubercles, anterior to which are a few irregularly arranged ones; these rows not interrupted by a median furrow. Ventral ampullae with two rows of tubercles. Segment 9 without a terminal spine (with a few setae only). Epipleurum protuberant on all segments. Pleural tubercle small, with only the ventral sclerotised pit distinct. *Legs* absent. *Spiracles* with peritreme broadly oval. Length up to 21 mm.; maximum breadth (at prothorax) 4·5 mm.

Material studied. 8 L, 1 I, Hawaiian Is., Molokai, 2.xi.1928, from *Cajanus* stem, O. H. Sweezey leg., in coll. B. M.

References. Duffy, 1953b (L Biol.), Gressitt, 1956 (Biol.).

Prosoplus marianarum Aurivillius

Distribution. AUSTRALASIAN REGION: Micronesia (Marianas).
Host plants: *Intsia*, *Gossypium*, *Ipomoea batatas* (Gressitt, 1956).
Reference. Gressitt, 1956 (Biol.).

Prosoplus atlanticus trukensis Blair

Distribution. AUSTRALASIAN REGION: Micronesia (Caroline Is., Caroline Atolls, Truk).

Host plant: *Sorghum* (Gressitt, 1956).

Reference. Gressitt, 1956 (Biol.).

Prosoplus hibisci Gressitt

Distribution. AUSTRALASIAN REGION: Micronesia (Eastern Marshall Is.).

Host plant: *Hibiscus tiliaceus* (Gressitt, 1956).

Reference. Gressitt, 1956 (L, Biol.).

Pterolophia (=**Praonetha**) **binodosa** Bates

Distribution. AUSTRALASIAN REGION: New Hebrides; ORIENTAL REGION: Formosa.

Host plant: *Theobroma cacao* (Dumbleton, 1951).

Economic importance. Risbec (1937) records this species as a pest of *Theobroma* in the New Hebrides.

References. Cohic, 1953(?); Dumbleton 1951 (Biol.); Risbec, 1937 (L fig., P fig., I fig., Biol.).

Pterolophia camura (Newman)

Distribution. AUSTRALASIAN REGION: Micronesia (Mariana Is.); ORIENTAL REGION: Philippine Is., Taiwan, Botel-Tobago.

Host plants: *Cynometra*? (Gressitt, 1956); *Persea americana* (Duffy, 1953b).

Mature larva. Head rather strongly depressed, elongate, with sides slightly diverging to middle and then strongly and broadly constricted posteriorly; frontal sutures indistinct; antennal foramen open behind. Frons smooth, broadly castaneous and with eight to ten long setae near front margin; six epistomal setae present. One pair of ocelli present; lens oval, protuberant, with pigmented spot distinct. Hypostoma micro-granulate, with front margin very narrowly ferruginous; one pair of distinct setiferous pores present; sutures distinct, slightly incurved. Gular region with a pale, median cleavage line. Antenna with segment 2 short, transverse, segment 3 slightly longer than broad and bearing an apical appendage; supplementary process conical, nearly as long as segment 3. Maxillary palpi with segment 3 almost as long as segment 2. *Prothorax* with pronotum pale testaceous anteriorly and with a fringe of setae across front margin and several long setae laterally; posteriorly smooth and shining. *Abdomen* with each dorsal ampulla with a single transverse furrow and two transverse rows of oval glabrous tubercles surrounded medially and sublaterally by additional tubercles; narrowly but deeply interrupted by the median furrow. Segment 9 with several long ferruginous setae and with a minute median spine near hind margin. Anal lobes with shorter setae.

Spiracles with peritreme subcircular, thick. Length up to 21 mm.; maximum breadth (at prothorax) 4·2 mm.

Pupa. Head with vertex visible from above, smooth, broadly excavated between antennal tubercles and with a pair of setae at base of each of them; front smooth, with

about five setae around each eye; clypeus with a transverse row of six setae; labrum with numerous long setae. Antennae short, extending as far as apices of elytra. *Pronotum* slightly transverse, widest posteriorly, disc with a few minute scattered setae. Mesonotum with an oblique row of setae on each side of middle. *Metanotum* with scattered short setae on each side of scutellar groove which is broad and shallow. Elytra and wings extending to abdominal segment 4. *Abdomen* entirely micro-granulate, tergites 1–6 each with two transverse rows of scattered, short, stout spines (each with a basal seta); tergite 7 elongate, tapering posteriorly and with numerous similar scattered setae; tergite 8 short, transverse, with a row of short spines on hind margin. Segment 9 retracted in segment 8. Sternites each with two or three lateral setae. *Legs* with hind femora extending nearly as far as segment 4; femora with a few fine scattered setae, tarsi glabrous.

Functional spiracles with peritreme narrowly oval. Length up to 14 mm.; maximum breadth 4·5 mm.

Material studied. 3 L, 2 P, 1 I, Hawaiian Is., Honolulu, 6.vi.1951, from dead branch of *Persea*, in coll. B. M.

References. Duffy, 1953b (L fig., P, Biol.); Gressitt, 1956 (Biol.).

Symphyletes piliger (Macleay) (=**nodosus** Newman)

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland, Victoria).

Host plant: *Acacia decurrens* (K. M. Moore).

References. None available.

Apomecynini

Larval Characters

Larvae of this tribe show stronger affinities to the Agapanthiini than to the Niphonini, near which this tribe has been placed on the basis of adult classification. The characters common to the Apomecynini and the Agapanthiini are the thick, salient, strongly sclerotised head capsule and the setose abdominal segment 9 which is subtruncate posteriorly.

Ropica exocentroides Pascoe

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland).

Host plants: *Wistaria* (A. R. Brimblecombe); *Acacia* (Illidge, 1922).

Mature larva. Form subcylindrical, rather slender. *Head* scarcely depressed, widest at middle and sides regularly rounded; antennal foramen narrowly open behind; frons rather broadly ferruginous, with a row of eight setiferous pores; six epistomal setae present. One pair of ocelli present, lens strongly convex, pigmented spot exceptionally distinct. Hypostoma flat, testaceous, micro-granulate. Gular region with a distinct, pale, median cleavage line. Antenna 2-segmented; segment 2 bearing a tapering hyaline process. Maxilla with palpal segment 3 longer than segment 2; labial palpi with segment 2 longer than segment 1. Mentum not distinct from submentum. *Prothorax*

fringed anteriorly with several long, fine, pale setae which extend anteriorly above the head; posterior part of pronotum feebly longitudinally striate. Eusternum clearly defined, semicircular, smooth, almost glabrous. *Abdomen* with each dorsal ampulla with a single transverse linear impression, on each side of which is a transverse row of glabrous moniliform tubercles. Tergite 9 without a sclerotised process. Epipleurum strongly protuberant on all segments. Pleural tubercle without sclerotised pits. Anus trilobed. *Legs* absent. *Spiracles* with peritreme rather thick, subcircular, marginal chambers absent. Length up to 7·9 mm.; maximum breadth (at prothorax) 1·2 mm.

Pupa. Cuticle dull, entirely microgranulate (only apparent when dry). *Head* with vertex partly visible from above, very shallowly excavate between antennal tubercles and with a row of three setae near each antennal tubercle; front with several very fine setae; clypeus with a row of six fine setae. Antennae extending to between abdominal segments 3 and 4, where they are slightly recurved ventrally to terminate near hind tarsi. Eyes feebly convex, glabrous. Labrum fringed with fine pale setae basally. *Pronotum* subquadrate, without lateral tubercles; disc bearing numerous short, ferruginous spinules, each with a fine basal seta. *Meso-* and *metanotum* with several slightly smaller spinules. *Abdomen* with tergites 1–6 each with two or three very regular transverse rows of short stout spinules (each with a fine basal seta). Tergite 7 with three similar rows of spines, the posterior row comprising distinctly larger, vertical spines arising from a protuberant ridge. Tergites 8 and 9 each with a single transverse row of vertical spines, those on tergite 9 being slightly larger. Sternites with a few very fine scattered pale setae. *Legs* with femora, tibiae and tarsi bearing several fine pale setae; hind femora extending almost to abdominal segment 4.

Material studied. 2 L, 1 P, 1 I, Australia, Queensland, Brisbane, 26.ii.1938, from *Wistaria*, A. R. Brimblecombe leg., in coll. D.A.S.B.

References. Froggatt, 1923 (Biol.); Illidge, 1922 (Biol.).

Ropica squamulosa Breuning

Distribution. AUSTRALASIAN REGION: Micronesia (S. Mariana Is., Palau, Yap, Caroline Atolls, Truk, Kusaie).

Host plant: *Artocarpus altilis* (Gressitt, 1956).

Reference. Gressitt, 1956 (Biol.).

Apomecyna histrio (Fabricius) (=**proba** Newman)

[The Cucurbit-stem Borer]

Distribution. AUSTRALASIAN REGION: Australia (Queensland); ORIENTAL REGION: India, Andeman Is., Burma, Malaya, Philippine Is.

Host plants: *Tinospora cordifolia* (Maxwell-Lefroy, 1910); *Astrebla lappacea* (roots) (H. Jarvis); *Cucumis*, *Cucurbita maxima*, *C. pepo* (May, 1946).

Mature larva. Similar to that of *Ropica exocentroides* Pascoe from which it may be distinguished as follows. Size more robust; length up to 9 mm.; maximum breadth 1·9 mm. *Abdomen* with dorsal ampullae bearing moniliform tubercles which are irregularly arranged.

Biology. Larvae infest living stems of the creeper (*Tinospora*), in which they make irregular galleries. In India, emergence occurs between April and July (Lefroy, 1910).

Eggs are laid singly in growth cracks or other scars along the stem of the melon. The larva tunnels steadily downwards towards a node; this causes a swelling in the stem which becomes more prominent as the larva matures within the gallery which is packed with glutinous waste material. Before pupating, the larva constructs a fibrous cocoon. Possibly there may be two or three generations a year (May, 1946).

Control. Risk of infestation may be reduced by rooting out and burning the remains of cucurbit crops after the fruit has been harvested (May, 1946).

Material studied. 3 L, Australia, 16.ix.1944, from *Astrebla lappacea*, H. Jarvis leg., in coll. D.A.S.B.

References. Beeson, 1941 (Biol.); Beeson and Bhatia, 1939 (Biol.); Lefroy, 1910 (L, P, I, Biol.); May, 1946 (I fig., Biol., Contr.).

Apomecyna alboguttata (Megerle)

Distribution. AUSTRALASIAN REGION: Australia (Queensland); ORIENTAL REGION: India, Ceylon, Pakistan, Andeman Is., Java, Philippine Is., Borneo, Indochina, Thailand, Hainan I.

Host plants: *Benincasa hispida*, *Lagenaria vulgaris*, *Luffa acutangula*, *L. aegyptiaca* (Beeson and Bhatia, 1939).

Biology. Adults emerge from May to September after having overwintered in the dead dry stems of the host. It is probable that there are one or more short generations during the monsoon.

References. Beeson, 1941 (Biol.); Beeson and Bhatia, 1939 (Biol.); Gardner, 1931, (L fig., P, Biol.); Gressitt, 1951 (Biol.).

Ptericoptini

Sybra alternans (Wiedemann)

Distribution. AUSTRALASIAN REGION: Micronesia (S. Mariana Is., Palau, Yap, Caroline Atolls, Kusaie); HAWAIIAN REGION: Hawaiian Is. (Hawaii); ORIENTAL REGION: Indonesia, Philippine Is.

Host plants: *Artocarpus*, *Barringtonia*, *Cycas*, *Triphasia* (Gressitt, 1956); *Hibiscus*, *Ficus*, *Cordia;* also in pseudo-bulbs of orchids *Dendrobium* and *Cattleya* spp.)(Duffy, 1953b).

Mature larva (fig. 126). Similar to those of the Apomecynini but differing as follows. *Head* with pigmented spot of ocelli indiscernible. Hypostoma microgranulate but pale testaceous. *Prothorax* with posterior part of pronotum coarsely longitudinally striate. Tergite 9 (fig. 126) with a small, transversely oval sclerotised plate (bearing a minute spine) near hind margin. Length up to 12 mm.;

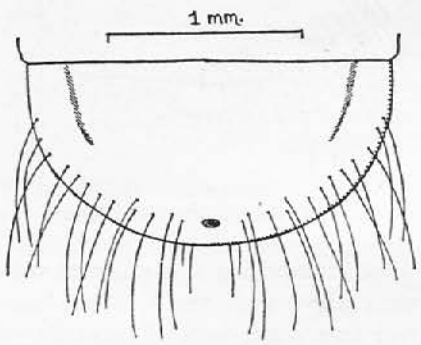

Fig. 126. *Sybra alternans* (Wiedemann). Mature larva. Abdominal tergite 9.

maximum breadth (at prothorax) 2·9 mm.

Material studied. 1 L, 1 I, Hawaii, Honolulu, 3.i.1952, from *Hibiscus*, in coll. B. M.

References. Duffy, 1953b (L fig., Biol.); Gressitt, 1956 (Biol.).

Sybra acuta Pascoe

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland).
Host plant: *Acacia longifolia* (Froggatt, 1894).
Biology. Adults emerge towards the end of December (Froggatt, 1894).
References. Froggatt, 1894 (I, Biol.), 1923 (Biol.).

Sybra centurio Pascoe

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland).
Host plant: *Xanthium pungens* (A. R. Brimblecombe).
References. None available.

Oopsis nutator (Fabricius)

Distribution. AUSTRALASIAN REGION: Society Is. (Tahiti), Tonga Is.; HAWAIIAN REGION: Hawaiian Is. (Hawaii).

Host plant: *Pipturus* (Duffy, 1953b)[1].

Mature larva (fig. 127). *Head* rather strongly depressed, elongate, with sides converging behind middle; frontal sutures indistinct; antennal foramen open behind. Frons smooth, with eight setiferous pores; six epistomal setae present. One pair of ocelli present; lens thick, oval, convex, pigmented spot indistinct. Hypostoma slightly convex, granulate; one pair of setiferous pores present; sutures distinct, ferruginous, slightly curved and converging posteriorly. Gular region with a pale median cleavage line. Antenna 2-segmented, segment 2 bearing a hyaline, dome-shaped process. Maxilla with segment 3 of palp about as long as segment 2. *Prothorax* with anterolateral regions bearing numerous long, fine, silky setae; posterior part of pronotum shining, faintly longitudinally rugose. Eusternum separated from sternellum by a transverse impression. *Meso-* and *metanotum* dull, microscopically granulate. *Abdomen* with dorsal ampullae slightly bilobed, comprising a pair of oval areas of subcontiguous moniliform tubercles, a transverse impression, and a broad, longitudinal, median furrow. Ventral ampullae with two transverse rows of tubercles. Segment 9 with a pair of dorso-lateral, curved impressions and a minute tubular, strongly sclerotised process (fig. 127); setae pale

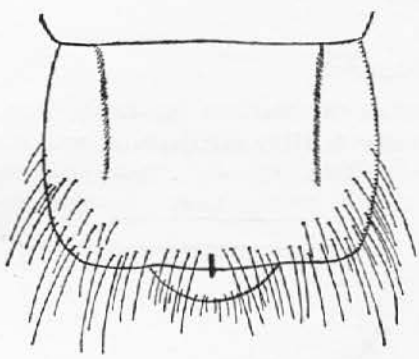

Fig. 127. *Oopsis nutator* (Fabricius). Mature larva. Abdominal tergite 9.

[1] An unknown species of *Oopsis* has been recorded from *Cocos nucifera* (Lepesme, 1947).

yellowish white. Epipleurum protuberant on all segments. Pleural tubercle small, with only the ventral sclerotised pit distinct. *Legs* absent. *Spiracles* with peritreme round, thin, testaceous. Length up to 17 mm.; maximum breadth (at prothorax) 3·1 mm.

Material studied. 3 L, 2 I, Oahu, Manoa Valley, 28.xii.1931, from *Pipturus*, O. H. Sweezey leg., in coll. B. M.

Reference. Duffy, 1953b (L fig., Biol.).

Estolini

Tetrorea cilipes White

Distribution. AUSTRALASIAN REGION: New Zealand.

Host plants: *Nothopanax* sp., not *Carpodetus serratus* (Townsend, 1959, 1960); *Nothopanax arboreum* (G. B. Rawlings); *Griselinia littoralis* (Morgan, 1960b).

Mature larva (fig. 128). Form rather slender, cylindrical. *Head* moderately depressed, with sides abruptly constricted for posterior fourth; antennal foramen open posteriorly; frons with anterior half ferruginous; frontal sutures distinct; six epistomal setae present. One pair of ocelli present; lens strongly protuberant, sclerotised, ferruginous; pigmented spot indiscernible owing to sclerotisation of lens. Hypostoma plane, entirely sclerotised and ferruginous, finely micro-granulate, and bearing eight to twelve long setae; sutures linear, subparallel, very distinct. Gular region with a distinct, broad, pale, median cleavage line. Antenna 2-segmented; segment 2 bearing a tapering, hyaline process. Maxillary palp 3-segmented; segment 3 slightly longer than segment 2. Labial palpi with segment 2 elongate, distinctly shorter than segment 1.

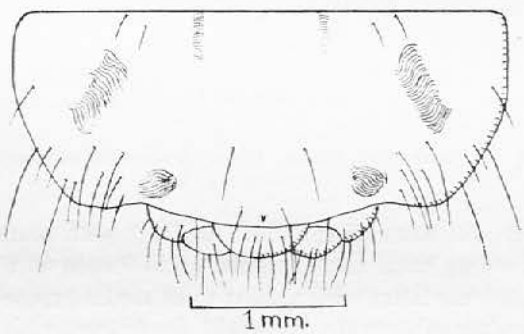

Fig. 128. *Tetrorea cilipes* White. Mature larva. Abdominal tergite 9.

Mentum distinct from submentum. *Prothorax* entirely pale testaceous, smooth, very sparsely setose; eusternum bearing a few scattered setae. *Abdomen* with dorsal ampullae covered with small shining, glabrous, moniliform tubercles which are irregularly arranged. Segment 9 (fig. 128) without a sclerotised process, sparsely setose, sub-truncate posteriorly and with a pair of sublateral, curved, linear impressions between which is a pair of conspicuous foveae; a minute median spine near posterior margin is usually present. Epipleurum feebly protuberant on all segments. Pleural tubercle without sclerotised pits. Anus trilobed. *Legs* absent. *Spiracles* with peritreme round, thick, with numerous subcontiguous marginal chambers on posterior

half. Length up to 26 mm.; maximum breadth (at prothorax) 5 mm.

From larvae of the Apomecynini it may be distinguished by the distinct submentum and the presence of numerous marginal chambers on the posterior half of the peritreme.

Pupa (fig. 129). *Head* with vertex partly visible from above, broadly but shallowly excavate between antennal tubercles near which are two pairs of stout setae; front with five pairs of setae; clypeus with a row of six setae; labrum with four setae. Mandibles each with a pair of setae near middle of outer face. Eyes feebly convex, glabrous. Antennae extending as far as abdominal segment 4, where they are strongly recurved ventrally to terminate alongside bases of front femora. *Pronotum* bearing several scattered coarse setae. *Mesonotum* with about eight short setae on each side of scutellum which is scarcely protuberant. *Metanotum* with numerous setae arranged in a V-formation, scutellar groove transversely striate. Elytra and wings extending as far as abdominal segment 5, the former attenuated apically. *Abdomen* with tergites 2–6

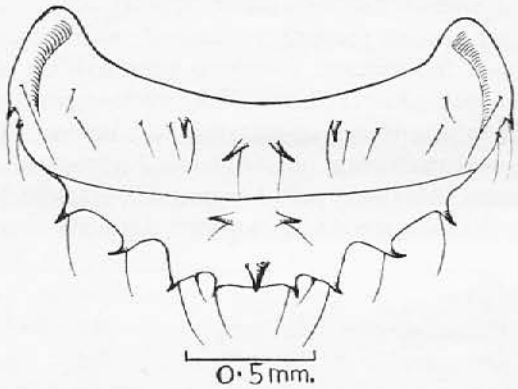

Fig. 129. *Tetrorea cilipes* White. Pupa. Abdominal tergites 8 and 9.

each with two transverse rows of spinules; tergite 7 with scattered, slightly larger spinules (each with a long basal seta); tergites 8 and 9 each with a transverse row of slightly larger spinules, the latter with a short stout median spine (fig. 129). Sternites each with a few fine setae sublaterally. *Legs* with femora and tibiae bearing long stout setae, hind femora extending to abdominal segment 5. Functional spiracles present on abdominal segments 1–6; peritreme rather thick, broadly oval and distinctly raised above general level of cuticle. Length up to 17 mm.; maximum breadth 5·1 mm.

Biology. Larvae tunnel in recently dead trees, feeding subcortically until nearly mature and then enter the wood to pupate (Pl. X, fig. 2) (G. B. Rawlings).

Larvae and pupae have been taken from dead branches of *Nothopanax* in November. The larval galleries are subcortical but the pupal cells are in the wood (Dumbleton, 1957).

According to Morgan (1960b), adults emerge from November to late January and eggs are laid singly or in twos and threes in small patches of chewed bark on twigs. The incubation period varies from between 16 and 25 days, averaging about 19. The

pupal and adult development periods together average about 28 days, with a range of 24 to 36 days.

Townsend (1959) gives an account of a very regular clicking noise, similar to that produced by a large cicada, produced by numerous larvae of this species feeding under the dry bark of a recently dead putaputaweta tree (*Carpodetus serratus*).

Parasite. Larvae and pupae are parasitised by the ectoparasitic larvae of the colydiid *Bothrideres obsoletus* Broun (Dumbleton, 1957).

Material studied. 12 L, 4 P, 3 I, New Zealand, 22.ii.1956, from *Nothopanax arboreum*, G. B. Rawlings leg., in coll. F.R.I.

References. Dumbleton, 1957 (L fig., P, Biol.); Morgan, 1960b (Biol.); Townsend, 1959 (Biol.), 1960 (Biol.).

Tetrorea sellata Sharp

Distribution. AUSTRALASIAN REGION: New Zealand.
Host plant: *Hedycarya arborea* (Hudson, 1934).
Reference. Hudson, 1934 (Biol.).

Tetrorea discedens Sharp

Distribution. AUSTRALASIAN REGION: New Zealand.
Host plant: *Hoheria glabrata* (Hudson, 1934).
Reference. Hudson, 1934 (Biol.).

Tetrorea maculata Broun

Distribution. AUSTRALASIAN REGION: New Zealand.
Host plant: *Nothofagus menziesii* (Morgan, 1960b).
Reference. Morgan, 1960b (Biol.).

Pogonocherini

Larval Characters

Form slender, subcylindrical. *Head* depressed, with sides slightly constricted behind middle. Mandible short, micro-reticulate on outer face. Antennal foramen closed behind. Setiferous pores on hypostoma present or absent. Antenna 2-segmented and bearing a hyaline process. Maxillary palp 2- or 3-segmented. Gular region without a distinct suture or ventral cleavage line. *Prothorax* with posterior region of pronotum shining and glabrous. *Abdomen* with ampullae feebly tuberculate and with a broad, longitudinal, median furrow. Epipleurum protuberant on last three segments only. Pleural tubercles without sclerotised pits and bearing one or two setae. Tergite 9 with a sclerotised plate, process or urogomphi. *Spiracles* with about six marginal chambers.

Hybolasius genalis Broun

Distribution. AUSTRALASIAN REGION: New Zealand.
Host plant: *Pinus radiata* (Dumbleton, 1957).

Mature larva. Head depressed, elongate, widest at mid-length, narrowed posteriorly; antennal foramen closed behind; frons rather broadly sclerotised, pale ferruginous, and with a row of eight setiferous pores; six epistomal setae present. One pair of ocelli present; lens strongly convex, pigmented spot distinct. Hypostoma flat, pale ferruginuous and with a pair of setal pores. Maxillary palpi 2-segmented. Mentum distinct from submentum. *Prothorax* with pronotum feebly longitudinally striate posteriorly. Eusternum feebly defined and with a few scattered setae. *Abdomen* with ampullae feebly tuberculate, glabrous. Epipleurum protuberant on last three segments only. Tergite 9 bearing a pair of subcontiguous urogomphi. Pleural tubercles bearing a pair of setae. Anus trilobed. *Legs* absent. *Spiracles* with peritreme round. Length up to 10 mm.; maximum breadth (at prothorax) 1·25 mm.

Pupa. Head with vertex visible from above and bearing a single bristly seta near each antennal base; front with three pairs of long fine setae, clypeus with three pairs of shorter setae. Mandible with a pair of setae; labrum with a pair of setae. Antennae extending as far as abdominal segment 4, where they are recurved ventrally to terminate alongside front femora. Eyes feebly convex, glabrous. *Pronotum* with sides broadly tuberculate; disc bearing several scattered fine setae. *Mesonotum* with a pair of setae; *metanotum* with two pairs of setae; scutellar groove indistinct. Elytra extending as far as abdominal segment 5. *Abdomen* with tergites 1–6 each with a transverse row of three to six widely separated setae near posterior margin. Tergite 7 elongate, with similar setae; tergite 8 very short, with a pair of setae; tergite 9 short, bearing a long, slender, vertical, spine-like process which is slightly curved anteriorly. *Legs* with femora bearing a pair of long fine subapical setae. Middle and hind femora with a long tubercular, sub-basal process; hind femora extending to abdominal segment 4; all tibiae at right-angles to longitudinal axis of body. *Functional spiracles* present on abdominal segments 1–6, peritreme broadly oval, thin and pale. Length up to 5 mm.; maximum breadth 1·8 mm.

Biology. Larvae, pupae and adults have been found under dead bark of *Pinus* in February (Dumbleton, 1957), but according to Milligan (in lit.) all stages of this species have been found during November, so either the emergence period is considerably extended or a second brood emerges late in the season.

Material studied. 1 L, 2 P, New Zealand, Waiotapu State Forest, 18.xi.1959, from *Pinus radiata*, R. H. Milligan leg., in coll. B. M.

Reference. Dumbleton, 1957 (L fig., Biol.).

Acanthoderini

Larval Characters

Head slightly to moderately depressed. Mandible with a longitudinal impression on apical third of outer face. Antenna 2- or 3-segmented. *Prothorax* with pronotum micro-asperate or glabrous. *Abdomen* with dorsal ampullae each with three or four transverse rows of large, glabrous, moniliform tubercles. Segments 7–9 distinctly broader than segment 6. Tergite 9 sometimes with a sclerotised process. Pleural tubercles each with a pair of sclerotised pits.

Steirastoma stellio Pascoe

Distribution. AUSTRALASIAN REGION: Society Is.; NEOTROPICAL REGION: South America.

Host plants: ?*Pandanus* (Fairmaire, 1850); *Acacia decurrens mollissima*, ?*Chorisia speciosa* (Lima, 1955); *Acacia cavenia*, *Salix*, *Populus* (Bosq, 1942a); *Acacia polyphylla* (Andrade, 1928); *Catostemma* (E. A. J. D.).

Mature larva (fig. 130). *Head* moderately depressed, with sides strongly rounded and slightly converging posteriorly. Mouthframe ferruginous; genae strongly shouldered and protuberant. One pair of ocelli present; lens oval, protuberant, pigmented spot indistinct. Clypeus glabrous. Labrum transversely oval, fringed anteriorly with coarse golden setae. Testaceous area of frons behind broadly ferruginous front margin rather densely setose, bearing at least 40 setae (fig. 130). Mandible with a distinct longitudinal impression on apical third of outer face. Hypostoma feebly convex, ferruginous, with a pair of setal pores on each side of gula; sutures pitchy, slightly converging posteriorly; gula not clearly defined. Antenna 3-segmented, the supplementary process much longer than segment 3. Maxilla with segment 3 of palp about half length of segment 2; segment 2 of labial palp about half length of segment 1. *Prothorax* with pronotum densely covered with small ferruginous asperities. *Abdomen* with tubercles of ampullae glabrous. Length up to 48 mm.; maximum breadth (at prothorax) 9 mm.

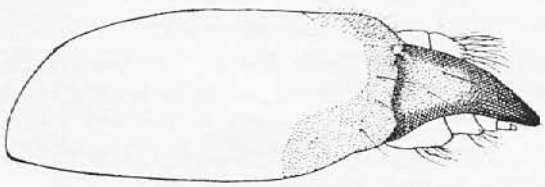

Fig. 130. *Steirastoma stellio* Pascoe. Mature larva. Head. Lateral aspect.

Biology. The larval galleries are subcortical, with the pupal cell up to 1 inch deep in the sapwood.

Material studied. 5 L, 1 I, British Guiana, Bartica District, Skull Point, 20.iv.1957, from *Catostemma* sp., E.A.J.D. leg., in coll. B. M.

References. Andrade, 1927 (Biol.), 1928 (Biol.); Bosq, 1942a (Biol.); Duffy, 1960 (L fig., Biol.); Fairmaire, 1850 (Biol.); Lima, 1930 (Biol.), 1955 (Biol.).

Acanthocinini

Larval Characters

Form variable but usually depressed and slender. *Head* moderately to very strongly depressed and moderately to strongly elongate, with sides abruptly constricted before or at middle; antennal foramen open or closed posteriorly. Gula with sutures not raised, but with a small rugose area on each side (each bearing two to six setae); six epistomal setae present. One pair of ocelli present; pigmented spot indistinct. Mentum distinct from submentum. Antenna 2-segmented and bearing a conical hyaline process.

Maxillary palp 2- or 3-segmented. *Prothorax* with posterior area of pronotum remarkably variable, being velvety micro-pubescent or micro-spiculate in the majority of genera but rather coarsely asperate in *Lagocheirus*. *Abdomen* with ampullae similarly variable, ranging from tuberculate and glabrous to non-tuberculate and micro-spiculate. Abdominal tergite 9 usually without a sclerotised process. Epipleurum very strongly protuberant, at least on abdominal segments 7–9. Pleural tubercles each with a pair of sclerotised pits. *Spiracles* broadly oval to circular, with posterior margin of peritreme bearing numerous subcontiguous marginal chambers.

Lagocheirus araneiformis (Linnaeus)

[The Almácigo Borer]

Distribution. AUSTRALASIAN REGION: Tahiti; HAWAIIAN REGION: Hawaiian Is.; NEARCTIC REGION: U.S.A. (Florida); NEOTROPICAL REGION: Mexico, Central America, Caribbean, S. America.

Host plants: *Ficus* (Craighead, 1923); *Saccharum officinarum* (Smith, 1921); *Spondias mombin* (Becker, 1953b); *Bursera simaruba* (Martorell, 1945); *Hura crepitans*, *Sapium aucuparium* (E.A.J.D.); *Spondias dulcis* (Fairmaire, 1850).

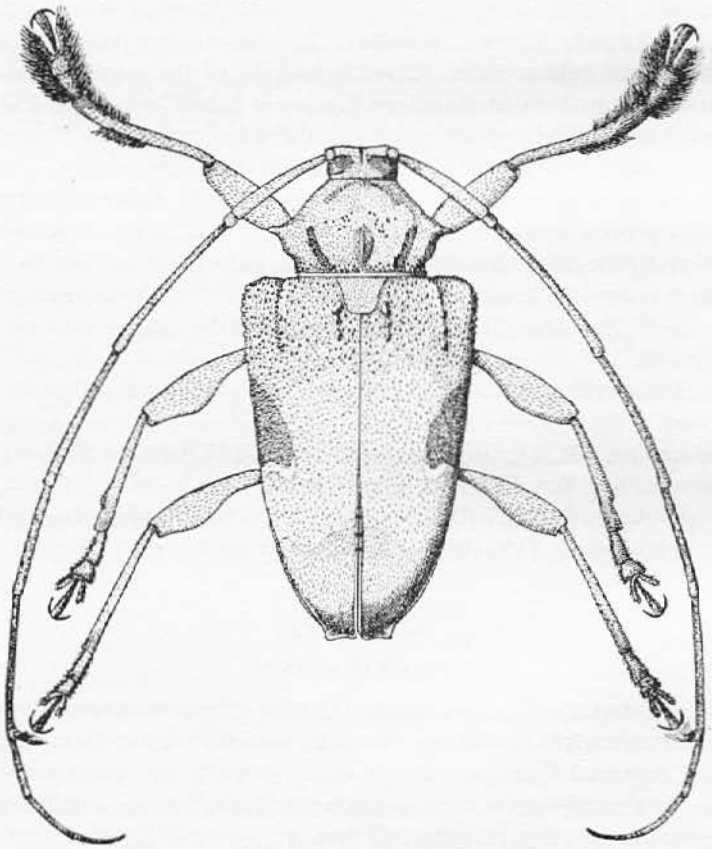

Fig. 131. *Lagocheirus araneiformis* (Linnaeus). Adult.

Adult (fig. 131). Length 14–28 mm. Head, prothorax, and elytra light brown, the latter each with a dark brown, subtriangular lateral area which is narrowly margined posteriorly with white. *Head* with antennae filiform, slightly longer than body in female and about twice as long as body in male. *Prothorax* with a pair of stout lateral tubercles and disc with a row of three tubercles. *Elytra* truncate apically.

Mature larva (fig. 132). *Head* strongly depressed, with sides slightly constricted just before middle and slightly converging posteriorly; antennal foramen open behind; mouthframe ferruginous, very strongly and rather broadly sclerotised; frons with eight setiferous pores and numerous minute setae. Genae strongly shouldered and protuberant, strongly sclerotised, pitchy and rugose. One pair of ocelli present; lens ferruginous, pigmented spot indistinct. Hypostoma flat, smooth, ferruginous; sutures pitchy and slightly curved; gular region with a pale cleavage line on each side of which is a rugose area bearing four to six setae. Antenna 2-segmented; segment 2 bearing a conical hyaline process. Maxillae strongly sclerotised, with palpi 3-segmented; segment 3 about two-thirds length of segment 2. *Prothorax* with anterolateral regions with numerous long, ferruginous setae; posterior half of pronotum covered with

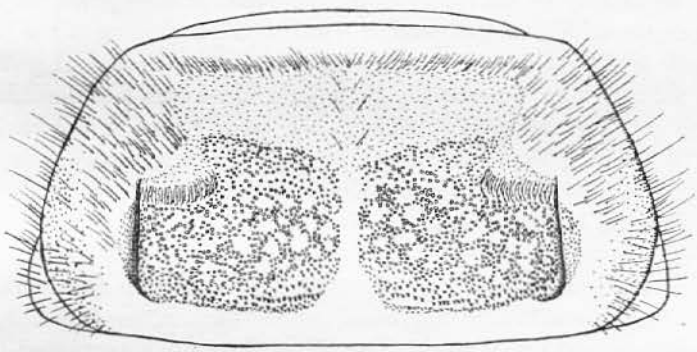

Fig. 132. *Lagocheirus araneiformis* (Linnaeus). Mature larva. Prothorax. Dorsal aspect.

semicircular asperities, with small, scattered, lenticular, glabrous areas. *Abdomen* with ampullae with a single transverse impression, a conspicuous pair of lateral furrows and a broad rather deep longitudinal furrow; non-tuberculate, full, coarsely micro-spiculate. Tergite 9 without a sclerotised process. Epipleurum protuberant on segments 7–9 only. Pleural tubercle broadly oval, with a pair of sclerotised pits and at least ten setae. Anus trilobate. *Legs* absent. *Spiracles* with peritreme round, thick, testaceous. Length up to 32 mm.; maximum breadth (at prothorax) 8·5 mm.

Pupa. *Head* with vertex visible from above and deeply excavate between antennae; bearing a few short spines (each with a basal seta) behind base of each antenna; front with groups of two to four spines near base of each antenna, half-way between and at inner margin of each eye and at base of clypeus. Antennae extending as far as abdominal segment 5, where (in female only?) they are strongly recurved and directed anteriorly to terminate alongside middle-coaxe. Eyes feebly convex glabrous. Mandibles each with a spine near middle of outer face. Labrum slightly transverse, with front margin strongly rounded and glabrous or almost so. *Pronotum* strongly trans-

verse, with sides bearing a pair of stout tubercles; numerous short spines present, especially along front margin. *Mesonotum* smooth, with about six small spines. *Metanotum* smooth, with four to six spines on each side of the scutellar groove, which is shallow. Elytra each with a conspicuous spine near base. Elytra and wings extending as far as abdominal segment 4. *Abdomen* with tergites 1–6 with anterior half with a median oval, tuberculate, spinose protuberance, and posterior half with a transverse row (interrupted medially) of short spines. Tergite 7 bearing numerous, much stouter, incurved spines. Tergite 8 with similar spines; tergite 9 very short, truncate apically and bearing a pair of large incurved spines (urogomphi?). Sternites glabrous. Pleura rather strongly protuberant, rugose. *Legs* with front and middle femora strongly clavate, each femur with a row of spines near apex; mid and hind femora each with a long tuberculate process near base; hind femora extending to abdominal segment 4; hind tibiae with a row of spines; all tibiae more or less at right angles to longitudinal axis of body. *Functional spiracles* present on abdominal segments 1–6, where they are placed laterally; peritreme rather narrowly oval but broadly rounded at its extremities. Length up to 24 mm.; maximum breadth 9 mm.

Biology. According to Becker (1953b), the peak of emergence (in Guatemala) occurs between the middle and the end of April, at the beginning of the rainy season. Adults become active at dusk; in the daytime they seek seclusion. Larvae feed subcortically on the cambium, superficially grazing the inner bark and the outer sapwood. Before boring into the sapwood to pupate, the larva gnaws in the bark a circular groove about 4–5 mm. in diameter. In so doing, the larva eats away the cambium and pushes the frass slightly beyond the boundary of the excision. Sometimes the larva gnaws so near to the surface of the bark that the disc is completely excised and falls away, but often it is only partly excised, in which case it is pushed out by the emerging adult. In thick stems the discs are usually round (20–35 mm. in diameter), but in thin stems they are mostly oval (22–35 mm. in diameter). This accomplished, the larva then tunnels into the sapwood where an elongate-elliptical gallery is excavated, the entrance of which is plugged with wooden shavings. The pupal cell lies 1 or 2 cm. deep in the sapwood. The emergence hole is subelliptical, one half being less convex than the other. The average dimensions are 9 × 6 mm. Some adults emerge inside the excised area of bark (i.e. close to the plugged larval gallery), others well beyond the excised area.

This characteristic damage has been described and illustrated earlier by Whitney (1942), Wolcott (1941), Beard (1942) and Martorell (1945), who had observed this species infesting *Bursera*.

Similar but much larger excisions are made by the larvae of certain African species of this subfamily (see Duffy, 1957, p. 183, Pl. IV, figs. 1 and 2).

This curious habit of excising discs of bark was recently observed by the author whilst in Trinidad. In some cases the discs of bark were almost one inch thick. The larval galleries were found to be broad, shallow, subcortical and packed with coarse, shredded wood fibres. Before pupation the larvae were seen in the act of excising the discs of bark, the average dimensions being $1\frac{1}{2} \times 1$ inch; the central entrance to the pupal cell was plugged with a protuberant wad of shredded fibres torn from the surrounding sapwood. In some cases examined these excisions were numerous throughout the whole length of a 55-feet, nine-month-felled log.

Oviposition occurs usually only on freshly cut logs or branches, seldom on living, healthy trees (E.A.J.D.).

Predator. Larvae of the introduced elaterid *Chalcolepidus silbermanni* Chevr. are predacious on larvae of this cerambycid.

Economic importance. In 1921 it was estimated that 5 per cent of the standard variety of sugar-cane was destroyed by this species in the Virgin Islands, only ripe canes being attacked (Smith, 1921).

Control. Wolcott (1933) suggests the cutting off and burning of all infested shoots (recognisable by their stunted growth and their abnormally swollen tissue). In the case of sugar-cane infestation, Smith (1921) recommends that, after harvesting, all rotten canes should be carted away and burned or passed through a mill to destroy the larvae.

Material studied. 6 L, 3 P, 3 I, Trinidad, South West Region, vii 1957 from *Bursera simaruba*, F. Peña leg., in coll. B. M.; 3 L, 1 I, Trinidad, Port-of-Spain (sawmills), 29.v.1957, from *Sapium acuparium*, E. A. J. D. leg., in coll. B. M.; 8 L, 1 I, Trinidad, Arena Reserve, 12.iii.1957, from *Spondias mombin*, E.A.J.D. leg., in coll. B. M.; 3 L, 1 I, Trinidad, Arima District, 12.vi.1957, from *Hura crepitans*, F. Peña leg., in coll. B. M.

References. Beard, 1942 (Biol., fig.); Becker, 1953b (I fig., Biol. fig.); Craighead, 1923 (L fig., Biol.); Duffy, 1953a (Biol.), 1960 (L fig., P, I fig., Biol. fig., Contr.); Fairmaire, 1850 (Biol.); Grégoire, 1957 (I, Physiol.); Martorell, 1945 (I fig., Biol. fig.); Smith, 1921 (Biol., Contr.); Whitney, 1942 (I fig., Biol. fig.); Wilson, 1923 (Biol.); Wolcott, 1933 (Biol., Contr.), 1941 (Biol.), 1951 (I fig., Biol.).

Illaena exilis Erichson (=**Neissa inconspicua** Pascoe)

Distribution. AUSTRALASIAN REGION: Australia (Queensland, S. Australia, Tasmania).

Host plant: *Acacia longifolia* (Froggatt, 1894).

Biology. Adults emerge in October and November (Froggatt, 1894).

References. Froggatt, 1894 (I, Biol.), 1923 (Biol.).

Ameipsis marginicollis Pascoe

Distribution. AUSTRALASIAN REGION: Australia (Queensland).

Host plant: *Acacia* spp. (Illidge, 1922).

References. Froggatt, 1932 (Biol.); Illidge, 1922 (Biol.).

Paremeopedus minimus (Blair)

Distribution. AUSTRALASIAN REGION: Micronesia (Eastern Caroline Is., Marshall Is.).

Host plants: *Glochidion puberulum, Messerschmidia argentea* (Gressitt, 1956).

Reference. Gressitt, 1956 (Biol.).

Paremeopedus tiliacei Gressitt

Distribution. AUSTRALASIAN REGION: Micronesia (Eastern Caroline Is.).

Host plant: *Hibiscus tiliaceus* (Gressitt, 1956).

Reference. Gressitt, 1956 (Biol.).

Paremeopedus wakensis Gressitt

Distribution. AUSTRALASIAN REGION: Micronesia (Wake Atoll).
Host plant: *Sida* (Gressitt, 1956).
Reference. Gressitt, 1956 (Biol.).

Pentacosmia scoparia Newman

Distribution. AUSTRALASIAN REGION: Australia (New South Wales, Queensland, Tasmania, Victoria).

Host plants: *Acacia longifolia* (Froggatt, 1894); *Pyrus malus*, *Citrus* sp. (K. M. Moore); *Viminaria denudata* (Dixon, 1908).

Biology. Adults emerge from October to December (K. M. Moore).
References. Dixon, 1908 (Biol.); Froggatt, 1894 (I, Biol.), 1923 (Biol.).

Sciadella meridiana (Ohbayashi)

Distribution. AUSTRALASIAN REGION: Micronesia (Mariana Is.).
Host plants: *Citrus*, *Malenolepis*?, *Artocarpus*? (Gressitt, 1956).
Reference. Gressitt, 1956 (Biol.).

Sciadella mariana Gressitt

Distribution. AUSTRALASIAN REGION: Micronesia (Mariana Is.).
Host plant: *Citrus*, *Myoporum* (Gressitt, 1956).
Reference. Gressitt, 1956 (Biol.).

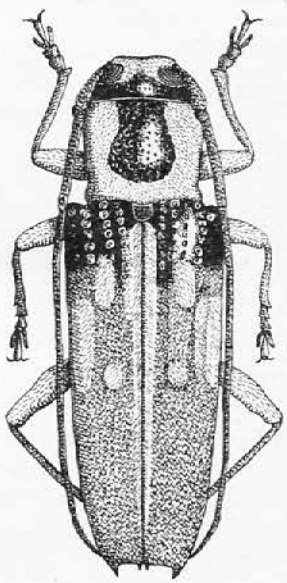

Fig. 133.
Glenea aluensis Gahan. Adult.

Sciadella saltator Gressitt

Distribution. AUSTRALASIAN REGION: Micronesia (W. Caroline Is., Yap).
Host plant: *Hibiscus tiliaceus* (Gressitt, 1956).
Reference. Gressitt, 1956 (Biol.).

Gleneini

Glenea (s.g. **Glenea**) **aluensis** Gahan

Distribution. AUSTRALASIAN REGION: Australia, Solomon Is., ORIENTAL REGION: New Britain: New Guinea.
Host plant: *Theobroma cacao* (Dumbleton, 1951).

Adult (fig. 133). Length 13–17 mm. Head and prothorax covered with dense orange-yellow pubescence but with disc glabrous and black with a metallic blue reflection. Elytra metallic blue, with pubescence sparse basally and with markings of white pubescence as figured. *Prothorax* subquadrate, without lateral tubercles. Elytra sinuate and spined apically.

Mature larva. Head moderately depressed, with sides subparallel, feebly constricted before middle and

broadly rounded at base; antennal foraman closed posteriorly. Mouthframe and frons moderately sclerotised, ferruginous, the latter with a transverse row of 8 to 12 setae; six epistomal setae present; genea strongly shouldered and ferruginous. One pair of ocelli present; lens round, strongly convex, pigmented spot large and very distinct. Clypeus bearing two or six short lateral setae. Hypostoma slightly convex, smooth and ferruginous. Gula indistinct; two widely separated setae present, one on each side. Antenna 2-segmented; segment 2, quadrate and bearing a hyaline process. Maxillary palp with segment 3 conical, slightly shorter than segment 2; palpifer elongate, sub-parallel-sided. Mentum not distinct from submentum. *Prothorax* (fig. 134) obliquely slanting anteriorly; posterior area of pronotum covered with very coarse individually distinguishable asperities which become gradually

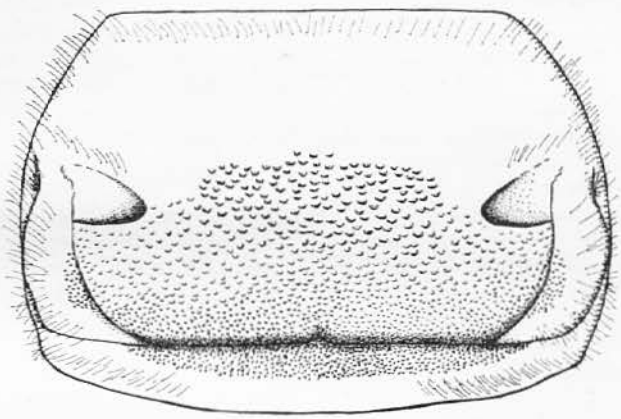

Fig. 134. *Glenea aluensis* Gahan. Mature larva. Prothorax. Dorsal aspect.

smaller towards posterior margin; sublateral impressions rather shallow, transversely oval. Presternum with scattered fine setae; posterior area of eusternum and anterior area of sternellum each with a transverse band of asperities. *Abdomen* with each dorsal ampullae with two curved transverse furrows, a distinct median longitudinal furrow and bearing numerous scattered, coarse, spine-like asperities. Tergite 9 without a sclerotised process. Epipleurum protuberant on all segments. Pleural tubercle oval, bearing about four pale setae; sclerotised pits absent. Anus rather strongly protuberant, trilobate. *Legs* absent. *Spiracles* with peritreme very pale, rather narrowly oval and moderately thick. Length up to 24 mm.; maximum breadth (at prothorax) 4·1 mm.

Biology. Injury to *Theobroma* is caused by the larva of this species tunnelling in the woody tissue beneath the bark. Damage is accentuated by the fact that it ring-barks the branch which later dies or breaks off. Another type of damage occurs in younger trees, where larval galleries at the point of ramification weaken the tree to a degree where a light wind, or even heavy rain, will cause complete collapse of the upper portion (Dun, 1951).

Economic importance. Before the war this species was not considered a serious pest and it is very probable that overgrowth and neglect of plantations favoured its increase.

There is also some indication that its level of population is now declining.

Material studied. 5 L, New Britain, Keravat, ii.1952, from *Theobroma*, G. S. Dun leg., in coll. B. M.

References. Dumbleton, 1951 (Biol.); Dun, 1951 (Biol.), 1955 (Biol.); O'Connor, 1952 (Biol).

CATALOGUE OF HOST PLANTS OF AUSTRALASIAN CERAMBYCIDAE

Abies spp. *Callidium rufipenne, Hylotrupes bajulus.*

Acacia aulacocarpa. *Xylotrechus australis.*

Acacia armata. *Uracanthus pertenuis.*

Acacia baileyana. *Rhinophthalmus nasutus, Xystrocera virescens.*

Acacia catechu. *Xystrocera globosa.*

Acacia cavenina. *Steirastoma stellio.*

Acacia confusa. *Xystrocera globosa.*

Acacia cunninghamii. *Penthea pardalis, Sceleocantha glabricollis.*

Acacia dealbata. *Ancita australis, A. crocogaster, A. marginicollis, Uracanthus acutus, Zorion minutum.*

Acacia decurrens. *Ancita australis, A. crocogaster, A. marginicollis, Bethelium signiferum, Curtomerus flavus, Didymocantha obliqua, Eurynassa australis, Lygesis mendica, Pachydissus sericus, Penthea vermicularia, Phacodes marmoratus, Phaolus metallicus, Phoracantha punctata, Piesarthrius marginellus, Platyomopsis nigrovirens, P. variolosa, P. vestigialis, Syllitus grammicus, Symphyletes piliger, Uracanthus triangularis, Xystrocera virescens.*

Acacia decurrens mollissima. *Steirastoma stellio.*

Acacia falcata. *Ancita crogocaster.*

Acacia farnesiana. *Curtomerus flavus.*

Acacia fimbriata. *Penthea intricata.*

Acacia homalophylla. *Phoracantha punctata.*

Acacia juniperina. *Platyomopsis nigrovirens.*

Acacia linifolia. *Xystrocera virescens.*

Acacia longifolia. *Illaena exilis, Pachydissus sericus, Pentacosmia scoparia, Piesarthrius marginellus, Platyomopsis albocincta, P. egena, P. nigrovirens, P. pulverulens, Rhinophthalmus nasutus, Rhytiphora rugicollis, Sybra acuta, Uracanthus bivittata U. simulans, U. triangularis.*

Acacia melanoxylon. *Oemona hirta.*

Acacia modesta. *Xystrocera globosa.*

Acacia mollissima. *Ancita crogogaster, A. marginicollis, Phoracantha punctata, Piesarthrius marginellus, Platyomopsis albocincta, Rhinophthalmus nasutus, Uracanthus acutus, U. triangularis, Xystrocera globosa.*

Acacia nilotica. *Hylotrupes bajulus.*

Acacia oxycedrus. *Platyomopsis modesta.*

Acacia pendula. *Ancita cristata, Pachydissus magnus, Platyomopsis egena, Rhinophthalmus modestus, Rhytiphora rosei.*

Acacia penninervis. *Platyomopsis pulverulens.*

Acacia polyphylla. *Steirastoma stellio.*

Acacia pychantha. *Uracanthus triangularis.*

Acacia spp. *Ameipsis marginicollis, Ancita australis, A. niphonoides, Bethelium spinicorne, Ceresium unicolor, Karadinia nubila, Penthea solida, P. vermicularia, Phalota tenella, Piesarthrius frenchi, Platyomopsis variolosa, P. vicaria, Probatodes plumula, Rhytiphora rubeta, Ropica exocentroides, Tryphocaria mastersi, Uracanthus albatus, U. simulans, U. strigosus.*

Acrocarpus fraxinifolius. *Xystrocera globosa.*

Adenanthera pavonina. *Xystrocera globosa.*

Aesculus sp. *Gracilia minuta.*

Agathis australis. *Prionoplus reticularis.*

Agathis robusta. *Dihammus vastator, Temnosternus planiusculus, Tryphocaria acanthocera.*

Agave sisalana. *Prosoplus banki.*

Aleurites fordii. *Oemona hirta.*

Albizia chinensis. *Xystrocera globosa .*

Albizia falcara. *Xystrocera globosa.*

Albizia lebbeck. *Xystrocera globosa.*

Albizia lucida. *Xystrocera globosa.*

Albizia odoratissima. *Xystrocera globosa.*

Albizia procera. *Xystrocera globosa.*

Albizia pycnantha. *Oemona hirta.*

Alnus glutinosa. *Oemona hirta.*

Alnus rubra. *Zorion minutum.*

Alnus sp. *Hylotrupes bajulus, Neoptychodes trilineatus.*

Alstonia constricta. *Disterna plumifera, Prosoplus woodlarkianus.*

Amygdalus persica. *Uracanthus acutus.*

Angophora intermedia. *Agrianome spini-*

collis, *Coptocercus aberrans*, *C. biguttatus*, *Epithora dorsalis*, *Phoracantha semipunctata*, *Tryphocaria solida*.

Angophora lanceolata. *Tryphocaria acanthocera*.

Anogeissus latifolia. *Gelonaetha hirta*.

Apophyllum anomalum. *Platyomopsis morata*.

Araucaria cunninghamii. *Archetypus frenchi*, *Coptopterus decoratus*, *Diotimana undata*, *Dysthaeta anomala*, *Rhiphidocerus australasiae*, *Syllitus araucariae*, *Temnosternus imbilensis*.

Araucaria excelsa. *Diotimana undata*.

Araucaria sp. *Dihammus vastator*.

Argyrodendron trifoliotatum. *Phacodes longicollis*, *P. mirabilis*, *Xylotrechus australis*.

Aristotelia serrata. ?*Navomorpha sulcata*, *Oemona hirta*.

Armeniaca vulgaris. *Uracanthus acutus*.

Artocarpus altilis. *Dihammus fasciatus*, *D. magneticus auripilis*, *Pelargoderus luteopsarsus*, *Ropica squamulosa*.

Artocarpus blumei. *Olenecamptus bilobus*.

Artocarpus chaplasha. *Olenecamptus bilobus*.

Artocarpus hirsuta. *Olenecamptus bilobus*.

Artocarpus integer. *Olenecamptus bilobus*.

Artocarpus spp. ?*Batocera oceanica*, *Ceresium flavipes*, *C. unicolor*, ?*Sciadella meridiana*, *Sybra alternans*.

Aster glandulosus. *Dihammus argentatus*.

Aster ramulosus. *Coptopterus scutellatus*.

Astrebla lappacea. *Apomecyna histrio*.

Atlantia glauca. *Citriphaga mixta*.

Baloghia lucida. *Temnosternus quadrituberculatus*.

Bambusa sp. *Chlorophorus annularis*.

Banksia australis. *Uracanthus simulans*.

Banksia integrifolia. *Paroplites australis*, *Uracanthus triangularis*.

Banksia serrata. *Paroplites australis*.

Barringtonia sp. *Sybra alternans*.

Bauhinia acuminata. *Xystrocera globosa*.

Bauhinia sp. *Olenecamptus bilobus*.

Beilschmeidia tawa. *Coptomma variegatum*, *Prionoplus reticulatus*.

Beilschmeidia sp. *Blosyropus spinosus*.

Benincasa hispida. *Apomecyna alboguttata*.

Berrya ammonilla. *Gelonaetha hirta*.

Betula verrucosa. *Gastrosarus nigricollis*, *Oemona hirta*.

Betula sp. *Gracilia minuta*, *Hylotrupes bajulus*.

Bombax malabaricum. *Xystrocera globosa*.

Boronia pinnata. *Uracanthus triangularis*.

Brachyglottis repandra. *Oemona hirta*.

Bucida buceras. *Curtomerus flavus*.

Bursera simaruba. *Lagocheirus araneiformis*.

Bursaria spinosa. ?*Distichocera thomsonella*.

Caesalpinia ferrea. *Prosoplus torosus*.

Cajanus indicus. *Platyomopsis pulverulens*, *Prosoplus banki*.

Callitris glauca. *Ceresium illidgei*, *Tritocosmia latecostata*.

Callitris hugelii. *Uracanthus pallens*.

Callitris sp. *Nungena binocularis*.

Capparis sp. *Prosoplus banki*.

Carpodetus serratus. *Somatidia antarctica*.

Cassia fistula. *Stromatium longicorne*.

Cassia glauca. *Xystrocera globosa*.

Cassinia aculeata. ?*Dihammus vastator*.

Cassinia leptophylla. *Oemona hirta*.

Casuarina equisetifolia. *Ceresium flavipes*, *Curtomerus flavus*.

Casuarina glauca. ?*Eurynassa australis*.

Casuarina suberosa. *Coptopterus decoratus*.

Casuarina torulosa. *Coptopterus cretifer*.

Casuarina sp. *Ceresium unicolor*, *Coptopterus cretifer*, *Paroplites australis*, *Platyomopsis albocincta*.

Cassinia sp. *Syllitus sinuaticosta*.

Catostemma sp. *Steirastoma stellio*.

Cattleya spp. *Sybra alternans*.

Cedrela australis. *Dihammus vastator*, *Disterna plumifera*, *D. pumila*, *Platyomopsis egena*.

Ceiba sp. ?*Hoplocerambyx inhirsutus*, *Olethrius carolinensis*.

Ceratonia siliqua. *Gracilia minuta*.

Cestrum elegans. *Oemona hirta*.

Chamaecyparis obtusa. *Callidium rufipenne*.

Chlorophora tinctoria. *Neoptychodes trilineatus*.

Chorisia speciosa. ?*Steirastoma stellio*.

Citrus aurantium. *Gracilia minuta*.

Citrus australasica. *Uracanthus cryptophagus*.

Citrus medica. *Disterna plumifera*, *Skeletodes tetrops*.

Citrus sinensis. *Skeletodes tetrops*, *Uracanthus cryptophagus*.

Citrus sp. *Agrianome spinicollis*, *Ceresium flavipes*, *Oemona hirta*, *Pentacosmia scoparia*, *Prosoplus banki*, *Sciadella mariana*, *S. meridiana*, *Uracanthus cryptophagus*.

Clusia pedicellata. *Agrianome fairmairei*.

Coccolobis uvifera. *Curtomerus flavus.*
Cocos nucifera. *Caroliniella aenescens aenescens, Oopsis* sp., *Olethrius insularis, O. tyrannus, Xixuthrus costatus.*
Cocos sp. ?*Curtomerus flavus.*
Conium maculatum. *Hylotrupes bajulus.*
Coprosoma sp. *Oemona hirta.*
Cordia sp. *Ceresium unicolor, Sybra alternans.*
Corylus sp. *Gracilia minuta, Hylotrupes bajulus, Uracanthus maleficus.*
Crataegus spp. *Coptocercus rubripes, Gastrosarus nigricollis, Gracilia minuta, Zorion minutum.*
Crotalaria sp. *Prosoplus banki, Zygrita diva.*
Cryptomeria japonica. *Callidium rufipenne, Navomorpha lineata.*
Cryptocarya glaucescens. *Aridaeus thoracicus.*
Cucumis sp. *Apomecyna histrio.*
Cucurbita maxima. *Apomecyna histrio.*
Cucurbita pepo. *Apomecyna histrio.*
Cupressus macrocarpa. *Ambeodontus tristis, Prionoplus reticularis.*
Cupressus sp. *Xystoena vittata.*
Cyathea dealbata. *Eurychaena fragilis.*
Cycas sp. *Sybra alternans.*
Cymbidium sp. *Dihammus vastator.*
Cynometra sp. ?*Pterolophia camura.*
Cyphomandra betacea. *Oemona hirta.*
Cytisus laburnum. *Oemona hirta.*
Cytisus proliferus. *Oemona hirta.*

Dacrydium cupressinum. *Agapanthida pulchella, Ambeodontus tristis, Liogramma zelandicum, Prionoplus reticularis, Pseudosemnus retifer, Somatidia antarctica, Stenopotes pallidus.*
Dacrydium intermedium. *Prionoplus reticularis.*
Dahlia imperialis. *Oemona hirta.*
Datura sp. *Curtomerus flavus.*
Delonyx regia. *Agrianome spinicollis.*
Dendrobium spp. *Sybra alternans.*
Dendrocalamus strictus. *Chlorophorus annularis.*
Diospyros cargillia. *Piesarthrius frenchi.*
Dipterocarpus sp. *Gelonaetha hirta.*
Dodonea viscosa. *Oemona hirta.*
Dracophylum traversii. *Blosyropus spinosus.*
Duabanga sonneratioides. *Hoplocerambyx spinicornis.*

Edwardsia microphylla. *Oemona hirta.*
Edwardsia tetraptera. *Coptomma variegatum.*
Elaeocarpus dentatus. *Leptachrous strigipennis.*
Eremocitrus glauca. *Citriphaga mixta.*
Eriostemon lanceolatus. *Uracanthus triangularis.*
Erythrina sp. *Prosoplus banki.*
Eucalyptus acmenioides. *Agrianome spinicollis, Phoracantha semipunctata, Tryphocaria acanthocera.*
Eucalyptus amygdalina. *Tryphocaria mastersi.*
Eucalyptus bicolor. ?*Oebarina ceresioides.*
Eucalyptus calophylla. *Tryphocaria acanthocera.*
Eucalyptus camaldulensis. *Atesta dixoni,* ?*Didymocantha novica, Phoracantha recurva, P. semipunctata, Sisyrium tripartitum.*
Eucalyptus citriodora. *Coptocercus aberrans.*
Eucalyptus crebra. *Phoracantha semipunctata.*
Eucalyptus dalrympleana. *Tessaromma undatum.*
Eucalyptus diversicolor. *Phoracantha semipunctata.*
Eucalyptus ficifolia. *Tryphocaria acanthocera.*
Eucalyptus globulus. *Phoracantha semipunctata, Tryphocaria mastersi.*
Eucalyptus gomphocephala. *Bimia bicolor, Tryphocaria acanthocera.*
Eucalyptus gracilis. *Phoracantha semipunctata, Scolecobrotus westwoodi.*
Eucalyptus grandis. *Phoracantha semipunctata, Tryphocaria acanthocera.*
Eucalyptus gummifera. *Scolecobrotus westwoodi.*
Eucalyptus intermedia. *Phoracantha recurva..*
Eucalyptus jacksoni. *Tryphocaria acanthocera.*
Eucalyptus leucoxylon. *Phoracantha punctata, P. semipunctata.*
Eucalyptus longifolia. *Phoracantha semipunctata.*
Eucalyptus macarthuri. *Tessaromma undatum.*
Eucalyptus maculata. *Phoracantha recurva, P. semipunctata, Tryphocaria mastersi.*
Eucalyptus melliodora. *Atesta bifasciata,* ?*Bimia bicolor, Distichocera macleayi, Omophaena taeniata, Omotes erosicollis,*

Phoracantha tricuspis, Scolecobrotus westwoodi, Tessaromma undatum.

Eucalyptus micrantha. *Tryphocaria solida.*

Eucalyptus microcorys. *Adrium artifex, Phoracantha semipunctata, Tryphocaria solida.*

Eucalyptus nova-anglica. *Bethelium cleroides, Ectosticta eburata, Phoracantha recurva.*

Eucalyptus obliqua. *Coptocercus rubripes, Phlyctaenodes pustulosus.*

Eucalyptus odorata. *Coptocercus rubripes.*

Eucalyptus oleosa. *Paphora modesta, Phoracantha semipunctata.*

Eucalyptus paniculata. *Tryphocaria acanthocera.*

Eucalyptus patens. *Tryphocaria acanthocera.*

Eucalpytus paucifolia. *Tragocerus lepidotterus.*

Eucalyptus phaeotricha. *Adrium artifex, Phoracantha semipunctata.*

Eucalyptus pilularis. *Paroplites australis, Phoracantha semipunctata.*

Eucalyptus piperita. *Phoracantha semipunctata.*

Eucalyptus propinqua. *Tryphocaria acanthocera, T. solida.*

Eucalyptus punctata. *Eurynassa australis, Tryphocaria acanthocera.*

Eucalyptus redunca var. **elata.** *Tryphocaria acanthocera.*

Eucalyptus resinifera. *Phoracantha semipunctata, Tryphocaria solida.*

Eucalyptus robusta. *Phoracantha semipunctata, P. tricuspis.*

Eucalyptus rostrata. *?Bimia bicolor, Tessaromma undatum.*

Eucalyptus saligna. *Agrianome spinicollis, Bimia bicolor, Macrones rufus, Phoracantha semipunctata, Tessaromma undatum, Tryphocaria acanthocera, T. solida.*

Eucalyptus salubris. *Phoracantha semipunctata.*

Eucalyptus sideroxylon. *Phoracantha semipunctata.*

Eucalyptus squamosa. *Eurynassa australis.*

Eucalyptus stuartiana. *Akiptera waterhousei, Bimia bicolor, Distichocera macleayi.*

Eucalyptus tereticornis. *Phoracantha semipunctata.*

Eucalyptus triantha. *Phoracantha semipunctata.*

Eucalyptus viminalis. *Distichocera macleayi, Phoracantha semipunctata, P. tricuspis, Tessaromma undatum.*

Eucalyptus spp. *Adrium artifex, Cnemoplites edulis, Curtomerus flavus, Ectosticta cleroides, Hesthesis cingulata, Pachydissus picipennis, Phoracantha recurva, P. semipunctata, Platyomopsis obliqua, Tessaromma undatum.*

Eugenia sp. *Platyomopsis pulverulens.*

Eupatorium sp. *Dihammus argentatus.*

Euphorbia sp. *Prosoplus banki.*

Excaecaria agallocha. *Dihammus mixtus.*

Exocarpos cupressiformis. *Coptopterus cretifer.*

Fagus moorei, *Rhiphidocerus australasiae.*

Ficus australis. *Batocera boisduvali.*

Ficus benghalensis. *Olenecamptus bilobus.*

Ficus carica. *Neoptychodes trilineatus, Olenecamptus bilobus.*

Ficus elastica. *Olenecamptus bilobus.*

Ficus glomerata. *Olenecamptus bilobus.*

Ficus infectoria. *Olenecamptus bilobus.*

Ficus laccifera. *Olenecamptus bilobus.*

Ficus lacor. *Olenecamptus bilobus.*

Ficus macrophylla. *Batocera boisduvali.*

Ficus religiosa. *Olenecamptus bilobus.*

Ficus retusa. *Olenecamptus bilobus.*

Ficus roxburghii. *Olenecamptus bilobus.*

Ficus rumphii. *Olenecamptus bilobus.*

Ficus stenocarpa. *Coptopterus decoratus.*

Ficus tjakela. *Olenecamptus bilobus.*

Ficus spp. *Dihammus vastator, Gracilia minuta, ?Hoplocerambyx inhirsutus, Lagocheirus araneiformis, Neoptychodes trilineatus, Rosenbergia megalocephala, Sybra alternans.*

Flindersia australis. *Dihammus vastator, Skeletodes tetrops.*

Flindersia oxycyana. *Callipyrga turrita.*

Flindersia xanthoxyla. *Skeletodes tetrops, Callipyrga turrita.*

Gerijera parviflora. *Callipyrga turrita, Skeletodes tetrops.*

Genista scorpius. *Hylotrupes bajulus.*

Glochidion puberulum. *Paremeopedus minimus.*

Glycine max. *Zygrita diva.*

Gmelina leichhardtii. *Xylotrechus australis.*

Gossypium sp. *Chlorophorus annularis, Prosoplus marianarum.*

Grevillea robusta. *Agrianome spinicollis.*

Grewia tiliifolia. *Xystrocera globosa.*

Grewia sp. *Gelonaetha hirta.*
Griselinia littoralis. *Tetrorea cilipes.*

Hakea acicularis. *Aphanasium australe.*
Hakea saligna. *Oemona hirta.*
Hedycarya arborea. *Calliprason sinclairi, Tetrorea sellata.*
Helichrysum ferrugineum. ?*Dihammus vastator, Uracanthus bivittata, U. simulans, U. strigosus.*
Hemicyclia australasica. *Xylotrechus australis.*
Heritiera fomes. *Gelonaetha hirta.*
Heritiera littoralis. *Ceresium unicolor.*
Hevea brasiliensis. *Hoplocerambyx spinicornis.*
Hibiscus tiliaceus. ?*Ceresium unicolor, Paremeopedus tiliacei, Prosoplus hibisci, Sciadella saltator.*
Hibiscus spp. *Prosoplus banki, Sybra alternans.*
Hoheria glabrata. *Tetrorea discedens.*
Hura crepitans. *Lagocheirus araneiformis.*

Inocarpus edulis. *Neoptychodes trilineatus.*
Intsia sp. *Prosoplus marianarum.*
Ipomoea batatas. *Prosoplus marianarum.*
Ixerba brexioides. *Pseudocalliprason marginatum.*

Juglans sp. *Hylotrupes bajulus.*

Kentia sp. *Agrianome spinicollis.*
Kunzea ambigua. *Distichocera maculicollis.*
Kunzea capitata. *Distichocera maculicollis.*

Lagenaria vulgaris. *Apomecyna alboguttata.*
Laportea gigas. *Dihammus vastator.*
Larix decidua. *Prionoplus reticularis.*
Larix sp. *Somatidia antarctica, Stenopotes pallidus.*
Lasiopetalum ferrugineum. *Uracanthus froggatti.*
Leptospermum ericoides. *Oemona hirta.*
Leptospermum scoparium. *Gastrosarus nigricollis, Hesthesis plorator, Ochrocydus huttoni, Oemona hirta.*
Leptospernum spp. *Didymocantha sublineata, Ochrocydus huttoni.*
Leucaena glauca. *Prosoplus banki.*
Leucopogon fasciculatus. *Gastrosarsus nigricollis.*
Liquidambar formosana. *Chlorophorus annularis.*
Litsea calicaris. *Zorion minutum.*
Litsea polyantha. *Olenecamptus bilobus.*
Loranthus pendulus. *Distichocera thomsonella, Xylotrechus australis.*
Loranthus sp. *Uracanthus loranthi, U. pertenuis.*
Luffa acutangula. *Apomecyna alboguttata.*
Luffa aegyptiaca. *Apomecyna alboguttata.*

Maba fasciculosa. *Dihammus vastator, Platyomopsis egena, Tessaromma sericans.*
Malus pumila. *Gracilia minuta.*
Mangifera indica. *Niptohammus korolensis, Olenecamptus bilobus.*
Medicago sativa. *Zygrita diva.*
Melaleuca uncinata. *Platyomopsis angasi.*
Melaleuca sp. ?*Pempsamacra carteri.*
Melanolepis sp. ?*Sciadella meridiana.*
Melia azedarach. *Coptopterus thoracicus.*
Melia composita. *Coptopterus thoracicus.*
Melicytus ramiflorus. *Oemona hirta, Somatidia antarctica, S. simplex.*
Messerschmidia argentea. *Paremeopdus minimus.*
Metrosiderus sp. *Blosyropus spinosus.*
Millettia megasperma. *Velora sordida.*
Morus indica. *Olenecamptus bilobus.*
Morus sp. *Neoptychodes trilineatus, Platyomopsis egena.*
Myoporum sp. *Sciadella mariana.*

Nicotiana sp. *Curtomerus flavus.*
Niemeyera chartacea. *Rhinophthalmus* sp.
Nothofagus fusca. *Blosyropus spinosus, Didymocantha* sp.
Nothofagus menziesii. *Didymocantha picta, D. sublineata, Hexatricha pulverulenta, Zorion minutum.*
Nothofagus solandri. *Didymocantha picta, Ochrocydus huttoni.*
Nothofagus solandri var. **cliffortioides.** *Didymocantha quadriguttata.*
Nothofagus truncata. *Hexatricha pulverulenta.*
Nothofagus sp. *Blosyropus spinosus, Didymocantha sublineata, Gastrosarus nigricollis, Hexatricha pulverulenta,* ?*Psilocneia brouni.*
Nothopanax arboreum. *Tetrorea cilipes.*
Nothopanax sp. *Tetrorea cilipes.*

Olearia laxiflora. *Oemona hirta.*
Olearia sp. ?*Uracanthus simulans.*

Pandanus sp. ?*Steirastoma stellio.*
Parashorea robusta. *Hoplocerambyx spinicornis.*

Parkia speciosa. *Xystrocera globosa.*
Pentaceras australe. *Platyomopsis egena.*
Pentacme suavis. *Hoplocerambyx spinicornis.*
Persea americana. *Pterolophia camura.*
Phormium tenax. *Zorion guttigerum.*
Picea spp. *Hylotrupes bajulus.*
Pimenta officinalis. *Curtomerus flavus.*
Pinus canariensis. *Hylotrupes bajulus.*
Pinus caribaea. *Hylotrupes bajulus.*
Pinus halepensis. *Dihammus vastator, Hylotrupes bajulus.*
Pinus laricio. *Prionoplus reticularis.*
Pinus maritima. *Hylotrupes bajulus.*
Pinus palustris. *Hylotrupes bajulus.*
Pinus patula. *Disterna plumifera.*
Pinus pinaster. *Prionoplus reticularis.*
Pinus pinea. *Hylotrupes bajulus.*
Pinus ponderosa. *Hylotrupes bajulus.*
Pinus radiata. *Arhopalus syriacus, Blosyropus spinosus, Cacodacnus planicollis, Dihammus vastator, Hexatricha pulverulenta, Hybolasius genalis, Hylotrupes bajulus, Navomorpha lineata, N. sulcata, Prionoplus reticularis, Somatidia antarctica, Stenopotes pallidus.*
Pinus sylvestris. *Hylotrupes bajulus.*
Pinus taeda. *Disterna plumifera, Hylotrupes bajulus, Prionoplus reticularis.*
Pinus spp. *Hylotrupes bajulus, Prionoplus reticularis.*
Pipturus sp. *Ceresium unicolor, Oopsis nutator.*
Pittosporum eugenioides. *Coptopterus thoracicus.*
Pittosporum phylliraeoides. *Syllitus parryi.*
Pittosporum revolutum. *Coptopterus thoracicus, Platyomopsis nigrovirens.*
Pittosporum undulatum. *Coptopterus thoracicus, Platyomopsis nigrovirens.*
Plagianthus betulinus. ?*Navomorpha stictica.*
Pleiogynium solandri. ?*Typhocesis macleayi.*
Podocarpus dacrydioides. *Ambeodontus tristis, Prionoplus reticularis, Sommatidia antarctica.*
Podocarpus ferrugineus. *Calliprason sinclairi, Prionoplus reticularis, Stenopotes pallidus.*
Podocarpus spicatus. *Ambeodontus tristis, Prionoplus reticularis, Sommatidia antarctica.*
Podocarpus totara. *Ambeodontus tristis, Stenopotes pallidus.*
Pomaderris phylicaefolia. *Gastrosarus nigricollis.*
Populus sp. *Hylotrupes bajulus, Oemona hirta, Steirastoma stellio.*
Prosopis sp. *Prosoplus banki.*
Prunus amygdalus. *Oemona hirta.*
Prunus laurocerasus. *Gastrosarus nigricollis.*
Prunus persica. *Xystrocera globosa.*
Pseudotsuga douglasii. *Prionoplus reticularis.*
Pseudotsuga taxifolia. *Hylotrupes bajulus, Navomorpha lineata.*
Pultenaea stipularis. *Ceresium australe, Uracanthus bivittata.*
Pyrus malus. *Aridaeus thoracicus, Disterna plumifera, Navomorpha sulcata, Oemona hirta, Pentacosmia scoparia.*

Rhamnus alternus. *Gracilia minuta.*
Ribes grosularia. *Oemona hirta.*
Rosa canina. *Gracilia minuta.*
Rubus sp. *Gracilia minuta.*

Saccharum officinarum. *Lagocheirus araneiformis.*
Salix babylonica. *Oemona hirta.*
Salix caprea. *Oemona hirta.*
Salix fragilis. *Oemona hirta.*
Salix spp. *Gracilia minuta, Paroplites australis, Steirastoma stellio.*
Sapindus sp. *Ceresium unicolor .*
Sapium aucuparium. *Lagocheirus araneiformis.*
Schinus molle. *Agrianome spinicollis.*
Senecio rotundifolia. *Oemona hirta.*
Sequoia gigantea. *Zorion minutum.*
Sequoia sempervirens. *Zorion minutum.*
Sesbania sp. *Zygrita diva.*
Shorea assamica. *Hoplocerambyx spinicornis.*
Shorea obtusa. *Hoplocerambyx spinicornis.*
Shorea robusta. *Chlorophorus annularis, Hoplocerambyx spinicornis.*
Shorea sp. *Stromtium longicorne.*
Sida sp. *Paremeopedus wakensis.*
Sinobambusa gibbosa. *Chlorophorus annularis.*
Sinocalamus sp. *Chlorophorus annularis.*
Siphonodon australe. *Bethelium inscriptum.*
Sorghum sp. *Prosoplus atlanticus, P. trukensis.*
Spondias dulcis. *Lagocheirus araneiformis, Neoptychodes trilineatus.*
Spondias mombin. *Lagocheirus araneiformis.*

Spondias sp. *Chlorophorus annularis.*
Sterculia lurida. *Disterna plumifera.*
Syncarpia laurifolia. *Coleocoptus senio, Phoracantha semipunctata.*
Syncarpia sp. *Coptocercus rubripes.*

Tamarix sp. *Hylotrupes bajulus.*
Tarrietia peralata. *Xylotrechus australis.*
Tectona grandis. *Chlorophorus annularis, Gelonaetha hirta.*
Terminalia kaernbachii. *Dihammus australis.*
Theobroma cacao. *Batocera nebulosa, Dihammus holotephrus, D. australis, Glenea aluensis, Pelargoderus arouensis, P. luteosparsus, Pterolophia binodosa.*
Theobroma sp. *Megaceresium horni, Olethrius tyrannus, Xystrocera globosa.*
Thuya plicata. *Eburilla sericea.*
Tinospora cordifolia. *Apomecyna histrio.*
Tree-fern. *Mesolita pascoei.*
Triphasia. sp. *Sybra alternans.*

Ulex europaeus. *Oemona hirta, Uracanthus bivittata.*
Ulmus racemosa. *Oemona hirta.*
Ulmus sp. *Gracilia minuta, Paraplites australis, Xyloteles griseus, Zorion minutum.*

Viminaria denudata. *Pentacosmia scoparia, Platyomopsis albocincta.*
Vitex lignum-vitae. *Xylotrechus australis.*

Wistaria sp. *Dihammus vastator, Platyomopsis egena, P. pulverulens, Ropica exocentroides.*

Xanthium pungens, *Corrhenes paulla, Sybra centurio.*
Xanthorrhoea sp. *Bardistus cibarius, Depsages solandri.*
Xylia xylocarpa. *Xystrocera globosa.*
Xylosma sp. *?Curtomerus flavus.*

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INDEX

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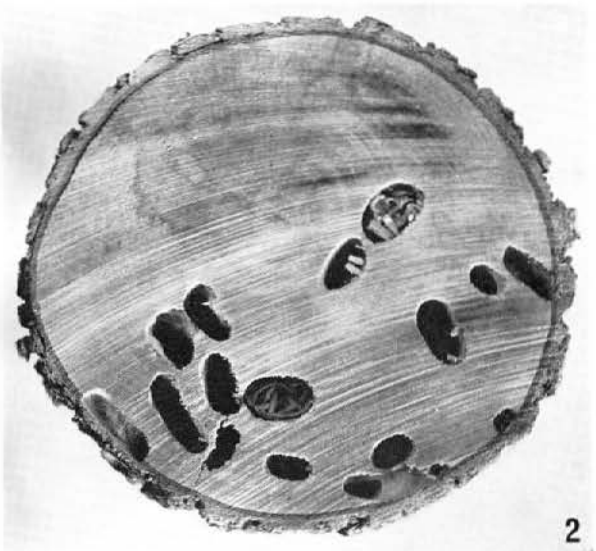
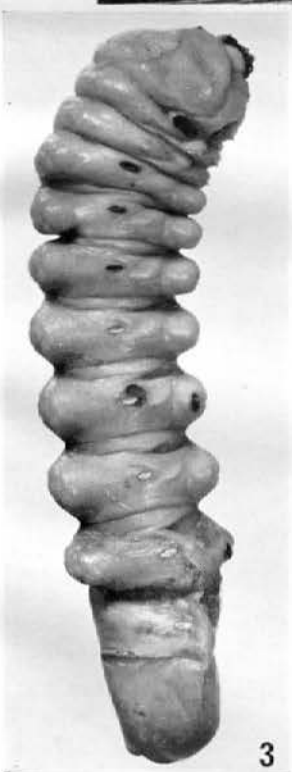
PLATES

PLATE I



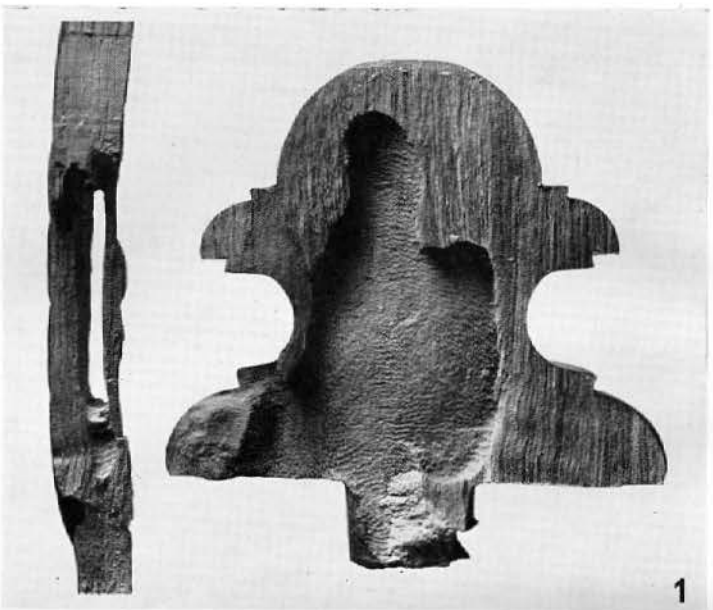


Figs. 1 and 2. *Oemona hirta* (Fabricius). Larval galleries and pupal cells in *Olearia laxiflora*.
Fig. 3. Larva of *Agrianome spinicollis* (Macleay) (natural size).

PLATE II

Figs. 1 and 2. Pupal cell and pupa of *Prionoplus reticularis* White in *Pinus radiata* (N.Z. Forest Service).

Fig. 1. Larvae of *Prionoplus reticularis* White in *Larix decidua* (N.Z. Forest Service).
Fig. 2. Pupa of *Ochrocydus huttoni* Pascoe in living *Leptospermum scoparium* (N.Z. Forest Service).



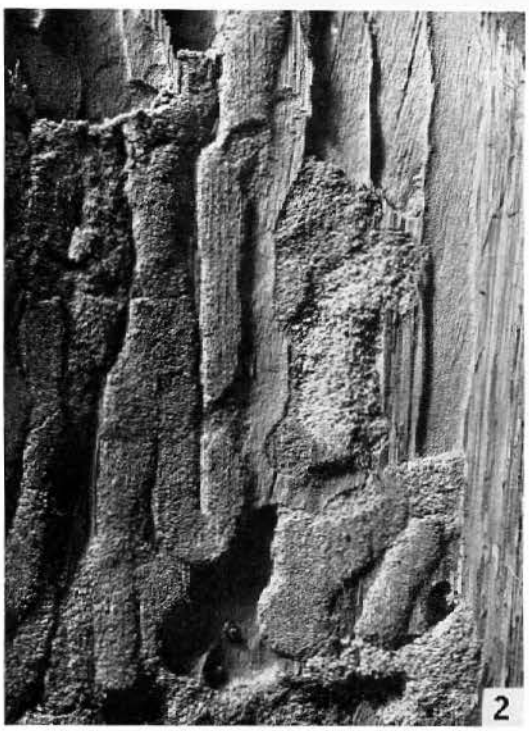
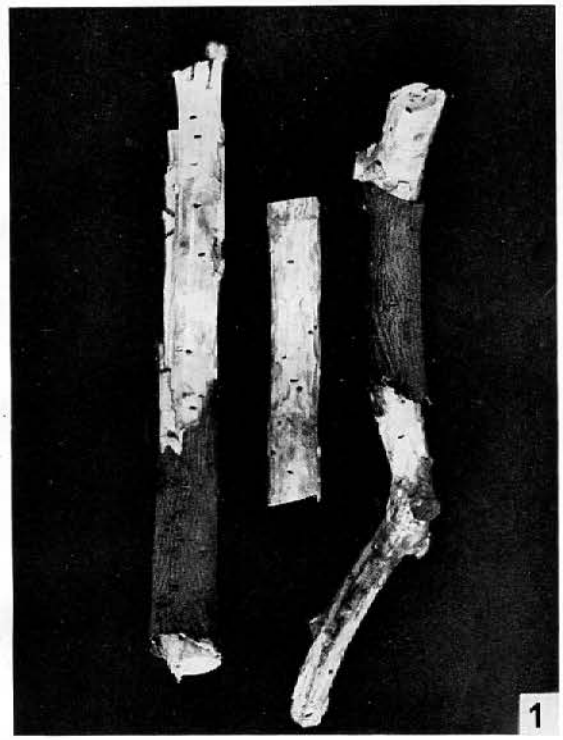


Fig. 1. Larval gallery of *Hylotrupes bajulus* (Linnaeus) in portion of walnut candelabra (note marks made by mandibles of larva). Figs. 2 and 3. *Tessaromma undatum* Newman. Fig. 2. Subcortical galleries in *Eucalyptus*. Fig. 3. Pupal cell in *Eucalyptus*.

PLATE V



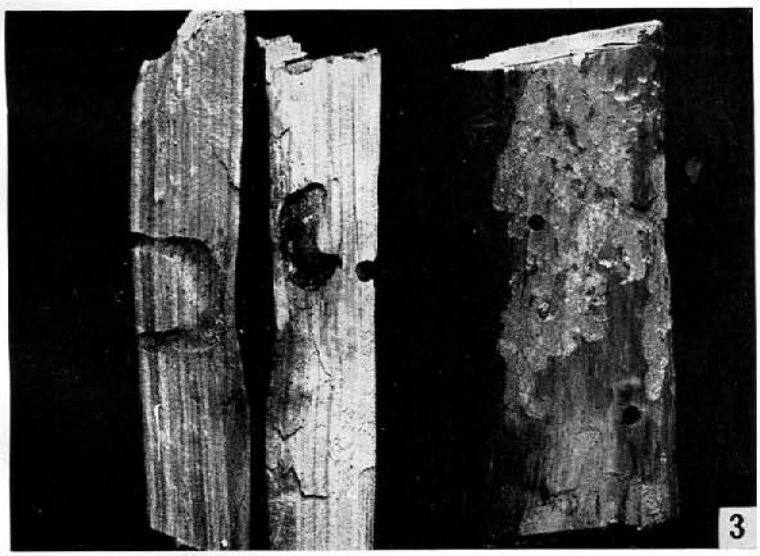


Fig. 1. Subcortical galleries and emergence holes of *Skeletodes tetrops* Newman in branches of *Citrus* (D.A.S.B.). Fig. 2. Transverse sections of *Araucaria* leaders showing spiral tunnelling by larvae of *Coptopterus decoratus* McKeown (E. P. Suchting). Fig. 3. *Dihamnus vastator* Newman. Longitudinal sections of *Araucaria* showing position of pupal cell with (left) both entrance and exit holes, (centre) entrance hole only and (right) external appearance of holes D.A.S.B.). Fig. 4. Subcortical pupal cells of *Temnosternus imbilensis* McKeown in *Araucaria* (A. R. Brimblecombe).

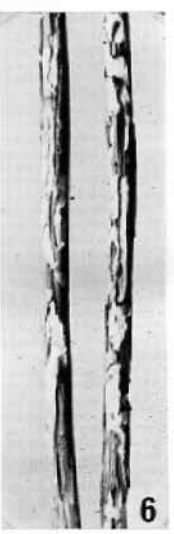
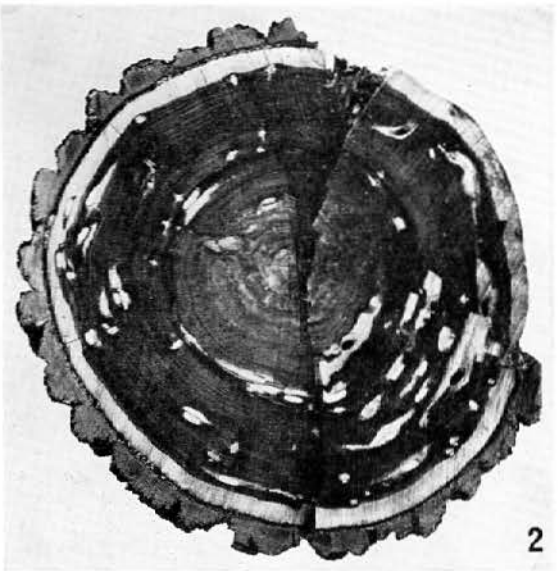


Fig. 1. Damage to trunk of *Eucalyptus saligna* by *Tryphocaria solida* Blackburn (K. M. Moore). Fig. 2. Damage to trunk of *Eucalyptus grandis* by *Tryphocaria acanthocera* (Macleay) (A. R. Brimblecombe). Fig. 3. Emergence holes in trunk of *Araucaria* made by *Diotimana undata* (Pascoe) (A. R. Brimblecombe). Fig. 4. *Penthea intricata* Pascoe. Adults on *Eucalyptus crebra* (A. R. Brimblecombe). Fig. 5. *Ceresium illidgei* Blackburn. Subcortical galleries in *Callitris glauca* (A. R. Brimblecombe). Fig. 6. *Xylotrechus australis* (Laporte & Gory). Larval galleries in *Acacia aulacocarpa* (E. P. Suchting).



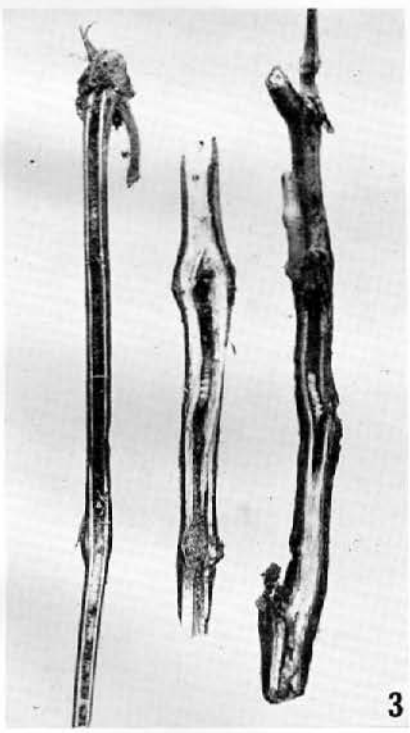


Fig. 1. *Diotimana undata* (Pascoe). Pupal cell in *Araucaria* (A. R. Brimblecombe). Fig. 2. *Tritocosmia latecostata* Fairmaire. Transverse section of log of *Callitris* showing larval galleries (D.S.A.B.). Fig. 3. *Zigrita diva* Thomson. Split stems of soya bean, showing larvae and their galleries (D.A.S.B.). Fig. 4. *Tryphocaria mastersi* Pascoe. Pupae and pupal cells in *Eucalyptus maculata* (A. R. Brimblecombe). Fig. 5. *Diotimana undata* (Pascoe). Eggs on decorticated trunk of *Araucaria* (A. R. Brimblecombe).

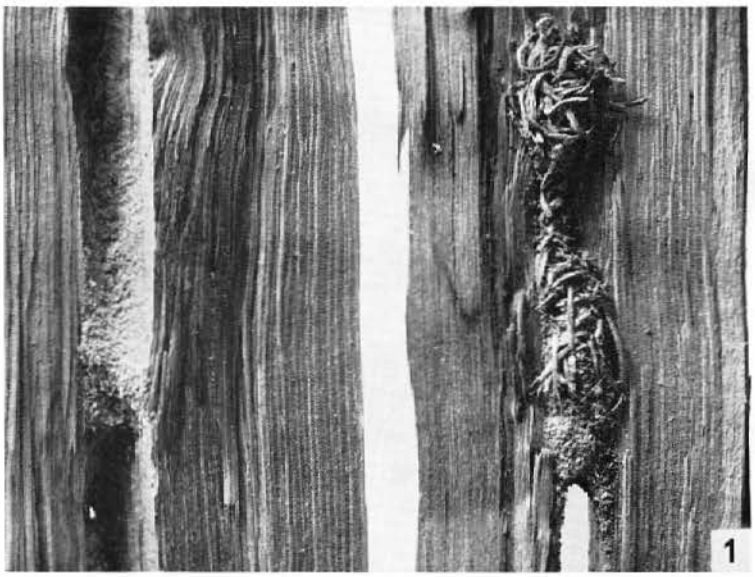


Fig. 1. *Ochrocydus huttoni* Pascoe. Larval gallery (left) and pupal cell (right) in *Leptospermum scoparium*. Fig. 2. *Ambeodontus tristis* (Fabricius). Larval damage in boards of *Dacrydium cupressinum*. Fig. 3. *Phoracantha semipunctata* (Fabricius). Radial galleries in branch of *Eucalyptus*.

PLATE IX

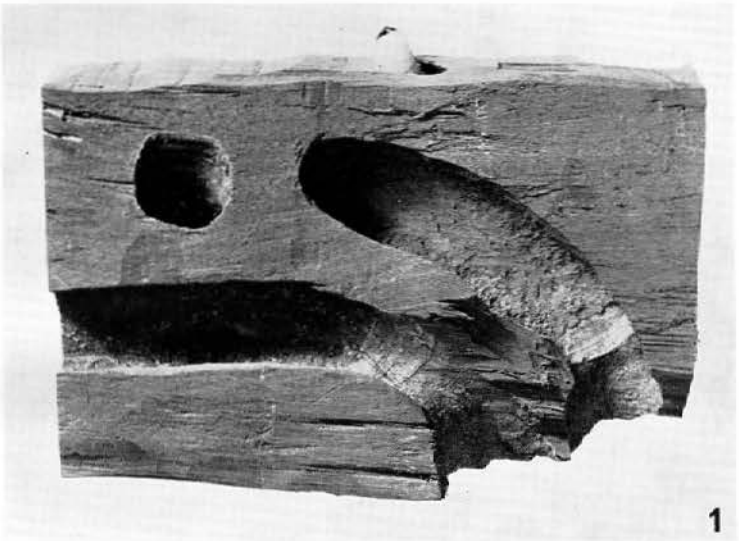
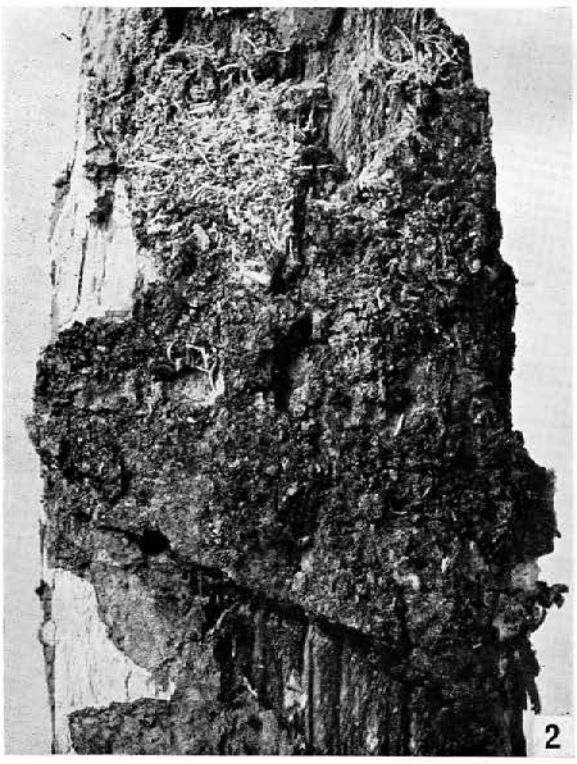


Fig. 1. *Hoplocerambyx spinicornis* (Newman). Larval galleries in *Shorea robusta*. Figs. 2 and 3. *Hexatricha pulverulenta* (Westwood). Subcortical larval gallery (fig. 2) and pupal cell (fig. 3) in *Pinus radiata*.

PLATE X



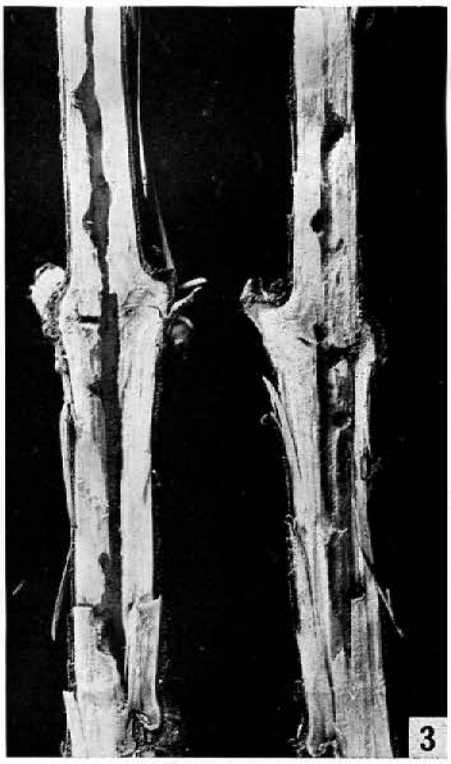


Fig. 1. *Eurynassa australis* (Boisduval). Larva in *Acacia decurrens* (K. M. Moore). Fig. 2. *Tetroria cilipes* White. Subcortical larval galleries and emergence holes in *Nothopanax* from which bark has partly been removed. Fig. 3. *Navomorpha lineata* (Fabricius). Larval gallery in split branch of *Pinus radiata*.

PLATE XI

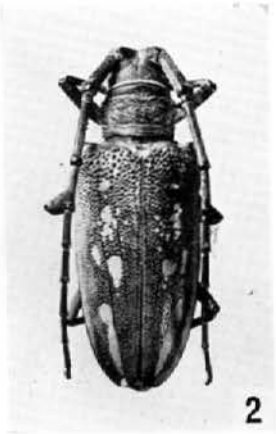


Fig. 1. *Diotimana undata* (Pascoe). Adult (natural size). Fig. 2. *Batocera boisduvali* (Hope). Adult (natural size). Fig. 3. *Xixuthrus heros* Heer. Adult (natural size). Fig. 4. *Hoplocerambyx spinicornis* (Newman). Adult (natural size).