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THE BIOLOGY, DISTRIBUTION AND TAXONOMY OF SOME LYGAEIDAE OF SOUTHWEST AUSTRALIA (HEMIPTERA: HETEROPTERA)*

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Abstract

Biological, ecological and distributional data are presented for 25 species of southwest Australian Lygaeidae. Numerous host plant associations are discussed. These species are segregated in 19 genera and 6 subfamilies. Attention is drawn to the association of terrestrial litter-inhabiting assemblages with particular soil types, particularly white sand areas. The position of the 7th abdominal spiracle in *Lepionysius* Ashlock, previously used for tribal position, is shown to be variable. A seasonal differential between 2 species of Cyminae occurring on the same host is discussed. The first description is given of the macropter of *Darwinocoris australicus* Slater. A key is presented to the southwest Australian species of *Udeocoris* Bergroth, and a discussion of the significance of wing polymorphism in species of the genus. Geographic variation in *Coleocoris ocellatus* Gross is treated, with a discussion of the adaptive value of the "coleopteroid" wing for insects living in xeric habitats.

Introduction

In 2 previous contributions (Slater 1975, 1976), I discussed zoogeographic relationships, wing polymorphism and host plant relationships, and described immature stages of a number of southwest Australian Lygaeidae.

In the present paper biological and ecological data are presented for a number of individual species. Taxonomic information is included only where existing literature needs modification or amplification. Only species of Lygaeidae from southwest Australia for which significant data are available are treated.

Carlquist (1974) reviewed the flora of southwest Australia, noting its disharmonic nature, the adaptive radiation that has occurred, the high degree of endemism and the fact that the area is a natural biogeographic region with many of the attributes of an island.

Many characteristic ground-dwelling southwest Australian lygaeids appear to be associated with plants growing on white sand. Carlquist (1974) pointed out that in southwest Australia two sand types occur as a series of islands. The white sands are granitic and tend to be acid, whereas laterized soils are reddish and tend to be alkaline. I believe recognition of this feature and its effect on plant types to be important in interpreting distribution and host plant relationships in southwest Australian Lygaeidae. These sand areas are said to form "bogs" or "swamps" during winter months, but to be "desert-like" in summer. This accounts for the occurrence, in the same area, of marsh-adapted species and species associated with xeric conditions, e.g., the numerous specimens of *Cryptorhamphus orbus* Stål that are found, apparently aestivating, below plants in white sand areas with populations of such xeric-adapted species as *Coleocoris ocellatus* Gross.

All measurements of insects are in millimetres.

Orsillinae

The southwest Australian fauna comprises 3 genera, the cosmopolitan *Nysius* Dallas and the endemic *Lepionysius* Ashlock and *Austronysius* Ashlock. There is a common and widespread species of *Nysius* related to *vinitor* Bergroth, and a strongly differentiated species that was taken only on *Arthrocnemum.*

Ashlock (personal communication) believes that both species of *Nysius* probably represent undescribed species, and that what I refer to below as *Lepionysius grossi* may also be undescribed.

The presence of 2 endemic genera (one the representative of a monotypic tribe) in southwest Australia indicates the importance and isolation of the area.

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Lepionysius grossi Ashlock

Ashlock (1967) described this species from a micropterous male and female from Kangaroo Island, South Australia, and a probably conspecific macropterous specimen from Katherine, Northern Territory. He based a new tribe within the Orsillinae upon it and discussed its possible phylogenetic importance, since it showed characters both of the Blissinae and of the Orsillinae. I obtained 16 adults and several nymphs representing all instars in 3 localities in Western Australia. The adults show considerable and interesting variability in the placement of the spiracle on abdominal segment 7. In other Orsillinae spiracle 7 is dorsal, while in the specimens Ashlock studied it was ventral. However, in my series, 5 specimens show both spiracles located exactly laterally. Only 2 have the spiracles ventral on both sides; 4 have one spiracle ventral, the other lateral; 3 have one spiracle dorsal, the other lateral; and 2 have the spiracles dorsal on both sides. This indicates that the ventral position of the spiracle in *Lepionysius* is not useful in establishing the subfamily position. It corroborates Ashlock's conclusion that *Lepionysius* is a true orsilline. This is further substantiated by the nymphs, which are typical orsillines in most respects. The mottled body coloration, lack of sclerotization on the posterior abdominal segments and the scent gland orifice sclerotization are all unlike the conditions found in blissine nymphs, but similar to those found in other orsillines. In the nymphs the abdominal spiracles are all located exactly laterally on the abdominal segments.

Specimens of *grossi* taken in Western Australia occurred only in white sand areas with a sparse plant cover with much open sand exposed. They occurred on the ground in seed litter, usually near the edge of the "seed shadow". At Torbay, 22 km W of Albany, on December 26, 1971, I took 2 ♂♂, 9 ♀♀ and some nymphs under *Hypocalymma angustifolium* Endl. and in seed litter of *Leucopogon revolutus* R. Br. In a very similar habitat 28 km W of Albany on December 28, 1971, 2 ♂♂ were taken in seed litter of *Andersonia caerulea* R. Br., and at Pemberton on December 21, 1971, 3 ♀♀ and some nymphs were taken in seed litter of *Leucopogon unilateralis* Stschegl. *Lepionysius* is adapted to hot xeric conditions. The body bears numerous, flattened, scale-like hairs. These hairs appear independently in a number of different evolutionary lines within the Lygaeidae, and in almost all cases they are associated with species that live in dry, hot habitats. Both nymphs and adults of *Lepionysius* are slow-moving and depend more on their cryptic coloration than on an active escape mechanism. While adults are cryptic, nymphs are much more so, their mottled brown, yellow and white coloration making them very difficult to distinguish when motionless in sand and mixed litter. Nymphs have a somewhat spidery movement on the sand surface.

Fifteen of the 16 adults taken were micropterous, as described by Ashlock (1967), the clavus and corium being fused, the veins strongly elevated, the resultant wing pads tapering and acuminate and very widely separated from each other mesally. No membrane remnant is evident. One specimen from 22 km W of Albany at Torbay is a macropterous male. It is similar to the brachypters in most respects but (as is usual with macropters) has a broader posterior pronotal lobe. The anterior ½ of the clavus and area adjacent to the corium are yellowish in contrast with the dark brown, almost grey-black colour of the rest of the body. The membrane is whitish, extensively mottled and streaked with dark brown. Length head 0.74, width 1.0, interocular space 0.54; length pronotum 0.71, width 0.97; length wing pads 1.08; length abdomen 2.10; length antennal segments I 0.42, II 0.50, III 0.36, IV 0.42; total body length 4.10.

In the laboratory the insects feed readily on sunflower seeds. Eggs are deposited in the crevices of cracked seeds and in the litter, in loose aggregations of 8 or 10.

Austronysius sericus Ashlock

Austronysius was based on a single female of this species described from Western Australia at Bluff Knoll in the Stirling Range at 150 m. Ashlock's (1967) excellent description of the species matches the specimens noted below. This appears to be a scarce species in Western Australia as I took only 2 specimens. Both of these were taken on plants rather than on the ground and although in both cases an intense search of the area was made no subsequent specimens were taken. One of these sites was along a roadside in mixed natural vegetation 16 km S of Margaret River on December 20,

1971. The 2nd specimen was taken on *Melaleuca thymoides* at the Gold Holes picnic site in the Stirling Range on December 23, 1971. This latter site is only a few kilometres from the type locality, which was also visited. The entire Bluff Knoll montane area at the time of our visit had recently been completely burned.

Ischnorhynchinae

The members of this subfamily are small hyaline insects that usually live above the ground on the inflorescences of various plants. Four genera and 5 species are known to occur in Australia. We took only 1 species in Western Australia.

Crompus opacus Scudder

This species is readily recognizable by the elongate head, the tylus extending beyond the distal end of antennal segment 1, and by the milky white veins of the hemelytral membrane, which contrast strongly with the otherwise transparent membranal surface. Colour varies more in the long series before me than indicated in Scudder's (1958) original description. He indicated that antennal segment 1 is black. This is rarely the case; usually it is chiefly light yellowish brown with an irregular subdistal black area, but sometimes completely pale. Segment 2 is also often completely pale. Fuscous markings are only present on the pronotal humeri in a few specimens; the median longitudinal dark stripe is frequently obsolete and sometimes absent. There is often a complete fuscous band across the pronotum in the area of the calli. The pleural and sternal areas are pale whitish or greyish pruinose, as are the anterolateral areas of the scutellum, and only the apical ½ of tarsal segment 3 is fuscous.

This species appears to breed on various species of Myrtaceae. It is especially associated with the inflorescences of bush species growing about 2.5-3.5 m in height in rather damp areas along roadsides. Scudder (1958) reports it from *Leptospermum* sp. in Queensland. I took 2 ♂♂ and 5 ♀♀ from *Agonis linearifolia* (D.C.) Schau. at Gold Holes picnic site, Stirling Range, on December 23, 1971, and 1 ♂ on the same plant species at Mundaring Weir, December 11, 1971. Thirty ♂♂ and 26 ♀♀ were taken on *Kunzea recurva* Schau., 13-16 km S of Margaret River, on December 20, 1971, and 2 ♂♂ and 1 ♀ on the same plant species at the Serpentine Dam, nr Jarrahdale, December 9, 1971.

Cyminae

This subfamily is well represented in southwest Australia, where representatives of 2 tribes occur. The interesting host plant relationships and zoogeographic significance of the southwest fauna were noted by Slater (1975).

Ontiscus Stål

This is a genus of elongate, slender, generally reddish brown insects of which nothing was known of the biology until now. The group was recently revised by Hamid (1970). Prior to his work, 6 species were recognized and he will describe an additional 3. The distribution of *Ontiscus* is primarily Australian, 7 of the 9 species being known from there. However, it is also represented by 1 species from the Philippines, 1 from Fiji, Ceylon and New Caledonia, and an as yet undescribed species from New Caledonia. In Western Australia, 4 species may occur, 1 of which is undescribed. I took only 2 species.

Nymphs and adults of *Ontiscus* species occur in the seed heads of sedges and restios, where they are very cryptic in that the nymphs are strikingly similar to the seeds in general shape and in their color markings.

Ontiscus obscurus Scudder

This species was originally described from Yanchep and Rottnest Island, Western Australia, and is also known from South Australia.

This appears to be the commonest species of *Ontiscus* in southwest Australia. I collected it at 7 different sites. Near the Serpentine Dam at Jarrahdale, 1 ♂, 3 ♀♀ and a number of 1st and 2nd instar nymphs were collected on December 9, 1971, on

Lepidosperma angustatum R. Br. (Cyperaceae) growing in a white sand area at the edge of a jarrah forest. These nymphs were placed in a laboratory culture containing only seeds of the above plant and were observed to feed actively on the seeds. Survival was almost 100 per cent and all were adults by January 1, 1972. At Kings Park, Perth, on December 10, 1971, 1 ♂, 2 ♀♀ and nymphs of this species were taken breeding in the seed heads of *Mesomelaena stygia* (R. Br.) Nees (Cyperaceae). There seems to be no question but that this species feeds on the seeds of sedges. Generally the sedges were growing in white sand areas either along roadsides or in forest margins. Two ♀♀ and nymphs were taken on sedges, December 11, 1971, at Julimar State Forest; 3 ♂♂, 1 ♀ and nymphs 11 km NE of Cracklin, December 11, 1971; nymphs at Margaret River on December 20, 1971; 1 ♂, 1 ♀ and nymphs at an unnamed Wildlife Reserve 34 km N of Perth, December 16, 1971; and 1 ♀ at Bluff Knoll, Stirling Range, December 23, 1971.

Ontiscus brevipilus Scudder

O. brevipilus was described from Yanchep in Western Australia and remains known only from the southwest corner of the continent.

This is an extremely elongate, slender species, markedly different in general appearance from *obscurus*. Both nymphs and adults have very short decumbent hairs on the antennae in contrast with the long upstanding hairs of *obscurus*. This difference is even more marked in the nymphs than it is in adults due to the raised tubercular nature of the hair bases in the nymphs of *obscurus*.

In contrast with *obscurus*, *brevipilus* feeds on the seeds of restionaceous plants. At the Tortoise Reserve, 38 km N of Perth, on December 16, 1971, I took 41 ♂♂ and 36 ♀♀ in the seed heads of the restio *Lyginia tenax* (Labill.) G. A. Gardn. This plant was growing near a railroad track in white sand in a low-lying area. It appears to be the host plant for, although no nymphs were taken, the long series of adults was present only upon the upright, spikey seed heads of this small plant, even though other species of restios and sedges grew intermixed in the area. At Torbay, 22 km W of Albany, on December 26, 1971, and at the Gold Holes picnic site, Stirling Range, December 23, 1971, I took nymphs which I believe pertain to this species on a species of restionaceous plant. Although I was unable to obtain adults and did not remain in Australia long enough to rear these specimens to the adult stage, the very distinctive nature of *brevipilus* leaves little doubt that these nymphs represent this species.

Cymus novaezelandiae Woodward

This species was previously reported only from New Zealand. However Hamid (1970) cited records from southwest Australia. On December 8, 1971, at Yanchep National Park, I took 39 ♂♂ and 50 ♀♀ on the seed heads of a large sedge, *Cyperus tenuiflorus* Rottb., growing along the margin of a lake. These specimens were on the same seed heads as specimens of *Cymodema basicornis* (Motschulsky). The entire series of *novaezelandiae* was adult at the time of collection, whereas, while adults of *basicornis* (Motschulsky) were present, the majority of individuals of the latter species was in the 5th instar. This indicates that, while the 2 species utilize the same host, they are not in direct competition as their life cycles appear to differ. I anticipate *novaezelandiae* will prove to "go through" a generation and reach adulthood long before *basicornis* is present on the host in any numbers. Not only was there a large number of adults of *novaezelandiae* at the Yanchep site, but most of the other specimens of that species taken at various places in Western Australia occurred in small numbers on the ground together with a variety of litter-living lygaeids. These individuals were probably aestivating. A similar condition I believe is indicated by the collections of *Cryptorhamphus orbus* Stål discussed below. If such a life cycle differential exists between *novaezelandiae* and *basicornis*, it would be understandable from the present distribution and probable evolutionary history of the 2 species. Presumably *novaezelandiae* is a cool-adapted species and therefore would begin reproductive activity early in the spring, whereas *basicornis*, which is widely distributed in tropical and subtropical areas, would need a higher temperature threshold to initiate reproductive activity. It is possible that the nymphs of *Cymus novaezelandiae* breed on a different host and that only adults utilize *Cyperus tenuiflorus* as a food plant. Hamid

(1971a), working with 3 species of North American *Cymus* Hahn, found that their life cycles differed markedly and that, while each species would feed as an adult on 2 or 3 host plants, they were restricted in oviposition and nymphal development to only 1 of the plants, and the development of the nymphs differed seasonally among the 3 species.

Although Woodward (1954) found that *novaezelandiae* occurs in the brachypterous condition in New Zealand, this is not true of the 109 specimens taken in Western Australia, which were all macropterous.

The coloration of this series varies considerably. While some individuals are testaceous or reddish brown as indicated by Woodward for New Zealand material, many individuals show various degrees of melanism. Frequently the head is entirely black, in addition to extensive black markings on the pronotum. Sometimes the pronotum is completely black, and extensive black coloration is frequently present on the corium as well.

Specimens were collected at the following additional localities: 1 ♂, Cranbrook, December 29, 1971; 2 ♂♂, 22 km W of Albany, December 26, 1971; 1 ♂ and 1 ♀, Serpentine Dam, nr Jarrahdale, December 9, 1971; 2 ♂♂ and 2 ♀♀, Tortoise Reserve, 38 km N of Perth, December 16, 1971; 1 ♂, Perth, December 12, 1971; 3 ♂♂ and 7 ♀♀, Kings Park, Perth, December 4, 5, 10 and 13, 1971.

Cymodema basicornis (Motschulsky)

As noted above, on December 8, 1971, a series of adults (6♂♂, 13 ♀♀) and nymphs of this species were taken on the seed heads of *Cyperus tenuiflorus* together with numerous adults of *Cymus novaezelandiae* at Yanchep National Park. The adults of *basicornis* were in many cases teneral, indicating that this species was only reaching the adult stage at the time of collection. Specimens taken on December 12, 1971, at Perth, also from a large species of *Cyperus* along the Swan River, also were chiefly nymphs (1 ♂). The Yanchep series consisted of: adults 19, 5th instar nymphs 61, 4th instar 22, 3rd instar 7, 2nd instar 2 and 1st instar 1.

The colour of adults of this species varies considerably. Some specimens are predominantly pale testaceous, others very strikingly marked with red on the head, pronotum, scutellum and hemelytra.

Cryptorhamphinae

This subfamily was recently raised from synonymy with the Cyminae by Hamid (1971b) to include 2 Australian genera, *Cryptorhamphus* Stål and *Gonystus* Stål (the latter also in Fiji). It shows a Bassian distribution, being concentrated in southeast Australia, but with 1 species in southwest Australia.

Cryptorhamphus orbus Stål

Hamid (1971b) reported *orbus* in Western Australia from Badgeberth, Warren River, Wyening and Yanchep, noting that this species is extremely variable in colour. Most specimens are dark greyish brown extensively mottled with black, but others are nearly uniformly clay yellow. Sometimes there is a reddish cast to the hemelytra.

Structurally the species is also variable, and some of the characters given in Hamid's key do not seem to hold. For example, *orbus* is defined as having the labium short, with the apex nearer to the fore coxae than the mesocoxae, and with the distal end of the third (*sic*, = second) labial segment nearer to the anterior prosternal margin than to the fore coxae. In the majority of specimens I have examined this is true, but some specimens have the labium as long as defined for *slateri* Hamid. The tylus also varies somewhat in length; in most specimens it does not extend beyond the proximal ¾ of antennal segment 1, but in a few it reaches nearly to the distal end. The veins of the membrane of the fore wing anastomose in almost all specimens I have examined, and this does appear to separate *orbus* from *slateri* as defined by Hamid.

This is a common species in southwest Australia. Specimens were taken from the following localities: 10 ♂♂ and 15 ♀♀, 34 km N of Perth, December 16-18, 1971; 1 ♂, 13-16 km S of Margaret River, December 20, 1971; 10 ♂♂ and 21 ♀♀, Kings Park, Perth,

December 4, 5, 10 and 13, 1971; 2 ♂♂ and 1 ♀, Torbay, 22 km W of Albany, December 26, 1971; 4 ♂♂ and 4 ♀♀, 1.6 km W of Cunderdin, December 14, 1971; 1 ♀, Tortoise Reserve, 34 km N of Perth, December 16, 1971; 5 ♂♂ and 3 ♀♀, Cranbrook, December 29, 1971; 1 ♂, Julimar State Forest, December 11, 1971; 2 ♀♀, Boyagin Rock, 16 km NW of Pingelly, December 30, 1971.

All specimens were in ground litter below the following plants, which were usually growing in dry habitats and most frequently on white sand substrates: *Hypocalymma angustifolium* Endl., *H. robustum* Endl., *H. strictum* Schau., *Arthrocnemum halocnemoides* Moq. var. *pergranulatum* J. M. Black, *Jacksonia nematoclada* F. Muell., *Acacia laricina* Meisn. and *Spartochloa scirpoides* (Steud.). In almost all of these habitats, a complex of rhyparochromine species was also present.

All individuals of *C. orbus* are slow-moving and appear not to be adapted to a litter habitat. I believe all specimens were aestivating. The body form of this species is similar to that of species of Cyminae. This form and the obvious lack of mobility in the litter both indicate that this species goes through its life cycle on the seed heads of plants well above the ground.

Pachygronthinae

Six genera occur in Australia: *Magninus* Distant, *Pachygrontha* Germar (Pachygronthini), *Darwinocoris* Slater, *Opistholeptus* Bergroth, *Stenophlegyas* Slater and *Stenophyella* Horvath (Teracriini). *Magninus*, *Darwinocoris* and *Stenophlegyas* are endemic, the first 2 known only from southwest Australia.

The species of Pachygronthini feed on sedges. Teracriine species feed on grasses, except for *Darwinocoris australicus* Slater (here shown to feed on members of the Restionaceae).

Darwinocoris australicus Slater

D. australicus was described by Slater (1962) from King George Sound, Wanneroo and Maida Vale, nr Perth.

At the Tortoise Reserve, 38 km N of Perth, on December 16, 1971, 1 ♂, 2 ♀♀ and nymphs of this species were taken breeding on *Leptocarpus coangustatus* Nees (Restionaceae), which is much taller than most of the other species, and has somewhat pendulous seed heads. Adults and nymphs were restricted entirely to this species, although many other restios were present. The plants occurred in scattered groups adjacent to large shrubby bushes about 180-300 cm high. This is a sandy, relatively damp habitat with numerous plants of *Banksia*, *Nuytsia*, kangaroo paws and other characteristic native plants adjacent to the area. The area often known as the Bullsbrook Reserve is now a reserve for the West Australian swamp tortoise, *Pseudemydura umbrina* Siebenrock. Ellenbogen (1971) summarized the literature on this tortoise, and noted that the habitat is swampy but dries up by December, and that the soil is sandy, with a vegetation characterized by "*Banksia*, Zamia palms, acacias, paperbarks and tussocky grass".

The nymphs, particularly the earlier instars, have the characteristic cryptic coloration of hemipterans living on slender monocotyledonous plants, the white lateral stripes resembling those found in nymphs of *Ontiscus* and at least 1 species of mirid living on restios.

The macropter of *D. australicus* was hitherto unknown, all previous individuals having been micropterous with wing pads reduced to extremely minute, nearly uniformly coriaceous pads extending only onto abdominal tergum 1. At the Tortoise Reserve, 1 female macropter was taken. This differs markedly from brachypters in the shape of the pronotum, which in the latter is rather cylindrical. In the macropter the humeral angles are rounded, there is a vague, but evident, transverse constriction across the middle of the pronotum, and the lateral margins are sinuate and taper strongly from the humeri to the anterolateral angles. Other features are: anterior pronotal lobe reddish brown, concolorous with head with exception of anterior margin, which is pale testaceous and concolorous with entire posterior lobe; posterior

pronotal margin very slightly concave; scutellum convex, reddish brown, becoming black at anterolateral angles, with smooth pale calloused median stripe; hemelytron with punctate clavus and corium; claval commissure short; corium with lateral margins nearly straight, apical margin straight; membrane dark chocolate brown with paler veins, somewhat transversely rugulose, apex of membrane extending onto abdominal tergum 7; connexivum broadly exposed; corium and clavus marked with red along apical margin of corium, cubital vein of clavus and claval commissure; reddish marking of apical corial margin extending midway along medius; length head 0.86, width 0.78, interocular space 0.52; length pronotum 1.09, width 1.32; length scutellum 0.62, width 0.70; distance apex clavus—apex corium 1.12, apex corium—apex abdomen 2.10; length labial segments I 0.32, II 0.40, III 0.24, IV 0.32; length antennal segments I 0.22, II 0.74, III 0.28, IV 0.50; total body length 5.96.

Stenophyella macreta Horvath

Slater (1955) reported *macreta* in Western Australia from Derby, Dongarra, Fortescue River and the Hamersley Range. His inference that the species seems to favor damp areas and may prove to feed on sedges and rushes is incorrect. It is common on grasses in Western Australia, particularly in disturbed dry habitats. Its adaptation to slender monocots is shown not only by the elongate, slender form and straw-coloured surface, but also by the pair of elongate black stripes, one on either side of the midline of the abdomen, which are quite conspicuous through the semi-transparent hemelytra and appear to serve as a break-up pattern.

S. macreta appears to feed on a number of grasses even when they are completely dry. Unfortunately collecting in Western Australia was during a period when most of the individuals were in the adult stage and host specificity was impossible to ascertain. One ♂ and 3 ♀♀ were taken on *Ehrharta brevifolia* Schrad at Kings Park, Perth, December 5, 1971.

Specimens were collected from the following additional localities: 1 ♂, 11 km NE of Cracklin, December 11, 1971; 2 ♀♀, Tortoise Reserve, 38 km N of Perth, December 16, 1971; 1 ♀, Bluff Knoll, Stirling Range, December 23, 1971; 1 ♂ and 3 ♀♀, 19 km E of Katanning, December 29, 1971; 1 ?, Waneroo, December 8, 1971; 1 ♂ and 1 ♀, 3 km S of Tammin, December 14, 1971.

Rhyparochrominae

This subfamily contains the majority of southwest Australian Lygaeidae. The majority of species is ground-living and feed on mature fallen seeds.

The general composition of the Australian fauna and its relationship to wing polymorphism was discussed previously (Slater 1975). The southwest fauna is largely made up of members of the tribes Udeocorini, Lethaeini and Drymini (1 species each of Antillocorini, Ozophorini and Myodochini and at least one of Rhyparochromini are also present). This lack, or near lack, of tribes that are dominant or abundant in other parts of the world has apparently led to replacement ecologically by various udeocorine taxa. We still know too little about the ecological requirements of the majority of Rhyparochrominae to make definitive comparisons as to adaptive replacement, but from the general morphology and field habits of the species it is apparent that such replacement is occurring. Members of the genus *Fontejus* Stål look and act the way such fast-moving myodochines as *Cnemodus* Herrich-Schaeffer and some species of *Pseudopamera* Distant (Nearctic) do; the species of *Udeocoris* Bergroth are broadened and thick-bodied, resembling palaearctic Rhyparochromini such as *Raglius* Stål, *Rhyparochromus* Hahn etc.; *Porander* Gross has a rather gonianotine habitus; *Euander* Stål resembles species of *Beosus* Amyot and Serville; *Telocoris* Gross resembles a coleopteroid lethaeine; etc.

Udeocorini

This tribe is the dominant litter-living taxon in southwest Australia. It is chiefly Australian, although there are 4 or 5 genera in the Western Hemisphere and 1 in Fiji and New Zealand. Gross (1962) included them in the Myodochini, but Sweet (1967)

recognized a distinct tribe which is presumably ancestral to the Myodochini. Nine genera and at least 20 species are known from Australia.

Fontejus Stal

This genus is endemic in Australia and contains 3 species, all of which are present in Western Australia. The species are large, long-legged, very active insects and all show coleopteroid wing modifications.

Fontejus westraliensis Gross

This large, brown, long-legged species was taken (2 ♂♂, 3 ♀♀, nymphs) with a ground lygaeid assemblage at Cranbrook, Western Australia, on December 29, 1971. It occurred in seed litter below both *Acacia laricina* Meisn. and *Jacksonia nematoclada* F. Muell., but more commonly below the former. The habitat was a hot, open, dry area with scattered plants and open interspaces between individual plants. *F. westraliensis* is a very active, fast-moving species that darts quickly away with rapid, jerky, rather ant-like running movements when disturbed, making it difficult to capture. Its movements and general *habitus* are very similar to those of the Nearctic *Cnemodus mavortius* (Say), and these 2 species are largely ecological equivalents.

All 5 adults taken at Cranbrook are coleopteroid, with the clavus and corium fused into an undifferentiated coriaceous wing, the hemelytra meeting along the midline for their entire length. The hemelytra extend posteriorly onto abdominal tergum 6, the apical margin is obliquely angled anteromesad from the lateral margin, and a small convex membrane remnant is present along this oblique margin that is black with a small triangular white spot near the middle of the posterior margin.

The species may be sexually dimorphic, as 1 of the 2 males taken has the anterior pronotal lobe relatively more elongate and much more strongly convexly swollen than is the case in females.

One male shows oligomery of the right antenna, with 3 segments present. Segments 2 and 3 are both elongate so that the antenna is equal in length to the normal 4-segmented left antenna. The 3rd (terminal) right segment has a narrow pale proximal annulus and a second pale annulus about $\frac{1}{3}$ of the way from the proximal end.

In Gross (1962), this species keys to the section with the pronotum and head for the most part smooth and shining. This character causes some difficulty in practice, since the head and pronotum are sometimes not actually shining, and the pronotum has small punctate areas around dark upstanding hairs, giving the appearance of a punctured surface. Furthermore, at couplet 9 of Gross' key the hemelytra are stated to be "ochraceous or ochraceous-piceous, nearer black", as opposed to "dark distally with a conspicuous pale marginal fascia near the apex". In the specimens I have examined the hemelytra are indeed a light brown with some darker markings, but could not be construed as approaching black, and there always is a broad subquadrate white fascia near the posterior end. In addition to the characters given by Gross in his original description, antennal segment 2 is testaceous on the proximal $\frac{2}{3}$ and chocolate brown in the distal $\frac{1}{3}$, whereas segment 4 is primarily chocolate brown with only the proximal $\frac{1}{4}$ testaceous. The entire dorsal surface is clothed with very prominent, elongate, upstanding black hairs. As in *Euander multicoloratus* (Distant), a short projecting spine is present at each anterolateral pronotal angle, but no laterally directed spine on the fore coxae. The fore femora have only 1 row of sharp spines ventrally along the inner surface.

On December 23, 1971, 3rd and 5th instar nymphs were taken at Gold Holes picnic site, Stirling Range (see *Fontejus* sp. for habitat).

Fontejus sidnicus (Stål)

This species was previously known from South Australia and New South Wales.

This appears to be the species treated by Gross (1962), although it does not agree with his key characters or description in some particulars. In Gross' key, *F. sidnicus*

goes through couplet 5 which states that the pronotum and head are for the most part smooth and shining. In specimens of this species before me (2 ♀♀, Kings Park, Perth, December 13, 1971), the head is shining with some pruinosity basally, but the pronotum is completely dull and subpruinose. The first 3 antennal segments are reddish brown rather than dark brown, and the pronotal coloration differs in having the anterior collar pale yellowish brown, and the posterior lobe almost entirely yellowish brown with the humeral angles black and with a dark median spot. Along the lateral margin immediately above the black humeral area is a white patch. Gross mentioned 3 luteous patches on the hemelytron, 1 of which is at the apex. I believe this is a *lapsus* for base. He indicated that the posterior spot is large and oblique and reaches almost to the midline of the hemelytra. In my specimens this "spot" is a large, irregularly ovoid patch which extends only half-way to the midline. Gross indicated that the fore femora are black, and the legs otherwise brown with the mid and hind femora paler distally. In my specimens each fore femur is orange on the proximal $\frac{1}{3}$ and dark brown to black on the remainder. The hind and mid femora are orange-coloured over at least the proximal $\frac{3}{4}$. The tarsi are pale yellowish brown on all legs, and labial segment 2 is yellow rather than dark brown. The body is sparsely covered with elongate upstanding hairs. The head has an orange red spot on either side of the midline behind the ocelli. This may represent an undescribed species but, if so, it is most closely related to *sidnicus*. Both specimens examined have the clavus and corium indistinguishably fused, with the hemelytra meeting each other for their entire length along the midline and extending posteriorly to abdominal tergum 6. The posterior margin of each hemelytron is obliquely rounded and lacks any vestige of a membrane. Gross mentioned a specimen attracted to light, indicating that macropters exist.

One specimen shows oligomery of the left antenna, in which the 2nd segment is very elongate, almost as long as normal segments 2 and 3 combined, and is light reddish brown on the proximal $\frac{1}{2}$ and dark chocolate brown on the posterior $\frac{1}{2}$. The 3rd (terminal) segment is uniformly dark in this oligomerous condition. The anterior pronotal collar has lateral spines, but the calloused anterolateral patches on the scutellum are very weakly developed. The fore femora have a series of sharp ventral spines. In the field nymphs move very rapidly with jerky, ant-like movements.

Fontejus sp.

A series of 6 5th instar and 2 4th instar nymphs was taken at Gold Holes picnic site on December 23, 1971, together with 1 brachypterous female. On December 28, 1971, I took 1 macropterous male at Torbay Inlet, 16 km W of Albany. These specimens do not agree in some important particulars with Gross' (1962) description of *collaris*. He indicated specimens which are chiefly black and chocolate brown, whereas in my specimens the head and anterior pronotal lobe are black, but the anterior collar and posterior lobe of the pronotum and the hemelytra are pale yellowish brown. He also indicated that the scutellum is black, which is true of my specimens, except that the apex is white, with 2 large pale patches present laterally slightly anterior to the middle. Antennal segment 4 was said to be black, as well as (sometimes) the distal ends of segments 1, 2 and 3 and the entire femora. In my specimens the antennae are pale tan, with segments 2 and 3 reddish distally and 4 with a pale subbasal band, but distally reddish; the femora are chiefly yellow with the distal $\frac{1}{3}$ dark chocolate brown, and the anterior femora have additional brown spots scattered over the surface. Gross' specimens had the antennae, posterior lobe of pronotum, hemelytra, tarsi and tibiae brown to chocolate brown, with some small pale patches on the hemelytra and the hind lobe of the pronotum. He also indicated that the head, pronotum and the hemelytra have a sparse long pilosity, whereas in my specimens these are nearly glabrous, with at most extremely minute setae visible under high magnification.

This species superficially resembles some of the larger species of *Pachybrachius* Hahn.

The Gold Holes series was taken in a dry, sandy, lightly wooded area beneath a large specimen of *Eucalyptus marginata* Sm. The 2 common plants under this tree were *Leucopogon tamariscinus* R. Br. and *Petrophile squamata* R. Br., the majority of seeds apparently belonging to the *Leucopogon*, which is possibly the only host. The nymphs

run extremely rapidly when disturbed and are very cryptic against the light tan background of the substrate. The specimen from Torbay Inlet was taken in an assemblage of Rhyparochrominae in the seeds below *Andersonia sprengelioides* R. Br.

An adult and a number of nymphs of *Fontejus westraliensis* were taken in this Gold Holes habitat, the nymphs of the 2 species being extremely distinctive in the field.

Euander Stal

This genus is endemic in Australia. Four species are recognized, 2 occurring in southeast Australia, 1 widespread (including southwest Australia), and 1 apparently restricted to the heath-like country along the extreme southwest coast of Australia.

Euander lacertosus (Erichson)

E. lacertosus appears to be very widespread in Australia. Gross (1962) reported specimens from Queensland, New South Wales, Victoria, Tasmania, South Australia and Western Australia (King George Sound, Collie).

This large, variegated species resembles species of *Udeocoris* Bergroth in general *habitus*, but is readily recognizable by the dull, rather than shining, dorsal surface, the deep, complete transverse pronotal impression and the greyish white dots scattered over the black anterior pronotal lobe. The white apex of the membrane and the 2 large pale maculae distally on the corium are very distinctive in the field.

Gross (1962) reported *lacertosus* in large numbers on cape weed (*Cryptostemma calendulaceum*), and on *Poa caespitosa* scrub. He also collected it by sweeping undergrowth in a dry sclerophyll *Eucalyptus obliqua* forest. Thus the species does sometimes occur on vegetation above the ground. Presumably it occurs there in response to the presence of mature seeds, as it is primarily a terrestrial litter inhabitant.

This species is of some economic importance, particularly as a pest of strawberries. Thompson (1895) and Lea (1903) referred to this species without a definite name. Lea (1903) said that it feeds on the juices of many berries, sometimes occurring in hundreds around strawberry plants and in such numbers that sometimes the berries cannot be seen. He also noted attack on gooseberries and raspberries. Evans (1939, 1941), using the name *Dieuches raphaeli* Evans, a junior synonym, also discussed damage to strawberries. It is sometimes called the "strawberry bug" in economic literature.

In Western Australia it is widespread, but less abundant and ubiquitous than is *Udeocoris nigroaeneus* Erichson. In Kings Park, Perth, on December 10, 1971, I took 3 ♂♂, 3 ♀♀ and nymphs in seed litter of *Hypocalymma robustum* Endl., together with *Udeocoris nigroaeneus* and species of *Isopeltus* Gross, *Plinthisus* Stephens and *Coleocoris* Gross (this habitat is discussed below under *Coleocoris ocellatus* Gross).

At Pemberton, on December 21, 1971, 2 ♂♂ and spectacular numbers of early instar nymphs were taken in seed litter of *Leucopogon unilateralis* Stschegl. These plants were growing in a dry, white sand area with individual plants widely scattered. Most plants were at most 30 cm tall. The thin litter consisted almost exclusively of recently fallen seeds. The concentration of rhyparochromines was astonishing and consisted largely of early instars of *E. lacertosus*, although species of *Plinthisus*, *Porander* Gross, *Lepionysius* and *Botocudo* Kirkaldy were also present. Seed predators in such concentrations must eliminate almost the entire seed crop and be an important factor in slowing the succession in such a dry, overdrained, sunbaked habitat.

On December 23, 1971, at Gold Holes picnic site, 4 ♂♂, 6 ♀♀ and nymphs of *lacertosus* were present together with 2 species of *Fontejus* and 1 of *Botocudo*. This habitat was on white sand, but shaded by a large specimen of *Eucalyptus marginata* Sm. The majority of seeds was below *Leucopogon tamariscinus* R. Br., and the *lacertosus* nymphs seemed to be associated primarily with them.

Nymphs and adults (not collected) were observed on December 28, 1971, 28 km W of Albany, in seed litter of *Andersonia caerulea* R. Br. in a white sand area similar to that at Pemberton.

On December 29, 1971, at Cranbrook, 2 ♂♂, 1 ? and nymphs were taken in seed litter below *Acacia laricina* Meisn. and *Jacksonia nematoclada* F. Muell., with a varied association of rhyparochromines. The habitat was dry and open, on reddish sand with interspaces between individual plants. The species was not taken along the southwest coast with *E. multicoloratus*, which occurs in areas with a denser vegetation cover.

Euander multicoloratus (Distant)

The type was from Albany and the species was reported by Gross (1962) from King George Sound. *E. multicoloratus* was originally described as the type-species of *Albanyaria* Distant, which was synonymized with *Fontejus* by Scudder (1962), but later with *Euander* by Scudder (1967). It is a much more slender species than *lacertosus*, with bright white spots on the pronotum and hemelytra, and with a distinct white annulus proximally on antennal segment 4.

E. multicoloratus is a characteristic species of the short, leathery "heath-like" vegetation that occurs along the extreme southwest coast of Western Australia. It is a very active species with an escape mechanism that consists of running rapidly with jerky, ant-like movements.

At Torbay Inlet, 16 km W of Albany, on December 28, 1971, 2 ♂♂, 4 ♀♀ and nymphs were taken, chiefly in seed litter below *Leucopogon reflexus* R. Br. (see *Porander scudderi* Gross below).

At Torbay, 22 km W of Albany, on December 26, 1971, 3 ♂♂, 2 ♀♀ and nymphs were taken in seed litter of a *Hypocalymma strictum* Schau. plant growing in isolation on dry white sand. In a similar habitat at Pemberton on December 21, 1971, 1 ♀ was taken in seed litter of *Leucopogon unilateralis* Stschegl. (see habitat discussion above under *E. lacertosus*). One ♂ and nymphs from Peak Head, S of Albany, on December 27, 1971, were in "heath-like" vegetation, a habitat very similar to that at Torbay Inlet.

Gross (1962) apparently had not seen this species. He keyed it into a couplet with the pronotum not markedly longer than wide. The pronotum is at least ¼ longer than its maximum width. The pronotum and hemelytra do not have elongate upstanding hairs, in contrast with other members of the genus. Modifications to the original description are as follows: apex of scutellum white; posterior pronotal lobe with a pair of elongate white spots running from lateral end of transverse impression half-way to humeral angles; greater part of posterior lobe dull testaceous (sometimes chiefly black), always ochraceous in transverse impression area, never uniformly greyish white; antennae ochraceous on segments 1, 2 and proximal ½ to ⅔ of 3; distal ⅓ of segment 3 dark brown to black; segment 4 primarily black, but with white annulus on proximal ½ (in nymphs, segment 4 is entirely black); in coleopteroid, clavus testaceous to ochraceous; broad ochraceous area on corium near apex of claval commissure and claval suture, remainder of corium strongly variegated; elongate white spot at each anterolateral angle of explanate margin of corium; 2nd white spot midway along corial margin and 3rd located subapically; area between preceding white spots suffused with black (original description gives impression spots are black); posterior pronotal lobe more coarsely punctate than scutellum, latter with number of small punctures on anterior ½, transversely striated on posterior ½; anterolateral pronotal angles with sharp projecting tooth; fore coxae with sharp curved spine on lateral surfaces; fore femora strongly incrassate, each armed below with 2 rows of spines, those on inner ventral surfaces most numerous, with large mesal spine.

In the laboratory, *multicoloratus* usually placed its eggs in crevices in the inflorescences of dried seed heads of the host plants. They were also placed in sunflower seed crevices.

Porander scudderi Gross

Gross (1962) gave an excellent description of this species. It has not previously been taken in Western Australia, but is apparently widespread. The type series included material from South Australia, New South Wales, Australian Capital Territory, Victoria and Tasmania.

This species was taken in numbers only near the extreme southwest coast (Albany and Pemberton areas), but 3 nymphs were taken in leaf litter in company with *Isopeltus australis* (Bergroth) 34 km N of Perth on December 18, 1971, 1 of which was reared to adulthood. At Pemberton on December 21, 1971, 3 ♂♂, 4 ♀♀ and small nymphs were taken in a rhyparochromine assemblage in seed litter of *Leucopogon unilateralis* Stschegl. At Torbay Inlet, 16 km W of Albany, on December 28, 1971, 7 ♂♂, 7 ♀♀ and nymphs were taken in seed litter of *Leucopogon reflexus* R. Br. The habitat was a large rock outcrop adjacent to bluffs overlooking Muttonbird Island. Plants in the habitat were low-growing (30-60 cm high), with a heath-like appearance. The plants were in crevices and interfaces between rock outcrops. *Leucopogon* seeds seem to be the preferred food, but other seeds are also utilized. For example, at Torbay, 22 km W of Albany, on December 26, 1971, 1 ♀ and nymphs were taken in seed litter of *Hypocalymma angustifolium*. *Leucopogon revolutus* R. Br. was also present, but the insects were associated with *Hypocalymma*.

Specimens were also taken at the following localities: 1 ♀, Parry Beach, December 22, 1971; 2 ♂♂ and 2 ♀♀, Peak Head, S of Albany, December 27, 1971; 1 ♀, unnamed Wildlife Reserve, 34 km N of Perth, December 18, 1971; 2 ♂♂ and 1 ♀, Bluff Knoll; and 3 nymphs, Gold Holes picnic site, December 23, 1971.

Two ♂♂ from Torbay Inlet and one ♂ from Bluff Knoll show antennal oligomery. In all 3 specimens, the left antenna is 3-segmented; in 1, however, the 2nd segment is much more elongate than in the others. In all specimens the antennae are as long as the normally 4-segmented antenna of the right side.

Although *Porander* occurs predominantly in the coleopteroid condition, macropters do occur. Of 31 specimens examined, 1 male and 2 females are fully macropterous and may be characterized as follows: posterior pronotal lobe relatively larger and broader than anterior lobe; clavus reddish brown, with darker punctures and small median fuscous spot; white stripe along anterior $\frac{1}{3}$ of outer claval vein and irregular yellowish white macula at anteromesal corner; each lateral corial margin with series of 4 irregular dark brown spots; large fuscous patch between radial and cubital veins reaching apical corial margin, but suffused with lighter tan markings; membrane fully developed, almost attaining apex of abdomen.

Hemelytral length in the coleopters varies: 14 of 28 specimens examined have the hemelytra extending only onto the anterior portion of abdominal tergum 6; the other 14 have the hemelytra reaching tergum 7.

Western Australian material agrees with the original description. To the characters given by Gross (1962) may be added: (♂) proximal $\frac{1}{3}$ of antennal segment 3 often reddish brown and concolorous with segment 2; head somewhat declivent, acuminate anteriorly; tylus almost attaining distal end of antennal segment 1; eyes prominent, nearly in contact with anterolateral pronotal angles; ocelli present; buccular groove broad, terminating at level of middle of eye in acute point; length head 0.74, width 1.10, interocular space 0.70; anterior pronotal lobe convex (said by Gross to be "somewhat flattened"); deep coarsely punctate groove along posterior margin of anterior pronotal collar, lateral margins carinate, rather obtusely so along anterior lobe; propleural area with broad pruinose area near middle including anterior acetabula; length pronotum 1.20, width 1.40; scutellum with ovoid granulose spot anteriorly along each lateral margin, length scutellum 0.86, width 0.90; each hemelytron with clavus and corium fused into coriaceous pad, hemelytra broadly meeting along meson for entire length, lateral margins broadly arcuate; posterior hemelytral margins convex, attaining anterior margin of abdominal tergum 7, minute membrane remnant present on inner $\frac{1}{2}$, not extending cauded of corium, length of hemelytron 2.0; metathoracic scent gland auricle small, little raised above rugulose evaporative area, curving caudolaterad, slender with rounded apex; each fore coxa with a prominent sharp lateral spine; labium attaining mesocoxae, length labial segments I 0.52, II 0.50, III 0.42, IV 0.32; antennae robust, segments 2 and 3 gradually enlarged distally, length antennal segments I 0.30, II 0.44, III 0.56, IV 0.64; total body length 4.40.

Eggs laid in the laboratory were pushed into cotton and into the open spaces between the shell and the inner core of sunflower seeds.

Udeocoris Bergroth

Gross (1962) related *Udeocoris* to *Euander*, from which he differentiated it by the lack of a transverse pronotal constriction. This character was also used in the opening couplet of his key, but this statement is misleading. In macropters of all 3 species there is a definite lateral indication of a transverse constriction on the pronotum that in Gross' key will lead many students to *Euander* rather than *Udeocoris*.

Nevertheless, *Udeocoris* appears to be a monophyletic unit worthy of generic status. It is readily separable from *Euander* by the conspicuously curved metathoracic scent gland auricle and by the nature of the adjacent evaporative area, which occupies only the inner $\frac{1}{2}$ of the metapleuron and has a rounded outer margin. In *Euander* the scent gland auricle is slender and nearly straight, and the evaporative area occupies all but the outer $\frac{1}{4}$ of the metapleuron and has a straight outer margin. All species of *Udeocoris* have the entire dorsal surface shining or subshining, whereas in *Euander* the surface is dull. The transverse impression on the pronotum is much more prominently developed in *Euander*.

All 3 Australian species of *Udeocoris* are dimorphic in wing development. Coleopters have the clavus and corium fused, with the resulting coriaceous "elytra" meeting broadly along the midline. The apical corial margin is strongly angled cephalomesad from the lateral margin, and a small rounded membrane remnant is present.

The occurrence of coleoptery in these species is particularly interesting as they are all frequently found in relatively disturbed, temporary habitats. Actually, they are probably oligophagous and have thus been able to adapt to disturbed conditions produced by man. In Western Australia, *scudderi* and *nigroaeneus* are among the most abundant rhyparochromines and are found in many habitats including some permanent ones. One may hypothesize that, before the development of disturbed ruderal conditions produced by white man, *Udeocoris* spp. lived in relatively permanent habitats and developed coleoptery. At present they appear to be responding to new niches produced by disturbance and cultivation. It would thus seem that selection should be away from the flightless form. There is some evidence of this, for while *rolandi* (South Australia) and *scudderi* are still predominantly coleopteroid, 70% (N = 50) and 81% (N = 48) respectively in my sample, by contrast 60% (N = 78) of *nigroaeneus* are macropterous. Dr T. E. Woodward (personal communication) informs me that the University of Queensland collection has 19 specimens of *U. nigroaeneus* from Tasmania and 2 from Victoria, all from relatively unaltered habitats. Of these, only 4 (from Tasmania) are coleopteroid, further supporting the idea that the macropterous morph is being selected for in this species (if the sample is not biased by collecting technique).

It is very unusual in litter-living Rhyparochrominae with a flightless form not to have this morph predominate. *Udeocoris nigroaeneus* is extremely variable in habitats utilized and appears to be an example of a species selecting away from the coleopteroid in response to the variety of new temporary habitats available to it. An example of the dispersal value of the macropterous morph may be seen in the collections made at Bluff Knoll. This area, formerly an excellent collecting site, had, as noted above, been almost completely burned a short time previous to our collecting. The only unburned area was immediately adjacent to a picnic site and parking lot. A few coleopteroid specimens of *Porander scudderi* and *Coleocoris ocellatus* were taken in the more permanent vegetation, but along the road on a very temporary site both *Udeocoris scudderi* (9 ♂♂, 2 ♀♀) and *U. nigroaeneus* (3 ♂♂, 7 ♀♀) were common, and all individuals but 1 were macropterous, indicating recent arrival.

Udeocoris is one of the few Australian udeocorine genera that occur outside the continent, another indication of its relatively high dispersal and colonizing ability. Gross (1962) reported *U. nigroaeneus* from Timor and Eyles (1971) described a New Zealand species.

Key to Australian species of *Udeocoris*

1. Pronotum and hemelytra with numerous, elongate, prominent, upstanding hairs .. .. **scudderi**
   Pronotum and hemelytra glabrous or nearly so, lacking conspicuous, upstanding, elongate hairs 2
2. Posterior pronotal lobe in large part black and concolorous with anterior pronotal lobe, pale only as a white macula on humeral angle; corium chiefly dark with white lateral stripe on anterior ½ of corium .. .. **nigroaeneus**
   Posterior pronotal lobe largely pale and strongly contrasting with dark anterior lobe, at most with 4 or 5 darker vittae on chiefly pale posterior lobe; corium chiefly pale tan to yellowish with darker spots and maculae distally .. .. **rolandi**

Udeocoris scudderi Gross

This species is readily recognizable by the numerous, elongate, upstanding hairs on the dorsal surface and the prominent white fascia near the posterior end of the corium. It is considerably smaller than the other 2 Australian members of the genus. Gross (1962) stated that antennal segments 1 and 4 are dark brown, segment 3 brown and segment 2 yellowish brown. This is occasionally true, but, in the great majority of specimens, segments 1, 2 and 3 are bright yellow, with only segment 4 and the base of 1 darkened (this appears to be the condition in Gross' Pl. 16, Fig. D). Gross said the anterior pale area of the hemelytra is creamy white. The coloration is variable; in many specimens the above area is tan or has a rufous tinge. The membrane is somewhat hyaline, as Gross stated, but is pale white along the veins, with the intervening areas clouded with grey and with scattered white spots.

In coleopters the corium extends to the anterolateral area of tergum 6 and the membrane is very reduced, being represented only by a very narrow rim along the apical corial margin that does not extend caudad of the apical corial angle.

Antennal oligomery is present in 5 of 37 specimens (with antennae). In 3 cases the fusion appears to be between segments 2 and 3, and in 2 cases between segments 3 and 4.

On December 14, 1971, 3 km S of Tammin, hundreds of adults (6 ♂♂, 15 ♀♀ collected) and nymphs were present in litter below *Ptilotus polystachyus* (Gaud.) F. Muell. along a roadside. When disturbed, the insects dispersed with great rapidity, the aggregations literally exploding in all directions. On the same date, numbers of specimens (2 ♂♂, 4 ♀♀ and nymphs collected) were also present 1.6 km W of Cunderdin in litter below *Arthrocnemum halocnemoides* Moq. var. *pergranulatum* J. M. Black, almost the only vegetation present in a heavily over-grazed area. The insects were taken at both localities only where a dense litter cover was present. This may have been due to the presence of more seeds, but possibly also because the litter provided cover from the intense heat of the sun. On December 12, 1971, 2 adults and nymphs were taken along the shore of the Swan River at Perth, on sand among mixed grasses and sedges. One ♀ was taken on December 11, 1971, in a recently burned area in the Julimar State Forest.

Udeocoris scudderi appears to select more open, hot, dry areas in southwest Australia than does *nigroaeneus*. While very abundant at some sites, it is also more local than *nigroaeneus*.

In the laboratory *scudderi* is very hardy and breeds readily on a diet of sunflower seeds.

Udeocoris nigroaeneus (Erichson)

Gross (1962) figured and described this species. It has a wide distribution in Australia. Gross (1962) reported material from Torres Strait, Queensland, New South Wales, Victoria, Australian Capital Territory, Tasmania, South Australia and Western Australia (Boyop Brook, Fremantle, Swan River and Warren River). It is readily recognizable by the black, subshining body surface, with the lateral areas of the

posterior pronotal lobe strongly contrasting ivory white or bright yellow. The lateral corial margin also has a white band, which sometimes is confined to the anterior ½, but frequently extends along the entire lateral corial margin. Anteriorly this white area usually extends mesad to the claval suture. The clavus has a white vitta basally, adjacent to the claval suture, which in a few specimens is continued the entire length of the clavus. Gross (1962) mentioned that specimens may be without the yellowish markings, but in all material I have examined these are well developed. Gross also stated that the pronotum is "very sparsely punctate." Actually the obscure anterior collar area and the entire posterior lobe have conspicuous punctures in both macropters and coleopters. In macropters the membrane may be either hyaline or opaque, with a white ground colour and an irrorate brown mottling over the entire surface in addition to the brown area near the apical corial margin.

Two ♀♀ taken with nymphs at Yanchep National Park, December 8, 1971, have appreciably lighter hemelytra and posterior pronotal lobes than any other Western Australian material I have examined. These specimens were taken on a very dry, yellow, sandy area. They are structurally typical of *nigroaeneus* and have white areas laterally on the posterior pronotal lobe and the corium.

Gross (1962) mentioned macropterous material from Timor that was scarcely distinguishable, and stated that Australian macropters were very rare. As noted earlier, this is one of the very few litter-inhabiting rhyparochromines with wing dimorphism that shows a predominance of macropters. Sometimes a high percentage of macropters in collections is due to collecting bias resulting from sweeping or light trap samples. My specimens of *nigroaeneus* were taken in ground litter. If the Timor specimens mentioned by Gross (1962) are actually *nigroaeneus*, the occurrence of macropters might only indicate recent colonization (Lindroth 1957), or be the result of collecting technique. Coleopters have the clavus and corium fused, but the membrane remnant is relatively large, lobate and often extends slightly caudad of the apex of the corium.

U. nigroaeneus is very closely related to *rolandi* and their relationship needs further study. In addition to the characters given in the key, *nigroaeneus* appears to be distinguishable by its shorter antennal segment 3 and less numerous and wider-spaced punctures on the posterior pronotal lobe and clavus. Nymphs of the 2 species are extremely similar.

Nothing appears to have been reported of the biology of this species other than the collecting notes "in tussocks" and "leaf debris". At Kings Park, Perth, on December 4, 5, 10 and 13, 1971, 34 ♂♂, 35 ♀♀ and nymphs of several instars were taken in seed litter below *Hypocalymma robustum* Endl. in association with species of *Plinthisus*, *Isopeltus*, *Coleocoris*, *Euander* and *Cryptorhamphus*. The habitat was a dry, white sand substrate with an overstory of *Eucalyptus* and *Banksia*.

At Mundaring Weir on December 11, 1971, 1 ♂ and 2 ♀♀ were taken under a large ornamental *Ficus*. These were placed in culture in the laboratory with fig seeds alone. This colony was still alive and flourishing when destroyed in late January 1972, with eggs and many early instar nymphs present. *U. nigroaeneus* thus appears able to breed successfully on fig seeds alone. Since figs are not native to southwest Australia, this further strengthens the belief that *nigroaeneus* is oligophagous and able to utilize a variety of seeds. We also took *nigroaeneus* (2 ♂♂, 2 ♀♀, December 12, 1971) along the shore of the Swan River at Perth, and have seen it in gardens within the city itself.

On December 16 and 18, 1971, 3 ♂♂ and 2 ♀♀ were taken at an unnamed Wildlife Reserve, 34 km N of Perth, below *Hypocalymma angustifolium* Endl. associated with at least 7 species of Rhyparochrominae.

On December 19, 1971, along a roadside 18 km W of Busselton, 1 ♂, 4 ♀♀ and many early instar nymphs were taken in seed litter near the bases of large specimens of *Pimelea argentia* R. Br. On the same date, 3 (1 ♀ retained) adults were beaten from *Melaleuca acerosa* Schau. at Cape Naturaliste. *Hypocalymma* sp. was abundant in the habitat, but the area appeared to have been recently burned and no definite breeding host was established. I have examined the following additional material: 1 ♂, 3 km S of Tammin, December 14, 1971; nymphs, Lake Powell, 16 km W of Albany, December

27, 1971; nymphs, Parry Beach, 19 km W of Denmark, December 22, 1971; 1 ♂, Julimar State Forest, December 11, 1971. The Western Australian Department of Agriculture collection has specimens from Wyndham, Beckenham, Mt Pleasant, Bramley River Station, Lucerne and Malup.

Such a species is likely to become a pest of cultivated crops and the Department of Agriculture collection in Perth already has specimens taken on strawberries.

Udeocoris rolandi (Distant)

Gross (1962) indicated a wide distribution, reporting material from New South Wales, Victoria, Bass Strait, South Australia, Northern Territory and Western Australia (Beverley and Mullewa). We did not take the species in Western Australia. Distant's type locality was Yallingup, Western Australia. I would interpret Distant's description of *rolandi* to fit *nigroaeneus* better than Gross' concept of *rolandi*. More work is needed on this complex.

This species is very closely related to *nigroaeneus* and differentiated chiefly by colour characters given in the preceding key. However, in *rolandi*, the anterior pronotal lobe is usually finely and more conspicuously punctate, and the punctures on the posterior lobe are more numerous and coarse, with a tendency for the surface to become rugulose between the punctures.

Material of these 2 species from many parts of their ranges should be carefully studied to determine if intergradation occurs. Both species can readily be reared in the laboratory on sunflower seeds and thus crossing experiments should be easily accomplished. Both species appear to be widely distributed and simple allopatry is not evident.

In South Australia, I took 14 ♂♂ and 21 ♀♀ of *rolandi* 3 km SE of Reeves Plains (53 km NW of Adelaide) on January 1, 1972, in litter below large, greyish salt bushes growing in yellowish sand areas. Mr G. F. Gross and I took 9 ♂♂ and 6 ♀♀ from temporary habitats in sandy areas at Ferries-MacDonald National Park on January 5, 1972. The habits and habitats of *rolandi* in South Australia are similar to those of *nigroaeneus* in Western Australia.

Lethaeini

This large tribe is represented in all major zoogeographic regions; it is, however, predominantly tropical and subtropical. The Australian fauna is complex, with old endemic taxa as well as more recent Old World tropical stocks (Slater 1975). Only species of the former are known from southwest Australia.

Coleocoris ocellatus Gross

Although previously known only from the types (2♀♀) from "Swan River", this remarkable little species is one of the most common ground lygaeids in southwest Australia. Its scarcity in collections is presumably due to the extreme agility of the adults and its absence from plants and from lights.

Gross (1958) remarked that this species resembles a carabid beetle, and called species of the genus "beetle-mimicking bugs". Each hemelytron consists of an undifferentiated, convex, coriaceous "elytron" which meets the opposing forewing evenly along the midline of the body. The forewings are elongate and extend posteriorly at least onto abdominal tergum 7. I have examined 86 adults from 12 localities and have seen no variation in wing condition. The hind wings are represented only by minute, finger-like projections at the caudolateral angles of the metanotum. Abdominal terga 1-5 and the anterior ½ of tergum 6 within the connexivum are completely desclerotized and membranous, although inner laterotergites are present on terga 3, 4 and 5.

While *C. ocellatus* does resemble a small beetle in general appearance and activity, it is doubtful whether they should be considered truly mimetic. The coleopteroid wings are an adaptation to enable the insect to survive on the hot, arid white sand which it prefers. Hadley (1972) noted that in desert tenebrionid beetles a subelytral cavity

delays the flow of heat from the elytra to the abdomen. Hadley's figures show arched convex elytra and a membranous abdomen below. The convex hemelytra of *C. ocellatus* are very similar, leaving a distinct cavity between the wings and membranous dorsal surface of the abdomen. This is not a unique condition in Lygaeidae, as it occurs in the psammine genera *Sympeplus* Bergroth, *Psammium* Breddin and *Saxicoris* Slater, all of which inhabit arid environments.

Nymphs and adults of *C. ocellatus* run rapidly with jerky, ant-like movements. The white coloration of the hemelytra, pronotum and 4th antennal segments forms a break-up pattern.

C. ocellatus prefers dry, hot habitats, particularly with open areas of white sand where the plant cover is incomplete. When in association with other ground living rhyparochromines, it is most abundant near the edge of the seed litter "shadow".

The species is an oligophagous seed feeder. We were able to rear it successfully in the laboratory on sunflower seeds alone. Twenty-one ♂♂, 19 ♀♀ and nymphs were taken below *Hypocalymma robustum* Endl. at Kings Park, Perth, on December 4, 5, 10 and 13, 1971; 1 ♂ below *Acacia laricina* Meisn. at Cranbrook, December 29, 1971; 5 ♂♂ and 4 ♀♀ under *Leucopogon reflexus* R. Br. at Torbay, 28 km W of Albany, December 28, 1971; 6 ♂♂ and 6 ♀♀ below *Hypocalymma angustifolium* Endl. and *H. strictum* Schau. at Torbay, 22 km W of Albany, December 26, 1971; 1 ♀ and nymphs under H. *angustifolium* at an unnamed Wildlife Reserve, 34 km N of Perth, December 18, 1971; and 1 ♀ under *Melaleuca acerosa* Schau. at Cape Naturaliste, December 19, 1971.

Other locality records are as follows: 1 ♂, 29 km W of Meckering, December 14, 1971; 1 ♀, Serpentine Dam, nr Jarrahdale, December 9, 1971; 2 ♀♀ and 1 ?, Peak Head, S of Albany, December 27, 1971; nymphs, Boyagin Rock, 16 km NW of Pingelly, December 30, 1971; 1 ♂ and 1 ♀, Bluff Knoll, December 23, 1971.

Nymphs of *C. ocellatus* are probably ant-mimetic. This is not particularly evident in preserved specimens as there is little structural modification. In the field the movements are ant-like. The large, shining, round, black, sclerotized plate that covers all of tergum 7 and the posterior portion of tergum 6, together with the black sclerites of terga 8 and 9 and the dark head, pronotum and wing pads, may be an evolutionary attempt to simulate an ant with an elongate pedicel, although it is possible to conceive of this development as a deflective adaptation to facilitate escape from vertebrate predators. The transverse white band running across the abdomen is characteristic of many ant-mimics.

The colour pattern of *C. ocellatus* is characteristic, with a white transverse band across the posterior margin of the pronotum which widens at the humeral angles, 2 white spots, 1 on each hemelytron near the midline, and a pale white lateral marginal band on each hemelytron. In 3 specimens from Perth, the white pronotal coloration is reduced. Two of these specimens have the white transverse band narrowed, leaving the posterior margin broadly black. In the 3rd specimen, the white coloration is present only on the humeri.

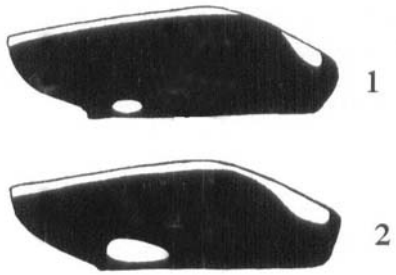
There is significant geographic difference between populations in the Perth area and those from the south coast in the Albany area. While it is premature to recognize nominal subspecies from such limited locality data, these populations differ strikingly in the length of the antennae and in 3 colour characteristics. As shown in Table 1, the Perth populations have longer antennae in both sexes, have a more elongate mesal white hemelytral spot, usually have the marginal white hemelytral stripe complete (Fig. 2), and lack a brown ventral stripe through antennal segment 4. The south coast populations usually have the marginal white stripe interrupted by a brown area on the posterior $\frac{1}{4}$ (Fig. 1). The female from Bluff Knoll resembles Perth specimens, but the male resembles south coast specimens.

Two males from Perth show antennal oligomery, one of the left antenna, the other of the right. In both cases, 3 antennal segments are present, the "fusion" appearing to be of segments 3 and 4. These oligomerous specimens have an elongate "3rd" segment in which the proximal $\frac{1}{3}$ is dark brown to black and the distal $\frac{2}{3}$ (except the extreme apex) white.

TABLE 1

GEOGRAPHIC VARIATION IN *COLEOCORIS OCELLATUS*

Locality	N	Length median white hemelytral spots (units)		White marginal hemelytral stripe broken	White area of antennal segment 4 with ventral brown stripe	Length antennal segment 2 (units)		Length antennal segment 3 (units)		Length antennal segment 4 (units)	
		Mean	range			Mean		Mean		Mean	
Perth	10	9.5	7-11	10%	0%	16.3		15.9		16.4	
Torbay (nr Albany)	10	6.2	5-8	80%	100%	12.3		12.0		12.6	
						Mean	Range	Mean	Range	Mean	Range
Perth ♂♂	5	9	7-10	20%	0%	15.6	15-16	15.4	15-16	15.5	15-16.5
Torbay ♂♂	5	5.8	5-6	80%	100%	12	11-13	11.4	11-12	12.4	12-13
Perth ♀♀	5	10	9-11	0%	0%	17	16-18	16.4	15-18	17.2	17-18
Torbay ♀♀	5	6.6	5-8	80%	100%	12.6	12-13	12.6	12-13	12.8	12-13



FIGS. **1, 2.**—*Coleocoris ocellatus* Gross, hemelytral patterns: **(1)** Torbay specimen; **(2)** Perth specimen.

Gross (1958) in his generic description stated that the dorsal surface is impunctate with scattered long hairs, and that the 2nd antennal segment is the longest. In *C. ocellatus* both pronotum and hemelytra have small punctures over the entire surface. These punctures are obscure on black areas and marked chiefly by tiny setiferous hairs that arise from each puncture, but the punctures are plainly evident on the lateral hemelytral area and the posterior pronotal white stripe. The dorsal surface is smooth, polished and almost glabrous except for the trichobothrial hairs on the head and anterolateral areas of the pronotum. Antennal segments 2, 3 and 4 are frequently subequal and, in some specimens, the 2nd segment is slightly shorter than either segment 3 or 4. The statement that the labium extends posteriorly almost to the base of the 3rd abdominal sternum (2nd visible) is also misleading, as the great majority of specimens before me does not have the labium extending beyond the posterior margin of the metacoxae.

Noteolethaeus armstrongi Woodward and Slater

This small, black, densely punctate, short-legged species was previously known from Queensland, New South Wales and Victoria. One ♂, 6 ♀♀ and nymphs were taken at Boyagin Rock, 16 km NW of Pingelly, on December 30, 1971.

The specimens were taken, in company with *Myocara* sp. nr *acuminatum* (Dallas), *Plinthisus* sp. and a species of Lethaeini nr *Lamproceps* Reuter, below a large grass tussock of *Spartochloa scirpoides* (Steud.) C. E. Hubbard at the base of a huge, rounded rock outcropping. The habitat was extremely dry, had been burned recently and contained a considerable amount of leaf litter with scattered seeds of 3 or 4 different plants. *N. armstrongi* was extremely cryptic in the burned, almost black, litter. When disturbed, individuals ran rapidly for a short distance, hid under litter and remained motionless even with considerable disturbance. At this site *N. armstrongi* occurred closer to the base of the tussock than did most of the *Myocara* specimens.

Woodward and Slater (1962) reported habitat notes from collection labels on the type series: "dryish leaf litter, *Eucalyptus* and grass", "leaf litter" and "under logs". This seems consistent with the Western Australian habitat, which also was in open, dry woodland. I took an adult and nymph of *N. armstrongi* on January 10, 1972, in open *Eucalyptus* woodland in leaf litter with scattered grasses on Mt Coot-tha, Brisbane, Queensland.

The taxonomic situation is probably more complex than presently understood, as Woodward and Slater (1962) noted differences in antennal proportions in the specimens from Victoria relative to those from Queensland and New South Wales. Although Western Australian specimens are very similar to east Australian specimens, they may represent a distinct species or subspecies as the antennae are considerably longer, with segment 4 relatively shorter than 3.

The type series consisted of 3 macropterous males and 2 females, and 10 brachypterous (= submacropterous) females (the statement under "Comments" on p. 58 of Woodward and Slater's (1962) paper citing 6 females is in error—see paratype series). They noted that in the brachypters the clavus and corium are fused, the

membrane reduced to a narrow marginal strip and the hind wings absent. Brachypters usually predominate in dimorphic rhyparochromines. It is significant that the entire series from Boyagin Rock is macropterous, although in 2 females there is a very slight reduction in the length of the membrane. However, the hind wing is completely developed even in these submacropters. If this small series is at all representative of the population structure of the species in Western Australia, it indicates that *N. armstrongi* has reached Western Australia relatively recently and that wing polymorphism has not yet been developed from the macropterous propagules that established the population.

Myocara sp. nr **acuminatum** (Dallas)

Ten ♂♂ and 2 ♀♀ were taken at Boyagin Rock, 16 km NW of Pingelly, on December 30, 1971, in company with *Noteolethaeus armstrongi* (see discussion of latter for habitat).

These specimens fit Dallas' original description rather well, but differ considerably from Distant's (1918) description of *Arrianoides australis* (placed in *Myocara* by Scudder (1962)). However, Dr T. E. Woodward informs me that there are a number of undescribed species of *Myocara* in Australia. These Western Australian specimens also differ from specimens of *Myocara* which Mr G. F. Gross and I collected at Ferries-MacDonald and Parra Wirra National Parks, South Australia, in January 1972.

The entire series above is coleopteroid, with the clavus and corium fused, the apex of the corium obliquely truncate and with a narrow membrane remnant present. The hemelytra extend over the anterior $\frac{2}{3}$ of abdominal tergum 6 and meet along the midline for their entire length. However, macropters exist, as they are mentioned by both Dallas (1852) and Distant (1918) in the descriptions of the two known species of *Myocara*.

Gross (1958) believed it possible that the beetle-like genera *Coleocoris* Gross and *Carabocoris* Gross may be specialized forms derived from *Myocara* Bergroth. However, the elongate, attenuated head and remarkable, elongate labium that sometimes nearly reaches the end of the abdomen in *Myocara* spp. are both extremely derived (apomorphic) conditions in the Lethaeini, and it is not possible to consider *Coleocoris* and *Carabocoris* as being directly derived from *Myocara*. These 2 conditions in *Myocara* indicate unusual feeding habits.

Drymini

This is a large tribe, most diverse in the Oriental region, but well represented in all of the major zoogeographic regions of the world except the Neotropical.

In Western Australia, I took only 2 species representing 2 genera. An additional genus and species, *Pseudodrymus florestalis* Gross, was reported by Gross (1965) from Perth and King George Sound.

Isopeltus australis* (Bergroth)

This species is widespread in Australia. Gross (1965) reported material from Victoria, South Australia, Tasmania, New South Wales, Queensland and Western Australia (Fremantle, King George Sound), and also from Papua and Norfolk Island.

This is a small, coarsely punctate species, which is easily recognizable by the broad, pale, explanate lateral pronotal flange, the dark vitta across the hemelytra at the level of the claval commissure, the dark corial apex and the stout, reddish brown antennae.

*Mr G. F. Gross (personal communication) informs me that this species actually belongs to the genus *Brentiscerus* Scudder, as do *Isopeltus obscurus* Gross and *I. tenuicornis* Gross. Thus *Isopeltus* Gross is a junior synonym of *Brentiscerus*, and *Brentiscerus sensu* Gross, 1965 *non* Scudder, 1962 requires a name. Mr Gross suggests that I propose one, and I therefore propose *Grossander* gen. n. to include *Brentiscerus pallidus* Gross, *B. major* Gross, *B. triocellatus* Gross and *B. diffusus* Gross. *B. major* is designated as type-species.

Gross (1965) noted that this species was under investigation in Tasmania as a possible seed predator causing poor germination of broadcast seed of *Eucalyptus regans*. His collection notes included 2 records from flood debris, "in tussocks", "in moss and lichens", "in leaf debris", "in sand dunes under herbs, fallen leaves and seeds of *Casuarina*", "on cunjeroi lilu" and from *Helichrysum diosmifolium* Less.

In southwest Australia this is a common and widespread species. My collecting records agree with several of those of Gross, indicating that *I. australis* generally occurs in shaded, woodland areas. It also is present in numbers in more open sandy areas, but in such habitats is usually encountered in numbers only in dense shade below plants. For example, at an unnamed Wildlife Reserve 34 km N of Perth on December 18, 1971, where a varied rhyparochromine litter fauna was present, chiefly below *Hypocalymma angustifolium* Endl., *I. australis* was one of the most common species (38 ♂♂, 34 ♀♀ collected), but occurred only where the plants were growing under the shade of trees or where the plants were large and themselves created a deep shaded area over a thick litter layer near the base of the plant. In such microhabitats *I. australis* was the most abundant species. It was frequently noticeable, when collecting litter lygaeids below a plant, that *Isopeltus* would appear only after one had spent considerable time collecting in the periphery of the "seed shadow" and had subsequently worked into the deeper litter close to the base of the plant. The species is not completely ground living, as occasional specimens are taken by sweeping.

Apparently *I. australis* occurs only as macropters. Adults fly readily when disturbed. Gross (1965) mentioned specimens taken at light.

At Kings Park, Perth, on December 10, 1971, 4 ♂♂, 5 ♀♀ and nymphs were taken in seed litter of *Hypocalymma robustum* Endl. These plants had a large rhyparochromine assemblage including *Coleocoris ocellatus*, *Udeocoris nigroaeneus*, *Euander lacertosus* and *Plinthisus* sp. *I. australis* was relatively scarce and was found only at the base of the plant where maximum shade and cover was present.

On December 9, 1971, near the Serpentine Dam, Jarrahdale, 4 ♂♂ and 4 ♀♀ were taken in leaf debris below *Daviesia divaricata* (Turcz.) Benth. These plants were growing on an overdrained slope in the shade of large *Hakea* sp. trees.

One ♀ and nymphs were taken at Pemberton, December 21, 1971, in seed litter of *Leucopogon unilateralis* Stschegl. on white sand. This habitat was, for the most part, apparently too hot and dry for *I. australis*, as the few specimens taken were in shade at the edge of the habitat. Additional West Australian specimens were taken as follows: 1 ♀, Torbay, 22 km W of Albany, December 26, 1971; 1 ♀, Pemberton, December 21, 1971; 1 ♀, Mundaring Weir, December 11, 1971.

Austrodrymus flindersi Gross

The holotype was from Flinders Island, South Australia, and the single paratype from Morley Park, Perth (W.A.). Woodward took the paratype from dead *Banksia* leaves.

This small (2.5-2.75), stocky, short-bodied species has a blackish appearance in the field, despite the tan coloration of the clavus and corium. The explanate lateral pronotal flange is slightly sinuate or concave near the transverse impression rather than straight as indicated by Gross (1965). Actually Gross' treatment of this area is confusing, as in couplet 7 of his key he said "sides of pronotum convex from humeral angles to region of collar" (the figure also shows this), but in the original description he said "lateral margins . . . straight from base to about middle of fore lobe, thence convex anteriorad". This latter condition better agrees with the specimens before me if one allows for the slight sinuosity near the transverse impression. Gross mentioned the 1st antennal segment as being dark basally and paler distally. This is variable, some specimens having a completely dark brown segment, others having a pale yellowish-tan segment. Only macropters are known.

Five ♂♂ and 10 ♀♀ were taken at Cranbrook on December 29, 1971, under *Jacksonia nematoclada* F. Muell. and *Acacia laricina* Meisn., but were most common in seed litter below the former. It is a slow-moving, cryptic species whose avoidance

behavior is to move deeper into the litter and even the sand below the litter and remain quiet. Most individuals at the above site were found very close to the bases of the plants. The movements and general habitus are very similar to such Nearctic species as *Drymus unus* (Say).

Antillocorini

The members of this tribe are very small, short-bodied, short-legged species. The distribution is similar to that of the Lethaeini (to which they are related) in that, although the tribe is represented in all major zoogeographic regions of the world, it is chiefly tropical and subtropical in distribution.

Only a single species was taken in Western Australia. This species agrees rather well with the description of *Botocudo ornatulus* (Bergroth). Dr T. E. Woodward informs me that several undescribed species are present in Australia. Because of this, the species is only provisionally placed.

Botocudo sp. nr **ornatulus** (Bergroth)

This is a common species in southwest Australia. We found it associated chiefly with seed litter below species of *Leucopogon*, but it also occurs in seed litter of *Hypocalymma*. It generally occurs in shaded habitats on or near the soil surface. When it is below plants exposed to full sunlight, *B.* sp. nr *ornatulus* usually occurs in dense litter close to the base of the plant.

At Pemberton on December 21, 1971, adults were very abundant (17 ♂♂, 17 ♀♀ collected) below *Leucopogon unilateralis* Stschegl. Both nymphs and adults were abundant (6 ♂♂, 12 ♀♀ collected) under *Leucopogon reflexus* R. B. at Torbay Inlet, 16 km W of Albany on December 28, 1971. We also took 1 ♂ and nymphs under *Leucopogon revolutus* R. Br. at Torbay, 22 km W of Albany on December 26, 1971, and 3 ♀♀ below *Leucopogon tamariscinus* R. Br. at Gold Holes, December 23, 1971. Twenty-three ♂♂ and 10 ♀♀ were taken 34 km N of Perth (unnamed Wildlife Reserve) below *Hypocalymma angustifolium* Endl., December 16 and 18, 1971, and 10 ♂♂ and 13 ♀♀ at Peak Head, S of Albany, below *Hypocalymma cordifolium* (Schm.) on December 27, 1971. Other localities are: 1 ♀, Lake Powell, 16 km W of Albany, December 28, 1971; 1 ♂, Bluff Knoll, December 23, 1971. The entire series is macropterous.

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