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A revision of *Sphodrotes* Kohl, 1889 (Hymenoptera, Sphecoidea Larridae)

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Sphodrotes Kohl, 1889 (Hymenoptera, Sphecoidea, Larridae) is endemic of Australia incl. Tasmania. Twelve species are recognized, and seven of these are new to science. The new species are: *S. ordinaria*, *acuticollis*, *rubra*, *dearmata*, *occidentalis*, *prima* and *splendens*. A single case of synonymy is proposed, viz. *Sphodrotes pilosella* Turner, 1910 (♂) = *S. rubricata* Turner, 1910 (♀). Lectotypes are designated for *S. rubricata* Turner, 1910 and *S. marginalis* Turner, 1914.

A key is given and all species are figured. The male external genital sclerites are figured, and the significance of these and sternum VIII in elucidating the intrageneric phylogeny of *Sphodrotes* is discussed. Brief notes on biology and distribution are presented.

Key words: Sphecoidea. Larridae. *Sphodrotes*. Systematics. Distribution. Biology. Phylogeny.

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1. INTRODUCTION

This paper is to be considered a consequence of my studies on the systematics and phylogeny of the Miscophini of Southern Africa and Madagascar (Lomholdt, in press) which also comprises a re-evaluation and a re-definition of the larrine tribes. In the cited paper, the tribe Miscophini was defined in terms of apomorphic traits, whereby numerous genera were excluded from the tribe (c.f. Bohart & Menke, 1976). The systematic positions of these genera were discussed, and their phylogeny was argued according to cladistic principles. The Miscophini was found to comprise the following nine genera, viz. *Sphodrotes* Kohl, *Solierella* Spinola, *Miscophus* Jurine, *Saliostethus* Brauns, *Miscophoides* Brauns, *Saliostethoides* Arnold, an undescribed genus, *Miscophoidellus* Menke (new status), and *Auchenophorus* Turner. *Sphodrotes* was found to represent the least advanced member of the Miscophini, displaying a sister group relationship to the remaining genera of the tribe. An analysis of the phylogenetic affinities of *Sphodrotes* species thus contributes to the understanding of the ground plan characters of the Miscophini.

In the present paper an attempt is made to analyse the phylogenetic relations of the species of this, obviously monophyletic genus. Morphological details of the male external genital sclerites are valuable. Integumental sculpture and pilosity vary considerably even within species. Colour characteristics are also difficult to use to elucidate the phylogeny of the species.

Previously, only six specific names were applied to *Sphodrotes* (Bohart & Menke, 1976), all of which were published during this century, except *punctuosa* Kohl, 1889, the type species of the genus. All species are endemic of Australia incl. Tasmania.

Recent collecting revealed several undescribed species as well as material to elucidate secondary sexual characters and geographic variation.

Sexual dimorphism is extensive within this genus, and not being aware of this, Turner de-

scribed a new species, *S. pilosella* in 1910, actually being the male of *rubricata* Turner, described a few pages above in the same paper.

2. SYSTEMATICS

Sphodrotes Kohl, 1889

Sphodrotes Kohl, 1889: 188. Type species: *punctuosa* Kohl, 1889, by monotypy.

2.1. Systematic position

Sphodrotes is a member of the subfamily Larriinae and has the following characters considered synapomorphies of all larrine genera (see Lomholdt, 1982 and Lomholdt, in press), viz. 1. antennal sockets close to epistomal suture, 2. cuspis and digitus absent or much reduced, 3. genal tentorial arm present, 4. hindcoxa carinate. In addition, the genus is readily recognized as being associated with other larrine genera since the midtibia has only a single spur, and the mandibles have an externoventral notch and a prominent subbasal tooth. *Sphodrotes* is a member of the tribe Miscophini, of which it is regarded the least advanced member, displaying a sister-group relationship to the remaining genera in the tribe (Evans, 1973, Lomholdt, in press). Unfortunately, the single apomorphic character shared by all miscophinine genera, i.e., absence of the volsellar sclerite, is "negative".

2.2. Description

Head. Inner orbita parallel or slightly converging ventrally. Lateral ocelli circular. Female clypeal synsclerite (i.e. clypeus + lateroclypeus) with a wide median, slightly arcuately convex lobe usually slightly emarginate medially, three small rounded lateral teeth or nodules usually present. Median lobe and lateral teeth are strongly reduced in males. A wide, shallow facial depression above the antennal sockets (the "scapal basin" of Bohart & Menke, 1976) present in most species. Both a frontal line (or carina) and facial foveae usually present, most distinct in females. Proximal flagellar segments with distinct tyloidea in some males. These segments

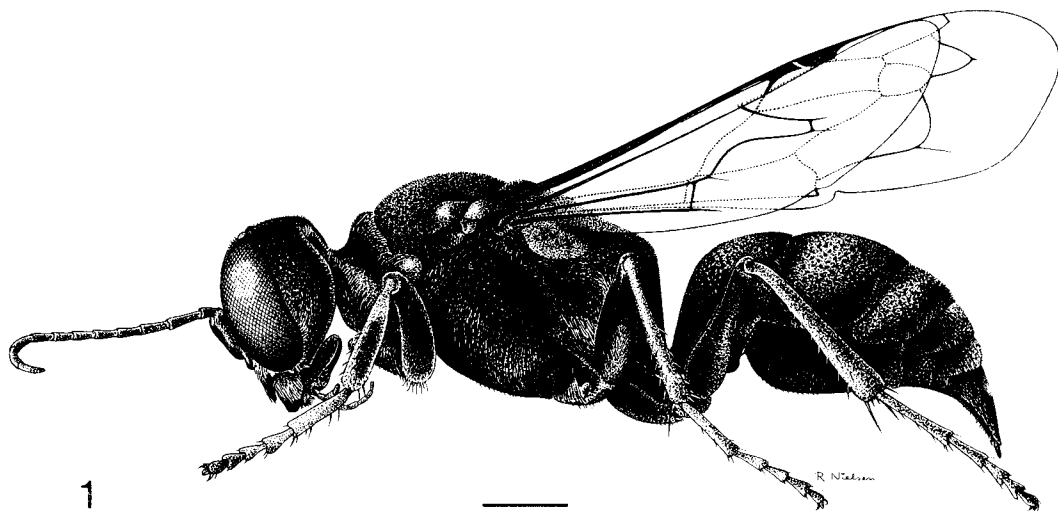


Fig. 1. *Sphodrotes punctuosa* Kohl ♀. Scale 1 mm.

with concave dorsal faces. Mandibles with exte-noventral notch, proximally delimited by a blunt tooth. Inner margin with a double tooth corresponding to the lateral clypeal teeth (fe-males). Occipital carina usually highly raised, not joining hypostomal carina.

Thorax. Pronotum short, collar usually with a low, median swelling. Axillae shining smooth. Anterolateral part of mesopleuron plane.

Propodeal synsclerite. One or two posterola-teral prominences usually present, less pro-nounced in males than in females. Dorsal face with a median carina terminating in a shallow depression, this face otherwise with strong, ir-regular, radiating rugae, or foveolate. Dorsal en-closure only indicated by a shallow, indistinctly pitted, groove.

Gaster. Tergum 1 with a laterobasal, strongly raised, almost angularly projecting lamella. Sternum 1 (except in *prima*) with a median vault or carina terminating in a compressed tooth. Terminal tergum without pygidial plate.

Male terminalia. Distal margin of sternum 8 usually evenly rounded. Volsella absent. Aede-gal valves separate, devoid of marginal teeth ven-trodistally (serrate in *acuticollis*). Gonostyle set-ae sometimes strongly modified (Figs. 42, 51).

Legs. Females with a well developed tarsal

rake and — at least indications of — a psammo-phore.

Wings. Forewings with three submarginal cells of which the second is petiolate. Both re-current veins received by the second submar-ginal cell, or the first being interstitial, or even joining first submarginal cell in single specimens.

2.3. Distribution

Sphodrotes is endemic of the Australian Region, being confirmed to the Australian continent and Tasmania. *S. punctuosa* is the only species occurring in both areas.

Most species are restricted to relatively small geographic areas. Only *rubricata* and *ordinaria* display very extensive distributions. As judged from the available material, *Sphodrotes*-species are rare. Evans (1973), however, collected 18 specimens of *memoralis* near Barron River at Kuranda, NE. Queensland. *S. rubricata* is, ap-parently, the most frequent species, and more than 30 specimens have been available for the present study.

2.4. Biology

The paper by Evans (1973) is the only available one on this subject. He reported on *memoralis* nesting in a sandy bank, shaded throughout the

day by *Eucalyptus* spp. The ground was littered with leaves and debris from the trees. Flight is slow. Prey consists of juvenile pentatomid bugs (Hetetoptera, Pentatomidae), 2-5 mm, which are flown to the nest held by the mandibles. Nests are left open during prey capture. The main tunnel is about half a meter deep, about 6 mm wide, descending vertically the last about 40 cm. The paralyzed prey is presumably stored at the bottom of the tunnel prior to excavation of the cells. Each cell is provisioned with from 6 to 15 specimens.

Pentatomids as prey seem to be rare among the Larrinae, but several genera are insufficiently known as to this subject. Only among *Solierella* Spinola, *Paranysson* Guérin-Méneville, *Protopigastra* A. Costa and *Plenoculus* W. Fox Heteroptera are common prey. Of these, especially *Solierella* is of interest, since it is also a member of the Miscophini sensu Lomholdt (in press), but the common choice of prey apparently does not indicate common ancestry. *Paranysson* and *Plenoculus* were included in the Miscophini by Bohart & Menke (1976), but as result from a cladistic analysis, both genera were excluded from this tribe by Lomholdt (l.c.).

2.5. Key to species

1. Sternum I without posteromedial prominence. Tarsal rake with from seven to nine spines, the distal three collected in a bundle. Foretarsomeres II-IV with three spines distally (Fig. 49). Punctuation very weak, integument without pit-like sculpture 8. *prima* sp.n.
- Sternum I with a posteromedial prominence. Tarsal rake with at most six spines. Foretarsomeres II-IV with two spines distally. Punctuation stronger; deep pits present, at least laterally on mesopleuron 2
2. Clypeal synsclerite, labio-maxillary complex, and legs incl. coxae entirely yellowish ferrugineous. Gaster yellowish ferrugineous apart from a transverse band on tergum II and two black lateral marks on sternum II. ♂: Thorax and propodeal synsclerite more or less ferrugineous. Genitalia strongly aberrant (Fig. 74) . 12. *splendens* sp.n.
- Mainly black species, not agreeing with the characters mentioned above 3
3. An oblique vault between lateral ocellus and inner orbita separating the facial fovea from the remaining frons. Gaster mainly ferrugineous. Posterolateral faces of propodeal synsclerite evenly rounded, without teeth. Posteromedian swelling of sternum I very weak 5. *dearmata* sp.n.
- No vault between lateral ocellus and inner orbita. Character combination different 4
4. Head relatively wide (Fig. 15). Punctuation relatively fine, not forming pits on frons, interstices equal or subequal to diameter of punctures. Terga usually entirely ferrugineous.
♀: Scapal basin absent. Psammophore well developed. Median pronotal prominence shining smooth.
♂: Genitalia and sternum VIII, Figs. 20, 21 4. *rubra* sp.n.
- Head narrower. Sculpture on head, thorax and gaster very strong, punctures pit-like, very closely set. At least terminal terga black.
♀: Scapal basin usually present. Psammophore very weak. Median prominence of pronotal collar punctate or pitted 5
5. Second sternum strongly angularly bent, projecting in lateral view (Fig. 37). All femora and trochanters entirely ferrugineous 7. *cygnorum* Turner
- Profile of second sternum not strongly bent. Trochanters and proximal part of femora black or brownish. NB! Single female *rubricata* from Western Australia with almost entirely light legs . 6
6. First gastral segment elongate, its yellowish ferrugineous pattern much extended (Fig. 65). Lower face, clypeal synsclerite, pronotal collar, dorsal mesopleuron, posterior scutum, propodeal synsclerite, posterior margins of tergum I and II, entire tergum II-V and sternum II and III with dense, appressed, strongly golden shining or brassy pubescence 11. *nemoralis* Evans
- First gastral segment not elongate (Fig. 56), its yellowish ferrugineous markings much reduced, absent or replaced by a reddish ferrugineous colouring. Pubescence much sparser, only slightly golden, brassy or silvery, or indistinct 7
7. Females 8
- Males 12
8. Vertex and genae strongly developed (Fig. 38). Second sternum strongly convex in profile *occidentalis* n.sp.
- Vertex and genae not strongly developed. Second sternum more evenly arcuately convex 9
9. Posterolateral faces of propodeal synsclerite al-

- most evenly rounded, without projecting teeth, at most with a weak dilation. Femora almost entirely black. Gaster black, terga without or with very indistinct apical ferrugineous bands 9. *punctuosa* Kohl
- Posterolateral parts of propodeal synsclerite with a projecting tooth. Femora with large ferrugineous areas. Gaster with distinct apical ferrugineous tergal bands or entirely ferrugineous 10
10. Gaster almost entirely reddish ferrugineous. Tergum I strongly shortened (Fig. 12) 3. *rubricata* Turner
- At most anterior part of tergum I, apical margins of terga II-V, and entire tergum VI yellowish ferrugineous. Tergum I not shortened 11
11. Flagellar segments 1-5 mainly bright ferrugineous. Proximal part of tergum I yellowish ferrugineous (Figs. 56, 57) 10. *marginalis* Turner
- Flagellar segments 1-5 mainly brownish or black. Proximal part of tergum I black 1. *ordinaria* sp.n.
12. Pronotal lobes produced into a slightly compressed spine projecting laterally. Antennae very short (Fig. 26). Entire mesopleuron covered with a strong, densely appressed, slightly golden shining pubescence, obscuring the sculpture 2. *acuticollis* sp.n.
- Pronotal lobes rounded. Antennae not shortened. Mesopleuron with sparser, silvery or brassy pubescence 13
13. Femora mainly ferrugineous. Gaster mainly ferrugineous or ferrugineously transparent 2. *rubricata* Turner
- Femora and gaster mainly black or brownish 14
14. Propodeal spines absent or very indistinct. Tyloidea indistinct or absent. Proximal flagellar segments almost conical. Aedeagal apex subtriangular in outline (Fig. 34) 9. *punctuosa* Kohl
- Propodeal spines present. Tyloidea very distinct. Proximal flagellar segments distinctly convex ventrally, concave dorsally. Aedeagal apex different 15
15. Vertex and genae strongly developed (Fig. 38). Gaster very strongly and densely punctate, without distinct fasciae 6. *occidentalis* sp.n.
- Vertex and genae not so strongly developed. Gaster punctation weaker, the fasciae distinct 16
16. First tergum usually ferrugineous medially and proximally. Facial pubescence slightly golden or brassy. Aedeagus strongly bent, widened subapically (Fig. 59) 10. *marginalis* Turner
- First tergum black except apical margin. Facial pubescence silvery or slightly brassy. Aedeagus evenly bent, apicoventral margin with a lateral dilation (Fig. 7) 1. *ordinaria* sp.n.

2.6. Description of species

2.6.1. *Sphodrotes ordinaria* sp.n.

Figs. 2-7

Holotype ♀: NORTHERN TERRITORY, 12-17 miles E. Alice Springs, 22-27.IX.1972. In CE.

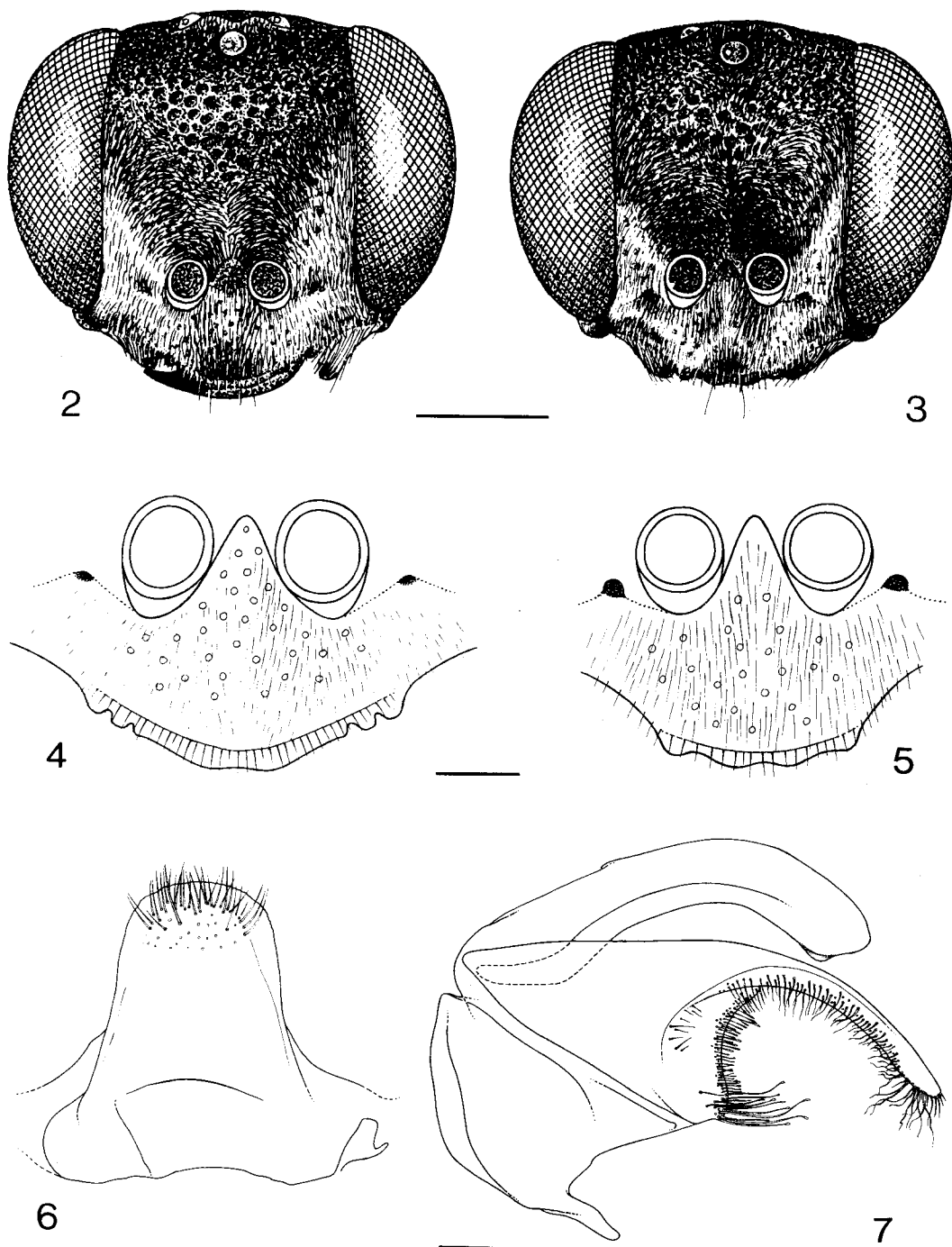
Paratypes: NORTHERN TERRITORY. 1 ♀, Emily Gap, 7 miles E. Alice Springs, 22-26.IX.1972 (CE). 1 ♂, Roe Creek, 12 miles SW. Alice Springs, 23-28.IX.1972 (CE). QUEENSLAND. 1 ♂, Cunnamulla, November (CE). 3 ♂♂, Beerwah, 30.X.1966 (AMCS). 1 ♀, Aratula, 19.XI.1966 (UQDE). 1 ♂, Blackall, 26.X.1968, on *Pepperina* blossoms, (UQDE). 1 ♂, Charleville, 30.X.1968, on *Pepperina* blossoms, (UQDE). 1 ♂, Deane, Caloundra (UQDE). 3 ♀♀, 6 ♂♂, 3 km. S. Tamborine Village, 5., 8., and 20.III.1980 (UQDE). 1 ♂, Caloundra, November 1912 (QMGT). 2 ♂♂, Bribie Island, 3.XI.1913 (QMGT). 1 ♂, Stradbroke Island, 17.IX.1915 (QMGT). 2 ♂♂, Brisbane, 12.II.1914, flowers of *Lomatia*, and 10.X.1916 (QMGT). 1 ♂, Isis district near Childers, 10.X.1973 (ANIC). NEW SOUTH WALES. 1 ♂, George's River near Lugarno, 16.XI.1941 (AMCS). 1 ♂, Como near Sydney, 17.XI.1923 (AMCS). 2 ♀♀, 5 km E. Bilpin near Kurrajong, 8.XI.1977 and 30.XI.1981 (AMCS). 1 ♂, 6 km NE. Bilpin near Kurrajong, 12.XI.1980 (AMCS). 1 ♂, Mountain Lagoon, 12.XII.1977 (AMCS). 1 ♂, Chowilla project, Keera, 23-25.XI.1967 (ANIC). 1 ♀, Sydney, November 1915 (NMNH). 1 ♂, Botany Bay (NMNH). VICTORIA. 1 ♂, Barter, 3.II.1935 (NMNH). 1 ♂, Melbourne district, 1914-494 (BMNH). SOUTH AUSTRALIA. 1 ♂, 15-25 miles SE. Musgrave Park. 16.X.1972 (CE).

Etymology: From Latin: *ordinarius* = ordinary.

Description

Female: 8-9.5 mm.

Head relatively wide (Fig. 2). Frontal punctation usually sparser than in *nemoralis* and *marginalis*, interstices shining, very weakly micro-punctate. Scapal basin indistinct. Almost entire frons and clypeus with fairly strong, greyish-silvery pubescence obscuring the sculpture only on the clypeal synsclerite. Frontal line just indicated. Facial foveae mat, elongate, drop-like depressions, mesally delimited by a shining vault. A deep, strongly sculptate depression between lateral ocelli. Anterior clypeal margin ferrugineous, the three lateral teeth small, rounded, median emargination weak. Scapus black medially, ferrugineous basally and distally. Flagel-



Figs. 2-7. *Sphodrotes ordinaria* sp.n. 2: Female head. 3: Male head. Scale 1 mm. 4: Female clypeus. 5: Male clypeus. Scale 0.2 mm. 6: Male sternum VIII. 7: Male genitalia. Scale 0.1 mm.

lum fairly short, first flagellomere hardly three times longer than wide (17:6), as long as the second. Median flagellar segment ferrugineous beneath.

Thorax. Pronotal collar densely punctate, with a weak, median swelling, covered by a dense, silvery or slightly brassy shining pubescence. Pronotal lobes ferrugineous distally. Scutum and scutellum very densely punctate, interstices shining, less than half the diameter of the punctures, with a dark, brownish golden pubescence. Pubescence along posterior margin of scutum silvery. Mesopleuron densely and deeply punctate/pitted, interstices with silvery pubescence. Hypoepimeral area striato-rugose.

Propodeum. Dorsum with an irregular median carina terminating in a wide, shallowly depressed area. Dorsal face otherwise with indications of radiating rugae connected by transverse rugae, whereby a coarse reticulate sculpture is formed. Posterolateral teeth distinct. Lateral faces irregularly striate anteriorly and posteriorly, a punctate, non-striate area separating the two faces (see "Note"). Posterior face with distinct, widened median groove, otherwise transversely carinate. Posterolateral faces with densely appressed silvery pubescence.

Gaster black, apical tergal margins with silvery fasciae. Punctuation deep.

Legs. Femora black, apices ferrugineous. Femora 2 and 3 ferrugineous along dorsal faces. Tibiae and tarsi also ferrugineous. Metatarsus I with five spines, of which the distal as long as, or slightly shorter than the second tarsal segment.

Wings slightly infumate.

Male: 7-8.5 mm.

Differing from female by following characters. Head (Fig. 3). Facial foveae at most indicated. Clypeal outline as in Fig. 5, lateral teeth only slightly projecting. Pubescence denser, usually more brassy. Proximal flagellar segments with tyloidea, distinctly convex ventrally. Sculpture coarser. Lateral propodeal faces usually transversely carinate throughout. Gaster with-

out ferrugineous areas except extreme base and apical tergal margins. Morphology of the compressed tooth on sternum I highly varying.

Sternum VIII (Fig. 6).

Genitalia (Fig. 7).

Note

The Sydney-specimen (NMNH) deviates from the description above by the following traits: 1) Facial foveae indistinct. 2) Depression between the lateral ocelli more shallow. 3) Pronotal collar with indicated lateral prominences. 4) Lateral propodeal faces striate throughout. 5) Propodeal spines weak. 6) Distal projection of sternum I lower, more rounded. 7) Posterior face of propodeum reticulo-punctate.

This specimen may not be conspecific with *ordinaria*, but before more material is available, this problem cannot be solved.

2.6.2. *Sphodrotes rubricata* Turner, 1910

Figs. 8-14.

Sphodrotes rubricatus Turner. Turner, 1910a, 1914b, Bohart & Menke, 1976. Lapsus.

Sphodrotes pilosella Turner, 1910. Syn. n.

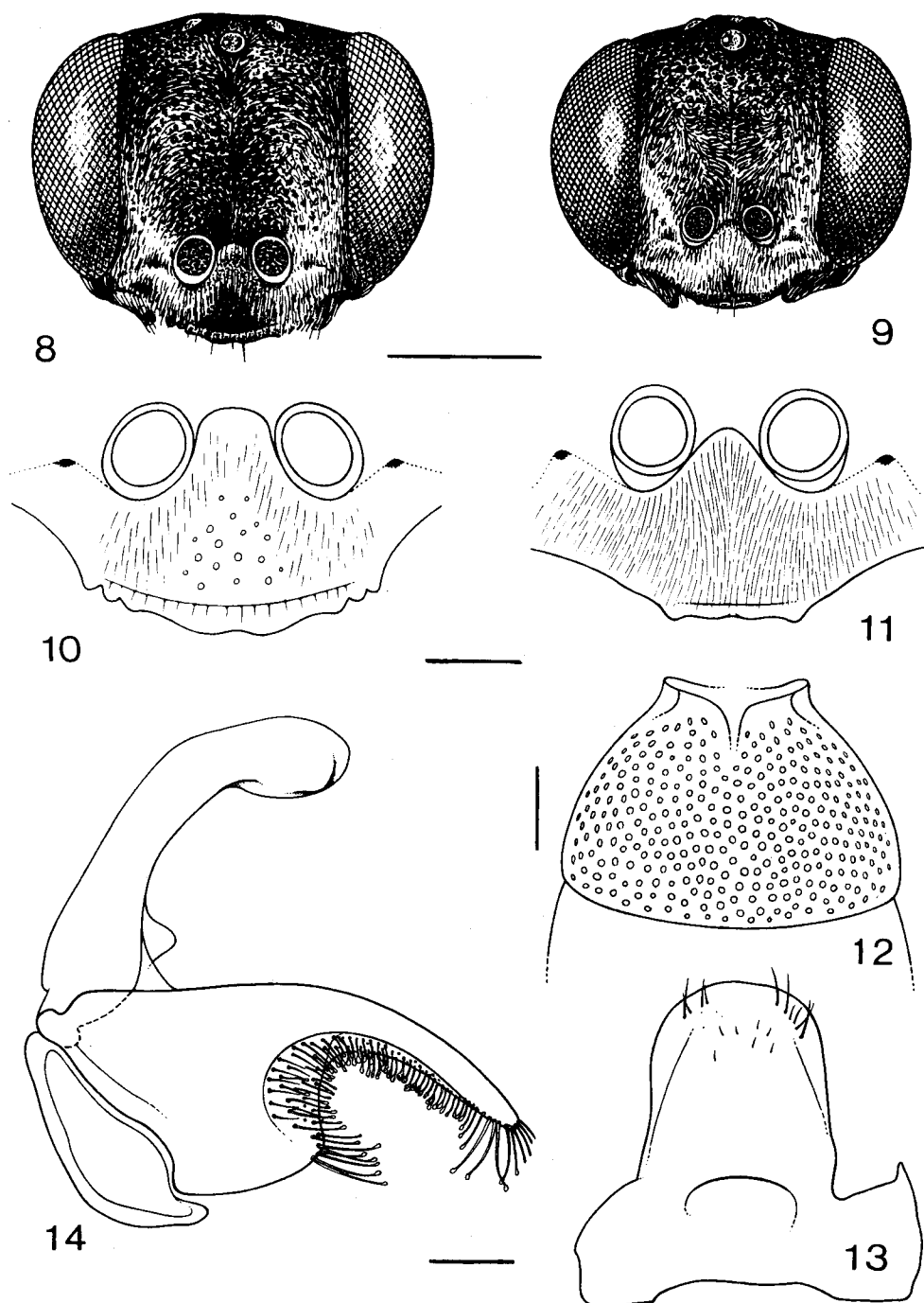
Sphodrotes pilosellus Turner, Turner, 1910a, 1914b, Bohart & Menke, 1976. Lapsus.

Type material of *rubricata*: Lectotype ♀: SOUTH AUSTRALIA, Adelaide, In BMNH. Present designation. — Paralectotypes: 1 ♀, 1 ♂. Same labels as lectotype. In BMNH.

Type material of *pilosella*: Holotype ♂: QUEENSLAND, Cairns, 1911-307. In BMNH.

Further material examined

NORTHERN TERRITORY. 5 ♂♂, 12-17 miles E. Alice Springs, 22-27.IX.1972 (CE). 2 ♀♀, 12°47'S, 132°51'E, 19 km. NE by E of Mount Cahill, 13.VI.1973 (ANIC). 1 ♀, 22°47'S, 136°18'E, Plenty Highway 286 km. ENE of Alice Springs, 14.X.1978 (ANIC). 1 ♂, 4 km. W. of Alice Springs, 31.X.1974, storey on *Aracia aneura* (UQDE). QUEENSLAND. 1 ♀, 2 ♂♂, 23°05'S, 139°18'E, 62 km. W. by S. of Boulia, 16.X.1978 (ANIC). 1 ♂, Blackall, 25-26.X.1968, on *Brachychiton australe* (UQDE). 1 ♂, Cunnamulla, 27-29.X.1979 (UQDE). NEW SOUTH WALES. 1 ♂, Packsaddle, 111 miles N. Broken Hill, 22.XI.1969 (CE). 1 ♀, 40 miles W. Bourke, 28.X.1949 (ANIC). 1 ♀, Mount Boppy, 25.XI.1949 (ANIC). SOUTH AUSTRALIA. 1 ♂, Sth. Para. [?], on *Leptospermum* (SAMA). 1 ♂, N. Adelaide, *Bursaria*, 7.I.1966 (BMNH). WESTERN AUSTRALIA. 1 ♀,



Figs. 8-14. *Sphodrotes rubricata* Turner. 8: Female head. 9: Male head. Scale 1 mm. 10: Female clypeus. 11: Male clypeus. Scale 0.2 mm. 12: Proximal part of female gaster. Scale 0.4 mm. 13: Male sternum VIII. 14: Male genitalia. Scale 0.1 mm.

3 ♂♂, Merredin, 12-13.XII.1935 (BMNH). 1 ♀, Yanchep, 32 miles N. of Perth, 3-19.XII.1935 (BMNH). 1 ♂, Tammin, 11.XII.1935 (BMNH). 1 ♀, 2 ♂♂, Kukurin (ANIC). 1 ♀, Fremantle, 20.XII.1933 (ANIC). 1 ♀, 4 ♂♂, Bunbury, January, 1957 (AMCS). 1 ♀, Cottesloe, 36-4773 (WAMP). 3 ♂♂, Kukerin, November, 1951, on *Casuarina* (WAMP). 10 ♂♂, Dudinin, 48-2530/1, 48-2534/5, 48-2536/7, 48-2540/1, and 48-2546/7 (WAMP). 2 ♀♀, 2 ♂♂, Tarin Rock, 48-2643/4, 48-2684, and 48-2717 (WAMP). 1 ♀, Roltnest, 36-5115 (WAMP). 1 ♀, Dumbleyung, 20.XII.1964 (WAMP).

Description

Female: 7-8.5 mm.

Head (Fig. 8). Strength of sculpture drastically increasing from lower frons to occipital carina behind vertex. The relatively fine punctures on lower frons spaced by several diameters, the pit-like punctures on vertex separated by interstices less than diameter of punctures. Lower face with silvery pubescence of varying strength. Transition between frons and vertex marked by a slight swelling. A deep depression between lateral ocelli. Frontal line only slightly indicated. Facial foveae distinct, in some specimens as an extended drop-like depression devoid of pits. Clypeal outline (Fig. 10), anterior margin ferrugineously transparent. Mandibles densely pubescent proximally, median part ferrugineous amber, apex darker. Scapus dark medially, ferrugineous proximally and distally. Remaining antenna mainly reddish ferrugineous, pedicellus and first flagellomere infusate dorsally, terminal 3-4 segments darkened. First flagellomere almost 2.5 times longer than wide (16:7).

Thorax. Pronotal collar with a weak, sometimes almost impunctate median swelling, its posterior margin with fairly thin, silvery, or slightly golden pubescence. Pronotal lobes bright ferrugineous. Interstices on scutum much less than half the diameter of the punctures (pits), very finely punctate. Axillae shining smooth, without or with a single puncture. Anterior mesopleuron (epicnemium) very finely and densely punctate, with a few, scattered, larger punctures. Episternal sulcus shallow, hard-

ly visible in some specimens. Hypoepimeral area not distinct. Median part of metanotum elevated, coarsely rugose.

Propodeum. Dorsal face with weak median carina terminating in a shallow depression. Dorsal face irregularly rugose, sometimes with slight indications of radiating rugae. Posterolaterally a pointed tooth. Lateral faces with strong, slightly undulating carinae. Posterior face irregularly, transversely rugose/foveolate. Propodeal pubescence silvery, sparse except on posterolateral parts.

Gaster short, mainly ferrugineous (see "Notes"), terga strongly and densely punctate, interstices very finely punctate. Sternum I with a pointed, posteromedian prominence.

Legs mainly light ferrugineous. Psammophore weak, foretarsal rake composed of five strong spines of which the distal is as long as or slightly longer than the second tarsal segment. Succeeding segments with two apical spines.

Wings slightly infusate distally. The first recurrent vein interstitial in a few specimens.

Male: 5-7.5 mm.

Head (Fig. 9). Frontal line distinct, reaching from mid-frons almost to anterior ocellus. Facial foveae absent. Clypeus and lower frons with dense (rarely slightly golden) silvery pubescence totally covering sculpture, reaching along inner orbits to middle of eyes. Clypeal outline (Fig. 11). Antennae short, proximal flagellar segments not, or only slightly swollen ventrally, very slightly concave dorsally. Entire flagellum strongly darkened dorsally. First flagellomere about 1.65 times longer than wide (10:6).

Thorax. Median pronotal swelling absent or indicated. Pronotal lobes strongly darkened.

Propodeum. Posterolateral tooth pointed only in large specimens, in which the posterior face is distinctly transversely carinate.

Gaster. Colour strongly varying. See "Notes".

Legs. Ventral face of anterior femora darkened in some specimens. Psammophore indicated by a few erect setae on anterior trochanter. Foretarsal rake with four to five spines, of which

the distal is shorter than the distal width of the segment.

Wings lighter than in female. The course of the first recurrent vein strongly varying, viz. joining first submarginal cell in single specimens, being interstitial with RS, or (most frequently) joining second submarginal cell.

Sternum VIII (Fig. 13).

Genitalia (Fig. 14).

Notes

Rubricata is selected as the valid name of this species because a) the description includes both sexes of *rubricata*, b) *rubricata* is more frequently used in the literature, and c) *rubricata* has page precedence.

Variation is extensive, even in specimens from the same sample. a) Gastral colouration. In both sexes first and last tergum are quite reddish ferrugineous. A few female specimens from South Australia have a median, longitudinal blackish band on tergum 1. Specimens without blackish gastral markings mainly occurring in the southern part of Western Australia, South Queensland, the southern parts of Northern Territory, and the northern parts of New South Wales, i.e. the relatively dry parts of the continent. Melanisation is initiated from the anterior, i.e. tergum II becomes totally black "before" tergum III etc. b) First recurrent vein usually joins the second submarginal cell, but in several cases (more frequently in males) this vein is interstitial with RS. In some specimens venation is different in two fore wings. In very few specimens (males only) the first recurrent vein joins the first submarginal cell. c) The posterolateral propodeal teeth are absent in about half the male specimens.

2.6.3. *Sphodrotes rubra* sp.n.

Figs. 15-21

Holotype ♀: NORTHERN TERRITORY, 44-45 km. NE of Andado HS, Simpson Desert, 29.IX.1972. In ANIC.

Paratypes: NORTHERN TERRITORY. 1 ♀, 8 km. NE of New Crown, Simpson Desert, 26.IX.1972. In ANIC. NEW SOUTH WALES. 3 ♂♂, 4 miles E. Wilcan-

nia, 1-2.XI.1969. In CE. SOUTH AUSTRALIA. 2 ♂♂, Edeowie, near Wilpena, 29.X.1972, on flowers of *Heterodendron oleifolium*. In CE. 1 ♀, 1 ♂, Emu Springs, 24.I.1963. In SAMA. 1 ♀, Privatefield [?]. In SAMA.

Etymology: From Latin: ruber = red.

Description

Female: 8 mm.

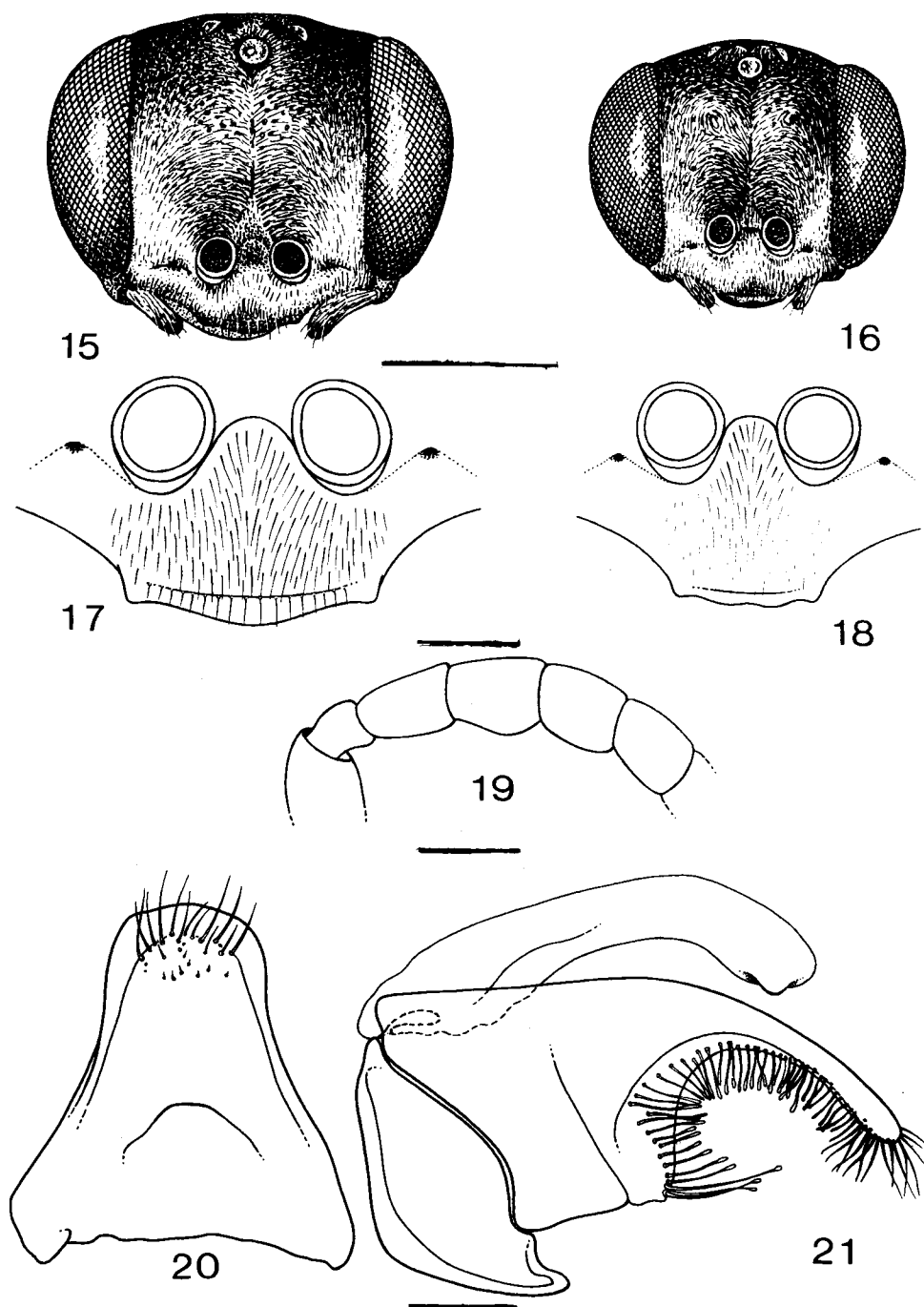
Head (Fig. 15) relatively wide. Sculpture double, consisting of sparse punctures separated by 1-2 diameters on upper frons (invisible on lower frons, clypeus, and lower genae due to very dense, silvery pubescence). Interstices with fine and very dense micropunctuation. Punctuation becoming gradually stronger on vertex, interstices more shining. Frontal line distinct. Facial foveae indistinct, flat, slightly more dull than surrounding integument. Occipital carina low. Median clypeal margin evenly convexly arcuate, lateral teeth indistinct (Fig. 17). Scapus clothed with a thin, silvery pubescence, light ferrugineously transparent basally and distally. Flagellum reddish ferrugineous apart from pedicellus and first flagellomere. First flagellomere about 2.5 times longer than wide (17:7), distinctly longer than the second (15).

Thorax black. Pronotal collar except a median, shining swelling, and mesopleuron covered by a dense silvery pubescence. Posterior half of pronotal more or less ferrugineously transparent. Punctuation stronger than on frons, interstices narrower, the micropunctuation weak.

Propodeum with weak median, longitudinal carina. Radiating rugae irregular. Lower posterolateral spine acute, upper tooth absent. Transition between posterior and lateral faces of propodeum with dense, appressed, silvery pubescence. Lateral faces with transverse, irregular rugae.

Gaster light reddish ferrugineous, sparsely punctate, interstices with very fine micropunctuation. Sternum I with a longitudinal keel, posteriorly produced into a compressed, rounded projection.

Legs. Psammophore well developed. Foretarsal rake with from five to six spines. Tibiae and



Figs. 15-21. *Sphodrotes rubra* sp.n. 15: Female head. 16: Male head. Scale 1 mm. 17: Female clypeus. 18: Male clypeus. 19: Proximal part of male flagellum. Scale 0.2 mm. 20: Male sternum VIII. 21: Male genitalia. Scale 0.1 mm.

tarsi light reddish ferrugineous. Only femur 1 darkened.

Wings hyaline.

Male: 5.5-7.5 mm.

Differing from female by the following characters. Head (Fig. 16). Punctuation on frons almost completely covered by silvery pubescence. Note the "cowlicks". Facial foveae indicated in a few specimens. Clypeal outline (Fig. 18), lateral teeth and median emargination absent. Flagellum fairly short, proximal flagellar segments convex ventrally, concave dorsally, without distinct tyloidea (Fig. 19). Thoracic sculpture denser, interstices between punctures on scutum much smaller than diameters. Median pronotal swelling very weak. Posterolateral propodeal teeth present in a few specimens. Foretarsal rake with five spines, the distal as long as or slightly shorter than maximum width of metatarsus.

Sternum VIII (Fig. 20).

Genitalia (Fig. 21).

2.6.4. *Sphodrotes dearmata* sp.n.

Figs. 22-23

Holotype ♀: WESTERN AUSTRALIA, 10 miles W. of Mullewa, 2.XI.1958. In ANIC.

Paratypes: WESTERN AUSTRALIA. 1 ♀, 25 miles S. of Denham, 9.X.1969. In CE. 1 ♀, Darlington, 1974. In WAMP.

Etymology: from Latin: dearmata = unarmed.

Description

Female: 7.5-9.5 mm.

Very close to *rubra*.

Head (Fig. 22). Punctuation on upper frons stronger than in *rubra*, the punctures spaced by one diameter or less. Two oblique vaults originating from the lateral ocelli, continuing about halfway to the antennal sockets. The impressed line between lateral ocelli very deep. Facial foveae delimited medially by a short, distinct vault.

Thorax. Median pronotal turbercle very weak.

Propodeum. Dorsum with sharp median longitudinal carina, the radiating rugae only slightly irregular. Posterolateral faces evenly rounded, no teeth present.

Gaster reddish ferrugineous with lateral fuscous spots on tergum I. Posteromedian tooth on sternum I very weak, rounded. Sternum II with dark, lateral spots.

Legs. Tibiae and tarsi more strongly spinose than in *rubra*. Femora dark brown.

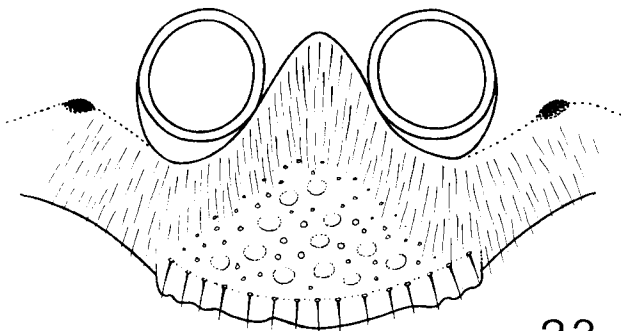
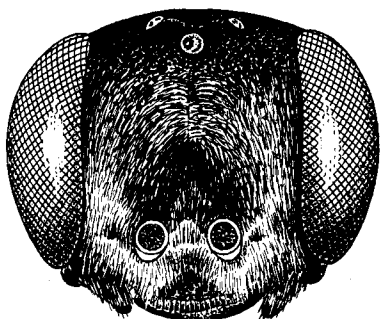
Male unknown.

2.6.5. *Sphodrotes acuticollis* sp.n.

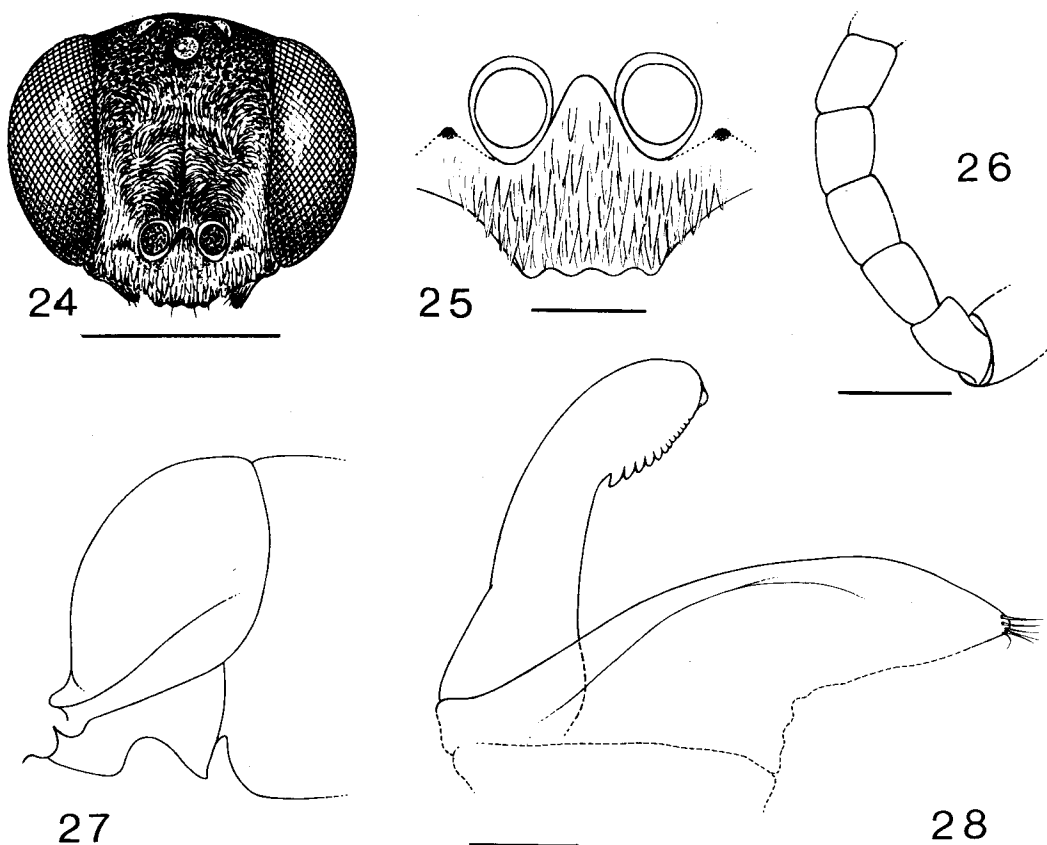
Figs. 24-28

Holotype ♂: NORTH QUEENSLAND, 19 [??], 1942-94. In BMNH.

Etymology: From Latin: acutus = sharp or pointed and collum = neck.



Figs. 22-23. *Sphodrotes dearmata* sp.n. 22: Female head. Scale 1 mm. 23: Female clypeus. Scale 0.2 mm.



Figs. 24-28. *Sphodrotes acuticollis* sp.n. ♂. 24: Head. Scale 1 mm. 25: Clypeus. Scale 0.2 mm. 26: Proximal part of flagellum. Scale 0.2 mm 27: Proximal part of gaster. Scale 0.4 mm. 28: Genitalia. Scale 0.1 mm.

Description

Female unknown.

Male: 6 mm.

Head (Fig. 24): Face and clypeus with a very dense, strongly appressed, light brassy or silvery shining pubescence covering the sculpture. Frons closely and densely pitted, interstices finely micropunctate, much smaller than diameter of pits. Scapal basin deep and wide. Setae along lower half of the inner orbita radiating from a shallowly impressed line. Vertex short, lateral margins strongly converging posteriorly. No distinct impression between lateral ocelli. Occipital carina strongly raised. Median clypeal lobe with four rounded teeth (Fig. 26). Antennae

bright ferrugineous except terminal three segments being dark brown. Flagellum short, no segments with secondary sexual characters. First flagellomere 1.5 times longer than wide (7.5:5), only slightly shorter than the second (8).

Thorax. Pronotal collar with densely appressed brassy pubescence, sculpture coarsely pitted, almost obscured by the pubescence. Anterior pronotal half with very sparse and thin pubescence. Pronotal lobes pointing laterally. Scutum coarsely pitted, interstices very finely and densely punctate, with dark golden or coppery pubescence, posterior margin with brassy pubescence. Scutellum with similar sculpture and pubescence. Metanotum somewhat raised, the posterior, foveolate part falls vertically to

the metanotal-metapostnotal suture. Mesopleuron with densely appressed, light brassy pubescence, underlying sculpture hardly visible.

Propodeum. Dorsum short, with median concavity becoming deeper posteriorly, median carina short. Dorsum and parts of lateral faces with densely appressed brassy pubescence. Dorsal face delimited from the posterior face by irregular ridge. Dorsolateral tooth small, rounded, the lower one absent.

Gaster mainly ferrugineous. Tergum II-VII strongly infuscate medially. Punctuation sparse, punctures on tergum II separated by a distance equal to their diameter (on average). Profile of sternum I characteristic (Fig. 27), deeply concave medially. Sternum II only slightly vaulted, densely pubescent.

Legs ferrugineous, mid- and hind coxae darkened proximally. Forecoxa and -trochanter with a long, whitish, slightly woolly pilosity. Metatarsus I with three short spines.

Wings. First recurrent vein interstitial.

Genitalia (Fig. 28). Very small and unexpectedly delicate, only slightly sclerotized. Aedeagal valve serrate ventro-distally.

2.6.6. *Sphodrotes punctuosa* Kohl, 1889

Figs. 1, 29-34.

Sphodrotes punctuosus Kohl. Turner, 1914a, 1914b. Bohart & Menke. 1976. Unjustified emendation or lapsus.

Holotype ♂: NEW SOUTH WALES. In ZMW.

Further material examined

NEW SOUTH WALES. 2 ♀♀, 2 ♂♂, Kiandra, 10.II.1961 (ANIC). 1 ♂, Island Bend, 2.I.1957 (ANIC). 1 ♂, Jindabyne, 3000 ft., Helms, March, 1889 (AMCS). 1 ♀, Wilson, Blue Mountains, 23.I.1932, 3500 ft. 3 ♀♀, 3 ♂♂, 3 km. South of Mt. Wilson, Blue Mountains, 9.I.1979 (AMCS). 1 ♀, 11 km. North of Clarence, Blue Mountains, 13.II.1978 (AMCS). 1 ♀, Clarence, Blue Mountains, 17.I.1979 (AMCS). 1 ♂, Jinkick, Blue Mountains, 24.XII.1980 (AMCS). 1 ♂, 5 km East of Bilpin near Kurrajong, 15.XI.1977 (MACS). AUSTRALIAN CAPITAL TERRITORY. 1 ♀, Canberra, 14.XII.1954 (ANIC). VICTORIA. 1 ♀, Victoria Hill (QMG). 1 ♂, Wedge Bay, 7.I.1914 (QMG). 1 ♂, Gorae West, 16.I.1951 (ANIC). "NEW HOLLAND". 1 ♂ 44/4 [circular label] (BMNH). 1 ♂, (ZMUC). TASMA-

NIA. 1 ♂, Eaglehawk Neck, 12.II.-3.III.1913 (BMNH). 1 ♂, (MNHN).

Description

Female: (previously undescribed) 9.5-12 mm.

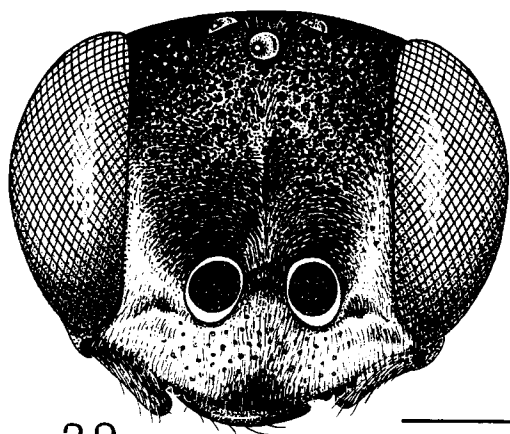
Head (Fig. 29). Facial sculpture double, consisting of deep punctures separated by shining, finely and densely punctate interstices less than their diameter. Lower face with silvery pubescence of varying density. Frontal line absent or very indistinct. Facial foveae distinct, medially bordered by a longitudinal elevation. Clypeal outline (Fig. 31), the three lateral teeth distinct, median emargination very shallow or absent. Mandibles densely pubescent proximally, median part ferrugineously amber, apex black to dark ferrugineous. Antennal colour varying from almost quite dark brown or black to light yellowish ferrugineous. First flagellomere three times longer than wide (27:9).

Thorax incl. pronotal lobes black, strongly and densely punctate, punctuation on scutum not as strong as that of frons, interstices even, finely punctate. Pronotal collar with a small, shining, median tubercle, posterior margin with silvery or slightly brassy pubescence. Anterodorsal mesopleuron very strongly sculptured, punctures pit-like. Episternal sulcus deep. Hypoepimeral area with coarse, reticulo-striate sculpture. Entire mesopleuron with thin greyish-white pubescence.

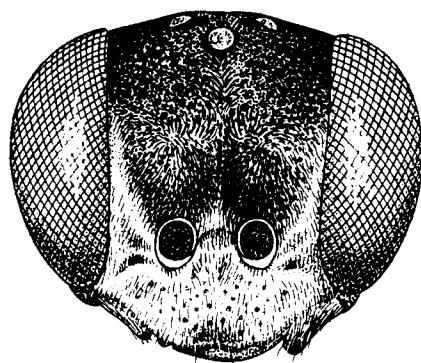
Propodeum. Dorsal face with a weak, median carina (absent in some specimens), remaining surface strongly reticulate. Posterolateral areas with dense, silvery pubescence, teeth absent or only slightly indicated. Lateral faces coarsely striate medially. Posterior face with superficial, transverse striation.

Gaster black, apical tergal margins slightly ferrugineously transparent. Pubescence thin, silvery to slightly golden, forming fasciae on tergum I-III. Sternum I with indistinct median keel, posterior tooth rather weak.

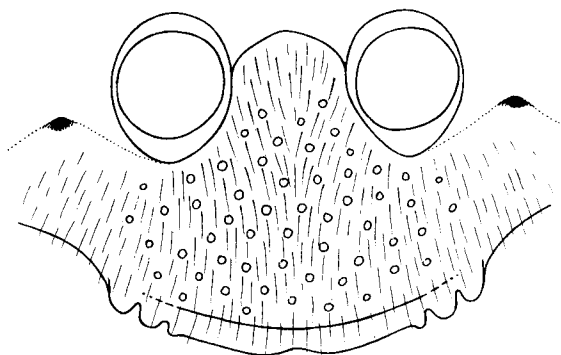
Legs. Femora black with light ferrugineous apices. Tibiae and tarsi light ferrugineous. Fore-



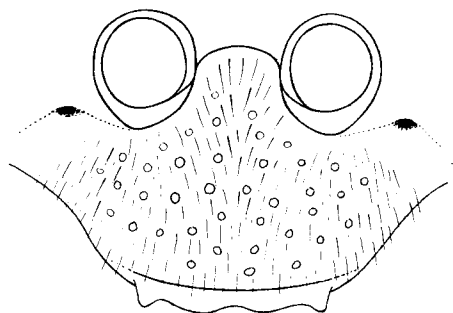
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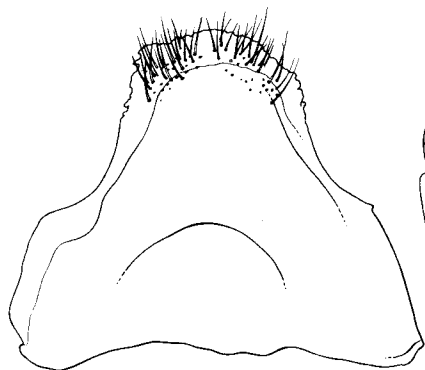
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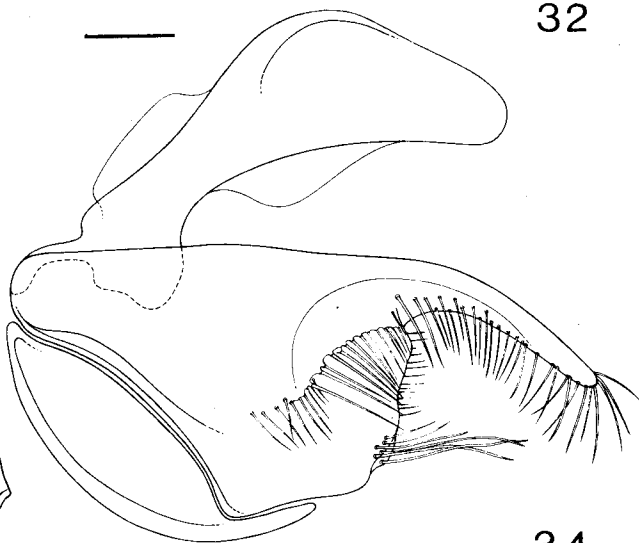
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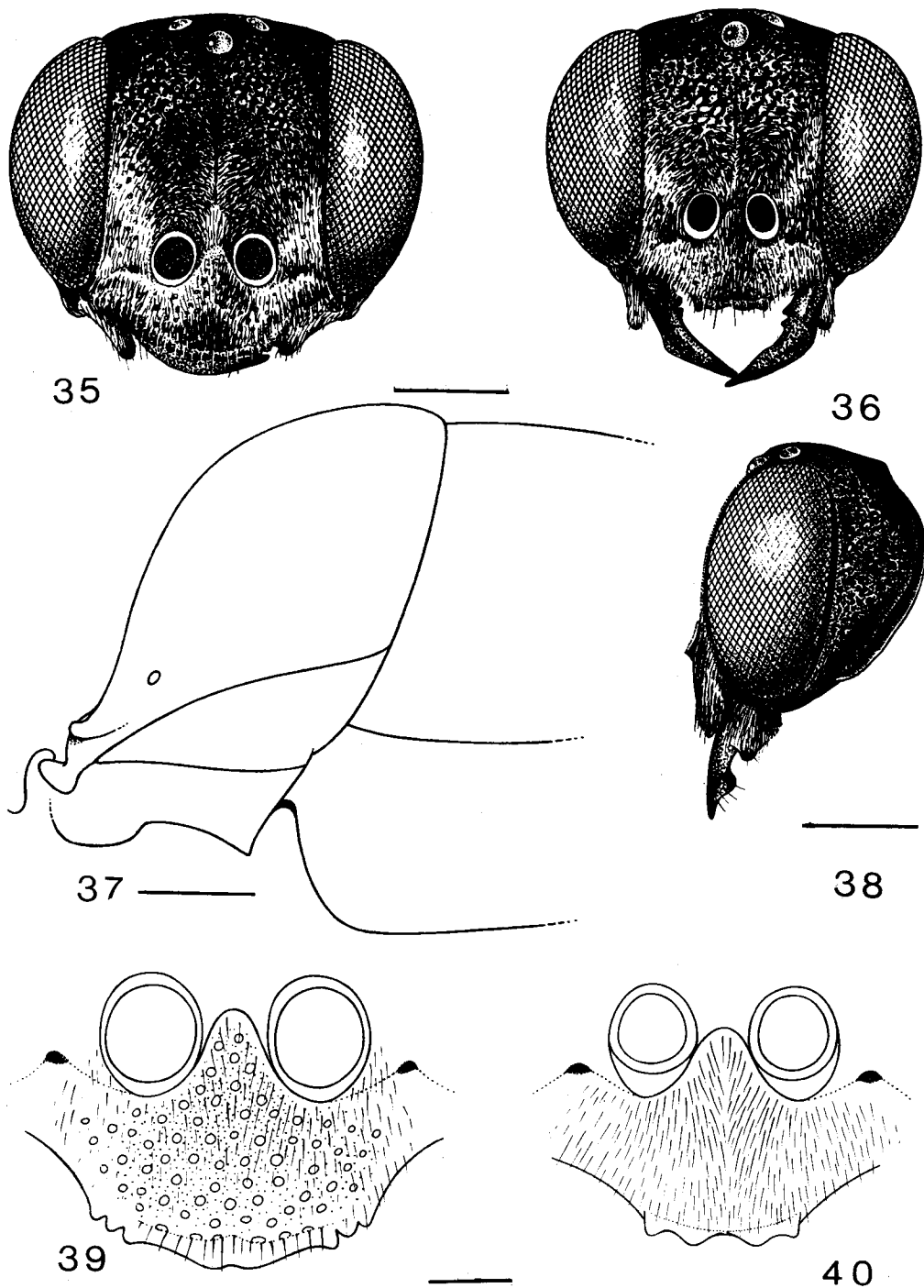


33



34

Figs. 29-34. *Sphodrotes punctuosa* Kohl. 29: Female head. 30: Male head. Scale 1 mm. 31: Female clypeus. 32: Male clypeus. Scale 0.2 mm. 33: Male sternum VIII. 34: Male genitalia. Scale 0.1 mm.



Figs. 35-40. *Sphodrotes cygnorum* Turner. 35: Female head. 36: Male head. Scale 1 mm. 37: Proximal part of female gaster. Scale 0.4 mm. 38: Male head. Scale 1 mm. 39: Female clypeus. 40: Male clypeus. Scale 0.2 mm.

metatarsus with 5-6 rake spines of which the distal one is distinctly shorter than the second tarsal segment.

Wings slightly infumate.

Male: 8-10 mm.

Differing from female by the following characters. Head (Fig. 30). Punctuation on frons much denser and stronger, interstices narrower, micropunctuation finer. Frontal line distinct in some specimens. Facial foveae absent. Scapal basin deeper. Frontal and clypeal pubescence much denser, brassy or slightly golden. Clypeal outline as in Fig. 32. Antennae long, first flagellomere almost twice as long as wide (15:8). Proximal flagellar segments light ferrugineous ventrally to quite light ferrugineous. Tyloidea absent or only very slightly indicated. Proximal flagellar segments conical, slightly convex ventrally and concave dorsally in a few specimens. Median pronotal prominence very weak or absent. Pronotal lobes slightly ferrugineously transparent in some specimens. Thoracic, propodeal, and gastral sculpture stronger and denser.

Legs. Metatarsus I with 4-5 rake spines.

Sternum VIII (Fig. 33).

Genitalia (Fig. 34).

Note

Small males of this species may be difficult to separate from *cygnorum* without examining the genital sclerites. *S. cygnorum* apparently occurs only in Western Australia.

2.6.7. *Sphodrotes cygnorum* Turner, 1910

Figs. 35-42

Holotype ♀: WESTERN AUSTRALIA, Claremont, 10. XII.1908. In BMNH.

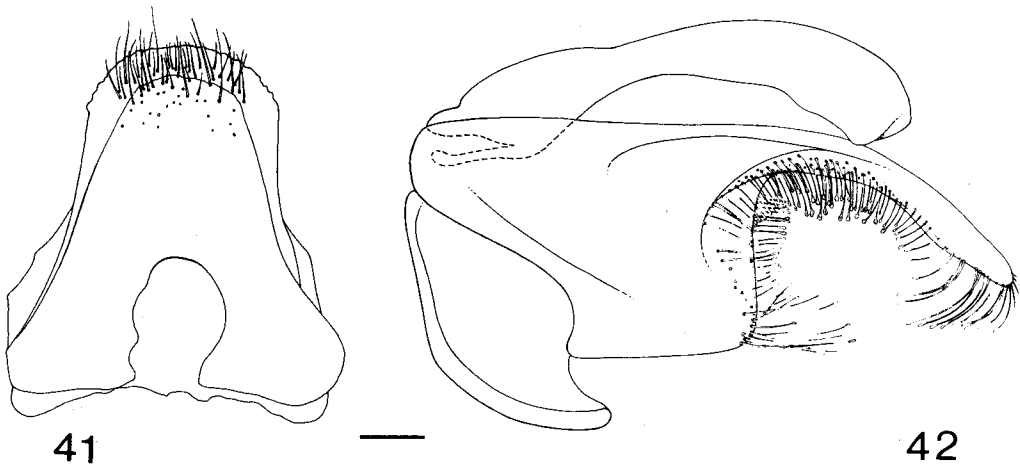
Further material examined

WESTERN AUSTRALIA. 8 ♀♀, Yanchep, 32 miles North of Perth, 24.XI.-2.XII.1935 (BMNH). 2 ♀♀, 4 ♂♂, Yallingup and 44 km. South of Yallingup, 23.-24.XII.1979 (UCD). 1 ♂, 6 miles East of Yallingup, 22.XII.1966, on *Eucalyptus* (UQDE). 1 ♂, Dongarra, 11.-28.X.1935 (BMNH). 3 ♀♀, 4 ♂♂, Bunbury, January 1957 (AMCS). 1 ♂, Pearce (ANIC). 1 ♂, Pemberton, 30.XI.1936 (ANIC). 1 ♂, Coogee, Fremantle, 8.XII.1933 (ANIC). 1 ♀, Cannington, 5.I.1956 (WAMP). 1 ♂, Murdoch, Perth, 13.XI.1978 (WAMP). 1 ♂, Denmark, 16.I.1980 (WAMP). 1 ♀, Deep Dene, Karridale, 1.II.1963 (ANIC).

Description

Female: 9-11 mm.

Head (Fig. 35). Frons very densely pitted,



Figs. 41-42. *Sphodrotes cygnorum* Turner. 41: Male sternum VIII. 42: Male genitalia. Scale 0.1 mm.

interstices shining, with very fine micropunctuation. Lower face excavated forming a scapal basin. Frontal line distinct, facial foveae indistinct. Facial pubescence fairly sparse, silvery. Clypeus (Fig. 39), lateral teeth as well as median emargination distinct in most specimens. Anterior margin ferrugineous in single specimens. Vertex heavily developed. Genae large. Occipital carina strongly raised, collar-like. Mandibular base black, apex dark ferrugineous to black, median part amber to dark ferrugineous. Antennae brownish, darkened towards apex. Scapus light ferrugineous distally and proximally. Flagellum long, first flagellomere three times longer than wide (24:8).

Thorax strongly and densely punctate, interstices shining, finely punctate. Pronotal collar with very weak median swelling sometimes invaded by the strong sculpture. Distal half of pronotal lobes often dark ferrugineous. Posterior part of scutum and scutellum with indications of longitudinal rugosity. Mesopleuron flattened anteriorly, episternal suture strongly pitted, hypopleural area slightly stronger sculptured than remaining lateral mesopleuron. Thoracic vestiture much reduced, restricted to a short and sparse, greyish-silvery pubescence along posterior margin of pronotal collar, humeral tubercles, and ventral and lateral faces of mesopleuron.

Propodeum. Dorsal face coarsely pitted or rugoso-reticulate. Median carina indistinct. Lateral faces with coarse, slightly undulating carinae. Posterolateral faces densely clothed with silvery pubescence, punctate, teeth distinct. Posterior face transversely carinate, most distinctly ventrally.

Gaster. Strongly and densely punctate, black except the shining, ferrugineous apical tergal margins and the last segment. Entire gaster with dull appearance due to rather dense, greyish pubescence. Sternum I with strong, backwardly projecting spine. Sternum II strongly angularly bent when examined laterally (Fig. 37).

Legs mainly dark yellowish ferrugineous. Foremetatarsus with five (rarely six) short spines,

of which the distal one is shorter than the second tarsal segment.

Male (hitherto undescribed): 6.5-9.5 mm.

Differing from the female by the following traits. Head (Figs. 36, 38). Clypeal outline (Fig. 40). Lower face with dense, silvery to brassy pubescence. Facial sculpture very strong, interstices very much reduced. Frontal line and facial foveae reduced. Antennae brownish, proximal flagellar segments more or less ferrugineous. Flagellar segments 1-4 with distinct tyloidea, distinctly convex ventrally, concave dorsally. Thoracic and gastral sculpture stronger and denser, pronotal lobes mainly black. Angulation of sternum II much less pronounced, especially in small specimens. Colour of legs varying from almost uniform ferrugineous to brownish.

Sternum VIII (Fig. 41).

Genitalia (Fig. 42).

Notes

All specimens originate from close to the SW coast of Western Australia near Perth. Male *cygnorum* and *punctuosa* may easily be confused, but the distribution-pattern of these two species is highly different. The morphology of the genital sclerites (Figs. 34 and 42) easily separates the two species.

2.6.8. *Sphodrotes occidentalis* sp.n.

Figs. 43-44

Holotype ♀: WESTERN AUSTRALIA, Busselton, 14.XII.1972. In WAMP.

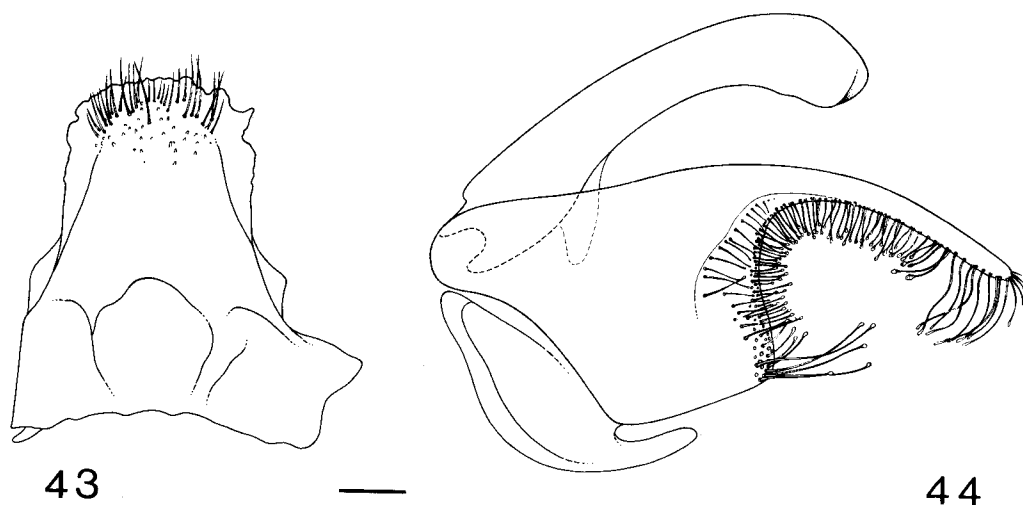
Paratypes: WESTERN AUSTRALIA. 1 ♂, Murdoch, Perth, 13.XI.1978. In WAMP. 2 ♂♂, Busselton, December 1979. In UCD. 1 ♀, Esperance, 20.I.1968. In NMVN.

Etymology: From Latin: Occidens = The countries in the (south) west.

Description

Female: 10.5 mm. *Male*: 8 mm.

Very close to *cygnorum*, but distinguished from it by the following characters: Sculpture stronger and denser. No indication of longitudinally orientated sculpture on scutellum and scu-



Figs. 43-44. *Sphodrotes occidentalis* sp.n. 43: Male sternum VIII. 44: Male genitalia. Scale 0.1 mm.

tum. Foremetatarsus with six spines. Femora black. Angulation of sternum II less pronounced. Male sternum VIII and genitalia (Figs. 43-44). No distinct morphological characters of these sclerites different from *cygnorum*.

2.6.9. *Sphodrotes prima* sp.n.

Figs. 45-51

Holotype ♀: WESTERN AUSTRALIA, Carnamah, 4. XI.1958. In ANIC.

Paratypes: WESTERN AUSTRALIA. 4 ♀♀, Miaboolya Beach 9 miles North of Carnarvor, 4.X.1969. In MCZH and NMNH. 1 ♀, Morawa, 12.X.1975. In WAMP. NORTHERN TERRITORY. 1 ♀, 1 ♂, Emily Gap 7 miles East of Alice Springs, 22.-26.IX.1972. In MCZH. 1 ♀, 12-17 miles East of Alice Springs, 22.-27.IX.1972. In MCZH. 1 ♂, Ayres Rock 250 miles SW of Alice Springs, 25.IX.1972. In MCZH.

Etymology: From Latin: primus = the first.

Description

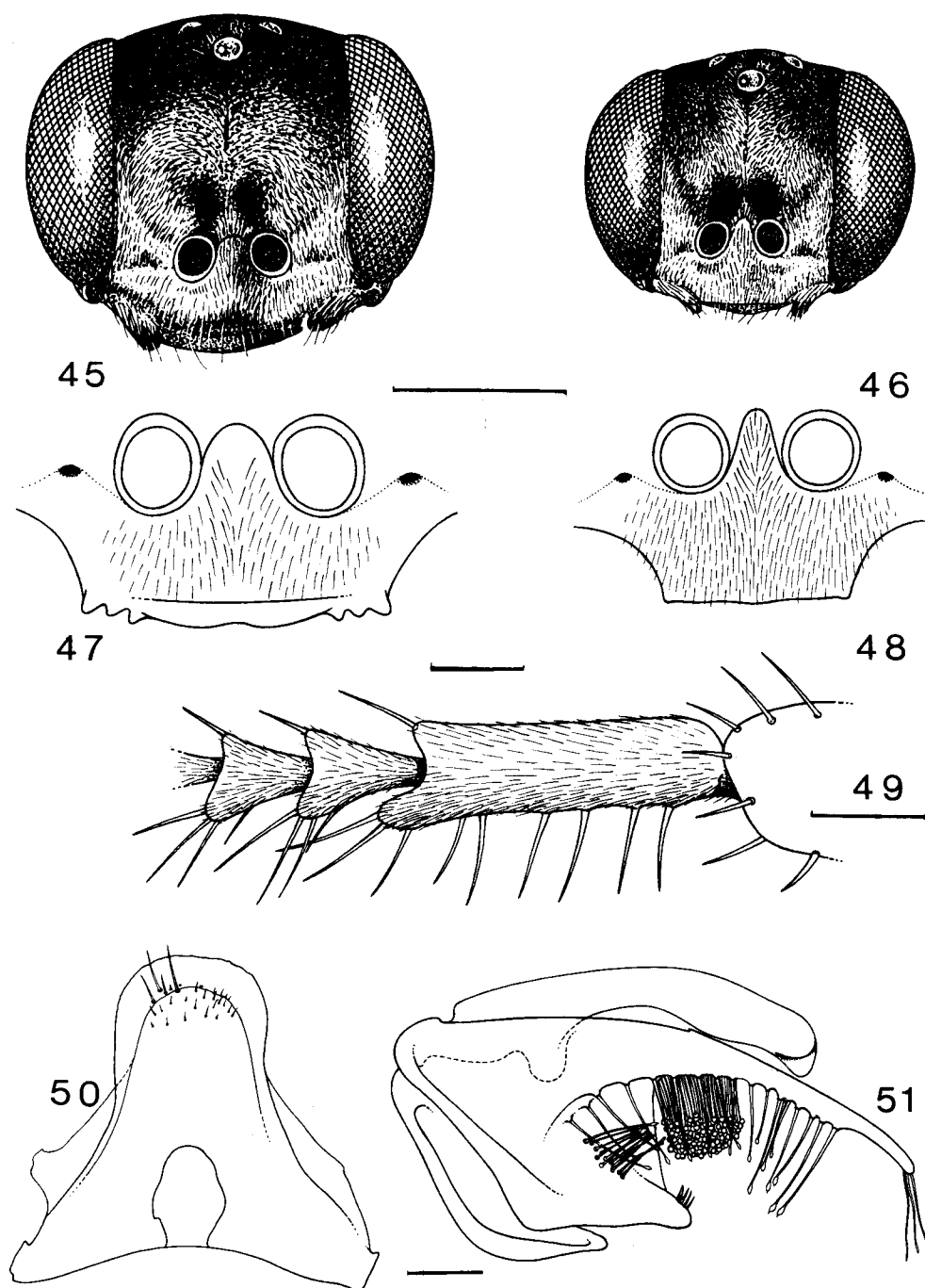
Female: 7.5-9.5 mm.

Head (Fig. 45). *Lyroda*-like. Frons shining, sculpture composed of small, very densely set punctures, interstices less than diameter of punctures. Punctuation becomes more sparse on vertex, interstices becoming equal or subequal to punctures. Frontal line well impressed and

distinct. Facial foveae indistinct, duller than remaining frons. Lower face almost even, punctate apart from impunctate area above antennal sockets. Pubescence on lower frons silvery or very slightly golden, darker golden in larger specimens. Genae shining, sparsely punctate, with dense, silvery pubescence. Occipital carina low. Clypeus covered with densely appressed pubescence, anterior margin wide between two or three lateral teeth (Fig. 47). Mandibles ferruginous, apex and base darker. Antennae long, dark brown or blackish except base and apex of scapus. First flagellomere almost 2.5 times longer than wide (17: 7), much longer than the second (12).

Thorax. Only lateral mesopleuron with scattered, shallow pits, otherwise very finely and densely punctured. Pronotal collar very indistinctly trituberculate. Entire thorax with thin, greyish, silvery, or slightly golden shining pubescence, densest on the pronotal collar and dorsal mesopleuron.

Propodeum. Dorsal face with well developed median sulcus, a series of almost straight, oblique rugae originating from sulcus. Interstices finely rugosopunctate, with fine, short pubescence. No posterolateral teeth, in their place



Figs. 45-51. *Sphodrotes prima* sp.n. 45: Female head. 46: Male head. Scale 1 mm. 47: Female clypeus. 48: Male clypeus. 49: Proximal part of female tarsus 1. Scale 0.2 mm. 50: Male sternum VIII. 51: Male genitalia. Scale 0.1 mm.

two blunt swellings covered with denser pubescence. Lateral propodeal face shining, sparsely and finely punctured anteriorly, rugosostrate posteriorly. Posterior face plane, indistinctly rugose.

Gaster. Mainly black, apical tergal margins ferrugineous. All terga finely and sparsely punctate, interstices densely micropunctate. Sternum I without posteromedian prominence, a median sulcus indicated.

Legs mainly black. Apices of femora, tibiae, and tarsi ferrugineous. Psammophore well developed, composed of strong, slightly curved setae. Foretarsal rake with seven spines on metatarsus (three collected in an apical bundle). Succeeding three segments with three long, distal spines (Fig. 49).

Wings infuscate.

Male: 6.5-7.5 mm.

Very similar to female, but deviating by the following characters. Head (Fig. 46). Anterior clypeal margin slightly protruded medially, with strongly developed lateral teeth. Pubescence and sculpture stronger.

Sternum VIII (Fig. 50). Apical margin microscopically crenulate.

Genitalia (Fig. 51). Volsellar area protruded, concavity deep, with dorsomedian pouch carrying a strong bundle of stout spines. Pouch with mesal projection distally. Remaining gonostyle setae with knob-like dilation distally.

2.6.10. *Sphodrotes marginalis* Turner, 1914

Figs. 52-60

Lectotype ♀: QUEENSLAND, Maryborough, 2.II.1913. In BMNH. Present designation. **Paralectotype** ♀: QUEENSLAND, Brisbane, 22.I.1912. In BMNH.

Further material examined

QUEENSLAND. 1 ♀, 1 ♂, Stradbroke Island, 5.XII.1913 and 3.XII.1912, respectively, Type series (red labels) (QMG). See notes below. 1 ♀, Stradbroke Island, 1.III.1980 (UQDE). 4 ♂♂, Bribie Island, 1.IV.1923 (QMG). 2 ♀♀, 1 ♂, Yeppoon, 18-23.XII.1979, 3-6.II.1970, 20.XII.1961 (UQDE, CE and ANIC). 1 ♀, Goodwood, Isis Shire, 5.IV.1973 (ANIC). 1 ♂, Childers Road near Bundaberg, 29.XI.1972 (ANIC).

The paralectotype carries a label in Turner's hand: *Sphodrotes* sp.n. It is most probably identical with the specimen mentioned in the original description (Turner, 1914: 346) and is therefore considered a syntype.

The two specimens (♀ and ♂) from Stradbroke Island (QMG) carry red labels: Type series. This material cannot be regarded part of the type material since it was not mentioned in the original description.

Description

Female: 7-11 mm.

Head (Fig. 52). Frons densely punctate, interstices shining, punctate, on average much narrower than diameter of punctures. Sculpture gradually becomes finer and sparser on lower frons. A wide, very densely punctate depression between lateral ocelli. Behind these an oblique row of stronger punctures/pits. Frontal line indistinct, of varying length, interrupted in some specimens. Facial foveae distinct, forming elongate, drop-like, mat depressions. Anterior clypeal margin (Fig. 54) ferrugineous. Lower face and clypeus with dense silvery or slightly golden pilosity. Mandibles, except the darkened apex, almost uniform light ferrugineous amber. Antennal base, i.e. pedicellus + flagellomeres 1-4 (5) also light ferrugineous amber. First flagellomere three times longer than wide (22:7), distinctly longer than the second (20).

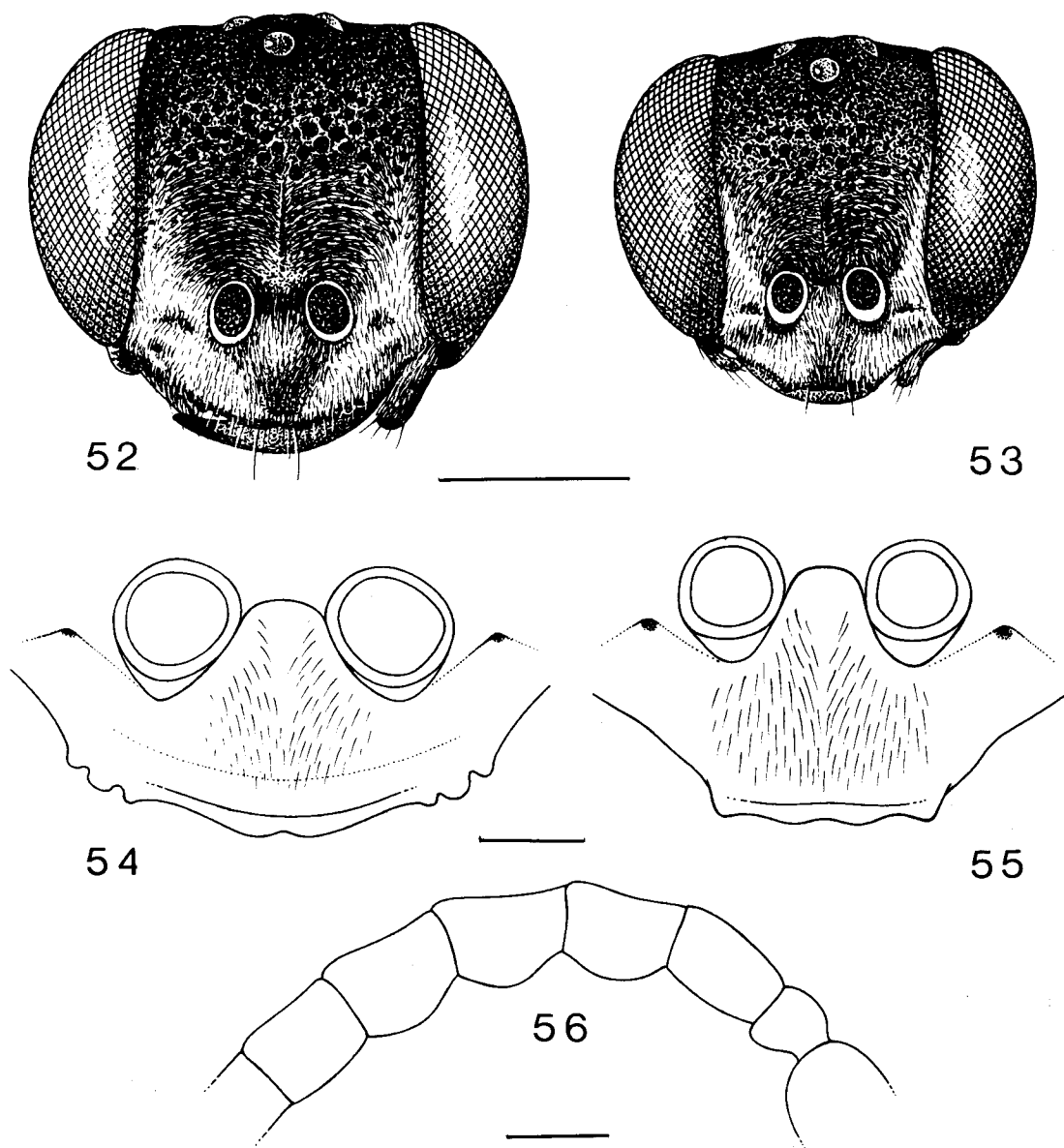
Thorax. Pronotal collar relatively finely and sparsely punctate. Pronotal lobes light ferrugineous with median, black mark. Collar with dense covering of brassy or slightly golden (never silvery!) hairs. Scutum very densely and strongly punctate, almost rugose, with a brassy or slightly golden band along the posterior margin. Lateral faces of mesopleuron with dense, large, rounded pit-like punctures. Episternal sulcus deeply impressed, pitted. Hypoepimeral area distinctly delimited, rugose. Mesopleural pilosity sparse, greyish-silvery.

Propodeum. Dorsal propodeal face strongly reticulate, median carina distinct in most specimens. Posterolateral spines well developed. Lateral faces with a few, short, very strong rugae crossing a slightly depressed area. Dorsal, poste-

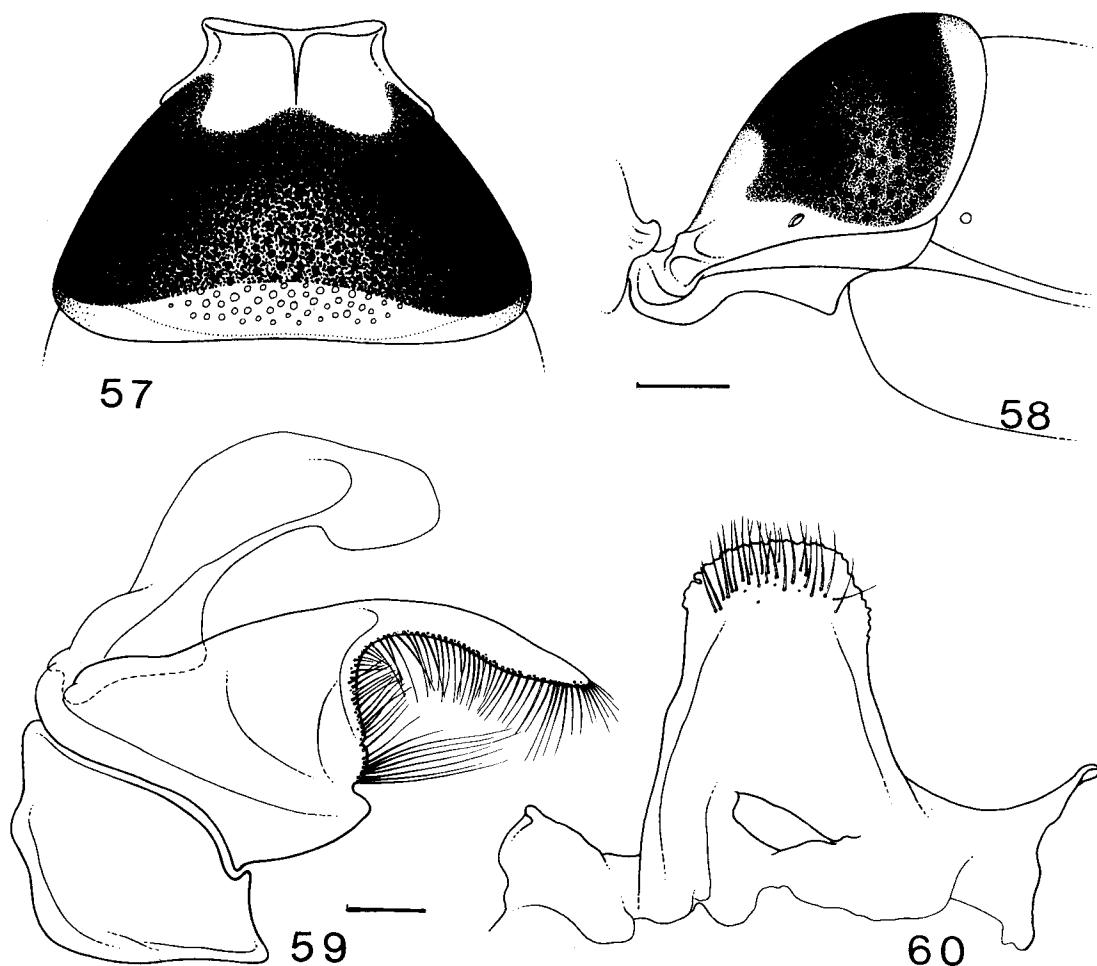
rolateral, and posterior faces with fairly dense, brassy or slightly golden shining pubescence.

Gaster. Tergum I slightly elongate, proximal and lateroventral parts, as well as apical margin reddish ferruginous (Figs. 57-58). Apical mar-

gins of terga II-V and entire tergum VI also ferruginous. Punctuation of tergum II not very dense. Apical margins of tergum I and II and entire terga II-V with a fairly dense covering of brassy golden hairs. Sternum I ferruginous, with



Figs. 52-56. *Sphodrotes marginalis* Turner. 52: Female head. 53: Male head. Scale 1 mm. 54: Female clypeus. 55: Male clypeus. Scale 0.2 mm. 56: Proximal part of male flagellum. Scale 0.2 mm.



Figs. 57-60. *Sphodrotes marginalis* Turner. 57-58: Proximal part of female gaster in dorsal and lateral view. Scale 0.4 mm. 59: Male genitalia. 60: Male sternum VIII. Scale 0.1 mm.

a weak median keel terminating in rounded tooth. Sternum II with very coarse and dense pit-like punctation.

Legs. Apical half of femora, entire tibiae and tarsi light ferrugineously amber. Metatarsus I with five spines of which the distal as long as or slightly shorter than second tarsal segment.

Wings slightly infumate.

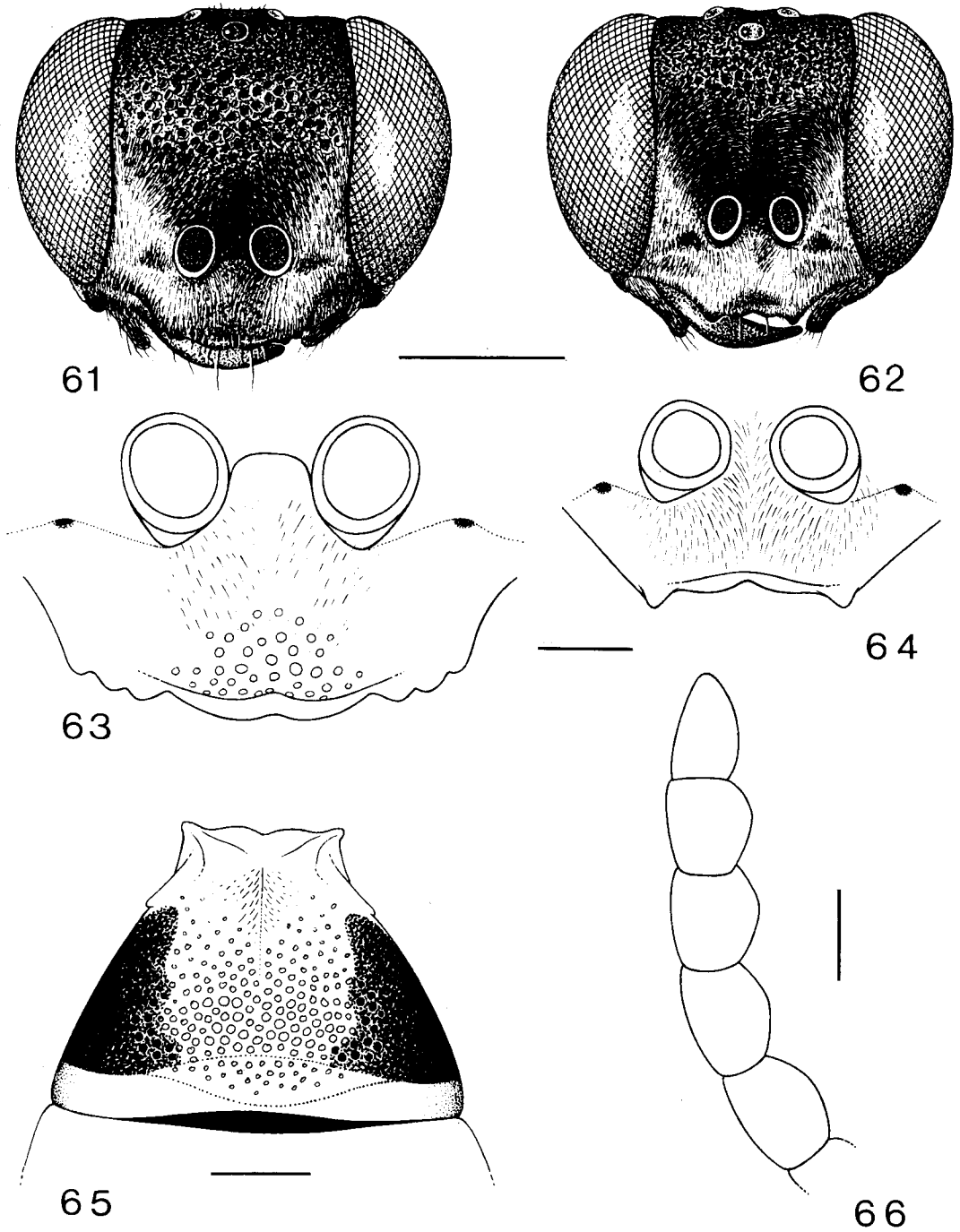
Male: 7-8 mm.

Deviating from female by the following characters. Head (Fig. 53). Clypeal outline (Fig.

55), lateral tooth slightly projecting (as in *ordinaria*, Fig. 5, but less than in *nemoralis*, Fig. 64). Facial sculpture a little stronger, facial foveae very indistinct. Flagellomeres 1-4 with distinct tyloidea, distinctly concave dorsally (Fig. 56). Almost entire flagellum light ferrugineous. Thoracic sculpture stronger and denser. Pubescence of propodeum weaker, light brassy to silvery. Gaster more strongly punctate. Tergum I at least with some red at the base and ventrolaterally.

Sternum VIII (Fig. 60).

Genitalia (Fig. 59). Aedeagal valve strongly



Figs. 61-66. *Sphodrotes nemoralis* Evans. 61: Female head. 62: Male head. Scale 1 mm. 63: Female clypeus. 64: Male clypeus. Scale 0.2 mm. 65: Proximal part of female gaster. Scale 0.4 mm. 66: Proximal part of male flagellum. Scale 0.2 mm.

dilated subapically. Volsellar setae almost reaching apex of gonostylus.

Notes

Large females may be confused with small female *nemoralis*, and small females with large *ordinaria*. Males are readily identified by genital characters. It seems that this species has a very limited (isolated) occurrence in SE Queensland.

2.6.11. *Sphodrotes nemoralis* Evans, 1973

Figs. 61-68

Holotype ♀: QUEENSLAND, Kuranda and vicinity, 4-13. XI.1972. In ANIC. *Paratypes*: 12 ♀♀, 6 ♂♂, same labels as holotype. In ANIC, BMNH, CE and NMNH.

Further material examined

QUEENSLAND. 1 ♀, near Hartley's Creek, March 1950 (NMNH). 1 ♀, Dividing Range, 15 km. West of Captain Billy Creek, Cape York Peninsula, 4.-9.VII.1975 (ANIC). 2 ♂♂, Somerset, Cape York, 16.-17.IV.1973 (ANIC). 1 ♂, Stewart River, 5 km West of Port Stewart, 25.-27.VI.1976 (ANIC). 1 ♂, Isis District near Childers, 10.X.1973 (ANIC).

Description

Female: 9.5-11.5 mm.

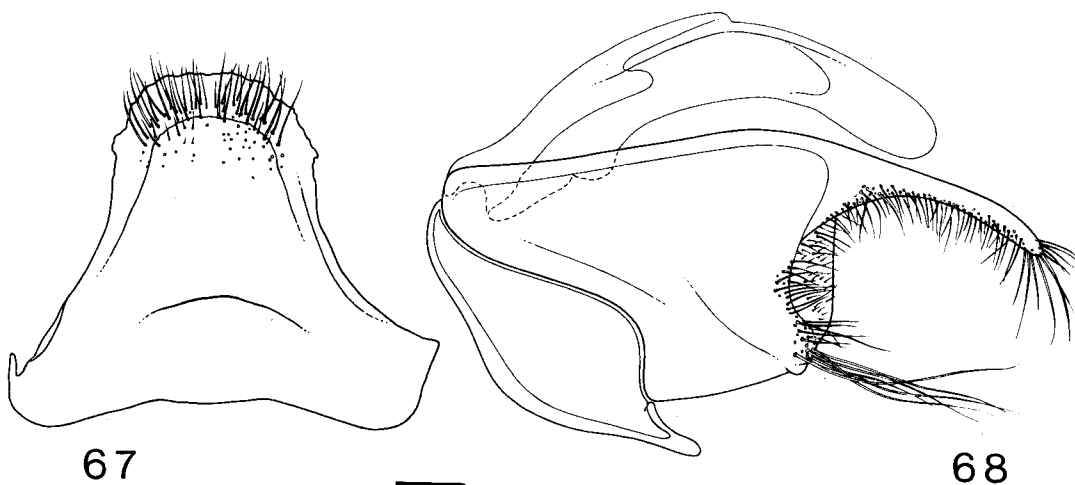
Head (Fig. 61). Very close to *marginalis*, but typical females are easily distinguished by the characters mentioned in the key. Individuals from SE Queensland approach *marginalis* due to the golden pubescence on the hypopleural area, and the propodeal dorsum being less intensive, i.e. brassy. *S. nemoralis* is slightly larger than *marginalis*. The statement of Evans (1973-74) that "*marginalis* ... differs in the sculpturing of the mesopleura and the more hyaline wings" cannot be verified by the material available for the present study.

Male: 8-11 mm.

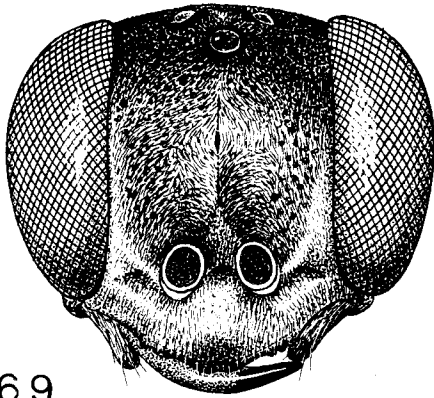
Deviating from the female by the following characters. Head (Fig. 62). Clypeal outline as in Fig. 64, the lateral teeth fairly strongly projecting. Proximal flagellar segments with tyloidae, distinctly swollen ventrally, the segments slightly concave dorsally. Distal part of flagellum slightly moniliform. Flagellomeres 7-10 shortened, strongly convex ventrally (Fig. 66). Facial and thoracic sculpture stronger and denser. The metallic pubescence strongly golden, light golden, or brassy — or even silvery.

Sternum VIII (Fig. 67).

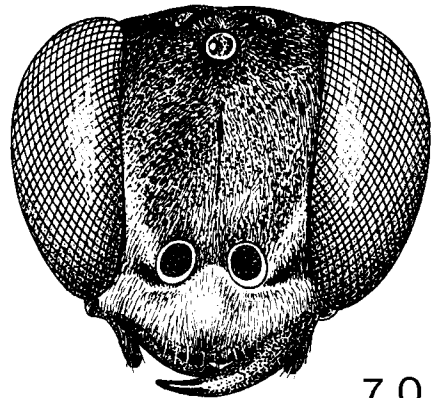
Genitalia (Fig. 68).



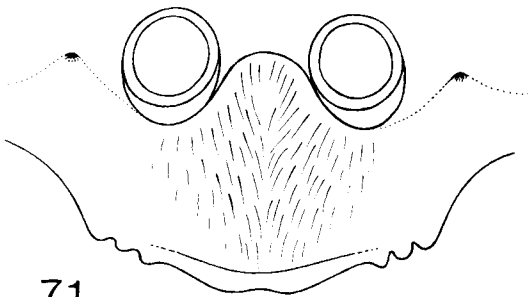
Figs. 67-68. *Sphodrotes nemoralis* Evans. 67: Male sternum VIII. 68: Male genitalia. Scale 0.1 mm.



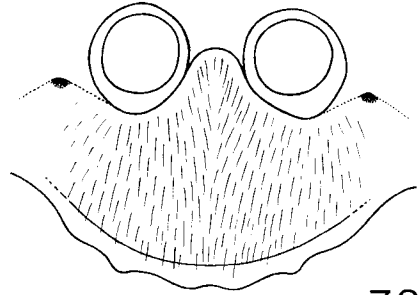
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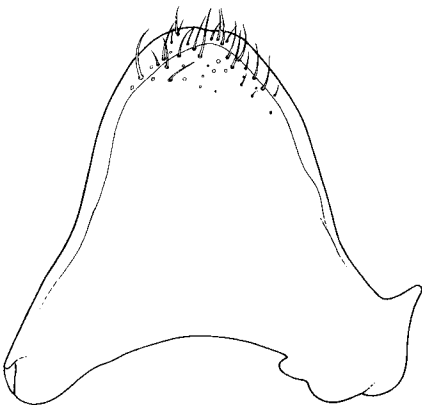
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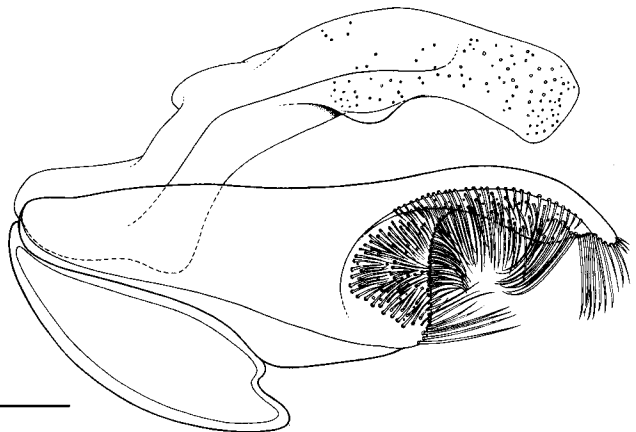
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72



73



74



Figs. 69-74. *Sphodrotes splendens* sp.n. 69: Female head. 70: Male head. Scale 1 mm. 71: Female clypeus. 72: Male clypeus. Scale 0.2 mm. 73: Male sternum VIII. 74: Male genitalia. Scale 0.1 mm.

2.6.12. *Sphodrotes splendens* sp.n.

Figs. 69-74.

Holotype ♀: WESTERN AUSTRALIA, Kimberley, 8 km. South of Coulomb Point, 17°26'S, 122°09'E, 16. IV.1977. In ANIC.

Paratypes: WESTERN AUSTRALIA, Kimberley: 2 ♂♂, 8 km. South of Cape Bertholet, 19°19'S, 122°10'E, 17.IV.1977. In ANIC. NORTHERN TERRITORY. 1 ♂, Avon Downs, 10.IV.1976. In ANIC. QUEENSLAND. 1 ♂, 45 miles South of Nappamerry, 5.XI.1949. In ANIC.

Etymology: From Latin: splendens (from splendere = to shine): brilliant or brilliantly shining (with gold).

Description

Female: 10.5 mm.

Head (Fig. 69). Entire head clothed with brilliantly shining, golden pubescence. Lower frons laterally, a spot between antennal sockets, mandibles (except extreme apex), labio-maxillary complex, and a narrow area surrounding the mandibular articulations ferrugineous. Punctuation strong, rapidly increasing in strength from lower frons to vertex. Interstices finely punctate, less than diameter of punctures on upper frons and vertex, 2-3 times diameter on lower frons. Frontal line distinct, almost reaching anterior ocellus. Facial foveae large and dull. Clypeus light yellowish ferrugineous, anterior margin with three lateral teeth (Fig. 71). Antennae long and slender. Scapus, pedicellus, and flagellar segments 1-3 yellowish ferrugineous. Terminal flagellar segments black. First flagellar segment almost 2.5 times longer than wide (21:9), slightly longer than the second (19).

Thorax. Pronotal collar with distinct median swelling. Entire thorax with strong and dense, pit-like punctuation, interstices finely micropunctate. All surfaces except anterior pronotum, scutellum, and metanotum covered with brilliantly shining, golden pubescence. Pronotal lobes, propleuron, and antero-ventral parts of pronotum ferrugineous. Dorsal mesopleuron with a slight ferrugineous touch.

Propodeum. Median carina indistinct. Sculpture coarse, irregularly foveolate dorsally and dorsolaterally. Propodeal spines represented by

very weak and blunt dilations. Entire dorsal and posterolateral faces covered with dense, brightly golden shining pubescence.

Gaster mainly yellowish ferrugineous. Tergum II with velvet-black transverse band. Sternum II with anterolateral black spot. Apical tergal margins and tergum IV-V with dense, golden pubescence. Posterior prominence of sternum I distinct, pointing backwards.

Legs incl. coxae yellowish ferrugineous. Psammophore very weak. Foremetatarsus with five spines, the distal one shorter than second tarsal segment.

Wings strongly infusate apically and behind subcosta. Costa, subcosta, basal wing sclerites and tegula light ferrugineous. 1st. m-cu interstitial with RS.

Male: 9-10.5 mm.

Deviating from female by the following characters. Head (Fig. 70): Sculpture and pilosity stronger. Clypeus, mandibles, and scapus more yellow. Tyloidea absent or very inconspicuous. Median pronotal tubercle more prominent, sculpture and density of pubescence stronger. Gaster more strongly sculptate, black transverse band on tergum II dissolved into two rounded spots in specimens from Avon Downs and Nappamerry.

Sternum VIII (Fig. 73).

Genitalia (Fig. 74) very characteristic. Aedeagus with large, obliquely outwardly-directed lobe-like dilation medioventrally, the basal part strongly concave dorsally. Gonostyli strongly elongate, the setose area occupying only about half of its length.

3. PHYLOGENY

Sphodrotes is a member of the Miscophini (see p. 86) of which it constitutes the least advanced genus; in fact it is to be considered the sister group of the remaining Miscophini. It can be characterized as a monophyletic entity in terms of the autapomorphic attributes listed below.

The corresponding plesiomorphic character states as displayed by the sister group are presented in a parenthesis.

- I. Integument strongly sculptured, usually deeply pitted
(Integument smooth, punctate)
In *S. prima*, *rubra* and *dearmata* sculpture is reduced, but additional evidence strongly suggests that this character state is to be considered a reversal.
- II. Occipital carina strongly raised
(Occipital carina low)
Reduction of sculpture parallels reduction in strength of the occipital carina.
- III. Posterolateral face of the propodeal synsclerite with one or two tubercles or tooth-like projection
(Posterolateral face of the propodeal synsclerite evenly rounded)
In strongly sculptured species the propodeal pro-

jections are more prominent than in less sculptured ones.

- IV. Frons concave, usually with a scapal basin
(Frons convex or plane, without scapal basin)
The scapal basin is only vaguely defined since the transition from the concavity to the surrounding frons is almost gradual. In males the transition is less pronounced.
- V. Sternum I with a median carina terminating in a compressed, tooth-like projection
(Sternum I without tooth-like projection)
Size-reduction of this tooth apparently parallels reductions of integumental sculpture.
- VI. Tergum I with laterobasal prominences
(Tergum I without laterobasal prominences)
The morphology of these prominences is very similar in all species.
- VII. Ventrodistal aedeagal teeth absent
(Ventrodistal aedeagal teeth present)
A series of marginal or submarginal ventrodistal teeth on the aedeagal valve is present in many larvae and sphecine genera. It could be argued that

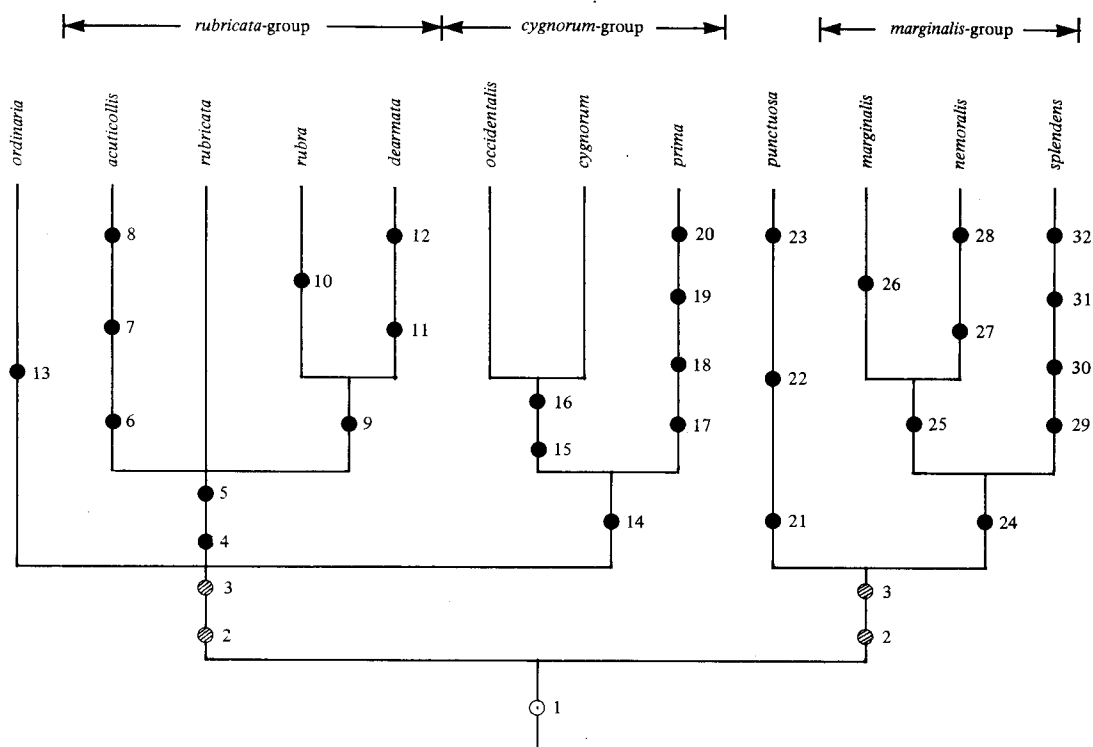


Fig. 75. Tentative cladogram presenting phylogenetic affinities of *Sphodrotes* species. Numbers refer to Table 1.

such teeth belong to the ground plan characters of the Miscophini since they are found in *Solie-rella* and indications of such are seen in, e.g., the less advanced *Miscophus* and *Saliostethus*. In *Sphodrotes acuticollis* the aedeagal valve is ventrodistally serrate. Proper teeth are absent in *Sphodrotes*. The phylogenetic affinities of *acuticollis* are most uncertain especially because the female sex is unknown. It cannot be excluded that the aedeagal serration is to be considered an autapomorphy of *acuticollis*.

The intrageneric phylogeny as I understand it is shown in the cladogram, Fig. 75. It appears from the cladogram that it has not been possible to document dichotomies throughout the diagram. Furthermore, no apomorphies can be demonstrated for *rubricata* and *occidentalis* (concerning *occidentalis* – *cygnorum*, see below). The following species groups, defined by apomorphies, are operated with below in order to facilitate the discussion.

The figures in parentheses refer to Fig. 75.

The *ordinaria*-group (monotypic): Distal gonostyle setae irregularly curled (13).

The *rubricata*-group (*acuticollis*, *rubricata*, *rubra*, *dearmata*): Gaster ferrugineous (4). Tergum 1 shortened (5).

The *cygnorum*-group (*occidentalis*, *cygnorum*, *prima*): Male sternum VIII with lateral dilations (14).

The *punctuosa*-group (monotypic): Pilosity much reduced (21). Aedeagal valve with midventral dilation (22). Propodeal teeth reduced (23).

The *marginalis*-group (*marginalis*, *nemoralis*, *splendens*): Golden pubescence much developed (24).

If the basal dichotomy in the cladogram, Fig. 75, is in accordance with evolutionary events, only a minimum of convergently developed attributes must be postulated to explain the phylogenetic interrelations between the species of *Sphodrotes*.

Relatively much attention is paid to the morphology of the male genital sclerites and to sternum VIII. Especially the aedeagal valve and the gonostylus incl. its setae are of importance since they provide constant, species-specific characteristics. It is, however, most uncertain to deduce whether simply attenuate gonostyle setae (2) represent a derived state or not. Pulawski (1962) made excellent use of various morphological types of these setae in separating species of *Tachysphex*, and Lomholdt (in press) applied this methodology to distinguish and characterize species of *Miscophus* and *Saliostethus*. A distal dilation on these setae occur in many larrine genera incl. *Lyroda* which is considered one of the least specialized members of the Lar-

Table 1. Apomorphic characters used in the cladogram, Fig. 75

- | | |
|--|---|
| 1. See p. 112, I-VII | 15. Occipital carina strongly raised (Fig. 38) |
| 2. Setae of volsellar area clevate or attenuate. See discussion p. 113 | 16. Sternum I humped (Fig. 37) |
| 3. Aedeagal apicoventral lobe present or absent. See discussion p. 114 | 17. Genital sclerites strongly aberrant (Fig. 51) |
| 4. Gaster ferrugineous | 18. Sternum I without ventral tooth |
| 5. Tergum I shortened | 19. Propodeal teeth absent |
| 6. Aedeagal valve serrate ventrodistally (Fig. 28) | 20. Punctuation reduced |
| 7. Sternum I with strong median tooth (Fig. 27) | 21. Pilosity reduced |
| 8. Pronotal lobe pointed | 22. Midventral aedeagal dilation (Fig. 34) |
| 9. Punctuation reduced | 23. Propodeal teeth reduced |
| 10. Female clypeal margin without lateral teeth (Fig. 17) | 24. Golden pubescence much developed |
| 11. Propodeal teeth absent | 25. Tyloidea prominent (Figs. 58, 66) |
| 12. Sternum II with dark spot | 26. Aedeagal valve humped dorsally (Fig. 59) |
| 13. Distal gonostyle setae irregularly curled (Fig. 7) | 27. Gastral segment I elongate (Fig. 65) |
| 14. Male sternum VIII with lateral dilations (Figs. 41, 43, 50) | 28. Golden pubescence stronger |
| | 29. Male sternum VIII strongly aberrant (Fig. 73) |
| | 30. Male genitalia strongly aberrant (Fig. 74) |
| | 31. Golden pubescence extremely highly developed |
| | 32. Integument extensively yellowish ferrugineous |

rinae. This type of seta also occurs in all the less specialized *Miscophus* and *Saliostethus*. On the other hand, these setae are relatively simple structures, and extensive convergence as to the morphology of the distal tip of these cannot be excluded.

The most generalized *Sphodrotes* is suspected of having differentiated only relatively slightly from the sister group of the Miscophini. Lomholdt (in press) suggested the group in question to be the Trypoxylonini in which *Pisonopsis* is regarded the least advanced genus, habitually being close to *Sphodrotes*. As synapomorphies between Miscophini and Trypoxylonini the apicoventral dilation of the aedeagal valve could be considered. Loss of this lobe is then to be regarded a derived state (3). If the lobe is not an expression of common ancestry of these tribes and, consequently, does not belong to the ground plan characters of the Miscophini, absence of this structure is considered a plesiomorphic trait in *Sphodrotes*. An additional character linking Miscophini with Trypoxylonini is the strongly reduced or absent pygidial plate. Only in some *Pisonopsis* a weakly defined pygidial plate is present. The *Sphodrotes* species possessing an apicoventral aedeagal dilation are: *ordinaria*, *acuticollis*, *rubricata*, *rubra*, *cygnorum*, *occidentalis*, and *prima*. These species are characterized by the additional trait: volsellar setae club-like dilated apically.

S. ordinaria is characterized by the apomorphic character: distal gonostyle setae irregularly curled. Members of the *rubricata*-group are easily recognized by the extensive ferrugineous markings on gaster (4). Furthermore, all four species are relatively stout (5) as compared with other *Sphodrotes* species. *S. acuticollis* is readily distinguished by the following autapomorphic characters, viz. aedeagal valve serrate ventrodistally (6) (cf. above), sternum I with an extraordinarily strong tooth-like projection (7), pronotal lobe pointed (8). *S. rubra* and *dearmata* share the synapomorphic trait: sculpture reduced (9). *S. rubra* displays a single apomorphic trait, viz. female clypeal margin without lateral teeth (10).

Such teeth are almost universal in the least specialized species of most larrine genera, and no other *Sphodrotes* species displays this condition. *S. dearmata* is remarkable because of the loss of the posterolateral propodeal teeth (11) and by the presence of dark lateral spots on sternum II (12).

Members of the *cygnorum*-group share the synapomorphic trait: male sternum VIII with lateral dilations (14) (Fig. 41). *S. prima* has a series of autapomorphic characters, viz. genitalia strongly aberrant (17) (Fig. 51), sternum I without ventral tooth (18), propodeal teeth absent (19) and punctation much reduced (20). *S. cygnorum* + *occidentalis* constitute a monophyletic group owing to the extremely highly raised occipital carina (15) (Fig. 38) and the humped sternum II (16) (Fig. 37). *S. cygnorum* may be considered slightly more advanced than *occidentalis* because of the stronger angulation of sternum II and the ferrugineous legs.

S. punctuosa is considered the sister group of the *marginalis*-group. It only displays inconspicuous autapomorphic features, of which the midventral dilation of the aedeagal valve (22) (Fig. 34) is the character to distinguish it from other, almost entirely black species. The posterolateral propodeal teeth and the pilosity are much reduced (23, 21), but the punctation is stronger and deeper than in most of the other black species. Female *punctuosa* might be misidentified as *occidentalis*, but the distribution areas of the two are widely separated, *punctuosa* occupying SE Australia incl. Tasmania, while *occidentalis* occurs in SW Australia.

Members of the *marginalis*-group are held together by the strongly developed golden or brassy pubescence (22) especially on lower frons, the clypeal synsclerite, the dorsal part of mesopleuron, and along the apical tergal margins. In addition, the integument of at least the tergal margins usually is ferrugineously transparent. These two characters are most pronounced in larger females. Female *marginalis*, *nemoralis* and *ordinaria* may be very difficult to separate, especially in their small, common distribution area

in SE Queensland. *S. marginalis* has a very restricted occurrence in SE Queensland, *nemorialis* is widely distributed towards the north in Queensland, and *ordinaria* is widespread in Australia. Especially *nemorialis* "approaches" *marginalis* as concerns external morphology towards the SE. This may be a case of character convergence, but additional material is necessary to analyze this situation in detail. Males of these species are, despite of being even more alike as concerns external morphology, easily separated on genital characters (Figs. 7, 59, 68). Male *marginalis* and *nemorialis* have distinct tyloidea (25) ventrally on some of the flagellar segments, and even if tyloidea are present in several other species, they are so strongly developed in these two that this character state is considered a synapomorphic trait. The golden pubescence and the light colourings are much more extended (28) in *nemorialis* than in *marginalis*, and the former is also characterized by the somewhat elongate first gastral segment (27). The humped aedeagal valve (26) (Fig. 59) in *marginalis* is the single autapomorphic character found in this species. *S. splendens* is a very distinctive species displaying the following autapomorphies, viz. lateral flanges of male sternum VIII much shortened (29) (Fig. 73), male genitalia strongly elongate and aberrant (30) (Fig. 74), golden pubescence extremely highly developed (31), and integument very extensively yellowish ferrugineous (32).

From the discussion above it is concluded that *ordinaria* is the species displaying the lowest number of derived characters states, but *rubricata* is also to be considered among the least advanced *Sphodrotes*. Since transformation from ferrugineous to black appears to be much less frequent among sphecids (and Hymenoptera as a whole) than from black to ferrugineous, *Sphodrotes ordinaria* is suggested to represent the least differentiated species known today.

Sphodrotes is very insufficiently known and undescribed species are certainly yet to be found, but the present paper provides — at least — an introduction to the genus.

4. ACKNOWLEDGEMENTS AND ORIGIN OF THE MATERIAL

All curators of institutions mentioned below are cordially thanked for providing material for this study. Prof. Howard E. Evans, Colorado, USA is especially acknowledged because of lending me material from his private collection.

All primary type-material has been examined, and numerous museums and institutions throughout the World have been consulted as to loan of material. As judged from the list below, *Sphodrotes* seems to be very insufficiently represented in collections outside Australia. Mrs. A. Volsøe (ZMUC) is cordially thanked for linguistic revision, and Mrs. M. Bévort (ZMUC) is heartily thanked for typing the manuscript. Mr. R. Nielsen (ZMUC) prepared the final drawings with his famous skill.

Origin of the material

- AMCS: Australian Museum Collection, Sydney (G.A. Holloway)
- ANIC: Australian National Insect Collection (CSIRO), Canberra (I. Naumann and J. Cardale)
- BMNH: British Museum (Natural History), London (C. R. Vardy)
- CE: Collection Evans, Colorado (H.E. Evans)
- MCZH: Museum of Comparative Zoology, Harvard (M. Thayer)
- MNHN: Museum National d'Histoire Naturelle, Paris (S. Kellner-Pillault)
- NMNH: National Museum of Natural History, Washington (A.S. Menke)
- NMVM: National Museum of Victoria, Melbourne (A. Neboiss)
- QMGT: Queensland Museum, Gregory Terrace, Brisbane (E.C. Dahms)
- SAMA: South Australian Museum, Adelaide (E.G. Matthews)
- UCD: University of California, Davis (R.O. Schuster)
- UQDE: University of Queensland. Dept. of Entomology. Brisbane (M. Schneider)
- WAMP: Western Australian Museum. Perth (T. Houston)
- ZMUC: Zoological Museum. University of Copenhagen (B. Petersen)
- ZMW: Zoologisches Museum. Wien (M. Fischer)

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