Revision of the genus *Psix* Kozlov & Lê (Hymenoptera: Scelionidae)

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ABSTRACT. The genus *Psix* Kozlov & Lê (Hymenoptera: Scelionidae) is revised from a worldwide perspective. Twelve species are described as new: *annulatus* [Cameroon], *asper* [Uganda], *aulax* [Australia], *conflus* [Sri Lanka], *flavicosa* [Ivory Coast, Zimbabwe], *fusus* [Australia], *lacunatus* [Pakistan east to Taiwan, south to Australia], *metopa* [Australia], *rasilis* [Ivory Coast, Gambia], *sulcifer* [Malaysia], *viriosus* [India east to Philippine Is.] and *watshami* [E. Africa, Madagascar]. *Psix abnormis* Kozlov & Lê [W. Africa east to at least India], *glabriscrobus* (Girault) n.comb. [Australia], *olympus* (Dodd) n.comb. [Australia], *saccharicola* (Mani) n.comb. [India], *striaticeps* (Dodd) n.comb. [W. Africa east to India, Madagascar] and *tunetanus* (Mineo and Szabó) n.comb. [Tunisia, Gambia, Ivory Coast, Saudi Arabia, S.W. Nearctic, Venezuela] are redescribed. An identification key for the species of *Psix* is presented. The relationships among species are discussed. The earliest derived species are generally found in Australia and southeast Asia. The more apomorphic species occur generally in Africa, southwest Asia and India. The distribution of *Psix tunetanus* has possibly been influenced by man. Details of the relationship with *Trissolcus* and *Archiphantes* are unclear; the position of *Psix* within the subfamily is therefore also obscure.

Introduction

The search for effective biological control agents against bugs of the superfamily Pentatomoidae (Heteroptera) has often focused on their egg parasitoids, and, in particular, on the species of the subfamily Telenominae (Hymenoptera: Scelionidae; see, e.g., Brown, 1962; Safavi, 1968). Biological and systematic research on these wasps has focused on the large genera *Telenomus* Haliday and *Trissolcus* Ashmead (= *Asolcus* Nakagawa, *Microphanurus* Keiffer). We present here information on another, relatively unknown group of telenominies: the genus *Psix* Kozlov & Lê.

*Psix* is most diverse in the Ethiopian, Oriental and Australian regions. Its distribution also extends into the southern reaches of the Palaearctic and, for one species, the New World. The genus is characteristic found in relatively arid climates typical of southwestern Asia, central Australia and the savannas of Africa. *Psix*, however, is not entirely restricted to these biomes: species have also been collected from the humid forests of southwestern India, southeast Asia, Taiwan, and both northern and eastern Australia. The few host records available indicate that the species are egg parasitoids of bugs in the families Pentatomidae, Scutelleridae and Coreidae. Biological information on this genus is scarce; further study and collections of tropical faunas will substantially add to our knowledge of *Psix*. 

Material. This revision is based upon specimens from the following persons and institutions (acronyms used in text follow Heppner & Lamas, 1982, where possible): American Entomological Institute, Ann Arbor, Michigan (AEI); Australian National Insect Collection, Canberra (ANIC); Bernice P. Bishop Museum, Honolulu, Hawaii (BPBM); British Museum (Natural History), London (BMNH); California Department of Food and Agriculture, Sacramento, California (CDAS); Canadian National Collection of Insects, Arachnids and Nematodes, Ottawa (CNC); collection of Dr Lars Huggert, Lund, Sweden (HUGG); Hungarian National Museum of Natural History, Budapest (TMB); Museum National d'histoire Naturelle, Paris (MNHP); collection of NFJ; The Ohio State University Collection of Insects and Spiders, Columbus, Ohio (OSU); National Pusa Collections, Division of Entomology, Indian Agricultural Research Institute, New Delhi, India (IARI); United States National Museum of Natural History, Washington, DC (USNM); University of Arizona, Tucson (UAT); University of California, Berkeley (UCB); University of California, Riverside (UCR); Zoological Institute, Academy of Sciences USSR, Leningrad (ZIL).

Morphological terminology. The nomenclature and abbreviations used below generally follow Masner (1979, 1980). Psix, however, is unusually rich in sculptural characters for a telenomine. Some other terms must therefore be defined.

The metanotum of Psix, as in most other telenomines, bulges medially to form the dorsellum. This structure is transversely divided into two parts (Fig. 25): the dorsal portion is continuous with, and has the same costate sculpture as the lateral portions of the metanotum. The ventral lip (VL) (Fig. 25) is variable in sculpture; it may be coarsely areolate-rugose (Fig. 21), finely punctulate (Fig. 22) or smooth (Fig. 25). The sculpture of the frons of several species is dominated by a few strongly-developed longitudinal carinae (Fig. 3): the central keel (CK) (Masner, 1980); the orbital carinae (OC), continuous with the inner orbits and extending ventrad toward the mandibles; and the submedian carinae (SC), located between the orbitals and the central keel, and, in species such as Psix viriosus, defining the lateral margins of the antennal scrobes. The genal carina (GC) (Fig. 13) arises at the base of the mandible and continues dorsad on the gena, generally not farther than the upper edge of the eye. The acetabular field (AF) (Fig. 15) is a small area of coriaceous microsculpture on the mesepisternum near the dorsal apex of the acetabular carina. The intercoxal space (ICS) (Fig. 50) is the ventral region of the mesepisternum between the fore and mid coxae. There is a line of foveae on the mesopleuron that we are unable to homologize with those of any other telenomine group. This lies posterior to the foveae we believe represent the mesopleural suture (MPS) (Fig. 13) and are referred to as postepimeral foveae (PF). The metaepisternal carina (MC) is generally indicated only by a line of foveae extending from the posterior margin of the metaepisternum toward the propodeal spiracle (Fig. 14). On the second metasomal sternum (S2) are two densely setose areas of finely coriaceous or granulose microsculpture; these are referred to as setal fields (SF) (Figs. 31, 32). The function of these unusual structures is unknown.

PSIX Kozlov & Lé
Psix Kozlov & Lé, 1976: 143. Type species: Psix abnormis Kozlov & Lé, by original designation.
Aporophlebus (part); Masner, 1976: 76.
Aporophlebus (part); Mineo, 1979: 234.
Psix; Masner, 1980: 10.

The following generic description serves both to distinguish Psix from other telenomines and to summarize character states held in common by a majority of species. These characters are therefore not further discussed in the individual species descriptions except as they differ from the most common condition.

Head with fanlike carinae arising near base of mandibles and extending dorsad onto frons and cheeks (Figs. 2–13); central keel bifurcate above antennal insertions, branches passing ventrad on either side of insertions; clypeus (Figs. 4, 7, 8, 11) usually weakly protruding, apical margin usually bidentate; subocular sulcus absent, replaced by carina; genal carina parallel to posterior orbits; eyes glabrous; lateral ocelli usually separated
FIGS. 1–8. 1–2, *Psix striaticeps*. 1. Dorsal habitus; 2. Detail of lower head and mandibles. 3–8. Head, frontal view. 3, *P. viriosus*; CK: central keel, OC: orbital carinae, SC: submedian carinae; 4, *P. lacunatus*; 5, *P. asper*; 6, *P. striaticeps*; 7, *P. rasilis*; 8, *P. flavicosa*. 
FIGS. 9–16. 9–12, Head, frontal view. 9, _Psix abnormis_; 10, _P. watshami_; 11, _P. tunetanus_; 12, _P. saccharicola_. 13, _P. striateps_, head and mesosoma, lateral view; GC: genal carina, MPS: mesopleural suture, PF: postepimeral foveae. 14–16, Mesosoma, lateral view. 14, _P. viriosus_; MC: metapleural carina; 15, _P. asper_; AF: acetabular field; 16, _P. flavicoxa_.

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FIGS. 17–24. 17–19, Pronotum, fronto-lateral view. 17, *Psix viriosus*; 18, *P.asper*; NT: netrion; 19, *P.lacunatus*. 20, *P.abnormis*, mesosoma, frontal view; 'SK': anterior declivous portion of mesoscutum, 'skaphion' sensu Kozlov & Lé. 21–22, Dorsellum, posterior view. 21, *P.asper*; 22, *P.striatriceps*. 23–24, Scutellum and posterior portion of mesoscutum. 23, *P.asper*, dorsal view; N: notaulus; 24, *P.viriosus*, postero-dorsal view.
from inner orbits by at least one ocellar diameter, not connected to orbits by furrow; occiput usually areolate-rugose (Fig. 1); claval formula (Bin, 1981): A1–A8/1-2-2-1; mandibles usually short, wide, flat, not or only weakly tapering toward apex, teeth normally weakly-developed (Fig. 2); mesoscutum (Fig. 1) usually areolate-rugose throughout; scutellum usually with same sculpture as mesoscutum; notauli normally absent; lateral portion of pronotum usually covered with deep longitudinal furrows (Figs. 13–20); netrion usually absent (Figs. 17, 19, 20); epomial carina well developed; acetabular and postpectal carinae usually meeting ventrally, fore and mid coxae therefore contiguous, intercoxal space occluded (Figs. 13, 14, 16); mesopleural carina most often indicated ventrally by single line of foveae, without raised keel (Figs. 13, 16); postepimeral foveae present; anterior extension of metapleuron toward mid coxa usually short, rounded (compare Figs. 14 and 16); course of metapleural carina normally not indicated (Figs. 13, 16); T1 black, concolorous with T2; T2 usually glabrous except at lateral margins (Figs. 27–29, cf. Fig. 26); apex of T2 usually punctulate (Fig. 26); S2 with deeply impressed, longitudinal arcuate sulci at least laterally (Figs. 30–40, 49); setal fields on S2 usually well developed; dorsum of head and mesosoma usually with well-developed superimposed granulose or coriaceous microsculpture (Fig. 1).

Discussion

The only other telenomine genus known with the bifurcate central keel and fanlike facial carinae is Archiphanurus Szabó. Psix may be most conveniently distinguished from it by the black T1, well-developed setal fields on S2 and contiguous fore and mid coxae. Those species of Psix in which the intercoxal space is present may be separated from Archiphanurus by the presence of crenulae flanking the mesopleural carina anteriorly and the presence of a netrion on the pronotum.

Nixon (1938) was the first to appreciate the unusual character states of Telenomus striaticeps Dodd and to suggest that it may represent a distinct genus. Psix was not described until 1976 by M. A. Kozlov and Lê Xuân Huê to contain their new species from Afghanistan, Psix abnormalis. In the time since the generic description was published there has been some confusion of Psix with Archiphanurus and Aporophlebus Kozlov. Kozlov & Lê (1977) correctly treated Aporophlebus as a junior synonym of Telenomus (type-species Aporophlebus aporus Kozlov, examined by us). Masner (1980) provided characters by which to separate the species of Psix then known from those of Archiphanurus.

We have not examined the type material of the many species of Telenominae described from Australia by A. P. Dodd. The taxonomy of the subfamily in the early part of this century was based largely on the relative length, width, number and coloration of antennomeres. The emphasis has subsequently shifted away from these characters. Consequently, it is impossible to determine on the basis of the original descriptions which of Dodd’s species of Telenomus, or possibly even Trissolcus, should be classified in Psix.

Discovery of species from Australia and southeast Asia has forced us to expand our concept of the generic limits of Psix to the point that it is now impossible to cite a series of characters that will serve to separate all Psix from Archiphanurus. We feel, nevertheless, that Psix is a convenient and identifiable unit and, for the time being, can be treated as a distinct genus. Further study of the relationships within the Telenominae will eventually demand a reclassification in order to be consistent with the criterion of monophyly. Whether Psix will then remain standing as a separate genus or will be subsumed within a larger one (e.g. Trissolcus) is uncertain.

Check-list of world species of Psix

abnormalis Kozlov & Lê, 1976.
annulatus sp.n.
asper sp.n.
aulax sp.n.
confluus sp.n.
contemporalis Lê, 1982.
flavicoxa sp.n.
fusus sp.n.
FIGS. 25—32. 25, *Psix watshami*, mesosoma, postero-lateral view; VL: ventral lip of metanotum. 26—29, Metasoma, dorsal view. 26, *P.asper*; 27, *P.striaticeps*; 28, *P.flavicaxa*; 29, *P.lacunatus*. 30—31, Metasoma, ventral view. 30, *P. virfams*; 31, *P.striaticeps*; SF: setal field. 32, *P. striaticeps*, detail of setal field.
FIGS. 33–40. Metasoma, ventral view. 33, P. simplex; 34, P. lacunatus; 35, P. saccharicola; 36, P. tunetanus; 37, P. watshami; 38, P. abnormis; 39, P. flavicola; 40, P. rasilis.
Revision of Psix

Key to world species of Psix

1 Radicle black or dark brown, usually sharply contrasting in colour with scape (included here are species with antennae entirely darkened)......................
   2 – Radicle either yellow or light brown, concolorous with scape..................
   2 – Dorssellum strongly produced medially, ventral lip areolate-rugose (Fig. 21)...........
   3 – Dorssellum weakly expanded, ventral lip punctuate (Fig. 22) or smooth (Fig. 25)...........
   3 – Intercoxal space occluded, fore and mid coxae contiguous (as in Figs. 13–16)..........
   4 – Intercoxal space present, coxae distinctly separated by ventral strip of mesepisternum (Fig. 50)..........................
   5 – Notauli absent; no sublateral setae on T1 (Australia)........................................
   6 – Notauli present (Fig. 23, N); 1–2 pairs of sublateral setae on T1 (Fig. 26) (E. Africa).....
5 – T2 with strong longitudinal costae, no indication of transverse sculpture; metasoma distinctly elongate, wings long and narrow; apex of T2 sparsely punctulate (N. Australia)........
   7 – T2 with distinct transverse elements in sculpture; metasoma and wings short; apex of T2 densely punctulate (E. Australia).....................
6 – Frons with distinct submedian carinae (Fig. 4); ventral lip of dorsellum punctate; coxae usually yellow (Pakistan east to S.E. Asia, N. Australia)........
   8 – Frons without distinct submedian carinae (Figs. 6–12); ventral lip smooth (Fig. 25) or punctulate (Fig. 22); coxae usually darkened.............
   7 – Ventral lip of dorsellum and apex of T2 smooth (as in Fig. 25)......................
   8 – Ventral lip of dorsellum and apex of T2 punctulate (Figs. 22, 27)......................
8 – Frontal and scutellar sculpture often strongly effaced (Fig. 11); acetal tuber field sparsely setose; S2 sulci distinctly separated posteriorly (Fig. 36) (W. Africa, Tunisia, Saudi Arabia, S.W. Nearctic, Venezuela).....................
   9 – Frons and scutellum usually with well-developed sculpture covering entire surface (Fig. 12); acetal tuber field glabrous; S2 sulci nearly continuous posteriorly (Fig. 35) (India)..................
   6 – Frons of transverse sculpture covering entire surface (Fig. 12); acetal tuber field glabrous; S2 sulci distinctly separated posteriorly (Fig. 35) (India)..................
   10 – S2 sulci broadly separated posteriorly (Fig. 31); area between sulci (except setal fields) punctate (W. Africa east to India)..................
   9 – S2 sulci closely approximated posteriorly (Fig. 40); area between sulci (excluding setal fields) smooth, glabrous (W. Africa)..................
   11 – S2 sulci closely approximated posteriorly, not continuous from one side to other (Fig. 39); setal fields well developed (Africa)..................
   12 – Ventral lip of dorsellum smooth (Fig. 23); anterior declivous portion of mesoscutum smooth (Fig. 20)..................
   13 – Ventral lip of dorsellum coarsely punctate (as in Fig. 21); mesoscutum sculptured throughout (Fig. 17)..................
   14 – Mandibular teeth deeply incised, acute..................
   15 – Mandibular teeth weakly developed, usually rounded or truncate (as in Fig. 2)..................
   16 – Notauli present (Malaysia)..................
   17 – Notauli absent..................
   16 – Mandibles bidentate (E. Australia)..................
   17 – Mandibles tridentate (E. Australia)..................
   18 – Mandibles with strongly developed seta on inner margin of T2 (W. Africa)..................
   19 – Mandibles closely approximated anteriorly (Fig. 24); dorsellum weakly protruding (India to Philippine Is.)..................
   20 – Notauli extremely short, obscured by coarse mesoscutal sculpture; scutellum rounded apically; dorsellum strongly protruding (Ceylon)..................

Psix abnormis Kozlov & Lé (Figs. 9, 20, 38)

Psix abnormis Kozlov & Lé, 1976: 144.

Holotype ♂, AFGHANISTAN: near Jalalabad, along Kabul River; host, unknown. (ZIL) [examined].

Length 0.5–0.8 mm; radicle and scape yellow; coxae dark brown to black; frons with weakly-developed central keel, no distinct submedian carinae, area between orbitals and
FIGS. 41-48. Head, frontal view. 41, P.six confluus; 42, P.metopa; 43, P.fusus; 44, P.glabriscrobus; 45, P.olympus; 46, P.aulax; 47, P.sulcifer; 48, P.annulatus.
central keel rugulose, often with transverse elements medially (Fig. 9); frons width > eye height; occiput longitudinally striate; anterior declivous portion of mesoscutum smooth, shining (Fig. 20), this area referred to by Kozlov & Lê (1976) and Lê (1982) as the skaphion (Fig. 20, 'SK'); dorsellum weakly expanded, ventral lip smooth; acetabular field and anteroventral portion of mesepisternum glabrous; T1 with one pair sublateral setae; T2 finely longitudinally striate in basal half, distally with cross-striae present; S2 covered by deep sulci arrayed in pattern of nearly concentric circles (Fig. 38), circles broken by smooth, narrow longitudinal band in anterior half of sclerite; setal fields greatly reduced.

Host. Unknown.

Material examined. AFGHANISTAN: 2♀, (paratypes) same locality data as holotype; 22.vii.1966 (Sugonyayaev) (ZIL). GAMBIA: 4♀, 3♂, Bakau, 16, 18, 20.1.1978 (Huggert) (HUGG). 1♀, Fajara, 24.i.1978 (Huggert) (HUGG). INDIA: 1♀, Karnataka, Bangalore, 19-23.x.1979 (Noyes) (BMNH). 2♀, Tamil Nadu, Coimbatore, 25.ix-1.x.1979 (Noyes) (BMNH). 15♀, 4♂, Uttar Pradesh, Aligarh, 8-10.xi.1979 (Noyes) (BMNH, ANIC, IARI). IVORY COAST: 25♀, Bouaké, 7.xii.1978, ii-iv.1980, i-x.1981 (Cochereau) (CNC). KENYA: 2♀, Nairobi Game Park, 28.xii.1980, pan trap (Levin) (CNC). 2♀, Nairobi, International Centre for Insect Physiology and Ecology, ii, iii.1982, (Lubega) (NFJ). RWANDA: 1♂, 1♀, Kigali, malaise trap, 1977 (CNC). SOMALIA: 10♀, 7♂, Mogadiscio, Afgoi-Shabelli Valley, malaise trap, 1-15.xi.1977, 6-20.xii.1977, 14-28.xiv.1977, 7-14.vi.1978, ix.1978, 16-28.iv.1980 (Bin & Omlin) (CNC). SOUTH AFRICA: 1♂, Cape Province, Somerset East, x.1930, (Turner) (BMNH). ZIMBABWE: 37♀, 6♂, Chishawasha, nr. Harare (Salisbury), ix-xi.1974; i-iii.1975; v- vii.1975; 1977; v-vii.1979; x.1979; iii, iv, vii, viii.1980 (Watsham) (BMNH, NFJ, CNC).

Remarks. Psix annulatus may be distinguished from those species of the genus with yellow or light brown radicle (watshami, virinos, conflus, olympus group) by the circular pattern of sulci on S2. This species may also be distinguished from those with closely approximated or continuous S2 sulci (rasilis, annulatus, flavicoxa, saccharicola) by the yellow radicle and the highly reduced setal fields on S2 (without microsculpture, a small area of granulose sculpture is retained in annulatus).

Lê (1982) has recently described a species of Psix from Vietnam. In the English summary he states that this species has the base of the scape brown; nothing is said about the colour of the radicle. On the basis of the illustration of the head and S2 we suspect this name, P.contemporalis, to be a junior synonym of P.abnormis.

**Psix annulatus sp.n. (Figs. 48, 49)**

Length 1.0 mm; radicle black; scape yellow; mid and hind coxae yellow; fore coxae brown; frons with no distinct submedian carinae; frons laterad of central keel with 12 strong transverse costae (Fig. 48), near inner orbits with irregular longitudinal costae; frons width > eye height; narrow anterior declivous portion of mesoscutum smooth; dorsellum weakly protruding, ventral lip narrow, smooth; acetabular field and anteroventral portion of mesepisternum sparsely setose; T1 with 2-3 pairs of sublateral setae; T2 with longitudinal costae and well-developed cross-striae, near apex sculpture weaker, more irregular, glabrous laterally; sulci on S2 continuous medially, U-shaped (Fig. 49), with superimposed microsculpture; posterior portion of S2 with medial longitudinal band of scattered setae over sulci; S2 glabrous anteriorly; setal fields small.

Host. Unknown.

Material examined. Holotype ♀: CAMEROON: Nkoemvon, malaise trap, vii-viii. 1980 (Jackson) (BMNH). Paratype ♀: same locality as holotype, 1980, malaise (Jackson) (CNC).

Remarks. Psix annulatus may be distinguished from those species of the genus with closely approximated or continuous sulci on S2 (rasilis, flavicoxa, saccharicola, abnormis) by the combination of the black radicle, yellow coxae, reduced setal fields on S2, and the unique U-shaped pattern of the sulci. The microsculpture on S2 in addition gives the ridges the distinctive appearance of braided rope.
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**PSIX ANNULATUS**

**FIG. 49.** Psix annulatus, metasoma, ventral view.

**PSIX ASPER sp.n.** (Figs. 5, 15, 18, 21, 23, 26, 33)

Length 0.9–1.0 mm; radicle black; scape yellow; coxae dark brown to black; frons with well-developed submedian carinae (Fig. 5); area between orbitals and submedians granulose, with weak transverse wrinkles; area between submedians and central keel transversely carinate, carinae dorsally reaching keel, ventrally extending only about halfway to keel, otherwise this area smooth; frons width subequal to eye height; mesoscutum rugose throughout; notauli present, short, somewhat obscured by coarse surface sculpture (Fig. 23); scutellum with same sculpture as mesoscutum; dorsellum strongly protruding, ventral lip coarsely areolate-rugose (Fig. 21); netrion present, narrow, poorly-defined (Fig. 18); acetabular field and anteroventral portion of mesepisternum setose (Fig. 15); mesopleural carina indicated posteriorly by line of foveae, indicated anteriorly only by few foveae ventrally (Fig. 15), with no or only weakly raised crest; postepimeral foveae reduced to 2–3 impressions dorsally, 1 shallow impression near midpoint of height of mesosoma (Fig. 15); anterior extension of metapleural toward mid coxa long, acute; course of metapleural carina indicated by line of foveae; T1 with 1–2 pairs of sublateral setae; T2 longitudinally rugulose (Fig. 26), rugulae weak apically, at most with only faint indication of cross-striae, surface of sclerite with numerous setae; lateral sulci of S2 broadly separated posteriorly (Fig. 33); setal fields large; central area of S2 between sulci otherwise with scattered setigerous punctures, each separated by 1–3 times its own diameter, anteriorly punctures more widely separated.

**Host.** Pentatomomidea.

**Material examined.** Holotype 9: UGANDA: Buikwe, vi. 1938, (Taylor) (BMNH). Paratypes. 8 9, 1 d, with same data as holotype (BMNH). UGANDA: 8 9, 1 d, Buundu, x. 1936 (Hargreaves) (BMNH).

**Remarks.** This species may be distinguished from the other members of the genus possessing notauli (sulcifer, viriosus, conflus) by means of its black radicle; it may be separated from those species with both a black radicle and well-developed submedian carinae (glabriscrobus group, lacunatus) by the combination of the occluded intercoxal space, netrion narrow or absent, postepimeral foveae reduced, no areolae on the scutellum, and dark coxae.

**PSIX AULAX sp.n.** (Fig. 46)

Length 0.9 mm; radicle and scape yellow; coxae brown; central keel not reaching median ocellus, antennal scrobes delimited dorsally by transverse rugae; submedian carinae well developed (Fig. 46), extending as far dorsad as central keel; frons above and laterad of scrobes irregularly longitudinally rugose; area between orbital and submedian carinae narrow, with only single longitudinal wrinkle on each side; transverse rugae on frons restricted to dorsal apex of scrobes; frons width subequal to eye height; right mandible with two strong, equally developed acute teeth (left mandible not visible); dorsellum produced medially, ventral lip coarsely punctate; netrion present, narrow; acetabular field and anteroventral portion of mesepisternum setose; mesopleural carina flanked by crenulae both anteriorly and posteriorly; anterior extension of metapleuron toward mid coxa distinct, acute; course of metapleural
carina indicated by row of foveae; no sublateral setae on T1; T2 longitudinally costate, microsculpture and costae effaced near midline; T2 with few setigerous punctures laterally; sulci on S2 broadly separated posteriorly; setal fields well developed; area between sulci in posterior half of S2 coarsely and evenly coriaceous, setose, but without distinct punctures at setal bases (as in \textit{P. glabriscrobus}), S2 smooth in anterior half.

\textit{Host.} Unknown.

\textit{Material examined.} Holotype 9: AUSTRALIA: Queensland, Forest Station, Bulburin State Forest via Many Peaks, 610 m, 2–5. iv. 1972 (Monteith) (ANIC).

\textit{Remarks.} \textit{Psix aulax} may be distinguished from the other members of the \textit{olympus} group by means of the combination of bidentate mandibles and the lack of notauli.

\textbf{\textit{Psix confluus} sp. n. (Fig. 41)}

Length 1.5 mm; radicle and scape yellow; coxae dark brown; frons with distinct submedian carinae (Fig. 41); central keel effaced midway between antennal insertions and median ocellus; area between orbital and submedian carinae with weak transverse wrinkles, area between central keel and submedians transversely striate, striae reaching central keel only near median ocellus, ventrally extending from submedians only halfway to keel leaving smooth frontal depression; frons width > eye height; lateral ocelli connected to inner orbits by short crenulate furrow; pair of deep pits in position of notauli, somewhat obscured by surrounding sculpture; longitudinal furrow arising medially from scutoscutellar sulcus extending short distance anteriorly, less than one-fourth length of mesoscutum; disc of scutellum with weak impression postero-medially, depression granulose, without surface rugae, dorsal edge of marginal rim drawn up into point at this position; dorsellum strongly protruding, ventral lip coarsely punctate; netrion present, broad; fore and mid coxae separated by short but distinct intercoxal space; acetabular field and anteroventral portion of mesepleural carina; mesopleural carina flanked by row of contiguous foveae posteriorly, by poorly differentiated foveae anteriorly, with distinct raised crest; anterior extension of mesepleuron toward mid coxa long, acute; course of mesepleural carina indicated by line of foveae; sublateral setae on T1 absent; T2 longitudinally rugulose in basal two-thirds, apicad of midpoint of length of sclerite densely punctate, setose throughout; lateral sulci on S2 broadly separated posteriorly; setal fields well developed; area between sulci on S2 covered with large setigerous punctures, each separated by distance subequal to or less than its own diameter.

\textit{Host.} Unknown.

\textit{Material examined.} Holotype 9: SRI LANKA: Hambantota Dist., Palatupana, WL NPS Bungalow, malaise trap, 20–22. vi. 1978 (Krombein, Karunarathne & Jayawickrema & Karunarathne) (SE Ceylon, 6°16'N 81°24'E) (USNM).

\textit{Remarks.} This unusual species may be recognized among the other members of the genus with yellow or light brown radicle (\textit{viriosus, olympus group, watshami, abnormis}) by the combination of the coarse sculpture of the ventral lip of the strongly protruding dorsellum, the lack of deeply incised, acute mandibular teeth, the presence of a narrow intercoxal space, and the extremely short notauli.

\textbf{\textit{Psix flavicoxa} sp. n. (Figs. 8, 16, 28, 39)}

Length 0.6–1.0 mm; radicle black; scape yellow; all coxae yellow; frons (Fig. 8) with no single distinct pair of submedian carinae, with 2–4 irregular longitudinal carinae laterally, transverse carinae arising from pair nearest keel dorsally, ventrally transverse elements sometimes effaced before reaching keel; frons width > eye height; acetabular field and anteroventral portion of mesepleural carinae granulose (Fig. 16); narrow anterior declivous portion of mesoscutum smooth; dorsellum weakly protruding, ventral lip finely punctured; T1 with 3 pairs of sublateral setae; T2 longitudinally striate in basal two-thirds (Fig. 28), with only weak transverse wrinkles, apically with weak longitudinal wrinkles on granulose background; lateral sulci on S2 closely approximated posteriorly (Fig. 39); setal fields well developed; area between
sulci posterior to setal fields with scattered small setigerous punctures, each separated by 2–4 times its own diameter; anteriorly, area between sulci smooth, glabrous.

**Host.** Unknown.

**Material examined.** Holotype ♀: IVORY COAST: Bouaké, pan traps, irrigated rice field, iv.1980 (Cochereau) (CNC). Paratypes. 6 ♂, same data as holotype, except collected iii, iv.1980 (CNC). 6 ♂, Bouaké, malaise trap, rice field, ii, iii.1980 (Cochereau) (CNC, NFJ). ZIMBABWE: 2 ♀, Chishawasha, nr Harare (Salisbury), v–vii.1975, vi.1979 (Watsham) (BMNH).

**Remarks.** *Psix flavicoxa* may be distinguished among the other species of the genus with yellow coxae (*annulatus*, some *lacunatus*) by the lack of distinct submedian carinae, the well-developed setal fields, and by the pattern of sulci on S2 (sulci closely approximated, but neither intersecting nor continuous).

*Psix fusus* sp.n. (Fig. 43)

Length 0.7–1.2 mm; radicle black; scape yellow basally, darkened distally; coxae dark brown to black; frons (Fig. 43) with central keel not reaching median ocellus, separated by < 2 ocellar diameters; antennal scrobes delimited dorsally by transverse carinae; upper portion of scrobes with 2–3 transverse rugae; submedian carinae well developed ventrally, upper part of scrobes not defined laterally by submedians, but by irregular longitudinal extensions of them; area between orbital and submedian carinae narrow, with few raised setal bases; frons above scrobes with irregular longitudinal rugae; frons width subequal to eye height; genal carina curved toward eye; mesoscutum areolate-rugose, areolae not as well developed as in other *Psix* spp.; scutellum without distinct areolae, near scutoscutellar sulcus with irregular rugae, otherwise with only granulose microsculpture; dorsellum produced medially, ventral lip coarsely punctate; netrion present, broad; acetabular field and anteroventral portion of mesepisternum setose; mesopleural carina flanked by crenulae both anteriorly and posteriorly; anterior extension of metapleural toward mid coxa long, acute; course of metapleural carina indicated by line of foveae; no sublateral setae on T1; T2 longitudinally striate, lateral portions of sclerite with well-developed microsculpture; T2 setose laterally, setae not inserted into large punctures; S2 as in *P. glabriscrobus*.

**Host.** Unknown.

**Material examined.** Holotype ♀: AUSTRALIA: Northern Territory, Yuendumu, 15–30.ix (AEI). Other material. These specimens are generally in very poor condition: some are broken, all are extremely dirty. Our concept of *Psix fusus* is based upon the single female from Yuendumu. Accordingly the following specimens have not been designated as paratypes. AUSTRALIA: 4 ♀, pentatomid egg mass, Queensland, Nappamerry, 6.xi.1949 (Riek) (one without metasoma, one without head) (ANIC).

**Remarks.** This species may be separated from the other members of the *glabriscrobus* group by the lack of a distinct intercoxal space, the fore and mid coxae are contiguous, the normal condition in the genus. *Psix fusus* may be distinguished from the other species of the genus that possess both a black radicle and submedian carinae by the presence of a well-developed netrion, the lack of transverse rugae in the ventral portion of the scrobes, and by the failure of the central keel to reach the median ocellus.

This species is very similar to *P. glabriscrobus*, the major difference being the presence of a distinct intercoxal space in the latter species. We eagerly wait the collection of further Australian material that may serve to test our hypothesis that this difference is one between species and not a case of intraspecific variability.

*Psix glabriscrobus* (Girault) comb.n. (Figs. 44, 50)

*Telenomus glabriscrobus* Girault, 1926: 138.

Holotype ♀, AUSTRALIA: Queensland, Roma; host, *Biprorulus bibax* Bredden (Heteroptera: Pentatomidae) (ANIC) [examined].

Length 1.2–1.4 mm; radicle black; scape yellow; coxae dark brown to black; frons (Fig. 44) with central keel extending dorsad only
short distance from suprarental bifurcation to median ocellus; antennal scrobes delimited by submedian carinae laterally, strong transverse rugae above; area between orbital and submedian carinae with irregular longitudinal rugae above, setose below, setal bases pustulate; frons above scrobes with weakly defined transverse rugae medially, laterally more or less longitudinally rugose; lateral ocelli connected to inner orbits by furrow; frons width > eye height; genal carina curved toward eye; dorsellum strongly produced medially, ventral lip coarsely punctate; netrion present, broad; intercoxal space narrow, but distinct (Fig. 50); acetabular field and anteroventral portion of mesepisternum setose; mesopleural carina flanked by crenulae both anteriorly and posteriorly; anterior extension of metapleuron toward mid coxa long, acute (Fig. 50); course of metapleural carina indicated by line of foveae; no sublateral setae on T1; T2 longitudinally striate, microsculpture especially well developed postero-laterally; lateral sulci on S2 broadly separated posteriorly; setal fields well developed; area between sulci in posterior two-thirds of S2 with distinct setigerous punctures, each separated by 1–2 times its own diameter, punctures superimposed on finely punctulate surface, this area so strongly setose and sculptured that mesal boundaries of setal fields indistinct; S2 anteriorly with narrow smooth area between sulci.

Host. Bipurorus bibax (Pentatomidae).

Material examined. AUSTRALIA: 1♀, New South Wales, Gerogery, 14.iv.1961 (Colless) (ANIC). 1♀, Cabramatta. 9.iii. 1963 (Nikitin) (BMNH). 1♀, Northern Territory, Yuendumu, 25.viii–14.ix (AEI). 1♀, 23° 36'S 133° 35'E, 32 km WNW of Alice Springs, 8.x.1978 (Cardale) (ANIC).

Remarks. Psix glabriscurbus may be distinguished from its sister species fusus by the presence of a narrow, but distinct intercoxal space. It may be separated from metopa by the shorter and stouter body and wings, by the presence of well-developed transverse elements in the sculpture of T2, and by the densely punctulate apex of T2. It may also be recognized among the other species with black radicle and submedian carinae by the well-developed netrion and the presence of the intercoxal space.

Psix lacunatus sp.n. (Figs. 4, 19, 29, 34)

Length 0.7–1.3 mm; radicle black; scape yellow; coxae usually yellow, sometimes infuscated; frons (Fig. 4) with well-developed submedian carinae; area between central keel and submedians transversely rugose, rugae dorsally reaching central keel, ventrally fading out before reaching midline leaving smooth frontal depression; area between submedian and orbital carinae with single longitudinal row of setae, setal bases pustulate; frons width usually less than eye height; acetabular field and anteroventral portion of mesepisternum setose (Fig. 19); narrow anterior declivous portion of mesoscutum with sculpture effaced; dorsellum weakly

FIG. 50. Psix glabriscurbus, lateral habitus; ICS: intercoxal space.
protruding, ventral lip punctate; T1 with one pair of sublateral setae; apex of T2 either weakly punctulate or smooth; T2 otherwise longitudinally rugose throughout (Fig. 29), with at most only weak indications of cross-striae; S2 (Fig. 34) as in *P. striaticeps*, except lateral sulci more nearly straight, setigerous punctures more widely separated.

**Hosts.** *Caystrus* sp. on *Desmostachya bipinnata* [Gramineae], *Dolycoris indicus* Stål, *Eurydema festivum* (Linn.), *Nezara viridula* (Linn.) (Heteroptera: Pentatomidae, Scutelleridae) [all records from material reared in Pakistan].

**Material examined.** Holotype ♂: INDIA: Tamil Nadu, Siruvani Forest, 30.ix.1979 (Noyes) (BMNH). Paratypes. AUSTRALIA: 10, Northern Territory, Cattle Creek, 16°32'S 136°10'E, 54 km S by W of Boroolooa; 27.x.1975 (Cardale) (ANIC). 10, 15°37'S 135°21'E, Bing Bong, 20.iv.1976 (Feehan) (ANIC). HONG KONG: 1♀, N.T., Taipokau, Kowloon, malaise trap, 26.vi.1965 (Lee Kit Ming & Hui Wai Ming) (BPBM). INDIA: 10, same data as holotype (BMNH). 10, Tamil Nadu, 3 km E Manjaler Dam, 15-18.x.1979 (Noyes) (BMNH). LAOS: 1♀, Wapikhamthong Province, Wapi, 15.vii.1967 (native collector) (BPBM); 2♂, light trap, 30.iii.1967 (BPBM). PAKISTAN: 1♀, Gujrat, 20.iv.1968 (BMNH). 1♀, Rawalpindi, 2.v.1968, (BMNH); 2♂, 3♀, 14.vi.1969 (USNM); 1♂, 1♀, 2.v.1968 (BMNH). TAIWAN: 1♀, Taipei, 3.iv.1977 (Klapperich) (CNC). THAILAND: 1♀, Pangmakpampon (Pankampawng), nr Fang, 450 m, 15-16.xi.1957 (BPBM). Other material. LAOS: 1♀, Sayaboury Prov., Sayaboury, light trap, 15.i.1966 (native collector) (BPBM). The following specimens have no locality data, but the labels are written in the same handwriting as the CIBC specimens above, and are presumably from Pakistan. Many are broken, missing either the head, head appendages or metastoma. All are from the USNM. 1♀, lab reared 16.v.1968; 1♂, lab reared, 20.v.1968; 1♂, lab reared 31.v.1968; 2♀, 3♂, lab reared 12.vi.1968.

**Remarks.** This species may be separated from others in the genus with yellow coxae (*flavicoxa, annulatus*) by the presence of distinct submedian carinae, punctate ventral lip of the dorsellum, and the narrow frons.

*Psix lacunatus* may be distinguished from those species possessing both a black radicle and distinct submedian carinae (*asper, glabriscrobus* group) by the lack of notauli and netrion, the weakly expanded and more finely sculptured dorsellum, and the absence of foveae indicating the course of the metapleural carina.

**Psix metopa sp.n.** (Fig. 42)

Length 1.4–1.6 mm; radicle black; scape yellow; coxae dark brown to black; submedian carinae well developed (Fig. 42); antennal scrobes delimited dorsally by transverse carinae; frons above scrobes with irregular longitudinal rugae; area between orbital and submedian carinae setose, setal bases strongly raised; frons width > eye height; genal carina parallel to posterior orbit; dorsellum strongly produced medially, ventral lip punctate, deeply excavate dorsally; netrion present, narrow; intercoxal space present, narrow; acetabular field and anteroventral portion of mesepisternum setose; mesopleural carina flanked by crenulae both anteriorly and posteriorly; anterior extension of metapleuron toward mid coxa long, acute; course of metapleural carina indicated by line of foveae; no sublateral setae on T1; T2 longitudinally costate, with no indication of transverse elements, sparsely setose laterally; lateral sulci on S2 broadly separated posteriorly; setal fields large, located in posterior half of sulci, not extending beyond apex of sulci; area between setal fields smooth, with setigerous punctures separated by 3–4 times their own diameter; anteriorly sulci closely approximated medially, space between them with weak longitudinal wrinkles.

**Host.** Unknown.

**Material examined.** Holotype ♂: AUSTRALIA: Northern Territory, 12°28'S 132°52'E, Jabaluka Lagoon, 14 km N Mudgibarry HS, 14.xi.1972 (Cardale) (ANIC). Paratypes. 1♀ with same data as holotype (ANIC). 1♀, Northern Territory, 12°40'S 132°54'E, Magela Ck, 9 km SSE of Mudgibarry HS, 7–8.xi.1972 (Cardale) (ANIC).

**Remarks.** This species may be distinguished from the closely related *P. glabriscrobus* by the
lack of cross-striae on T2, apex of T2 weakly punctulate, and the more elongate body and wings.

**Psix olympus** (Dodd) comb.n. (Fig. 45)

*Telenomus olympus* Dodd, 1913: 166. Holotype, AUSTRALIA: Queensland, Gordonvale; host, unknown [not examined].

*Microphanurus olympus*; Keiffer, 1926: 115.

Length 1.1–1.4 mm; radicle light brown; scape yellow; coxae brown; submedian carinae (Fig. 45) present, sometimes only ventrally; scrobes narrow, lateral margins converging dorsad, often with 4–5 strong transverse costae (not well developed in the specimen illustrated in Fig. 45); frons otherwise irregularly areolate-rugose; frons width > eye height; mandibles distinctly tridentate, all teeth acute; clypeal margin with two weak, widely spaced teeth; dorsellum weakly protruding medially, ventral lip excavate medially, lateral of excavation with shallow punctures (similar to *Psix lacunatus*), otherwise smooth; metepisternum and anteroventral portion of mesepisternum sparsely setose; mesopleural carina flanked by crenulae both anteriorly and posteriorly; anterior extension of metapleuron toward mid coxa distinct, acute; course of metapleural carina indistinct, entire lateral surface of metapleuron + propodeum areolate; number of sublateral setae on T1 variable, from 0–2 pairs; T2 longitudinally striate, without cross-striae, no setigerous punctures; lateral sulci on S2 weakly arcuate, broadly separated posteriorly; setal fields well developed; area between S2 sulci posteriorly with setigerous punctures, each separated by 2–3 times its own diameter, smooth anteriorly.

*Host.* Unknown.

*Material examined.* AUSTRALIA: 1 ♂, Queensland, Gordonvale, x.1920; 1 ♂, Mt Tambourine (Dodd); 1 ♂, The Boulders, Babinda, 10.v.1967 (Colless); 1 ♂, Kuranda Range State Forest, 20.iv.1967 (Colless); 1 ♂, 17° 54’S 146° 06’E, Laceys Creek, Mission Beach, 13–14.v.1980 (Naumann & Cardale) (all ANIC).

*Remarks.* *Psix olympus* may be distinguished from the other members of the *olympus* group by the combination of the tridentate mandibles and the lack of notauli. We have not yet had the opportunity to examine the holotype of this species. Our interpretation is based upon the specimen from Gordonvale that was identified as *Telenomus olympus* by A. P. Dodd.

**Psix rasilis** sp.n. (Figs. 7, 40)

Length 0.8 mm; radicle black; scape yellow; coxae dark brown to black; frons (Fig. 8) with no distinct submedian carinae, with transverse rugulae arising from or near central keel, merging laterally with irregular confused rugulae; frons width > eye height; acetabular field and anteroventral portion of mesepisternum setose; narrow anterior declivous portion of mesoscutum smooth; dorsellum weakly protruding, ventral lip finely granulose; T1 with 2–3 pairs of sublateral setae; T2 longitudinally costate in basal two-thirds, apical third with well-developed cross-striae over longitudinal sculpture; S2 (Fig. 40) with arcuate lateral sulci intersecting or closely approximated posteriorly; setal fields well developed; area of S2 between sulci otherwise smooth.

*Host.* Unknown.

*Material examined.* Holotype ♂: IVORY COAST: Bouaké, pan traps, irrigated rice field, iii.1980 (Cochereau) (CNC). Paratypes. 3 ♀ with same data as holotype, except collected iv–v.1980 (2) and i–x.1981 (1). GAMBIA: 1 ♀, Abuko, Lamin, 20.i.1978 (Huggert) (HUGG).

*Remarks.* *Psix rasilis* may be distinguished from others in the genus with closely approximated, intersecting or continuous S2 sulci by its black radicle (yellow in *abnormis*), dark coxae (yellow in *flavicoxa* and *annulatus*), and punctulate ventral lip of the dorsellum (smooth in *saccharicola* and *abnormis*).

**Psix saccharicola** (Mani) comb.n. (Figs. 12, 35)

*Telenomus saccharicola* Mani, 1941: 26.

Holotype ♂, INDIA: New Delhi, host, pentatomid (?) (sic) (IARI) [see below].
Length 0.6–0.7 mm; radicle black; scape yellow to yellowish-brown; coxae dark brown; frons (Fig. 12) without distinct submedian carinae, laterally with several fine longitudinal carinae, medially carinae curve to become nearly transverse, converging on central keel; frons width > eye height; crenulae of occipital carina elongate, occiput therefore longitudinally striate near carina; narrow anterior declivous portion of mesoscutum smooth; dorsellum weakly protruding, ventral lip smooth; acetabular field and anteroventral portion of mesepisternum glabrous; T1 with one pair of sublateral setae; apex of T2 smooth; T2 otherwise with fine longitudinal rugulae in basal half, apically rugulae more irregular and cross-striae appearing, sculpture coriaceous near apex of sclerite; S2 (Fig. 35) similar to that of *P.tunetanus* (Fig. 36), except that some sulci are continuous posteriorly.

*Host.* Pentatomidae.

**Material examined.** INDIA: 1♀, Karnataka, Bangalore, 19–23.x.1979 (Noyes) (BMNH); 2♀, Bangalore, CIBC grounds, pan traps, 14.iv.1975 (CNC); 1♀, Mudigere, 26.x–4.xi.1979 (Noyes) (BMNH). 6♂, 1♂, Kerala, Walayer Forest, 26.ix–1.x.1979 (Noyes) (BMNH). 26♀, 3♂, Tamil Nadu, Coimbatore, 25.ix–1.x.1979 (Noyes) (BMNH); 1♀, Mudumalai, A. San., 23–24.x.1979 (Noyes) (BMNH); 3♀, Marudumalai (hill slope, 10 km from Coimbatore; Mani, 1976), 28.iii.1972 (Mani and party) (USNM). 28♀, 8♂, Uttar Pradesh, Aligarh, 8–10.xi.1979 (Noyes) (BMNH, ANIC, NFJ, IARI).

Remarks. *Psix saccharicola* may be separated from *tunetanus* on the basis of the continuous sulci on S2; from *watshami* and *abnormis* by the dark radicle and the pattern of the sulci on S2 (compare Fig. 35 with Figs. 37 and 38); it may be separated from *rasilis*, *annulatus* and *flavicoxa* by the combination of the smooth ventral lip of the dorsellum and the darkened coxae.

One specimen from India (Bhorghat-Sangvi village, Bhatghar Dam, 70 km from Poona, near R. Joguati, Deccan Plateau [Mani, 1976]) agrees with the specimens of *saccharicola* described above except in colour characters. This specimen, in the collection of the USNM, is extremely dark in colour, appearing very similar to *P.tunetanus*. It was collected in March 1962, as were the three females from Marudumalai above. We conclude that this represents only an extreme colour variant of *saccharicola*.

We have associated the type of *Telenomus saccharicola* Mani with this species through the assistance of Drs M. Farooqi and S. Ghai (IARI).

**Psix striaticeps** (Dodd) comb.n. (Figs. 1, 2, 6, 13, 22, 27, 31, 32)

*Telenomus striaticeps* Dodd, 1920: 355. Holotype ♀, NYASALAND (Malawi): Mt Mlanje; host, pentatomid. (BMNH) [examined].

*Microphanurus carinifrons* Fouts, 1934: 105. Holotype ♀, ITALIAN SOMALILAND (Somalia): Villaggio Duca deli Abruzzi, host, *Nezara* sp. (Heteroptera: Pentatomidae). (Museo Zoologico della Specola, Florence, Italy) [examined]. [Junior secondary homonym in *Trissolcus of Immsia carinifrons* Cameron, 1912.]

[Synonymized by Nixon, 1943: 139.]

*Microphanurus striaticeps*; Nixon, 1935: 100. *Microphanurus striaticeps*; Nixon, 1938: 125. *Microphanurus striaticeps*; Nixon, 1943: 139. *Trissolcus striaticeps*; Masner, 1965: 128. *Trissolcus carinifrons*; Bin, 1974: 463. *Trissolcus fousii* Masner, 1976: 76. [Replacement name for *Microphanurus carinifrons* Fouts, 1934].

*Aporophlebus striaticeps*; Mineo, 1979: 235.

Length 0.6–1.1 mm; radicle black; scape yellow; coxae dark brown to black; frons (Fig. 6) with no distinct submedian carinae; area between central keel and orbital carinae approximately 4–5 longitudinal carinae that medially curve toward smooth central field or become confused near midpoint of height of frons; frons width > eye height; dorsellum weakly protruding (Fig. 22), ventral lip punctate or with fine longitudinal striae; acetabular field and anteroventral portion of mesepisternum glabrous (Fig. 13); T1 usually with one pair of sublateral setae; T2 (Fig. 27) longitudinally rugulose, with distinct cross-striae throughout; lateral sulci
on S2 broadly separated posteriorly (Fig. 31); setal fields well developed (Fig. 32); area between sulci on S2 otherwise covered with large setigerous punctures, each separated from others by 0.5–2 times its own diameter.

Hosts. Acanthomia brevirostris Stål (Heteroptera: Coreidae) on Cajanus indicus (Leguminosae) [Sudan]; Acrosternum acutum (Dallas) (Pentatomidae) [Nigeria]; Nezara sp. (Pentatomidae) [Somalia].

Material examined. ETHIOPIA: 1♀, Asmara, 2316 m, 18–20.i.1962 (Clark) (CNC). GAMBIA: 1♀, Bakau, 16.i.1978 (Huggert) (HUGG). INDIA: 4♀, Tamil Nadu, Coimbatore, 2.vi.1936 (Nathan) (BMNH). 5♀, Karnataka, E. Ghat, Hogenakal, i–ii.1977 (Mani party) (CNC). IVORY COAST: 20♀, 4♂, Bouaké, pan traps, irrigated rice field, ii–iv.1980, i–x.1981 (Cocheareau) (CNC). MALAGASY REPUBLIC: 1♀, Chaînes Anosyennes, region of Fort-Dauphin, summit basin, 1900 m, beaten from bunches of bamboo, 20.ii.1971 (Peyrieras) (MNHP). NIGERIA: 4♀, Aus, i.1930 (Turner) (BMNH). NIGERIA: 4♀, Ibadan, 12.vi.1977 (Dina) (BMNH); 6♀, 19.iii.1919 (BMNH). SUDAN: 12♂, Bambe, 31.v.1939 (Riabec) (BMNH). SOMALIA: 2♀, Mogadiscio, Afgoi-Shabelli Valley, malaise trap, 1–15.ii.1977 (Bin) (CNC); 1♀, 16–28.iv.1980 (Olmi) (CNC). SUDAN: 12♀, Wad Medani, 12.ii.1928 (Johnston) (BMNH); 14♀, 5♂, 15.ii.1928 (Johnston) (BMNH); 5♀, 16.ii.1928 (Johnston) (BMNH). TANZANIA: 10♀, 1♂, Tanga, 4.viii.1917 (Lamborn) (BMNH). ZIMBABWE: 16♀, Chipinga Dist., ex unknown eggs on coffee, 10.xii.1974 (Hill) (BMNH). 39♀, 5♂, Chishawasha, nr Harare (Salisbury), x–xii.1974; i–iii, v–vii, ix–xii.1975; ix, x, xi.1978; i, ii, iii, v, vi, vii, viii, ix, x, 1979; iv, vii, viii.1980; ix.1981 (Watsham) (ANIC, BMNH, CNC, NFJ, IARI).

Remarks. Psix striaticeps may be distinguished from the closely related P. lacunatus by its lack of distinct submedian carinae, dark coxae, punctulate or finely striate ventral lip of the dorsellum, and the smooth anterior declivous portion of the mesoscutum. It may also be separated from the related P. rasilis by the wide separation of the S2 sulci posteriorly.

The range of Psix striaticeps extends from western Africa through that continent, into Madagascar, and at least into southern India. In addition to its wide geographical distribution, P. striaticeps is also fairly commonly collected; only abnormis and watshami have been collected in comparable numbers within their range. The collection dates at Chishawasha, Zimbabwe suggest that striaticeps is multivoltine and/or polyphagous.

Psix sulcifer sp.n. (Fig. 47)

Length 1.0 mm; radicle light brown; scape yellow; coxae dark brown; submedian carinae well developed (Fig. 47), extending as far dorsad as smooth glabrous portion of scrobes; scrobes not delimited dorsally by carinae; frons dorsad of scrobes with rugae diverging above; area between submedian and orbital carinae narrow, setose, setal bases pustulate; frons width subequal to eye height; lateral ocelli connected to inner orbits by indistinct furrow; mandibles tridentate, all teeth acute; mesoscutum irregularly rugose, rugae effaced near scutocutellus sulcus and anterior declivous portion of mesoscutum;notaui present, crenulate, diverging anteriorly, reaching midpoint of length of mesoscutum; scutellum with sculpture similar to mesoscutum, but closer to areolate-rugose condition common in the genus; dorsellum produced medially, ventral lip with pair of deep excavations above, lateral margins of excavations dentate, ventral lip punctate below; netrion present, narrow; acetabular field and anteroventral region of mesepisternum setose; mesopleural carina flanked by crenulae both anteriorly and posteriorly; only single postepimeral fovea present dorsally; anterior extension of metapleural toward mid coxa distinct, acute; course of metapleural carina indicated by foveae, somewhat obscured by coarse sculpture of metapleuron + propodeum; no sublateral setae on T1; T2 longitudinally costate in basal half, in apical half costae weak, merging with cariaceous microsculpture; sulci on S2 broadly separated posteriorly; setal fields well developed; area between and posterior to setal fields with numerous large setigerous punctures, each separated by less than its own diameter; area of S2 anterior to setal fields smooth, glabrous.
**Psix tunetanus** comb. n. (Figs. 11, 36)

_Aporophlebus tunetanus_ Mineo & Szabó, 1979: 271. Holotype ♀, TUNISIA: Ham-mam, 5 km NW Sousse; host, unknown. (TMB) [examined].

Length 0.6–0.8 mm; radicle black; scape variable in colour, from yellow throughout, to yellowish-brown basally, dark brown apically; coxae dark brown to black; frons (Fig. 11) without distinct submedian carinae; frontal sculpture otherwise variable: from rugulose with distinct transverse elements medially, to sculpture largely effaced medially with few longitudinal wrinkles near eyes; frons width > eye height; occiput longitudinally striate; narrow anterior declivous portion of mesoscutum smooth; scutellum with same sculpture as disc of mesoscutum, often effaced posteriorly; dorsellum weakly protruding, ventral lip smooth; acetalbar field and anteroventral portion of mesepisternum sparsely setose; T1 with one pair of sublateral setae; apex of T2 finely punctulate or smooth; T2 otherwise longitudinally striate, with only weak indication of cross-striae apically; lateral sulci on S2 broadly separated posteriorly (Fig. 36); setal fields well developed; posteriorly area on S2 between sulci otherwise granulose, sparsely setose; area between anterior halves of sulci smooth.

Hosts. Pentatomidae; _Euschistus impictiventris_ Stål, Chlorochroa sp. (Pentatomidae; both USA).

Material examined. GAMBIA: 9 ♀, Bakau, 18, 19, 20, 28.i.1978 (Huggert) (HUGG). 13 ♀, Fajara, 21, 24.i.1978 (Huggert) (HUGG). IVORY COAST: 1 ♂, Bouaké, rice field, ii.1980 (Cocheureau) (CNC). MEXICO: 1 ♀, Baja California Sur, Los Barriles, malaia trap, 28–29.iv.1979 (Wasbauer) (CDAS); 1 ♀, Baja California Sur, Sierra de la Laguna, 1829 m, La Laguna, 27.8 km ENE Todos Santos, malaia trap, 14–16.xii.1979, (Was-bauer) (CDAS). 2 ♀, Sonora, 40 km N Carbo, 22.vi.1981 (LaSalle) (NFJ). SAUDI ARABIA: 1 ♀, E. Riyadh, 3.ix.1959 (Diehl) (CNC). 3 ♀, 1 ♂, Riyadh, 16.xii.1979 (Tal-houk) (HUGG). USA: Arizona: 2 ♀, Cochise Co., Chiricahua Mts, Fly Park above Portal, 6.viii.1977 (Masner) (CNC); 7 ♀, Cochise Co., 11.3 km NE Douglas, 27.viii.1979 (Melton) (NFJ); 2 ♀, Cochise Co., 0.6 km NE Portal, 28.viii.1979 (Melton) (NFJ); 3 ♀, Maricopa Co., Buckeye, 2.ix.1912 (Urbahns) (USNM); 45 ♀, 2♂, Maricopa Co., Buckeye, 2.vii.1935 (Johnston) (USNM); 1♂, Maricopa Co., 33.8 km S Gila Bend, 25.viii.1979 (Melton) (NFJ); 1 ♀, Maricopa Co., Wickenburg, 16.vi.1937 (Knoll) (OSU). 1 ♀, Pima Co., IBP, Sta. Rita, Destr. Site, 23.vi.1970; 1 ♀, Pima Co., Sta. Rita Rnge Res., 19.vi.1970; 4 ♀, 1♂, Pima Co., Tucson, 13, 19, 24, 27, 28.vii.1962 (UAT); 1 ♀, Spencer Camp, Coronado Nat. Forest, 10.ix.1978 (UCR). 1 ♀, Guadalupe Cyn., 9.viii.1977 (Masner) (CNC). California: 35 ♀, 4♂, Fresno Co., Mendota, assoc. Aphalara suaveola (series accompanied by pinned specimen of Chlorochroa sp.), viii.1952 (Hagen) (UCB); 1 ♀, Kern Co., Edison, 20.iv.1953 (Kennett) (UCB); 2♀, Kings Co., Avenal, on Salsola kali (Chenopodiaceae), 29.vi.1952 (Wilson) (UCB); Riverside Co., 1♀, Colorado Des., 8.0 km S Palm Springs, in shade of leafy plant, 8.vi.1930 (Timberlake); 2♀ as above, but on Eriogonum trichopes (Polygonaceae), 30.v.1930 (Timberlake); 1♀, Riverside Co., nr Indio, on mesquite (Prosopis sp., Mim- sacae), 3.vi.1929 (Timberlake) (all Riverside Co. specimens from UCR); 1♀, San Bernadino Co., Baldy Mesa, 9.7 km E Phelan, 30.v.–5.vi.1981 (Huber) (NFJ); 1♀, San Bernadino Co., Barstow, on Cleomella obtusifo-lia (Capparidaceae), 12.ix.1924 (Timber-lake) (UCR); 1♀, San Bernadino Co., Helen-dale, on Cobotusfolia, 14.ix.1935 (Timberlake) (UCR); 2♀, 1♂, San Bernadino Co., Hodge, on Cobotusfolia, 14.ix.1935 (Timberlake) (UCR); 17♀, 1♂, San Bernadino Co., 0.6 km N Hodge, coll. on Prosopis, 13.vi.1979 (LaSalle) (CNC, UCR); 8♀, 3♂, San Bernadino Co., 9.7 km N Twentynine Palms,
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14.v.1981 (*J. La Salle*) (NFJ); 2 ?, San Diego Co., Coyote Cyn, Anza-Borrego S.P., 15.iv.1981, swept (*Huber*) (NFJ); 1 d, 6 ?, Tulare Co., Corcoran, 1.viii.1913 (*Urbahn*) (USNM). Illinois: 1 ?, Marion Co., Centralia, screen sweeping, 4.ix.1983 (*Huber*) (CNC). New Mexico: 1 ?, Catron Co., 12.9 km SE Luna, 2286 m, 9–14.vii.1979 (*Peck*) (CNC); 1 ?, Lincoln Co., Sr. Blanco, 2957 m, malaise trap, 10–26.vi.1979 (*Peck*) (CNC); 1 ?, Valencia Co., 32.2 km W Los Lunas, Carizzo Arroyo, malaise trap, 1–22.viii.1977 (*Peck*) (CNC). Oklahoma: 2 d, 2 ?, Canadian Co., El Reno, ex seed head *Bouteloua curtipendula* (Gramineae), 1.viii.1959 (USNM). Texas: 4 ?, Blanco Co., Pedernales Falls S.P., 17.x.1978 (*Masner*) (CNC); 1 ?, Brewster Co., Big Bend N.P., lowland desert springs, 19.vii.1977 (*Masner*) (CNC). Utah: 1 d, Davis Co., 0.6 km W Centerville, grass and herbaceous veg. nr salt lake, 8.ix.1983, (*Huber*) (CNC). VENEZUELA: 11 ?, Zulia, Maracaibo, 20 m, shrubs, 22.iv.1983 (*Huber*) (CNC, NFJ).

Remarks. *Psix tunetanus* may be distinguished from the closely related species *saccharicola, rasilis, annulatus* and *flavicoxa* by the broad separation of the sulci in the posterior portion of S2; the dark radicle of *tunetanus* will serve to separate it from both *abnormis* and *watshami* (radicle yellow).

The anomalous distribution of *tunetanus* deserves comment. As summarized above, this species is known in the Old World from Saudi Arabia, Tunisia, the Ivory Coast and Gambia; and in the New World from the southwestern U.S. (California, Arizona, New Mexico, Utah, Oklahoma, Texas, Illinois), northern Mexico (Sonora, Baja California Sur), and the Lake Maracaibo basin in Venezuela. On the basis of the distribution of other species of *Psix*, and the position of *tunetanus* in the cladogram, we have little doubt that this species originated in the Old World and has since spread into the New. We suggest that the range expansion has been connected with commercial traffic into the southwestern United States — in support of this we note the large-scale importation of Mediterranean plants into southern California and neighbouring states in the past century. The Venezuelan population, by virtue of its isolation, may represent a second introduction. Lake Maracaibo is a major port of entry into the country, and the area immediately surrounding the lake is a dry enclave in the surrounding tropical habitat.

### Psix viriosus sp.n. (Figs. 3, 14, 17, 24, 30)

Length 0.7–1.0 mm; radicle and scape color- lorous, yellow to brownish-yellow; coxae dark brown; frons (Fig. 3) with well-developed submedian carinae; area between orbitals and submedians setose, setal bases pustulate, otherwise smooth; area between submedians and central keel transversely costate, costae not reaching keel; frons width > eye height; mesoscutum (Fig. 24) weakly rugose to areolate-rugose posteriorly; notaui present; disc of scutellum with same sculpture as mesoscutum, weakly excavate posteriorly, marginal rim below this point protruding (Fig. 24); dorsellum weakly protruding, ventral lip longitudinally costate, as on dorsal portion of sclerite; acetabular field and anteroventral portion of mesepisternum setose (Fig. 14); mesopleural carina flanked by crenulae both anteriorly and posteriorly, raised crest present; anterior extension of metapleuron toward mid coxa long, acute (Fig. 14); course of metapleural carina indicated by line of foveae; T1 with 2 pairs of sublateral setae; apex of T2 punctulate, sculpture effaced at extreme apex; T2 otherwise with irregular longitudinal rugae throughout, no indication of cross-striae, with distinct setigerous punctures, each separated from others by 2–4 times its own diameter; lateral sulci on S2 broadly separated posteriorly (Fig. 30); setal fields large, located near posterior limits of sulci; area between sulci otherwise covered with setigerous punctures, each separated from others by 1–3 times its own diameter.

Host. Unknown.

Material examined. Holotype ?: INDIA: Tamil Nadu, Coimbatore, 25.ix–1.x.1979 (*Noyes*) (BMNH). Paratypes. 1 ? with same data as holotype; metasoma missing. BORNEO: 1 d, 1 ?, Sarawak, Kapit District, Meriah Valley, 28–31.vii.1958 (*Maa*) (BPBM). HONG KONG: 1 ?, N.T., Tai pokau, Forestry Sta., light trap, 10–14.vii.1964 (*Lee Kit Ming & Hui Wai Ming*) (BPBM). PHILIPPINE IS.: 1 d, Busuanga, 4 km N of...
San Nicolas, malaise trap, 21.v.1962 (Holt- 
man) (BPBM). Other material: BANGLA-
DESH: Dacca, 1962, on Lady's Finger, 1♀ mounted for SEM.

Remarks. This species is a very distinctive 
member of the genus because of the pres-
ence of short, parallel notauli and its very 
short, squat habitus. *Psix viriosus* may be 
easily separated from the other species 
possessing notauli by means of its yellow 
radicle (black in *asper*), narrow frons, short, 
parallel notauli (diverging in *sulcifer*), and 
acute apex of scutellum.

*Psix watshami* sp.n. (Figs. 10, 25, 37)

Length 0.5–0.9 mm; radicle and scape yel-
low; coxae dark brown; frons (Fig. 10) 
with no distinct submedian carinae, with 
weak longitudinal rugulae, sculpture effaced 
neat central keel; frons width > eye height; 
occiput longitudinally striate; narrow anterior 
divisive portion of mesoscutum smooth; 
notauli absent; scutellum (Fig. 25) coriaceous, 
sculpture often effaced near posterior margin 
to form smooth transverse band; dorsellum 
weakly protruding, ventral lip smooth (Fig. 25); 
acetabular field and anteroventral por-
tion of mesepisternum glabrous; T1 with one 
pair of sublateral setae; apex of T2 smooth or 
with widely separated punctulae; T2 other-
wise finely longitudinally rugulose through-
out; lateral sulci on S2 distinctly separated posteriorly 
(Fig. 37); setal fields well 
developed, sometimes contiguous medially; 
area on S2 between sulci otherwise smooth, 
glabrous.

Host. Unknown.

Material examined. Holotype ♀: ZIM-
BABWE: Chishawasha, nr Harare (Salis-
bury), ix–xii.1975 (Watsham) (CNC). Para-
types. MALGASY REPUBLIC: 1♀, Chaînes 
Anosyennes, Massif de L'Andohahelo, 1800 
m, beaten from *Philippia* (Ericaceae), v.1972 
(Peyrieras) (MNHP). RWANDA: 1♀, Kigali, 
malaise trap, 1977 (CNC). SOMALIA: 1♀, 
Mogadisco, Afgoi-Shabelli Valley, malaise 
trap, 14–28.iv.1977 (Bin) (CNC). ZIM-
BABWE: 64♀, 10♂, same data as holotype, 
but collected x.1974; v–vi, ix–xii.1975; 
i–vi.1976; i, iii, v, vi, vii, viii, ix, x.1979; 
iv, vii.1980; x.1981 (ANIC, BMNH, CNC, 
NFJ).

Remarks. *Psix watshami* may be distin-
guished from other *Psix* with a yellow or light 
brown radicle (*abnormis*, *viriosus*, *confluus*, 
*olympus* group) by the lack of distinct sub-
median carinae, the smooth ventral lip of the 
dorsellum, and the distinctive coriaceous 
sculpture of the scutellum (lacking the raised 
areolate-rugose sculpture typical for the 
genus). This species is named for the Rev. 
Anthony Watsham, whose extensive collect-
ing in southern Africa has provided a great 
treasure of both Chalcidoidea and Proctotrupoidea.

Phylogeny

A cladogram representing one hypothesis of 
the interrelationships among species of the 
genus *Psix* is presented in Fig. 51. The charac-
ters upon which this is based are listed in 
Appendix 1. Hypotheses of character polarity 
were derived using *P.confluus* as the out-
group. This choice was made despite the fact 
that *Archiphanurus* is undoubtedly closely 
related to *Psix*. *Archiphanurus* is a highly 
specialized genus in many respects and deter-
mination of homologies is often difficult. 
A subgroup of *Trissolcus* is probably the 
best candidate as an out-group, but our 
understanding of the systematics of that genus 
is as yet so fragmentary that this was not a 
practical option. We believe *P.confluus* is a 
relatively good choice as an out-group because 
it retains many character states that are 
probably plesiomorphic for the subfamily 
as a whole, i.e. widely found in the Tele-
asinae and tribes of the Scelioninae, viz 
setose lateral margins of T2, mesopleural 
carina present and flanked by crenulae, 
mesoscutum and scutellum coarsely sculpt-
tured, notauli present, lateral ocelli connected 
to inner orbits by a furrow. The implicit 
assumption, therefore, is that in character 
polarity hypotheses 'common equals primi-
tive', but given the present state of our know-
ledge of the systematics of these groups we 
see no better alternative.

The cladogram figured is only one of 
several possible with a total length of 36 
steps (excluding autapomorphies). We do not 
present this one as a definitive answer, but 
rather as a graphic illustration of some general
FIG. 5. Cladogram illustrating hypothesized relationships among species of Psix. Autapomorphies are not indicated except in cases of homoplasy; r indicates apparent reversal of character state. Numbers refer to characters listed in Appendix 1. Geographic distributions are summarized using biogeographic regions outlined in Brown (1973). Question mark in Oriental—E row for P. abnormis refers to uncertain synonymy with P. contemporalis.
characteristics of all of them. Two points are consistent. First, the species *lacunatus*, *striaticeps*, *rasilis*, *flavicoxa*, *annulatus*, *saccharicola*, *tunetanus*, *watshami* and *abnormis* form a monophyletic group, the *lacunatus* species group. The relationships within this group are consistent and illustrated in Fig. 51. Second, the species from Australia and southeast Asia generally cluster together near the base of the cladogram, in this example as two monophyletic groups, the *olympus* group (*olympus*, *aulax*, *sulcifer*) and the *glabriscrobus* group (*glabriscrobus*, *fuscus*, *metopa*). These species do not always appear as monophyletic groups; the relationships among them (and *asper* and *viriosus*) are unclear as a result of widespread homoplasy, difficulties with using *P.conflus* as an outgroup, and the small numbers of specimens available for these species.

The homoplasy in character 4, i.e. the presence on occlusion of the intercoxal space, is disturbing to us. Our understanding of both the inter- and intraspecific variation in *Psix* species from Australia and southeast Asia is, however, based upon a very small sample size. We anticipate that further collecting efforts will greatly help to clarify character state distributions among these species.

The more derived species of the genus, the *lacunatus* group, are generally found in Africa, southwest Asia and India (see Fig. 51). *Psix asper* is an Ethiopian species, known only from Uganda; in some cladograms it appears as the sister species of the *lacunatus* group. The earlier-derived species occur in the Australian and eastern Oriental realms. *Psix lacunatus* bridges these two groups; it is the basal branch of its species group and connects the generally western distribution of its relatives with the more plesiomorphic eastern species. As discussed above, *Psix tunetanus* has an unusual distribution for the genus in that it extends to the New World. We believe this may be a result of accidental introduction by man. There remain too many large unsampled areas to make any other, more detailed inferences about the evolution and zoogeography of *Psix*.

The position of the genus *Psix* within the subfamily Telenomininae is uncertain. As we have already mentioned, species such as *P.conflus* have many characters that are plesiomorphic for the subfamily as a whole. Indeed, the striking feature of the genus, the striate frons, is a very common character in the Scelioninnae and Teleasinae. This suggests an early derivation of the genus from the common ancestor of the Telenomininae. Another possibility is that *Psix* is a specialized ex-group of *Trissolcus*. Resolution of this general question awaits a better understanding of other relatively plesiomorphic telenomine groups, particularly those now classified within *Trissolcus*. The concentration of plesiomorphic species of *Psix* in Australia and southeast Asia suggests that clues may be found in that part of the world.

Acknowledgments

We thank D. E. Johnston (Ohio State University) and M. J. Sharkey (BR I, Ottawa) for critical review of the manuscript. We also thank L. Caltagirone (UCB), N. D. M. Ferguson (BMNH), J. C. Hall (UCR), M. A. Kozlov (ZIL), P. M. Marsh (USNM), G. Nishida (BPBM), I. D. Naumann (ANIC), J. Papp (TMB), H. Townes (AEI), M. W asbauer (CDAS) and F. Werner (UAT) for the kind loans of specimens from their institutions. Fig. 50 was prepared by Rebecca Dodson. S. Ghai and M. Farooqi (National Pusa Collections, IARI, New Delhi) generously compared the holotype of *P.saccharicola* with our keys, descriptions and specimens to help determine its identity. The collection efforts of A. Watsham (St Ignatius College, Harare, Zimbabwe), P. Cochereau (Agricole ORSTOM, Bouaké, Ivory Coast) and J. S. Noyes (BMNH) provided the initial data base, without which this revision would have been impossible. This material is based in part upon work supported by the National Science Foundation under Grant No. DEB-7919679 and Grant No. DEB-8201082 to N.F.J.

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Accepted 6 December 1983

Appendix 1

Characters used in construction of cladogram illustrated in Fig. 51; a = hypothesized apomorphic condition, p = plesiomorphic. Character state polarity hypotheses based upon comparison with Psix confinis. 1. Postepimeral forveae absent (p)/present (a). 2. T2 coriaceous (p)/smooth (a) laterally. 3. Mandibular teeth shallowly emarginate, short, truncate (p/deeply incised, acute (a). 4. Intercoxal space present (p)/occluded (a). 5. Notalaul present (p)/absent (a). 6. Antennal radicle: yellow (p)/black (a). 7. Central keel reaching median ocellus (p)/abbreviated (a). 8. Genal carina parallel to posterior orbits (p)/curved toward eye (a). 9. Nettion present (p)/absent (a). 10. Mesopleural carina crenulate anteriorly and posteriorly (p/anteriorly only (a). 11. Sublateral setae absent (p)/present (a). 12. Course of metapleural carina indicated (p)/obliterated by sculpture (a). 13. Ventral lip elongate medially (p)
as long laterally as medially (a). 14. Ventral lip of metanotum areolate-rugose (p)/punctate (a)/smooth (a, indicated as state 14.1). 15. T2 with (p)/without (a) setigerous punctures laterally. 16. Submedian carinae on frons present (p)/absent (a). 17. Anteroventral portion of mesepisternum setose (p)/glabrous (a). 18. Anterior declivous portion of mesoscutum sculptured (p)/smooth (a). 19. S2 with (p)/without (a) setigerous punctures medially. 20. Apex of T2 punctulate (p)/smooth (a). 21. Occiput areolate-rugose (p)/longitudinally striate (a). 22. S2 sulci broadly separated (p)/closely approximated (a) posteriorly. 23. Coxae dark (p)/yellow (a). 24. Anterior extension of metapleuron toward mid coxa long, deflexed, acute (p)/short, rounded (a).