

Revisions of Nearctic Tersilochinae IV. Genus *Phradis* Förster

(Hymenoptera, Ichneumonidae)

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The Nearctic species of the genus *Phradis* Förster are revised and described. A key is provided for eighteen species. Seventeen species are described as new: *Phradis basalis*, *P. brevicauda*, *P. coriaceus*, *P. curvicauda*, *P. flavicoxa*, *P. flavipes*, *P. longicauda*, *P. minor*, *P. nigricoxa*, *P. nitidipleuris*, *P. nitidus*, *P. punctatus*, *P. rarus*, *P. striatus*, *P. sulcator*, *P. tenuicauda*, and *P. texanus*.

Introduction

Phradis Förster is a moderately large genus, which was re-described by Horstmann (1971: 67 f.), Townes (1971: 46) and Gauld (1984: 313). Described and undescribed species are known from almost all parts of the world, except from the Neotropic region (Khalaim et al. 2009: 107). The Nearctic species were unnamed, until Khalaim (2002) described the species *P. kaspanyani*. In the present paper, eighteen species are treated, seventeen of them new. Many species are rarely collected, six species being known from only one specimen. Probably a considerable number of species is still undetected.

Whereas in Europe some species of *Phradis* have been reared from species of *Meligethes* Stephens (Coleoptera, Nitidulidae) (Horstmann 1971: 68, 1981: 22), no host record is known from North America. Some Nearctic species have been collected on pines (*Pinus* spp.). Apparently all species are univoltine, most of them with a flight period in spring or early summer (exception: *P. nitidus* spec. nov.).

Material and methods

In general terminology follows Townes (1969: 36 ff.). Some additional characters used for the differentiation of species are defined in the second part of the present series of revisions (Horstmann 2010). Two indices are defined: the ocellar index is the ratio of the shortest distance between the eye and the lateral ocellus to the longest diameter of the lateral ocellus; the malar space index is the ratio of the shortest distance between the rim bordering the mandibular groove and the eye (= malar space) to the basal width of a mandible. For the females, the number and the proportions of the flagellar segments and the length and the shape of the ovipositor are important diagnostic characters. Because in the males the antennae are much more uniform and differences in male genitalia are unknown, the determination of males is difficult, and for half of the species males are unknown. Therefore, only a provisional key to the males of some species is given.

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* The entire collection Horstmann is located in the Bavarian State Collection of Zoology in Munich after the sad demise of Prof. Dr. Klaus Horstmann on 30 July 2013. Requests should be sent to the following address: Zoologische Staatssammlung München, Sektion Hymenoptera, Münchhausenstr. 21, 81247 München, Germany.

and R. A. Wharton (Department of Entomology, Texas A & M University, College Station, USA). M. R. Shaw (National Museums of Scotland, Edinburgh, U.K.) assisted me with the English language. I am indebted to them all.

Abbreviations of depositories

AEI	American Entomological Institute, Gainesville (including Dasch collection)
CAM	Museum of Comparative Zoology, Harvard University, Cambridge (Mass.)
FRA	Department of Entomology, California Academy of Sciences, San Francisco
HOR	Coll. K. Horstmann, Würzburg
LAN	Department of Entomology, Michigan State University, East Lansing
LAR	Insect Museum, University of Wyoming, Laramie
NHM	Department of Entomology, Natural History Museum, London
OTT	Canadian National Collection of Insects, Agriculture and Agri-Food Canada, Ottawa
TEX	Department of Entomology, Texas A & M University, College Station (Texas)
WAH	Coll. D. B. Wahl, Gainesville
WAS	Systematic Entomology Laboratory, Smithsonian Institution, Washington (D.C.)
ZSM	Zoologische Staatssammlung, München

Taxonomy

Phradis Förster

Phradis Förster, 1869. Type species: *Thersilochus (Phradis) brevis* Brischke.

Eutomus Förster, 1869 (preocc.). Type species: *Isurgus lanceolatus* Szépligeti.

Isurgus Förster, 1869. Type species: *Isurgus lanceolatus* Szépligeti.

The following character states apply to all species discussed here and are not repeated in the descriptions: Ratio of the shortest distance between the inner margins of the eyes to the longest distance between the outer contours of the eyes 0.53–0.59. Face about as wide as the frons. Apex of clypeus rounded, blunt, with a transverse row of bristles. Genal carina low. Thorax short, 1.9–2.1 times as long as the width of the mesoscutum. Epomia obliterated. Prepectal carina low or slightly raised, bent forwards dorsally. Hind tibia distinctly longer than hind femur. Hind basitarsus 0.4–0.5 times as long as hind tibia. Longer hind tibial spur almost straight distally, about 0.3 times as long as the basitarsus (exception: *P. flavipes*). Tarsal claws not pectinate. Intercubitus of front wing subopposite to the 2nd recurrent vein (Fig. 4) (with some inter- and intraspecific variation). First brachial

cell closed at its lower distal corner (but the post-nervulus interrupted by a narrow bulla). Nervellus reclivous. Basal area of propodeum not replaced by a keel. Petiole almost circular in cross-section (exception: *P. flavicoxa*), without glymmae. Postpetiole rounded dorsally, with divergent lateral contours. Gastral tergites of the females incised posteriorly from the 3rd or the 4th tergite onwards. Ovipositor without subapical teeth ventrally.

Key to females

- Flagellum with 7–9 segments. 2.
 - Flagellum with 13–17 segments. 4.
- Flagellum with 7 segments, the last segment 0.6 times as long as the penultimate (Fig. 39). Metapleurum and dorsolateral area of propodeum distinctly punctate on a smooth background. *flavipes* spec. nov.
 - Flagellum with 8–9 segments (rarely with 7 segments), the last segment slightly longer than the penultimate (Figs 24, 61). Metapleurum and dorsolateral area of propodeum granulate, sometimes with additional punctures. 3.
- Flagellum with 9 segments (Fig. 24). Mesopleurum distinctly and rather densely punctate on a very finely granulate or smooth background. Dorsolateral area of propodeum finely granulate and with fine punctures. Ovipositor 2.8 times, ovipositor sheath 1.9 times as long as 1st gastral tergite. *curvicauda* spec. nov.
 - Flagellum with 8 segments (Fig. 61) (rarely with 7 segments). Mesopleurum finely granulate and densely punctate or rugose-punctate. Dorsolateral area of propodeum granulate and dull, a very fine punctation hardly discernible. Ovipositor 2.2–2.3 times, ovipositor sheath 1.4–1.5 times as long as 1st gastral tergite. *minor* spec. nov.
- Temple granulate, without discernible punctures, usually dull (slightly shining in *P. longicauda*, in this species ovipositor 3.0 times, ovipositor sheath 2.2 times as long as 1st gastral tergite). Flagellum with 14–15 segments. 5.
 - Temple with fine or distinct punctures on a finely granulate or smooth background. Ovipositor at most 2.6 times, ovipositor sheath at most 1.8 times as long as 1st gastral tergite. 8.
- Temple finely granulate, slightly shining. Ovipositor 3.0 times, ovipositor sheath 2.2 times as long as 1st gastral tergite. *longicauda* spec. nov.

- Temple distinctly granulate, dull. Ovipositor at most 2.0 times, ovipositor sheath at most 1.3 times as long as 1st gastral tergite. 6.
- 6. Foveate groove absent, replaced by a very shallow and finely wrinkled depression (Fig. 18). Ovipositor abruptly narrowed subapically, the tip thin (Fig. 22). Ovipositor 1.3 times, ovipositor sheath 0.9 times as long as 1st gastral tergite. *coriaceus* spec. nov.
- Foveate groove present as a distinct furrow (Figs 3, 111). Ovipositor with a shallow rounded dorsal depression subapically, its tip evenly tapered (Figs 8, 115). Ovipositor 1.6–2.0 times, ovipositor sheath 1.1–1.3 times as long as 1st gastral tergite. 7.
- 7. 2nd flagellar segment 1.2 times as long as the 1st segment (Fig. 2). Foveate groove about half as long as mesopleurum (Fig. 3). Petiole with a few fine striae dorsally and laterally, partly smooth (Fig. 6). Ovipositor 1.6 times, ovipositor sheath 1.1 times as long as 1st gastral tergite. *basalis* spec. nov.
- 2nd flagellar segment 0.8 times as long as the 1st segment (Fig. 110). Foveate groove almost as long as mesopleurum (Fig. 111). Petiole completely and distinctly striate dorsally and laterally (Fig. 113). Ovipositor 2.0 times, ovipositor sheath 1.3 times as long as 1st gastral tergite. ... *sulcator* spec. nov.
- 8. Flagellum with 13–14 segments. 9.
- Flagellum with 15–17 segments. 12.
- 9. Flagellum stout, 2nd segment 2.3 times as long as wide (Fig. 32). Ovipositor 1.7 times, ovipositor sheath about as long as 1st gastral tergite. *flavicoxa* spec. nov.
- Flagellum slender, 2nd segment 2.9–3.4 times as long as wide (Figs 82, 96, 103). Ovipositor 2.1–2.6 times, ovipositor sheath 1.2–1.8 times as long as 1st gastral tergite. 10.
- 10. Glossa usually 0.8 times as long as the width of clypeus (glossa shorter in a variety). Mesopleurum with disperse or rather dense punctation on a smooth background. Dorsolateral area of propodeum covered with irregular wrinkles. Ovipositor 2.1 times, ovipositor sheath 1.2 times as long as 1st gastral tergite. *nitidus* spec. nov.
- Glossa 0.4 times as long as the width of clypeus. Mesopleurum granulate, sometimes with additional punctures. Dorsolateral area of propodeum granulate, sometimes with additional punctures, sometimes with wrinkles at the edges. Ovipositor 2.4–2.6 times, ovipositor sheath 1.8 times as long as 1st gastral tergite. 11.
- 11. Temples almost not constricted directly behind the eyes (Fig. 95). Mesopleurum granulate, partly with fine wrinkles or striae, punctures hardly discernible. Dorsolateral area of propodeum granulate and dull, without punctures. ... *rarus* spec. nov.
- Temples distinctly constricted behind the eyes (Fig. 102). Mesopleurum and dorsolateral area of propodeum granulate and distinctly punctate. *striatus* spec. nov.
- 12. Ovipositor 1.2–1.4 times, ovipositor sheath 0.7–0.9 times as long as 1st gastral tergite. 13.
- Ovipositor 1.7–2.0 times, ovipositor sheath 1.1–1.4 times as long as 1st gastral tergite. 15.
- 13. Ovipositor stout, medially higher than the apical width of a hind basitarsus, with a small almost triangular dorsal incision subapically (Fig. 52). *kasparyani* Khalaim
- Ovipositor slender, medially half as high as the apical width of a hind basitarsus, without a dorsal incision subapically (Figs 15, 122). 14.
- 14. Foveate groove reduced (Fig. 11). Dorsolateral area of propodeum granulate, partly with fine punctures, slightly shining. Posterior lateral area of propodeum 0.7 times as long as petiolar area (Fig. 12). Ovipositor abruptly narrowed subapically, the tip thin (Fig. 15). *brevicauda* spec. nov.
- Foveate groove present as a slightly depressed furrow (Fig. 118). Dorsolateral area of propodeum shining and with a few fine punctures on a smooth background anteriorly, with fine wrinkles and rugose-punctate laterally and posteriorly. Posterior lateral area of propodeum small, half as long as petiolar area (Fig. 119). Ovipositor evenly tapered apically (Fig. 122). *tenuicauda* spec. nov.
- 15. Ovipositor abruptly narrowed subapically, the tip thin (Figs 73, 94). 16.
- Ovipositor with a shallow rounded dorsal depression subapically, its tip evenly tapered (Figs 80, 129). 17.
- 16. Temples almost not constricted directly behind the eyes (Fig. 67). Temple, mesopleurum and dorsolateral area of propodeum with disperse or rather dense punctation on a very finely granulate background, distinctly shining. Ovipositor 1.7 times, ovipositor sheath 1.1 times as long as 1st gastral tergite. *nigricoxa* spec. nov.

- Temples distinctly constricted behind the eyes (Fig. 88). Temple, mesopleurum and dorsolateral area of propodeum distinctly granulate and with rather dense or dense punctation, slightly shining. Ovipositor 2.0 times, ovipositor sheath 1.4 times as long as 1st gastral tergite. *punctatus* spec. nov.
- 17. Temple, mesoscutum and mesopleurum with fine disperse punctation on a smooth background, shining. Metapleurum finely granulate and with very fine punctation, shining. Hind coxa black. *nitidipleuris* spec. nov.
- Temple, mesoscutum and mesopleurum finely granulate and with fine punctation, dull or slightly shining. Metapleurum granulate and with fine punctures and wrinkles, rather dull. Hind coxa reddish brown. *texanus* spec. nov.
- Temple and mesopleurum distinctly punctate on a finely granulate or smooth background. ... 7.
- 7. Glossa usually 0.7–0.8 times as long as the width of clypeus (glossa shorter in a variety). Dorsolateral area of propodeum covered with irregular wrinkles. *nitidus* spec. nov.
- Glossa 0.4 times as long as the width of clypeus. Dorsolateral area of propodeum finely granulate and slightly shining or punctate on a smooth background. 8.
- 8. Dorsolateral area of propodeum finely granulate, punctures hardly discernible. *curvicauda* spec. nov.
- Dorsolateral area of propodeum punctate on a smooth background. *flavipes* spec. nov.

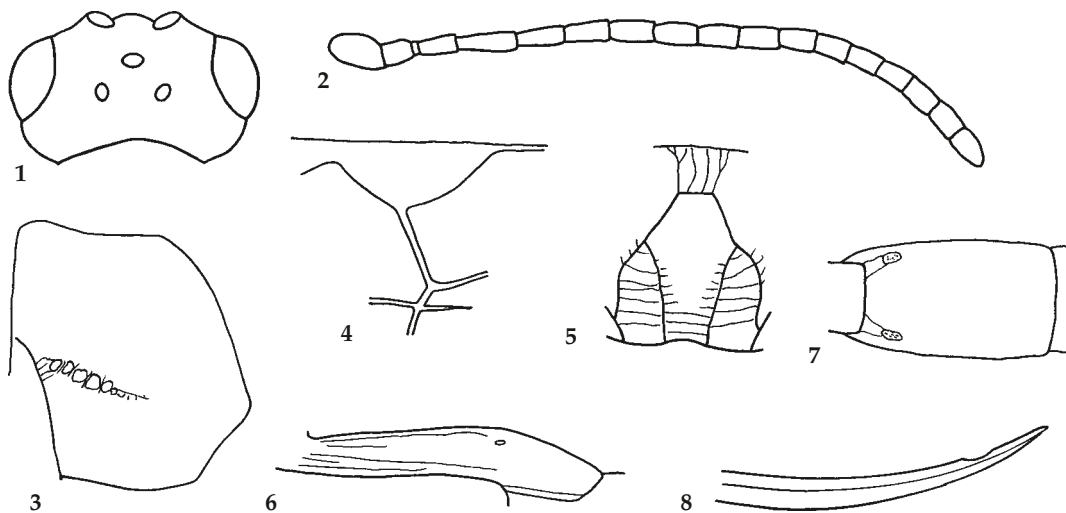
Provisional key to the males of some species

1. Temple granulate and dull, without punctures. 2.
- Temple with fine or distinct punctures on a finely granulate or smooth background. 3.
2. Flagellum with 14 segments. Petiole smooth dorsally, with few striae laterally. *basalis* spec. nov.
- Flagellum with 18–20 segments. Petiole with distinct striae dorsally and laterally. *sulcator* spec. nov.
3. Flagellum with 16–20 segments. 4.
- Flagellum with 14–15 segments. 6.
4. Dorsolateral area of propodeum almost smooth centrally, with wrinkles at the edges. Flagellum with 16–20 segments. *kaspanyani* Khalaim
- Dorsolateral area of propodeum granulate or wrinkled. 5.
5. Flagellum with 19 segments, yellowish proximally. Foveate groove absent, replaced by a very shallow and finely wrinkled depression. *brevicauda* spec. nov.
- Flagellum with 16–17 segments, blackish proximally. Foveate groove usually indicated as a furrow. *striatus* spec. nov.
6. Temple with fine disperse punctation on a smooth background. Mesopleurum granulate, punctation hardly discernible. Metapleurum and dorsolateral area of propodeum granulate and dull. *flavicoxa* spec. nov.

***Phradis basalis* spec. nov.**

Holotype (♀): “Manistique, Mich., Jack pine, Swept, June 2, 1961, W. R. M. Mason” (on *Pinus banksiana* Lamb.; Michigan, USA) (OTT).

w: Body length 3.5 mm. Temples distinctly constricted behind the eyes, 0.7 times as long as the width of an eye, tangential lines on eyes and temples intersect on the scutellum (Fig. 1). Head 1.2 times as wide as high. Ocellar index 1.8. Malar space index 1.1. Glossa 0.4 times as long as the width of clypeus. Upper mandibular tooth slightly the longer. Clypeus 0.85 times as long as face, 2.7 times as wide as long, slightly rounded, granulate and with fine punctures dorsally, smooth medially and subventrally. Head (except clypeus) granulate and dull, central swelling of face slightly shining. Flagellum with 15 segments, slightly clavate, 1st segment 2.3 times, 2nd segment 2.8 times, median segments 1.6 times, penultimate segment 1.4 times as long as wide. 2nd segment 1.2 times as long as 1st segment (Fig. 2). Pronotum granulate and dull dorsolaterally, with fine striae in the anterior groove. Mesoscutum and scutellum granulate, dull. Notaulus as a distinct furrow, extending to 0.2 the length of the mesoscutum. Prescutellar furrow smooth. Scutellum bordered by carinae on the anterior half. Mesopleurum granulate, slightly shining, with fine punctation dorsally in the posterior half. Foveate groove as a distinct row of small grooves, about half as long as mesopleurum (Fig. 3). Mesosternum finely granulate, slightly shining. Metapleurum granulate, dull. Hind leg slender, femur 4.7 times as long as high. Hind tarsal claws short. Pterostigma 2.0 times as long as wide (Fig. 4). Metacarpus reaching 0.6 the distance from radial cell to the tip of wing. Basal area of propodeum 0.3 times



Figs 1-8. *Phradis basalis* spec. nov. (♀). 1. Head, top view. 2. Antenna. 3. Mesopleurum. 4. Pterostigma and areolet. 5. Propodeum, top view. 6. 1st gastral segment, side view. 7. 2nd gastral tergite, top view. 8. Ovipositor, side view.

as long as petiolar area, 0.85 times as long as wide, covered with longitudinal wrinkles, without distinct lateral carinae. Dorsolateral area granulate and dull, with some short wrinkles at the edges. Petiolar area 1.8 times as long as wide, slightly depressed, granulate, with fine transverse striae posteriorly. Posterior lateral area 0.7 times as long as petiolar area (Fig. 5). Propodeal spiracle separated from the pleural carina by four times its diameter, spiracular carina narrow. 1st gastral tergite 3.3 times as long as wide. Petiole 1.4 times as long as postpetiole, very finely granulate-strigose dorsally, with fine dorsolateral carinae, with fine striae laterally. Postpetiole 1.4 times as long as wide, smooth. 1st sternite slightly surpassing the spiracles (Fig. 6). 2nd tergite 1.6 times as long as wide. Thyridium oval, distant from the anterior edge of the 2nd tergite, thyridial depression about twice as long as wide (Fig. 7). Gaster compressed posteriorly. Ovipositor 1.6 times, ovipositor sheath 1.1 times as long as 1st tergite. Ovipositor rather stout and almost straight proximally and medially, moderately bent upwards distally, with a very shallow rounded dorsal depression subapically, its tip evenly tapered (Fig. 8).

Colour: Black. Palpi, mandible (teeth medium brown), ventral half of clypeus, scape, pedicellus, tegula and legs yellowish red or light reddish brown. Flagellum for the greater part dark brown, the three proximal segments reddish brown. Pterostigma dark reddish brown. Gastral tergites from the 2nd tergite onwards dark reddish brown.

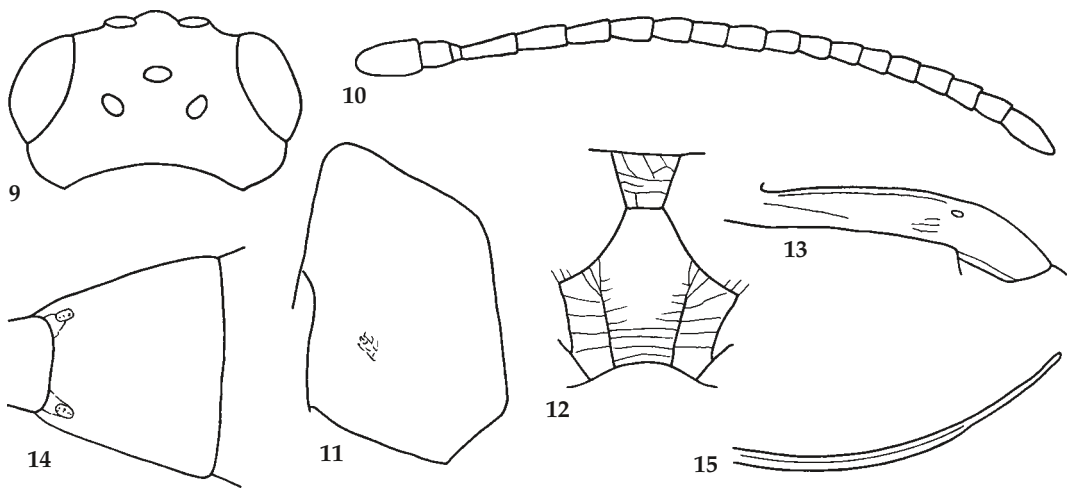
?M: Body length 2.7 mm. Malar space index 0.7. Flagellum with 14 segments, 1st segment 2.1 times,

2nd segment 1.8 times, median segments and penultimate segment 1.7 times as long as wide. Basal area of propodeum with lateral carinae. Petiole smooth dorsally. In other characters similar to the ♀, but without clear evidence that it belongs to the same species (1♂ from Hughesville, Maryland; AEI).

Phradis brevicauda spec. nov.

Holotype (♀): "Julian, Calif., May 16, 1974, H. & M. Townes" (California, USA) (AEI). – Paratypes (3♀): USA: California: Julian (AEI, HOR); Wyoming: Falls Campground, Fremont Co. (TEX). Flight period: v-vi.

w: Body length 3.5 mm. Temples distinctly constricted behind the eyes, 0.6 times as long as the width of an eye, tangential lines on eyes and temples intersect on the propodeum (Fig. 9). Head 1.3 times as wide as high. Ocellar index 1.5. Malar space index 0.7. Glossa 0.6 times as long as the width of clypeus. Upper mandibular tooth slightly the longer. Clypeus 0.8 times as long as face, 3.2 times as wide as long, slightly rounded, with a few distinct punctures on a smooth background dorsally, smooth medially and subventrally. Face and frons finely granulate and with fine dense punctation. Vertex with fine dense punctation on a finely granulate or smooth background. Temple with fine rather dense punctation on a very finely granulate or smooth background. Flagellum with 16 segments, slightly clavate, 1st segment 3.5 times, 2nd segment 2.8 times, median segments 1.3 times, penultimate segment 1.1 times as long as wide (Fig. 10). Pronotum granulate and with



Figs 9–15. *Phradis brevicauda* spec. nov. (♀). 9. Head, top view. 10. Antenna. 11. Mesopleurum. 12. Propodeum, top view. 13. 1st gastral segment, side view. 14. 2nd gastral tergite, top view. 15. Ovipositor, side view.

fine dense punctation dorsolaterally, with fine striae in the anterior groove. Mesoscutum and scutellum with fine rather dense punctation on a smooth background, background of mesoscutum finely granulate laterally. Notaulus weakly indicated, extending to 0.15 the length of the mesoscutum. Prescutellar furrow smooth. Scutellum bordered by carinae on the anterior 0.4. Mesopleurum finely granulate and with fine rather dense or dense punctation, speculum with additional wrinkles. Foveate groove absent, replaced by a very shallow and finely wrinkled depression (Fig. 11). Mesosternum with fine disperse punctation on a smooth background. Metapleurum finely granulate and finely rugose, partly rugose-punctate. Hind femur 4.0 times as long as high. Hind tarsal claws short. Pterostigma 2.0 times as long as wide. Metacarpus reaching half the distance from radial cell to the tip of wing. Basal area of propodeum 0.4 times as long as petiolar area, about as long as wide, covered with wrinkles, with lateral carinae. Dorsolateral area finely granulate, slightly shining, sometimes with some fine punctures. Petiolar area 1.6 times as long as wide, flat, the lateral carinae replaced by several wrinkles anteriorly, granulate and with fine wrinkles, with fine transverse striae posteriorly. Posterior lateral area 0.7 times as long as petiolar area (Fig. 12). Propodeal spiracle separated from the pleural carina by five times its diameter, spiracular carina narrow. 1st gastral tergite 3.2 times as long as wide. Petiole 1.7 times as long as postpetiole, for the greater part smooth dorsally, with few fine striae, with weakly indicated dorsolateral carinae, with few fine striae laterally. Postpetiole 1.2 times as long as wide, smooth. 1st sternite slightly surpassing the

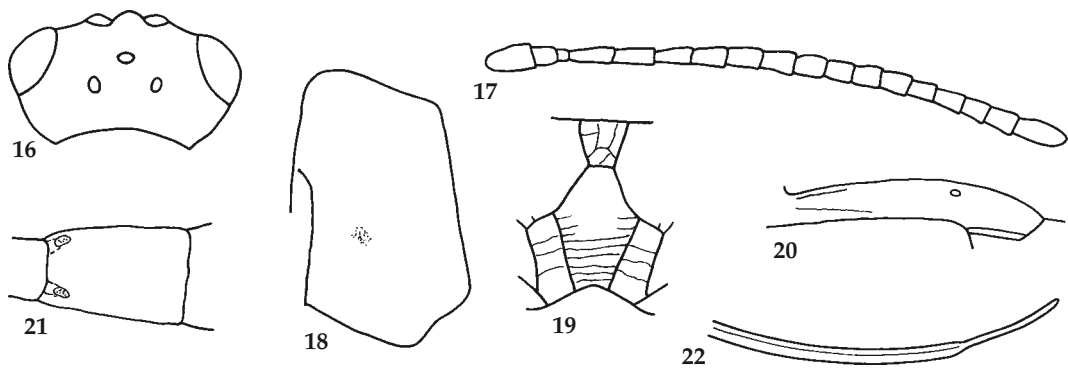
spiracles (Fig. 13). 2nd tergite 0.8 times as long as wide. Thyridium oval, close to the anterior edge of the 2nd tergite, thyridial depression weak, about 1.2 times as long as wide (Fig. 14). Gaster claviform and slightly compressed posteriorly. Ovipositor 1.2 times, ovipositor sheath 0.8 times as long as 1st tergite. Ovipositor slender, almost evenly bent upwards over its total length, abruptly narrowed subapically, the tip very thin (Fig. 15).

Colour: Black. Palpi, mandible (teeth dark brown), ventral half of clypeus, scape, pedicellus, base of flagellum up to the 3rd segment, tegula and legs yellowish red. Flagellum dark brown or blackish medially and distally. Mid coxa basally and hind coxa almost completely blackish. Pterostigma dark brown. Gastral tergites from the 2nd tergite onwards dark brown, the tergites yellowish red posteriorly and laterally.

?M: Malar space index 0.5. Flagellum with 19 segments, 1st segment 2.7 times, 2nd segment 2.0 times, median segments and penultimate segment 1.7 times as long as wide. In other characters similar to the ♀, but without clear evidence that it belongs to the same species (1♂ from Wada, Idaho; CAM).

Phradis coriaceus spec. nov.

Holotype (♀): “Laurel, MD., 26. Apr. 65, Malaise Trap” (Maryland, USA) (OTT) – Paratypes (4♀): USA: Louisiana: Alexandria (HOR); Maryland: Colesville, on *Pinus virginiana* Mill. (OTT), Meadowood, Colesville (WAS), Hughesville (AED). Flight period: iii–v, with a peak in iv.



Figs 16–22. *Phradis coriaceus* spec. nov. (♀). 16. Head, top view. 17. Antenna. 18. Mesopleurum. 19. Propodeum, top view. 20. 1st gastral segment, side view. 21. 2nd gastral tergite, top view. 22. Ovipositor, side view.

w: Body length 3 mm. Temples distinctly constricted behind the eyes, 0.75 times as long as the width of an eye, tangential lines on eyes and temples intersect on the scutellum (Fig. 16). Head 1.3 times as wide as high. Ocellar index 2.0. Malar space index 1.0. Glossa 0.3 times as long as the width of clypeus. Upper mandibular tooth slightly the longer. Clypeus 0.85 times as long as face, 3.1 times as wide as long, slightly rounded, finely granulate and with a few punctures dorsally, smooth medially and subventrally. Head (except clypeus) granulate and dull, without punctures. Flagellum with 15 segments (14 segments in one paratype), filiform, 1st segment 2.7 times, 2nd segment 2.2 times, median segments 1.4 times, penultimate segment 1.2 times as long as wide (Fig. 17). Pronotum granulate. Mesoscutum and scutellum granulate. Notaulus as a fine furrow, extending to 0.1 the length of the mesoscutum. Prescutellar furrow smooth. Scutellum bordered by carinae on the anterior 0.4. Mesopleurum granulate and dull, a few fine punctures hardly discernible, speculum with fine longitudinal striae. Foveate groove absent, replaced by a very shallow and very finely wrinkled depression (Fig. 18). Mesosternum granulate, partly somewhat shining. Metapleurum granulate and dull. Hind femur 4.0 times as long as high. Hind tarsal claws short. Pterostigma 2.2 times as long as wide. Metacarpus reaching half the distance from radial cell to the tip of wing. Basal area of propodeum 0.4 times as long as petiolar area, slightly longer than wide, covered with wrinkles, lateral carinae complete or partly obliterated. Dorsolateral area granulate and dull. Petiolar area 1.5 times as long as wide, slightly depressed, granulate, with fine transverse striae posteriorly. Posterior lateral area 0.7 times as long as petiolar area (Fig. 19). Propodeal spiracle separated from the pleural carina by four times its diameter, spiracular carina narrow. 1st gastral tergite 3.5 times as long as wide. Petiole 1.9 times as long as post-

petiole, smooth dorsally, without dorsolateral carinae (these sometimes indicated anteriorly), almost smooth laterally, with few fine striae. Postpetiole 1.2 times as long as wide, smooth. 1st sternite surpassing the spiracles (Fig. 20). 2nd tergite 1.4 times as long as wide. Thyridium oval, close to the anterior edge of the 2nd tergite, thyridial depression weak, about 1.5 times as long as wide (Fig. 21). Gaster claviform and slightly compressed posteriorly. Ovipositor 1.3 times, ovipositor sheath 0.9 times as long as 1st tergite. Ovipositor slender, almost evenly bent upwards over its total length, abruptly narrowed subapically, the tip very thin (Fig. 22).

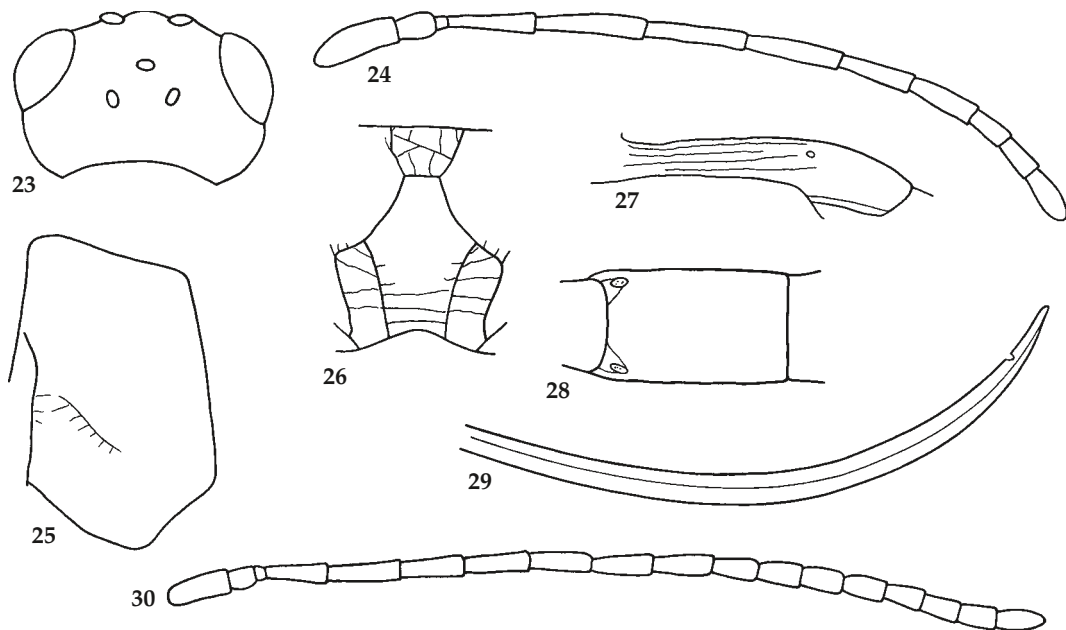
Colour: Black. Palpi, mandible (teeth brown), ventral half of clypeus, scape, pedicellus, base of flagellum up to the 4th segment, tegula and legs yellowish red or light reddish brown. Flagellum dark brown medially and distally. Mid coxa basally, hind coxa almost completely black. Pterostigma medium brown. Gastral tergites from the 2nd tergite onwards dark brown or blackish.

M unknown.

Phradis curvicauda spec. nov.

Holotype (♀): “Hyatt Reservoir, VI. 20. 78, Ore., H. & M. Townes” (Oregon, USA) (AEI). – **Paratypes** 6♀♀, 4♂♂: USA: Oregon: Hyatt Reservoir (AEI, HOR), Aldrich Mts., Grant Co. (AEI); Wyoming: Dunraven Pass, Yellowstone Park, 2700 m (CAM). Flight period: vi–vii.

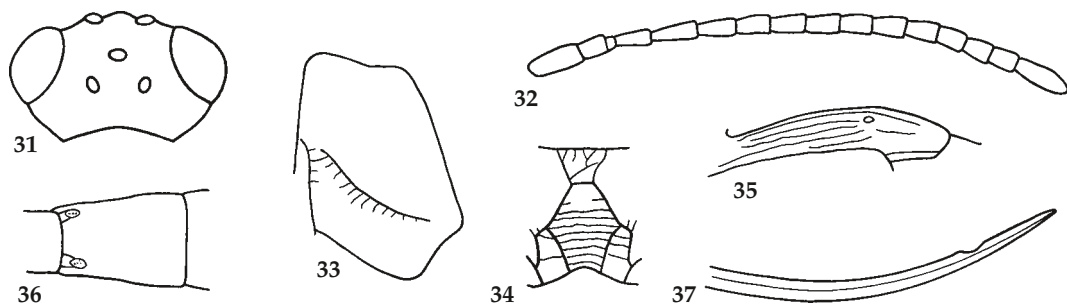
w: Body length 4 mm. Temples moderately constricted behind the eyes, 0.8 times as long as the width of an eye, tangential lines on eyes and temples intersect on the 1st gastral tergite (Fig. 23). Head 1.2 times as wide as high. Ocellar index 2.0. Malar space index 0.7. Glossa 0.4 times as long as the width of clypeus. Upper mandibular tooth slightly the longer.



Figs 23-30. *Phradis curvicauda* spec. nov. 23-29. ♀. 23. Head, top view. 24. Antenna. 25. Mesopleurum. 26. Propodeum, top view. 27. 1st gastral segment, side view. 28. 2nd gastral tergite, top view. 29. Ovipositor, side view. 30. ♂. Antenna.

Clypeus 0.9 times as long as face, 3.0 times as wide as long, slightly rounded and with a few punctures on a smooth background dorsally, flat and smooth subventrally. Face and frons finely granulate and with fine and dense punctation. Vertex with dense punctation on a very finely granulate background. Temple with fine rather dense punctation on a smooth background. Flagellum with 9 segments, slightly clavate, 1st segment 5.3 times, 2nd segment 5.5 times, 5th segments 3.0 times, penultimate segment 1.6 times as long as wide (Fig. 24). Pronotum finely granulate and with fine punctation dorsolaterally, striate in the anterior groove. Mesoscutum and scutellum with fine and dense punctation on a very finely granulate or smooth background. Notaulus as a distinct furrow, with a carina at its inner side, extending to 0.2 the length of the mesoscutum. Prescutellar furrow smooth. Scutellum bordered by carinae on the anterior 0.4. Mesopleurum with fine and rather dense punctation on a very finely granulate or smooth background, speculum wrinkled. Foveate groove as a furrow with transverse wrinkles, about half as long as mesopleurum (Fig. 25). Mesosternum with fine dispersed punctation on a smooth background. Metapleurum finely granulate and finely rugose-punctate. Hind femur 4.1 times as long as high. Hind tarsal claws short. Pterostigma 2.1 times as long as wide. Metacarpus

reaching 0.6 the distance from radial cell to the tip of wing. Basal area of propodeum 0.3 times as long as petiolar area, 0.7-0.9 times as long as wide, covered with wrinkles, usually with distinct lateral carinae. Dorsolateral area finely granulate and finely rugose-punctate, slightly shining. Petiolar area 1.6 times as long as wide, slightly depressed, finely rugose-punctate anteriorly, with fine transverse striae posteriorly. Posterior lateral area 0.7 times as long as petiolar area (Fig. 26). Propodeal spiracle separated from the pleural carina by five times its diameter, spiracular carina narrow. 1st gastral tergite 3.3 times as long as wide. Petiole 1.5 times as long as postpetiole, almost smooth and with few very fine striae dorsally, with indistinct dorsolateral carinae, completely striate laterally. Postpetiole 1.3 times as long as wide, almost smooth, sometimes very finely sculptured anteriorly, the lateral contours slightly rounded. 1st sternite slightly surpassing the spiracles (Fig. 27). 2nd tergite 1.4 times as long as wide. Thyridium oval, close to the anterior edge of the 2nd tergite, thyridial depression about as long as wide (Fig. 28). Gaster compressed posteriorly. Ovipositor 2.8 times, ovipositor sheath 1.9 times as long as 1st tergite. Ovipositor slightly bent upwards proximally and medially, strongly bent upwards distally, with a distinct triangular dorsal incision subapically, its tip evenly tapered (Fig. 29).



Figs 31–37. *Phradis flavicoxa* spec. nov. (♀). 31. Head, top view. 32. Antenna. 33. Mesopleurum. 34. Propodeum, top view. 35. 1st gastral segment, side view. 36. 2nd gastral tergite, top view. 37. Ovipositor, side view.

Colour: Black. Palpi, mandible (teeth dark brown), median and ventral parts of clypeus, scape, pedicellus, base of flagellum up to the 3rd segment, tegula and legs yellowish red. Flagellum dark brown medially and distally. Hind coxa brown basally. Pterostigma dark brown. Gastral tergites from the 2nd tergite onwards yellowish red, the 2nd tergite tinged with black anteriorly.

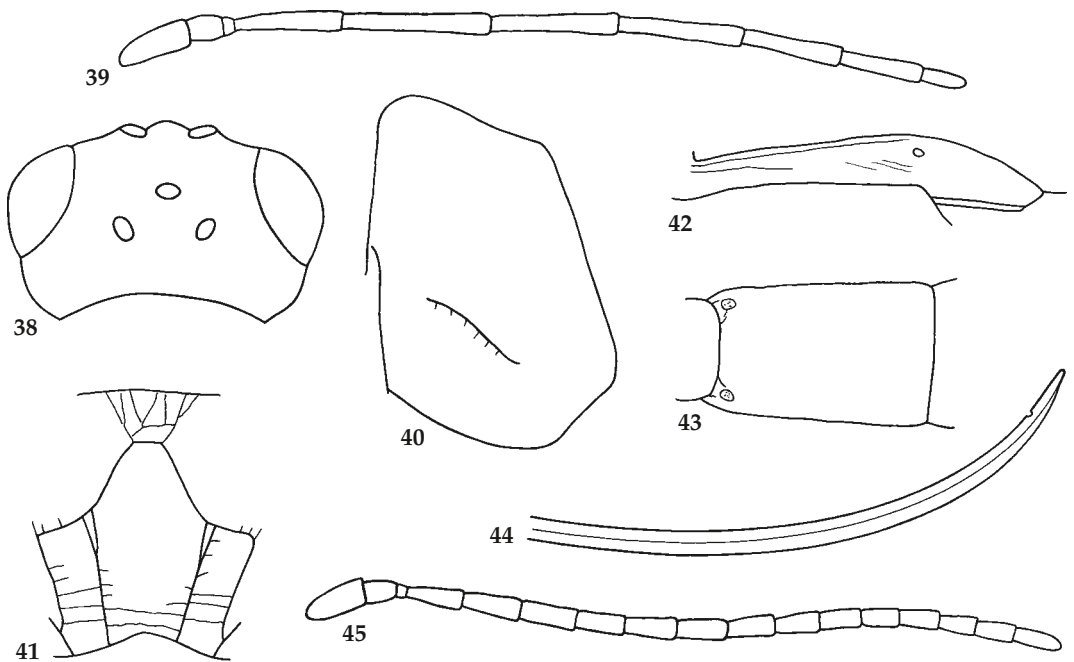
M: Malar space index 0.5. Flagellum with 15 segments, 1st segment 3.2 times, 2nd segment 2.6 times, median segments 2.0 times, penultimate segment 1.6 times as long as wide (Fig. 30). In other characters similar to the ♀. In one case, ♀♀ and ♂♂ were collected at the same locality (Hyatt Reservoir, Oregon).

Phradis flavicoxa spec. nov.

Holotype (♀): “NFLD., July 1974, South Branch, Heinrich, Mal. Trap” (Newfoundland, Canada) (OTT) – Paratypes (12♀, 2♂): Canada: British Columbia: White Lake, Oliver (OTT); Manitoba: Ninette (OTT); Ontario: Ottawa, 1♀ collected at a sap spot on maple (*Acer* sp.) (TEX), Trenton (OTT); Quebec: Laniel (HOR). USA: California: Olema, Marin Co. (TEX); Iowa: Forest City (WAS); Washington: Mt. Constitution (CAM). Flight period: v–vii, with a peak in vi.

w: Body length 2.5 mm. Temples strongly constricted behind the eyes, 0.7 times as long as the width of an eye, tangential lines on eyes and temples intersect on the posterior half of the mesoscutum (Fig. 31). Head 1.1 times as wide as high. Ocellar index 1.6. Malar space index 0.9. Glossa 0.4 times as long as the width of clypeus. Mandibular teeth about equal. Clypeus 0.8 times as long as face, 2.8 times as wide as long, slightly rounded, with a few fine punctures on a smooth background dorsally, smooth subventrally. Face and frons granulate. Vertex finely granulate and with fine dispersed punctation. Temple with very fine dispersed punctation on a finely granulate or smooth background. Flagellum with 13 segments,

slightly clavate, 1st segment 2.6 times, 2nd segment 2.3 times, median segments 1.2 times, penultimate segment as long as wide (Fig. 32). Pronotum finely granulate dorsolaterally, with very fine striae in the anterior groove. Mesoscutum and scutellum granulate, rather dull. Notaulus as a distinct furrow, extending to 0.25 the length of the mesoscutum. Prescutellar furrow smooth. Scutellum bordered by carinae on the anterior 0.4. Mesopleurum finely granulate and with very fine dispersed punctation dorsally and medially, slightly shining, granulate and dull below the foveate groove. Foveate groove as a distinct furrow with transverse wrinkles, 0.6–0.8 times as long as mesopleurum (Fig. 33). Mesosternum finely granulate and with fine punctation. Metapleurum granulate, dull. Hind femur 4.2 times as long as high. Hind tarsal claws slender, slightly longer than empodium. Pterostigma 2.1 times as long as wide. Metacarpus reaching 0.7 the distance from radial cell to the tip of wing. Basal area of propodeum half as long as petiolar area, about as long as wide, covered with wrinkles, the lateral carinae indistinct. Dorsolateral area granulate and dull, with short wrinkles at the edges. Petiolar area 1.7 times as long as wide, slightly depressed, granulate, with additional transverse striae medially and posteriorly. Posterior lateral area 0.6 times as long as petiolar area (Fig. 34). Propodeal spiracle separated from the pleural carina by four times its diameter, spiracular carina narrow. 1st gastral tergite 3.5 times as long as wide. Petiole 1.5 times as long as postpetiole, almost trapezoid in cross-section, flat dorsally, completely striate dorsally and laterally, dorsolateral carinae present. Postpetiole 1.4 times as long as wide, finely striate anteriorly, smooth posteriorly. 1st sternite surpassing the spiracles (Fig. 35). 2nd tergite 1.3 times as long as wide. Thyridium oval, rather close to the anterior edge of the 2nd tergite, thyridial depression 1.5 times as long as wide (Fig. 36). Gaster compressed posteriorly. Ovipositor 1.7 times, ovipositor sheath 1.0 times as long as 1st tergite. Ovipositor rather



Figs 38-45. *Phradis flavipes* spec. nov. 38-44. ♀. 38. Head, top view. 39. Antenna. 40. Mesopleurum. 41. Propodeum, top view. 42. 1st gastral segment, side view. 43. 2nd gastral tergite, top view. 44. Ovipositor, side view. 45. ♂. Antenna.

stout, slightly bent upwards proximally and medially, moderately bent upwards distally, with a shallow rounded dorsal depression subapically, its tip evenly tapered (Fig. 37).

Colour: Black. Palpi, mandible (teeth light brown), median and ventral parts of clypeus, scape, pedicellus, tegula and legs yellowish red. Flagellum tinged with yellowish red proximally (up to the 3rd segment or less), blackish medially and distally. Pterostigma medium or dark brown. Gastral tergites from the 2nd tergite onwards dark reddish brown or blackish.

M: Body length 2 mm. Malar space index 0.6. Flagellum with 15 segments, filiform, 1st segment 2.4 times. 2nd segment 2.5 times, median segments and penultimate segment 1.6 times as long as wide. Foveate groove 0.6 times as long as mesopleurum. In other characters similar to the ♀. In two cases, ♀♀ and ♂♂ were collected at the same locality (Ottawa, Trenton, Ontario).

Phradis flavipes spec. nov.

Holotype (♀): "Julian, Calif., May 24, 1974, H. & M. Townes" (California, USA) (AEI). - Paratypes (2♀♀, 5♂♂): USA: California: Julian (AEI, HOR), Maricopa, Kern Co. (WAH). Flight period: v-vi.

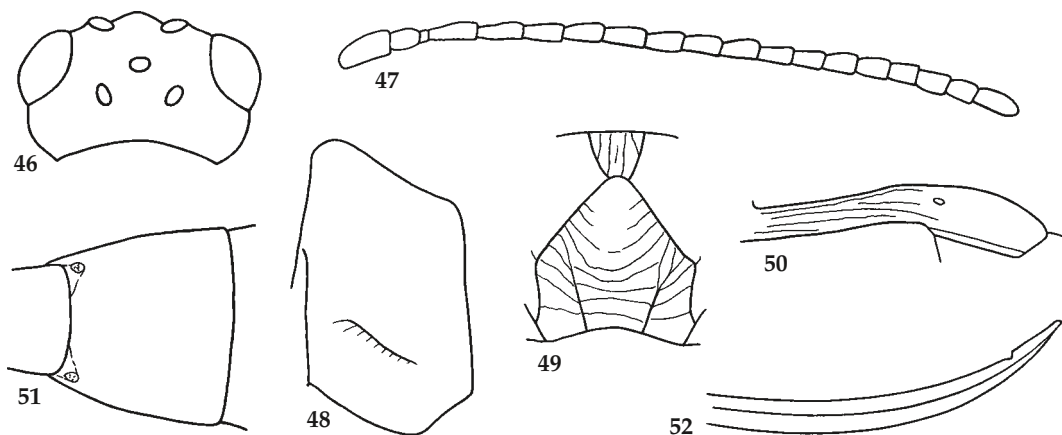
W: Body length 4-5 mm. Temples distinctly constricted behind the eyes, 0.65 times as long as the width of an eye, tangential lines on eyes and temples intersect on the propodeum (Fig. 38). Head 1.3 times as wide as high. Ocellar index 1.6-1.7. Malar space index 0.6. Glossa 0.4 times as long as the width of clypeus. Upper mandibular tooth slightly the longer. Clypeus 0.8 times as long as face, 3.3 times as wide as long, rounded and with some punctures on a finely granulate background dorsally, flat and smooth medially and subventrally. Face, frons and vertex finely granulate and with fine and rather dense or dense punctation. Temple with fine and rather dense punctation on a very finely granulate or smooth background. Flagellum with 7 segments, very slender, filiform, 1st segment 5.2 times, 2nd segment 5.8 times, penultimate segment 3.5 times, last segment 2.1 times as long as wide, last segment 0.6 times as long as penultimate segment (Fig. 39). Thorax with a smooth background. Pronotum with fine and dense punctation dorsolaterally, with rather long striae in the anterior groove. Mesoscutum and scutellum with fine and dense punctation. Notaulus as a distinct furrow, with a carina at its inner side, extending to 0.2 the length of the mesoscutum. Prescutellar furrow smooth. Scutellum bordered by carinae on the anterior 0.3. Mesopleurum with distinct rather

dense or dense punctation, speculum with additional wrinkles. Foveate groove as a rather narrow furrow, with short transverse wrinkles, about half as long as mesopleurum (shorter in smaller specimens) (Fig. 40). Mesosternum with fine dispersed punctation. Metapleurum with fine and very dense punctation. Hind femur 4.2 times as long as high. Longer hind tibial spur short, 0.2 times as long as the basitarsus. Hind tarsal claws short. Pterostigma 1.8 times as long as wide. Metacarpus reaching 0.6 the distance from radial cell to the tip of wing. Basal area of propodeum 0.3 times as long as petiolar area, about 0.7 times as long as wide, covered with wrinkles, without distinct lateral carinae. Dorsolateral area with distinct dispersed or rather dense punctation on a smooth background. Petiolar area 1.5 times as long as wide, slightly depressed, rugose-punctate, with a few transverse striae posteriorly. Posterior lateral area 0.7 times as long as petiolar area (Fig. 41). Propodeal spiracle separated from the pleural carina by five times its diameter, spiracular carina narrow. 1st gastral tergite 3.5 times as long as wide. Petiole 1.6 times as long as postpetiole, for the greater part smooth dorsally and laterally, with very fine dorsolateral carinae, with fine sculpture dorsally in front of the postpetiole, with a few fine striae laterally. Postpetiole 1.4 times as long as wide, with very fine sculpture anteriorly, smooth posteriorly. 1st sternite surpassing the spiracles (Fig. 42). 2nd tergite 1.3 times as long as wide. Thyridium oval, close to the anterior edge of the 2nd tergite, thyridial depression indistinct, about as long as wide (Fig. 43). Gaster clavate-compressed posteriorly. Ovipositor 2.5 times, ovipositor sheath 1.5 times as long as 1st gastral tergite. Ovipositor slightly bent upwards proximally and medially, strongly bent upwards distally, with a distinct triangular dorsal incision subapically, its tip evenly tapered (Fig. 44).

Colour: Black. Palpi, mandible (teeth dark brown), median and ventral parts of the clypeus, scape, pedicellus, tegula and legs yellowish red. Flagellum tinged with yellowish red proximally, dark brown distally. Pterostigma dark brown. Gaster tergites from the 2nd tergite onwards yellowish red, the 2nd tergite marked with black basally (to a variable extent).

m: Body length 3.8–4.5 mm. Malar space index 0.4. Flagellum with 15 segments, almost filiform, 1st segment 3.0 times, 2nd segment 2.4 times, median segments and penultimate segment 1.9 times as long as wide (Fig. 45). Foveate groove somewhat shorter and straighter than in the ♀. In other characters similar to the ♀. In one case, ♀♀ and ♂♂ were collected at the same locality (Julian, California).

w: Body length 3–4 mm. Temples moderately constricted behind the eyes, 0.75 times as long as the width of an eye, tangential lines on eyes and temples intersect on the petiole (Fig. 46). Head 1.25 times as wide as high. Ocellar index 1.5. Malar space index 0.6. Glossa 0.3 times as long as the width of clypeus. Upper mandibular tooth slightly the longer. Clypeus large, as long as face, 3.2 times as wide as long, slightly rounded, finely granulate and with a few punctures dorsally, smooth subventrally. Face granulate and with fine dispersed or rather dense punctation. Frons granulate and dull, punctation hardly discernible. Vertex finely granulate and with fine dispersed punctation. Temple with fine dispersed punctation on a very finely granulate or smooth background, distinctly shining. Flagellum with 15–17 segments, filiform, 1st segment 3.0 times, 2nd segment 2.3 times, median segments 1.7 times, penultimate segment 1.4 times as long as wide (Fig. 47). Pronotum finely granulate and with fine dense punctation dorsolaterally, with long striae in the anterior groove. Mesoscutum granulate and with fine dispersed or rather dense punctation, for the greater part dull, slightly shining sublaterally. Notaulus as a wrinkled furrow, extending to 0.2 the length of the mesoscutum. Prescutellar furrow with fine striae. Scutellum bordered by carinae on the anterior 0.5–0.7, granulate and punctate. Mesopleurum for the greater part granulate and dull, speculum and central part somewhat shining (rarely mesopleurum with a very finely granulate background, strongly shining), a fine punctation distinct or hardly discernible. Foveate groove as a wrinkled furrow, about half as long as mesopleurum (sometimes shorter and somewhat indistinct) (Fig. 48). Mesosternum finely granulate and with fine dispersed punctation, shining. Metapleurum granulate, dull or somewhat shining, punctation hardly discernible. Hind femur 4.0 times as long as high. Hind tarsal claws short. Pterostigma 1.9 times as long as wide. Metacarpus reaching 0.4 the distance from radial cell to the tip of wing. Basal area of propodeum 0.3 times as long as petiolar area, about as long as wide, with lateral carinae, covered with longitudinal wrinkles. Dorsolateral area almost smooth centrally, with fine sculpture, shining, with wrinkles at the edges (sometimes granulate and less shining centrally). Petiolar area 1.1 times as long as wide, flat, covered with striae and wrinkles, the lateral carinae distinct posteriorly, replaced by several wrinkles anteriorly. Posterior lateral area 0.8 times as long as petiolar area (Fig. 49). Propodeal spiracle separated from the pleural carina by 3–4 times its diameter, spiracular carina narrow. 1st gastral tergite 2.4 times as long as



Figs 46–52. *Phradis kaspariyani* Khalaim (♀). 46. Head, top view. 47. Antenna. 48. Mesopleurum. 49. Propodeum, top view. 50. 1st gastral segment, side view. 51. 2nd gastral tergite, top view. 52. Ovipositor, side view.

wide. Petiole 1.3 times as long as postpetiole, with fine striae dorsally and laterally, with dorsolateral carinae, the dorsal anterior part smooth. Postpetiole 1.1 times as long as wide, often with a small groove medially, with fine striae anteriorly, smooth posteriorly. 1st sternite reaching the spiracles (Fig. 50). 2nd tergite about as long as wide. Thyridium almost circular, indistinct, close to the anterior edge of the 2nd tergite, thyridial depression usually wider than long (Fig. 51), sometimes slightly longer than wide. Gaster clavate-compressed posteriorly. Ovipositor 1.4 times, ovipositor sheath 0.9 times as long as 1st gastral tergite. Ovipositor stout, almost straight proximally, distinctly bent upwards distally, with a small almost triangular dorsal incision subapically, its tip evenly tapered (Fig. 52).

Colour: Black. Palpi, mandible (teeth light brown), scape, pedicel, proximal segments of flagellum (to a variable extent), tegula and legs yellowish red. Flagellum blackish medially and distally. Hind coxa dark brown. Hind femur often tinged with brown medially. Pterostigma medium or dark brown. Gastral tergites from the 2nd tergite onwards blackish, tinged with brown laterally (rarely tergites marked with yellowish red posteriorly and laterally).

M: Flagellum with 16–20 segments, 1st segment 3.0 times, 2nd segment 2.3 times, median segments and penultimate segment 1.7 times as long as wide. Foveate groove sometimes short and indistinct. Thyridium larger, and thyridial depression distinct and about as long as wide. In other characters similar to the ♀. ♀♀ and ♂♂ were often collected at the same localities.

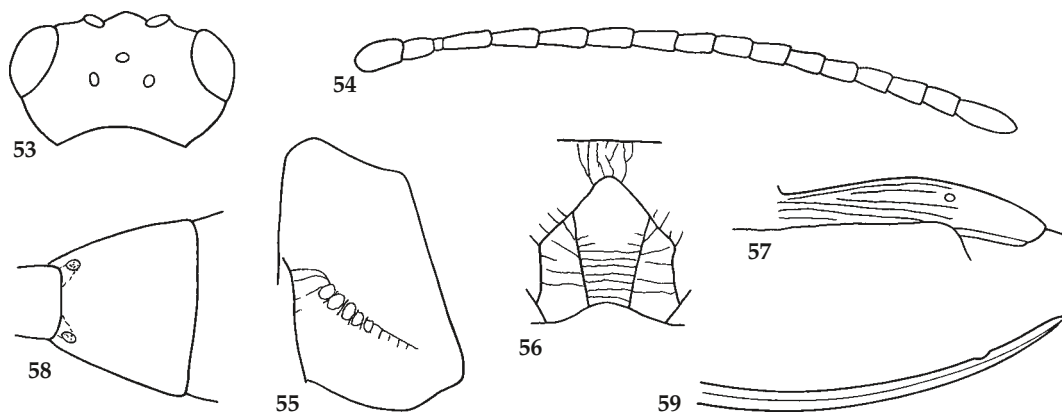
Material (83♀♀, 88♂♂): USA: Arizona (AEL), California (AEL, FRA, HOR, OTT, TEX, WAS, ZSM), Oregon (AEL). Flight period: iii–v, with a peak in iv. Few specimens were collected in Arizona and California at 1400–1700 m a.s.l. (AEL, OTT).

Taxonomic remark: One paratype (♀) from the type locality (San Bernardino, California) was studied (ZSM).

Phradis longicauda spec. nov.

Holotype (♀): “Texas: Brazos Co.: Lick Creek Park, 2–9. ii.2008, R. Wharton” (TEX).

w: Body length 3.5 mm. Temples distinctly constricted behind the eyes, 0.8 times as long as the width of an eye, tangential lines on eyes and temples intersect on the prescutellar furrow (Fig. 53). Head 1.2 times as wide as high. Ocellar index 2.0. Malar space index 1.3. Glossa 0.4 times as long as the width of clypeus. Upper mandibular tooth distinctly the longer. Clypeus 0.8 times as long as face, 2.9 times as wide as long, slightly rounded, finely granulate and with a few punctures dorsally, with few punctures on a smooth background subventrally. Face and frons granulate, rather dull. Vertex and temple slightly granulate, shining, without discernible punctures. Flagellum with 14 segments, filiform, 1st segment 2.6 times, 2nd segment 2.1 times, median segments 1.7 times, penultimate segment 1.4 times as long as wide (Fig. 54). Pronotum granulate dorsolaterally, with striae in the anterior groove. Mesoscutum and scutellum granulate and dull. Notaulus as a narrow furrow, with a carina at its inner side, extending to 0.2 the length of the mesoscutum. Prescutellar furrow with few fine striae. Scutellum bordered by



Figs 53- 59. *Phradis longicauda* spec. nov. (♀). 53. Head, top view. 54. Antenna. 55. Mesopleurum. 56. Propodeum, top view. 57. 1st gastral segment, side view. 58. 2nd gastral tergite, top view. 59. Ovipositor, side view.

carinae on the anterior 0.2. Mesopleurum granulate and dull, speculum somewhat shining. Foveate groove as a distinct transversely striated furrow, about 0.7 times as long as mesopleurum (Fig. 55). Mesosternum finely granulate and with very fine punctures. Metapleurum granulate and dull, with wrinkles ventrally. Hind leg slender, femur 4.4 times as long as high. Hind tarsal claws slightly longer than empodium. Pterostigma 1.8 times as long as wide. Metacarpus reaching 0.7 the distance from radial cell to the tip of wing. Basal area of propodeum 0.3 times as long as petiolar area, about as long as wide, covered with longitudinal wrinkles, without lateral carinae. Dorsolateral area granulate and dull, with wrinkles at the edges. Petiolar area about 1.3 times as long as wide, slightly depressed, granulate and granulate-strigose, with fine transverse striae posteriorly, the lateral carinae distinct medially and posteriorly, replaced by several wrinkles anteriorly. Posterior lateral area 0.7 times as long as petiolar area (Fig. 56). Propodeal spiracle separated from the pleural carina by 0.3 times its diameter, spiracular carina narrow. 1st gastral tergite 3.0 times as long as wide. Petiole 1.5 times as long as postpetiole, almost smooth and with very fine sculpture dorsally, with indistinct dorsolateral carinae, completely striate laterally. Postpetiole 1.2 times as long as wide, smooth. 1st sternite slightly surpassing the spiracles (Fig. 57). 2nd tergite 0.9 times as long as wide. Thyridium oval, close to the anterior edge of the 2nd tergite, thyridial depression indistinct, about as long as wide (Fig. 58). Gaster clavate posteriorly. Ovipositor 3.0 times, ovipositor sheath 2.2 times as long as 1st gastral tergite. Ovipositor slender, slightly bent upwards proximally and medially, distinctly bent upwards distally, with a shallow rounded dorsal depression subapically, its tip evenly tapered (Fig. 59).

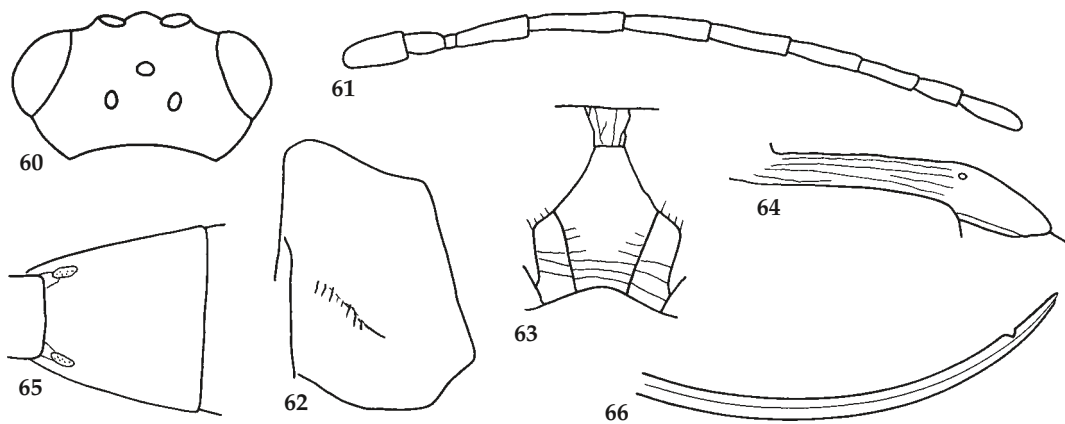
Colour: Black. Palpi, mandible (teeth dark brown), median and subventral parts of clypeus, scape, pedicellus, tegula and legs yellowish red. Flagellum blackish, 1st segment tinged with yellowish red. Pterostigma blackish, narrowly marked with white proximally and distally. Gastral tergites from the 2nd tergite onwards blackish, the tergites tinged with reddish brown posteriorly and laterally.

M unknown.

Phradis minor spec. nov.

Holotype (♀): "TEXAS: Walker Co., 10 mi. W New Waverly, 24.iii.1991, R. Wharton" (TEX). – Paratype: 1♀ USA, Louisiana, Oak Grove, 31.iii.1960 (OTT).

w: Body length 3.5 mm. Temples distinctly constricted behind the eyes, 0.65 times as long as the width of an eye, tangential lines on eyes and temples intersect on the prescutellar furrow (Fig. 60). Head 1.3 times as wide as high. Ocellar index 2.0. Malar space index 1.0. Glossa 0.4 times as long as the width of clypeus. Mandibular teeth about equal. Clypeus 0.9 times as long as face, 3.0 times as wide as long, almost flat, finely granulate and with rather dense punctation dorsally, smooth medially and subventrally. Face and frons granulate and with fine dense punctation. Vertex finely granulate and with fine rather dense punctation. Temple with very fine dispersed punctation on a very finely granulate background, distinctly shining. Flagellum with 8 segments, filiform, very slender proximally and medially, 1st segment 4.7 times, 2nd segment 5.0 times, 5th segment 3.5 times, penultimate segment 1.8 times, last segment 2.8 times as long as wide (Fig. 61). Pronotum granulate and dull dorsolaterally, with indistinct striae in the



Figs 60- 66. *Phradis minor* spec. nov. (♀). 60. Head, top view. 61. Antenna. 62. Mesopleurum. 63. Propodeum, top view. 64. 1st gastral segment, side view. 65. 2nd gastral tergite, top view. 66. Ovipositor, side view.

anterior groove. Mesoscutum and scutellum finely granulate and with fine dense punctation. Notaulus as an indistinct furrow, extending to 0.15 the length of the mesoscutum. Prescutellar furrow with few fine striae. Scutellum bordered by carinae on the anterior 0.4. Mesopleurum finely granulate and with rather dense or dense punctation, partly rugose-punctate. Foveate groove as a rather indistinct furrow, with some transverse striae, about 0.4 times as long as mesopleurum (Fig. 62). Mesosternum finely granulate and with fine dispersed punctation, shining. Metapleurum granulate and with very dense punctation. Hind femur 4.0 times as long as high. Hind tarsal claws short. Pterostigma 1.8 times as long as wide. Metacarpus reaching 0.6 the distance from radial cell to the tip of wing. Basal area of propodeum 0.3 times as long as petiolar area, about as long as wide, covered with longitudinal wrinkles, lateral carinae indistinct. Dorsolateral area granulate and dull, with wrinkles at the edges. Petiolar area 1.3 times as long as wide, slightly depressed, granulate and dull, with fine transverse striae posteriorly. Posterior lateral area 0.6 times as long as petiolar area (Fig. 63). Propodeal spiracle separated from the pleural carina by 2.5 times its diameter, spiracular carina narrow. 1st gastral tergite 3.4 times as long as wide. Petiole 1.8 times as long as postpetiole, finely granulate and granulate-strigose dorsally, with indistinct dorsolateral carinae, completely striate laterally. Postpetiole 1.2 times as long as wide, very finely granulate. 1st sternite surpassing the spiracles (Fig. 64). 2nd tergite 0.8 times as long as wide. Thyridium oval, rather close to the anterior edge of the 2nd tergite, thyridial depression indistinct, about twice as long as wide (Fig. 65). Gaster clavate-compressed posteriorly. Ovipositor 2.2 times, ovipositor sheath 1.5 times as long as 1st gastral tergite. Ovipositor slender,

slightly bent upwards proximally and medially, distinctly bent upwards distally, with a small almost triangular dorsal incision subapically, its tip evenly tapered (Fig. 66).

Colour: Black. Palpi, mandible (teeth dark brown), median and ventral parts of clypeus, scape, pedicellus, tegula and legs yellowish red. Flagellum blackish, 1st and 2nd segments tinged with brown. Hind coxa dark brown basally. Pterostigma dark brown. Gastral tergites from the 2nd tergite onwards reddish brown, 2nd tergite tinged with black anteriorly.

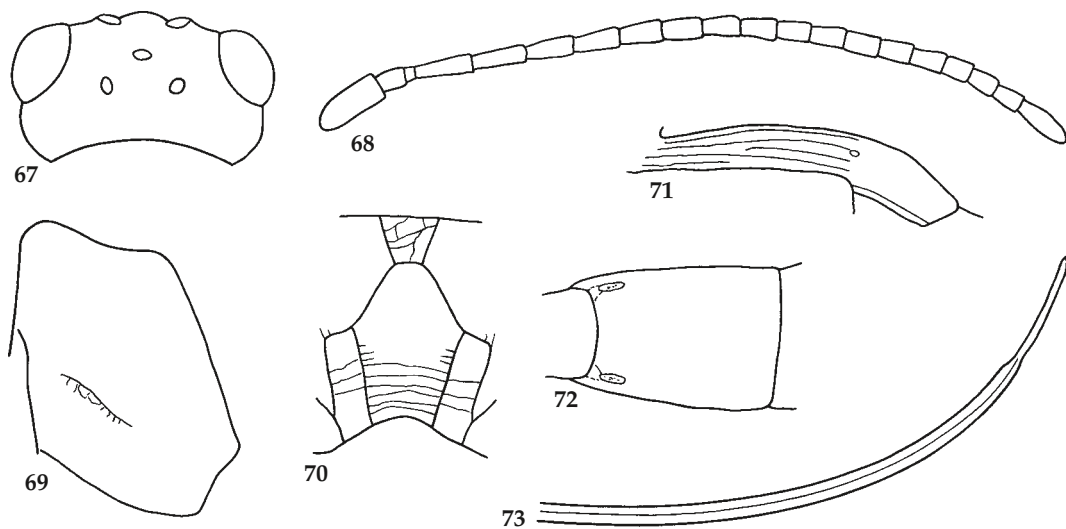
M unknown.

Variation: The description is made from the holotype. The paratype is smaller (body length 2.5 mm), the right flagellum consists of 7 segments (proportions as in the holotype), in the left flagellum the last segment is subdivided (thus flagellum with 8 segments). In other characters this specimen agrees very well with the holotype.

Phradis nigricoxa spec. nov.

Holotype (♀): "Hyatt Reservoir, VI.29.78, Ore., H. & M. Townes" (Oregon, USA) (AEL). – Paratype: 1♀ with the same data (AEL).

w: Body length 3.5 mm. Temples slightly constricted behind the eyes, 0.8 times as long as the width of an eye, tangential lines on eyes and temples intersect on the 1st gastral tergite (Fig. 67). Head 1.2 times as wide as high. Ocellar index 1.8. Malar space index 0.7. Glossa 0.4 times as long as the width of clypeus. Upper mandibular tooth slightly the longer. Clypeus 0.8 times as long as face, 3.4 times as wide as long,

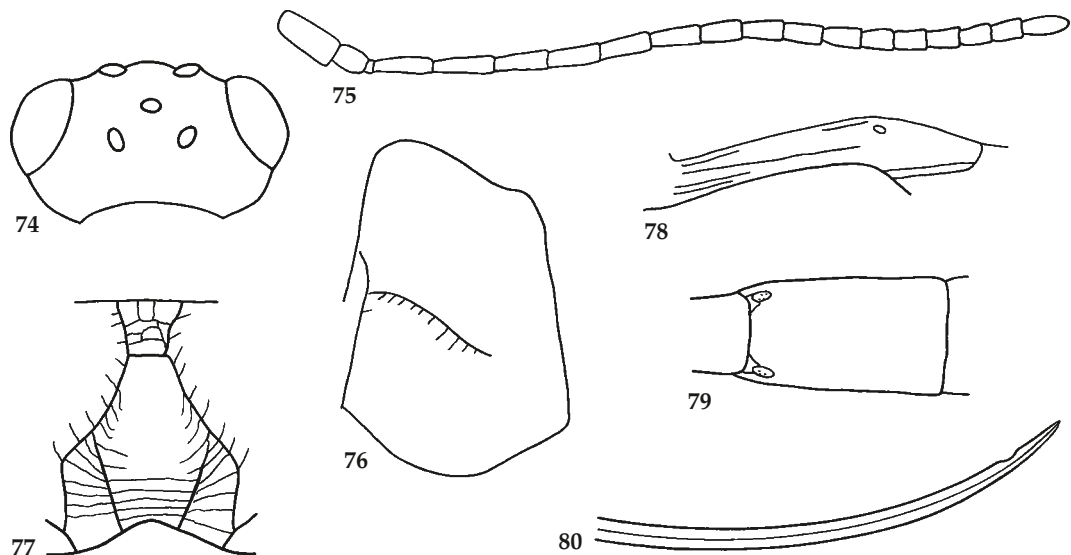


Figs 67- 73. *Phradis nigricoxa* spec. nov. (♀). 67. Head, top view. 68. Antenna. 69. Mesopleurum. 70. Propodeum, top view. 71. 1st gastral segment, side view. 72. 2nd gastral tergite, top view. 73. Ovipositor, side view.

slightly rounded, finely granulate and distinctly punctate dorsally, flat and smooth medially and subventrally. Face and frons distinctly granulate and with fine dense punctation, central swelling of face somewhat shining. Vertex finely granulate and with fine rather dense punctation. Temple with fine dispersed punctation, the background smooth centrally, finely granulate ventrally. Flagellum with 17 segments, filiform, 1st segment 3.3 times, 2nd segment 2.4 times, median segments and penultimate segment 1.2–1.3 times as long as wide (Fig. 68). Pronotum finely granulate and with fine dispersed or rather dense punctation dorsolaterally, with distinct striae in the anterior groove. Mesoscutum and scutellum finely granulate and with rather dense or dense punctation, shining. Notaulus as a shallow wrinkled groove, extending to 0.2 the length of the mesoscutum. Prescutellar furrow smooth. Scutellum bordered by carinae on the anterior 0.3. Mesopleurum finely granulate and with fine dispersed or rather dense punctation, shining. Foveate groove as a wrinkled furrow, 0.3–0.4 times as long as mesopleurum (Fig. 69). Mesosternum with fine dispersed punctation on a finely granulate or smooth background. Metapleurum finely granulate and with fine dense punctation. Hind femur 4.1 times as long as high. Hind tarsal claws short. Pterostigma 1.8 times as long as wide. Metacarpus reaching 0.7 the distance from radial cell to the tip of wing. Basal area of propodeum about 0.4 times as long as petiolar area, trapezoid, about as long as wide, covered with irregular wrinkles, with distinct

lateral carinae. Dorsolateral area finely granulate and with fine rather dense punctation, shining. Petiolar area 1.4 times as long as wide, flat, slightly granulate and shining anteriorly, with transverse striae posteriorly. Posterior lateral area 0.6 times as long as petiolar area (Fig. 70). Propodeal spiracle separated from the pleural carina by three times its diameter, spiracular carina narrow. 1st gastral tergite 3.5 times as long as wide. Petiole 1.6 times as long as postpetiole, almost smooth dorsally, with weak dorsolateral carinae, completely striate laterally. Postpetiole 1.4 times as long as wide, with very fine sculpture anteriorly, smooth posteriorly, with a small central depression. 1st sternite slightly surpassing the spiracles (Fig. 71). 2nd tergite 1.2 times as long as wide. Thyridium elongated, close to the anterior edge of the 2nd tergite, thyridial depression about twice as long as wide (Fig. 72). Gaster compressed posteriorly. Ovipositor 1.7 times, ovipositor sheath 1.1 times as long as 1st gastral tergite. Ovipositor slender, slightly bent upwards proximally, strongly bent upwards distally, abruptly narrowed subapically, the tip very thin (Fig. 73).

Colour: Black. Palpi, mandible (teeth dark brown), scape, pedicellus, tegula and legs yellowish red. Clypeus dark brown medially and ventrally. Flagellum blackish. Mid and hind coxa black. Hind trochanter, hind trochantellus and hind femur brown, the femur marked with yellowish red apically. Pterostigma blackish. Gastral tergites from the 2nd tergite onwards blackish, tinged with dark brown.



Figs 74–80. *Phradis nitidipleuris* spec. nov. (♀). 74. Head, top view. 75. Antenna. 76. Mesopleurum. 77. Propodeum, top view. 78. 1st gastral segment, side view. 79. 2nd gastral tergite, top view. 80. Ovipositor, side view.

M unknown.

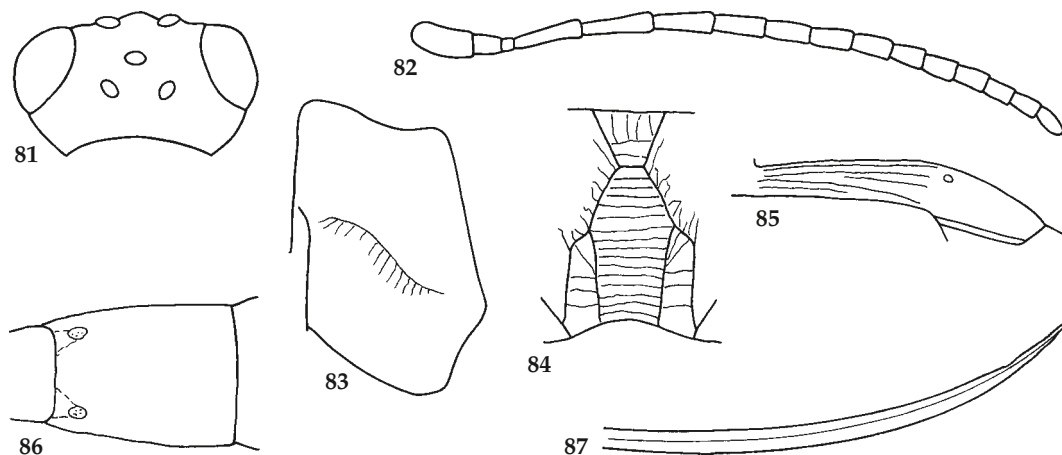
Variation: In 1 ♀ (Moscow Mt., Idaho; CAM) (not included in the type series) the foveate groove is about 0.8 times as long as mesopleurum. This ♀ is slightly smaller (body length 3 mm), and the ovipositor is slightly longer (ovipositor 1.8 times, ovipositor sheath 1.3 times as long as 1st gastral tergite). In other characters it agrees well with the nominate form. Its status is uncertain.

Phradis nitidipleuris spec. nov.

Holotype (♀): “USA, Wyoming, Albany Co., Medicine Bow Natl. Forest, Yellow Pines Camp Area near Pole Creek, S. R. Shaw, 4–11 June 2003, Malaise trap (near willows)” (LAR).

w: Body length 4 mm. Temples distinctly constricted behind the eyes, 0.7 times as long as the width of an eye, tangential lines on eyes and temples intersect on the scutellum (Fig. 74). Head 1.3 times as wide as high. Ocellar index 1.7. Malar space index 0.8. Glossa 0.3 times as long as the width of clypeus. Mandibular teeth about equal. Clypeus 0.85 times as long as face, 2.9 times as wide as long, distinctly rounded and with fine punctation on a finely granulate background dorsally, flat and smooth medially and subventrally. Face and frons finely granulate and with fine dispersed punctation, central swelling of face with a smooth background. Vertex and temple with fine dispersed punctation on a smooth

background. Flagellum with 16 segments, filiform, 1st segment 3.4 times, 2nd segment 2.7 times, median segments 1.8 times, penultimate segment 1.25 times as long as wide (Fig. 75). Pronotum finely granulate and with fine dispersed punctation dorsolaterally, with distinct striae in the anterior groove. Mesoscutum and scutellum with fine dispersed punctation on a smooth background. Notaulus as a shallow wrinkled groove, extending to 0.2 the length of the mesoscutum. Prescutellar furrow smooth. Scutellum bordered by carinae on the anterior 0.3. Mesopleurum and mesosternum with fine dispersed punctation on a smooth background, strongly shining, mesopleurum with wrinkles below the foveate groove and at the posterior edge. Foveate groove as a wrinkled furrow, about 0.6 times as long as mesopleurum (Fig. 76). Metapleurum finely granulate and with very fine dispersed punctation, shining. Hind leg rather slender, femur 4.4 times as long as high. Hind tarsal claws slender, longer than empodium. Pterostigma 2.4 times as long as wide. Metacarpus reaching 0.4 the distance from radial cell to the tip of wing. Basal area of propodeum 0.4 times as long as petiolar area, about as long as wide, covered with wrinkles, lateral carinae indistinct. Dorsolateral area with wrinkles and some punctures, shining. Petiolar area 1.5 times as long as wide, flat, with irregular wrinkles anteriorly, with fine transverse striae posteriorly, the lateral carinae indistinct anteriorly, distinct posteriorly. Posterior lateral area 0.7 times as long as petiolar area (Fig. 77). Propodeal spiracle separated from the pleural carina by four times



Figs 81–87. *Phradis nitidus* spec. nov. (♀). 81. Head, top view. 82. Antenna. 83. Mesopleurum. 84. Propodeum, top view. 85. 1st gastral segment, side view. 86. 2nd gastral tergite, top view. 87. Ovipositor, side view.

its diameter, spiracular carina narrow. 1st gastral tergite 4.0 times as long as wide. Petiole 1.6 times as long as postpetiole, smooth dorsally, without dorsolateral carinae, with a few fine striae laterally. Postpetiole 1.5 times as long as wide, smooth, with a shallow groove centrally. 1st sternite reaching the spiracles (Fig. 78). 2nd tergite 1.5 times as long as wide. Thyridium oval, close to the anterior edge of the 2nd tergite, thyridial depression about 1.5 times as long as wide (Fig. 79). Gaster clavate posteriorly. Ovipositor 1.9 times, ovipositor sheath 1.3 times as long as 1st gastral tergite. Ovipositor slightly bent upwards proximally and medially, distinctly (but not strongly) bent upwards distally, with a shallow rounded dorsal depression subapically, its tip evenly tapered (Fig. 80).

Colour: Black. Palpi, mandible (teeth brown), median and ventral parts of clypeus, tegula and legs yellowish red. Scape and pedicellus tinged with yellowish red ventrally. Flagellum blackish. Mid coxa for the greater part and hind coxa completely black. Hind femur tinged with brown medially. Gastral tergites from the 2nd tergite onwards blackish, tinged with dark brown laterally.

M unknown.

Phradis nitidus spec. nov.

Holotype (♀): "CANADA: Yukon Territory, Haines Junt, Dezadeash Lake, 700-900 m; 2.viii.1988; S & J Peck" (AEI). – Paratypes (19♀♀, 8♂♂): Canada: Alberta: Cameron Lake, Waterton Nat. Pk. (OTT), Johnston Canyon, Banff, 1430 m (HOR, OTT); British Columbia: Cassiar Hwy. (AEI), Kaslo (WAS), Lac la Hache (OTT),

Mt. Robson Prov. Pk. (AEI), Oliver (OTT), Squamish, 975 m (HOR, OTT), Stone Mt. Pk., 1160 m (AEI); Yukon: Burwath Landing (OTT), Champagne, 700 m (AEI), La Force Lake, 1000 m (OTT), Whitehorse (OTT). USA: Colorado: Grand Lake (AEI), Poudre Lake (AEI); Idaho: W. Springs (LAN); New Mexico: Sandia Mts., 2600 m (AEI), Taos (AEI, HOR); Wyoming: Medicine Bow Range, 2900 m (WAS). Flight period: vi–viii, with a distinct peak in viii.

w: Body length 4 mm. Temples strongly constricted behind the eyes, 0.6 times as long as the width of an eye, tangential lines on eyes and temples intersect on the prescutellar furrow (Fig. 81). Head 1.15 times as wide as high. Ocellar index 1.5. Malar space index 0.85. Glossa usually 0.7–0.8 times as long as the width of clypeus (but see below). Maxillary palpus about half as long as the height of head. Upper mandibular tooth slightly the longer. Clypeus 0.8 times as long as face, 2.8 times as wide as long, rounded, almost smooth, with a few punctures dorsally. Head shining. Face and frons finely granulate and with very fine rather dense or dense punctation, central swelling of face with a smooth background. Vertex finely granulate and with fine dispersed punctation. Temple with fine dispersed punctation on a smooth background. Flagellum with 13 segments, filiform, 1st segment 3.4 times, 2nd segment 3.3 times, median segments 1.7 times, penultimate segment 1.3 times as long as wide (Fig. 82). Pronotum finely granulate and with fine rather dense punctation dorsolaterally, with long striae in the anterior groove. Mesoscutum and scutellum finely granulate and with fine and rather dense punctation. Notaulus as a distinct furrow, with a carina at its inner side, extending to 0.2 the length of the mesoscutum. Prescutellar

furrow with a few fine striae. Scutellum bordered by carinae on the anterior 0.3. Mesopleurum with distinct dispersed or rather dense punctation on a smooth background dorsally and medially, shining, wrinkled ventrally below the foveate groove. Foveate groove as a wrinkled furrow, about 0.7 times as long as mesopleurum (Fig. 83). Mesosternum with fine dispersed punctation on a smooth background. Metapleurum granulate and rugose-punctate. Hind femur 4.2 times as long as high. Hind tarsal claws slightly longer than empodium. Pterostigma 2.1 times as long as wide. Metacarpus reaching 0.7 the distance from radial cell to the tip of wing. Basal area of propodeum 0.45 times as long as petiolar area, about as long as wide, trapezoid, lateral carinae sometimes indistinct, covered with irregular wrinkles. Dorsolateral area covered with irregular wrinkles. Petiolar area 1.6 times as long as wide, slightly depressed, with distinct transverse striae. Posterior lateral area 0.7 times as long as petiolar area (Fig. 84). Propodeal spiracle separated from the pleural carina by four times its diameter, spiracular carina narrow. 1st gastral tergite 3.2 times as long as wide. Petiole 1.5 times as long as postpetiole, with distinct striae dorsally and laterally, dorsally with a smooth area anteriorly, dorsolateral carinae indicated. Postpetiole 1.3 times as long as wide, with a shallow depression anteriorly, smooth or with fine longitudinal striae anteriorly. 1st sternite reaching the spiracles (Fig. 85). 2nd tergite 1.2 times as long as wide. Thyridium oval, slightly distant from the anterior edge of the 2nd tergite, thyridial depression distinct, about 1.3 times as long as wide (Fig. 86). Gaster compressed posteriorly. Ovipositor 2.1 times, ovipositor sheath 1.25 times as long as 1st gastral tergite. Ovipositor slender, slightly bent upwards proximally and medially, moderately bent upwards distally, with a very shallow rounded dorsal depression subapically, its tip very slender, evenly tapered (Fig. 87).

Colour: Black. Palpi, mandible (teeth brown), scape, pedicellus, tegula and legs yellowish red. Clypeus brownish ventrally. Flagellum dark brown, its proximal segments to a variable extent marked or tinged with yellowish brown. Hind coxa marked with brown or blackish basally. Pterostigma medium brown. Gaster tergites from the 2nd tergite onwards yellowish red, 2nd tergite marked with black anteriorly, posterior tergites tinged with brown or black dorsally.

M: Malar space index 0.7. Flagellum with 15 segments, 1st segment 3.6 times, 2nd segment 3.2 times, median segments 2.0 times, penultimate segment 1.3 times as long as wide. Petiole with fine striae, sometimes almost without striae dorsally. Gaster tergites sometimes completely dark brown dorsally. In other

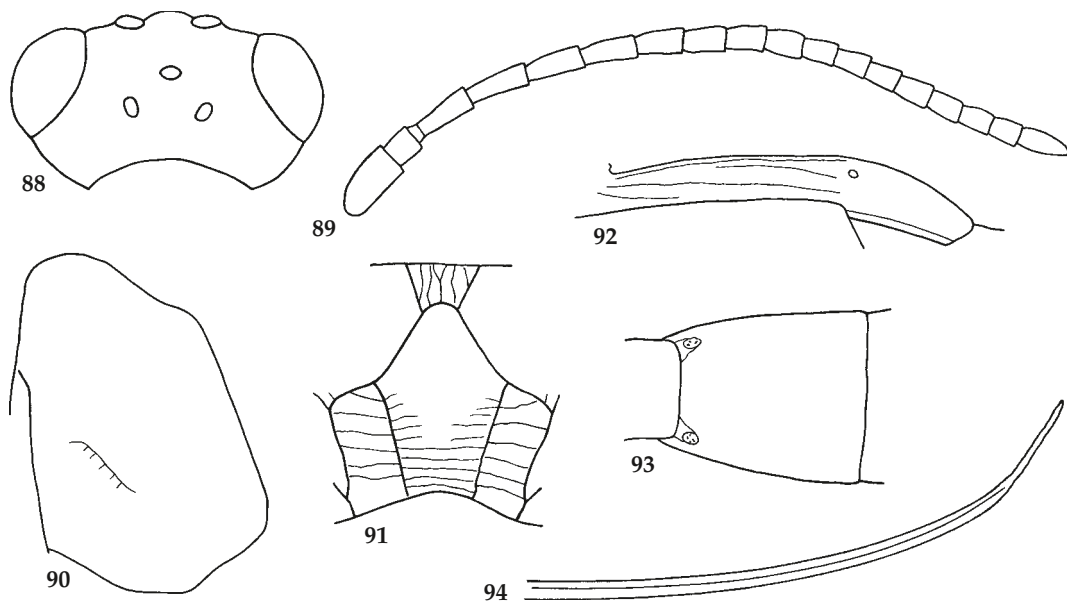
characters similar to the ♀. In one case, ♀♀ and ♂♂ were collected at the same locality (Banff, Alberta).

Variation: In some specimens (not included in the type series) the glossa is shorter, 0.4 times as long as the width of clypeus in the ♀, 0.5 times as long in the ♂ (1♀, 3♂ Graham Mts., 2700 m, Coronado Natl. Forest, Graham Co., Arizona; TEX; 1♀ Forest Road 60, Skamania Co., Washington; TEX). Other differences from the nominate form could not be found.

Phradis punctatus spec. nov.

Holotype (♀): "Kazabazua, Que., 6-VI-56" (Quebec, Canada), "Collector W. R. M. Mason", "Taken on pines" (OTT). – Paratype: 1♀ from the same locality, 21.v.1957 (OTT).

w: Body length 4 mm. Temples distinctly constricted behind the eyes, 0.65 times as long as the width of an eye, tangential lines on eyes and temples intersect on the scutellum (Fig. 88). Head 1.25 times as wide as high. Ocellar index 1.9. Malar space index 0.8. Glossa 0.4 times as long as the width of clypeus. Mandibular teeth about equal. Clypeus 0.8 times as long as face, 2.8 times as wide as long, slightly rounded and with distinct punctation on a finely granulate background dorsally, flat and smooth subventrally. Face and frons granulate and with very fine rather dense punctation, rather dull, central swelling of face somewhat shining. Vertex and temple with fine rather dense punctation on a very finely granulate background. Flagellum with 16 segments, filiform, 1st segment 2.9 times, 2nd segment 2.4 times, median segments and penultimate segment 1.2–1.3 times as long as wide (Fig. 89). Pronotum finely granulate and with dense punctation dorsolaterally, with short striae in the anterior groove. Mesoscutum and scutellum finely granulate and with fine dense punctation. Notaulus as a shallow furrow, extending to 0.2 the length of the mesoscutum. Prescutellar furrow smooth. Scutellum bordered by carinae on the anterior 0.4. Mesopleurum finely granulate and with distinct dense punctation, speculum rugose-punctate. Foveate groove as a shallow wrinkled groove, about 0.3 times as long as mesopleurum (Fig. 90). Mesosternum with dispersed punctation on an almost smooth background. Metapleurum granulate and finely and densely punctate. Hind femur 3.9 times as long as high. Hind tarsal claws short. Pterostigma 2.0 times as long as wide. Metacarpus reaching 0.7 the distance from radial cell to the tip of wing. Basal area of propodeum 0.3 times as long as petiolar area, 0.7 times as long as wide, trapezoid, with lateral carinae, covered with irregular wrinkles. Dorsolateral area finely granulate and with distinct dense punctation. Petiolar area 1.7



Figs 88- 94. *Phradis punctatus* spec. nov. (♀). 88. Head, top view. 89. Antenna. 90. Mesopleurum. 91. Propodeum, top view. 92. 1st gastral segment, side view. 93. 2nd gastral tergite, top view. 94. Ovipositor, side view.

times as long as wide, slightly depressed, distinctly granulate and with fine punctures anteriorly, with fine transverse striae posteriorly. Posterior lateral area 0.7 times as long as petiolar area (Fig. 91). Propodeal spiracle separated from the pleural carina by four times its diameter, spiracular carina narrow. 1st gastral tergite 3.0 times as long as wide. Petiole 1.6 times as long as postpetiole, smooth dorsally (with very fine sculpture posteriorly), with dorsolateral carinae, striate laterally. Postpetiole 1.1 times as long as wide, granulate and granulate-strigose anteriorly, smooth posteriorly. 1st sternite surpassing the spiracles (Fig. 92). 2nd tergite about as long as wide. Thyridium oval, close to the anterior edge of the 2nd tergite, thyridial depression about as long as wide (Fig. 93). Gaster clavate-compressed posteriorly. Ovipositor 2.0 times, ovipositor sheath 1.4 times as long as 1st gastral tergite. Ovipositor slender, slightly bent upwards proximally and medially, distinctly bent upwards distally, abruptly narrowed subapically, the tip very thin (Fig. 94).

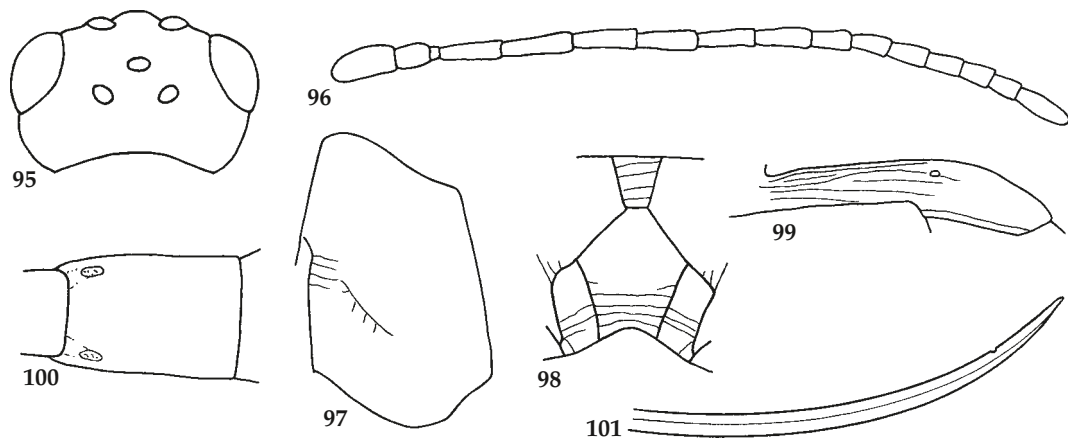
Colour: Black. Palpi, mandible (teeth light brown), ventral third of clypeus, scape, tegula and legs yellowish red. Pedicellus and proximal segments of flagellum (up to the 1st or 2nd segment) tinged with yellowish red. Mid and hind coxae blackish. Pterostigma dark brown. Gastral tergites from the 2nd tergite onwards completely blackish or marked with reddish brown laterally.

M unknown.

Phradis rarus spec. nov.

Holotype (♀): "Waterton, Alta., 18-VI-1957, O. Peck" (Alberta, Canada) (OTT).

w: Body length 3.5 mm. Temples slightly constricted behind the eyes, 0.85 times as long as the width of an eye, tangential lines on eyes and temples intersect on the 1st gastral tergite (Fig. 95). Head 1.15 times as wide as high. Ocellar index 1.6. Malar space index 0.8. Glossa 0.4 times as long as the width of clypeus. Upper mandibular tooth slightly the longer. Clypeus 0.7 times as long as face, 2.9 times as wide as long, rounded, punctate dorsally, smooth medially and subventrally. Face and frons granulate and with fine rather dense or dense punctation, rather dull. Vertex finely granulate and with fine rather dense punctation. Temple with distinct dispersed or rather dense punctation on a very finely granulate background, shining. Flagellum with 13 segments, filiform, 1st segment 3.5 times, 2nd segment 3.4 times, median segments 1.7 times, penultimate segment 1.3 times as long as wide (Fig. 96). Pronotum granulate and dull dorsolaterally, with few fine striae in the anterior groove. Mesoscutum and scutellum finely granulate and with fine rather dense punctation, somewhat shining. Notaulus as a slightly depressed wrinkled groove, extending to 0.2 the length of the mesoscutum. Prescutellar furrow smooth. Scutellum bordered by carinae on the anterior 0.3. Mesopleurum granulate, finely granulate-strigose and with



Figs 95- 101. *Phradis rarus* spec. nov. (♀). 95. Head, top view. 96. Antenna. 97. Mesopleurum. 98. Propodeum, top view. 99. 1st gastral segment, side view. 100. 2nd gastral tergite, top view. 101. Ovipositor, side view.

some fine striae dorsally, punctation hardly or not at all discernible. Foveate groove as a shallow groove, with some transverse wrinkles, about half as long as mesopleurum (Fig. 97). Mesosternum finely granulate and finely punctate. Metapleurum finely granulate, somewhat shining. Hind femur 4.2 times as long as high. Hind tarsal claws short. Pterostigma 2.3 times as long as wide. Metacarpus reaching 0.6 the distance from radial cell to the tip of wing. Basal area of propodeum 0.4 times as long as petiolar area, 1.1 times as long as wide, trapezoid, with lateral carinae, covered with predominantly transverse wrinkles. Dorsolateral area granulate, with fine wrinkles laterally. Petiolar area 1.2 times as long as wide, flat, granulate, with some transverse striae posteriorly. Posterior lateral area 0.7 times as long as petiolar area (Fig. 98). Propodeal spiracle very small, separated from the pleural carina by six times its diameter, spiracular carina narrow. 1st gastral tergite 2.9 times as long as wide. Petiole 1.4 times as long as postpetiole, for the greater part smooth dorsally, with fine sculpture anteriorly, with indistinct dorsolateral carinae, with fine striae laterally. Postpetiole 1.2 times as long as wide, finely granulate anteriorly, smooth posteriorly. 1st sternite reaching the spiracles (Fig. 99). 2nd tergite 1.3 times as long as wide. Thyridium oval, distant from the anterior edge of the 2nd tergite, thyridial depression indistinct, about twice as long as wide (Fig. 100). Gaster compressed posteriorly. Ovipositor 2.6 times, ovipositor sheath 1.8 times as long as 1st gastral tergite. Ovipositor slightly bent upwards proximally and medially, distinctly bent upwards distally, with a small triangular dorsal incision subapically, its tip evenly tapered (Fig. 101).

Colour: Black. Palpi, mandible (teeth light

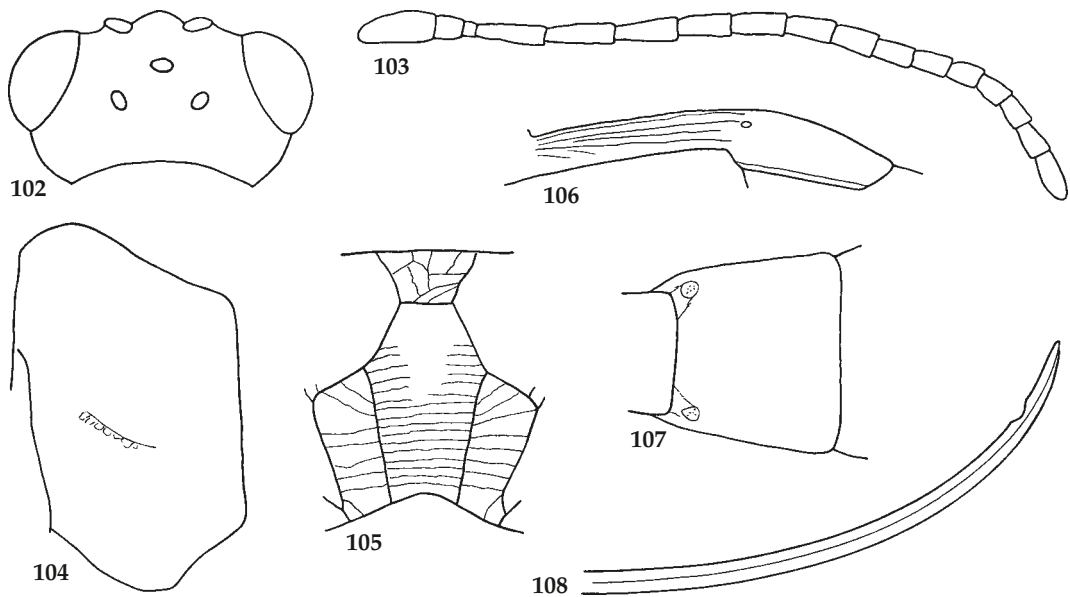
brown), scape, pedicellus, tegula and legs yellowish red. Clypeus reddish brown ventrally. Flagellum dark brown, the three proximal segments tinged with yellowish red. Hind coxa dark brown. Hind femur tinged with light brown basally. Pterostigma light brown. Postpetiole brown. Gastral tergites from the 2nd tergite onwards reddish brown, the posterior tergites tinged with dark brown dorsally.

M unknown.

Phradis striatus spec. nov.

Holotype (♀): "Kazabazua, Que., 6-VI-56" (Quebec, Canada), "Collector W. R. M. Mason", "Taken on pines" (OTT). – Paratype: 1♀ with the same data (OTT).

w: Body length 4.5 mm. Temples strongly constricted behind the eyes, 0.65 times as long as the width of an eye, tangential lines on eyes and temples intersect on the prescutellar groove (Fig. 102). Head 1.3 times as wide as high. Ocellar index 1.75. Malar space index 0.8. Glossa 0.4 times as long as the width of clypeus. Mandibular teeth about equal. Clypeus 0.9 times as long as face, 2.7 times as wide as long, slightly rounded and with distinct punctation on a smooth background dorsally, flat and smooth sub-ventrally. Face and frons granulate and with fine dense punctation, rather dull, central swelling of face shining. Vertex granulate and with fine rather dense punctation. Temple finely granulate and with fine rather dense punctation, shining. Flagellum with 14 segments, filiform, 1st segment 3.1 times, 2nd segment 2.9 times, median segments 1.5 times, penultimate segment 1.2 times as long as wide (Fig. 103). Pronotum finely granulate and with fine dense punctation



Figs 102- 108. *Phradis striatus* spec. nov. (♀). 102. Head, top view. 103. Antenna. 104. Mesopleurum. 105. Propodeum, top view. 106. 1st gastral tergite, side view. 107. 2nd gastral tergite, top view. 108. Ovipositor, side view.

dorsolaterally, with fine striae in the anterior groove. Mesoscutum and scutellum finely granulate and with distinct dense punctation, somewhat shining. Notaulus as a shallowly depressed wrinkled groove, extending to 0.15 the length of the mesoscutum. Prescutellar furrow smooth. Scutellum bordered by carinae on the anterior 0.4. Mesopleurum finely granulate and with distinct rather dense or dense punctation, somewhat shining, speculum with some wrinkles. Foveate groove as a shallowly depressed wrinkled furrow, about 0.3 times as long as mesopleurum (Fig. 104). Mesosternum finely granulate and finely punctate. Metapleurum finely granulate and with fine very dense punctation. Hind femur 4.0 times as long as high. Hind tarsal claws short. Pterostigma 2.1 times as long as wide. Metacarpus reaching 0.7 the distance from radial cell to the tip of wing. Basal area of propodeum 0.3 times as long as petiolar area, 0.7 times as long as wide, trapezoid, with indistinct lateral carinae, covered with irregular wrinkles. Dorsolateral area granulate and with distinct dense punctation, dull, with wrinkles at the edges. Petiolar area 1.6 times as long as wide, slightly depressed, slightly granulate, with distinct transverse striae medially and posteriorly, the anterior 0.3 with some punctures and without striae. Posterior lateral area 0.7 times as long as petiolar area (Fig. 105). Propodeal spiracle separated from the pleural carina by four times its diameter, spiracular carina narrow. 1st gastral tergite 2.7 times as long as

wide. Petiole 1.4 times as long as postpetiole, for the greater part smooth dorsally, with fine sculpture posteriorly, with indistinct dorsolateral carinae, with striae laterally. Postpetiole 1.15 times as long as wide, with fine sculpture anteriorly, smooth posteriorly. 1st sternite reaching the spiracles (Fig. 106). 2nd tergite 0.8 times as long as wide. Thyridium oval, close to the anterior edge of the 2nd tergite, thyridial depression about 1.3 times as long as wide (Fig. 107). Gaster clavate-compressed posteriorly. Ovipositor 2.4 times, ovipositor sheath 1.8 times as long as 1st gastral tergite. Ovipositor slightly bent upwards proximally and medially, distinctly bent upwards distally, with a shallow rounded dorsal depression subapically, its tip evenly tapered (Fig. 108).

Colour: Black. Palpi, mandible (teeth light brown), ventral half of clypeus, scape, pedicellus, tegula and legs yellowish red. Flagellum dark brown, the four proximal segments tinged with reddish brown. Mid coxa dark brown basally, hind coxa completely dark brown. Pterostigma light brown. Gastral tergites from the 2nd tergite onwards light reddish brown, 2nd tergite marked with black anteriorly.

?M: Malar space index 0.6. Flagellum with 16-17 segments, 1st segment 3.0 times, 2nd segment 2.2 times, median segments and penultimate segment 1.5 times as long as wide. Gastral tergites darker, sometimes completely brownish black, sometimes marked with

reddish brown medially. In other characters similar to the ♀, but without clear evidence that it belongs to the same species (1♂ Colesville, Maryland, on *Pinus virginiana* Mill., OTT; 4♂♂ Hughesville, Maryland; AEI; 1♂ Meadows of Dan, Virginia; AEI). These ♂♂ might as well belong to *P. punctatus*.

Taxonomic remark: The types of *P. punctatus* and *P. striatus* were collected at the same locality, on the same day and on the same plant species. The species agree with each other in most characters (see descriptions, which were independently made from the holotypes). They differ in the number and the proportion of the flagellar segments, the sculpture of the petiolar area of propodeum, the shape and the length of the ovipositor, and the colour of the gaster.

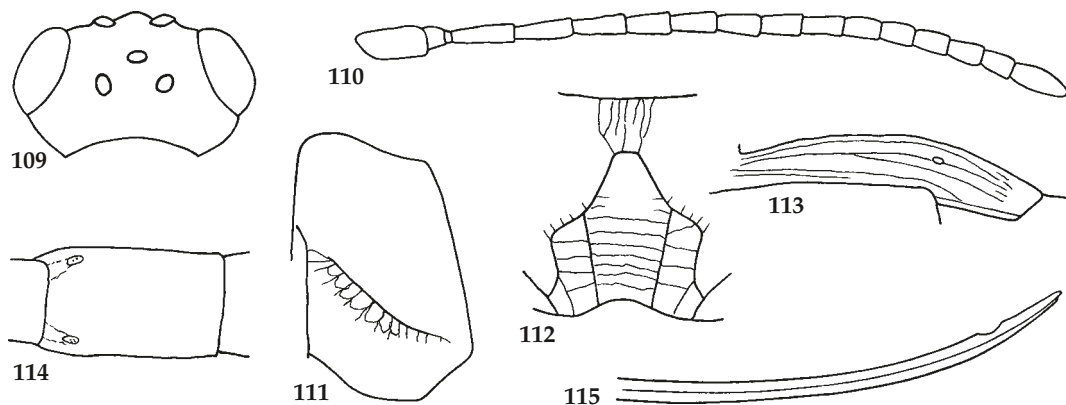
Phradis sulcator spec. nov.

Holotype (♀): "Florence, Ill, v.22.41, K. H. Townes" (Illinois, USA) (AEI). – Paratypes (165♀♀, 107♂♂): Canada: Ontario: Belleville (HOR, OTT), Cumberland (AEI), Gracefield (OTT), Hog's Back (OTT), Innisville (OTT), Ottawa (OTT), Pt. Pelee Nat. Pk. (OTT), Rondeau Prov. Pk. (OTT), Shirleys Bay (AEI), St. Annes (OTT), Vernon (OTT), Wallaceburg (OTT). USA: Illinois: Florence (AEI, HOR), Mahonet, Champaign Co. (AEI); Indiana: Cloverdale (AEI), Lafayette (WAS); Iowa: Des Moines Co. (WAS), Hartford, Warren Co. (OTT), Henry Co. (OTT), Jefferson Co. (WAS), Johnson Co. (WAS), Lee Co. (WAS), Linn Co. (WAS), Mt. Pleasant (WAS), Van Buren Co. (WAS), Washington Co. (WAS); Maryland: Plummers Island (WAS), Riley's Lock, Montgomery Co. (WAH), Williamsville (OTT); Massachusetts: South Hadley (AEI); Michigan: Ann Arbor (AEI, NHM), Delhi Huron, Metro Pk. (AEI), Gratiot Co. (LAN), Kalkaska Co. (LAN), Kent Co. (LAN), Midland Co. (LAN), Missaukee Co. (LAN), Saginaw Co. (LAN), Sinilac Co. (LAN), Van Buren Co. (LAN); Missouri: Patterson, Wayne Co. (WAH), Williamsville, Wayne Co. (AEI); New York: Bemus Pt. (AEI), Ithaca (AEI, HOR); Ohio: New Concord (AEI), Wills Cr. Res. (AEI); Pennsylvania: New Cumberland (WAS); South Carolina: Watacoo, Pickens Co. (AEI); Virginia: Annandale, Fairfax Co. (WAH), Arlington (WAS), Falls Church (CAM), Shenendoa Nat. Pk., Page Co. (AEI); Wisconsin: Middleton, Dane Co. (AEI). Flight period: iv–vii, with a distinct peak in v.

w: Body length 3 mm. Temples strongly constricted behind the eyes, 0.6 times as long as the width of an eye, tangential lines on eyes and temples intersect on the posterior half of the mesoscutum (Fig. 109). Head 1.25 times as wide as high. Ocellar index 1.7. Malar space index 0.55. Glossa half as long as the width of clypeus. Mandibular teeth about equal or upper tooth slightly the longer. Clypeus 0.8 times as long as face,

2.9 times as wide as long, slightly rounded and with some punctures on a finely granulate background dorsally, almost flat and with some punctures on a smooth background medially and subventrally. Head granulate, dull, frons with hardly discernible punctation. Flagellum with 14 segments, slightly clavate, 1st segment 3.3 times, 2nd segment 2.4 times, median segments 1.6 times, penultimate segment 1.4 times as long as wide (Fig. 110). Pronotum granulate dorsolaterally, with fine striae in the anterior groove. Mesoscutum and scutellum granulate and dull, a very fine punctation hardly discernible. Notaulus as a wrinkled furrow, extending to 0.2 the length of the mesoscutum. Prescutellar furrow smooth. Scutellum bordered by carinae on the anterior 0.3. Mesopleurum with rather dense punctation on a finely granulate and shining background on the speculum and in front of and below the speculum (punctation sometimes indistinct), granulate and dull without punctures above and below the foveate groove. Foveate groove as a distinct wrinkled furrow, almost as long as mesopleurum (Fig. 111). Mesosternum finely granulate and with fine punctation. Metapleurum granulate and dull. Hind femur 4.1 times as long as high. Hind tarsal claws short. Pterostigma 2.2 times as long as wide. Metacarpus reaching 0.7 the distance from radial cell to the tip of wing. Sometimes the intercubitus is slightly basad of the 2nd recurrent vein. Basal area of propodeum half as long as petiolar area, 1.0–1.5 times as long as wide, with distinct or indistinct lateral carinae, covered with predominantly longitudinal wrinkles. Dorsolateral area granulate and dull, with wrinkles at the edges. Petiolar area 1.7 times as long as wide, slightly depressed, granulate and dull, with fine transverse striae medially and posteriorly. Posterior lateral area 0.7 times as long as petiolar area (Fig. 112). Propodeal spiracle separated from the pleural carina by three times its diameter, spiracular carina narrow or partly widened. 1st gastral tergite 3.1 times as long as wide. Petiole 1.6 times as long as postpetiole, striate dorsally and laterally, dorsolateral carinae distinct. Postpetiole 1.2 times as long as wide, granulate-strigose or with fine striae anteriorly and medially, smooth posteriorly. 1st sternite surpassing the spiracles (Fig. 113). 2nd tergite 1.5 times as long as wide. Thyridium elongate, distant from the anterior edge of the 2nd tergite, thyridial depression narrow, about twice as long as wide (Fig. 114). Gaster compressed posteriorly. Ovipositor 2.0 times, ovipositor sheath 1.25 times as long as 1st gastral tergite. Ovipositor slender, slightly bent upwards proximally and medially, moderately bent upwards distally, with a shallow rounded dorsal depression subapically, its tip evenly tapered (Fig. 115).

Colour: Black. Palpi, mandible (teeth brown),



Figs 109- 115. *Phradis sulcator* spec. nov. (♀). 109. Head, top view. 110. Antenna. 111. Mesopleurum. 112. Propodeum, top view. 113. 1st gastral segment, side view. 114. 2nd gastral tergite, top view. 115. Ovipositor, side view.

median and ventral parts of clypeus, scape, pedicellus, four proximal segments of flagellum, tegula and legs yellowish red. Flagellum dark brown distally. Pterostigma light brown. Gastral tergites from the 2nd tergite onwards dark brown or blackish, 2nd tergite tinged with reddish brown posteriorly, the following tergites tinged with reddish brown laterally.

M: Malar space index 0.3. Flagellum with 18–20 segments, slightly attenuated, 1st segment 3.3 times, 2nd segment 2.3 times, median segments and penultimate segment 1.7 times as long as wide. In other characters similar to the ♀, ♀♀ and ♂♂ were often collected at the same localities.

Variation: In 1 ♀ (not included in the type series) the temple is finely granulate and distinctly shining (Pt. Pelee Nat. Pk., Ontario; OTT). Other differences from the nominate form could not be found.

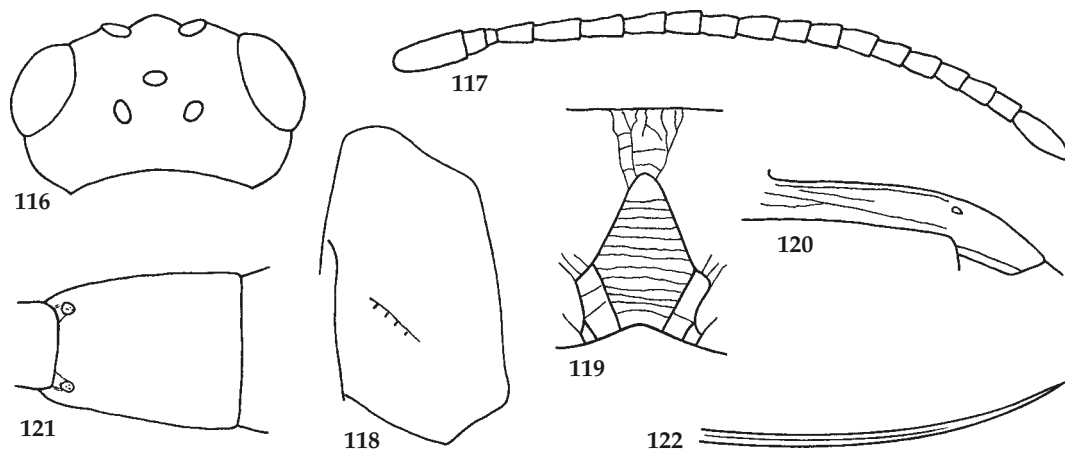
Taxonomic remark: *P. sulcator* is similar to the Palearctic species *P. thyridialis* Horstmann. The latter differs by: Ocellar index 2.0. Foveate groove 0.3 times as long as mesopleurum. Mesopleurum without punctation on the speculum and in front of and below the speculum. Thyridial depression about as long as wide. Ovipositor 2.4 times, ovipositor sheath 1.6 times as long as 1st gastral tergite. Hind coxa brown.

Phradis tenuicauda spec. nov.

Holotype (♀): "Idaho City, Ida., June 9, 1978, H. & M. Townes" (Idaho, USA) (AEI).

w: Body length 3 mm. Temples moderately constricted behind the eyes, 0.7 times as long as the width of an eye, tangential lines on eyes and tem-

ples intersect on the propodeum (Fig. 116). Head 1.2 times as wide as high. Ocellar index 1.4. Malar space index 0.7. Glossa 0.4 times as long as the width of clypeus. Mandibular teeth about equal. Clypeus 0.7 times as long as face, 3.8 times as wide as long, slightly rounded, finely sculptured dorsally, smooth subventrally. Face and frons finely granulate and with fine dense punctation. Face with conspicuous dense and long white pilosity ventrally. Vertex and temple with distinct rather dense or dense punctation on a very finely granulate or smooth background, shining. Flagellum with 16 segments, almost filiform, 1st segment 2.3 times, 2nd segment 2.1 times, median segments 1.3 times, penultimate segment 1.1 times as long as wide (Fig. 117). Pronotum finely granulate and with fine rather dense punctation dorsolaterally, with short striae in the anterior groove. Mesoscutum and scutellum with fine rather dense punctation on a finely granulate or smooth background. Notaulus as an indistinct furrow, extending to 0.15 the length of the mesoscutum. Prescutellar furrow smooth. Scutellum bordered by carinae on the anterior 0.3. Mesopleurum finely granulate and with distinct rather dense or dense punctation, partly rugose-punctate, speculum with a small smooth area. Foveate groove as a slightly depressed wrinkled furrow, about 0.3 times as long as mesopleurum (Fig. 118). Mesosternum finely granulate and with fine dispersed punctation. Metapleurum finely granulate and finely rugose-punctate. Hind femur 4.0 times as long as high. Hind tarsal claws short. Pterostigma 2.1 times as long as wide. Metacarpus reaching 0.6 the distance from radial cell to the tip of wing. Basal area of propodeum 0.5 times as long as petiolar area, about as long as wide, with indistinct lateral carinae, covered with wrinkles. Dorsolateral area shining and with a few fine punctures on a smooth background



Figs 116- 122. *Phradis tenuicauda* spec. nov. (♀). 116. Head, top view. 117. Antenna. 118. Mesopleurum. 119. Propodeum, top view. 120. 1st gastral segment, side view. 121. 2nd gastral tergite, top view. 122. Ovipositor, side view.

anteriorly, with fine wrinkles and rugose-punctate laterally and posteriorly. Petiolar area 1.4 times as long as wide, flat, with transverse striae on an almost smooth background. Posterior lateral area small, half as long as petiolar area (Fig. 119). Propodeal spiracle separated from the pleural carina by three times its diameter, spiracular carina partly narrow, partly widened. 1st gastral tergite 3.1 times as long as wide. Petiole twice as long as postpetiole, smooth dorsally, with very indistinct dorsolateral carinae, partly smooth and with a few fine striae laterally. Postpetiole 1.1 times as long as wide, smooth, with a shallow depression medially. 1st sternite surpassing the spiracles (Fig. 120). 2nd tergite as long as wide. Thyridium almost circular, close to the anterior edge of the 2nd tergite, thyridial depression about as long as wide (Fig. 121). Gaster clavate-compressed posteriorly. Ovipositor 1.3 times, ovipositor sheath 0.7 times as long as 1st gastral tergite. Ovipositor very slender, almost not bent upwards proximally, slightly bent upwards distally, attenuated distally, without a dorsal depression or incision subapically (Fig. 122).

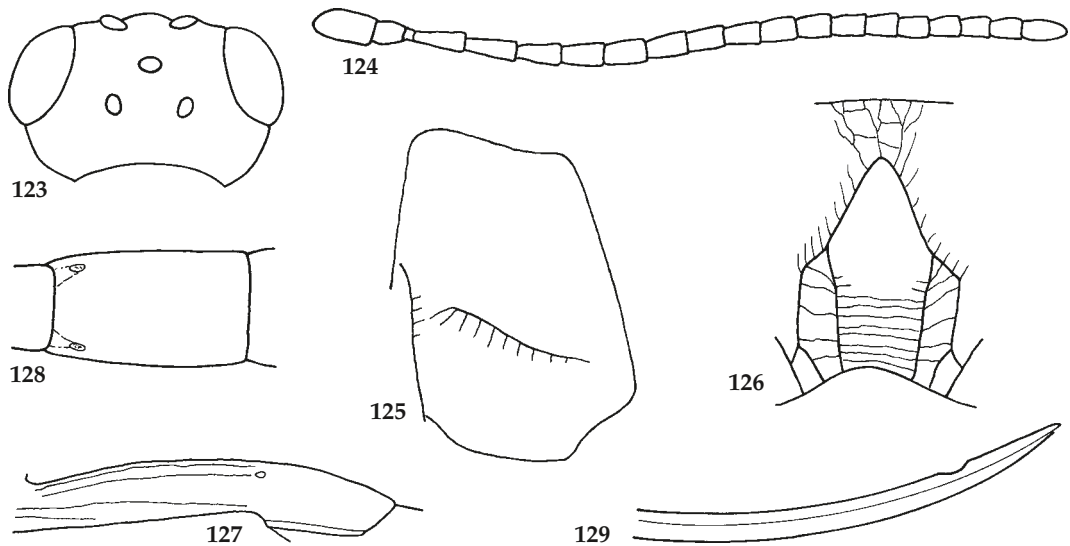
Colour: Black. Palpi, mandible (teeth brown), median and ventral parts of clypeus, scape, pedicellus, tegula and legs yellowish red. Flagellum light reddish brown proximally, dark brown distally. Mid coxa brown basally, hind coxa almost completely brown. Pterostigma dark brown. Gastral tergites from the 2nd tergite onwards brownish black, the tergites tinged with brown posteriorly.

M unknown.

Phradis texanus spec. nov.

Holotype (♀): "TEXAS: Bastrop Co., Bastrop State Park, IV-12-17-1991, Wharton & Geiselbrecht, Malaise trap" (TEX).

w: Body length 4.5 mm. Temples distinctly constricted behind the eyes, 0.65 times as long as the width of an eye, tangential lines on eyes and temples intersect on the scutellum (Fig. 123). Head 1.2 times as wide as high. Ocellar index 1.5. Malar space index 0.75. Glossa half as long as the width of clypeus. Upper mandibular tooth slightly the longer. Clypeus 0.7 times as long as face, 2.5 times as wide as long, slightly rounded, finely granulate and with fine dispersed punctation dorsally, smooth medially and subventrally. Face granulate, central swelling finely granulate and with fine punctation. Frons and vertex finely granulate and with very fine dispersed punctation. Temple with fine dispersed punctation on a very finely granulate or smooth background, shining. Flagellum with 17 segments, filiform, 1st segment 2.9 times, 2nd segment 2.4 times, median segments and penultimate segment 1.3 times as long as wide (Fig. 124). Pronotum granulate and dull dorsolaterally, with fine striae in the anterior groove. Mesoscutum and scutellum finely granulate and with fine dispersed punctation. Notaulus as a distinct wrinkled furrow, with a carina at its inner side, extending to 0.2 the length of the mesoscutum. Prescutellar furrow smooth. Scutellum bordered by carinae on the anterior 0.4. Mesopleurum finely granulate and with fine dispersed or rather dense punctation, slightly shining. Foveate groove as a distinctly depressed wrinkled furrow, 0.8 times as



Figs 123- 129. *Phradis texanus* spec. nov. (♀). 123. Head, top view. 124. Antenna. 125. Mesopleurum. 126. Propodeum, top view. 127. 1st gastral segment, side view. 128. 2nd gastral tergite, top view. 129. Ovipositor, side view.

long as mesopleurum (Fig. 125). Mesosternum with fine dispersed punctation on a very finely granulate background. Metapleurum granulate, with fine punctures and fine wrinkles, rather dull. Hind femur 3.9 times as long as high. Hind tarsal claws slender, slightly longer than empodium. Pterostigma 2.4 times as long as wide. Metacarpus reaching 0.7 the distance from radial cell to the tip of wing. Basal area of propodeum 0.25 times as long as petiolar area, broader than long, without lateral carinae, covered with irregular wrinkles. Dorsolateral area granulate and with fine irregular wrinkles. Petiolar area 1.8 times as long as wide, distinctly depressed, almost pointed anteriorly, granulate and dull, granulate-strigose and with fine transverse striae posteriorly. Posterior lateral area 0.7 times as long as petiolar area (Fig. 126). Propodeal spiracle rather large, separated from the pleural carina by three times its diameter, spiracular carina narrow. 1st gastral tergite 3.7 times as long as wide. Petiole 1.7 times as long as postpetiole, with striae dorsally, an anterior area smooth, with dorsolateral carinae, with few fine striae laterally. Postpetiole 1.4 times as long as wide, with striae anteriorly, smooth posteriorly. 1st sternite slightly surpassing the spiracles (Fig. 127). 2nd tergite 1.5 times as long as wide. Thyridium oval, somewhat distant from the anterior edge of the 2nd tergite, thyridial depression 1.5 times as long as wide (Fig. 128). Gaster compressed posteriorly. Ovipositor 1.8 times, ovipositor sheath 1.1 times as long as 1st gastral tergite. Ovipositor rather slender, slightly bent upwards proximally and medially,

moderately bent upwards distally, with a shallow rounded dorsal depression subapically, its tip evenly tapered (Fig. 129).

Colour: Black. Palpi, mandible (teeth dark brown), scape, pedicellus, proximal half of flagellum, tegula and legs yellowish red. Clypeus reddish brown medially and ventrally. Flagellum dark brown distally. Pterostigma brownish black. Gastral tergites from the 2nd tergite onwards brownish black, the tergites tinged with reddish brown posteriorly and laterally (2nd tergite almost completely dark reddish brown).

M unknown.

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