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New Descriptions of *Halictus (Seladonia)* from the New World (Hymenopterta: Halictidae)

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Abstract.—We describe females of ***Halictus (Seladonia) pinguismentus*** **Janjic and Packer** *new species* from Guadeloupe Island, Mexico and provide the first descriptions of the male and putative queen of *H. (S.) harmonius* Sandhouse and the male and worker of *H. (S.) lanei* (Moure). Additonally, we describe the second known putative queen specimen of *H. (S.) lanei* and describe the huge morphological differences between the castes in this species. Differences among these species are discussed with respect to other New World members of the subgenus.

In order to facilitate the preparation of a phylogenetic analysis of bees of the subgenus *Seladonia* (genus *Halictus*) with particular emphasis on the New World species, we present additional descriptions of bees in this group. North American species of the genus *Halictus* were treated by Sandhouse (1941) and Central and South American *Seladonia* by Wille and Michener (1971). Hitherto, seven New World *Seladonia* species have been recognized (Moure and Hurd 1987): *H. (S.) confusus* Smith, a holarctic species found throughout North America and Europe; *H. (S.) harmonius* Sandhouse, apparently restricted to southern California; *H. (S.) hesperus* Smith, which is primarily a central American species, found from Mexico to Colombia; *H. (S.) lanei* (Moure), which has been recorded from Brazil but which seems to extend into Venezuela and Colombia; *H. (S.) lutescens* Friese, which is found approximately sympatrically with *H. hesperus*; *H. (S.) tripartitus* Cockerell, found in the western USA and northwestern Mexico; and *H. (S.) virgatellus* Cockerell, restricted to areas around and above the treeline in western North America from the North West Territories of Canada to New Mexico.

As a result of our studies we have found specimens of an additional species collected from the island of Guadeloupe off the west coast of Baja California. We describe this new species below. We also present the first descriptions of the males of *H. (S.) harmonius* and *H. (S.) lanei*. Most of the aforementioned species of *Seladonia* are known to be social and at least *H. hesperus* has large morphological caste differences (Brooks and Roubik 1983; Packer 1985) such that the castes would not readily be recognized as being conspecific. The description of *H. harmonius* was apparently based upon worker females (some observations on sociality in this species will be published elsewhere) and that of *H. lanei* appears, based upon macrocephaly, to be that of a queen. Here we provide the first detailed descriptions of an apparent queen of *H. harmonius* and worker of *H. lanei*. Lastly, as the original description of *H. lanei* was short and in Portuguese (Moure 1940), we provide an additional description of a queen of this rare species, a specimen which is larger and even more macrocephalic than the type.

We are not undertaking a complete revision of the New World members of the subgenus *Seladonia* as this is beyond our scope at this time. In particular, detailed studies of the widespread and variable *H.*

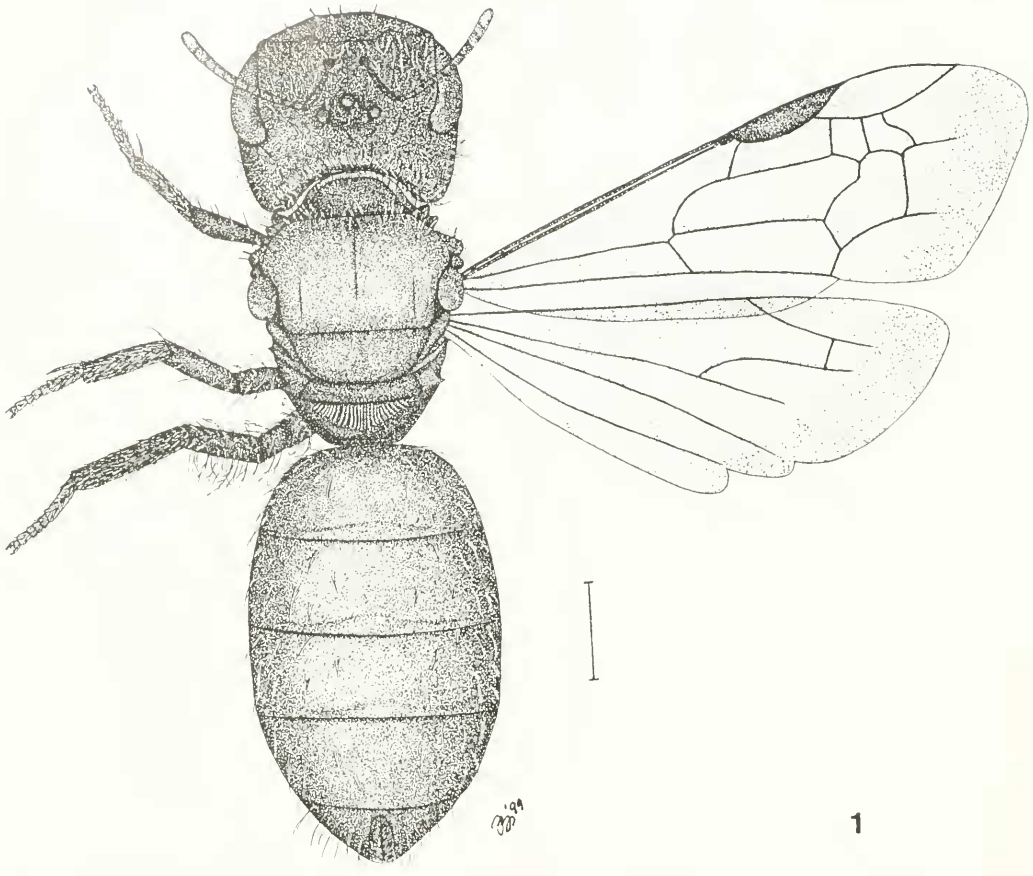


Fig. 1. *Halictus pinguismentus* Janjic and Packer, habitus, largest paratype female. Scale bar = 1mm.

(S.) confusus are badly needed and should be performed in conjunction with genetic studies (Rosenmeier and Packer 1993; Taylor and Packer 1997). The North American *Seladonia* species were keyed and briefly described by Sandhouse (1941) and the Central American species-pair *H. hesperus* and *H. lutescens* were treated in detail by Wille and Michener (1971).

MATERIALS AND METHODS

External morphology is described from pinned specimens. Genitalia from male *H. harmonius* and *H. lanei* and the labra of all castes/species were removed and treated in 5% potassium hydroxide before being stored in glycerine. Details of surface sculpture were observed with light reflected from the light source (a Schott KL 1500-Z fibre optic system) using a variety of white surfaces, this was found more convenient than using light transmitted through semi-opaque paper. Terminology generally follows that of Eickwort (1969), however, for the labrum we use the terminology of Walker (1995) and for surface sculpture characteristics we refer to McGinley (1986). Measurements were made using a Leica MS5 microscope with an ocular micrometer. When more than one individual was available to us we present measurements for the type followed by the range in brackets.

We often refer to lengths of particular structures or of pilosity with reference to the diameter of the median ocellus "od" of the same individual. The relative size and density of punctures are given in

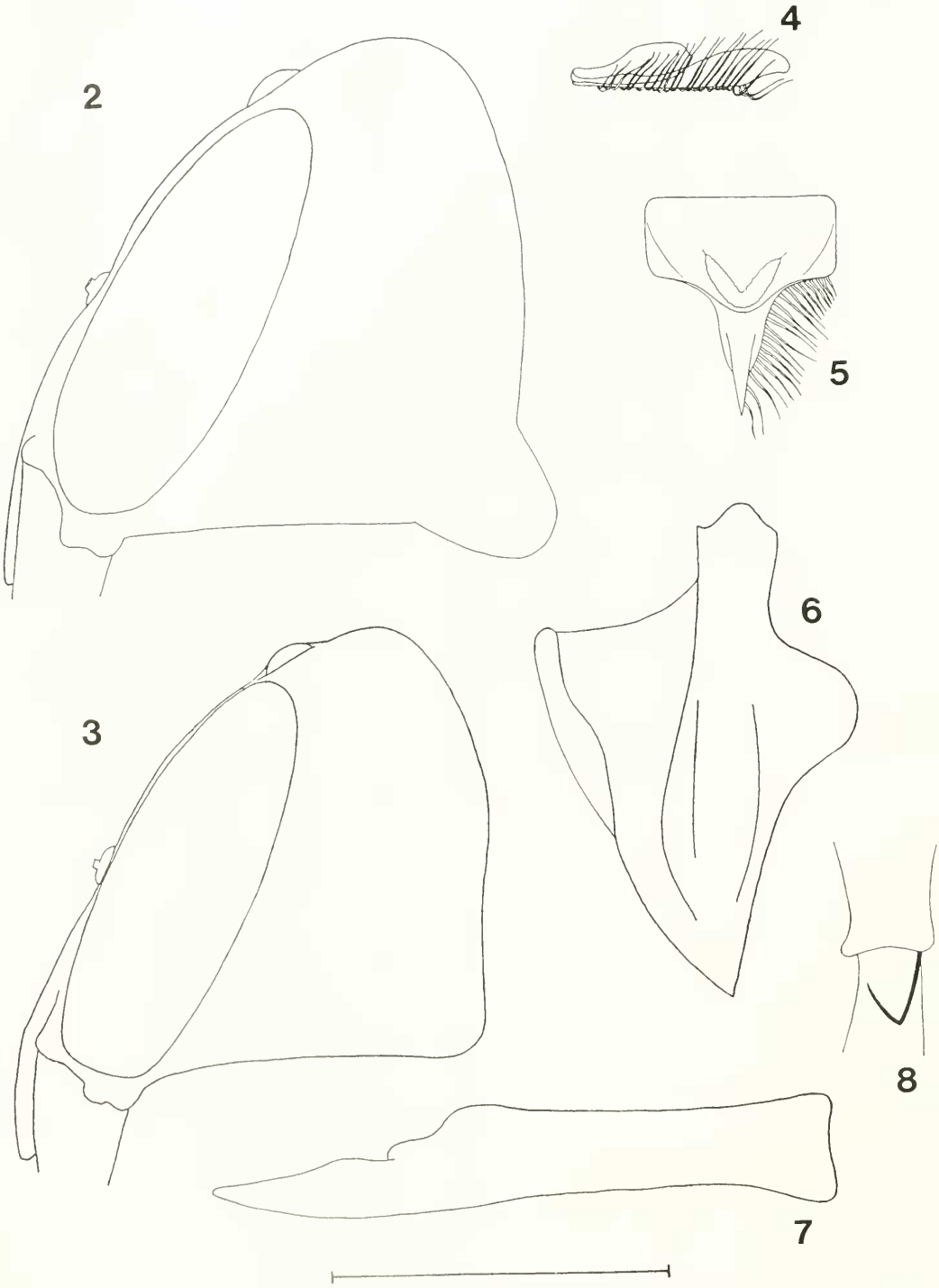
terms of the relationship between puncture diameter and the interspaces between them such as "i = 2d". Other acronyms used are as follows: for metasomal terga and sterna we us T and S respectively (as the first abdominal segment is the mesosomal propodeum this means that T3 represents the third metasomal tergum but the fourth abdominal tergum), A1 refers to the first annulus of the antenna (ie following the pedicel), UID and LID refer to the upper and lower interorbital distances respectively, IOD is the interocellar distance—the distance between the inner margins of the lateral ocelli and OOD is the ocell-ocular distance, the shortest distance between the outer margin of one lateral ocellus and the ipsilateral compound eye.

In the descriptions below, we concentrate on those features which vary among the New World species of *Seladonia* and do not repeat aspects which are constant, or almost so, among all 8 species. Character states which are diagnostic for a species are italicized.

Halictus (Seladonia) pinguismentus Janjic and Packer, new species

(Figs. 1–8)

Holotype female.—**Size:** Total body length 7mm (7–8.3mm), head width 2.1mm (2.1–2.4mm), forewing length 5.3mm (5.3–5.7mm). **Coloration:** Head brown with dark metallic blue reflections except for clypeus, supraclypeal area, and epistomal and hypostomal regions nonmetallic, red-brown; meosoma brown with dull metallic green reflections except disk of scutum with bronze-metallic reflections, scutellum and metanotum dark brown, and legs amber but with tibiae slightly darker; metasoma orange-brown with apical impressed areas translucent testaceous; general body surface quite shiny especially on lower face, disk of scutum and scutellum. **Pubescence:** Off-white, moderately long (1.5–2od), pale orange recumbent hairs 0.5 od long mixed with longer hairs on scutum. **Structure:** *Head* (Figs. 1–2): Slightly broader than long (1:0.9); round in anterior view but with vertex flat. Labrum (Figs. 4, 5) with basal box comparatively long, length to width 1:1.6, *apico-medially produced into an obtuse angle*; elevated median area U-shaped; distal process narrow, $^{2}/_{5}^{th}$ as wide at base as width of basal box, triangular; apical keel very broad basally, 0.7 times as wide at base as width of distal process at that point, gradually tapering to apex in dorsal view; keel flat on top, largely semicircular in profile, elongate beyond ventral margin of distal process for almost half of its length and with this produced portion weakly concave ventrally. Mandible (Fig. 7) long, reaching base of opposing mandible, *subapical tooth with dorsal margin concave, thus appearing unusually small at apex and expanded basally.* Clypeus wide, 3 times wider than long, evenly convex, punctures uniformly sparse (i ≥ 2od). Supraclypeal area with apical margin gently convex, punctures of two distinct sizes, apically sparser than on clypeus, basally more dense than on clypeus. Malar space extremely short, approximately as long as diameter of ommatidium of compound eye. Interocular area with punctures almost contiguous medially, less crowded (i = d) laterally and below antennal base. Frontal carina extending from just below antennal bases to less than half distance from its apex to the median ocellus. Eyes converging above, UOD: LID 1:0.9. Vertex flat and long, 2.5od, area between lateral ocelli slightly raised, IOD = 2od, area between lateral ocelli and compound eyes flat, OOD = 3.75od; punctures behind ocelli crowded, on rest of vertex less dense, i≤d. Gena long, gradually narrowing behind eyes in dorsal view, produced postero-ventrally to form right angle or produced as a rounded lobe; maximum width approximately twice maximum width of compound eye in lateral view, excluding lobe if present; punctures somewhat effaced in weak striae, striae becom-



Figs. 2–8. *Halictus pinguismentus*. 2–3. Head, side view. 2, Largest paratype female. 3, Holotype female. 4–5. Labrum. 4. Lateral view. 5, Dorsal view. 6, Pronotum, side view, holotype. 7, Mandible. 8, Femur/tibial junction to show basitibial plate, not to scale. Scale bar = 1 mm.

ing stronger ventrally. Hypostomal region longitudinally weakly and finely striate, concave as a result of the genal angle. *Mesosoma*: Pronotum (Figs. 1 and 6) with lateral angle strongly produced, carinate anteriorly, carina continuous with pronotal lateral ridge which is strong, acute and entire; *lateral angle concave behind carina in dorsal view* and then swollen; lateral surface with one or two additional weak dorso-ventral carinulae; dorsal ridge not carinate. Scutum wider than long (1.2:1); anterior margin evenly convex in dorsal view, overhanging pronotum medially; median line weak, half length of scutum; parapsidal lines weak, extending ⅔ length of scutum; punctation uniformly deep and density, i = 0.5–1d, moderate in size, becoming effaced along anterior margin of scutum. Scutellum ⅘ as long as scutum; punctures sparser (i ≥ 2d), shallower and smaller than on scutum. Metanotum half as long as scutellum; punctures fine, dense (i = d), becoming transversely effaced laterally. Mesepisternum dorso-ventrally striate, striations deep and coarse; hypoepimeral area with striations primarily longitudinal. Metepisternum with striae which are so deep and coarse as to appear more like ridges, primarily directed longitudinally. Propodeal dorsal surface intermediate in length between scutellum and metanotum; posterior surface carinate to ¾ height, sparsely and minutely punctate; dorsal surface with approximately 30 longitudinal striae; fine, moderately dense punctures at postero-lateral corners; lateral surface with dorso-ventrally directed, weak striae, these absent on anterior portion which has small, dense (i = d) but shallow punctures. Tegula orange-brown, shining; with very fine, shallow punctures anteriorly. *Wings:* Veins translucent amber and wing membrane hyaline as usual in *Seladonia*. *Legs:* Hindleg with basitibial plate elongate triangular, 2od in length, entire (anterior and posterior margins well defined) and acutely pointed (Fig. 8); inner hind tibial spur with 3 or 4 teeth (not including apex), the first longer than wide, the remainder shorter than basal width. *Metasoma:* T1 length to width ratio 0.7:1; length of apical impressed area 3od medially and 2od laterally; anterior surface shining, sparsely punctured (i ≥ 3d), without background microsculpture; becoming weakly, transversely microreticulate at brow with punctures minute and dense, especially laterally (i ≥ d); microreticulations absent on disk and punctures increasingly larger and denser (i = d) posteriorly, sparser on lateral swellings; apical impressed region with fine, irregular punctures. T2 minutely roughened anteriorly, disk with shallow, dense punctures (i = d), apical impression long, 4od, punctures as described for T1. Punctures increasingly small and effaced on successive terga, apical impressions of T3 and T4 long, 4od. Apical hair bands weakly developed, not extending ventrally.

Male.—Unknown.

Etymology:—The specific epithet literally means "fat chin", referring to the expanded genal region of this species, especially in larger specimens.

Specimens examined.—The holotype female is missing both antennae, the left mid leg beyond the coxa, and the left hind leg beyond the trochanter. The specimen appears to have become slightly worn and somewhat faded. In addition to the holotype, we designate three paratypes, two of which are significantly larger (see below). The holotype and one paratype are labeled "Guadeloupe Island, Pac. Ocean" (the other two paratypes are labeled "Guadeloupe Island P.O."), without date or name of collector. Each specimen bears a second reddish brown label that has "Ent. Soc." typed upon it and all four specimens were originally from the Philadelphia Academy of Sciences Collection where all but one are now housed (one remains in the Packer collection at York University). The two large paratypes have several marked differences from the two smaller individuals reminiscent of caste

differences found in some of the other New World *Seladonia* species. We describe the most important differences below.

Discussion.—Based upon the appearance of the specimens and the labels associated with them, they would appear to be quite ancient. The locality is an island off the west coast of Baja California. It is currently uninhabited, has been ecologically damaged by goats, and is difficult to access owing to steep cliffs on all sides.

The larger individuals have slight bronze reflections on the gena and scutellum. The gena is produced into a rounded lobe postero-ventrally (Fig. 2), this lobe is 2.5od long and 3od wide at its base and it renders the ventral margin of the gena concave. The pronotal lateral angle is even more strongly developed than in the holotype. Additionally, the larger bees have 4 teeth on the inner hind tibial spur, as opposed to the 3 in the holotype. One of the larger specimens has much of its surface covered in an amber coloured material which may be dried nectar, it also has much of the pubescence worn away although its wings are not nicked, suggesting that it was not an old individual but rather one that had been badly treated following capture. The other large paratype is in good condition, although it is missing apical tarsal segments of both hind legs and the left mid leg. The single small paratype has had its head and thorax partially crushed.

We have not been able to locate any additional specimens of this species. In fact, we have not been able to find any additional collections of bees from the type locality.

Halictus (Seladonia) harmonius Sandhouse
(Figs. 10–16)

Halictus (Halictus) harmonius Sandhouse 1941: 36, female (USNM).

Male.—**Size:** *Very small, total length 4–5mm, head width 1.05–1.2mm, forewing length 2.8–3mm.* **Coloration:** Head metallic bluish-green except for clypeus, antennae and hypostoma; clypeus dark brown with apical $\frac{1}{5}^{th}$ often yellow; antennae reddish-brown with scape and pedicel darker and anterior surface of flagellum slightly paler than remainder, anterior surface of first annulus yellowish; hypostoma brown; mesosoma metallic bluish-green except for reddish brown venter and legs; legs with narrow basal and apical bands on tibiae and stripe of varying width on outer surface of fore tibia, this and mid and hind tarsi pale brown. **Pubescence:** White, mostly of moderate length, approximately 1od; longer (1.5–2od) on face, gena, anterior of scutum, on scutellum and metanotum, laterally on T5, and apical half of T6; short (0.5od) scale-like pubescence on side of face, sparse on gena and on apical impressions of abdominal terga. **Structure** (Fig 14.): *Head:* As wide as long but appearing longer due to narrowing of clypeus and of vertex behind compound eyes. Labrum wider than long (2.6:1). Malar area very short, less than 0.2od. Clypeus 1.3 times as wide as long; apical ⅔ projecting below a lower tangent of compound eye; punctures shallow and sparse, i = 3d. Supraclypeal area with punctures deeper and denser than clypeus, i = 2d. Gena and vertex unmodified. Antenna long, reaching past base of metasoma; scape short, twice apical width and no longer than medial flagellar annuli; pedicel shorter than wide; A1 less than half length of succeeding annuli, length and width subequal; remaining annuli twice as long as wide or longer. *Mesosoma:* Pronotum with lateral ridge weakly carinate; pronotal angle obtuse; dorso-ventral carina undefined. Scutum length and width subequal; convex anteriorly, slightly overhanging pronotum medially; median furrow weak but faintly discernible for entire length of scutum; parapsidal lines distinct, extending anteriorly for ⅔ length of scutum; punctation deep, distinct and uniformly dense with interspaces approxi-

mately equal to puncture diameters. Scutellum slightly shorter than 1/2 scutal length; median line defined on anterior half; punctures uniform as on scutum. Metanotum half length of scutellum; raised medially; punctures dense to rugose medially, sparse but well defined laterally. Mesepisternum minutely roughened, punctures effaced. Metepisternum with uneven longitudinal striae. Propodeal dorsal surface intermediate in length between scutellum and metanotum, 2od long; rounded posteriorly in dorsal view; posterior carinae undefined; dorsal surface longitudinally ruguloso-striate, striations not reaching posterior margin and finely rugose apico-medially; posterior margin shining and devoid of sculpture; lateral and posterior surfaces with fine punctures i ≥ d laterally, sparser on shinier background posteriorly. *Wings:* Veins dark amber, membrane hyaline. *Metasoma:* Terga slightly sinuate in lateral view (especially for T2 and T3), weakly depressed apically then gently convex to short (1od) apical impressed areas. T1 length subequal to width; basal area impunctate and shining; punctures deep, fine and dense (i = 1–2d) elsewhere; punctures increasingly fine and sparse on succeeding terga, apical impressed areas impunctate and shining beneath hair bands. Sterna with short, dense pubescence. Apical margin of S4 broadly concave, with apically directed tuft of hairs on lateral ¼ of posterior margin, these hairs twice as long as elsewhere, hairs medial to these tufts laterally directed, short and dense. Apical margin of S5 almost straight, with marginal row of sparse, posteriorly directed hairs, increasing in length from centre to lateral margins of segment. S6 with faint medial, basal depression. *Terminalia* (Figs. 15, 16): S7 triangular with pointed apex. S8 rounded. Gonobase with dorso-median suture distinct; ventro-lateral margins converging posteriorly to very acute lateral projections, no medio-dorsal cleft to apical margin, dorsally convex in lateral view; gonocoxae elongate, sides subparallel with no marked concavities, strongly reflexed inner dorsal basal margin, lacking striation. *Gonostylus enormous, swollen, almost as long as gonocoxae, with ventral margin broadly rounded and becoming vertical apically, with apical lobe glabrous and quadrate both from above and in profile,* with medial semicircular concavity half way along length just ventral to inner setose lobe. Second gonostylus half as long as apical gonostylus, parallel sided.

Putative Queen.—**Size:** *Small, body length 4.3mm, head width 1.3mm, forewing 3mm.* **Coloration:** Head metallic green with bronze reflections; clypeus and epistomal region dark red-brown; gena and hypostomal area brown with greenish-bronze reflections; scutum and scutellum metallic green; metanotum dark brown with weak green reflections; pleura and propodeum metallic blue-green; area between fore and mid coxae orange-brown; legs brown, tibiae with pale basal spots; tegula amber; antennae brown, paler on anterior surface and at apex; metasoma brown; entire body except pleura, propodeum, and metasoma strongly shining owing to absence of microsculpture. **Pubescence:** Sparse, fine, and long (1.5–2od) on clypeus, anterolaterally on scutum, laterally on scutellum and metanotum, on pleura, dorsally on lateral surfaces of propodeum and laterally on metasomal terga, more abundant on T5 and covering T6; short (0.5od) and appressed near compound eyes on frons and gena, on pronotal angles, and metanotum; apical tergal hair bands weak and extending ventrally. **Structure:** *Head* (Fig. 12): quadrate, very slightly longer than wide 1.03:1, vertex slightly swollen behind compound eyes. Labrum (Fig. 10) with basal box twice as wide as long, apical margin convex; glandular area less than half width of basal box, not strongly protuberant, with basal portion lacking glandular openings medially to give whole area a flattened U-shape; distal process an equilateral triangle with 17 lateral setae,

somewhat sparser on apical half; apical keel long, extending ⅓ of its length beyond apical margin of distal process, slightly concave ventrally, rounded apically and somewhat unevenly convex dorsally in lateral view, dorsal surface narrow and flat. Clypeus weakly produced medially, lateral teeth obtuse; length to width 1:3.5; punctures small, shallow and unevenly sparse, i = 1–5d. Supraclypeal area weakly convex apically, punctures as on clypeus but somewhat more dense basally and laterally, i = 1–4d; epistomal lobe very obtuse with subantennal sutures gradually curving into fronto-clypeal suture. Eyes converging slightly above (UID: LID = 0.95:1). Malar space very short, 0.25od. Frons with punctures small, dense and well defined throughout, i = d, except sparser below antennae (i = 1.5–2d) and with impunctate area immediately above antennal bases; frontal suture short, extending from mid-level of toruli to less than half distance to median ocellus. Vertex slightly elongate, 2.5 od from lateral ocelli to posterior margin; IOD slightly less than 3od; OOD 3.5od; punctures effaced behind ocelli. Gena convex without angular projections, greatest width to eye width ratio slightly less than 2:1; punctures distinct immediately behind compound eye (i = d); effaced elsewhere, weakly microstriate ventrally; hypostoma broadly convex, without angles or projections. Mandible (Fig. 11) swollen basally with well defined subapical tooth. *Mesosoma:* Pronotum overhung by scutum medially; lateral angle obtuse, dorso-ventral ridge undefined; lateral carina weak to pronotal lobe, collar weakly wrinkled. Scutum longer than wide (1.17:1); anterior margin straight between pronotal angles; median suture broad, extending half length of scutum; parapsidial lines weak, extending to anterior ⅓ of scutum; punctures fine, moderately deep and uniformly dense (i = d), but slightly more dense laterad to parapsidial lines and effaced along anterior margin. Scutellum weakly impressed medially; punctation as on scutum. Metanotum half length of scutellum; punctures minute, dense (i = d) medially becoming sparser and effaced laterally. Mesepisternum with large, shallow, sparse (i = 2d) punctures partly effaced in roughened background. Metepisternum with antero-posteriorly oriented roughening. Propodeum with dorsal face as long as scutellum, posterior margin rounded; weakly and irregularly striate on dorsal surface except rugulose medially; lateral surfaces microreticulate, anteriorly with weak antero-posteriorly directed striae; posterior carinae not developed. *Legs:* Inner hind tibial spur with 3 teeth, the first longer than basal breadth, the other two broader than long. Basitibial plate entire, acutely pointed, narrow and long (1.7od). *Wings:* Veins pale honey coloured, costa and prestigma darker, membrane hyaline. *Mesosoma:* T1 length:width 1:1.7; apical impressed area 1od long; anterior half transversely microreticulate; apical half with small, weak, and slightly transversely effaced punctures of uniform density (i = d); apical impressions with exceedingly minute, sparse punctures. Punctation increasingly weak on succeeding terga. Apical impressed area of T2 1od, of T3 and T4 longer, almost 2od. Weak apical hair bands extending ventrally, that of T1 broadly interrupted medially, that of T2 narrowly so.

Specimens examined.—We have seen males from San Timoteo Canyon, Riverside Co., California and Yucaipa, San Ber-

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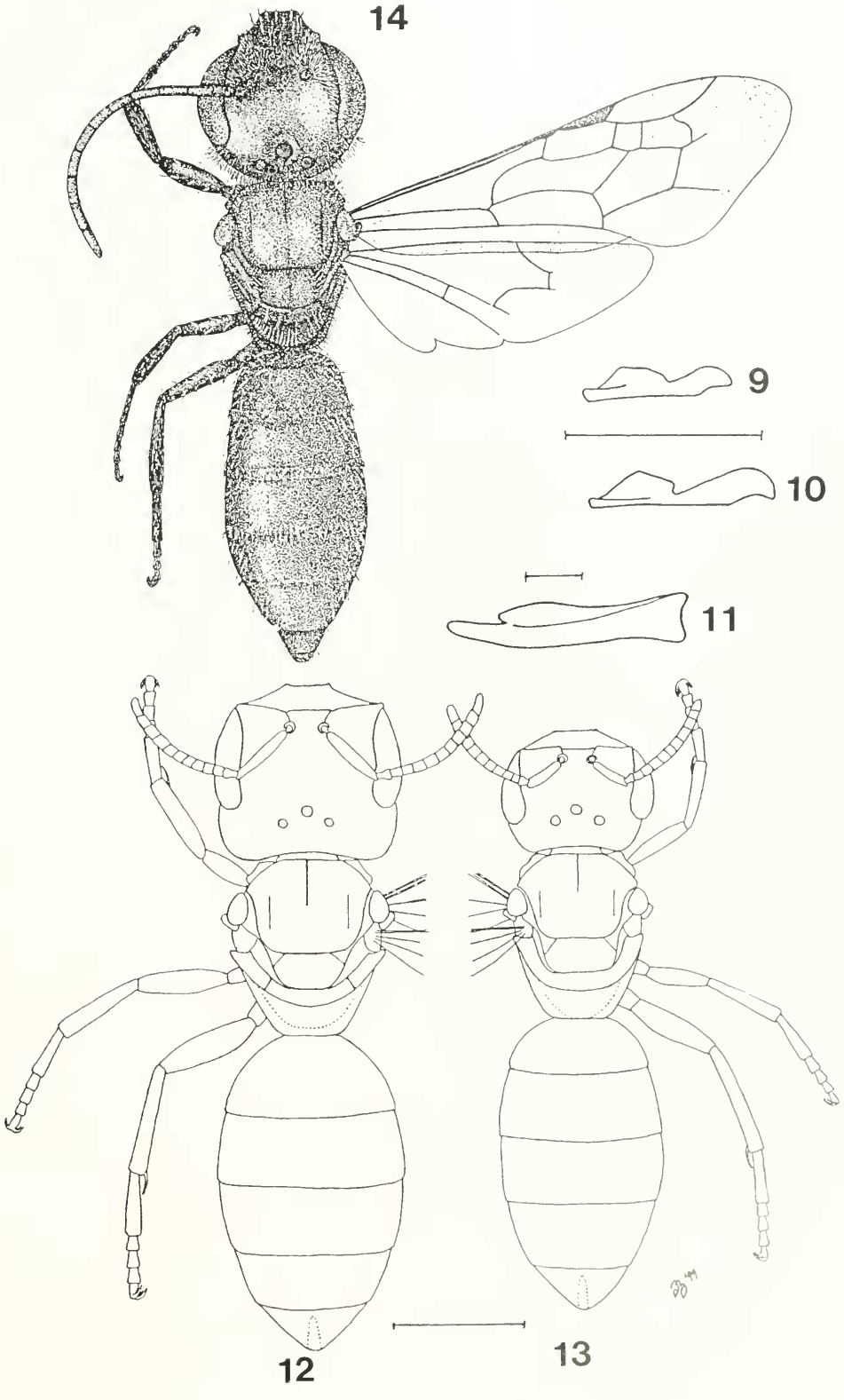
Figs. 9–14. *Halictus harmonius*. 9, Labrum, worker, side view. Lower scale bar, = 1 mm. 10, Labrum, putative queen, side view. 11, Mandible, queen. Scale bar = 0.1 mm. 12, Putative queen. Scale bar = 0.1 mm. 13, Worker. 14, Habitus, male. Lower scale bar, = 1 mm.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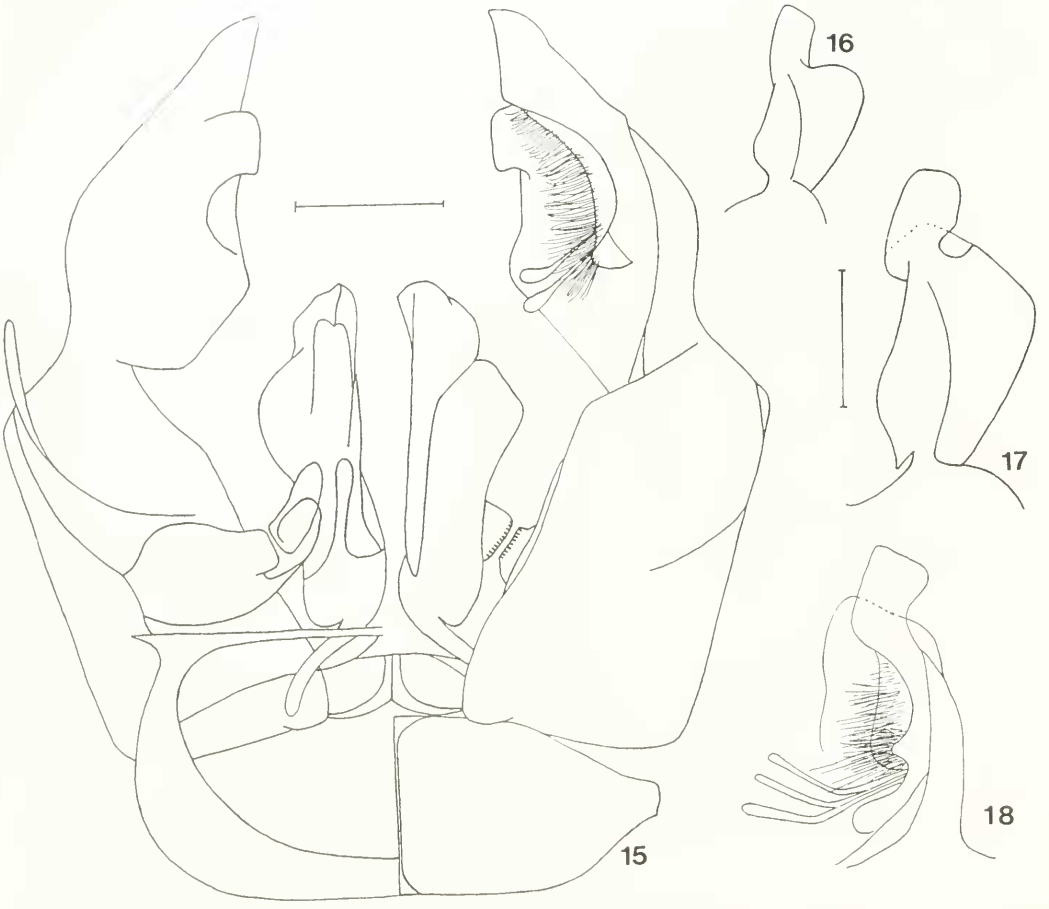


Figs. 15–18. *Halictus*, terminalia. 15–16. *Halictus harmonius*. 15, Genitalia, ventral view on left, dorsal on right. Scale bar = 0.1 mm. 16, Gonostylus, lateral view. 17–18. *Halictus tripartitus*. 17, Gonostylus, lateral view. 18, Gonostylus, ventral view. Scale bar = 0.25 mm.

nardino Co., California. The first specimen collected was found on August 12th, 1897 by H.A. Horn, and is deposited in the University of California, Riverside collection. Two additional males collected in the same canyon in 1974 were found in malaise traps run by M. Wasbauer and R. McMaster on Sept. 9th, these are in the Cornell University collection. The male from Yucaipa was collected by T. Griswold on June 9th 1975 and resides in the USDA collection at Logan, Utah. The queen specimen was collected at Wildwood Canyon, San Bernardino Co., California on May 22nd, 1977 by Terry Griswold who recognised the macrocephalic nature of the specimen and labeled it as such. It resides in the USDA bee lab, Logan, Utah.

Discussion.—Males of *H. harmonius* vary in the extent of pale colouration on the legs and clypeus. Some specimens have the clypeus entirely dark and some have almost the entire surface of the fore tibia pale in colour. All, however, have the mid and hind tibiae dark and concolorous with the corresponding femur.

Variation among the females would appear to result from features that probably relate to caste differences. The large putative queen specimen differs from the smaller workers that we have seen primarily in having a large, quadrate head

which is slightly longer than wide and eyes that are slightly divergent below (compare Figs. 12 and 13). In contrast, the worker head is slightly wider than long, more rounded and the eyes are slightly convergent below. The worker also has a more strongly produced clypeus; the widened lower portion of the face of the putative queen giving the clypeus a flatter aspect. The labra differ in that the queen has a longer and slightly differently shaped apical portion and a basal portion with a more abrupt apical margin than is found in the worker (compare Figs. 9 and 10 for worker and queen, respectively).

This species is most readily distinguished from other North American members of the subgenus by its extremely small size. Indeed, these bees are small even for *Lasioglossum (Dialictus)*, from which they can be readily distinguished by the usual *Halictus* characters of strong apical wing veins and apical bands of pubescence on the abdominal terga (contrast figures 143 with 145 and 146 with 147 in Michener et al., 1994). Based upon genitalic characters (see below), this species is most closely related to *H. tripartitus*, from which it is readily distinguished on the basis of size (the smallest *H. tripartitus* are fully 50% larger than the largest *H. harmonius*) and the greater density of punctation of head, mesosoma and metasoma in the larger species. Additionally, fresh females of *H. tripartitus* have very well developed snowy-white apical tergal bands of pubescence whereas those of *H. harmonius* are sparser and on T1 are very broadly interrupted.

The genitalia of male *H. harmonius* are very distinctive and differ markedly from all other New World *Seladonia* except *H. tripartitus* (compare Figs. 15 and 16 with 18 and 17, respectively). Both species have large, swollen, sinuate gonostyli with a medial semicircular concavity and a thick, glabrous, apical lobe instead of a narrow, setose process. These gonostylus characters are shared by no other *Halictus* species known to us. The two species differ in that *H. harmonius* has a proportionately much larger gonostylus—as long as the gonocoxae (Fig. 15), whereas this feature is only ⅔ as long as the gonocoxe in *H. tripartitus*. The shape of the apical lobe of the gonostylus also differs markedly between the species. In *H. harmonius* it is quadrate in profile (Fig. 16), whereas in *H. tripartitus* it is dorso-ventrally flattened (Fig. 17). The shape of the gonostylus just basal to the apical lobe is also different—in *H. harmonius* this area is angularly emarginate whereas in *H. tripartitus* there is a deep, sharp cleft that extends to the inner-basal margin of the lobe and the area basal to the lobe is expanded apically to form a short shelf beneath the apical lobe. The male of *H. tripartitus* also has paler legs and a head that is slightly wider than long, as opposed to round, and is not so markedly narrowed behind the compound eyes as in *H. harmonius*.

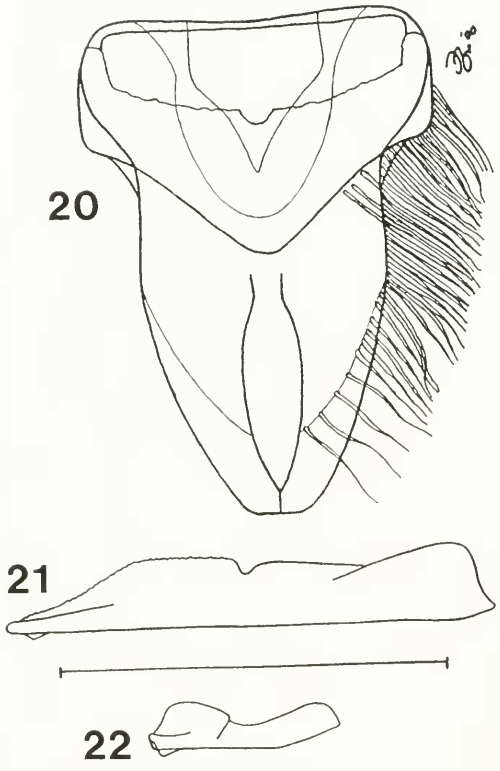
Halictus harmonius is a rare species having been found most often in the region around Yucaipa and the San Timoteo canyon in the San Bernardino/Riverside region of California. We have been unable to verify the records of this species listed in Krombein et al. (1979) from Colorado. We presume that their records were erroneous as this state was not included in the list of localities given by Moure and Hurd (1987).

Halictus (Seladonia) lanei (Moure)
(Figs 19–23, 26–29, 32–36)

Pachyceble lanei Moure 1940:55.
Halictus (Seladonia) lanei Michener 1954:38 (Moure Collection).

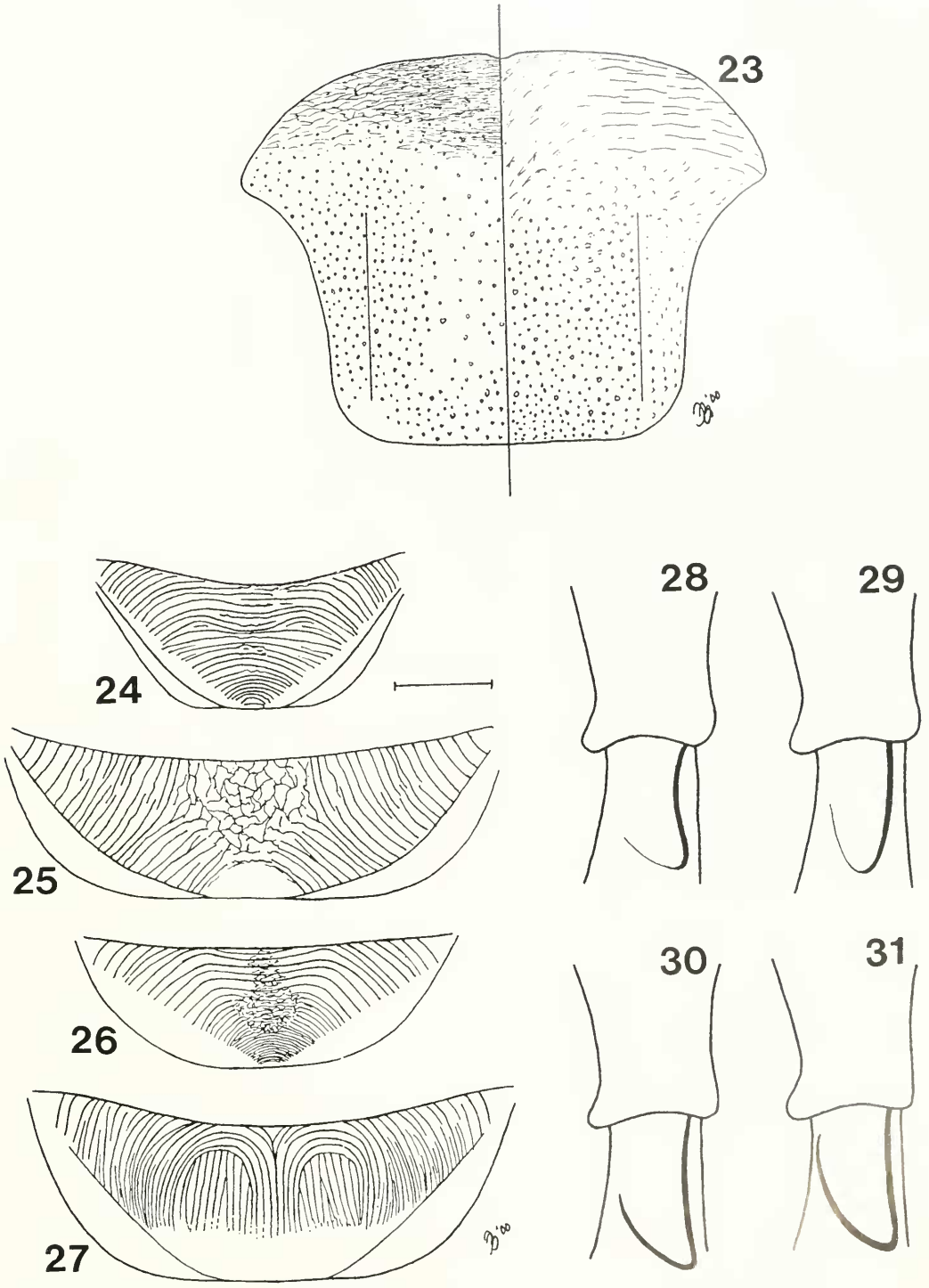
Queen.—Size: Total body length 9.5mm; head width 3.1mm, forewing length 6.8mm. **Coloration:** Head red-brown on clypeus, supraclypeal area, genae, and hypostomal area, with bronze-green metallic reflections elsewhere; malar area and apex of mandible black; antennae light brown. Scutum and scutellum dark brown with

Fig. 19. *Halictus lanei*, macrocephalic female head (center) with worker (lower left) to show size difference between castes.



Figs. 20–22. *Halictus lanei* labra. 20–21. Queen. 20, Dorsal view. 21, Lateral view. 22, Worker, lateral view. Scale bar = 1 mm.

bronze-green reflections anteriorly on scutum and medially and along lateral margins of scutellum; remainder of mesosoma greenish-blue metallic except legs light amber-brown. Metasomal terga light brown on T1–3, T4 and T5 almost black, with weak metallic green reflections throughout, though somewhat more strongly in more posterior segments. Entire head and dorsal surface of mesosoma very shiny, completely lacking in background microsculpture. **Pubescence:** Off-white except for short appressed pubescence on metasomal terga 3 to 5 and all pilosity on the legs which are golden; mostly 1 od in length and sparse, particularly on dorsum of mesosoma. **Structure:** *Head* (Fig. 19): *Massive, considerably wider than thorax, ratio of head width to intertegular distance 1.6:1*; shape quadrate, slightly wider than long. Labrum (Figs. 20, 21) with basal box only 1.5 times as wide as long, parallel sided, apical margin medially produced to give a pronounced V shape but with apex somewhat rounded; glandular area very weakly produced, U shaped, pores sparse; *distal process elongate, almost 1.5 times as long as basal width, laterally weakly convex, apex broadly rounded; marginal setae becoming widely separated in apical half where they arise from the dorsal surface of the labrum rather than the lateral margins*; median keel bisinuate, apical half with dorsal margin transversely concave, apical margin of keel concave; ventral surface of labrum completely flat. Mandibles enormous, reaching inner ventral margin of contralateral compound eye, narrowed and slightly outwardly curved beyond subapical tooth. Clypeus wide and short, length to width 1:4; very weakly convex,



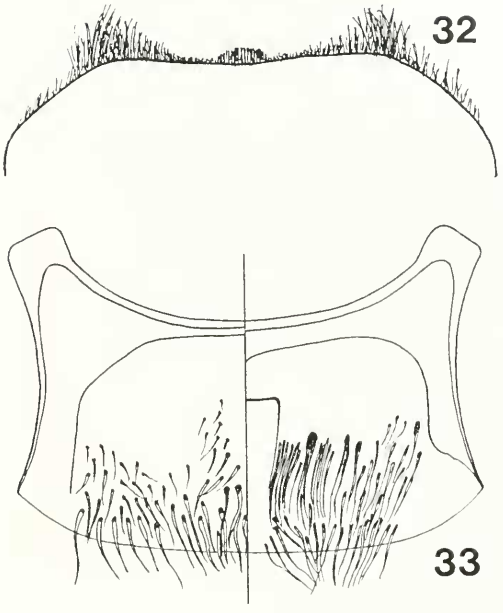
Figs. 23–31. *Halictus lanei* and *H. hesperus*. 23, Worker scutum showing punctation of *H. lanei* (left side) and *H. hesperus* (right side). 24–25. *H. hesperus*, propodea. 24, Worker, 25, queen. 26–27. *H. lanei*, propodea. 26, Worker, 27, queen. Scale bar = 0.3 mm. 28–29. *H. lanei*, basitibial plate. 28, Worker. 29, queen. 30–31. *H. hesperus*, basitibial plate. 30, Worker, 31, queen. Basitibial plates not to scale.

with blunt median tubercle, slightly depressed lateral to the tubercle, lateral clypeal teeth very short and obtuse; dorsal margin for the outermost quarter on each side completely straight and slightly oriented anteriorly, epistomal angle obtuse; punctures large and shallow with i = d. Supraclypeal area triangular, apical width twice its length, very weakly convex; sparsely punctured i = 2d. Compound eyes convergent above, UOD: LID 7:8; unusually small in comparison to reminder of head, length only 0.6 that of head. *Frontal carina very short, extending from level with ventral margin of antennal socket to just above them.* Punctures small and moderately dense, most dense (i ≥ d) around ocelli, becoming larger and sparser both anteriorly and posteriorly, particularly sparse on vertex (i = 3d). Vertex swollen, such that head slightly wider at some distance behind compound eyes than across them; *very long such that distance between lateral ocellus and posterior margin of vertex = 6od* (Fig. 19); OOD 4od, IOD 2.5od; ocelli situated in shallow depressions. Gena postero-ventrally greatly elongate, almost twice as long as greatest width of compound eye, giving head a triangular appearance in lateral view. Hypostoma broad and flat, without teeth or other protuberances; hypostomal carina strong, particularly posteriorly. *Mesosoma:* Pronotum with *lateral angles quadrate, strongly produced beyond scutum both anteriorly and dorsally*, carinate anteriorly, carina continuous with strong pronotal lateral ridge; no carina on dorsal ridge; lateral surface with strong dorso-ventral striae. Scutum wider than long, ratio 6:5; *median furrow deep such that anterior margin of scutum is biconvex*, extending half length of scutum; parapsidal lines distinct, extending from near posterior margin to anterior ⅖ths of scutum; punctures shallow, small, and sparse, i = 1.5d, except near antero-lateral corners where i = d. Scutellum 2.5 times as wide as long, ⅗ths as long as scutum, very flat; punctures as on scutum but denser around margins. Metanotum half as long as scutellum, uniformly, densely, and minutely punctured. Mesepisternum dorsoventrally striate on lateral and anterior surfaces, striae continuing transversely on ventral surface, posterior margin lacking striae, with a few weak punctures, this non-striate region is longer ventrally. Metepisternum dorsoventrally striate as in mesepisternum. Propodeum with dorsal surface two-thirds as long as scutellum, with approximately 40 fine, longitudinal striae which are *strongly curved to give an almost fingerprint-like pattern* (Fig. 27); striae do not reach apical margin of dorsal surface medially, space between striae and apical margin completely devoid of sculpture and very shiny; lateral surface microreticulate with sparse, minute punctures. *Wings:* veins amber except for costa, which is darker brown, membrane hyaline. *Legs: Basitibial plate of hind leg with anterior margin only well defined at the apex, posterior margin well defined*, apex pointed (Fig. 29); hind tibial spur with four teeth, the first twice as long as broad, the second as long as broad, the third and fourth successively shorter. *Metasoma:* Anterior of T1 microreticulate with small, weak, widely spaced punctures (i > 3d); disk with very small, dense punctures, i = d; apical impressed region weakly differentiated from remainder of tergum, 2od in length, similarly punctured as on disk; punctures on remaining gastral terga minute and somewhat sparser than on T1; apical impressed areas poorly differentiated; apical hair bands extremely weak, not extending ventrally.

Worker.—**Size:** Body length 5.8–6.5mm, head width 1.6–1.8mm, wing length 4.5–5mm. **Coloration:** Metallic green throughout except for apical ⅓ of clypeus dark brown; mandible amber with red-brown apical 1/3 and dark brown basal spot; antennae pale brown; femur and posterior surface of fore and sometimes mid-tibia brown, remainder of tibiae and tarsi amber; mesosomal venter brown, apical im-

pressions of terga translucent. **Pubescence:** Hairs white, slightly off-white on pleura and abdomen; mostly 1od long. **Structure:** *Head:* Slightly wider than long, rounded. Labrum (Fig. 22) with basal box twice as wide as long, anterior margin convex; glandular area strongly produced, medially divided almost completely by non-glandular depression to give it a biconvex shape in apical view; distal process longer than basal width, laterally gently bisinuate, convex apically; with approximately 27 lateral setae; apical keel projecting for ⅕ its length beyond apex of distal process, flat ventrally, convex dorsally, subtruncate apically; narrowed to sharp dorsal margin. Mandible extending only slightly beyond opposing clypeal tooth; with blunt subapical tooth. Clypeus length to width 1:2.5; evenly and quite strongly convex; punctures weak, highly variable in size, anteriorly open and uneven in density with i ≃ d apically and basally, i = 2–3d on disk. Supraclypeal area with anterior margin only slightly convex, almost straight; punctures as on clypeus but more clearly bimodal in size, with larger ones more numerous. Frontal suture extending from below antennal sockets to half the distance to median ocellus. Inner eye margins subparallel UID ≃ LID. Frons with punctures larger, shallower, partly effaced and sparse (i = 1.5d) lower on face to smaller, deeper, entire, and denser (i = d) below ocelli. Vertex with IOD = 2od, OOD = 2od and distance from lateral ocelli to posterior margin of vertex 2od; punctures becoming increasingly sparse, small and effaced posteriorly. Gena with greatest width barely any greater than that of compound eye (1.1:1); without processes or angulation; punctures weak and effaced. Hypostoma flat without processes. *Mesosoma:* Pronotal lateral angle obtuse, lateral ridge weak, no stronger than the few, more posterior dorso-ventral carinae. Scutum slightly wider than long (1.1:1); straight between pronotal angles; slightly overhanging pronotum medially; *punctures small, shallow, slightly effaced transversely and sparse (i = 1.5–4d),* somewhat more dense and even laterad of parapsidal lines (Fig. 23). Medial suture extending half length of scutum, deeply impressed anteriorly; parapsidal lines extending from posterior ¼ of scutum to anterior ⅓; ending in small pits both anteriorly and posteriorly. Scutellum medially unimpressed; punctures as on scutellum, but more uneven in size and density. Metanotum half length of scutellum; impressed medially; punctures effaced, surface shiny. Propodeum with dorsal surface intermediate in length between scutellum and metanotum; with striae transverse medially on basal half, arcuate, open posteriorly on posterior half, transverse laterally; in its entirety area appears like a broad fingerprint (Fig. 24); lateral surface with weak, effaced punctures in minute dorso-ventral roughening. Mesepimeron with weak, effaced punctures, background weakly dorso-ventrally microstriate; hypoepimeral area with weak, broad striae directed antero-dorsal to postero-ventrally. Metepisternum with coarse antero-dorsal-postero-ventrally directed weak, irregular striae. *Wings:* Veins pale straw in colour, membrane hyaline. *Legs: Basitibial plate of hind leg with anterior margin weakly defined at apex only, posterior margin well defined and sinuate* (Fig. 28). Inner hind tibial spur with 3 broadly rounded teeth, first much larger than others. *Metasoma:* T1 longer than broad (1.2:1); apical impressed area much wider medially (3od) than laterally (1od); background sculpture transversely microreticulate with small, weak punctures (i ≤ 1.5d) in anterior half, punctures becoming stronger and background sculpture weaker in apical half; apical impression minutely and sparsely punctured. T2 with punctures slightly larger and deeper than T1, without microsculpture. T3 with punctures more effaced, even more so on T4 and T5. Apical impressed areas on T2–5 2od in length.

Male.—**Size:** Total body length 7mm, maximal head width 1.5mm, forewing length 4.7mm. **Coloration:** Head metallic bluish green with slight bronze reflection medially, except clypeus which is brown with bluish green reflection basally, paling to yellowish amber non-metallic on apical ⅓. Scape and pedicel brown, flagellum pale brown dorsally, dark amber ventrally, first annulus amber throughout. Pronotum and mesosomal venter brown with metallic bluish green reflection; mesosomal pleura and terga metallic green; propodeum metallic bluish green. Legs amber with fore and hind coxae pale brown. Metasomal terga metallic golden green, more weakly so on apically impressed areas. Sterna dark testaceous. **Pubescence:** White to cream coloured, mostly long (1.5–2o.d.) on face, gena, hypostoma, scutum, scutellum, metanotum, and mesosomal pleura. Shorter (1 o.d.) on vertex, even shorter (¾ o.d.) on anterior interocular area, intermixed with long, fine, and golden hairs on metasomal terga, and creamy white with pronounced branching on posterior propodeum, and laterally and anteriorly on metasoma. Very short (½ o.d.), broadly plumose, and appressed on supraclypeal area, clypeus, dorsal surface of collar and of posterior lobe of pronotum, lateral and posterior margins of scutum, metanotal anterior margin, and on apical impressed areas of metasomal terga in worn or incomplete bands. **Structure:** *Head:* as wide as long, but appearing longer owing to narrowing at level of clypeus. Labrum not visible in undissected specimen. Malar area short, approx. 0.5 o.d. Clypeal width subequal to length; apical 2/3 projecting below lower tangent of eye margins; punctures large, shallow, and dense (d>i), apically effaced. Supraclypeal area with smaller punctures apically and much smaller between toruli, d>i. Intraocular punctures small, and longitudinally effaced between torulus and compound eye; small, deep, distinct, and crowded (d>2i) on frons; slightly larger on vertex, effaced and more widely spaced posteriorly on vertex. Gena and vertex unmodified. Antenna reaching posterior margin of scutellum; scape 3 times as long as apical width; pedicel shorter than wide; A1 shorter than wide, all remaining flagellar annuli twice as long as wide. *Mesosoma:* Pronotum with lateral ridge weakly angulate; pronotal angle wide but distinct; collar chagrined. Scutum length ¾ width; slightly produced anteriorly between pronotal lateral angles, otherwise flat anterior margin; not overhanging pronotum; median furrow distinct, extending half length of scutum; parapsidal lines weak, extending to anterior ⅓; punctures moderate in size and deep, d≥i, weaker and slightly effaced anteriorly, slightly sparser (d = i) posteriorly. Scutellum slightly less than half as long as scutum; punctures small anteriorly, d = 2i; becoming denser, larger, and irregular posteriorly, where d≈i; most dense on postero-lateral corners and posterior margin. Metanotum less than ½ length of scutellum; very narrow medial longitudinal area marked by very small contiguous and deep punctures; lateral to this punctures small, d = i; extreme lateral margin with punctures larger and effaced into rugae. Mesepisternum rugose to weakly dorso-ventrally striate anteriorly; hypoepimeron rugose. Metepisternum rugosostriate in antero-posterior direction. Propodeum length subequal to scutellum; arcuate striate with arcs open posteriorly, striae confused medially, giving them impression of rugae; smooth at postero-lateral margins; laterally rugose; posterior face with small punctures d>i; lateral carinae extending nearly half height. *Wings:* Veins, prestigma, and stigma pale honey coloured, costa brown, membrane hyaline. *Metasoma:* Terga with apical impressed areas up to 1o.d. long medially and 0.5 o.d. laterally, most distinctly marked on T1, and weaker and shorter on subsequent terga to imperceptible as an impression on T5; dorsal surface not sinuate in profile. T1 60% long as wide; lateral swellings dis-

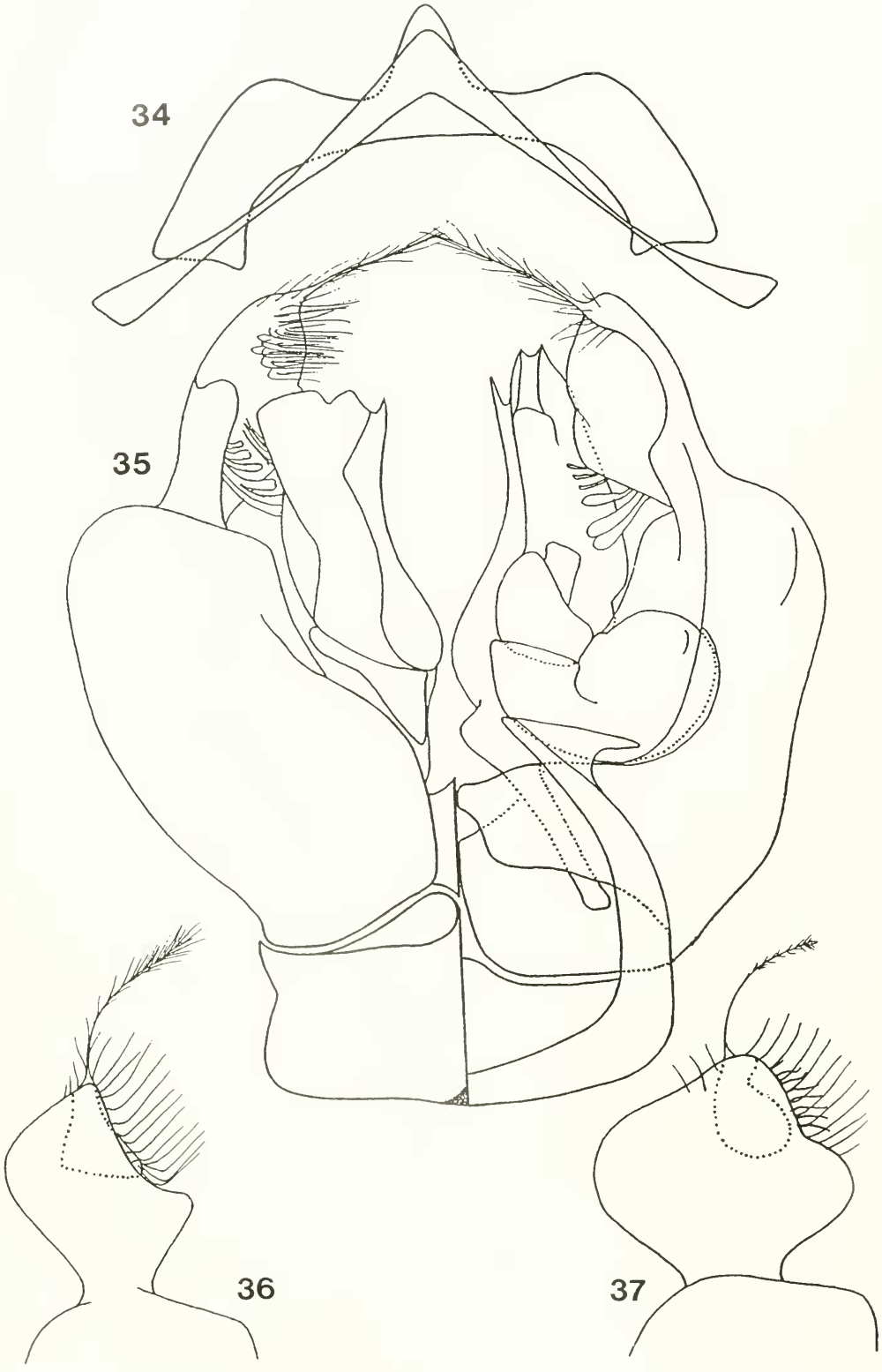


Figs. 32–33. *Halictus* sterna. 32, *H. lanei*, sternum 5, apical view. 33, Sternum 6, ventral, *H. hesperus* (right), *H. lanei* (left).

tinct; area anterior to brow transversely microrugulostriate, brow with shining background and small punctures (d<i); punctures on disc dense, d>2i, sparser across lateral swellings; punctures on impressed area smaller and very dense (d>i). Punctures small, d = i, becoming increasingly more effaced on subsequent terga; apical impressed areas of subsequent terga with punctures as on discs, slightly smaller and sparser on T5 and T6. S4 weakly concave apically. *S5 with a short medio-apical tuft of fine erect hair*, ¾ o.d. long and wide, hairs ⅜ o.d. long (Fig. 32). S6 with wide medial longitudinal impunctate, glabrous, depressed area bordered by long hairs (Fig. 33). *Terminalia:* S7 triangular with pointed apex. *S8 with triangular medial projection on rounded stepped base* (Fig. 34). Gonobase long, *concave laterally;* median suture distinct only basally; small medio-dorsal cleft in apical margin; anterior ventral margin obtusely angled (Fig. 35); ventro-lateral arms converging apically, though not touching. Gonocoxae with latero-basal concavity; ventral bridge very deep, basal margin deeply and abruptyl concave; lacking dorsal striations. Gonostylus with body approximately half length of gonocoxe; rectangular in lateral view with basal width slightly shorter than apical width and *with dorsobasal margin produced;* apical inner surface bearing numerous hairs; inner margin bearing 6 thick and apically swollen hairs directed mesad; *anteriorly directed portion of recurved apical projection narrowed to a blunt point;* apical stylus long, ¾ length of gonostylus body, narrow, recurved dorsally, and bearing long branched hairs. Second gonostylus absent. Penis valve with tips dorsoventrally flattened, bluntly pointed, and apically slightly recurved dorsad; penis valve ventro-basal projection long and narrow.

Specimens examined.—We have observed workers from Conceicao do Araguaia, Para, Brazil, collected in July, and from Lara, Venezuela, collected in June, and from Merida, Venezuela, no date from the Cornell University collection. The single male was found in a collection at the Carnegie Museum of Natural History, bearing the label: Boqeirao, Rio Grande, Brazil, collected on January 8, 1908, also labeled Carn. Mus. Acc. 3533 along with a series of 9 females labeled Barra Bahia, Brazil, Dec. 6 1907, Carn. Mus. Acc. 3533.

The large female specimen described here has been identified by Padre Moure as belonging to *Pachyceble lanei*, the name by which this species was known prior to its recognition as a member of the genus *Halictus* by Michener (1954). It bears no locality label and is in the Cornell University collection. Our specimen is larger and hence somewhat more macrocephalic than the type, photographs of which were kindly sent to us by Dr. Danuncia Urban of Curitiba. More interestingly, our specimen has the striations of the propodeal enclosure partly longitudinal, much more so than the type specimen or the workers, in which they are primarily transverse. While it is not impossible that this single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specimen represents a species distinct from *H. lanei* we take the more conservative position and ascribe the variation in propodeal sculpture to allometric variation. In support of this conclusion is the observation that queens of the closely related *H. hesperus* also have most of their propodeal striae longitudinal whereas those of the workers are transverse (compare Figs. 24 and 25 for worker and queen, respectively).

Discussion.—Only two other *Seladonia* species come close to the geographic range of *H. lanei: H. hesperus*, and *H. lutescens*. Females of the latter are readily separable from those of the other two species because of their largely orange metasoma, dense punctation on the scutum with i<d and their entirely rugulose dorsal propodeal surface. Both queens and workers of *H. lanei* are distinguishable from those of *H. hesperus* by the incomplete basitibial plate of the hind leg (Figs. 28–31). In *H. hesperus* the basitibial plate is entire whereas in *H. lanei* it is absent anteriorly except at the extreme apex. This reduced anterior margin of the plate is also shared by both large and small females of *H. lutescens*. Furthermore, queens of *H. hesperus* have an angle on the hypostomal carina rather than on the gena (Brooks and Roubik, 1983), the latter being evenly convex in both *H. hesperus* and *H. lutescens*, but markedly produced in large specimens of *H. lanei* as noted above.

Differentiating between the workers of *H. hesperus* and *H. lanei* is more problematic. Other than the basitibial plate character mentioned above, the most readily detectable difference appears to be in the nature of the scutal punctation (Fig. 22). In *H. hesperus* the punctures are shallow and largely effaced in an approximately triangular area between the central point of the scutum and its antero-lateral corners. Elsewhere they are better defined, separated by interspaces that approximate their own diameters and quite variable in size with some comparatively large and shallow punctures among the rest. In contrast, the scutal punctures of *H. lanei* are partly effaced throughout the scutum, nowhere are they as strongly effaced as in the anterior region of the scutum of *H. hesperus* but they are more uniformly so. The punctures of *H. lanei* workers are also more widely spaced, with i ≥ 1.5od.

Most of the interesting aspects of the morphology of the large specimen—the labrum (Figs. 20, 21), the extreme length of the mandibles (Fig. 19), enormous swollen head, very long gena, and the enlarged pronotal angles—are attributable to extreme caste dimorphism. Indeed, with a head width of 3.1mm, this queen-like individual is twice as large as the smallest worker we have available for study (Fig. 19). Translating these linear measurements into mass, it is possible that this queen weighs 8 times as much as the smaller workers. Halictines take approximately 8 foraging trips to produce a pollen ball that yields an individual of the same size as the forager. It is known for *H. hesperus* that the workers produced by the queens are smaller than the later emerging workers (Packer, 1985). This leads to the intriguing possibility that queens of this species can produce a worker from a single foraging trip.

The male *H. lanei* is easily distinguished from *H. lutescens* and *H. hesperus*, and in fact all other *Seladonia*, by the unique genitalic and sternal characters, though again,

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Figs. 34–37. *Halictus* terminalia. 34–36. *H. lanei*. 34, Sterna 7 and 8. 35, Genital capsule, dorsal view (left), ventral (right). Dorsal and ventral views shown at angles optimizing view of relevant structures, not symmetrical. 36. Gonostylus, lateral view. 37. *H. (S.) hesperus*, gonostylus, lateral view. Hairs and portions of hairs behind other structures not drawn.

only *H. hesperus* has a geographic range approaching that of *H. lanei*. In addition to the unique features of *H. lanei*, males of the two species can be distinguished by the following characters: *H. hesperus* has the anterior punctures on the scutum stronger and more effaced than *H. lanei*, with the scutum also more swollen anteriorly on either side of the median suture such that it appears biconvex and the punctures of the scutum and scutellum are more dense in *H. hesperus* than *H. lanei*. *Halictus hesperus* has darker legs, especially the coxae and trochanters, which are all brown in this species. S6 of *H. hesperus* has a shallow, ill-defined, impressed, glabrous area which does not reach the apex of the sternum and is separated from the apex by a region which is hirsute like the lateral areas. Conversely, in *H. lanei* the impression on S6 is deep, with a well defined, transverse anterior margin, and it reaches the apex of the sternum (Fig. 33). The genitalia also differ between the two species. In dorsal view, the gonobase of *H. lanei* is ¾ as long as it is wide, whereas in *hesperus*, it is less than ⅗ as long as wide, and is much more rounded; the gonostylus of *H. hesperus* is more quadrate, with a less pronounced dorso-basal projection and has a stronger swelling ventrally; this species also has denser hair on the dorsally recurved part of the gonostylus (compare Figs. 36 and 37); and the medially directed apico-dorsal projection of the penis valve is more pronounced in *H. hesperus* than in *H. lanei*.

The hair patch on the fifth sternum of the male is reminiscent of a similar feature in many species of the subgenus *Vestitohalictus*. However, in *Vestitohalictus* the hair tuft is most commonly found on the fourth sternum (Michener, 1978), although in some species, such as *H. (V.) concinnus* it is repeated on the fifth sternum (Packer, unpublished data). Owing to the presumed phylogenetic position of these subgenera and species, it is unlikely that this hair tuft is homologous between the two subgenera.

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