

## A Revision of the Genus *Hambletonia* Compere (Hymenoptera: Encyrtidae)

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**Abstract.**—The encyrtid genus *Hambletonia* is redescribed. Eight new species, *H. calvifrons*, n. sp. (Costa Rica), *H. marticephala*, n. sp. (USA: Florida, Georgia), *H. pilosifrons*, n. sp., *H. punctifrons*, n. sp. (Costa Rica), *H. roseni*, n. sp. (Panama, Costa Rica), *H. setosifrons*, n. sp., *H. squalicephala*, n. sp., and *H. undulitibiae*, n. sp. (Costa Rica) are described. A key to species is provided.

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The genus *Hambletonia* was originally described by Compere (1936) for a single species, *H. pseudococcina* Compere. It remained monotypic until the present study, inspired by the discovery in Florida and Georgia (USA) of a very peculiar encyrtid bearing a large protrusion on the frontovortex between the compound eyes, a feature not found in any other representative of the family. After analyzing its characters and consulting with Dr. J.S. Noyes (The Natural History Museum, London), we came to the conclusion that this encyrtid constitutes an aberrant new species of *Hambletonia*. Study of specimens received on loan from various institutions revealed seven more undescribed species, bringing a total number of species currently included in the genus to nine. The present article reviews the concept of *Hambletonia* based on the new material, and includes descriptions of eight new species and a key to species.

### MATERIALS AND METHODS

Specimens originally collected in alcohol were critical-point-dried (CPD), or prepared using hexamethyldisilazane (HMDS), a technique used as a chemical alternative to CPD (Brown, 1993; Heraty, personal communication and Internet

posting). Balsam mounted microscope slides were prepared following the method described by Noyes (1982), with slight modifications. Measurements were made from dry mounted specimens and from microslides using a stereomicroscope equipped with a filar ocular micrometer. All measurements (except body length) are given in units of the micrometer (1 unit = 0.01 mm). They are all comparable to each other, and can be translated into millimeters by multiplying the number of units by 0.01. Terminology follows Sharkov (1996), except "pygostyli" are called "cerci." All illustrations are original line drawings prepared by Sharkov from card mounted and pointed specimens, and microslides using a camera lucida on a compound microscope. Abbreviations for depositories of type materials and institutions that provided loans of specimens are as follows: AMNH (American Museum of Natural History, New York, NY, USA), BMNH (The Natural History Museum, London, UK), INBio (Instituto Nacional de Biodiversidad, San José, Costa Rica), OSUC (Ohio State University, Columbus, OH, USA), TAMU (Texas A & M University, College Station, TX, USA), UCDC (University of California, Davis, CA, USA), UCRC (University of California,



Riverside, CA, USA), USNM (National Museum of Natural History, Smithsonian Institution, Washington, D.C., USA).

### HAMBLETONIA Compere

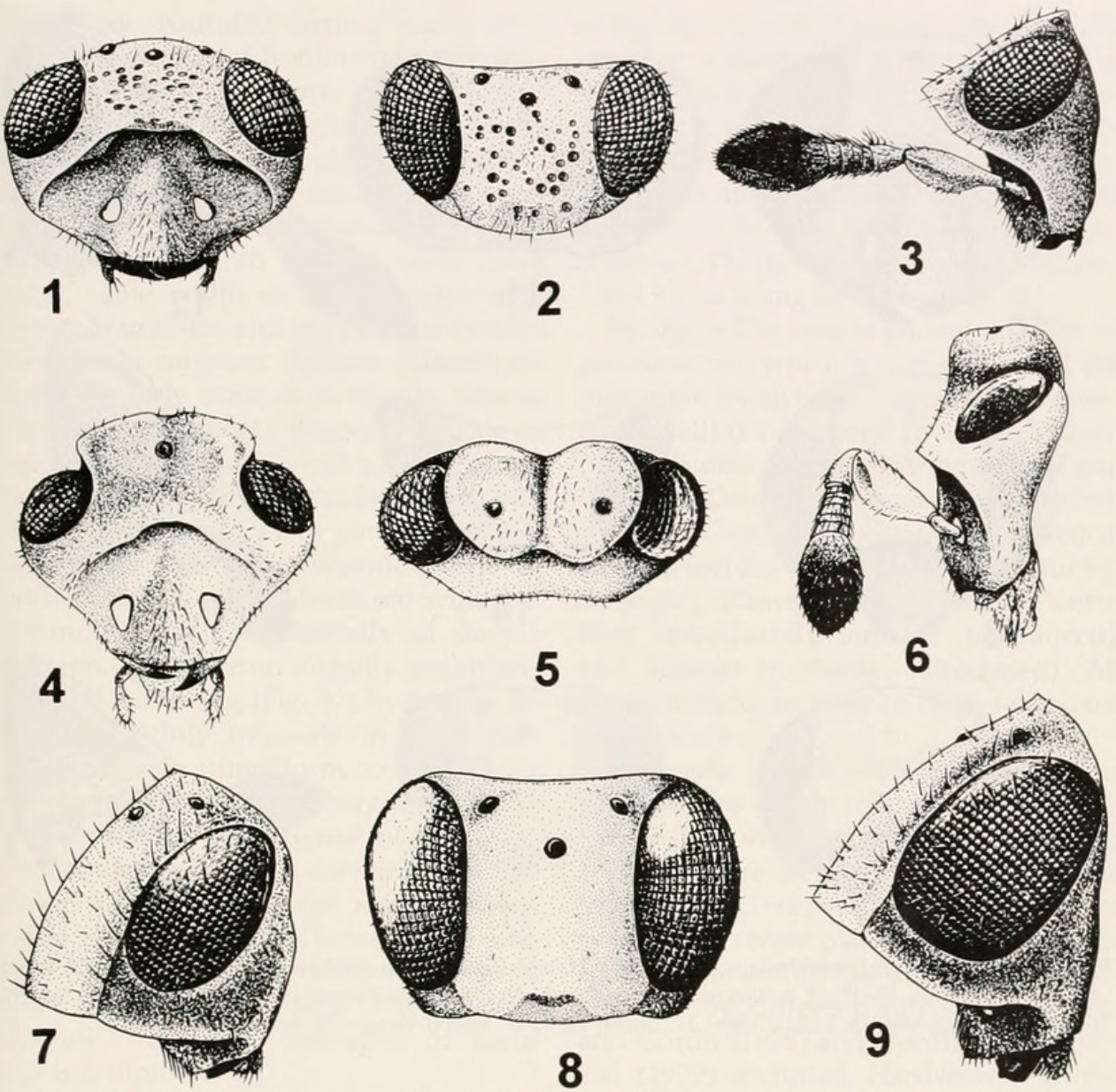
*Hambletonia* Compere, 1936:172–173. Type species: *H. pseudococcina* Compere, by original designation.

The original description of *Hambletonia* (Compere 1936) was based on a single species, *H. pseudococcina* Compere. Therefore, many of the characters Compere had thought to be of generic value (such as the shape of the head and the relative size of the head structures, the ability to retract the antennae in the facial depression, the shape of the scape, the number of funicular segments, the presence of "coarse, flattened setae on the dorsal margin at apex" of the pedicel, and the "very narrowly separated at inner tips" axillae), following discovery and study of new species, turned out to be of only specific value. We redescribe the genus based on all material available to us. Unique features of *H. marticephala* n. sp. are stated separately in the *Comments* section.

**Female.**—General body color from yellow to orange yellow or orange brown, sometimes brown or dark brown. Frontoververtex sometimes with very slight purple, greenish or bluish metallic luster that can be seen only at certain illumination. Forewing slightly to moderately infusate, especially in basal part. Body length 1.0–2.5 mm. **Head** (Figs. 1–18) hypognathous, length  $0.5\text{--}0.63\times$  width,  $0.65\text{--}0.8\times$  height, in lateral view more or less triangular, line outlining frontoververtex straight to moderately convex, at angle of about  $30^\circ$  to  $60^\circ$  to longitudinal axis of body (when posterior margin of gena is vertical) (Figs. 3, 12, 15, 18). Frontoververtex convex to almost flat, smooth, often with scattered (sometimes, numerous) non-piliferous punctures, naked or with scattered hairs, and one row of hairs along each inner eye orbit, length

$1.1\text{--}1.6\times$  width, width  $0.4\text{--}0.6\times$  width of head, anterior margin (dorsal view) convex to straight or concave (Figs. 2, 8, 11, 14, 17). Ocelli in obtuse triangle, with anterior angle of  $96^\circ\text{--}154^\circ$ . Eyes oval, naked to setose, maximum diameter from less than  $\frac{1}{2}$  to more than  $\frac{3}{4}$  head length (dorsal view), posterior orbit reaching, or almost reaching occipital margin, anterior orbit separated from margin of facial depression by  $0.2\text{--}0.3\times$  maximum diameter of eye (Figs. 1–18). Facial depression deep, sharply separated from frontoververtex and genae (in *H. undulitibiae* n. sp. border of facial depression and genae slightly rounded laterally, as in Fig. 10), with two concavities (one on each side) to accommodate apex of scape when antennae are enclosed in facial depression. Antennal toruli  $1.7\text{--}2.6\times$  closer to mouth margin than to each other. Interantennal prominence extending upwards as thin low carina, almost reaching margin of frontoververtex. Antennae (Figs. 21–32) compact, can be retracted into facial depression. Scape moderately to strongly broadened and flattened, length  $1.6\text{--}2.9\times$  maximum width; pedicel with more or less expressed tuft of elongated thickened setae at apex dorsally; funicle 4- to 6-segmented, segments transverse to strongly transverse; clava solid, heart-shaped, broader than funicle. Mandibles bidentate, with sharp teeth, upper tooth conspicuously larger than lower tooth. Maxillary palpi 4-segmented; labial palpi 3-segmented. **Mesosoma** compact, at most  $1.23\times$  longer than wide. Pronotum transverse, sometimes concealed by occiput. Mesoscutum transverse, width about twice length, anterior part sometimes concealed by occiput. Sculpture of mesoscutum smooth to shallowly reticulate or reticulate-punctate. Axillae with inner corners meeting to relatively widely separated. Scutellum slightly wider than long, smooth to shallowly reticulate, with distinct longitudinal median groove in anterior one- or two-thirds. Dorsum of metasoma with appressed to suberect hairs,



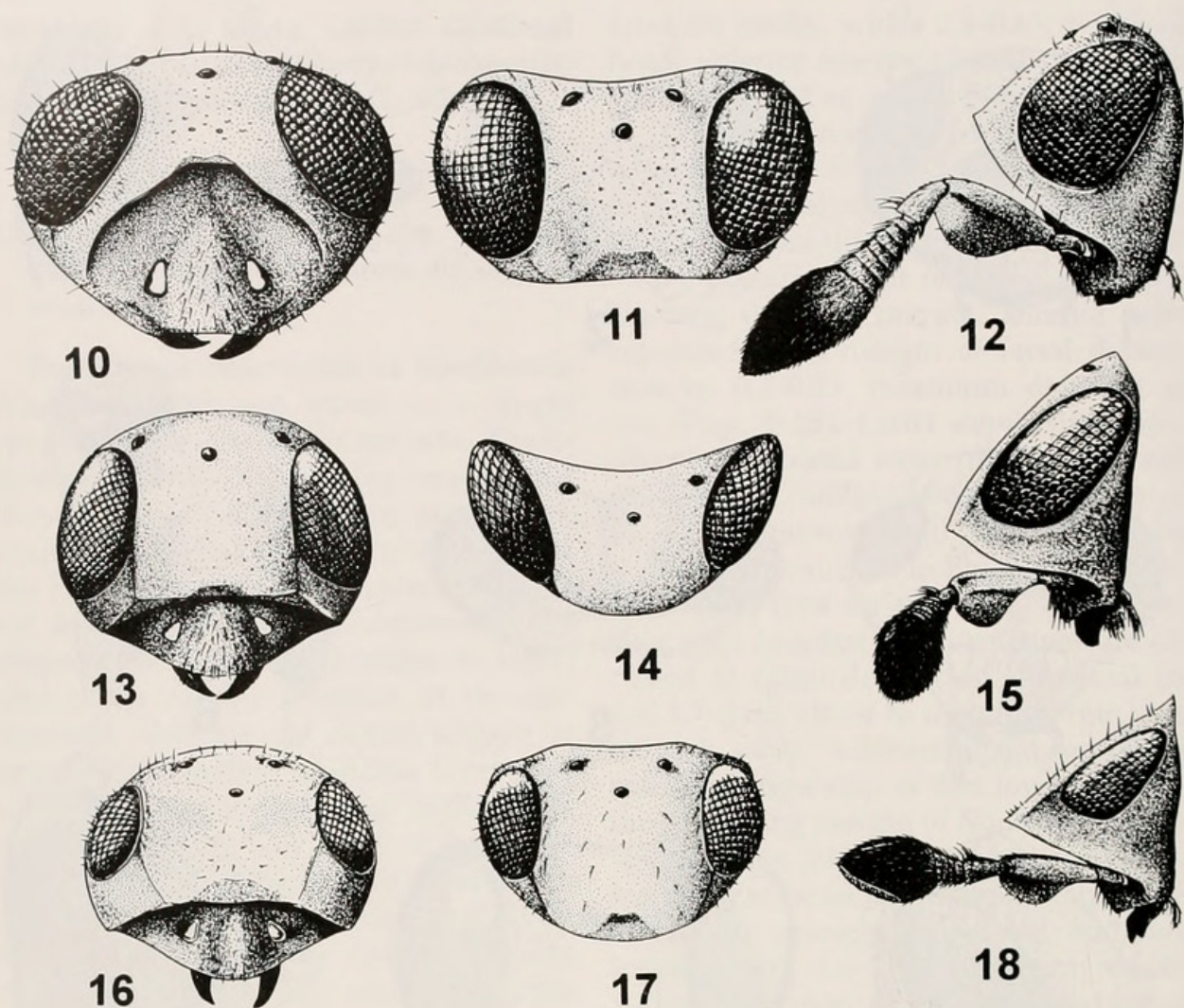


Figs. 1-9. Heads of *Hambletonia* species. 1-3. *H. punctifrons*. 1, frontal view; 2, dorsal view; 3, lateral view, with antenna. 4-6. *H. marticephala*. 4, frontal view; 5, dorsal view; 6, lateral view, with antenna. 7. *H. pilosifrons*, semiprofile view. 8. *H. calvifrons*, dorsal view. 9. *H. setosifrons*, semiprofile view.

and often with scattered non-piliferous punctures. Metanotum and propodeum short, dorsally more or less carinate. Forewing (Figs. 34, 36, 38-41) 2.0-2.4 $\times$  longer than broad. Costal cell usually bent ventrally (wing plane positionned horizontally). Basal part of forewing (proximad of linea calva) from almost hairless, with only few long hairs (Figs. 39, 40), to more or less densely ciliated, with hairs longer than on wing disk (Figs. 36, 38, 41). Linea

calva entire and open (Figs. 39, 40), or almost closed by one or two lines of hairs along posterior wing margin (Figs. 34, 36, 41). Marginal vein punctiform to about twice as long as broad. Stigmal vein 1.1-1.5 $\times$  postmarginal vein, almost straight to slightly curved toward anterior wing margin; stigma sometimes weakly expressed. Legs relatively short, slightly to moderately thickened. **Metasoma** very slightly longer than wide. Cerci situated slightly clos-





Figs. 10–18. Heads of *Hambletonia* species. 10–12. *H. undulitibiae*. 10, frontal view; 11, dorsal view; 12, lateral view, with antenna. 13–15. *H. pseudococcina*. 13, frontal view; 14, dorsal view; 15, lateral view, with antenna. 16–18. *H. squalicephala*. 16, frontal view; 17, dorsal view; 18, lateral view, with antenna.

er to base, or closer to apex of metasoma<sup>1</sup>. Ovipositor short, not protruding, directed slightly upwards.

*Male*.—General body color black or very dark brown, lateral and ventral surface of mesosoma and metasoma usually slightly lighter than dorsal surface, brown. Antennae light to dark brown. Forewings hyaline, or very slightly infuscate in basal part. Body length 1.0–1.7 mm. **Head** hypognathous, length approximately 0.5×

width, and approximately 0.5× height. Frontovortex convex to almost flat, coarsely reticulate-punctate to superficially transversely reticulate or coriaceous, slightly longer to slightly shorter than broad. Ocelli in slightly to strongly obtuse triangle. Eyes with posterior margin reaching, or almost reaching occipital margin, and with anterior orbit reaching, or almost reaching margin of facial depression. Frontovortex and eyes with sparse to rather dense hairs. Facial depression separated from frontovortex by sharp carina, and with rounded margin separating it from gena, smooth to superficially reticulate. Interantennal prominence rounded dorsally, or extending into

<sup>1</sup> The position of cerci in preserved specimens is affected by the method of preparation: they appear to be closer to base of the metasoma in air-dried specimens, and closer to the apex of the metasoma in critical-point-dried and HMDS-treated specimens.



thin, low, rounded carina, sometimes reaching margin of frontovertex. Antenna subcompact to compact; scape slightly broadened and flattened; funicle 5-segmented, segments strongly to moderately transverse, sometimes some of them subquadrate, round in transection, slightly increasing in width toward clava; clava solid, same width as last funicular segment. Mandibles and palpi as in female.

**Mesosoma** compact. Relative dimensions approximately same as in female. Mesoscutum from coarsely deeply reticulate to smooth (in *H. squalicephala* n. sp.); scutellum and axillae from reticulate to smooth. Axillae meeting at inner corners, usually slightly rising above scutellum (in *H. squalicephala* n. sp., axillae fused with scutellum). Metanotum laterally of dorsellum, and propodeum dorsally irregularly carinate. Forewing (Fig. 37) hyaline to extremely slightly infuscate in basal part. Marginal vein punctiform to about  $1.5\times$  longer than broad; postmarginal vein up to  $1.5\times$  longer than stigmal vein; stigmal vein straight to slightly curved toward anterior wing margin. Legs normal. **Metasoma** about as long as broad. Cerci situated slightly closer to base, or closer to apex of metasoma. Terga II to IV with shallow, transverse, reticulate or coriaceous sculpture.

**Comments.**—*H. marticephala* n. sp. differs from all other *Hambletonia* species in several aspects. Its head has a more complex shape because the frontovertex is produced dorsally between the eyes into a large prominence, slightly subdivided medially in two parts by frontal and occipital depressions and by a weak dorsal depression (Figs. 4–6, 19); head length is only  $0.41\text{--}0.47\times$  its height, and  $0.36\text{--}0.38\times$  its width. The anterior ocellus is located on the frontal surface of the frontovertexal prominence, inside the frontal depression, and is positioned vertically; the posterior ocelli are positioned horizontally on the dorsal surface of the prominence (Figs. 4, 5). The anterior margin of the frontovertex

is slightly concave (Figs. 5). The facial depression is shallow, the carina separating it from the frontovertex is sharp only medially and has rounded margins laterally (Fig. 4). Antennae (Figs. 25, 26) lack the elongated, thickened setae on the pedicel, and cannot be retracted into the facial depression. The forewings are very narrow,  $3.6\text{--}4.9\times$  as long as broad (Fig. 35).

**Biology.**—The host is known only for *H. pseudococcina*, which is a parasitoid of the pineapple mealybug, *Dysmicoccus brevipes* (Cockerell) (Homoptera: Pseudococcidae).

**Distribution.**—Brazil, Argentina, Peru, Ecuador, Colombia, Venezuela, Trinidad, Panama, Costa Rica, Guatemala, Mexico, USA (Florida, native and introduced, Georgia), Hawaii (introduced), Puerto Rico (introduced), Jamaica (introduced), and Taiwan (probably, introduced). All the introductions refer to *H. pseudococcina* (see below).

**Systematic position.**—Since phylogenetic relationships within the family Encyrtidae are poorly understood (Noyes & Hayat, 1994) and are beyond the scope of the present work, we provide here only a brief synopsis of recent placement of the genus *Hambletonia* within the subfamily Tetracneminae by different authors. Trjapitzin and Gordh (1978) and Gordh and Trjapitzin (1979) included *Hambletonia* in the tribe Chrysoplatygerini, subtribe Chrysoplatygerina, according to Trjapitzin's (1973) classification of the Encyrtidae. Later, Noyes and Hayat (1984) suggested that the genus might be more closely related to *Taftia* Ashmead, and transferred *Hambletonia* to the subtribe Taftiina (tribe Chrysoplatygerini), indicating that "in all probability Taftiina should be considered synonymous with Chrysoplatygerina." Trjapitzin (1989) accepted the placement of *Hambletonia* in Taftiina, but retained the subtribe name as valid. Most recently, Noyes and Hayat (1994) modified Trjapitzin's classification, and included all the genera previously placed in Chrysoplatygerini into the tribe Aenasiini, although



they did not formally synonymize the two tribes. Therefore, the placement of the genus *Hambletonia* within the subfamily Tetracneminae remains subjective and unstable. Further study is required to determine phylogenetic relationships between the genera and tribes of Tetracneminae.

In the original description Compere (1936) wrote: "[*Hambletonia*] is most closely related to *Tropidophryne* Compere. It is distinguished from the latter by having the funicle six-jointed instead of four to five jointed; the scape without a dorsal fold; the pedicel is circular in cross section instead of triangular; the marginal vein is almost as long as the postmarginal vein instead of absent; the anterior margin of the head, in dorsal view, is slightly convex instead of concave, etc." In fact, this diagnosis was based on differences between two species, *H. pseudococcina* and *T. africana* Compere, at that time the only known representatives of the respective genera. Analysis of these structures in other species of *Hambletonia* and *Tropidophryne* has shown that some of them are subject of intraspecific and individual variation. Thus, the number of funicular segments can be different in different species of both genera, and also can vary within a single species of either genus (from 4 to 6 in *Hambletonia*, and from 3 to 5 in *Tropidophryne*) (e. g., *H. marticephala* n. sp., Figs. 25, 26). This phenomenon was originally observed by Kerrich (1978) in *T. natalensis* Compere. In *H. marticephala* n. sp., even left and right antennae of the same specimen can have different number of funicular segments. The anterior margin of the head (frontovertex) can be convex, straight, or concave in different species of *Hambletonia* (Figs. 2, 5, 8, 11, 14, 17). The marginal vein, although always present in *Hambletonia*, can be very short and inconspicuous. The only character from among those listed by Compere (1936) that appears to be reliable for separating *Hambletonia* from *Tropidophryne* is the shape of the antennal scape and pedicel. We stud-

ied the holotype and two paratypes of *T. africana*, the type species of *Tropidophryne*, and found additional characters that can be used to differentiate the two genera. The costal cell in *Hambletonia* is gradually narrowed toward its distal end, which is pointed, while in *Tropidophryne* the costal cell is about equally broad along its entire length, and its distal end is truncate, forming an incision on the anterior margin of the wing, as shown in Compere's (1931) drawing. The stigmal vein in *Tropidophryne* is without stigma, narrowed at the apex, strongly curved toward the anterior wing margin, and at least as long as  $\frac{1}{4}$  the submarginal vein. In *Hambletonia* the stigma is present (although sometimes can be weakly expressed), stigmal vein is straight or only slightly curved toward the wing margin, and less than  $\frac{1}{6}$  as long as the submarginal vein. The reticulate sculpture of the head, mesosoma and metasoma is much deeper in *Tropidophryne* than in *Hambletonia*, and is also present on the mesopleuron (at least anteriorly) and all metasomal terga. The pubescence of the mesoscutum, axillae and scutellum in *Tropidophryne* is very inconspicuous, and consists of very short appressed translucent hairs, compared to longer, semiappressed to semierect, often brown hairs in *Hambletonia*.

At present it appears that *Hambletonia* is most closely related to an undescribed genus from Brazil, a single specimen of which we found among *Hambletonia* material from the UCRC. The specimen bears a label "ex *Pseudococcus* sp. # 15, São Paulo, Brasil, Aug. 1935, Hambleton," and an identification label "*Hambletonia* n. sp." in Compere's handwriting. Analysis of its features has shown that it does not belong to *Hambletonia*, and apparently represents a new genus. It displays mixed characters of *Hambletonia* (sculpture and pubescence) and *Tropidophryne* (shape of the antennal scape and pedicel, wing venation, and shape of the costal cell of the forewing), differing from both genera by the lateral



position of the propodeal spiracles, which are situated dorsally in both *Hambletonia* and *Tropidophryne*. Insufficient material and the poor condition of the specimen do not allow for a description of a new genus at this time.

KEY TO SPECIES OF HAMBLETONIA BASED ON FEMALES

- 1. Frontovortex between eyes forming characteristic bilobed vertical prominence, slightly overhanging interior eye orbits (Figs. 4–6, 19); anterior ocellus situated vertically on frontal side of prominence in its median depression, posterior ocelli situated horizontally on dorsal side of prominence (Figs. 4, 5); pedicel without tuft of elongated hairs on dorsal side (Figs. 25, 26); forewing very narrow, length 3.6–4.9× maximum width (Fig. 35) ..... *H. marticephala* n. sp.
- Frontovortex without prominence; anterior and posterior ocelli situated in same plane (Figs. 2, 8, 11, 14, 17); pedicel with tuft of elongated hairs on dorsal side (Figs. 21, 24, 27–32); forewing length 2–2.5× maximum width ..... 2
- 2 (1). Frontovortex with distinct, conspicuous, rather dense punctures, which can be relatively large (Figs. 1, 2) or small (Figs. 10, 11) ..... 3
- Frontovortex without punctures, or at most with scattered small inconspicuous punctures (Figs. 7–9, 13, 14, 16, 17) ..... 4
- 3 (2). Mid tibia flattened laterally, undulate dorsally; hind tibia carinate dorsally (Fig. 43); punctures on frontovortex relatively small and deep (Fig. 10, 11); anterior edge of frontovortex (occipital plane oriented vertically) slightly concave (Fig. 11); basal cell of forewing almost hairless, with only few long setae (Fig. 39); funicle 6-segmented (Fig. 31) ..... *H. undulitibiae* n. sp.
- Mid and hind tibiae rounded dorsally, without undulation or carina (Fig. 33); punctures on frontovortex large and shallow (although small punctures also present) (Fig. 1, 2); anterior edge of frontovortex (occipital plane oriented vertically) convex (Fig. 2); basal cell of forewing with numerous setae (as in Fig. 34, 36); funicle 4-segmented (Fig. 27) ..... *H. punctifrons* n. sp.
- 4 (2). Frontovortex and eyes completely hairless, or with extremely minute hairs visible only at higher magnification when viewed and illuminated at certain angle (Figs. 8, 13, 14) ..... 5
- Frontovortex and eyes with distinct, conspicuous setae (Figs. 7, 9, 16–18) ..... 7
- 5 (4). Basal part of forewing naked or with single seta (Fig. 40) ..... *H. roseni* n. sp.
- Basal part of forewing with numerous setae (Fig. 38) ..... 6
- 6 (5). Anterior edge of frontovortex in dorsal view (occipital plane oriented vertically) distinctly convex (Fig. 14); frontovortex and eyes completely naked (at most few very short hairs are present behind posterior ocelli); costal cell of forewing with several rows of setae dorsally (Fig. 38) ..... *H. pseudococcina* Compere
- Anterior edge of frontovortex in dorsal view (occipital plane oriented vertically) straight (Figs. 8); frontovortex and eyes with extremely minute translucent hairs that can be observed only at higher magnification, when viewed and illuminated at certain angle; costal cell of forewing with only one row of setae dorsally (Fig. 34) . . . *H. calvifrons* n. sp.
- 7 (4). Eyes relatively small, maximum diameter less than ½ head length (dorsal view) (Fig. 17); funicle 5-segmented (Fig. 24) ..... *H. squalicephala* n. sp.
- Eyes relatively large, maximum diameter more than ¾ head length (dorsal view) (as in Fig. 14); funicle 6-segmented (Figs. 21, 30) ..... 8
- 8 (7). Antennal club basally brownish yellow, same color as funicle, remainder of club dark brown to black; length 1.0–1.2× maximum width; scape yellow to brownish yellow, with dark brown flange (Fig. 21); anterior edge of frontovortex (frontovortex oriented horizontally) slightly convex, maximally protruding forward in middle, between sub-



ocular sulci; posterior ocelli situated closer to occipital margin than to eyes . . . . .

- ..... *H. pilosifrons* n. sp.  
 - Antennal club completely black; length 1.4–1.5× maximum width; scape dark brown to black (Fig. 30); anterior edge of frontoververtex (frontoververtex oriented horizontally) almost straight, slightly protruding forward laterally of subocular sulci; posterior ocelli situated closer to eyes than to occipital margin . . . . . *H. setosifrons* n. sp.

*Hambletonia calvifrons* Sharkov &

Woolley, new species

(Figs. 8, 28, 34)

*Female* (holotype).—Body length 1.75 mm.

*Relative measurements*.—**Head** width 1.9× length and 1.23× height (66.5:35.5:54); frontoververtex width at level of anterior ocellus 0.71× its length, 0.44× width of head (29.5:41.5:66.5); ocelli in obtuse triangle, with angle at anterior ocellus of 113°; POL:OOL:LOL:OCL = 19:3:10.5:2.5; OOL 0.67× diameter of posterior ocellus (3:4.5); distance between antennal toruli twice distance between torulus and mouth margin, 0.66× mouth width (15:7.5:23); eye maximum diameter 1.36× minimum diameter (36:26.5); posterior orbit of eye reaching occipital margin (dorsal view); antenna as in Fig. 28; scape strongly broadened and flattened, length 1.96× maximum width (23.5:12); funicle 6-segmented. **Mesosoma** length 1.35× width (77:57); mesoscutum length 0.52× width (29.5:57); scutellum length 1.03× width (32.5:31.5); mid tibial spur 0.88× as long as mid basitarsus, 0.3× as long as mid tibia (15:17:50); forewing length 2.31× maximum width (120:52); venation and setation as in Fig. 34. **Metasoma** length 1.06× width (72:68); distance from cerci to base of metasoma 0.8× corresponding distance to apex of metasoma (32:40).

*Color*.—**Head** orange yellow; frontoververtex at certain illumination with very slight pink, purple, and green metallic luster; antenna (Fig. 28) with radicle, scape, pedicel and funicle orange yellow, clava orange to brownish yellow in basal ⅓ or so, brown in apical ⅔ or so, with whitish-yellow

truncation. **Mesosoma** orange yellow; tegulae translucent, slightly brownish yellow; forewing with very weak infuscation in basal ⅓ or so, very slightly stronger infuscation in area outlining distal margin of basal cell, and almost inconspicuous infuscation anteriorly in apical part of wing beyond postmarginal vein (Fig. 34); all legs yellow. **Metasoma** yellow to orange yellow.

*Sculpture and pubescence*.—**Head**: frontoververtex (Fig. 8) very slightly convex, almost flat, smooth, matt, with extremely small translucent hairs, visible only at certain angle and illumination, and with a row of sparse, very short brownish hairs along edge of facial depression laterally, below lower orbit of eye; vertex between and behind posterior ocelli shallowly, minutely transversely coriaceous; anterior edge of frontoververtex (dorsal view) almost straight (Fig. 8); face smooth, hairless, except for short translucent yellowish hairs on interantennal prominence and clypeus; eyes with extremely short translucent hairs; gena smooth, with very few scattered brownish hairs; posterior margin of gena carinate. **Mesosoma**: mesoscutum with extremely shallow, almost inconspicuous, minute isodiametric reticulation and scattered small punctures; axillae and scutellum smooth, with very few scattered small punctures; pronotum, mesoscutum, axillae and scutellum with semiappressed to semierect brown hairs; mesopleuron glabrous; metanotum laterally of dorsellum irregularly carinate; propodeum dorsally with short longitudinal carinae, laterally smooth, with irregular impressions in upper half, and few short, slightly



curved hairs dorsolaterally. **Metasoma** almost smooth, with extremely shallow, almost inconspicuous, transverse coriaceous sculpture on dorsal surface of tergum II; pubescence consisting of few brown hairs on lateral part of terga IV–VI and along posterior edge of terga V–VII, and more numerous, and slightly longer hairs on syntergum VIII.

*Male*.—Unknown.

*Hosts and Biology*.—Unknown.

*Material examined*.—*Holotype* ♀: COSTA RICA: Heredia, OTS—La Selva, 75 m, 10°26'N 84°01'W, xii.1993, (ALAS) (left antenna and left wings in microslide # OSU-0020) (BMNH).

*Distribution*.—Costa Rica.

*Etymology*.—The name reflects the bold appearance of the frontovertex (from the Latin words *calvus*, bold, and *frons*).

*Diagnosis*.—From *H. pseudococcina* differs by the presence of minute hairs on the frontovertex and eyes, almost straight anterior edge of the frontovertex (Fig. 8), and the slightly more elongated and light colored scape, which is maximally broadened in distal half (Fig. 28) (in *H. pseudococcina* the scape is dark colored and maximally broadened in the middle part (Fig. 32)).

***Hambletonia marticephala*** Sharkov & Woolley, new species  
(Figs. 4–6, 19, 25, 26, 35)

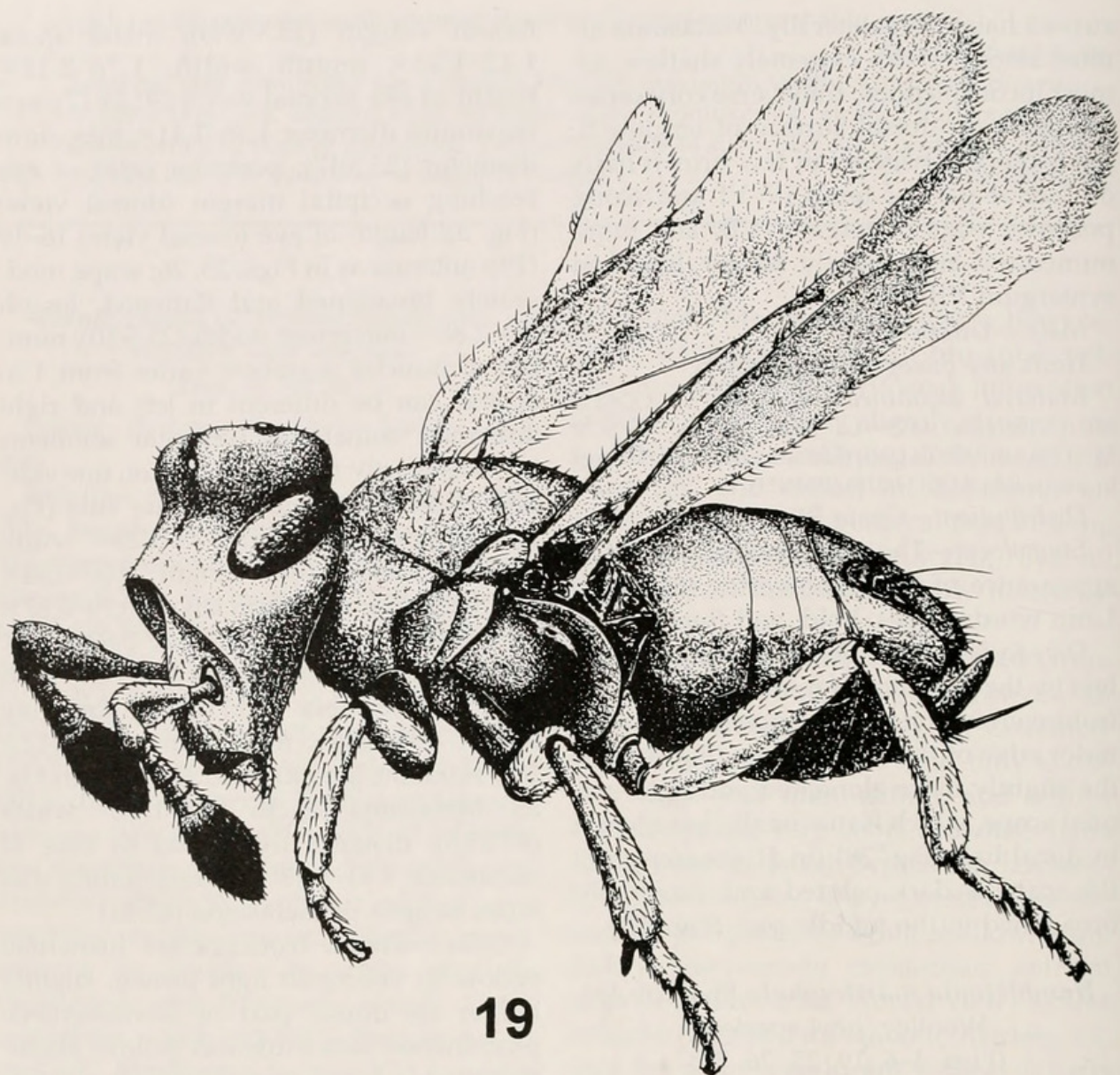
*Female* (holotype measurements in parentheses).—Body length 1.49–1.72 (1.67) mm.

*Relative measurements*.—**Head** width 2.6–2.77× length, 1.14–1.22× height (66.5: 24:54.5); frontovertex width at level of anterior ocellus 1.18–1.25× its minimum width, 0.53–0.61× width of head (39:33: 66.5); ocelli in obtuse triangle, with angle at anterior ocellus of 95°–116° (102°); POL: LOL:OCL = 19:12:10 (in holotype); OOL cannot be measured, because of shape of frontovertexal prominence (Figs. 4, 5); diameter of posterior ocellus 3–3.5 (3.5); distance between antennal toruli 0.71–0.79× distance between torulus and eye orbit, 1.65–1.92× distance between torulus and

mouth margin (13.5:19:8); malar space 1.12–1.25× mouth width, 1.76–2.12× height of eye (frontal view) (30:24:17); eye maximum diameter 1.38–1.41× minimum diameter (23.5:17); posterior orbit of eye reaching occipital margin (dorsal view) (Fig. 5); length of eye (dorsal view) 16–19 (19); antenna as in Figs. 25, 26; scape moderately broadened and flattened, length 2.4–2.88× maximum width (25.5:10); number of funicular segments varies from 4 to 6, and can be different in left and right antennae; sometimes funicular segments are only partly fused together on one side, and remain separated on other side (Fig. 26). **Mesosoma** length 1.13–1.23× width (64:52); mesoscutum length 0.48–0.52× width (25:52); scutellum length 0.79–0.87× width (29:33); mid tibial spur 0.63–0.86× as long as mid basitarsus, 0.15–0.19× as long as mid tibia (8.5:11.5:50); forewing length 3.58–4.86× maximum width (122: 33); venation, setation and shape as in Fig. 35. **Metasoma** length 1.28–1.44× width (77:53.5); distance from cerci to base of metasoma 1.41–1.48× corresponding distance to apex of metasoma (45:32).

*Color*.—**Head**: frontovertex brownish yellow to yellowish light brown, slightly lighter on dorsal part of frontovertexal prominence; face brownish yellow, slightly darker in lower part; gena yellow in upper part (near eye orbit), yellowish light brown in lower part; occiput yellow above occipital foramen, yellowish brown below it; antenna (Figs. 25, 26) yellow, with dark brown clava, except for its basal 1/3 or so, which is same color as funicle. **Mesosoma**: pronotum with brownish yellow collar, and light brown collum; mesoscutum with yellow area anteriorly in middle, outlined by diffuse brown band, light brown posteriorly; scutellum and axillae yellowish light brown, with inner corner of axilla yellow; mesopleuron brown, lighter anteriorly and posteriorly; forewing with light diffuse brownish infuscation, slightly more expressed in basal part (Fig. 35); legs yellow to brownish yellow; metanotum





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Fig. 19. *Hambletonia marticephala*, female habitus.

and propodeum yellowish light brown. **Metasoma** yellowish light brown dorsally, brownish yellow laterally and ventrally.

*Sculpture and pubescence.*—**Head** (Figs. 4–6): frontovertex forming characteristic prominence, arising vertically between eyes, subdivided in middle by frontal and occipital depressions, and weak dorsal depression (Figs. 4, 5), smooth, glossy, with scattered minute, erect, translucent hairs on its frontal part, and with very slightly longer and denser, translucent brownish hairs on dorsal part of frontovertexal prominence; anterior margin of frontov-

ertex concave (Fig. 5); occipital surface of frontovertexal prominence strongly concave; anterior ocellus positioned vertically in frontal depression on frontal surface of frontovertexal prominence; posterior ocelli positioned horizontally on dorsal surface of prominence (Figs. 4, 5); face smooth, facial depression with upper margin carinate only in middle, rounded laterally, with semierect minute hairs on rounded part of margin; interantennal prominence with vertical rows of semiappressed, minute, translucent brownish hairs; eyes with minute, inconspicuous translucent hairs;



gena smooth, with scattered minute translucent hairs; posterior margin of gena rounded; antennal pedicel without tuft of longer hairs on dorsal side (Fig. 25, 26).

**Mesosoma:** pronotum, mesoscutum, axillae and scutellum smooth, with suberect, thin, translucent hairs, hairs slightly longer and slightly curved in posterior part of scutellum; mesoscutum with very few scattered small punctures; mesopleuron glabrous; legs with translucent hairs; tibiae of all legs very slightly curved; metanotum laterally of dorsellum with low, oblique carinae; propodeum with several irregular carinae in callar and plical regions. **Metasoma** with terga II–V extremely shallowly transversely reticulate, almost smooth, shiny, terga VI–VIII smooth; pubescence consisting of very few minute hairs on lateral part of terga II–VI, on posterior margin of terga VI and VII, and slightly longer hairs on syntergum VIII, especially in its posterior part.

*Male*.—Unknown.

*Hosts and Biology*.—Unknown.

*Material examined*.—*Holotype* ♀: USA: 31°40.9'N 81°08.8'W, Georgia, Liberty Co., St. Catharines Isl., 6–10.iv.1995, yellow pan traps (A. Sharkov) (OSUC). *Paratypes*: same data, 7 ♀ (left antenna and left wings of 2 ♀ in microslides # OSU-0017 and # OSU-0018); same data, 30.ix–4.x.1995, white pan traps, 1 ♀; same data, light-blue pan traps, 1 ♀; same data, blue-green pan traps, 1 ♀; Florida, Gainesville, 24–30.iv.1986 (J. LaSalle), 1 ♀. (OSUC, BMNH, TAMU).

*Distribution*.—USA (Georgia, Florida).

*Etymology*.—Dr. J. LaSalle, who collected the first specimen of this species, humorously labelled it “Hammerheadencyrtus”. We retain this name in the Latinized form (from the Latin words *martus*, the hammer, and *cephalon*, the head).

*Diagnosis*.—From all other species of *Hambletonia* differs by the very peculiar shape of the head, with a characteristic frontovertexal prominence (Figs. 4–6), by the absence of the tuft of hairs on the pedicel (Figs. 25, 26), and by the very narrow forewings (Fig. 35).

*Hambletonia pilosifrons* Sharkov & Woolley, new species  
(Figs. 7, 21, 22, 36, 37)

*Female* (holotype measurements in parentheses).—Body length 1.58–2.06 (1.92) mm.

*Relative measurements*.—**Head** width  $1.6\text{--}1.76\times$  length,  $1.17\text{--}1.21\times$  height (75.5:43:63); frontovertex width at level of anterior ocellus  $0.62\text{--}0.67\times$  its length,  $0.5\text{--}0.54\times$  width of head (41:61:75.5); ocelli in obtuse triangle, with angle at anterior ocellus of  $125^\circ\text{--}134^\circ$  ( $133^\circ$ ); POL:OOL:LOL:OCL = 23.5:7:11.5:5 (in holotype); OOL  $1.44\text{--}1.67\times$  diameter of posterior ocellus (7:4.5); distance between antennal toruli  $2.58\times$  distance between torulus and mouth margin,  $0.44\times$  mouth width (15.5:6:35—in paratype); eye maximum diameter  $1.56\text{--}1.63\times$  minimum diameter (41:25.5); posterior orbit of eye almost reaching occipital margin (dorsal view); temple very short (1.5); antenna as in Fig. 21; scape strongly broadened and flattened, length  $1.42\text{--}1.72\times$  maximum width (21.5:12.5); funicle 6-segmented. **Mesosoma** length  $1.11\text{--}1.18\times$  width (70:63); mesoscutum length  $0.5\text{--}0.53\times$  width (31.5:63); scutellum length  $0.83\text{--}0.88\times$  width (31:37.5); mid tibial spur  $0.8\text{--}1.0\times$  as long as mid basitarsus,  $0.26\text{--}0.29\times$  as long as mid tibia (14:14:50); forewing length  $1.98\text{--}2.18\times$  maximum width (128:59); venation and setation as in Fig. 36. **Metasoma** length  $1.15\times$  width (85:74); distance from cerci to base of metasoma  $1.45\text{--}1.57\times$  corresponding distance to apex of metasoma (52.5:33.5).

*Color*.—**Head**: frontovertex yellowish to brownish orange, slightly darker posteriorly at occipital margin, at certain illumination with pink, purple, and, sometimes, blue and green metallic luster; face yellow; gena and occiput yellowish to brownish orange; antenna (Fig. 21) with radicle yellow, scape yellow to brownish yellow, with dark brown flange, especially on its inner surface and edge, pedicel and funi-



cle yellow to brownish yellow, clava very dark brown to black, except for its base, which is same color as funicle. **Mesosoma:** pronotum dorsally, mesoscutum, scutellum and axillae orange brown to dark brown, anterolateral corners of mesoscutum lighter; forewing with diffuse brownish infuscation, darker in basal part (Fig. 36); sides and ventrum brownish orange yellow; all legs yellow; metanotum and propodeum brownish orange yellow. **Metasoma** yellowish light brown dorsally, and brownish yellow laterally and ventrally.

*Sculpture and pubescence.*—**Head** (Fig. 7): frontovertex convex, smooth, matt, with scattered small setiferous punctures, and erect brownish hairs, with row of hairs along inner eye orbit; vertex between posterior ocelli with transverse coriaceous sculpture; anterior edge of frontovertex (dorsal view) convex; face smooth, its lower margin and clypeus with short brownish hairs; eyes with translucent hairs; gena smooth, with semierect brown hairs (scattered in middle part, and forming short rows along eye orbit and lower margin of gena); posterior margin of gena more or less rounded, with very low carina separating it from occiput. **Mesosoma:** lateral part of pronotum and prepectus slightly longitudinally reticulate; mesoscutum very shallowly, slightly transversely reticulate, with scattered small punctures; axillae and scutellum smooth, with very few scattered punctures; mesoscutum with semiappressed to semierect brown hairs; scutellum with semierect to erect brown hairs; mesopleuron glabrous; metanotum laterally of dorsellum with irregular longitudinal and oblique carinae; propodeum reticulate laterally in upper part, with carinate callar region, and longitudinally carinate plical region. **Metasoma** with tergum II (first visible) very shallowly, transversely coriaceous to reticulate, shiny, terga III–VIII almost smooth; pubescence consisting of brown hairs on lateral part of all terga, on posterior edge of terga VI

and VII, and longer brown hairs on syntergum VIII.

*Male.*—Body length 1.06–1.57 mm.

*Relative measurements.*—**Head** width about twice length, about  $1.2\times$  height; frontovertex width at level of anterior ocellus slightly less to equal to its length,  $0.4\text{--}0.5\times$  width of head; ocelli in almost right to slightly obtuse triangle, with angle at anterior ocellus of  $92^\circ\text{--}101^\circ$ ; POL:OOL: LOL:OCL = 12:2:7:2; OOL  $0.3\text{--}0.4\times$  diameter of posterior ocellus; distance between antennal toruli about  $3.5\times$  distance between torulus and mouth margin,  $0.6\times$  mouth width; eye maximum diameter  $1.2\times$  minimum diameter; posterior orbit of eye almost reaching occipital margin (dorsal view); antenna as in Fig. 22. **Mesosoma** length about equal width; mesoscutum length about  $0.5\times$  width; scutellum length about  $0.7\times$  width; mid tibial spur  $0.9\times$  as long as mid basitarsus, about  $0.25\times$  as long as mid tibia; forewing length twice maximum width; venation and setation as in Fig. 37. **Metasoma** length  $1.1\times$  width; distance from cerci to base of metasoma  $1.2\times$  corresponding distance to apex of metasoma.

*Color.*—**Head:** frontovertex black; face very dark brown, almost black; occiput black; antenna (Fig. 22) with radicle and scape yellow to brownish yellow, pedicel, funicle, and clava light brown to brown. **Mesosoma:** pronotum dorsally, mesoscutum, scutellum and axillae black; pronotum laterally, prepectus, and mesopleuron very dark brown; tegula very dark brown, almost black; forewing hyaline, or with very light diffuse brownish infuscation in basal part (Fig. 37); all legs with coxae very dark brown, femora, tibiae and tarsi yellowish light brown to yellowish brown, with slightly darker base of femora; metanotum and propodeum very dark brown. **Metasoma** brown to dark brown.

*Sculpture and pubescence.*—**Head:** frontovertex almost flat, with anterior edge slightly concave, minutely superficially reticulate, with numerous piliferous punc-



tures and translucent brownish semierect to erect hairs, some hairs directed anteriorly and some posteriorly; face with extremely shallow reticulation, appears smooth; interantennal prominence with light brown hairs; eyes with rather dense translucent hairs; gena finely reticulate, with scattered piliferous punctures and semierect brownish hairs. **Mesosoma:** pronotum dorsally, mesoscutum, axillae and scutellum coarsely minutely reticulate, with piliferous punctures and semiappressed to erect brown hairs; pronotum laterally and prepectus reticulate; mesopleuron smooth, with slightly coriaceous area in lower part in middle; metanotum laterally of dorsellum with few irregular oblique carinae; propodeum reticulate laterally in upper part, with few carinae in callar region behind spiracle, and longitudinally carinate plical region. **Metasoma** with terga II–IV very shallowly transversely reticulate, shiny, terga III–VIII almost smooth; pubescence consisting of one transversal row of appressed brown hairs on terga II–V, which is interrupted in middle  $\frac{1}{2}$  on terga II and III, in middle  $\frac{1}{3}$  on tergum IV, and in middle  $\frac{1}{4}$  on tergum V, two rows of hairs on terga VI and VII, and several irregular rows of longer, light brown hairs on syntergum VIII.

**Hosts and Biology.**—Unknown.

**Material examined.**—*Holotype* ♀: COSTA RICA: Heredia, La Selva BS, 50 m, ii.1991, MT/YPT (J.S. Noyes) (INBio). *Paratypes*: same data, 4 ♀ (on 3 pins) (left antenna and left wings of 1 ♀ in microslide # OSU-0016), 1 ♂; same location, 22.i–3.ii.1991, MT/YPT (J.S. Noyes), 1 ♀, 1 ♂; 10°26'N 84°01'W, Prov. Heredia, F. La Selva, 3 km S Puerto Viejo, 29.iii.1987 (H.A. Hespenheide), 1 ♀; same location, 27.iii.1988 (H.A. Hespenheide), 1 ♂; same location, 5–8.iii.1984, malaise trap (S.A. Cameron), 1 ♀; same location, 100 m, ii–iii.1993 (P. Hanson), 3 ♀, 1 ♂; same location, viii.1992 (P. Hanson, C. Godoy), 1 ♂; Heredia, 10 km W Puerto Viejo, La Selva Verde, 3.iii.1991 (A.E.H. Howden), BM 1991–85, 1 ♀; 10°26'N 84°01'W, Heredia, OTS-La Selva, 75 m, xii.1993 (ALAS), 1 ♀; Alajuela, Cordillera, Tilaran, Peñas Blancas, 700 m, rainforest, ix–x.1986 (E. Cruz), BM 1986-154, 3 ♀; Alajuela, San Ramon BS, 900 m, vii–viii.1995 (P. Hanson), 3 ♀; Limon, 16 km W Guapiles, 400 m, viii–ix.1988 (P. Hanson), 1 ♀; Guanacaste, Guanacaste NP,

Cacao Est., xi–xii.1990 (P. Hanson), 1 ♀; Guanacaste, SW side Volcan Cacao, Estac. Cacao, 1100 m, 1988–1989, 1 ♀; Guanacaste Pv, Sta. Rosa NP, Hacienda-2-C, 14.ix–15.x.1985 (Janzen & Gauld), 1 ♂; same location, 14.vi–5.vii.1986, 1 ♂; same location, 22.vi–13.vii.1985 (Janzen & Gauld), 1 ♂ (in microslide); same location, Hacienda-1-O, 2–23.iii.1986 (Janzen & Gauld), 2 ♂ (1 in microslide); same location, 20.xii.1986–10.i.1987 (Janzen & Gauld), 1 ♂; same location, Hacienda-3-O, 10–31.i.1987 (Janzen & Gauld), 1 ♀ (in microslide); Guanacaste Pv, Sta. Rosa NP, Sn. Emilio-5-O, 17–24.iv.1985 (Janzen & Gauld), 1 ♂; Guanacaste, Cacao (ACG), 1100 m, 26.i–24.ii.1996, MT/YPT (J.S. Noyes), 5 ♀; Guanacaste, Pitilla (ACG), 700 m, 12–16.ii.1996, MT/YPT (J.S. Noyes), 1 ♀, 1 ♂; San José, San Antonio de Escazu, 1300 m, YPT (L. Masner), 2 ♀; same location, vi.1988 (W. Eberhard), 1 ♀; San José, Ciudad Colon, iv–v.1990 (P. Hanson), 1 ♂; Cartago, Turrialba CATIE, Reventazon, 550 m, 4.ix.1986 (L. Masner) CR-19, BM 1986-330, 2 ♀ [BMNH, University of Costa Rica (San José), OSUC]. *Additional material*: GUATEMALA, Nov. 1932 (W. Carter), 5 ♀, 4 ♂ (UCRC).

**Comments.**—Five females and four males from Guatemala were identified as *H. pilosifrons* n. sp. but were not included in the type series because of their poor condition.

**Distribution.**—Costa Rica, Guatemala.

**Etymology.**—The name reflects the presence of setae on the frontovertex.

**Diagnosis.**—Very close to *H. pseudococcina*, from which differs by the presence of setae on the frontovertex and eyes (Fig. 7).

***Hambletonia pseudococcina* Compere**  
(Figs. 13–15, 20, 32, 38)

*Hambletonia pseudococcina* Compere 1936: 173–174.

**Distribution.**—Brazil, Colombia, Venezuela. Introduced to Hawaii (from Brazil and Venezuela), Puerto Rico (from Brazil, via Hawaii), Jamaica (from Hawaii), and USA (Florida) (from Puerto Rico). The species was also reported from Argentina, Trinidad, Antilles (De Santis, 1979), Mexico (Trjapitzin & Ruiz-Cancino, 1995), and Taiwan (probably, introduced) (Tachikawa, 1980).

**Hosts and biology.**—A parasitoid of the pineapple mealybug *Dysmicoccus brevipes* (Cockerell) (Homoptera: Pseudococcidae).



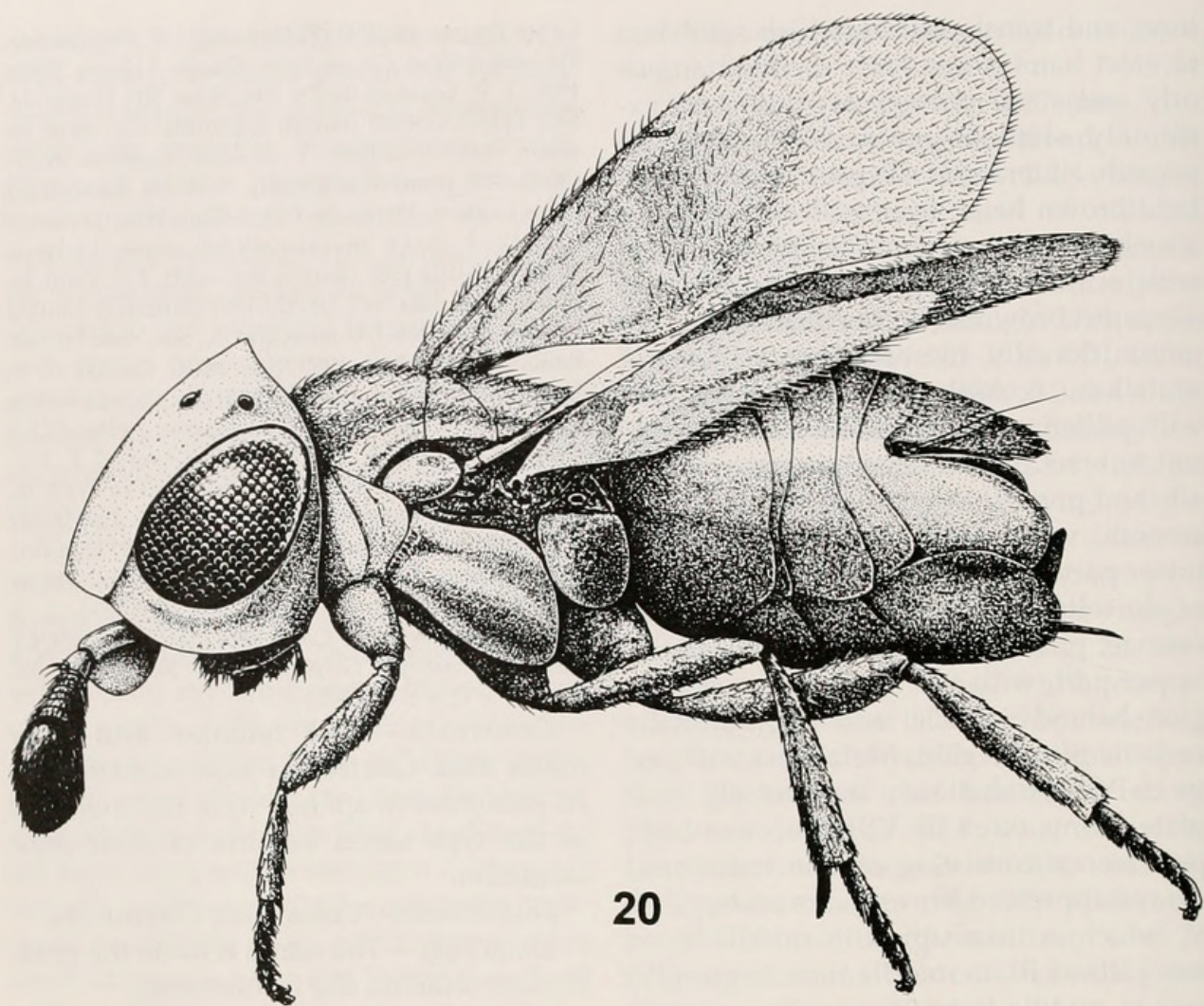


Fig. 20. *Hambletonia pseudococcina*, female habitus.

Occurs as a bisexual race in Brazil, and as a unisexual race in Colombia and Venezuela, with the males/females ratio in the latter race of about 1:200, and males being unnecessary for reproduction (Bartlett, 1978).

**Economical importance.**—Was used for biological control of the pineapple mealybug. The species had established in Florida, Hawaii, and Puerto Rico, and in Hawaii was found to be a relatively successful control agent of *D. brevipes* (Bartlett, 1978).

**Material examined.**—Holotype ♀: BRASIL: São Paulo, Araras, ex *Pseudococcus brevipes* on pineapple, July 10, 1935 (Edson Hambleton) (USNM) (the head of the holotype is missing). Paratypes: same data, 2 ♀ and 2 ♂ (1 ♂ labelled "Allotype") (USNM). Additional material: same location, 25.ix.1935 (Edson Hambleton), 7 ♀, 3 ♂; RO Fazenda, Rancho Grande, 62 km

S. Ariquemes, 10°32'S 62°48'W, 12–22.xi.1991 (E.M. Fischer), 1 ♀; same location 2.xii.1991 (S.L. Heydon), 1 ♀; same location, goat pasture sweep, 27.xi.1991 (S.L. Heydon), 1 ♀; 14°17.2'S 48°55.5'W, Goiás, Uruaçu, Serra da Mesa Survey, 21–30.v.1996, yellow pan traps, 2 ♀; TRINIDAD: B.W.I., *P. brevipes* on pineapple, v.1953 (Bennett No. 30), 6 ♀; "From F.J. Simmonds, Trinidad to D. Lloyd, Fontana, Jan.15, 53", 4 ♀; B.W.I., 18.vii.1950, ex *Pseudococcus brevipes*, (Wash. EQ # B-5521) (W.B.Wood coll.), 4 ♀; PUERTO RICO: Lajas, ex *Pseudococcus brevipes* on pineapple, 1.vi.1949 (H.K. Plank), 4 ♀; Palmareja, 1.vi.1949 (W. Gaud), 3 ♀; 6.vii.1943 (Lot #1), ~5 ♀ in gelatin capsule; vii.1943 (Lot #2), 60+ ♀ in 2 gelatin capsules; COLOMBIA: Caqueta, I.1936 (E.G. Salas), 3 ♀; Coqueta region, ex *Pseudococcus* on pineapple (E. Garcia Salas), 1 ♀ (36–4471, vial #2); B.W.I.C.R.S. Expedition (D.J. Taylor), 6 ♀; 12°50'S 69°20'W Madre de Dios, Rio Tambopata Res., 1–13.xi.1983 (N.E.Stork), 1 ♀; Cuzco Quillabamba, 24–26.xii.1983 (L. Huggert), 2 ♀ (B.M. 1984-337); Junin Satipo, 24.i.1984 (L. Huggert), 1 ♀ (B.M. 1984-337); ECUADOR: Napo Misahualli,



20.ii.1983 (L. Huggert), 1 ♀ (B.M. 1984-337); Rio Palenque, forest, 4.ii.1983 (L. Huggert), 1 ♀; COSTA RICA: Puntarenas, R F Golfo Dulce, 24 km W Piedras Blancas, 200 m, iv-v.1991 (P. Hanson), 1 ♀; DOMINICA: W.I. Springfield Plantation, 18-22.vii.1978 (G.C. Steyskal), 1 ♀ (Bredin-Archbold Smithsonian Bio. Surv. Dominica); St. Paul Parish, Springfield Est., 505 m, 20-27.xi.1995 (L. Masner), 7 ♀ (B.M. 1995-214); USA: Florida, Sebring, on pineapple mealybug, 1.vii.1946 (M.R. Osborn), 2 ♀; same location, pineapple mealybug, 17.i.1947 (M.R. Osborn), 3 ♀; HAWAII: 5.i.1937 (D.T. Fullaway), 22 ♀ (received from K.A. Bartlett) (P.R. No. 1881); Country unknown, ex collection of unidentified mealybug on cocoa, Palnura Valle, Jan. 1953 (D. Taylor), (Bennet coll., vial No. 3), 7 ♀; same data (Bennet coll., vial No. 31), 5 ♀; No data, 1 ♀ (BMNH, USNM, UCDC, UCRC).

**Diagnosis.**—Close to *H. pilosifrons* n. sp., *H. setosifrons* n. sp., *H. roseni* n. sp., and *H. calvifrons* n. sp. From first two species differs by the completely naked frontovertex and eyes (at most few minute hairs can be present behind the posterior ocelli) (Figs. 13-15, 20). From *H. roseni* n. sp. differs by the pilose basal cell of the forewing (Fig. 38), and from *H. calvifrons* n. sp. differs by the convex anterior edge of the frontovertex (Fig. 14) and the presence of several rows of setae on the dorsal surface of the costal cell of the forewing (Fig. 38).

***Hambletonia punctifrons* Sharkov & Woolley, new species**  
(Figs. 1-3, 27, 33)

**Female** (holotype measurements in parentheses).—Body length 1.42-1.6 (1.6) mm.

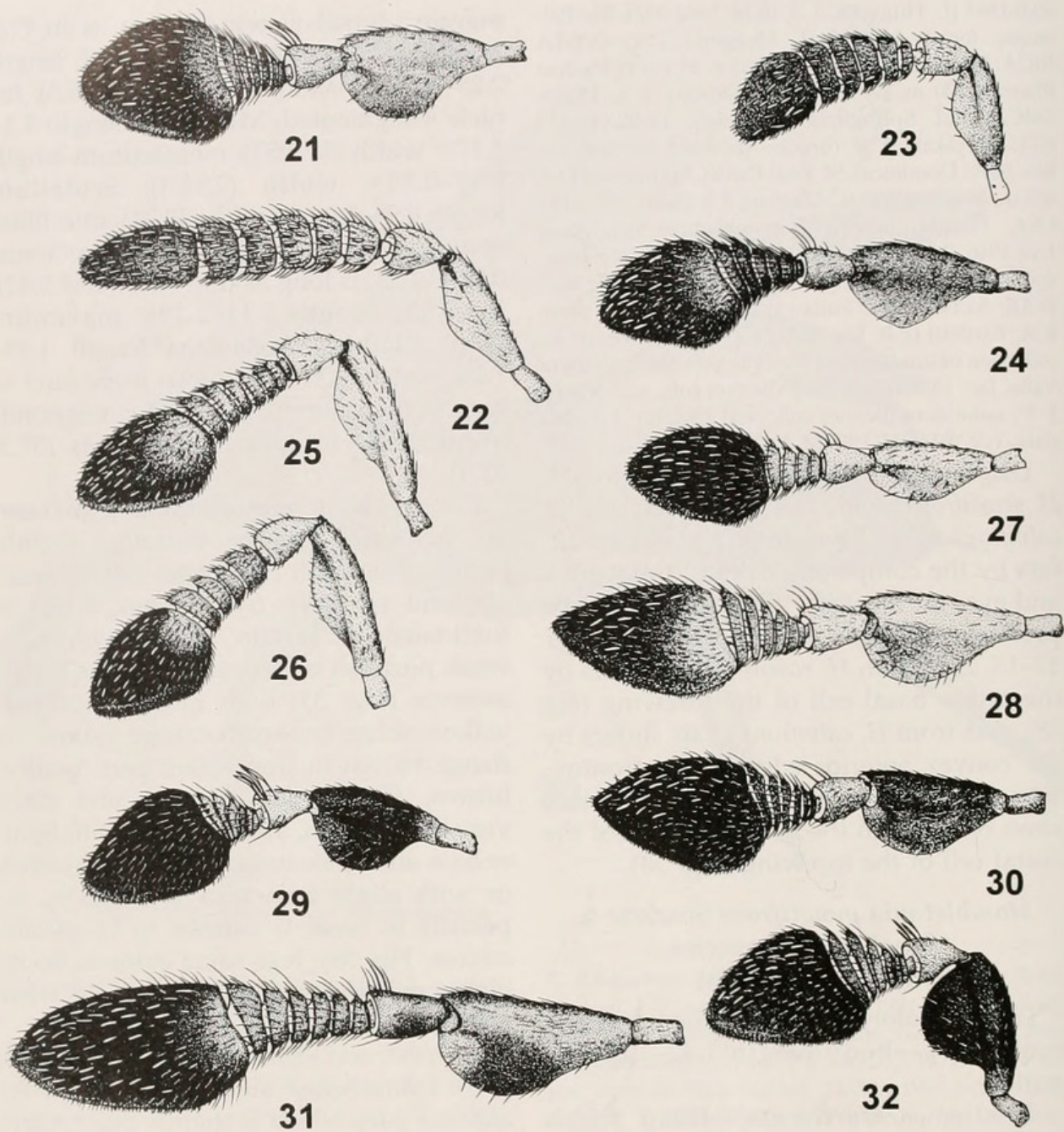
**Relative measurements.**—**Head** width  $1.8-1.93\times$  length,  $1.24-1.33\times$  height (57:29.5:43); frontovertex width at level of anterior ocellus  $0.81-0.89\times$  its length,  $0.46-0.49\times$  width of head (28:31.5:57); ocelli in obtuse triangle, with angle at anterior ocellus of  $111^{\circ}-154^{\circ}$  ( $128^{\circ}$ ); POL:OOL:LOL:OCL = 14:3.5:6.5:1 (in holotype); OOL  $0.88-1.14\times$  diameter of posterior ocellus (3.5:4); distance between antennal toruli  $2.08-2.25\times$  distance between torulus and mouth margin,  $0.64-0.71\times$  mouth width (13.5:6:19); eye oval, maximum diameter  $1.27-1.32\times$  minimum diameter (26:20.5); posterior orbit of eye reaching occipital

margin (dorsal view); antenna as in Fig. 27; scape broadened and flattened, length  $2.25-2.29\times$  maximum width (19.5:8.5); funicle 4-segmented. **Mesosoma** length  $1.1-1.17\times$  width (58.5:53); mesoscutum length  $0.47-0.53\times$  width (25:53); Scutellum length  $0.94-0.96\times$  width (30:31); mid tibial spur  $0.95-1.05\times$  as long as mid basitarsus,  $0.24-0.27\times$  as long as mid tibia (10:9.5:42); forewing length  $2.11-2.29\times$  maximum width (110:48). **Metasoma** length  $1.19-1.2\times$  width (70:59); distance from cerci to base of metasoma  $1.15-1.26\times$  corresponding distance to apex of metasoma (37.5:32.5).

**Color.**—**Head**, **mesosoma** and **metasoma** brownish orange dorsally, slightly lighter, yellowish orange to yellow laterally and ventrally; frontovertex, when illuminated at certain angle, with very weak purplish or greenish metallic luster; antenna (Fig. 33) with radicle brownish yellow, scape brownish orange yellow, its flange brown in translucent part, pedicel brown, funicle dark brown, and clava very dark brown, almost black, with lighter base and apex; forewing almost hyaline, or with slight brownish infuscation, especially in basal  $\frac{1}{3}$  (similar to *H. pseudococcina*, Fig. 38); legs same color as body; metasoma dorsally with extremely weak greenish and purplish metallic shine.

**Sculpture and pubescence.**—**Head** (Figs. 1, 2, 3): frontovertex almost flat, except for anterior part, which is slightly convex and raised upwards, with large, shallow, round to slightly oval punctures, which are more or less grouped in middle part of frontovertex between its anterior edge and anterior ocellus, with few smaller punctures along eye orbit; surface between punctures unsculptured, smooth, with sparse brownish hairs; anterior edge of frontovertex (dorsal view) slightly convex (Fig. 2); face unsculptured; lower part of interantennal prominence, and clypeus with brownish hairs; eyes with short translucent hairs; gena smooth, with few scattered translucent hairs. **Mesosoma:**





Figs. 21–32. Antennae of *Hambletonia* species. 21, 22. *H. pilosifrons*. 21, female; 22, male. 23, 24. *H. squalicephala*. 23, male; 24, female. 25, 26. *H. marticephala*, females. 27. *H. punctifrons*, female. 28. *H. calvifrons*, female. 29. *H. roseni*, female. 30. *H. setosifrons*, female. 31. *H. undulitibiae*, female. 32. *H. pseudococcina*, female.

mesoscutum, axillae and scutellum smooth, with erect brown hairs, with few scattered punctures and one row of punctures along posterior edge of scutellum; prepectus shallowly reticulate; mesopleuron glabrous; forewing setation similar to *H. pseudococcina* and *H. pilosifrons* (Figs. 36, 38); metanotum laterally of dorsellum ru-

glose; propodeum carinate dorsally, and with rather coarse, irregular sculpture, slightly indicated reticulation, and few short, brown hairs laterally. **Metasoma** with tergum II (first visible) shallowly coriaceous, shiny, terga III–VIII smooth; posterior edge of terga VI and VII, and anterior part of syntergum VIII with brownish



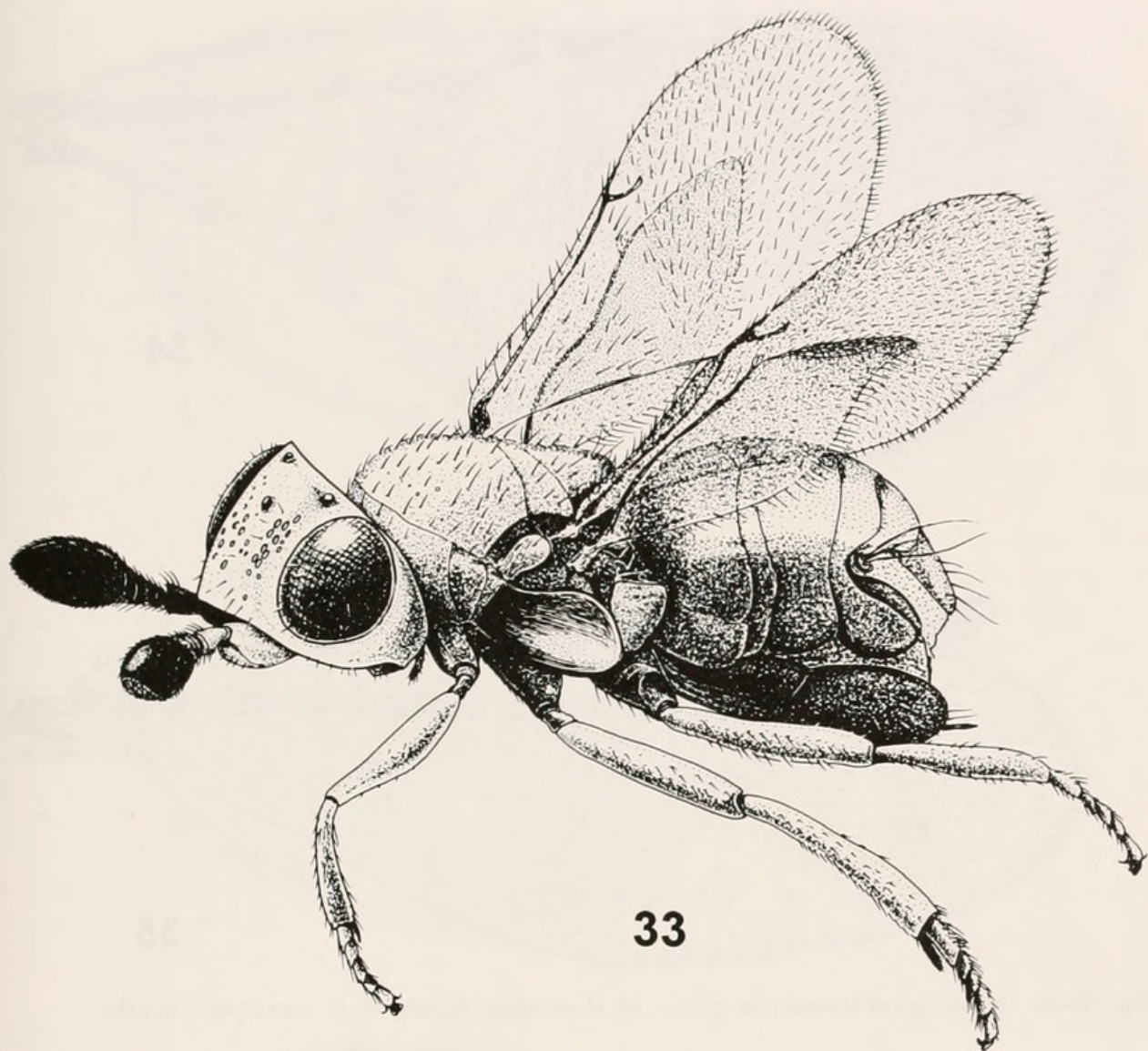


Fig. 33. *Hambletonia punctifrons*, female habitus.

hairs; posterior part of syntergum VIII with longer hairs, especially so along posterior margin.

*Male*.—Unknown.

*Hosts and Biology*.—Unknown.

*Material examined*.—*Holotype* ♀: COSTA RICA: Heredia, La Selva BS, 50 m, ii.1991, MT/YPT (J.S. Noyes) (BMNH). *Paratypes*: same data, 2 ♀ (left antenna and left wings of 1 ♀ in microslide # OSU-0012); Heredia, 3 km S Puerto Viejo, OTS-La Selva, 100 m, ii–iii.1993 (P. Hanson), 1 ♀ (BMNH).

*Distribution*.—Costa Rica.

*Etymology*.—The name reflects the presence of large punctures on the frontovertex.

*Diagnosis*.—From *H. pseudococcina* differs by the relatively short, punctate fron-

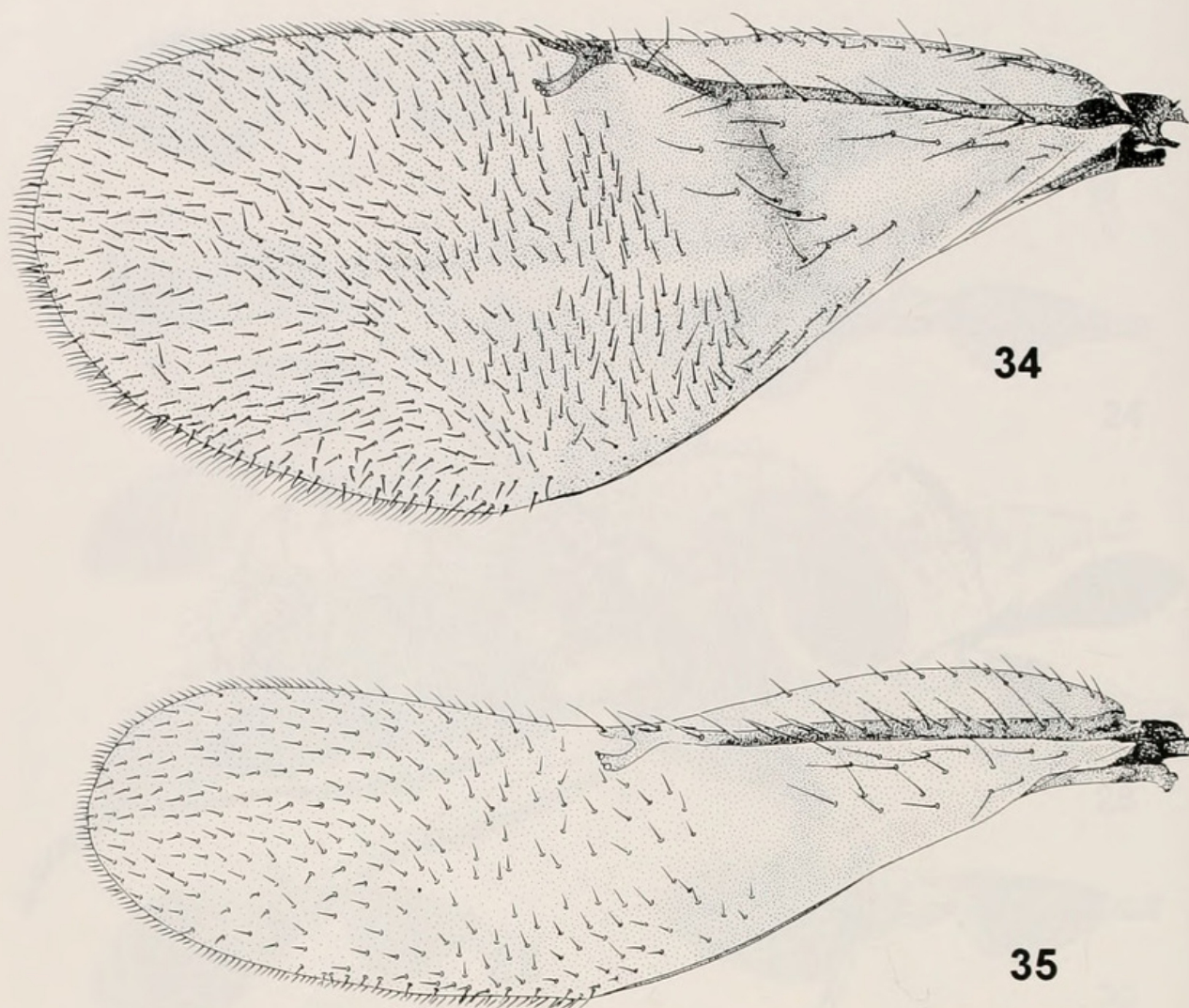
tovertex, and by the presence of hairs on the frontovertex and eyes (Figs. 1–3).

*Hambletonia roseni* Sharkov & Woolley,  
new species  
(Figs. 29, 40)

*Female* (holotype measurements in parentheses).—Body length 1.4–1.84 (1.84) mm.

*Relative measurements*.—Head width  $1.59\text{--}1.71 \times$  length,  $1.11\text{--}1.2 \times$  height (63.5:40:57.5); frontovertex width at level of anterior ocellus  $0.67\text{--}0.73 \times$  its length,  $0.51\text{--}0.54 \times$  width of head (33.5:50:63.5); ocelli in obtuse triangle, with angle at anterior ocellus of  $96^\circ\text{--}116^\circ$  ( $112^\circ$ ); POL:OOL:LOL:





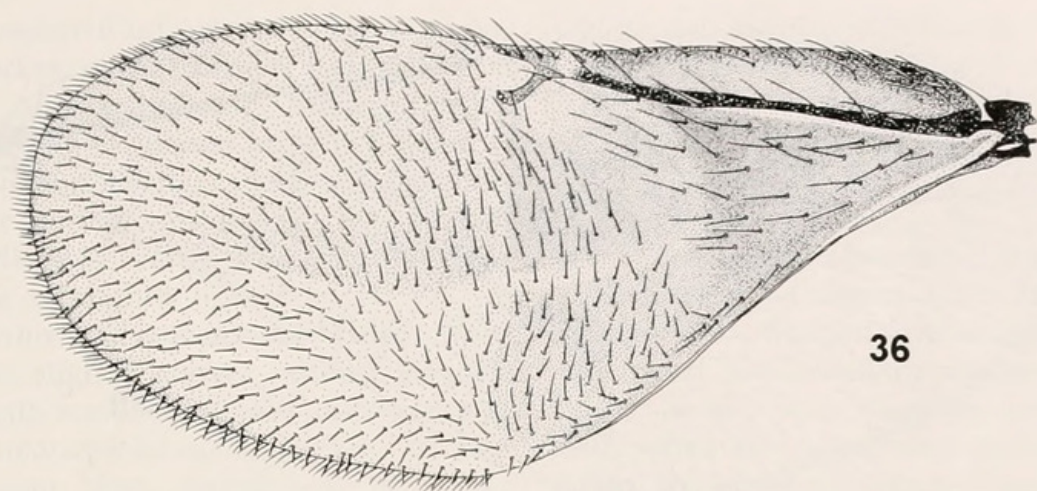
Figs. 34–35. Forewings of *Hambletonia* species. 34. *H. calvifrons*, female. 35. *H. marticephala*, female.

OCL = 17.5:5:9:3 (in holotype); OOL 1.42–1.71 $\times$  diameter of posterior ocellus (5:3.5); distance between antennal toruli 2.0–2.6 $\times$  distance between torulus and mouth margin, 0.6–0.65 $\times$  mouth width (13:6.5:20); eye oval, maximum diameter 1.5–1.7 $\times$  minimum diameter (37.5:25); posterior orbit of eye reaching, or almost reaching occipital margin (dorsal view); antenna as in Fig. 29; scape strongly broadened and flattened, length 1.58–1.67 $\times$  maximum width (20:12); funicle 6-segmented. **Mesosoma** length 1.12–1.23 $\times$  width (67:60); mesoscutum length 0.46–0.55 $\times$  width (31:59); scutellum length 0.86–0.94 $\times$  width (30:35); mid tibial spur slightly shorter or equal to mid basitarsus, 0.28–0.31 $\times$  as long as mid tibia (12.5:14:45); forewing length 1.96–

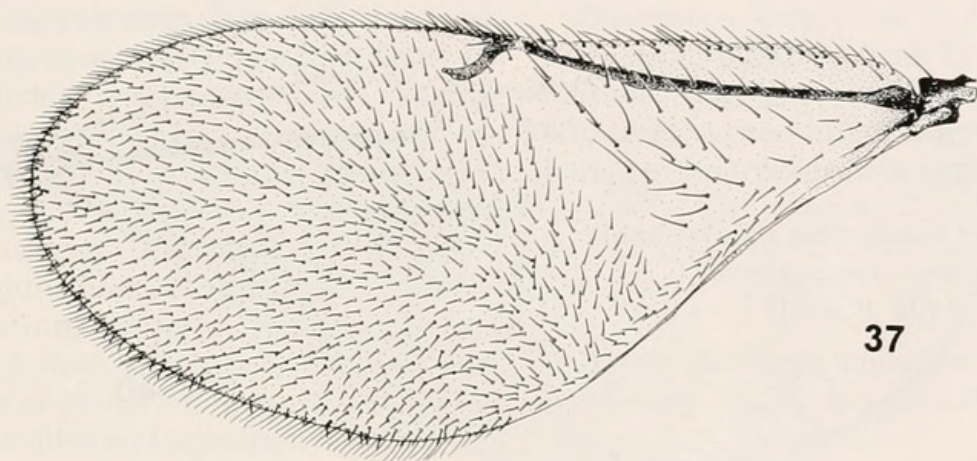
2.32 $\times$  maximum width (120:52); venation and setation as in Fig. 40. **Metasoma** length 1.14–1.2 $\times$  width (77:64); distance from cerci to base of metasoma 1.32–1.46 $\times$  corresponding distance to apex of metasoma (45:34).

**Color.**—**Head**, **mesosoma** and **metasoma** brownish orange dorsally, and slightly lighter, yellowish orange to yellow laterally and ventrally; frontovertex, when illuminated at certain angle, with very weak purple or green metallic luster; antenna (Fig. 29) with radicle brownish yellow, scape dark brown, except its base, pedicel and funicle brownish yellow, clava dark brown, almost black, with lighter apex; axillae and scutellum slightly darker than rest of body (in paratype from Costa

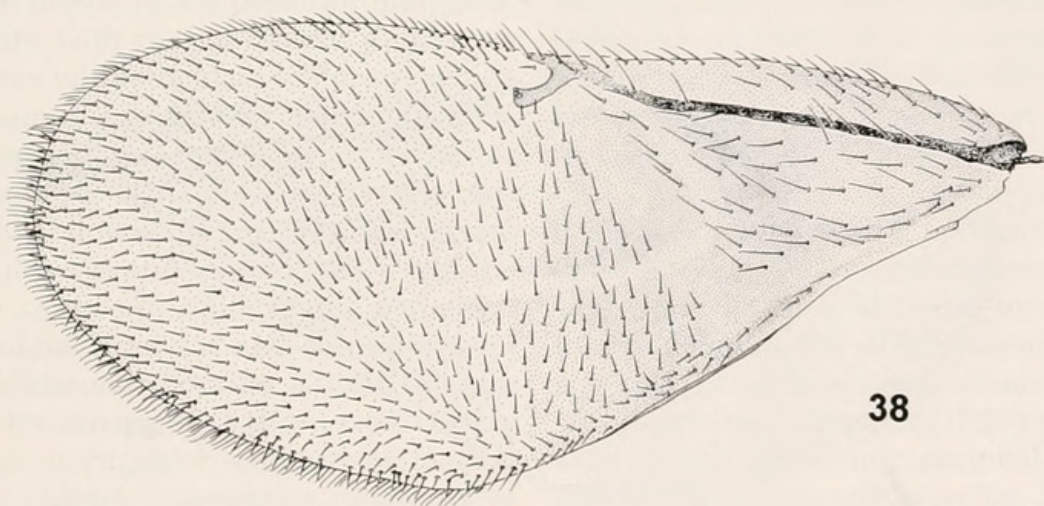




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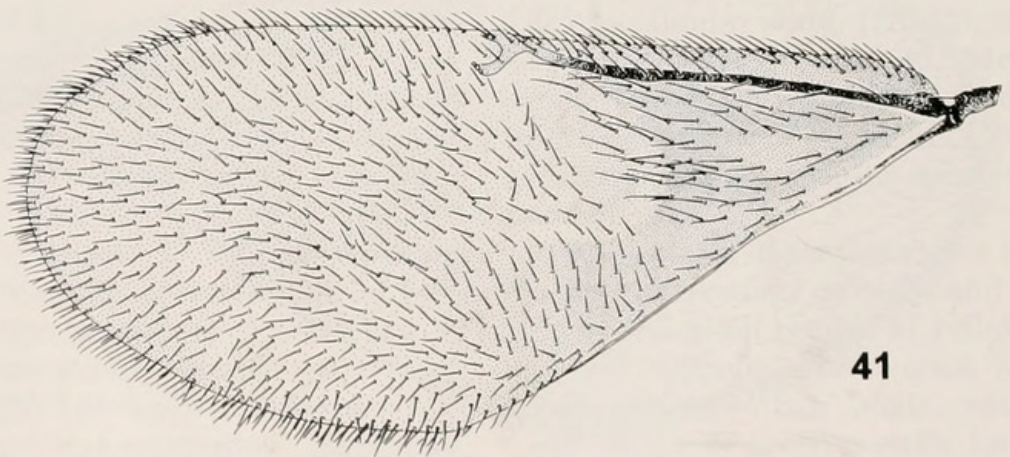
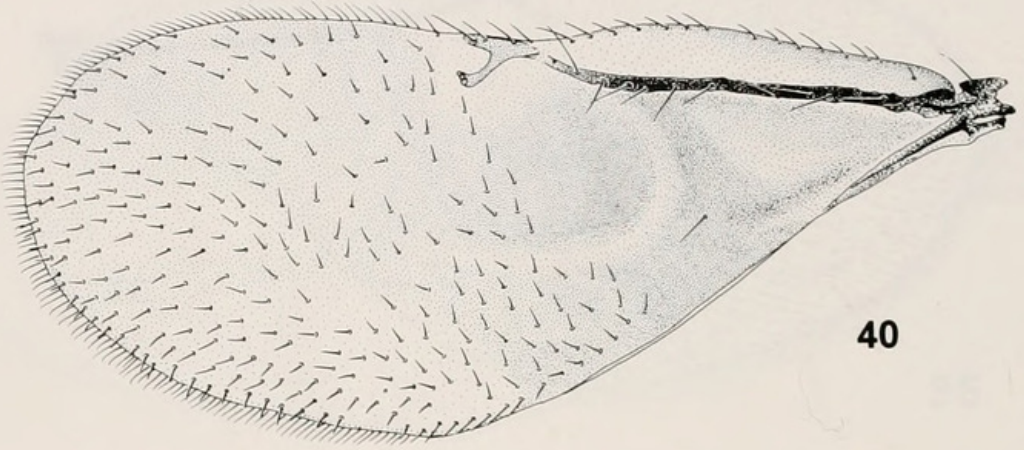
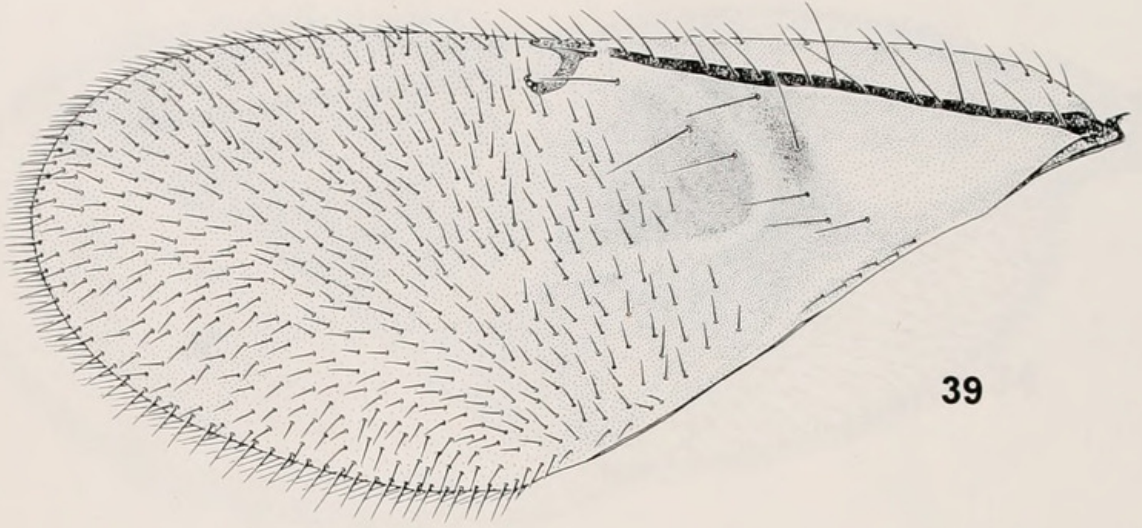
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Figs. 36–38. Forewings of *Hambletonia* species. 36, 37. *H. pilosifrons*. 36, female; 37, male 38. *H. pseudococcina*, female.





Figs. 39–41. Forewings of *Hambletonia* species. 39. *H. undulitibiae*, female. 40. *H. roseni*, female. 41. *H. squalicephala*, female.



Rica, mesoscutum, except basal  $\frac{1}{4}$  or so, also darker, orange brown, same color as axillae and scutellum); forewing with more or less expressed brownish infuscation, which is stronger in basal half and in anterior part of apical half (Fig. 40); all legs yellow to orange yellow, same color as body, or slightly lighter.

**Sculpture and pubescence.**—**Head:** frontovertex slightly convex, almost smooth, matt, with scattered minute punctures and very inconspicuous, extremely minute translucent hairs, visible only at higher magnification, at certain angle and illumination; anterior edge of frontovertex (dorsal view) convex; face with short, yellowish to brownish translucent hairs on interantennal prominence, and slightly longer hairs on clypeus; eyes with sparse, extremely minute translucent hairs; gena smooth, with very sparse, extremely minute translucent hairs. **Mesosoma:** mesoscutum punctulate, with extremely shallow reticulation between punctures, and brownish hairs arising between punctures at angle of about  $30^\circ$  to surface of mesoscutum; axillae and scutellum smooth, with very few scattered punctures, and sparse brownish translucent hairs, similar to hairs on mesoscutum; posterior margin of scutellum with row of deeper punctures; prepectus with reticulate sculpture, which is isodiametric in anterior half, and slightly elongate and shallower in posterior half; mesopleuron glabrous; metanotum laterally of dorsellum irregularly alveolate to rugulose; propodeum dorsally with irregular carinae in collar region and short longitudinal irregular carinae in plical region. **Metasoma** dorsally almost smooth, except for extremely shallow, transversely reticulate to rugulose sculpture on tergum II (first visible); pubescence consisting of short, scattered, brownish hairs on terga VI and VII and in anterior half of syntergum VIII, and longer brownish hairs in posterior half of syntergum VIII with (especially along its posterior margin).

**Male.**—Unknown.

**Hosts and Biology.**—Unknown.

**Material examined.**—**Holotype** ♀: PANAMA: Las Cumbres, 1–7.x.1982 (H. Wolda) (BMNH). **Paratypes:** same location, 3–9.xi.1982 (H. Wolda), 1 ♀ (left antenna and left wings in microslide # OSU-0011); Barro Colorado, 20–27.iii.1983 (H. Wolda), 1 ♀; COSTA RICA: Alaj Pv. Fa Sn Gabriel, 600 m, 2 km W Dos Rios, vii.1988 (Gauld & Mitchell), 1 ♀ (BMNH).

**Distribution.**—Panama, Costa Rica.

**Etymology.**—Named after our colleague and friend, the Israeli hymenopterist Dr. David Rosen, who died on January 8, 1997, when this paper was under preparation. Dr. Rosen contributed much to the knowledge of systematics, biology, and practical use of Chalcidoidea.

**Diagnosis.**—Very close to *H. pseudococcina*, from which differs by the almost hairless basal part of the forewing (Fig. 40), and the presence of extremely minute hairs on the frontovertex and eyes.

***Hambletonia setosifrons* Sharkov & Woolley, new species**  
(Figs. 9, 30)

**Female** (holotype measurements in parentheses).—Body length 1.78–2.47 (2.25) mm.

**Relative measurements.**—**Head** width  $1.78\text{--}1.91 \times$  length,  $1.12\text{--}1.15 \times$  height (83:46.5:74); frontovertex  $\times$  width at level of anterior ocellus  $0.58\text{--}0.60 \times$  its length,  $0.43\text{--}0.44 \times$  width of head (36.5:63:83); ocelli in obtuse triangle, with angle at anterior ocellus of  $113^\circ\text{--}114^\circ$  ( $114^\circ$ ); POL:OOL:LOL:OCL = 23:3.5:11:7 (in holotype); OOL  $0.64\text{--}0.82 \times$  diameter of posterior ocellus (3.5:5.5); distance between antennal toruli  $1.80\text{--}1.86 \times$  distance between torulus and mouth margin,  $0.67\text{--}0.77 \times$  mouth width (18:10:23.5); eye maximum diameter  $1.24\text{--}1.36 \times$  minimum diameter (47:35); posterior orbit of eye reaching occipital margin (dorsal view); antenna as in Fig. 30; scape strongly broadened and flattened, length  $1.56\text{--}1.67 \times$  maximum width (27.5:16.5); funicle 6-segmented. **Mesosoma** length  $0.99\text{--}1.2 \times$  width (77:78); mesoscutum length  $0.49\text{--}0.55 \times$  width (38:77.5); scutellum length  $0.88\text{--}0.94 \times$  width (42:44.5);



mid tibial spur  $0.80\text{--}0.84\times$  as long as mid basitarsus,  $0.27\text{--}0.28\times$  as long as mid tibia ( $17.5:22:64$ ); forewing length  $2.13\text{--}2.23\times$  maximum width ( $151.5:68$ ). **Metasoma** length  $1.15\times$  width ( $85:74$ ); distance from cerci to base of metasoma  $1.22\text{--}1.29\times$  corresponding distance to apex of metasoma ( $56:46$ ).

**Color.**—**Head:** frontovertex brownish orange, at certain illumination with slight pink or purple metallic luster; face yellow to orange yellow; gena yellow; occiput yellow to orange yellow; antenna (Fig. 30) with radicle yellow, scape black except for yellowish brown base, pedicel and funicle brownish yellow, clava black, with brownish-white truncation. **Mesosoma:** pronotum dorsally, mesoscutum, and axillae brownish orange to orange brown or dark brown, with darker posterior margin of mesoscutum and interior corner of axillae; scutellum brownish orange, slightly darker anteriorly; sides of pronotum brownish yellow; tegulae translucent, slightly brownish; forewing with slight infuscation in basal  $\frac{1}{3}$  or so, and almost inconspicuous infuscation anteriorly, beyond postmarginal vein (similar to *H. pseudococcina* and *H. pilosifrons* n. sp., Figs. 36, 38); mesopleuron orange brown; all legs yellow, with brownish-yellow coxae; metanotum and propodeum dorsally and laterally brownish yellow to yellowish brown. **Metasoma** yellow to brownish yellow, very slightly darker posteriorly.

**Sculpture and pubescence.**—**Head** (Fig. 9): frontovertex convex, smooth, matt, with erect translucent brownish hairs; vertex between and behind posterior ocelli extremely shallowly minutely transversely reticulate; anterior edge of frontovertex (dorsal view) convex (similar to *H. pseudococcina*, Fig. 14); face smooth, hairless except for translucent brownish hairs on interantennal prominence and longer hairs on clypeus; eyes with translucent hairs; gena smooth, with small piliferous punctures and scattered brownish hairs; posterior margin of gena with low carina

separating it from occiput. **Mesosoma:** pronotum and mesoscutum with extremely shallow, minute, transverse reticulation, and few scattered, minute punctures; axillae and scutellum smooth, with very few scattered minute punctures; pronotum, mesoscutum, axillae and scutellum with semiappressed to semierect brownish hairs; mesopleuron glabrous; forewing venation similar to *H. pseudococcina* and *H. pilosifrons* n. sp. (Figs. 36, 38); metanotum laterally of dorsellum with several oblique and one transverse carinae; propodeum laterally with irregular uneven surface in upper half, dorsally with mainly longitudinal, irregular carinae, with few short, slightly curved hairs dorsolaterally. **Metasoma** smooth, with few short hairs on lateral part of terga IV and V, appressed short hairs on posterior edge of terga VI and VII, and more numerous, longer hairs on syntergum VIII.

**Male.**—Unknown.

**Hosts and Biology.**—Unknown.

**Material examined.**—*Holotype* ♀: COSTA RICA: Puntarenas, RF Golfo Dulce 3 km SW Rincon, 10 m, xi.1992, (P. Hanson) (BMNH). *Paratypes*: Cartago, Turrialba, CATIE, 22.vi.1994 (P. Hanson), 2 ♀ (left antenna and left wings of 1 ♀ in microslide # OSU-0019) (BMNH).

**Distribution.**—Costa Rica.

**Etymology.**—The name reflects the presence of setae on the frontovertex.

**Diagnosis.**—Close to *H. pseudococcina* and *H. pilosifrons* n. sp. From *H. pseudococcina* differs by the presence of hairs on the frontovertex and eyes (Fig. 9), and from *H. pilosifrons* n. sp. differs by more elongated clava, and completely black scape (Fig. 30).

***Hambletonia squalicephala* Sharkov & Woolley, new species**  
(Figs. 16–18, 23, 24, 41, 42)

**Female** (holotype measurements in parentheses).—Body length  $1.54\text{--}1.55$  ( $1.55$ ) mm.

**Relative measurements.**—**Head** width  $1.58\text{--}1.65\times$  length,  $1.24\text{--}1.27\times$  height ( $64:40.5:50.5$ ); frontovertex width at level of



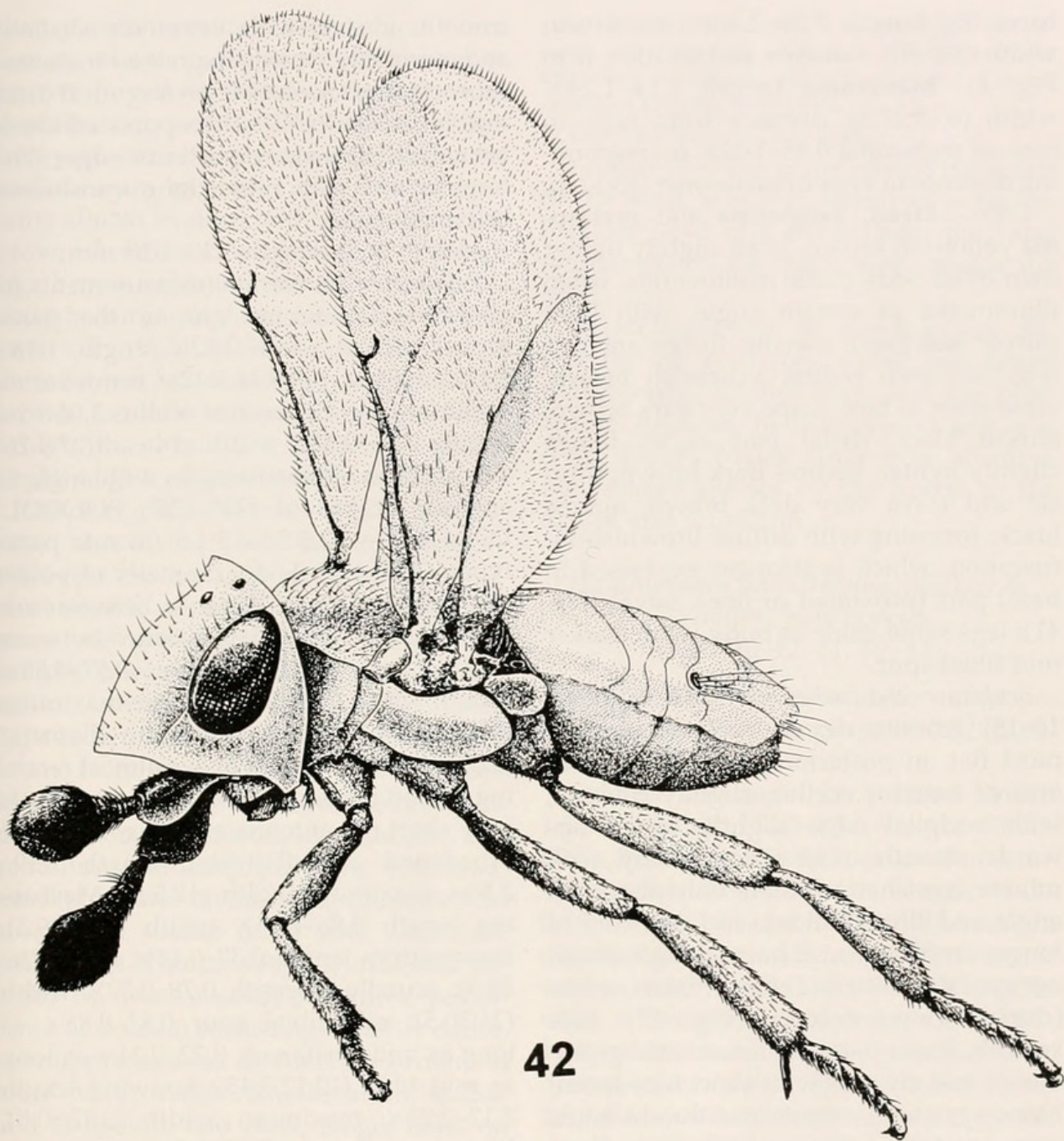


Fig. 42. *Hambletonia squalicephala*, female habitus.

anterior ocellus  $0.78\text{--}0.79\times$  its length,  $0.59\text{--}0.6\times$  width of head (38:48:64); ocelli in obtuse triangle, with angle at anterior ocellus of  $126^{\circ}\text{--}131^{\circ}$  ( $126^{\circ}$ ); POL:OOL:LOL:OCL = 17:8.5:8.5:2.5 (in holotype); OOL  $2.29\text{--}2.43\times$  diameter of posterior ocellus (8.5:3.5); distance between antennal toruli  $1.73\times$  distance between torulus and mouth margin,  $0.55\times$  mouth width (13:7.5:23.5); eye maximum diameter 1.57–1.63 $\times$  minimum diameter (27.5:17.5); pos-

terior orbit of eye almost reaching occipital margin (dorsal view); temple very short (2); antenna as in Fig. 24; scape strongly broadened and flattened, length  $1.71\text{--}1.74\times$  maximum width (20:11.5); funicle 5-segmented. **Mesosoma** length  $1.04\text{--}1.09\times$  width (56:54); mesoscutum length  $0.43\text{--}0.45\times$  width (23:54); scutellum length  $0.7\text{--}0.73$  width (23:33); mid tibial spur  $0.96\times$  as long as mid basitarsus,  $0.26\times$  as long as mid tibia (12:12.5:45);



forewing length  $2.38\text{--}2.44\times$  maximum width (122:50); venation and setation as in Fig. 41. **Metasoma** length  $1.14\text{--}1.24\times$  width (65.5:57.5); distance from cerci to base of metasoma  $0.95\text{--}1.02\times$  corresponding distance to apex of metasoma (33:32.5).

*Color.*—**Head**, **mesosoma** and **metasoma** yellowish brown, head slightly lighter than other body parts; frontovertex, when illuminated at certain angle, with light purple and green metallic luster; antenna (Fig. 24) with radicle yellowish brown, same color as face, scape very dark brown, almost black, distal part of its flange slightly lighter, pedicel dark brown, funicle and clava very dark brown, almost black; forewing with diffuse brownish infuscation, which is stronger expressed in basal part (proximad of linea calva) (Fig. 41); legs same color as body, with darker mid tibial spur.

*Sculpture and pubescence.*—**Head** (Figs. 16–18): frontovertex in anterior part almost flat, in posterior part, especially in area of anterior ocellus, slightly concave, with occipital edge slightly raised upwards, smooth, more or less glossy, with minute erect hairs (visible only at certain angle and illumination), and one row of longer erect brownish hairs along each inner eye orbit; anterior edge of frontovertex (dorsal view) convex (Fig. 17); face smooth; lower part of interantennal prominence and clypeus with short translucent hairs; eyes with minute translucent hairs; gena smooth, glossy, with few short brown hairs. **Mesosoma**: pronotum, mesoscutum, axillae and scutellum smooth, glossy, with appressed and semierect brownish hairs; mesoscutum with scattered small punctures, scutellum with few punctures along posterior margin; mesopleuron glabrous, glossy; metanotum laterally of dorsellum with several carinae in posterior part directed from its lateral (outer) margin toward dorsellum; propodeum laterally smooth, with irregular surface, its callar region carinate, and plical region smooth. **Metasoma** dorsally

smooth, glossy, with extremely shallow and extremely weakly expressed transversal coriaceous sculpture on tergum II (first visible); terga V–VII with appressed short brownish hairs along posterior edge; syntergum VIII with rather long translucent brownish hairs.

*Male.*—Body length 1.13–1.29 mm.

*Relative measurements* (measurements in parentheses refer to one of the paratypes).—**Head** width  $2.02\times$  length,  $1.18\text{--}1.19\times$  height (49.5:24.5:42); frontovertex width at level of anterior ocellus  $1.06\times$  its length,  $0.56\text{--}0.57\times$  width of head (27.5:26:49); ocelli in obtuse triangle, with angle at anterior ocellus of  $121^\circ\text{--}125^\circ$ ; POL:OOL: LOL:OCL =  $12.5:5.5:6.5:1.5$  (in one paratype); OOL  $1.25\text{--}1.38\times$  diameter of posterior ocellus (5.5:4); distance between antennal toruli  $1.85\text{--}2.1\times$  distance between torulus and mouth margin,  $0.57\text{--}0.58\times$  mouth width (12.5:5.5:215); eye maximum diameter  $1.22\text{--}1.31\times$  minimum diameter (21:16); posterior orbit of eye almost reaching occipital margin (dorsal view); temple very short (2); antenna as in Fig. 23; scape broadened and flattened, length  $2.19\text{--}2.54\times$  maximum width (17.5:8). **Mesosoma** length  $0.86\text{--}1.15\times$  width (56.5:59.5); mesoscutum length  $0.37\text{--}0.44\times$  width (26:59.5); scutellum length  $0.78\text{--}0.79\times$  width (24:30.5); mid tibial spur  $0.81\text{--}0.86\times$  as long as mid basitarsus,  $0.22\text{--}0.24\times$  as long as mid tibia (12:12.5:45); forewing length  $2.12\text{--}2.23\times$  maximum width (107:50.5). **Metasoma** length  $0.95\text{--}1.1\times$  width (50:45.5); distance from cerci to base of metasoma  $0.7\text{--}0.85\times$  corresponding distance to apex of metasoma (23:27).

*Color.*—**Head**: frontovertex very dark brown to almost black, at certain illumination with weakly expressed purplish and bluish metallic luster; face very dark brown, with darker, almost black middle  $\frac{1}{3}$  above interantennal prominence; gena very dark brown; temples and occiput very dark brown to almost black; antenna (Fig. 23) with radicle light brown, scape light brown to brown, very slightly darker



than radicle, pedicel, funicle and clava brown; mouth parts very light brown to brownish yellow. **Mesosoma**: pronotum dorsally, mesoscutum, axillae and scutellum very dark brown, almost black; sides and ventrum brown to dark brown; forewing almost hyaline, with extremely weak brownish infuscation in basal  $\frac{1}{3}$  or so; all legs brown, with femora and tibiae gradually becoming light brown toward apex, tarsi very light brown; mid tibial spur dark brown; metanotum and propodeum brown to dark brown. **Metasoma** dark brown to very dark brown dorsally, slightly lighter laterally and ventrally.

*Sculpture and pubescence*.—**Head**: frontovertex almost flat (very slightly convex), with very shallow coriaceous sculpture, almost smooth around anterior ocellus, with numerous semierect brown hairs; face smooth, lower part of interantennal prominence and clypeus with semiappressed light brown hairs; eyes with minute translucent hairs; gena smooth, with few scattered short brown hairs. **Mesosoma**: pronotum dorsally, mesoscutum, axillae and scutellum smooth, with few scattered, small punctures on mesoscutum; scutellum almost flat; axillae fused with scutellum, with traces of sutures slightly indicated laterally by lines of small punctures; pubescence of dorsum consisting of rather dense, semiappressed to semierect, brownish hairs on pronotum, mesoscutum, axillae and scutellum, and erect, longer hairs on apex of scutellum; pronotum laterally shallowly reticulate; prepectus, mesopleuron, and sides of propodeum smooth; metanotum and callar region of propodeum with several irregular carinae. **Metasoma** dorsally with tergum II shallowly transversely reticulate, terga V–VII smooth, with appressed short hairs along their posterior edge; syntergum VIII with longer (especially posteriorly) brown hairs.

*Hosts and Biology*.—Unknown.

*Material examined*.—*Holotype* ♀: COSTA RICA: San Vito, 1500 m, Las Cruces. Wilson Bot. Gdns, 18–22.iii.1990 (J.S. Noyes) (BMNH). *Paratypes*:

same data, 2 ♀ and 2 ♂ (1 ♀ in microslide; left antenna and left wings of second ♀ in microslide # OSU-0014; left antenna and left wings of 1 ♂ in microslide # OSU-0015) (BMNH).

*Distribution*.—Costa Rica.

*Etymology*.—The name reflects the shape of the head, which in lateral view resembles the head of a shark (from the Latin words *squalus*, the shark, and *cephalon*, the head).

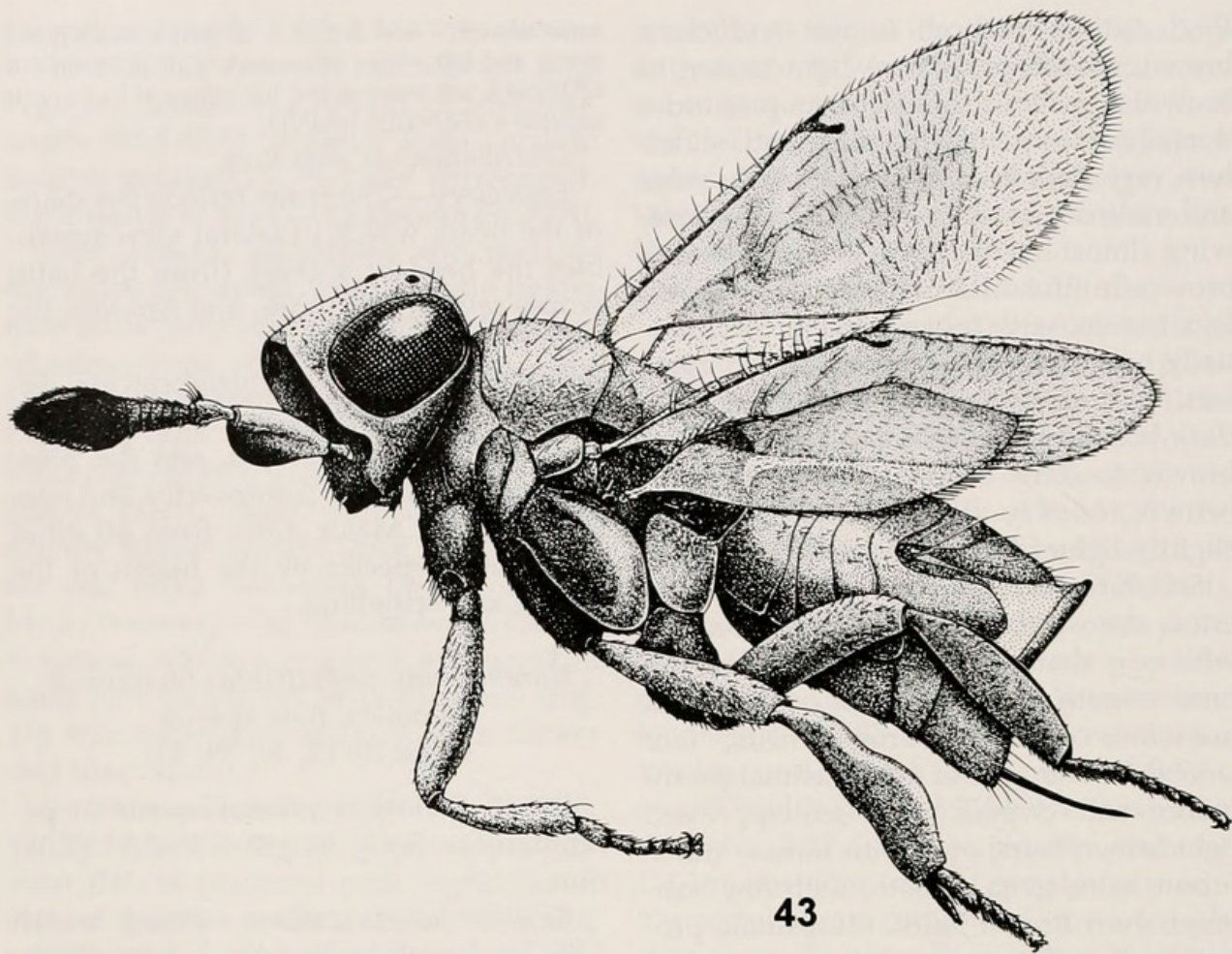
*Diagnosis*.—From *H. pseudococcina* differs by the relatively wider and flatter frontovertex, smaller eyes, and the presence of hairs on the frontovertex and eyes (Figs. 16–18). Males differ from all other *Hambletonia* species by the fusion of the axillae and scutellum.

*Hambletonia undulitibiae* Sharkov & Woolley, new species  
(Figs. 10–12, 31, 39, 43)

*Female* (holotype measurements in parentheses).—Body length 1.96–2.52 (2.08) mm.

*Relative measurements*.—**Head** width  $1.85\text{--}2\times$  length,  $1.23\text{--}1.3\times$  height (78:39:60.5); frontovertex width at level of anterior ocellus  $0.67\text{--}0.88\times$  its length,  $0.42\text{--}0.45\times$  width of head (32.5:40:78); ocelli in obtuse triangle, with angle at anterior ocellus of  $109^{\circ}\text{--}117^{\circ}$  ( $114^{\circ}$ ); POL:OOL:LOL:OCL = 16:4:8:2 (in holotype); OOL  $0.67\text{--}1.1\times$  diameter of posterior ocellus (4:5); distance between antennal toruli  $2.06\text{--}2.5\times$  distance between torulus and mouth margin,  $0.7\text{--}0.8\times$  mouth width (18.5:8:26.5); eye maximum diameter  $1.21\text{--}1.44\times$  minimum diameter (38:30); posterior orbit of eye almost reaching occipital margin (dorsal view); temple very short (1.5); antenna as in Fig. 31; scape strongly broadened and flattened, length  $1.54\text{--}1.83\times$  maximum width (28:16.5); funicle 6-segmented. **Mesosoma** length  $1.09\text{--}1.16\times$  width (83:76); mesoscutum length  $0.47\text{--}0.49\times$  width (36:76); scutellum length  $0.8\text{--}0.94\times$  width (39.5:45); mid tibial spur  $0.66\text{--}0.83\times$  as long as mid basitarsus,  $0.21\text{--}0.24\times$  as long as mid tibia (12.5:19:





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Fig. 43. *Hambletonia undulitibiae*, female habitus.

60); forewing length  $2.21\text{--}2.41\times$  maximum width (147:61); venation and setation as in Fig. 39. **Metasoma** length  $1.16\text{--}1.22\times$  width (88:76); distance from cerci to base of metasoma  $1.35\text{--}1.61\times$  corresponding distance to apex of metasoma (46:34).

**Color.**—**Head**, **mesosoma** and **metasoma** yellow orange to brownish orange dorsally and laterally, sometimes with slightly darker axillae and anterior part of mesoscutum, without any metallic luster, slightly lighter, orange yellow to yellow ventrally; antenna (Fig. 31) with radicle orange to brownish yellow, scape brownish orange yellow (with slightly brownish flange) to completely very dark brown, almost black, pedicel yellowish orange to orange brown, with darker base, funicle yellow orange to orange brown, clava in basal approximately  $\frac{1}{4}$  same color as fu-

nicle, gradually becoming black in apical  $\frac{2}{3}$  or so, slightly lighter at apex; forewing weakly, more or less uniformly infusate with brownish yellow, with slightly stronger infuscation in basal half, and diffuse darkening along line of hairs delimiting distal margin of basal cell (Fig. 39); legs same color as body, or slightly lighter.

**Sculpture and pubescence.**—**Head** (Figs. 10–12): frontovertex slightly convex, smooth, more or less glossy, with numerous small punctures, and erect brown hairs; anterior margin of frontovertex (dorsal view) slightly concave (sometimes, almost straight), in middle very thin and translucent (Fig. 11); face minutely superficially reticulate; lower part of interantennal prominence, and clypeus with short, brownish hairs; eyes with translucent hairs; gena minutely, extremely shallowly



reticulate, with scattered erect brown hairs; posterior margin of gena with more or less expressed carina, separating it from occiput. **Mesosoma**: lateral part of pronotum and prepectus reticulate; mesoscutum minutely, very shallowly, isodiametrically reticulate, with scattered punctures; axillae minutely, extremely shallowly reticulate; scutellum smooth, with very few scattered, minute to small punctures, its apex with inconspicuous, shallow, coriaceous sculpture; dorsum of metasoma with erect brown hairs, hairs longer on apex of scutellum; mesopleuron with glabrous upper part, and vertically coriaceous lower part; metanotum laterally of dorsellum with several long oblique carinae directed from its outer margin toward dorsellum, and several short, very weakly indicated longitudinal carinae directed posteriad from its anterior margin; propodeum laterally reticulate, with carinate callar region, and longitudinally carinate plical region; mid tibia characteristically thickened, slightly flattened laterally, undulate dorsally, and slightly undulate ventrally (in one specimen these features, especially undulation, are weakly expressed); hind tibia slightly thickened, flattened laterally, and carinate dorsally (Fig. 43). **Metasoma** with tergum II (first visible) very shallowly transversely coriaceous, shiny, terga III–VIII almost smooth; pubescence consisting of brown hairs on lateral part of all terga, shorter brownish hairs on posterior edge of terga V–VII, and longer brownish hairs of syntergum VIII.

*Male*.—Unknown.

*Hosts and Biology*.—Unknown.

*Material examined*.—*Holotype* ♀: COSTA RICA: 10°25'N 84°01'W, Heredia, 3 km S Puerto Viejo, OTS La Selva, 100 m, iii.1991 (P. Hanson) (INBio). *Paratypes*: Heredia, La Selva BS, 50 m, ii.1991, MT/YPT (J.S. Noyes), 1 ♀; Alajuela, Peñas Blancas, viii.1987 (E. Cruz), BM 1988-119, 1 ♀ (left antenna and left wings in microslide # OSU-0013); Guanacaste P., Sta Rosa NP, Sn. Emilio-8-C, 8.ii–1.iii.1986 (Janzen & Gauld), 1 ♀ (BMNH).

*Distribution*.—Costa Rica.

*Etymology*.—The name reflects the un-

dulate shape of the dorsal edge of the mid tibia.

*Diagnosis*.—From *H. pseudococcina* differs by the longer funicle and clava (Fig. 31), the presence of brown erect hairs on the frontovertex and brownish translucent hairs on the eyes, the concave anterior edge of frontovertex (Fig. 10–12), the almost naked basal cell of the forewing (Fig. 39), the thickened, flattened and undulate mid tibia, and the carinate dorsal margin of the hind tibia (Fig. 43).

### *Hambletonia* spp.

We were unable to assign four female specimens to any of the above species. Each of them apparently belongs to a separate species, and differs in some features from all other species. However, the material was insufficient to assess the consistency of those differences, and to determine the specific status of the specimens.

*Material examined*.—COSTA RICA: Cartago, Turrialba, CATIE, 22.vi.1994 (P. Hanson), 1 ♀; ECUADOR: Napo Misa hualli, 20.ii.1983 (L. Huggert), 1 ♀, BM 1984-337; Napo Tena, 16.ii.1983 (L. Huggert), 1 ♀; PERU: Madre de Dios, Rio Tambopata Res., 12°50'S 69°20'W, 1–13.xi.1983 (N.E. Stork), 1 ♀ (BMNH).

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