

**TWO NEW SPECIES OF *PSYLLAEPHAGUS* ASHMEAD  
(HYMENOPTERA: CHALCIDOIDEA: ENCYRTIDAE)  
ATTACKING *MYCOPSYLLA* SP. (HOMOPTERA:  
PSYLLIDAE) INFESTING *FICUS RELIGIOSA* IN  
MIZORAM, INDIA**

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**ABSTRACT.** Two new species of the encyrtid genus *Psyllaephagus* Ashmead i. e., *P. mycopsyllus* and *P. aizawlensis* are described from Mizoram, India and compared with related species. Both are parasitoids of *Mycopsylla* Froggatt sp. (Psyllidae) on *Ficus religiosa* leaves in Aizawl. Additional distribution data for the two described species, *P. macrohomotoma* and *P. mesohomotoma* are given. Keys to the males and females of Indian species are given. *Psyllaephagus drosophilidus* Singh & Agarwal is synonymised with *Cerchysius latiscapus* Kerich. A host-parasitoid list is appended.

### Introduction

During a recent visit to Aizawl, Mizoram, a road side *Ficus religiosa* tree was seen heavily attacked by a psyllid, *Mycopsylla* sp. (identified from Mathur, 1975). This species infests the ventral surface of leaves and its nymphs secrete white waxy filaments which, in combination with pale rubbery material (perhaps dried milky resin from the leaves), make hiding galleries (Fig. 14). The adults have hyaline wings, the females are green and the males brownish in color. Yellow spots appear on the dorsal surface of the leaves due to heavy attack. The leaves eventually turn brown, dry up and drop. Repeated attacks by the psyllid reduce the vigor of the tree which may die ultimately.

Two new species of *Psyllaephagus* emerged from *Mycopsylla* sp. collected from the above mentioned ficus tree. These are described below. The type specimens are deposited in the Entomological Museum, Forest Research Institute, Dehra Dun. Two females and two males paratypes of each species are also deposited in the Institute of Rain and Moist Deciduous Forests Research, Jorhat, India.

All the measurements are in  $\mu\text{m}$ , except when mentioned otherwise. In species description the measurements of head, thorax and gaster are taken from the holotypes (dried specimens on cards) and those of antenna, wings, legs, and gasteral components (X-tergum, hypopygium, ovipositor, etc.) are from the paratypes mounted on slides.

## Genus *Psyllaephagus* Ashmead

*Psyllaephagus* Ashmead, 1900: 382. Type species: *Encyrtus pachypsyllae* Howard, by original designation.

For generic synonymy see Noyes & Hayat (1984); and for generic characters, distribution and world literature see Singh & Agarwal (1992).

*Psyllaephagus* is a large genus comprising about 200 species (Trjapitzin, 1989). All the species are primary parasitoids of psyllids.

*Psyllaephagus faridabadensis* Fatima & Shafee, 1994: 53 is removed from this genus as it does not belong here. Its type specimens were studied.

*Psyllaephagus drosophilidus* Singh & Agarwal, 1992: 74 is transferred to *Cerchysius* as a junior synonym of *C. laticeps* Kerrich. **Syn. nov.**

Two new species are described below. The genus now includes 6 species from India. I know of another species, perhaps undescribed, occurring in Pantnagar, Uttar Pradesh.

The Indian species may be arranged under two groups as follows:

**Group A.** Large sized species, female length = 1.77-3.0 mm, male length = 1.41-2.2 mm; gaster beyond hypopygium tapering considerably into pointed apex in female; ovipositor exerted at least by one-third of gaster length; X-tergum V-shaped; male antenna with more or less flattened funicle segments; these segments with small setae, length of setae not exceeding 0.5 the width of respective segment.

**Group B.** Small sized species, female length = 1.25-2.5 mm, male length = 1.0-1.7 mm; gaster beyond hypopygium normal, apex pointed but not as in above, in females; ovipositor not or slightly exerted, at most by one-fifth of gaster length; X-tergum crescent shaped; male antenna with funicle cylindrical, funicle segments with very long setae, length of setae as long as or longer than the respective funicle segment.

### Key to the Indian species of *Psyllaephagus* Ashmead

Females (Modified from Singh & Agarwal, 1992)

1. Gaster beyond hypopygium tapering into pointed apex; ovipositor long, exerted part equal to or more than 0.33 the gaster length; tergum-X V-shaped; large sized species. (Group A) .....2
- Gaster otherwise; ovipositor not exerted, if so then less than 0.25 the gaster length; tergum-X crescent or broad U-shaped; small sized species. (Group B) .....3
2. Antenna with scape dull brown, distal tip whitish; pedicel, F1-F3 and club light brown, rest of funicle lighter, all the funicle segments darker dorsally and yellowish white ventrally; scape flattened, a little more than 2.2x as long as wide; legs pale yellow, hind coxa brown; postmarginal vein equal to stigmal. ....*macrohomotoma* Singh & Agarwal

- Antennae black with distal tip of scape, and tips of pedicel and funicle pale; funicle segments have more pale area than any other parts of antenna; scape 2.4x as long as wide; legs including coxae pale white; postmarginal vein shorter than stigmal vein. .... *mycopsyllus*, sp. nov.
- 3. Legs with all coxae black. ....4
- Legs with middle and hind coxae black. ....5
- 4. Scape less than 4.0x as long as wide, F1 slightly longer than wide, F2-F6 quadrate, subequal in length, gradually widening distally; III-valvula short, about 0.1 of ovipositor length..... *aligarhensis* Shafee et al.
- Scape 2.76x as long as wide, F1-F5 longer than wide, width increasing distally; III-valvula 0.27 of ovipositor length. .... *aizawlensis*, sp. nov.
- 5. Body slender; scape 3.5x as long as wide; marginal vein as long as post-marginal; stigmal vein as long as combined length of marginal and postmarginal veins..... *mesohomotoma* Singh & Agarwal
- Body robust; scape 4.25x as long as wide; marginal vein half as long as postmarginal; stigmal vein longer than combined lengths of marginal and postmarginal veins. .... *tekeddyensis* Singh & Agarwal

#### Males

- 1. Antenna with more or less flattened funicle segments which have small setae whose length is at the most half the respective funicle segment width. (Group A). ....2
- Antenna with cylindrical funicle segments which have very long setae, whose length equal to or more than the length of respective segment. (Group B). ....3
- 2. Hind coxa black; scape 2.0x as long as wide; F1 longer than pedicel and equal to F2..... *macrohomotoma* Singh & Agarwal
- All coxae pale; scape more than 3.0x as long as wide; F1 more than half of pedicel and slightly less than half of 2. .... *mycopsyllus*, sp. nov.
- 3. All coxae black. ....4
- Middle and hind coxae black. .... *mesohomotoma* Singh & Agarwal
- 4. Scape 2.3x as long as wide; pedicel slightly shorter than F1.  
..... *aligarhensis* Shafee et al.
- Scape 2.13x as long as wide; pedicel 0.58x F1. .... *aizawlensis*, sp. nov.

#### 1. *Psyllaephagus mycopsyllus*, sp. nov. (Figs. 1-7)

*Female*: Length including ovipositor 2.438 ± 0.235 mm, n=27, (holotype 2.3 mm).

Head metallic green; eyes chocolate brown; ocelli reddish; sculpture of frontovertex reticulate with irregularly placed large punctures (60-80) bearing setae, their diameter about 0.33 of median ocellus, setae borne by the punctures small and pale white; area of face below frontovertex and between gena thickly setose with somewhat flattened silvery white setae giving silvery white appearance. Antennae black, distal tip of scape and tips of pedicel and funicle segments pale; funicle segments with more pale area. Thorax

slightly convex transversely; metallic green except lateral fringes of mesoscutum, most of prepectus and tegulae yellow (straw like); pronotum and mesoscutum with deep reticulate sculpture, setae pale and placed at a distance less than their own lengths; axilla with faint transverse reticulate sculpture with 14 setae on the lateral half only; scutellum with more prominent reticulate punctate sculpture than mesoscutum, setae smaller and denser near base. Legs wholly pale white, tips of pretarsi brownish. Wings hyaline with pale setae on disc, those on the veins darker. Gaster metallic green, ovipositor tip lighter.

*Head* in frontal view (Fig. 4) 1.23x as wide as long (756:610); 4.0x as wide as frontovertex (195); eye 2.0x as long as wide (439:219); toruli right on the line joining lower ends of the eyes; toruli 2.0x as long as wide (97:49); intertorular distance 1.62x (158), torulo-mouth distance (110) slightly longer, and torulo eye distance (89) slightly shorter than torular length; scrobes moderately deep, not meeting dorsally and reaching half way (171) torulo-mid ocellus distance (240). In dorsal view 2.2x as wide as long (756:341); frontal and occipital margins concave; eye 1.5x as long as wide; ocelli in equilateral triangle, POL (110) more than 2.0x, OCL equal to, diameter of median ocellus (49), OOL touching eye. In profile eye 1.25x as long as wide (427:341); malar sulcus concave anteriorly and ridged, malar space slightly less than half the eye length (207:427). Antenna (Fig. 1) with scape flattened 2.4x as long as wide (355:146), 3.5x as long as pedicel (100); pedicel 1.8x as long as wide (100:55); all the funicle segments except F6 longer than wide, F3 the longest; their length : width dimensions as follows: F1 (73:41), F2 (91:45), F3 (100:50), F4 (91:55), F5 (82:64), F6 (64:73); club rounded at apex, three segmented, about twice as long as wide (182:91), longer than preceding two funicle segments (182:164).

*Thorax* flat in side view, slightly convex transversely; pronotum 9.0x as wide as long (683:73); mesoscutum 1.4x as wide as long (756:536), posterior margin angular in the middle and separates axillae slightly; scutellum slightly wider than long (488:439), apex pointed and curved downward over the propodeum; propodeum very narrow. Fore wing 2.0x as long as wide (2093:819); marginal vein about as long as wide (36:32); postmarginal vein (146) 4.0x as long as marginal vein (Fig. 3); stigmal vein longer than postmarginal vein (164:146). Hind wing 3.33x as long as wide (1365:409), 1.5x as long as vein length (910). Middle leg tibial spur shorter than basitarsus (219:171).

*Gaster* slightly shorter than thorax (excluding ovipositor sheath), pointed distally; ovipositor sheath exerted by about 0.25 of gaster length (268:976), hypopygium reaching half way along gaster length. Ovipositor (Fig. 2) total length 1.67x gaster length (1638:976), II-valvifer 2.8x as long as III-valvula; quadrate plate 4.0x as long as wide (910:275), reaching middle of III-valvula.

*Male*: Length  $1.45 \pm 0.98$  mm (n=9, actual range 1.419 - 1.67 mm).

Resembles female in coloration and sculpture except antennal characters as follows : scape straw-yellow, with small elongated brown patches on inner dorsal side, pedicel and funicle segments with dark brown bases, rest straw-yellow; club dark brown.

*Head* in frontal view 1.25x as wide as long (610:488), 2.5x as wide as frontovertex at median ocellus; eye 2.0x as long as wide (317:158); scrobes shallow with rounded off margins, meeting dorsally, reaching half way between torulo-median ocellus distance (244); torular lower ends lying on the line joining lower margins of eyes; torulo eye distance (73) equal to, intertorular distance (146) 2x, and torulo mouth distance (134) less than 2.0x as long as, torular length (73). In dorsal view, ocelli in obtuse angle triangle, apical angle about 110°; POL (146) 2.9x, and OCL (19) less than half, the diameter of median ocellus (49), respectively; posterior ocellus touching eyes. In profile eye 1.29x as long as wide (317:244); malar space 0.39x head length (195:488); half as high as head length (244:488). Antenna (Fig. 7) with scape 3.1x as long as wide (255:82); pedicel rounded, slightly wider than long (64:55); funicle segments longer than wide, except F1, their length:width dimensions are as follows: F1 (36:55), F2 (82:64), F3 (136:64), F4 (136:91), F5 (136:91), F6 (91:73); club 1.7x as long as wide (155:91), as long as F6 and half of F5.

*Thorax*: Pronotum 4.8x as wide as long (236:49); mesoscutum 1.37x as wide as long (585:427), posterior margin with angular tip which separates axillae slightly; scutellum slightly longer than wide (366:334). Fore wing 2.12x as long as wide (1410:664); marginal vein punctiform (45); postmarginal slightly shorter than stigmal (109:127); hind wing 3.1x as long as wide (992:318), 1.5x as long as vein length (637); middle leg basitarsus 1.33x as long as tibial spur (182:136).

*Gaster* as long as wide, slightly shorter than thorax; genitalia as in Figs. 5 and 6.

*Holotype*: ♀, card mounted, INDIA: Mizoram: Aizawl: M. G. Road, ex. *Mycopsylla* sp., on leaves of *Ficus religiosa*, 8.XI.1993, Coll. Sudhir Singh. *Paratypes*: 33 ♀, 12 ♂ (1 ♀, 1 ♂, dissected and mounted on slides), data same as for holotype.

*Distribution*: India: Mizoram.

*Biology*: Primary parasitoids of late instars of *Mycopsylla* sp. on *Ficus religiosa* leaves.

*Etymology*: The species name is derived from its host's generic name.

*Comments*: *Psyllaephagus mycopsyllus* is close to *P. syntomozae* (Tachikawa, 1955), but differs as follows: Pedicel longer than F1 *vs* equal or shorter than F1; club longer than F1 and F2 combined *vs* equal to F1 and half of F2; head 4.0x as wide as frontovertex *vs* 3.66x only. In males scape spindle shaped (more than 3.0x as long as wide) *vs* triangularly expanded (more than 2.0x as long as wide; F1 transverse (half as long as pedicel) *vs* F1

longer than wide (1.5x as long as pedicel); F3-F5 twice as long as F2 or F6 *vs* funicle segments subequal and all longer than wide. It is also close to *P. macrohomotoma* Singh & Agarwal (1992) but differs by having black hind coxa, postmarginal vein equal to stigmal and other finer details of antennae in both females and males.

## 2. *Psyllaephagus aizawlensis*, sp. nov. (Figs. 8-13)

*Female*: Length, including ovipositor  $1.69 \pm 0.138$  mm ( $n = 32$ , range 1.29-2.031 mm) (holotype 2.0 mm).

Head metallic green with three to four hues - frontovertex with golden yellow, between median ocellus and dorsal scrobal margin hue changing from golden yellow to bluish; scrobes, intertorular prominence, malar space and area below with red to yellow/brown red hues; frontovertex reticulately punctate, punctures small and scattered unevenly into about six rows, setae in the punctures small and pale; setae on the rest of head small and dull; eyes asetose, chocolate brown in color; mandibles black; maxillary and labial palpi yellowish white like legs; malar sulcus inconspicuous. Antennal scape black to dark brown with silvery white small setae, rest of antenna light brown with dull brown setae. Thorax metallic green; mesoscutum with some light golden reflections, lateral and posterior margins darker; reticulate punctate with evenly distributed small punctures, with small dull white setae, as long as distance between two punctures, setae lining the posterior margin longer; sculpture on axillae not distinct; sculpture on scutellum as on the mesoscutum but slightly deeper, finer on median line; setae are similar in color and lengthen; tegulae brown with basal half pale; laterally and ventrally thorax black with dull metallic reflections; laterally metanotum and hind coxa with fine small silvery white setae, propodeum with longer setae. Wings hyaline. Legs light yellow, except for black coxae, tibial apices and tarsi with brownish tinge, pretarsi brownish and basal 0.66 of hind femur black. Gaster dark brown with little metallic reflections.

*Head* in frontal view 1.28x as wide as long (658:512), 3.0x as wide as frontovertex (219); eye 1.4x as long as wide (317:219); toruli lying right on the line joining lower margins of eyes, 1.5x as long as wide (73:49); torulo-eye (97) and torulo-mouth distance (97) each 1.32x, and intertorular distance (146) 2x as long as, torular length; scrobes moderately deep with rounded margins, meeting dorsally, and reaching more than half the distance between torulus and median ocellus (171:292). In dorsal view twice as wide as long (658:317); eye 1.44x as long as wide (317:219); ocelli in right angle triangle, POL (97) 1.76x, OCL (56) equal to, and OOL (22) 0.4x diameter of median ocellus (55). In profile head rounded in front, 1.5x as long as high (512:341); eye slightly longer than wide (372:329); malar sulcus inconspicuous, malar space (183) more than 0.33 the head length or 0.5 eye length in frontal view. Antenna (Fig. 8) with scape slightly flattened ventrally, 2.76x as long as wide (227:82); pedicel conical 2.15x its width (82:38); all the funicle segments longer than wide and widening dastardly, their length : width dimensions are

as follows: F1 (45:27), F2 (45:82), F3 (54:36), F4 (59:41), F5 (59:45) and F6 (59:54); club rounded at tip, distal suture slightly oblique, 2.1x as long as wide (173:82), about as long as preceding three funicle segments.

*Thorax:* Pronotum stripe like, 12.0x as wide as long (585:49); mesoscutum 1.43x as wide as long (683:475), posterior margin angular and separates axillae slightly; scutellum 1.13x as wide as long (415:366). Fore wing (Fig. 9) 2.29x as long as wide (1501:655); marginal vein as long as wide (45) and equal to postmarginal (45), stigmal 2.42x as long as postmarginal (109:45). Hind wing 3.26x as long as wide (1037:318), 1.54x as long as vein length (673). Middle leg basitarsus 1.5x as long as tibial spur (164:109).

*Gaster* pointed at apex; hypopygium reaching 0.5 of gaster length; ovipositor exerted by one-tenth of gaster length. Ovipositor longer than gaster length (819:780); ovipositor (Fig. 10) with III-valvula about 0.2 of ovipositor length (164:819); quadrate plate 3.32x as long as wide (546:164).

*Male:* Length,  $1.31 \pm 0.159$  mm (n = 11, range = 1.16 - 1.7 mm.).

Resembles female in color, sculptural and setal patterns except finer details as follows: Head and thorax metallic green with reddish hue punctation on head denser; antenna with scape yellow, pedicel brown and rest of flagellum straw colored or suffused light brown; setae on head longer; eyes conspicuously setose.

*Head* in frontal view 1.27x as wide as long (561:439), 2.19x as wide as frontovertex (256); eye 1.9x as long as wide (305:158); scrobes shallow meeting dorsally, reaching upwards to slightly less than 0.66 distance from torulus to median ocellus (122:195); toruli lying above line joining lower margin of eyes, 1.69x as long as wide (61:36), torulo-mouth distance (122) 2.0x, torulo-eye distance (85) 1.4x, and intertorular distance (105) 1.7x, as long as torular length. In dorsal view ocelli in obtuse triangle, apical angle about 100°; POL (146) 3.0x, OCL (15) 0.3x, and OOL (24) 0.5x as long as median ocellus diameter (49). In profile head 1.79x as long as high (439:244); eye 1.33x as long as wide (293:219); malar space 0.33 of head length (frontal) (146:439). Antenna (Fig. 11), scape swollen, spindle shaped, 2.13x as long as wide (145:68); pedicel round, slightly wider than long (54:48); all funicle segments longer than wide, their length: width dimensions as follows: F1 (82:50), F2 (86:54), F3 (91:54), F4 (95:54), F5 (100:45) and F6 (91:39); club unsegmented, 3.22x as long as wide (145:45), as long as the length of F6 and half of F5.

*Thorax:* Mesoscutum 1.55x as wide as long (549:353), posterior margin slightly separating axillae; scutellum slightly wider than long (329:317). Fore wing 2.19x as long as wide (1240:564); marginal, postmarginal and stigmal veins in the ratio of 45:45:100; hind wing 3.13x as long as wide (855:273), 1.5x as long as vein length (564); middle leg basitarsus 1.5x as long as tibial spur (365:244).

*Gaster* 0.66x as long as thorax (488:780); genitalia as in figures 12 & 13.

*Holotype*: ♀, card mounted, INDIA: Mizoram: Aizawl: M. G. Road, ex. *Mycopsylla* sp. on leaves of *Ficus religiosa*, 8.XI.1993, coll. Sudhir Singh. *Paratypes*: 23 ♀, 11♂ (in gelatin capsule), 11 ♀, 5♂ (on cards), 2 ♀, 1♂ dissected and mounted on a slide) with data same as for holotype.

*Distribution*: India: Mizoram.

*Biology*: Primary parasitoids of III-instar nymphs of *Mycopsylla* sp. on leaves of *Ficus religiosa*.

*Etymology*: Named after its place of collection.

*Comments*: *Psyllaephagus aizawlensis* sp. nov. resembles the South African species *P. secus* Prinsloo (1981), but is distinct as follows: Tegulae dark brown basal half pale vs wholly black; all funicle segments longer than wide vs F5 quadrate and F6 slightly wider than long; scape about 3.0x as long as wide vs 4.33x as long as wide. It is also close to *P. aligarhensis*, distinguishing characters are given in the key.

### 3. *Psyllaephagus macrohomotoma* Singh & Agarwal

*Psyllaephagus macrohomotoma* Singh & Agarwal, 1992: 81. Holotype and paratypes from Assam: North Lakhimpur. (AMU).

*Specimens examined*: Several ♀, ♂, INDIA: Mizoram: Saitual, 12.XII.94, coll. Sudhir Singh, ex. *Macrohomotoma* sp. on *Ficus*. (In Entomology Museum, Institute of Rain and Moist Deciduous Forests Research, Jorhat, Assam, India).

### 4. *Psyllaephagus mesohomotoma* Singh & Agarwal

*Psyllaephagus mesohomotoma* Singh and Agarwal, 1992: 77. Holotype and paratypes from U.P.: Aligarh. (AMU).

*Specimens examined*: INDIA: Assam: Silchar, 5 ♀, 3♂, 8.XII.94, coll. Sudhir Singh, ex. *Mesohomotoma hibisci* (Froggatt) on *Bombax cieba* (In Entomology Museum, Institute of Rain and Moist Deciduous Forests Research, Jorhat, Assam, India).

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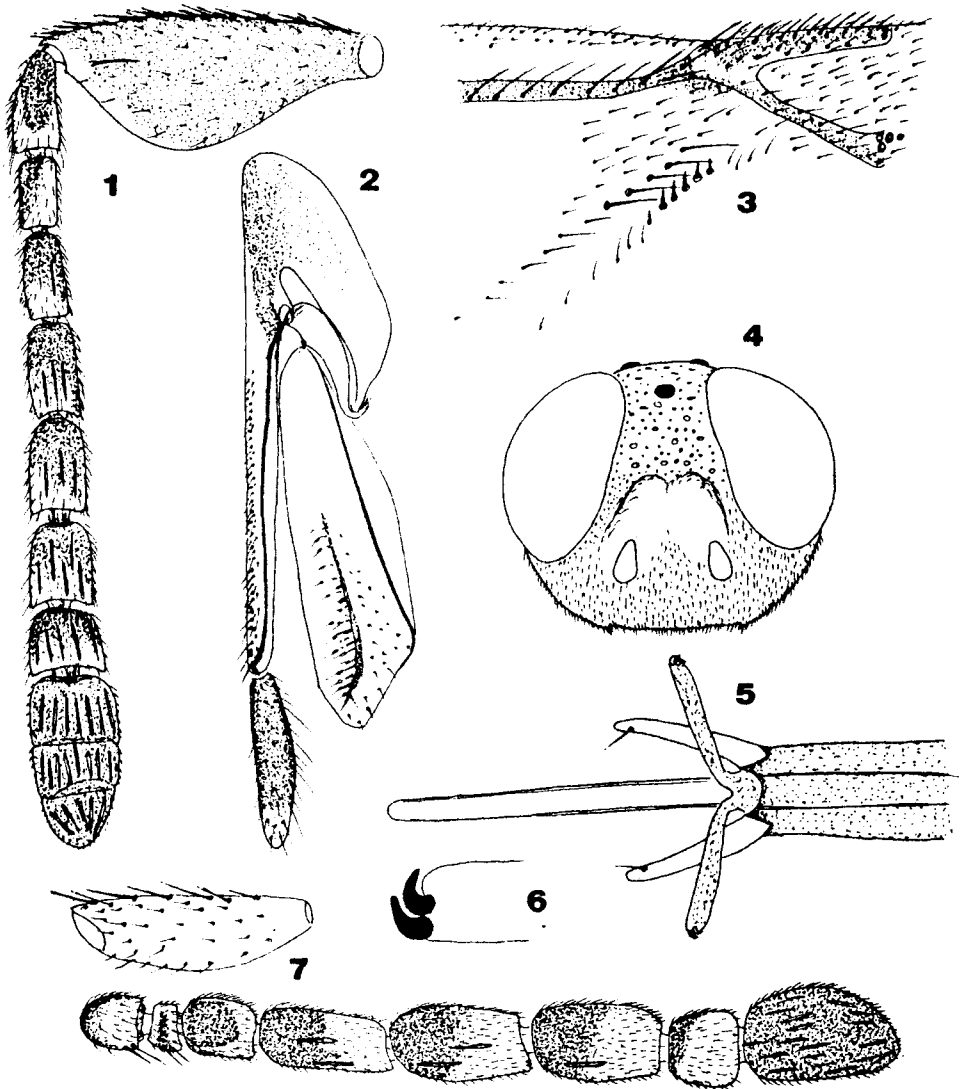


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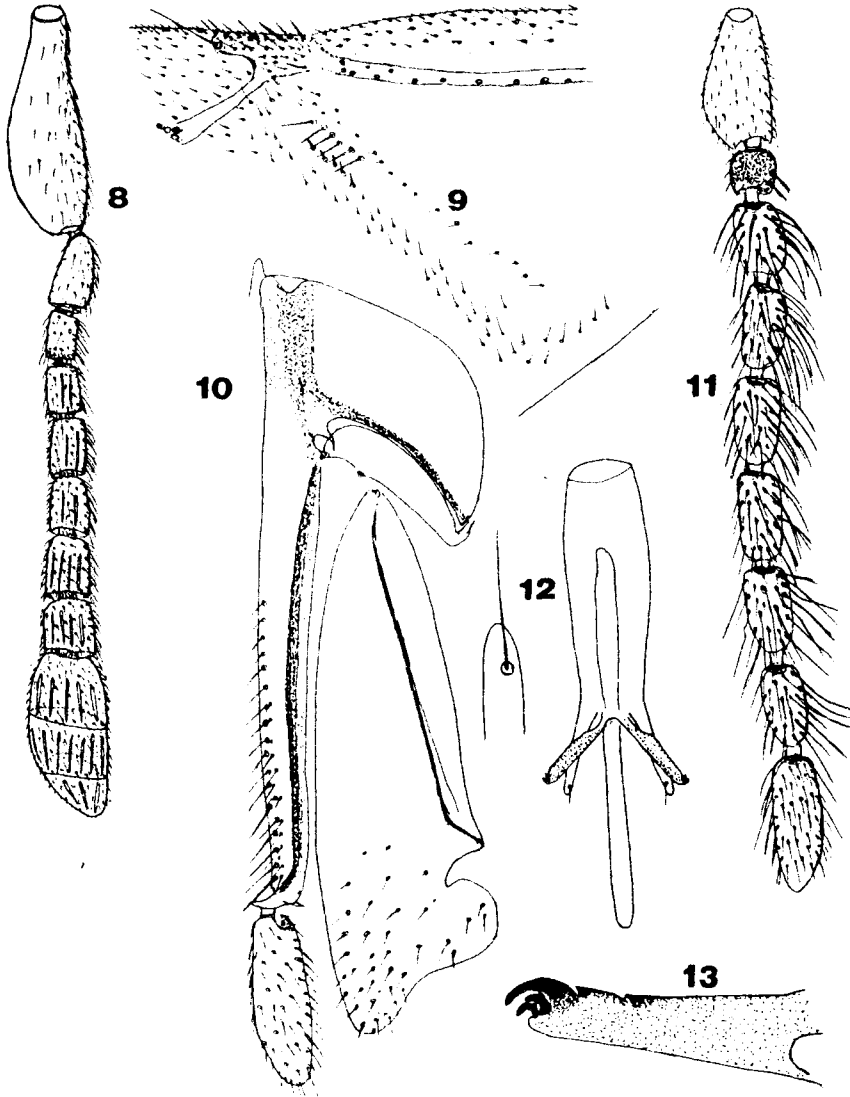
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## Parasitoid-Host-Plant List

No.	Parasitoid	Psyllid Host	Plant	Distribution
1	<i>Psyllaephagus aligarhensis</i>	<i>Psylla</i> sp.	<i>Citrus</i> sp., leaves	Aligarh, U.P.
2.	<i>Psyllaephagus mesohomotoma</i>	<i>Mesohomotoma hibisci</i>	<i>Bombax ceiba</i> , leaves	Aligarh, U.P.; Silchar, Assam
3.	<i>Psyllaephagus macrohomotoma</i>	<i>Macrohomotoma</i> sp.	<i>Ficus benjamina</i> , branches	N. Lakhimpur, Assam; Saitual, Mizoram
4.	<i>Psyllaephagus tekeddyensis</i>	<i>Mesohomotoma hibisci</i>	Malvaceae shrub stem; <i>Ficus religiosa</i> , leaves	Thekkedy, Kerala
5.	<i>Psyllaephagus mycopsyllus</i>	<i>Mycopsylla</i> sp.	<i>Ficus religiosa</i> , leaves	Aizawl, Mizoram
6.	<i>Psyllaephagus aizawlsensis</i>	<i>Mycopsylla</i> sp.	<i>Ficus religiosa</i> , leaves	Aizawl, Mizoram
7.	<i>Psyllaephagus</i> sp.	Undet. psyllid	<i>Terminalia arjuna</i>	Pantnagar, U. P.



Figs 1-7. *Psyllaephagus mycopsyllus*, sp. nov., female: 1, antenna; 2, ovipositor; 3, part of fore wing showing venation; 4, head in frontal view. Male: 5, aedeagus; 6, part of digitus; 7, antenna.



Figs 8-13. *Psyllaephagus aizawlensis*, sp. nov., female: 8, antenna; 9, part of fore wing showing venation; 10, ovipositor. Male: 11, antenna; 12, aedeagus; 13, part of digitus.



Fig. 14. Photograph of *Mycopsylla* sp. on leaves of *Ficus religiosa*.