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Five New Species of *Achrysocharoides* (Hymenoptera, Eulophidae) Associated with Leguminosae in Japan

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Abstract Five new species of *Achrysocharoides* associated with Leguminosae are described from Japan: *A. chrysasteris* sp. n. reared from *Chrysaster hagicola*, *A. hyloconidis* sp. n. from *Hyloconis puerariae*, *A. liocrobylae* sp. n. from *Liocrobyla* spp. and *Neolithocolletis hikomonticola*, *A. littoralis* sp. n. from *Phyllonorycter viciae*, and *A. spulerinae* sp. n. from *Spulerina dissotoma*. A key to the five species is given.

The genus *Achrysocharoides* GIRAULT, 1913, consists of 37 species: 34 have been recorded from the Holarctic Region and 3 from the Australian Region. The species of this genus are parasitic on leaf-mining Lepidoptera, the family Gracillariidae (mainly *Phyllonorycter* HÜBNER) on trees, shrubs, and occasionally herbs. Of the 37 species, three have hitherto been known to attack the hosts on Leguminosae, i.e., *Achrysocharoides insignitellae* (ERDÖS, 1966) reared from *Phyllonorycter ?insignitella* (ZELLER) on *Trifolium pratense* and *A. nigricoxae* (DELUCCHI, 1954) from *P. nigrescentella* (LOGAN) on *Vicia sepium*, both from Europe (BRYAN, 1980), and North American *A. guizoti* GIRAULT, 1917, from *Porphyrosela desmodiella* CLEMSON on *Centrosema*, *Lespedeza*, and *Desmodium* (YOSHIMOTO, 1977).

The present paper deals with five new species associated with Leguminosae in Japan. They were reared from gracillariid species of *Liocrobyla* MEYRICK, *Spulerina* VÁRI, *Chrysaster* KUMATA, *Hyloconis* KUMATA, *Neolithocolletis* KUMATA, and *Phyllonorycter* HÜBNER: the former two genera belong to Gracillariinae and the latter four to Lithocolletinae. Four of the new species may be placed in the *latreillii* species-group as defined by BRYAN (1980) on the basis of having a conical petiole in both sexes and a five-segmented fuscous flagellum in the males; while the other, *A. littoralis* sp. n. is a distinctive species characterized mainly by its propodeal feature, though it shows some resemblance to European *A. nigricoxae* as discussed below. The types will be deposited in the Entomological Institute, Hokkaido University, Sapporo.

Almost all the specimens treated in this paper have been reared by Dr. T. KUMATA, Hokkaido University, in the course of his taxonomic studies on the leaf-mining Lepidoptera: I would like to thank him for offering the specimens and information on their hosts. Thanks are also due to Dr. C. HANSSON, University of Lund, Sweden, for sending me some European specimens.

**A Key to the Species of *Achrysocharoides* Reared from Gracillariidae
on Leguminosae in Japan**

Females

1. Gastral petiole expanded posteriorly into a subrectangular portion; propodeum strongly reticulate throughout, with two weak, irregular median carinae (Fig. 1); scutellum bronze, without pits; all coxae metallic
..... *A. littoralis* sp. n.
- Gastral petiole conical in general shape; propodeum smooth to very weakly sculptured posteriorly; median carina absent, or sometimes traceable only posteriorly; scutellum blue-green with pits; at most hind coxae metallic 2
2. Scutellum rather flat, with reticulation much weaker and finer than that on mid lobe of mesoscutum (Fig. 5); transscutal suture shallow; forewing with a faint discal cloud; (pronotum without a trace of transverse ridge just in front of smooth strip; mid lobe of mesoscutum sometimes with a pair of indistinct pits) *A. chrysasteris* sp. n.
- Scutellum convex, reticulate as in mid lobe of mesoscutum; transscutal suture deep; forewing without a discal cloud 3
3. Hind coxae white; occipital margin not sharp; pronotum without a trace of transverse ridge; mid lobe of mesoscutum sometimes with a pair of indistinct pits *A. hyloconidis* sp. n.
- Hind coxae predominantly metallic; occipital margin sharp; pronotum with a trace of transverse ridge; mid lobe of mesoscutum usually with distinct pits 4
4. Gaster shorter than thorax; anterior margin of scutellum distinctly produced forwards in middle; propodeum weakly sculptured posteriorly; mesoscutum and scutellum not strongly reticulate *A. liocrobylae* sp. n.
- Gaster longer than thorax; anterior margin of scutellum hardly produced forwards; propodeum smooth; mesoscutum and scutellum strongly reticulate *A. spulerinae* sp. n.

Achrysocharoides littoralis sp. n.

(Figs. 1-2)

Female. Body length 1.2-1.4 mm. Body dark bluish green: frons below frontal fork, ocellar triangle, pronotum, scutellum, axillae, and second to last tergites bronze. Scape pale to broadly infuscate; pedicel and flagellum blackish. Legs white, with all coxae concolorous with thorax. Wings hyaline.

Head usually not collapsed, in dorsal view about twice as long as broad. Vertex weakly reticulate, smooth postero-laterally; major diameter of lateral

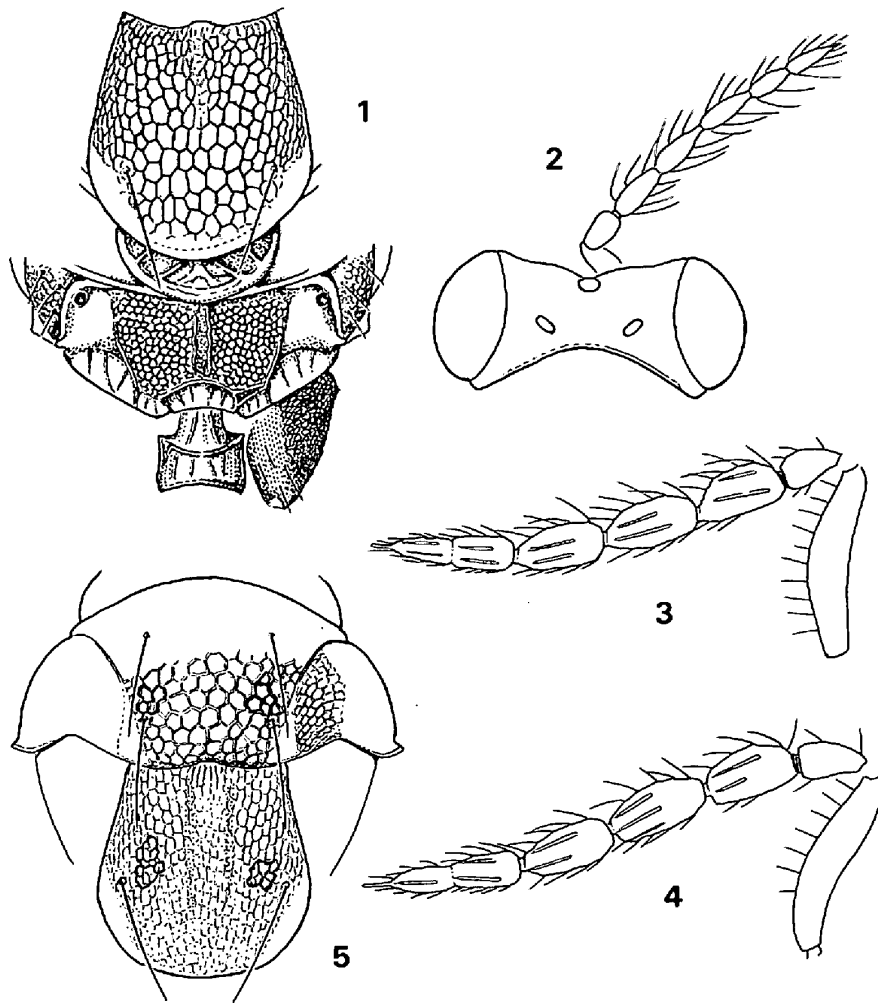
ocellus about as long as OOL, distinctly longer than OCL (distance between lateral ocellus and occipital margin); occipital margin sharply carinate between eyes. Frontal fork weakly ridged, raised above antennal scrobes. Frons above frontal fork weakly reticulate and below frontal fork strongly so; face sculptured medially and almost smooth laterally. Shortest distance between eyes 0.82 times height of eye, with inner orbits weakly divergent below. Malar space slightly more than 0.3 times height of eye. Scape slender; combined length of pedicel and flagellum 0.9 times breadth of head; first funicle segment much longer than pedicel (4.0 : 3.0), twice as long as broad or more; third segment a little shorter than, or sometimes as long as, first segment; first claval segment distinctly narrower than third funicle segment, as long as pedicel, separated from second claval segment by distinct constriction.

Thorax 1.55 times as long as broad. Pronotum with rather broad, shiny strip delimited anteriorly by obtuse ridge to form collar. Mesoscutum 1.7 times as broad as long; mid lobe convex, strongly narrowed posteriorly, very strongly and coarsely reticulate; side lobes densely so; notaular depression large, with bottom weakly reticulate. Scutellum evenly convex, slightly longer than broad (12 : 11), reticulate as in mid lobe of mesoscutum (Fig. 1). Propodeum with median panels flat, densely and strongly reticulate throughout, with two weak, irregular median carinae, area between them weakly depressed, transverse irregular carina present in front of petiolar foramen to form nucha; sides of median panels step-like, often with weak, irregular plicae on the edges; supracoxal flange very broad; callus with three (occasionally four) hairs. Mesepisternum densely reticulate throughout; upper and lower epimerons more coarsely and weakly reticulate. All coxae strongly reticulate. Forewing nearly twice as long as broad, rounded apically; post-marginal vein shorter than, or as long as stigmal; all admarginal hairs arising from wing-membrane distinctly below marginal vein.

Petiole (Fig. 1) broadly expanded posteriorly, the expanded portion about 2.5 times as broad as medially long, weakly, coarsely sculptured, with anterior crest not so sharp and shoulders not conspicuous. Gaster much shorter than thorax, usually 1.3 times as long as broad, with apex obtuse.

Male. Differs from female as follows: Body length 1.1–1.3 mm. Face and frons below frontal fork brilliant blue-green; gaster with whitish basal spot; scape and pedicel white; the remainder blackish.

Head (Fig. 2) in dorsal view transverse, 2.3 times as broad as long, with frons depressed between eyes; ocelli in an obtuse triangle; occipital carina sharp. Frons above frontal fork very weakly reticulate, shining, below frontal fork transversely sculptured. Face with cross-ridge below antennal toruli not sharp. Eyes separated by 1.2 times their height. Malar space about half height of eye. Antennae inserted at level of lower edge of eyes; scape weakly inflated, 2.8 times as long as broad; combined length of pedicel and flagellum a little longer than breadth of head; pedicel about 1.5 times as long as broad; funicle five-segmented (Fig. 2); first three



Figs. 1-5. — 1, *Achrysocharoides littoralis* sp. n., ♀, thorax (part), petiole, and hind coxa; 2, same, ♂, head and antenna, dorsal view; 3, *A. liocrobylae* sp. n., ♀, antenna; 4, *A. hyloconidis* sp. n., ♀, antenna; 5, *A. chrysasteris* sp. n., ♀, thorax (part).

segments about equal in length, slender, about 2.5 times as long as broad; the fourth segment slightly shorter than preceding segment; flagellum covered with very long hairs. Thorax 1.6 to 1.7 times as long as broad. Gaster narrower, about 1.6 times as long as broad.

Holotype (♀), Ishikari-cho, Hokkaido, em. xii. 1974, ex *Phyllonorycter viciae*, (K. KAMIJO). Paratypes: — Hokkaido: 11 ♀ 6 ♂, with same data as holotype; Esashi, Hiyama, 16 ♀ 4 ♂, em. 14-23. ii. 1959 (T. KUMATA).

Distribution. Japan (Hokkaido).

Host. A parasite of *Phyllonorycter viciae* (KUMATA) on *Vicia japonica*.

Through the courtesy of Dr. HANSSON, I have seen a pair of Swedish specimens of *A. nigricoxae* (DELUCCHI) reared from *P. nigrescentella* on *Vicia*

sepium. *A. littoralis* and *A. nigricoxae* share the five-segmented male funicle in spite of having a posteriorly expanded petiole, the metallic coxae, and the purplish scutellum. The new species is, however, readily distinguished from *A. nigricoxae* by the strongly reticulate propodeum with two median carinae and with a transverse carina posteriorly, the very broad supracoxal flange, and the pronotum with a trace of the collar. In respect of the latter two characters, as well as the slightly ridged frontal fork, the coarsely and strongly reticulated thoracic dorsum, and the propodeum with plicae and posterior transverse carina, the new species resembles species of *Kratoysma* BOUČEK (1965).

Achrysocharoides liocrobylae sp. n.

(Fig. 3)

Female. Body length 1.3–1.8 mm. Blue-green: frons above frontal fork blue to violet, below fork greenish with a bronze tinge; gaster blue-green often with golden reflections. Scape white, sometimes darker at apex; pedicel and flagellum dark brown. Legs white: hind coxae metallic with apices whitish; mid coxae predominantly infusate. Wings hyaline.

Head in dorsal view 1.83 to 1.9 times as broad as long; occipital margin weakly carinate; major diameter of lateral ocellus much longer than OOL, about as long as OCL. Vertex finely reticulate, smooth postero-laterally; frons above and below frontal fork densely reticulate. Eyes separated by 0.63 to 0.73 times their height, with inner orbits moderately divergent below. Malar space 0.27 to 0.3 times height of eye. Scape slender; pedicel plus flagellum 0.87 times breadth of head; pedicel about 1.7 times as long as broad; first funicle segment a little longer than pedicel (4 : 3) (Fig. 3), second segment usually slightly longer than first, third segment as long as first.

Thorax 1.38 to 1.48 times as long as broad. Pronotum with very narrow, shiny strip delimited anteriorly by weakly raised margin, hence a slight trace of collar is indicated. Mid lobe of mesoscutum moderately reticulate, usually with a pair of pits; side lobes more densely reticulate; notaular depression smooth. Scutellum slightly longer than broad, convex, reticulate as in mid lobe of mesoscutum, weakly and longitudinally reticulate posteriorly, with a pair of pits, which are occasionally absent; anterior margin of scutellum medially, distinctly produced anteriorly. Propodeum rather flat in transverse axis, almost smooth anteriorly and weakly reticulate posteriorly; median carina often present in posterior one-third to one-fourth; petiolar foramen deeply and broadly incised; supracoxal flange narrow; callus with three hairs. Forewing 1.84 to 1.9 times as long as broad, somewhat truncate apically; stigmal vein nearly as long as postmarginal.

Petiole conical; posterior raised portion with anterior crest moderately developed. Gaster nearly as long as thorax, 1.3 to 1.4 times as long as broad, with

apex usually somewhat acute.

Male. Differs from female as follows: Body length 1.4–1.5 mm. Blue-green: frons below frontal fork and face blue to violet; gaster broadly brownish in middle, with a whitish basal spot. Scape and pedicel whitish, flagellum infuscate.

Head in dorsal view more than 2.2 times as broad as long; occipital margin sharply carinate between eyes; OOL and OCL about equal in length, nearly as long as major diameter of lateral ocellus. Vertex smooth, with median part engraved-reticulate; frons above frontal fork feebly sculptured, below fork densely, transversely reticulate. Cross-ridge below antennal toruli sharp laterally. Eyes separated by slightly more than their height. Malar space about 0.42 times height of eye. Scape 2.6 to 3.0 times as long as broad; combined length of pedicel and flagellum a little longer than breadth of head; first three funicle segments about equal in length; fourth segment a little shorter than third segment; last segment excluding terminal spine as long as the fourth. Thorax 1.5 times as long as broad. Pronotum usually without a trace of collar. Propodeum usually with very weak median carina. Gaster oblong, nearly as long as thorax.

Holotype (♀), Moiwa, Sapporo, em. 9. v. 1970, ex *Liocrobyla lobata* on *Pueraria lobata*, (T. KUMATA). Paratypes: — Hokkaido: Moiwa, Sapporo, 2 ♀, em. 9. v. 1967, 1 ♀, with same data as holotype; Moiwa, Sapporo, 2 ♂, em. 6. v. 1970, 2 ♀ 1 ♂, em. 20. vi. 1970, (T. KUMATA); Tomakomai, 4 ♀, em. 8. v. 1970 (T. KUMATA). Shikoku: Nametoko, nr Uwajima, Ehime-ken, 2 ♀, em. 5. vi. 1981 (T. KUMATA).

Distribution. Japan (Hokkaido, Shikoku).

Hosts. Reared from *Liocrobyla lobata* KUROKO and *Neolithocolletis hikomonticola* KUMATA, both on *Pueraria lobata*, and from *L. desmodiella* KUROKO on *Desmodium racemosum*.

This species seems to be close to *A. splendens* (DELUCCHI, 1954) but differs in having the sharp occipital margin, the pronotum with a trace of transverse ridge posteriorly, and the thoracic dorsum more coarsely and strongly reticulate, usually with pits on mid lobe of mesoscutum.

Achrysocharoides spulerinae sp. n.

Female. Body length 1.5 mm. Color as in *A. liocrobylae*.

Head in dorsal view 1.87 times as broad as long; occipital margin sharp; lateral ocellus longer than OOL, nearly as long as OCL. Vertex smooth, with ocellar triangle very weakly reticulate; frons above frontal fork moderately reticulate, below fork more densely so; frontal fork weakly raised above antennal scrobes. Eyes separated by 0.75 times their height, with inner orbits rather strongly divergent below. Malar space 0.33 times height of eye. Scape slender; combined length of pedicel and flagellum 0.93 times breadth of head; pedicel a little less than twice as long as broad; first funicle segment much longer than pedicel (4.5 : 2.9);

following two funicle segments about equal to first segment in length; clava slender, 1.7 times as long as third funicle segment, separated by weak constriction between segments; terminal spine slender, longer than half length of the second segment.

Thorax 1.4 to 1.53 times as long as broad. Pronotum with a slight trace of collar as in *A. lioclobylae*. Mid lobe of mesoscutum strongly reticulate, with a pair of irregular, distinct pits; side lobes more densely reticulate; notaular depression smooth. Scutellum convex, a little longer than broad, reticulate as in mid lobe of mesoscutum, with a pair of pits and usually with a weak, median longitudinal depression, where the reticulation is denser and weaker; posterior area of scutellum engraved-reticulate to almost smooth. Propodeum moderately arched in transverse axis, smooth, sometimes with a trace of median carina at hind margin; petiolar foramen moderately incised; callus with three hairs. Forewing about 1.9 times as long as broad, with apex rounded; postmarginal vein a little longer than stigmal vein.

Petiole conical; posterior raised portion with anterior transverse crest sharp. Gaster distinctly longer than (37 : 32) and about as broad as thorax, about 1.8 times as long as broad.

Male. Unknown.

Holotype (♀), Tunagi, Morioka, Honshu, em. 8. vi. 1970, ex *Spulerina dissotoma*, (T. KUMATA). Paratypes: — 3 ♀, with same data as holotype.

Distribution. Japan (Honshu).

Host. Reared from *Spulerina dissotoma* MEYRICK on *Lespedeza bicolor*.

Achrysocharoides chrysasteris sp. n.

(Fig. 5)

Female. Body length 1.2–1.5 mm. Color much as in *A. liocroblyae*: legs with mid coxae darker, sometimes metallic basally, and forewing with a faint discal cloud.

Head in dorsal view 1.9 to 2.0 times as broad as long; lateral ocellus about as long as OOL, slightly shorter than OCL; occipital margin sharp in middle but not carinate. Vertex densely reticulate, smooth postero-laterally; frons above and below frontal fork densely and strongly reticulate; frontal fork medially free, distinctly raised above antennal scrobes. Eyes separated by 0.73 to 0.79 times their height, with inner orbits weakly divergent below. Malar space short, 0.21 to 0.24 times height of eye. Scape slender; combined length of pedicel and flagellum 0.83 to 0.89 times breadth of head; pedicel about 1.8 times as long as broad, much shorter than first funicle segment (3 : 4.5); funicle segments equal in length and breadth; claval segments 1.56 times as long as third funicle segment, separated by weak constriction; terminal spine long.

Thorax 1.4 to 1.5 times as long as broad. Pronotum smoothly sloping anteriorly, without a trace of collar. Mid lobe of mesoscutum very strongly and

coarsely reticulate, sometimes with a pair of pits (Fig. 5); side lobes densely reticulate; notaular depression weakly sculptured to almost smooth. Transscutal suture shallow. Scutellum very slightly longer than broad, not convex, usually with a median, longitudinal depression; reticulation much weaker and denser than that on mid lobe, becoming engraved-reticulate posteriorly; a pair of pits present, each pit often longitudinally elongate and sometimes divided into two pits. Propodeum rather flat, feebly sculptured postero-laterally; petiolar foramen moderately incised. Forewing almost twice as long as broad; marginal vein with bristles rather conspicuous; postmarginal vein a little longer than stigmal vein; apex of the wing rounded.

Petiole conical; posterior raised portion with anterior crest sharp. Gaster a little shorter than thorax, 1.1 to 1.3 times as long as broad, with apex obtuse.

Male. Unknown.

Holotype (♀), Kenebetsu, Nemuro, Hokkaido, em. 16. vi. 1980, ex *Chrysaster hagicola* on *Lespedeza bicolor*, (T. KUMATA). Paratypes: — Hokkaido: 4 ♀, with same data as holotype. Honshu: Nishinasuno, Tochigi-ken, em. 1 ♀, 19. v. 1976, (T. KUMATA). Kyushu: Mine-chô, Tsushima, 1 ♀, em. 30. v. 1980, (T. KUMATA).

Distribution. Japan (Hokkaido, Honshu, Kyushu).

Host. Reared from *Chrysaster hagicola* KUMATA on *Lespedeza bicolor*.

Achrysocharoides hyloconidis sp. n.

(Fig. 4)

Female. Body length 1.15–1.46 mm. Blue-green: frons above frontal fork blue; face with weak bronze reflections; gaster with second to fourth tergites darker with golden to coppery reflections. Scape white, infusate apically; pedicel and flagellum infusate. Legs white: hind coxae metallic at extreme base; mid coxae usually with a dark spot at base. Wings hyaline.

Head in dorsal view twice as broad as long; occipital margin not so sharp; lateral ocellus distinctly longer than OOL, about as long as OCL. Vertex weakly reticulate medially and anteriorly, smooth postero-laterally; frons strongly, coarsely reticulate above and below frontal fork, which is weakly raised above the antennal scrobes. Eyes separated by 0.73 to 0.77 times their height with inner orbits moderately divergent below. Malar space about 0.28 times height of eye. Scape slender; combined length of pedicel and flagellum 0.92 to 1.0 times breadth of head; pedicel about 1.7 times as long as broad; first funicle segment distinctly broader than pedicel, often a little shorter than second, which is as long as the third segment; clava with long terminal spine (Fig. 4).

Thorax 1.5 times as long as broad. Pronotum with narrow, smooth strip shallowly depressed, hardly margined anteriorly. Mid lobe of mesoscutum rather coarsely and strongly reticulate, sometimes with a pair of indistinct pits; side lobes

densely reticulate; notaular depression broadly smooth. Transscutal suture deep, sinuate, usually with a median fovea at hind margin of mid lobe. Scutellum nearly as broad as long, convex, more densely reticulate than mid lobe of mesoscutum, with median longitudinal area usually depressed, weakly reticulate; posterior one-third of scutellum engraved-reticulate; a pair of large pits always present. Propodeum moderately arched in transverse axis, almost smooth, sometimes weakly sculptured posteriorly and/or laterally, without median carina; petiolar foramen moderately incised, carinate. Forewing 1.9 times as long as broad, rounded apically; stigmal vein nearly as long as postmarginal.

Petiole conical, with anterior neck long and rather stout, posterior portion moderately long, with crest raised high. Gaster ovate, slightly shorter than thorax, 1.4 times as long as broad, pointed apically.

Male. Differs from female as follows: Body length 1.3–1.5 mm. Frons above frontal fork blue-green, below fork and face blue; vertex medially with bronze reflections; mesoscutum and scutellum sometimes with bronze reflections; gaster with a large, whitish basal spot, bronze medially and blue-green apically. Scape and pedicel whitish; flagellum blackish. Hind coxae blue-green at base.

Head in dorsal view about 2.4 times as broad as long; lateral ocellus as long as OOL, a little longer than OCL. Frontal fork situated midway between median ocellus and antennal toruli. Frons above fork very weakly reticulate, below fork transversely sculptured. Cross-ridge below antennal toruli not sharp. Eyes separated by about their height; malar space 0.42 times height of eye. Scape 2.5 times as long as broad; pedicel plus flagellum 1.17 times breadth of head; flagellum filiform; first three funicle segments very gradually increasing in length, fourth segment about as long as first; last segment as long as, or very slightly longer than third segment. Petiole with posterior raised portion longer, 2.3 times as broad as long. Gaster distinctly shorter than thorax, 1.4 to 1.6 times as long as broad.

Holotype (♀), Kaida, Kiso, Nagano-ken, em. 17. v. 1976, ex *Hyloconis puerariae* on *Amphicarpaea edgeworthii*, (T. KUMATA). Paratypes (all reared by T. KUMATA): — Hokkaido: Kenebetsu, Nemuro, 1 ♀ 4 ♂, em. 31. v.–10. vi. 1980. Honshu: Tsunagi, Morioka, 7 ♀ 3 ♂, em. 1–7. vi. 1970; Kaida, Kiso, Nagano-ken, 8 ♀ 8 ♂, em. 10–20. v. 1976; Todai, Ina, Nagano-ken, 27 ♀ 5 ♂, em. 4–21. v. 1976. Shikoku: Ino, Kôchi-ken, 2 ♀, em. 23. v. 1981. Kyushu: Minechô, Tsushima, 4 ♀ 4 ♂, em. 23–31. v. 1980.

Distribution. Japan (Hokkaido, Honshu, Shikoku, Kyushu).

Host. Reared from *Hyloconis puerariae* KUMATA on *Amphicarpaea edgeworthii*, *Lespedeza bicolor*, and *Pueraria lobata*.

The male of *A. hyloconidis* differs from that of *A. liocrobylae* in having the hind coxae white, propodeum almost smooth, without a trace of median carina, and occipital margin less sharp.

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