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A REVISION OF THE GENUS PAUESIA QUILIS IN JAPAN, WITH DESCRIPTIONS OF THREE NEW SPECIES

(HYMENOPTERA : APHIDIIDAE)

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Recently, as most of the European species of the genus *Pauesia* Quilis have been revised and redescribed in detail by Starý (1960) and Mackauer (1961) we have had the good opportunity to be able to identify the Japanese forms correctly. So far as we are aware seven species of this genus have been known to occur in Japan. In the course of the present study have been found six other species, of which three are new to science and the rest new to Japan. On this occasion we will give a revision of the Japanese species herein after. The type specimens of the new species are deposited in the collection of the Entomological Institute, Hokkaido University.

Before going further we wish to express our sincere thanks to Dr. V. F. Eastop of Department of Entomology, British Museum (N.H.), for his kindness in identifying aphids.

Genus ***Pauesia*** Quilis

Pauesia Quilis, Eos 7 : 67, 1931. (Type-species : *Pauesia albuferensis* Quilis).

Paraphidius Starý, Acta Faun. Ent. Mus. Nat. Pragae 3 : 56, 1958. (Type-species : *Aphidius californicus* Ashmead).

This genus is so closely related to the genus *Aphidius* Nees that taxonomists have taken divergent views about the taxonomic treatment of this taxon : Nees (1834), Marshall (1896), Gahan (1911) and others include it in *Aphidius*; Thomson (1895), Hincks (1943), Smith (1944), Starý (1958) and others treat it as a subgenus of *Aphidius*; and Szépligeti (1904), Fahringer (1937), Starý (1960), Mackauer (1961) and others elevate it to the generic rank. The nomenclature of this genus is discussed by Starý (1960) under the name *Paraphidius*. By the way, *Paraphidius* Starý is sunken as a synonym of *Pauesia* Quilis by Starý (1961) and Mackauer (1961). This genus is readily distinguished from *Aphidius* by the following characters :—

Propodeum, in general, strongly excavated on posterior surface and incompletely areolated, without prominent pentagonal areola just before petiole, and yet sometimes it is very shallowly excavated and completely areolated, with prominent pentagonal areola; in the latter case stigma less than 3 times as long as broad.

So far as their habits are known, the species of *Pauesia* are restricted to parasites of the Lachnidae.

[Insecta Matsumurana, Vol. 28, No. 1, August, 1965]

Key to the species occurring in Japan

1. Antennae with 27 to 29 segments in female and with 29 to 32 in male. 2
Antennae with less number of segments in both sexes. 3
2. Petiole about 3 times as long as broad at spiracles, with lateral margins strongly dilated convexly towards apex on apical half in female. Clypeus broad, 3 times as broad as long. Face 1.5 times as broad as long and just 2 times as long as frontal breadth of an eye. Mesoscutum smooth, with sparse hairs. Ovipositor sheath stout. Face entirely black; legs yellow to yellowish brown. Empty skin of victim brownish. . . . . 1. *Pauesia konoi* (Watanabe)
Petiole distinctly more than 3 times as long as broad at spiracles, with lateral margins moderately dilated straight towards apex on apical half in female. Clypeus normal, 2 times as broad as long. Face 2 times as broad as long and more than 2 times as long as frontal breadth of an eye. Mesoscutum with dense hairs. Ovipositor sheath less stout than *konoi*. Face somewhat yellowish; legs darker in colour than *konoi*. Empty skin of victim blackish. . . . . 2. *Pauesia nopporensis*, sp. nov.
3. Stigma distinctly shorter than metacarpus. Antennae with 22 to 25 segments in female and with 25 or 26 in male. . . . . 5. *Pauesia inouyei* (Watanabe)
Stigma as long as or longer than metacarpus. 4
4. Notaulices very distinct and deep, only at posterior end effaced. Antennae with 21 or 22 segments in female and with 23 to 25 in male. . . . . 9. *Pauesia momicola*, sp. nov.
Notaulices obsolete, only at anterior one-third distinct and deep. 5
5. Face very narrow, 1.5 times as broad as long and 1.2 times as long as frontal breadth of an eye. Antennae with 19 to 22 segments in female and with 25 or 26 in male. Apical segment of antennae brown, and the preceding 3 or 4 whitish brown in female. . . . . 6. *Pauesia infulata* (Haliday)
Face broad, more than 1.5 times as broad as long and about 2 times as long as frontal breadth of an eye. Flagellar segments entirely dark brown to black in female. 6
6. Propodeum shallowly excavated medially on posterior surface and completely areolated, with pentagonal areola. Antennae with 19 to 21 segments in female and with 23 to 26 in male. . . . . 12. *Pauesia salignae* (Watanabe)
Propodeum strongly excavated medially on posterior surface and incompletely areolated, without prominent pentagonal areola. 7
7. Ovipositor sheath very long and slender, weakly curved upwards. Temples long, two-thirds as long as dorsal length of an eye, rather parallel behind eyes. Antennae with 16 to 18 segments in female and with 19 or 20 in male. First flagellar segment slightly shorter than the 2 nd. . . . . 13. *Pauesia unilachni* (Gahan)
Ovipositor sheath short and stout, almost straight. Temples less than half as long as dorsal length of an eye, converging moderately behind eyes. First flagellar segment as long as or longer than the 2nd. 8
8. Stigma broad, triangular, less than 2.5 times as long as broad. Ovipositor sheath very stout, almost quadrate. 9
Stigma narrow, about 3 times as long as broad. Ovipositor sheath slenderer. 10
9. Petiole rather slender, 4 times as long as broad at spiracles in female. Temples two-thirds as long as dorsal length of an eye. Mesoscutum entirely black in female. Stigma as long as metacarpus. Antennae with 20 to 23 segments in female and with 22 to 25 in male. . . . . 3. *Pauesia pini* (Haliday)
Petiole stouter than *pini*, 3 times as long as broad at spiracles in female. Temples shorter than *pini*, one-third as long as dorsal length of an eye. Mesoscutum yellowish on lateral sides and along notaulices in female. Stigma 1.3–1.5 times as long as metacarpus. Antennae with 21 or 22 segments in female and with 23 to 25 in male. . . . . 4. *Pauesia abietis* (Marshall)
10. Ovipositor sheath stout, obtuse at apex. Propodeum narrowly excavated on posterior surface. Antennae with 18 to 20 segments in female and with 20 to 22 in male. 11

Ovipositor sheath slenderer, acute at apex. Propodeum broadly excavated on posterior surface. 12

11. Petiole a little more than 2.5 times as long as broad at spiracles, the lateral margins being weakly dilated gradually on apical half in female. Stigma about 2.5 times as long as broad, about equal to metacarpus in length; first abscissa of radius distinctly less than 1.5 times as long as the second, which is longer than second intercubitus. Mesoscutum entirely dark brown. Empty skin of victim blackish. . . . . 8. *Pauesia yezoensis* (Watanabe)
Petiole slenderer, about 3 times as long as broad at spiracles, the lateral margins being bowed convexly on apical half in female. Stigma conspicuously more than 3 times as long as broad, a little longer than metacarpus; first abscissa of radius distinctly more than 1.5 times as long as the second, which is shorter than second intercubitus. Mesoscutum yellowish on lateral sides and along notaulices. Empty skin of victim brownish. . . . . 7. *Pauesia soranumensis*, sp. nov.

12. Temples short, one-third as long as dorsal length of an eye. Petiole slenderer, about 4 times as long as broad at spiracles in female. Ovipositor sheath very narrow, weakly curved upwards. Antennae with 20 or 21 segments in female and with 23 or 24 in male. . . . . 10. *Pauesia laricis* (Haliday)
Temples long, half as long as dorsal length of an eye. Petiole about 3 times as long as broad at spiracles in female. Ovipositor sheath broader, almost straight. Antennae with 21 to 23 segments in female and with 25 to 29 in male. . . . . 11. *Pauesia japonica* (Ashmead)

1. ***Pauesia konoi*** (Watanabe)

Aphidius kônoi Watanabe, Ins. Mats. 15: 106, 1941.
Paraphidius kônoi: Starý, Acta Faun. Ent. Mus. Nat. Pragae 6: 35, 1960.
Pauesia konoi: Narayanan et al., Beitr. Ent. 11: 691, 1962; Watanabe & Takada, Ins. Mats. 27: 11, 1964.

As a supplement to the original description the following aspects may be added:—

♀. Black. Clypeus, mouth parts and palpi yellowish. Antennae including scapes and pedicels dark brown. Abdomen black; first to fifth sutures yellowish.

Temples rather long, half as long as dorsal length of an eye, converging moderately behind eyes. Ocelli round; distance between posterior ocelli about 3 times as long as the diameter. Face (fig. 1) densely haired, 1.5 times as broad as long and just 2 times as long as frontal breadth of an eye; clypeus 3 times as broad as long; malar space about half as broad as mandible at base. Antennae becoming stouter towards apex; 1st flagellar segment 2 times as long as broad and equal to the 2nd in length; the 19th 1.5 times as long as broad and the 24th a little longer than broad, respectively. Mesoscutum and mesopleura quite smooth, with scattered hairs. Petiole about 3 times as long as broad at spiracles, 1.7 times so at apex, somewhat rugose, weakly convex as seen laterally, excavated basally, with rather dense hairs on apical half, the lateral margins being rather parallel to spiracular tubercles which are situated at middle and from tubercles strongly dilated convexly towards apex (fig. 7); second and succeeding tergites smooth and shining, with sparse hairs. Genitalia (fig. 46): ovipositor sheath stout, almost quadrate. Stigma broad, triangular, a little less than 3 times as long as broad, distinctly longer than metacarpus; first abscissa of radius about 1.3 times as long as breadth of stigma, clearly longer than the second, which is 1.5 times as long as second intercubitus (fig. 43).

♂. Closely resembles the female except that the petiole is a little more than 2 times as long as broad at spiracles and flatter as seen laterally with lateral margins weakly

dilated straight towards apex.

Specimens examined: ♂♂ (type series of *Aphidius kônoi*); 5♀♀, 1♂, 23-v-62, Yuni, Hokkaido, C. Watanabe leg.; 30♀♀, 20♂♂, 24-v-62, Yuni, H.Takada leg.; 13♀♀, 7♂♂, 18-v-63, 4♀♀, 2♂♂, 25-v-63, Naganuma, Hokkaido, H. Takada leg. All the specimens were reared from *Cinara longipennis* living in *Abies sachalinensis*.

Hosts: *Cinara longipennis* (Matsumura).

Distribution: Japan (Hokkaido).

Aphids parasitized by the species are found here and there on the twigs of host plants, the empty skin becoming entirely dark brown.

In general appearance this species is very similar to *Pauesia nopporensis*, from which it is distinguished by the shape of the petiole, the colour of the empty skin of the victim, etc. as in the key given above. Furthermore, the species is also allied to *Pauesia grossus* (Fahringer) in Europe, but the differences between them were already discussed in our previous paper (1964).

2. ***Pauesia nopporensis,*** sp. nov.

♀. Black. Clypeus, mouth parts and palpi yellowish brown; face and scapes somewhat pale. Abdomen black; first to fifth sutures and seventh and eighth segments yellowish brown. Wings hyaline; stigma and veins dark brown. Fore and middle legs brown to yellowish brown. Hind legs dark brown; apical half of coxae, second trochanters and tibiae basally yellowish.

Body 5.0 mm., antennae 3.8 mm. in length. Head transverse dorsally, broader than thorax at tegulae, smooth and shining, with moderate hairs; temples rather long, half as long as dorsal length of an eye, converging moderately behind eyes. Ocelli round; distance between posterior ocelli about 3 times as long as the diameter. Face (fig. 2) densely haired, 2 times as broad as long and distinctly more than 2 times as long as frontal breadth of an eye; clypeus 2 times as broad as long; malar space about half as broad as mandible at base. Antennae filiform, with 27 or 28 segments [27 (1♀), 28 (1)], becoming stouter towards apex; 1st flagellar segment 2 times as long as broad and equal to the 2nd in length; the 19th 1.5 times as long as broad and the 24th a little longer than broad, respectively. Thorax smooth and shining, with rather dense hairs; pro- and mesopleura quite smooth, with sparse hairs; notaulices distinct and deep anteriorly, obsolete posteriorly. Propodeum somewhat rugose, densely haired, incompletely areolated, without post-median longitudinal carinae, the posterior surface being broadly excavated medially (fig. 22). Abdomen lanceolate, longer than head and thorax together; petiole conspicuously more than 3 times as long as broad at spiracles, 2 times so at apex, somewhat rugose, weakly convex as seen laterally, excavated basally, with dense hairs on apical half, the lateral margins being rather parallel to spiracular tubercles which are situated at middle and from tubercles dilated straight towards apex (fig. 8); second and succeeding tergites smooth and shining, with sparse hairs. Genitalia (fig. 47): ovipositor sheath less stout than *konoi*. Stigma broad, triangular, 2.5 times as long as broad, distinctly longer than metacarpus; first abscissa of radius longer than breadth of stigma, clearly longer than the second (fig. 34).

♂. Unknown.

Holotype ♀ and paratype 1♀: 11-vi-63, Nopporo, Hokkaido, H. Takada leg. These specimens were reared from *Cinara longipennis* on *Abies sachalinensis*.

Hosts: *Cinara longipennis* (Matsumura).

Distribution: Japan (Hokkaido).

Aphids parasitized by the species are solitarily attached to the twigs of host plants, the empty skin becoming entirely blackish.

This species is closely related to *Pauesia grossus* (Fahringer) in Europe, but it is readily distinguished from the latter by the metacarpus which is distinctly shorter than the stigma and by the entirely black thorax.

3. ***Pauesia pini*** (Haliday) (figs. 11, 23, 35 & 48)

Aphidius pini Haliday, Ent. Mag. 2: 96, 1834; Marshall, Spec. Hym. Eur. 5: 566, 1896; Dalla Torre, Cat. Hym. 4: 10, 1898; Marshll, Trans. Ent. Soc. London 1899: 40, 1899; Schimitschek, Zbl. Forstw. 61: 215, 1935; Seitner, Zbl. Forstw. 62: 46, 1936; ibid., Ztschr. Ang. Ent. 22: 564, 1936; Watanabe, Ins. Mats. 15: 54, 1940.

Aphidius (Coelonotus) pini: Thomson. Opusc. Ent. 20: 2334, 1895.

Coelonotus pini: Szépligeti, Gen. Ins. 22: 185, 1904; Fahringer, Festschr. 60. Geb. E. Strand, Riga 3: 243, 1937; Fulmek, Ann. Naturh. Mus. Wien 61: 159, 173, 190, 1957.

Paraphidius pini: Starý, Acta Faun. Ent. Mus. Nat. Pragae 6: 23, 1960.

Pauesia pini: Mackauer, Beitr. Ent. 11: 108, 1961; Narayanan et al., Beitr. Ent. 12: 693, 1962.

Aphidius lachnivorus Ashmead, Proc. U.S. Nat. Mus. 30: 189, 1906; Watanabe, Ins. Mats. 21: 2, 1957.

Specimens examined: 1♀, 19-vi-37, 1♀, 4♂♂, 25-vi-37, 1♂, 7-vii-37, 3♀♀, 2♂♂, 2-vi-38, Sapporo, H. Kôno leg.; 5♀♀, 3♂♂, 5-vi-38, 1♀, 1♂, 20-vi-39, 1♀, 23-vi-39, 1♂, 25-vi-39, 12♀♀, 11♂♂, 29-v-40, 6♀♀, 8♂♂, 18-vi-40, Sapporo, C. Watanabe leg.; 5♂♂, 14-ix-60, Yamabe, Hokkaido, S. Takagi leg.; 6♀♀, 10♂♂, 2-vii-61, Nopporo, Hokkaido, 1♀, 3♂♂, 25-vi-62, 2♀♀, 1♂, 7-vi-63, 6♀♀, 9♂♂, 12-vi-63, 2♀♀, 1♂, 10-vii-63, Sapporo, 2♂♂, 17-vi-63, Naganuma, Hokkaido, H. Takada leg. All the specimens were reared from *Cinaria laricis* and *Cinara laricicola* on *Larix* spp.

Hosts: *Cinaria laricis* (Walker); *Cinara laricicola* (Matsumura) (in Japan).

According to the literature the following host records are given in Europe:—*Cinara cembrae* (Cholodkovsky) (after Seitner, 1936); *Cinaria nuda* (Mordvilko) (after Fahringer, 1937 and Starý, 1960); *Cinaria taeniata* (Koch) (after Fulmek, 1957); *Cinaropsis cistata* Buckton (after Fahringer, 1937); *Cinaropsis pruinosa* (Hartig) (after Fulmek, 1957); *Cupressobium juniperi* (de Geer) (after Fulmek, 1957).

Distribution: Japan (Hokkaido); Europe.

Judging from Starý's redescription of the species based on the European form, the Japanese form differs from the European in the following points:—

(1) Mesoscutum, mesoscutellum and mesopleura entirely black, not yellowish. (2) In many specimens stigma entirely dark brown, not yellowish at base. (3) Abdomen entirely black; second tergite not yellowish at base. (4) Petiole slenderer, 4 times as long as broad at spiracles in female. (5) Ovipositor sheath almost quadrate, not narrowed towards apex.

4. ***Pauesia abietis*** (Marshall)

Aphidius abietis Marshall, Spec. Hym. Eur. 5: 565, 1896; Dalla Torre, Cat. Hym. 4: 5, 1898; Marshall, Trans. Ent. Soc. London 1899: 40, 1899; Szépligeti, Gen. Ins. 22: 185, 1904; Schimitschek, Ztschr. Ang. Ent. 22: 564, 1936; Starke, Nat. Lusatica 3: 91, 1956.

Coelonotus abietis: Fahringer, Festschr. 60. Geb. E. Strand, Riga 3: 242, 1937; Schimitschek,

Forstins. Tuerkei u. ihre Umwelt: 284, 1944.

Paraphidius abietis: Starý, Acta Faun. Ent. Mus. Nat. Pragae 3: 8, 1958.

Pauesia abietis: Mackauer, Beitr. Ent. 11: 106, 1961; Narayanan et al., Beitr. Ent. 12: 688, 1962.

This species is new to Japan. On the basis of the specimens examined a redescription will be given below:—

♀. Dark brown to black. Face, clypeus, mouth parts, palpi, scapes, pronotum, propleura, and mesoscutum on lateral sides and along notaulices yellowish brown. Abdomen entirely black. Wings hyaline; stigma and veins brown; stigma somewhat yellowish basally. Fore and middle legs yellowish brown to brown; coxae dark brown basally. Hind legs dark brown to brown.

Body 2.9–4.5 mm., antennae 2.0–2.5 mm. in length. Head (fig. 4) transverse dorsally, broader than thorax at tegulae, smooth and shining, with moderate hairs; temples one-third as long as dorsal length of an eye, converging rather strongly behind eyes. Ocelli round; distance between posterior ocelli about 3.5 times as long as the diameter. Face a little less than 2 times as broad as long, and a little less than 2 times as long as frontal breadth of an eye; clypeus 2 times as broad as long; malar space about half as broad as mandible at base. Antennae filiform, with 21 or 22 segments [21 (4♀♀), 22 (8)], becoming weakly stouter towards apex; 1st flagellar segment about 2 times as long as broad and equal to the 2nd in length; the 18th 1.5 times as long as broad. Thorax smooth and shining, with sparse hairs; notaulices distinct and deep on apical one-third, and shallower towards posterior end. Propodeum smooth and shining, somewhat rugose and moderately haired laterally, incompletely areolated, without post-median longitudinal carinae, the posterior surface being broadly excavated medially (fig. 24). Abdomen lanceolate, longer than head and thorax together; petiole 3 times as long as broad at spiracles, 1.7 times so at apex, almost smooth and shining, weakly convex as seen laterally, excavated basally, with sparse hairs, the lateral margins being rather parallel to spiracular tubercles which are situated at middle and from tubercles moderately dilated straight towards apex (fig. 10); second and succeeding tergites smooth and shining, with sparse hairs. Genitalia (fig. 51): ovipositor sheath stout, almost quadrate. Stigma broad, triangular, a little less than 2.5 times as long as broad, 1.3–1.5 times as long as metacarpus; first abscissa of radius a little shorter than breadth of stigma, longer than the second, which is clearly longer than second intercubitus (fig. 36).

♂. Similar to the female, but differs from the latter by the following aspects:—

Body and legs darker in colour; mesoscutum entirely dark brown. Antennae 2.2–2.5 mm. in length, with 23 to 25 segments [23 (7♂♂), 24 (11), 25 (1)]. Petiole 2.5 times as long as broad at spiracles, more parallel-sided. Body 2.5–3.0 mm. in length.

Specimens examined: 2♀♀, 1♂, 8-vii-37, Sapporo, H. Kôno leg.; 1♀, 3♂♂, 17-iv-63, 10♀♀, 13♂♂, 14-iv-64, 3♀♀, 16-iv-64, 2♂♂, 17-iv-64, 1♀, 2♂♂, 21-iv-64, Kyoto, H. Takada leg. All the specimens were reared from *Cinara pineti* on *Pinus* spp.

Hosts: *Cinara pineti* (Koch) (in Japan).

Furthermore, according to the literature the following species are recorded as hosts in Europe:— *Cinaropsis pilicornis* (Hartig) (after Schimitschek, 1944); *Cinaria laricis* (Walker) (after Starý, 1960).

Distribution: Japan (Hokkaido and Honshu); Europe.

The specimens (2♀♀, 1♂, 8-vii-37, reared from *Cinara pineti* at Sapporo by H. Kôno) identified as *Aphidius pini* by Watanabe (Ins. Mats. 15: 110, 1941) are, in reality,

to be identified as *Pauesia abietis*.

Aphids attacked by the parasite are solitarily attached to the leaves of host plants, the empty skin becoming entirely black.

The Japanese form somewhat differs from Starý's redescription of this species in having the petiole which is slenderer, distinctly more than 3 times as long as broad at spiracles in female.

5. ***Pauesia inouyei*** (Watanabe)

Aphidius inouyei Watanabe, Ins. Mats. 15: 106, 1941.
Paraphidius inouyei: Starý, Acta Faun. Ent. Mus. Nat. Pragae 6: 35, 1960.
Pauesia inouyei: Narayanan et al., Beitr. Ent. 12: 691, 1962.

As a supplement to the original description the following aspects may be added:—

♀. Body 3.7–4.6 mm., antennae 2.5–3.2 mm. in length. Temples two-fifths as long as dorsal length of an eye, converging moderately behind eyes. Ocelli almost round; distance between posterior ocelli about 3 times as long as the diameter. Face 2 times as broad as long, and a little more than 2 times as long as frontal breadth of an eye; clypeus 2 times as broad as long; malar space a little more than half as broad as mandible at base. Antennae filiform, with 22 to 25 segments [22 (2♀♀), 23 (8), 24 (2), 25 (2)], becoming slightly stouter towards apex; 1st flagellar segment 2 times as long as broad and a little longer than the 2nd; the 9th a little less than 2 times as long as broad and the 21th 1.7 times so, respectively. Petiole a little less than 4 times as long as broad at spiracles, 2.5 times so at apex (fig. 17). Genitalia (fig. 50): ovipositor sheath stout, slightly becoming slenderer towards apex, obtuse at apex.

♂. Closely resembles the female except the following points:—

Antennae 2.2–2.4 mm. in length, with 25 or 26 segements [25 (2♂♂), 26 (3)]. Petiole about 3 times as long as broad at spiracles, more parallel-sided. Body 2.0–26 mm. in length.

Specimens examined: 13♀♀, 6♂♂, (type series of *Aphidius inouyei*); 9♀♀, 23-v-62, Eniwa, Hokkaido, C. Watanabe leg. All the specimens were reared from *Cinara todocola* on *Abies sachalinensis*.

Hosts: *Cinara todocola* Inouye.

Distribution: Japan (Hokkaido).

Parasitized aphids are solitarily found on the twigs of host plants, the empty skin becoming dark brown.

6. ***Pauesia infulata*** (Haliday)

Aphidius infulatus Haliday, Ent. Mag. 2: 96, 1834; Marshall, Spec. Hym. Eur. 5: 564, 1896; Dalla Torre, Cat. Hym. 4: 8, 1898; Marshall, Trans. Ent. Soc. London 1899: 39, 1899; Szépligeti, Gen. Ins. 22: 186, 1904; Telenga, Trudi Inst. Zool. An USSR 1: 155, 1948.

Coelonotus infulatus: Fahringer, Festschr. 60. Geb. E. Strand, Riga 3: 241, 243, 1937; Fulmek, Ann. Naturh. Mus. Wien 61: 147, 149, 1957.

Paraphidius infulatus: Starý, Acta Faun. Ent. Mus. Nat. Pragae 6: 14, 1960.

Pauesia infulata: Mackauer, Beitr. Ent. 11: 107, 1961; Narayanan et al., Beitr. Ent. 12: 690, 1962.

Paraphidius albiflagellaris Starý, Acta Faun. Ent. Mus. Nat. Pragae 6: 10, 1960; Mackauer, Beitr. Ent. 11: 107, 1961.

The species is new to Japan. On the basis of the present specimens a redescription

will be given below:—

♀. Dark brown to black. Face, clypeus, mouth parts, palpi and scapes yellowish brown; apical segment of antennae brown, and the preceding 3 or 4 whitish brown; pronotum and propleura brown. Abdomen brown, becoming paler towards apex; petiole dark brown. Wings hyaline; stigma and veins dark brown. Fore and middle legs yellowish brown to brown; hind legs dark brown.

Body 2.4–3.4 mm., antennae 2.0–2.5 mm. in length. Head transverse dorsally, broader than thorax at tegulae, smooth and shining, with sparse hairs; temples two-fifths as long as dorsal length of an eye, converging moderately behind eyes. Ocelli round; distance between posterior ocelli about 4 times as long as the diameter. Face (fig. 3) densely haired, narrow, 1.5 times as broad as long and 1.2 times as long as frontal breadth of an eye; clypeus 2.5 times as broad as long; malar space very narrow, one-third as broad as mandible at base. Antennae filiform, with 19 to 22 segments [19 (1 ♀), 20 (29), 21 (24), 22 (2)], becoming stouter towards apex; 1st flagellar segment 2 times as long as broad and equal to the 2nd in length; the 18th about 1.5 times as long as broad. Thorax smooth and shining, with sparse hairs; metapleura densely haired; notaulices distinct and deep on apical quarter and becoming shallower towards posterior end. Propodeum rugose, moderately haired, incompletely areolated, without post-median longitudinal carinae, the posterior surface being rather narrowly excavated medially (fig. 26). Abdomen lanceolate, longer than head and thorax together; petiole about 3.5 times as long as broad at spiracles, a little less than 2 times so at apex, somewhat rugose, rather strongly convex as seen laterally, excavated basally, with moderate hairs on apical surface, the lateral margins being rather parallel to spiracular tubercles which are situated at middle and from tubercles strongly dilated gradually towards apex (fig. 12); second and succeeding tergites smooth and shining, with sparse hairs. Genitalia (fig. 49): ovipositor sheath stout, almost quadrate. Stigma rather broad, conspicuously more than 2.5 times as long as broad, about 1.3 times as long as metacarpus; first abscissa of radius a little longer than breadth of stigma, a little shorter than the second, which is clearly longer than second intercubitus (fig. 37).

♂. Closely resembles the female, from which it differs by the following points:—

Antennae 3.3–3.5 mm. in length, with 25 or 26 segments [25 (2 ♂♂), 26 (1)]. Petiole 3 times as long as broad at spiracles, more parallel-sided. Body 3.0–3.3 mm. in length.

Specimens examined: 58 ♀♀, 17 ♂♂, 24-v-62, Yuni, Hokkaido, H. Takada leg. The specimens were reared from *Cinara* sp. on *Picea* sp.

Hosts: *Cinara* sp. on *Picea* sp. (in Japan).

Furthermore, in the literature the following species are recorded as hosts in Europe:— *Laricaria kochiana* Boerner (after Fahringer, 1937); *Cupressobium juniperi* (de Geer) (after Starý, 1960).

Distribution: Japan (Hokkaido); Europe.

Parasitized aphids are solitarily attached to the twigs of host plants, the empty skin becoming dark brown.

Judging from Starý's redescription of the species based on the European form, the Japanese form is different from the European in the following points:—

(1) Face narrower, 1.5 times as broad as long, and 1.2 times as long as frontal breadth of an eye. (2) Petiole slenderer, more than 3 times as long as broad at spiracles in female.

7. ***Pauesia soranumensis,*** sp. nov.

♀. Dark brown. Clypeus, mouth parts, palpi, scapes, pronotum, propleura, mesoscutum on lateral sides and along notaulices, and propodeum yellowish brown; face somewhat pale. Abdomen brown; petiole, fourth and fifth tergites yellowish; apical tergite dark brown. Wings hyaline; stigma and veins brown. Legs yellow to yellowish brown; hind legs darker in colour.

Body 2.3 mm., antennae 2.0 mm. in length. Head (fig. 5) transverse dorsally, broader than thorax at tegulae, smooth and shining, with moderate hairs; temples rather long, half as long as dorsal length of an eye, converging moderately behind eyes. Ocelli round; distance between posterior ocelli about 3 times as long as the diameter. Face densely haired, distinctly more than 1.5 times as broad as long and just 2 times as long as frontal breadth of an eye; clypeus 2 times as broad as long; malar space two-thirds as broad as mandible at base. Antennae filiform, with 18 to 20 segments [18 (1 ♀), 19 (1), 20 (2)]; each flagellar segment about equal in length, 1.7 times as long as broad. Thorax smooth and shining, with moderate hairs; mesopleura quite smooth, with sparse hairs; notaulices distinct and deep on apical one-third, becoming shallower towards posterior end. Propodeum smooth and shining, moderately haired anteriorly and laterally, incompletely areolated, generally without post-median longitudinal carinae, but in a few specimens with faint ones, the posterior surface being narrowly excavated medially (fig. 27). Abdomen lanceolate, longer than head and thorax together; petiole about 3 times as long as broad at spiracles, 2.5 times so at apex, somewhat rugose, rather flat as seen laterally, excavated basally, with moderate hairs on apical half, the lateral margins being rather parallel to spiracular tubercles which are situated just before middle and from middle weakly bowed convexly towards apex (fig. 13); second and succeeding tergites smooth and shining, with moderate hairs. Genitalia (fig. 52): ovipositor sheath rather stout, obtuse at apex. Stigma narrow, conspicuously more than 3 times as long as broad, a little longer than metacarpus; first abscissa of radius about 1.3 times as long as breadth of stigma, distinctly more than 1.5 times as long as the second, which is shorter than second intercubitus (fig. 38).

♂. Similar to the female, but differs from the latter in the following aspects:—

Body and legs darker in colour. Antennae 1.6 mm. in length, with 20 to 22 segments [20 (5 ♂♂), 21 (3), 22 (3)]. Petiole a little more than 2 times as long as broad at spiracles, rather parallel-sided, only at spiracular tubercles slightly convex, which are situated at basal two-fifths. Body 1.7 mm. in length.

Holotype ♀ and paratypes 1 ♀, 1 ♂: 3-vii-64, Soranuma-dake, Hokkaido, reared from *Lachniella costata* on *Abies sachalinensis* by H. Takada. Paratypes: 1 ♂, 25-vi-37, 1 ♂, 27-vi-37, 1 ♀, 30-vi-37, 2 ♂♂, 10-vii-37, 1 ♂, 12-vii-37, 3 ♀♀, 1 ♂, 3-viii-37, 3 ♀♀, 4 ♂♂, 27-vii-38, Sapporo, reared from "*Cinara nopporensis* Inouye" (=*Cinara pinicola*) and *Lachniella costata* on *Picea* sp. by H. Kôno.

Hosts: *Cinara pinicola* (Kaltenbach); *Lachniella costata* (Zetterstedt).

Distribution: Japan (Hokkaido).

Parasitized aphids are gregariously attached to the twigs and boughs of host plants, the empty skin becoming brown.

The species is closely related to *Pauesia yezoensis* (Watanabe) but it can be separated from the latter by the shape of petiole, by the wing venation, etc. as in the key

mentioned above.

8. ***Pauesia yezoensis*** (Watanabe)

Aphidius yezoensis Watanabe, Ins. Mats. 15: 108, 1941 (in part).
Paraphidius yezoensis: Starý, Acta Faun. Ent. Mus. Nat. Pragae 6: 35, 1960.
Pauesia yezoensis: Narayanan et al., Beitr. Ent. 12: 691, 1962; Mackauer, Beitr. Ent. 12: 641 1962.

The species was originally described from 12 female and 11 male specimens by Watanabe in 1941. In the course of the present study, we have found that these specimens are divided into two different forms: the one (3♀♀) including the holotype agrees well enough with the original description of *yezoensis*, while the other is a new species, being described as *Pauesia soranumensis* in the preceding pages.

As a supplement to the original description the following points may be added:—

♀. Dark brown to black. Face, clypeus, mouth parts, palpi and pronotum yellowish brown; scapes, pedicels and propleura brown. Abdomen brown to yellowish brown. Wings hyaline; stigma and veins brown. Legs yellowish brown to brown; hind legs darker in colour.

Body 2.5–2.9 mm., antennae 1.8–2.1 mm. in length. Temples two-fifths as long as dorsal length of an eye, converging moderately behind eyes. Ocelli round; distance between posterior ocelli about 3 times as long as the diameter. Face densely haired, about 2 times as broad as long and a little less than 2 times as long as frontal breadth of an eye; clypeus a little more than 2 times as broad as long; malar space half as broad as mandible at base. Antennae filiform, with 18 or 19 segments [18(1♀), 19(9)], becoming stouter towards apex; 1st flagellar segment 2 times as long as broad and equal to the 2nd in length; the 9th 1.5 times as long as broad and the 17th a little less than 1.5 times so, respectively. Petiole a little more than 2.5 times as long as broad at spiracles, 2 times so at apex, with moderate hairs on apical surface, the lateral margins being rather parallel to spiracular tubercles which are situated just before middle and from tubercles weakly dilated towards apex (fig. 14); second and succeeding tergites smooth and shining, with moderate hairs. Genitalia (fig. 53): ovipositor sheath rather stout, obtuse at apex. Stigma broad, triangular, 2.5 times as long as broad, about equal to metacarpus in length; first abscissa of radius 1.2 times as long as breadth of stigma, distinctly less than 1.5 times as long as the second, which is as long as or longer than second intercubitus (fig. 42).

♂. Similar to the female except as follows:—

Antennae 1.7–1.9 mm. in length with 20 or 21 segments [20(1♂), 21(4)]. Petiole a little less than 2 times as long as broad at spiracles, rather parallel-sided, strongly bowed convexly at spiracular tubercles, which are situated at middle. Body 2.1–2.4 mm. in length.

Specimens examined: 3♀♀, 6-vii-37, Sapporo, reared from "*Cinara nopporensis* Inouye" (=*Cinara pinicola*) on *Picea* sp. by H. Kôno (holotype and part of paratypes of *Aphidius yezoensis*); 8♀♀, 5♂♂, 11-vi-63, Nopporo, Hokkaido, reared from an aphid on *Picea* sp. by H. Takada.

Hosts: *Cinara pinicola* (Kaltenbach) and an aphid on *Picea* sp. (in Japan); *Lachniella costata* (Zetterstedt) (after Mackauer, 1962, in Europe).

Distribution: Japan (Hokkaido); Europe.

Parasitized aphids are gregariously attached to the twigs and boughs of host plants, the empty skin becoming blackish.

Judging from the original description it is quite possible that *Pauesia piceaecollis* (Starý, 1960) from Europe might be sunken as a junior synonym of *Pauesia yezoensis* (Watanabe, 1941).

9. ***Pauesia momicola***, sp. nov.

♀. Dark brown to black. Clypeus, mouth parts, palpi and scapes yellowish brown; face brown. Abdomen yellowish brown to brown. Wings hyaline; stigma and veins brown. Legs yellowish brown to brown; hind legs dark brown.

Body 2.7–3.1 mm., antennae 2.2–2.4 mm. in length. Head transverse dorsally, broader than thorax at tegulae, smooth and shining, with moderate hairs; temples two-fifths as long as dorsal length of an eye, converging rather strongly behind eyes. Ocelli oval; distance between posterior ocelli about 3 times as long as the diameter. Face densely haired, 1.5 times as broad as long and about 2 times as long as frontal breadth of an eye; clypeus 2 times as broad as long; malar space half as broad as mandible at base. Antennae filiform, with 21 or 22 segments [21 (5 ♀♀), 22 (14)]; each flagellar segment about equal in length, 1.5–1.7 times as long as broad. Thorax smooth and shining, with moderate hairs; notaulices very distinct and deep, only at posterior end effaced. Propodeum smooth and shining, somewhat rugose posteriorly, sparsely haired, incompletely areolated, without post-median longitudinal carinae, the posterior surface being broadly and shallowly excavated (fig. 29). Abdomen lanceolate, longer than head and thorax together; petiole 3.5 times as long as broad at spiracles, 2.5 times so at apex, rather strongly rugose, weakly convex as seen laterally, excavated basally, with sparse hairs on apical half, the lateral margins being rather parallel to spiracular tubercles which are situated at middle and from the tubercles weakly bowed convexly towards apex (fig. 16); second and succeeding tergites smooth and shining, with moderate hairs. Genitalia (fig. 54): ovipositor sheath rather slender, obtuse at apex. Stigma narrow, 3 times as long as broad, distinctly longer than metacarpus; first abscissa of radius about 1.3 times as long as breadth of stigma, a little longer than the second, which is about 1.5 times as long as second intercubitus (fig. 44).

♂. Closely resembles the female in general structure and colour, from which it differs by the following points:—

Antennae 2.0–2.5 mm. in length, with 23 to 25 segments [23 (1 ♂), 24 (3), 25 (3)]. Petiole a little less than 3 times as long as broad at spiracles, more parallel-sided, with spiracular tubercles situated just before middle. Body 2.3–2.6 mm. in length.

Holotype ♀ and paratypes 13 ♀♀, 2 ♂♂: 2-v-64, Kyoto, H. Takada leg. Paratypes: 2 ♀♀, 8-x-63, Sendai, 1 ♂, 23-iv-64, 2 ♂♂, 28-iv-64, Kyoto, 4 ♀♀, 3 ♂♂, 27-iv-64, Nara, H. Takada leg. All the specimens were reared from *Cinara* sp. on *Abies* spp.

Hosts: *Cinara* sp. on *Abies* spp.

Distribution: Japan (Honshu).

Aphids attacked by the parasite are solitarily attached to the leaves of host plants, the empty skin becoming reddish brown.

This species is rather aberrant, being readily distinguished from any other species of the genus by the very distinct and deep notaulices and by the slender ovipositor sheath. On account of the shape of the ovipositor sheath and the wing venation the species is

superficially allied to *Pauesia scorpinicus* (Smith), a North American species, but it is distinguished from the latter in having the narrower face and the entirely dark brown thorax.

10. ***Pauesia laricis*** (Haliday) (figs. 15, 30, 45 & 56)

Aphidius laricis Haliday, Ent. Mag. 2: 97, 1834; Marshall, Spec. Hym. Eur. 5: 566, 1896; Dalla Torre, Cat. Hym. 4: 9, 1898; Marshall, Trans. Ent. Soc. London 1899: 41, 1899; Schimitschek, Ztschr. Ang. Ent. 22: 564, 1936; Watanabe, Ins. Mats. 15: 53, 1940.

Aphidius (Coelonotus) laricis: Thomson, Opusc. Ent. 20: 2334, 1895.

Coelonotus laricis: Szépligeti, Gen. Ins. 22: 185, 1904; Fahringer, Festschr. 60. Geb. E. Strand, Riga 3: 243, 1937; Fulmek, Ann. Naturh. Mus. Wien 61: 159, 173, 190, 1957.

Paraphidius laricis: Starý, Acta Faun. Ent. Mus. Nat. Pragae 6: 17, 1960.

Pauesia laricis: Mackauer, Beitr. Ent. 11: 107, 1961; Narayanan et al., Beitr. Ent. 12: 692, 1962.

Specimens examined: 1♀, 21-vi-37, Sapporo, reared from an aphid on *Larix* sp. by H. Kôno; 1♀, 4♂♂, 17-vi-40, Sapporo, reared from *Cinara laricicola* by C. Watanabe.

Hosts: *Cinara laricicola* (Matsumura) (in Japan).

Furthermore, in the literature the following species are recorded as hosts in Europe:— *Laricaria kochiana* Boerner (after Fahringer, 1937); *Cinaria nuda* (Mordvilko) (after Starý, 1960).

Distribution: Japan (Hokkaido); Europe.

Judging from Starý's redescription of the species based on the European form, the Japanese form differs from the European in the following points:—

(1) Mesoscutum, mesoscutellum and mesopleura entirely dark brown, not yellowish. (2) Abdomen entirely dark brown, without yellowish spots at second to fourth tergites, except for petiole yellowish on basal quarter. (3) Face narrower, 2 times as broad as long. (4) Ovipositor sheath stouter and broadened towards base, not narrowed.

11. ***Pauesia japonica*** (Ashmead)

Aphidius japonicus Ashmead, Proc. U. S. Nat. Mus. 20: 189, 1906; Watanabe, Ins. Mats. 13: 83, 1939 & 21: 2, 1957.

Coelonotus japonicus: Fahringer, Festschr. 60. Geb. E. Strand, Riga 3: 241, 1937.

Paraphidius japonicus: Starý, Acta Faun. Ent. Mus. Nat. Pragae 6: 35, 1960.

Pauesia japonica: Narayanan et al., Beitr. Ent. 12: 691, 1962.

A redescription based on the specimens examined is given below.

♀. Brown to dark brown. Face on upper part, clypeus, mouth parts, palpi, pronotum, propleura, mesoscutum and mesopleura yellowish brown; in a few specimens basal six antennal segments yellowish at base. Abdomen dark brown, with a yellowish broad band at second suture. Wings hyaline; stigma and veins brown. Legs yellowish brown to brown; hind coxae dark brown at base.

Body 3.3-3.6 mm., antennae 2.3-2.7 mm. in length. Head transverse dorsally, broader than thorax at tegulae, smooth and shining, with moderate hairs; temples rather long, half as long as dorsal length of an eye, converging moderately behind eyes. Ocelli almost round; distance between posterior ocelli about 3 times as long as the diameter. Face densely haired, 1.5 times as broad as long and 2 times as long as frontal breadth of an eye; clypeus 2 times as broad as long; malar space two-fifths as broad as mandible at base. Antennae filiform, with 21 to 23 segments [21 (2♀♀), 22 (14), 23 (4)], becoming stouter towards apex; 1st flagellar segment 2 times as long as broad and a little longer than the 2nd; the 9th a little more than 1.5 times as long as broad and the 19th 1.5

times so, respectively. Thorax smooth and shining, with moderate hairs; pro- and mesopleura quite smooth, with sparse hairs; notaulices distinct and deep on apical quarter, becoming shallower towards posterior end. Propodeum smooth anteriorly and rugose posteriorly, sparsely haired laterally, incompletely areolated, usually without prominent lateral and post-median longitudinal carinae, the posterior surface being very broadly excavated (fig. 31). Abdomen lanceolate, longer than head and thorax together; petiole about 3 times as long as broad at spiracles, a little more than 2 times so at apex, rugose, weakly convex as seen laterally, excavated basally, with moderate hairs on apical half, the lateral margins being rather parallel to spiracular tubercles which are situated at middle and from tubercles weakly dilated towards apex (fig. 9); second and succeeding tergites smooth and shining, with moderate hairs. Genitalia (fig. 57): ovipositor sheath rather slender, acute at apex, the edge being weakly curved outwardly at middle. Stigma narrow, 3 times as long as broad, a little longer than metacarpus; first abscissa of radius 1.5 times as long as breadth of stigma, a little longer than the second, which is about 2 times as long as second intercubitus (fig. 39).

♂. Similar to the female in general structure and colour, from which it differs by the following points:—

Antennae 2.3–3.1 mm. in length, with 25 to 29 segments [25 (3 ♂♂), 26 (3), 27 (7), 29 (1)]. Petiole clearly more than 2 times as long as broad at spiracles, more parallel-sided, with spiracular tubercles situated just before middle. Body 2.6–3.4 mm. in length.

Specimens examined: 4♀♀, 5-v-30, Kyoto, K. Takeuchi leg.; 2♂♂, 17-iv-63, 7♀♀, 5♂♂, 15-x-63, Kyoto, 7♀♀, 4♂♂, 19-vi-64, Sapporo, H. Takada leg. All the specimens were reared from *Lachnus tropicalis* on *Quercus* spp. and *Castanea* spp.

Hosts: *Lachnus tropicalis* (van der Goot).

Distribution: Japan (Hokkaido and Honshu).

Aphids attacked by the parasite are gregariously found on the twigs, boughs and tranks of host plants, the empty skin becoming entirely black. It is noteworthy that the specimens taken from Sapporo are darker in colour than those from Kyoto.

12. ***Pauesia salignae*** (Watanabe), comb. nov.

Aphidius salignae Watanabe, Ins. Mats. 13: 81, 1939 & 21: 2, 1957.

As a supplement to the original description the following aspects may be added:—

♀. Body 2.8–3.7 mm., antennae 2.0–2.5 mm. in length. Temples rather long, half as long as dorsal length of an eye, converging moderately behind eyes. Ocelli oval; distance between posterior ocelli about 3 times as long as the diameter. Face moderately haired, a little less than 2 times as broad as long, and 2.5 times as long as frontal breadth of an eye; clypeus 2 times as broad as long; malar space two-thirds as broad as mandible at base. Antennae with 19 to 21 segments [19 (2♀♀), 20 (14), 21 (16)], becoming slightly stouter towards apex; 1st flagellar segment distinctly more than 2 times as long as broad and equal to the 2nd in length; the 9th a little less than 2 times as long as broad and the 16th a little more than 1.5 times so, respectively. Petiole 3.5 times as long as broad at spiracles, 2.5 times so at apex (fig. 18). Genitalia (fig. 55): ovipositor sheath rather slender, acute at apex. Stigma broad, triangular, 2.5 times as long as broad (fig. 40).

♂. Similar to the female except as follows:—

Antennae 3.0–3.1 mm. in length, with 23 to 26 segments [23 (1 ♂), 24 (2), 25 (6), 26 (4)].

Petiole a little less than 3 times as long as broad at spiracles, more parallel-sided. Body 3.1–3.3 mm. in length.

Specimens examined: 12♀♀, 7♂♂ (type series of *Aphidius salignae*); 17♀♀, 4♂♂, 28-vi-63, Sapporo, 4♀♀, 4♂♂, 3-vii-64, Soranuma-dake, Hokkaido, H. Takada leg.; 2♀♀, 31-v-64, Sapporo, M. Miyazaki leg. All the specimens were reared from *Tuberolachnus salignus* on *Salix* spp.

Hosts: *Tuberolachnus salignus* (Gmelin).

Distribution: Japan (Hokkaido).

Parasitized aphids are gregariously attached to the twigs, boughs and tranks of host plants, the empty skin becoming entirely black.

The species is an intermediate form between *Aphidius* and *Pauesia*, since the propodeum is excavated very shallowly in the middle and areolated completely, with pentagonal areola just before petiole. We are, however, much inclined to the opinion, that it might be treated, for the time being, as a member of *Pauesia*.

13. ***Pauesia unilachni*** (Gahan)

Aphidius unilachni Gahan, Proc. U.S. Nat. Mus. 70: 1, 1927.

Paraphidius unilachni: Starý, Acta Faun. Ent. Mus. Nat. Pragae 6: 37, 1960.

Pauesia unilachni: Mackauer, Beitr. Ent. 12: 640, 1962; Narayanan et al., Beitr. Ent. 12: 695, 1962.

Pauesia albuferensis Quilis, Eos 7: 69, 1931; Starý, Acta Ent. Mus. Nat. Pragae 34: 23, 1961; Mackauer, Beitr. Ent. 12: 640, 1962; Narayanan et al., Beitr. Ent. 12: 688, 1962.

Aphidius praevisus Gautier & Bonnamour, Bull. Soc. Linn. Lyon 5: 74, 1936; Fahringer, Festschr. 60. Geb. E. Strand, Riga 3: 245, 1937; Fulmek, Ann. Naturh. Mus. Wien 61: 147, 1957.

Paraphidius praevisus: Starý, Acta Faun. Ent. Mus. Nat. Pragae 6: 27, 1960.

This species is new to Japan. On the basis of the present specimens a redescription will be given below:—

♀. Dark brown to black. Clypeus, mouth parts, palpi and scapes yellowish brown; face, pronotum and propleura brown; propodeum somewhat pale. Abdomen brown, darkened towards apex; basal four segments yellowish brown. Wings hyaline; stigma and veins dark brown. Legs yellowish brown to brown.

Body 2.0–2.2 mm., antennae 1.4–1.7 mm. in length. Head (fig. 6) transverse dorsally, broader than thorax at tegulae, smooth and shining, with moderate hairs; temples long, two-thirds as long as dorsal length of an eye, rather parallel behind eyes. Ocelli oval; distance between posterior ocelli about 3 times as long as the diameter. Face moderately haired, a little less than 2 times as broad as long and 2 times as long as frontal breadth of an eye; clypeus a little less than 2 times as broad as long; malar space half as broad as mandible at base. Antennae filiform, with 16 to 18 segments [16(2♀♀), 17(12) 18(4)]; each flagellar segment about equal in length; 1st segment distinctly more than 2 times as long as broad and slightly shorter than the 2nd; the 13th about 2 times as long as broad. Thorax smooth and shining, with sparse hairs; notaulices distinct and deep on apical quarter, obsolete posteriorly. Propodeum smooth and shining, coarsely haired laterally, incompletely areolated, without post-median longitudinal carinae, the posterior surface being very shallowly excavated (fig. 32). Abdomen lanceolate, longer than head and thorax together; petiole about 3 times as long as broad at spiracles, 2.5 times so at apex, somewhat rugose, very weakly convex as seen laterally, excavated basally, with scattered hairs, the lateral margins being rather parallel to spiracular tubercles which

are situated at middle and from tubercles weakly dilated towards apex (fig. 19); second and succeeding tergites smooth and shining, with sparse hairs. Genitalia (fig. 58): ovipositor sheath very long and slender, acute at apex, weakly curved upwards, the edge being slightly curved inwardly. Stigma narrow, 3 times as long as broad, about equal to metacarpus in length; first abscissa of radius a little longer than breadth of stigma and a little less than 2 times as long as the second, which is as long as second intercubitus (fig. 41).

♂. Closely resembles the female in general structure and colour, from which it differs by the following points:—

Antennae 1.4–1.8 mm. in length, with 19 or 20 segments [19(3♂♂), 20(8)]. Petiole more parallel-sided. Body 1.8–2.0 mm. in length.

Specimens examined: 5♀♀, 5♂♂, 14-iv-64, 13♀♀, 7♂♂, 17-iv-64, Kyoto, H. Takada leg. All the specimens were reared from *Schizolachnus* sp. on *Pinus* sp.

Hosts: *Schizolachnus* sp. on *Pinus* sp. (in Japan); *Schizolachnus pineti* (Fabricius) (after Starý, 1960, Mackauer, 1962, in Europe); *S. obscurus* (Boerner) (after Mackauer, 1962, in Europe).

Distribution: Japan (Honshu); Formosa; Europe.

Parasitized aphids are usually attached solitarily and sometimes gregariously to the leaves of host plants, the empty skin becoming usually pale brown and rarely black.

Judging from Starý's redescription the Japanese form seems to differ from the European in the following points:—

(1) Face narrower, a little less than 2 times as broad as long. (2) Ovipositor sheath with edge weakly curved inwardly, not straight.

Host list

Host	Parasite	Page
Cinara cembrae (Cholodkovsky)	*P. pini* (Haliday)	5
**Cinara laricicola* (Matsumura)	*P. laricis* (Haliday)	12
* "	*P. pini* (Haliday)	5
**Cinara longipennis* (Matsumura)	*P. konoi* (Watanabe)	3
* "	*P. nopporensis* Watanabe & Takada	4
**Cinara pinicola* (Kaltenbach)	*P. soranumensis* Watanabe & Takada	9
* "	*P. yezoensis* (Watanabe)	10
**Cinara pineti* Koch	*P. abietis* (Marshall)	6
**Cinara todocola* Inouye	*P. inouyei* (Watanabe)	7
**Cinara* sp. on *Abies* spp.	*P. momicola* Watanabe & Takada	11
**Cinara* sp. on *Picea* sp.	*P. infulata* (Haliday)	8
**Cinaria laricis* (Walker)	*P. pini* (Haliday)	5
"	*P. abietis* (Marshall)	6
Cinaria nuda (Mordvilko)	*P. laricis* (Haliday)	12
"	*P. pini* (Haliday)	5
Cinaria taeniata (Koch)	*P. pini* (Haliday)	5
Cinaropsis pilicornis (Hartig)	*P. abietis* (Marshall)	6
Cinaropsis pruinosa (Hartig)	*P. pini* (Haliday)	5
Cupressobium juniperi (de Geer)	*P. infulata* (Haliday)	8
"	*P. pini* (Haliday)	5

* This relationship occurs in Japan.

**Lachniella costata* (Zetterstedt)	*P. soranumensis* Watanabe & Takada 9
* „	*P. yezoensis* (Watanabe) 10
**Lachnus tropicalis* (van der Goot)	*P. japonica* (Ashmead) 12
Laricaria kochiana Boenrer	*P. infulata* (Haliday) 8
„	*P. laricis* (Haliday) 12
Schizolachnus pineti (Fabricius)	*P. unilachni* (Gahan) 14
Schizolachnus obscurus (Boerner)	*P. unilachni* (Gahan) 14
**Schizolachnus* sp. on *Pinus* sp.	*P. unilachni* (Gahan) 14
**Tuberolachnus salignus* (Gmelin)	*P. salignae* (Watanabe) 13

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Explanation of plates

Plate I. Head of female in frontal (fig. 1–3) and dorsal (4–6) view ; petiole of female (7–9). Fig. 1, *Pauesia konoi* (a, breadth of face; b, length of face ; c, frontal breadth of an eye ; d, breadth of clypeus ; e, length of clypeus ; f, malar space) ; 2, *P. nopporensis* ; 3, *P. infulata* ; 4, *P. abietis* (a, dorsal length of an eye ; b, length of temple ; c, distance between posterior ocelli) ; 5, *P. soranumensis* ; 6, *P. unilachni* ; 7, *P. konoi* ; 8, *P. nopporensis* ; 9, *P. japonica*.

Plate II. Petiole of female. Fig. 10, *Pauesia abietis*; 11, *P. pini*; 12, *P. infulata*; 13, *P. soranumensis*; 14, *P. yezoensis*; 15, *P. laricis*; 16, *P. momicola*; 17, *P. inouyei*; 18, *P. salignae*; 19, *P. unilachni.*

Plate III. Propodeum of female. Fig. 20, *Pauesia salignae* (a, ante-median longitudinal carina; b, oblique carina; c, transverse carina; d, post-median longitudinal carina; e, lateral longitudinal carina); 21, *P. konoi*; 22, *P. nopporensis*; 23, *P. pini*; 24, *P. abietis*; 25, *P. inouyei*; 26, *P. infulata*; 27, *P. soranumensis*; 28, *P. yezoensis*; 29, *P. momicola*; 30, *P. laricis*; 31, *P. japonica*; 32, *P. unilachni.*

Plate IV. Fore wing of female. Fig. 33, *Pauesia inouyei* (An_1, first abscissa of anal vein; An_2, second abscissa of anal vein; B, basal vein; C_2, second abscissa of cubitus; C_3, third abscissa of cubitus; Co, costa; IC_2, second intercubitus; M_1, first abscissa of median; M_2, second abscissa of median; Mc, metacarpus; N, nervulus; P, parallel vein; R_1, first abscissa of radius; R_2, second abscissa of radius; Rc, recurrent vein; SC, subcosta; St, stigma); 34, *P. nopporensis*; 35, *P. pini*; 36, *P. abietis*; 37, *P. infulata*; 38, *P. soranumensis*; 39, *P. japonica*; 40, *P. salignae*; 41, *P. unilachni*; 42, *P. yezoensis*; *P. konoi.*

Plate V. Fore wing of female (fig. 44–45); female genitalia (46–51). Fig. 44, *Pauesia momicola*; 45, *P. laricis*; 46, *P. konoi*; 47, *P. nopporensis*; 48, *P. pini*; 49, *P. infulata*; 50, *P. inouyei*; 51, *P. abietis.*

Plate VI. Female genitalia. Fig. 52, *Pauesia soranumensis*; 53, *P. yezoensis*; 54, *P. momicola*; 55, *P. salignae*; 56, *P. laricis*; 57, *P. japonica*; 58, *P. unilachni.*

A NEW SPECIES OF THE GENUS TOXARES HALIDAY FROM JAPAN (HYMENOPTERA : APHIDIIDAE)

By HAJIMU TAKADA

In the present paper is described a new species of the genus *Toxares* Haliday, which has hitherto been considered as a monotypic genus, being represented by *T. deltiger* Haliday from Europe. On this occasion I wish to express my sincere thanks to Mr. M. Shiga, the Entomological Laboratory of Kyushu University for his kindness in offering the valuable specimens.

Toxares shigai, sp. nov.

♀. Dark brown. Mouth parts, palpi, scapes, pedicels and first three flagellar segments yellowish brown; clypeus, 4th flagellar segment and prosternum somewhat pale. Abdomen brown; petiole, 5th and succeeding segments yellowish brown. Wings hyaline; stigma and veins brown. Legs yellowish brown.

Body 2.0 mm., antennae 1.5 mm. in length. Head transverse dorsally, broader than thorax at tegulae, smooth and shining, with moderate hairs; temples as long as dorsal length of an eye, rather parallel behind eyes. Ocelli oval; distance between posterior ocelli 2 times as long as the diameter. Face moderately haired, 2 times as broad as long and a little less than 2 times as long as frontal breadth of an eye; clypeus 2 times as broad as long; malar space one-fourth as broad as mandible at base. Antennae filiform, 17-jointed, becoming stouter towards apex, with dense hairs; 1st flagellar segment 4 times as long as broad and a little longer than the 2nd, and the 9th 2.5 times as long as broad and the apical 4 times so and more than 1.5 times as long as the preceding.