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Some Korean species of the subfamily Lithocolletinae (Gracillariidae, Lepidoptera)

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韓國産 가는나방 亞科에 關하여 (나비目, 가는나방科)

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ABSTRACT

Thirteen species distributed over 3 genera of the subfamily Lithocolletinae are reported from Korea. Of them 8 species are new to the Korean fauna. Two genera, *Hyloconis* and *Chrysaster*, are recorded from the Asian continent for the first time. Fore wings of all the species and male and female genitalia of some ones are illustrated. Besides these Korean species, one North American species, *Argyromiges ostensackenella* Fitcher, 1859, is newly transferred to the genus *Chrysaster*.

INTRODUCTION

As far as we are aware, 7 species of the subfamily Lithcolletinae have been recorded from Korea (Nakayama & Okamoto, 1940; Ko, 1969; Park, 1975; Park et al., 1977; Kumata & Park, 1978; and Kumata, 1982). Among them one species, *Lithocolletis malivorella* Matsumura, was transferred to the genus *Lyonetia* (Lyonetiidae) by Kuroko (1964).

In this paper are dealt with 13 species distributed over 3 genera of the subfamily on the bases of the materials preserved in the Institute of Agricultural Sciences, Suweon, and collected by one of us (Kuroko) during his stay in Korea from 13 June to 12 September of 1977 as a FAO-consultant for the Microlepidoptera of Korea. Out of the 13 species 8 are new to the fauna of Korea. Moreover, 2 genera, *Hyloconis* and *Chrysaster* both of which are hitherto known from Japan alone, are recorded from the Asian continent for the first time. On the other hand, *Lithocolletis* (=*Phyllonorycter*) *quercifoliella* Zeller recorded by Ko (1969) is not mentioned in this paper at all, because we have failed to examine any Korean representatives of this European species. It is so far not recorded from Japan.

It is generally accepted by the most entomologists that the insect fauna of Korea is biogeographically very similar to that of Japan. Of the 13 Korean species enumrated in this paper, 12 are also known

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Table 1. Distribution of Korean species of the Subfamily Lithocolletinae.

	Korea	Japan				China	USSR		European countries
		Hokkaido	Honsyu	Sikoku	Kyusyu		Primorskiy Kray	Other States	
Hyloconis lespedezae	+	+	+*		+*				
Chrysaster hagicola	+	+	+	+	+				
Phyllonorycter nipponicella	+		+				?		
P. similis	+	+	+	+	+				
P. acutissimae	+	+	+	+	+				
P. kamijoi	+		+		+				
P. aino	+	+							
P. issikii	+	+	+	+	+		+		
P. koreana	+								
P. pastorella	+	+	+	+	+	+	+	+	+
P. meiacoronis	+				+		+		
P. ringoniella	+	+	+	?	+	+	+		
P. ulmi	+	+							

*New record based on unpublished data.
? Record based on doubtful identification.

from Japan (Table 1). *Phyllonorycter koreana* is only an exception being so far endemic in Korea, but it is closely related to *P. kisoensis* known from Central Honsyû, Japan (Kumata & Park, 1978). Although the studies on the Lithocolletinae of the Asian continent are still in an infant state, recently 2 species are recorded from China(Liu & Bai, 1981) and 22 from the Far East of U.S.S.R. (Ermolaev, 1977, 1979 & 1981; and Kuznetzov, 1979). Both the species recorded from China by Liu & Bai are distributed in Korea and Japan in common. Among 22 species known from the Far East of U.S.S.R., on the other hand, 5 are common to Korea, and 20 are common to Japan. These facts may suggest that the Korean species dealt with in this paper are merely fragments of the Korean fanua of the subfamily Lithocolletinae.

ENUMERATION

I. Genus *Hyloconis* Kumata

Hyloconis Kumata, 1963, Ins. matsum. 26 : 28 & 74. [Type-species: *Hyloconis puerariae* Kumata, 1963.]

The genus *Hyloconis* is a small group containing 4 species, all of which are leaf miners of Leguminosae in their larval stage and have so far been known only from Japan. Therefore, this is the first record of the genus from the Asian continent.

Hyloconis is closely related to *Protolithocolletis* and *Phyllonorycter* in general structures and colour-pattern of the adult. However, it may be distinguished from *Protolithocolletis* by the absence of the vein M_2 of the fore wing and by the presence of the flap-like 8th sternite of the male. From *Phyllonorycter* it is more easily separated by the following combination of the characters: Fore wing with 9 veins, the vein R_3 present; hind wing with 6 veins, the vein M_2 stalked with vein M_1; transtilla of male genitalia incomplete, separated at middle; tegumen with some slender setae on dorsum at apex; mine flat, not contorted by silken threads into a tentiform type; cocoon circular in outline, pure white; and larva of tissue-feeding form with 2 pairs of ventral prolegs, each pair on 3rd and 4th abdominal segments. The last character is very peculiar to *Hyloconis*, and should serve to separate the genus from any others of the Gracillariidae.

1. *Hyloconis lespedezae* Kumata

싸리가는나방[Figs. 2 & 16]

Hyloconis lespedezae Kumata, 1963, Ins. matsum. 6 : 25, Fig. 15; ibid., 1963, ditto 26 : 75, pl. V(98).

Specimens examined: 1♂, Mt. Seolag, em. 4/vii/977, ex *Lespedeza bicolar*, H. Kuroko leg.; 2♀♀, Mt. Chiag, 4~9/vii/1977, H. Kuroko leg.

Distribution: Korea(new record) and Japan.

Food plant: *Lespedeza bicolor* Turczaninov (Leguminosae) in Korea and Japan.

Leaf mine: An elliptical blotch mine occurring on lower surface of leaf, sometimes occupying whole the leaf surface; in full-developed state mine changed into a full-depth type, and discoloured into greenish-white, but remaining a green patch, where the larva makes a round and white cocoon; blackish excrements scattered along margin or throughout mine-cavity.

Comments: Having compared the present material with the Japanese, we have found that the former is slightly smaller, but quite agrees with the latter in colour pattern and genital structure.

II. Genus *Chrysaster* Kumata

Chrysaster Kumata, 1961, Ins. matsum. 24 : 52. [Type-species: *Chrysaster hagicola* Kumata, 1961.]

This genus was excluded from his work on Japanese Lithocolletinae by Kumata (1963). However, it surely belongs to the subfamily on account of the radial sector running nearly parallel with the median vein in the hind wing as pointed out by Kumata (1978).

Chrysaster is distinguished from *Phyllonorycter* by the fore wing having the vein R_5 stalked with the vein M_1, and by the 8th sternite of the male being normal in shape and not produced into a flap. In the larval stage, it is also separated from the latter in that there is a quiescent form between the last sap-feeding and spinning forms, and in that pupation takes place outside the mine (Kumata, 1978).

The genus is represented by the type-species alone which makes an upper blotch mine on the leaf of *Lespedeza* (Leguminosae) in Japan. Recently, one of us (Kumata) has examined 1♂ & 1♀ (Cincinnati, Ohio, 6/viii/1905 A.F. Braun leg.) of *Argyromiges ostensackenella* Fitcher, 1859, which makes a similar leaf mine on *Robinia* (Leguminosae) in North America, and he has found that *ostensackenella* is, in reality, referable to the present genus. Thetwo species are distinguishable from each other as follows:

—Tuft on head blackish; fore wing on basal area up to the 1st silvery fascia widely fuscous except at the extreme base, where is silvery whitish indistinctly; in male genitalia, saccus widely truncated apically (Fig. 14-c), ventro-apical corner of valva shortly produced and having 2 or 3 short, scale-like setae (Fig. 14-a). Mine on leaf of *Robinia* spp. .....*Chrysaster ostensackenellus*(Fitcher), comb. nov.

—Tuft on head golden ochreous; basal area of fore wing golden orangebrown, with a short, longitudinal silvery streak running just below wing-fold; in male genitalia, saccus round apically(Fig. 15-c), and ventro-apical corner of valva ending in an acute projection (Fig. 15-a). Mine on leaf of *Lespedeza* spp. .....*Chrysaster hagicola* Kumata

2. *Chrysaster hagicola* Kumata

참싸리 가는나방 [Figs. 1 & 15]

Chrysaster hagicola Kumata, 1961, Ins. matsum. 24 : 53, Figs. 1 & 2.

Specimens examined: 1♀, Mt. Seolag, em. 11/VIII/1977, ex *Lespedeza cyrtobotrya*, H. Kuroko leg.; 1♂ & 1♀, Mt. Chiag, 9~12/vii/1977, H. Kuroko leg.

Distribution: Korea (new record) and Japan.

Food plants: *Lespedeza cyrtobotrya* Miquel (Leguminosae) in Korea; Korea; *Lespedeza bicolor* Turczaninov and *L. cyrtobotrya* Miquel in Japan.

Leaf mine: An elliptical blotch-mine occurring upon upper leaf surface, brown with circular traces of darker colour except along margin where is pale creamy-green; upper epidermis of mine never contorted with silken threads. When fully developed, larva leaving the mine through a semicircular slit for pupation; cocoon boat-shaped.

III. Genus *Phyllonorycter* Hübner

Phyllonorycter Hübner, 1822, Syst.-alphab. Verz.: 66. [Type-species: *Phalena Tinea rajella* Linné, 1758.]

Lithocolletis Hübner, 1825, Verz. bek. Schmett.: 423. [Type-species: *Tinea alnifoliella* Hübner, 1796.]

Eucestis Hübner, 1825, Verz. bek. Schmett.: 423. [Type-species: *Tinea ulmifoliella* Hübner, 1817.]

Phyllorycter Walsingham, 1914, Biol. Center. Am. Het. 4 : 336. [Emendation.]

This is the largest genus in the subfamily, including more than 500 species described from almost whole the world. The larva of the species of the genus makes a more or less tentiform mine on the upper or lower surface of the leaf of various plants, mostly broadleaved trees or shrubs, or rarely herbaceous plants such as legumes.

3. *Phyllonorycter nipponicella*(Issiki)

굴참가는나방 [Figs. 3 & 17]

Lithocolletis nipponicella Issiki, 1930, Ann. Mag. nat. Hist. 10(6) : 430.

Phyllonorycter nipponicella: Kumata, 1982, Tyô to Ga 33 : 71.

Specimens examined: 1♂, Suweon, 10/v/1976, K.-T. Park leg.; 1♂, ditto, 18/v/1977, K.-T. Park leg.; 1♂, ditto, 23/v/1977, B.Y. Lee leg.; 1♂, ditto, em. 27/vi/1977, ex *Quercus variabilis*, H. Kuroko leg.

Distribution: Korea, Japan and U.S.S.R. (Primorskiy Kray). Food plants: *Quercus variabilia* Blume (Fagaceae) in Korea; *Quercus acutissima* Carruthers in Japan.

Leaf mine: An elongate-elliptical blotch mine occurring on lower leaf surface, usually on space between 2 veins; mining part of leaf discoloured into pale brown afterwards; loosened lower epidermis of mine moderately contorted with silken threads, with a longitudinal median fold. Pupation occurring inside mine; pupa enclosed with a rough cocoon.

4. *Phyllonorycter similis* Kumata

시밀리가는나방 [Figs. 4 & 18]

Phyllonorycter similis Kumata, 1982, Tyô to Ga 33 : 74.

Specimens examined: 1♀ (paratype of *P. similis*), Mt. Chiag, em. 27/vi/1977, and 1♂ (paratype of *P. similis*), Mr. Sogri, em. 11/viii/1977, ex *Quercus serrata*, H. Kuroko leg.

Distribution: Korea and Japan.

Food plants: *Quercus serrata* Thunberg (Fagaceae) in Korea; *Quercus dentata* Thunberg, *Q. monogolica* Fischer var. *grosseserratat* Rehder et Wilson, *Q. serrata* Thunberg and *Q. acutissima* Carruthers in Japan.

Leaf mine: The mine is quite similar to that of the proceding species, and may be not clearly distinguishable from the latter. As discussed by Kumata (1982), however, *P. similis* feeds on oaks belonging to the section *Prinus*, while *P. nipponicella* attacks the oaks of the section *Cerris*.

5. *Phyllonorycter acutissimae* (Kumata)

상수리가는나방 [Figs. 5 & 19]

Lithocolletis acutissimae Kumata, 1963, Ins. matsum. 25 : 81, Fig. 20.

Phyllonorycter acutissimae: Kumata, 1982, Tyô to Ga 33 : 77.

Specimens examined: 1♂, Mt. Suri, Suweon, 22/iv/1976, K.-T. Park leg.; 1♀, Suweon, 25/viii/1976, Y.B. Uhm leg.; 3♂♂ & 3♀♀, ditto, 2~4/v/1977, Y.Y. Ha leg.; 1♀, ditto, em. 14/iii/1977, ex *Quercus* sp. J.C. Paik leg.; 1♂ & 1♀, 22/iv-8/v/1977, K.-T. Park leg.

Distribution: Korea and Japan.

Food plants: *Quercus* sp. (Fagaceae) in Korea; *Quercus acutissima* Carruthers, *Q. variabilis* Blume, *Q. mongolica* Fischer var. *grosseserrate* Rehder et Wilson, *Q. serrata* Thunberg and *Castanea crenata* Siebold et Zuccarini in Japan.

Leaf mine: Unknown to us in Korea.

Comments: This species together with the preceding 2 belongs to the *nipponicella* complex, on which the taxonomic discussions are given by Kumata (1982).

6. *Phyllonorycter kamijoi* (Kumata)

밤나무가는나방 [Figs. 6 & 20]

Lithocolletis kamijoi Kumata, 1963, Ins. matsum. 25 : 82, Fig. 21.

Specimens examined: 3♂♂, Suweon, 15/v/1976, K.-T. Park leg.; 1♂, ditto, 2/v/1977, Y.Y. Ha leg.

Distribution: Korea (new record) and Japan.

Food plants: Unknown in Korea; *Quercus acutissimae* Carruthers and *Castanea crenata* Siebold et Zuccarini (Fagaceae) in Japan.

Comments: *P. kamijoi* is readily distinguished from the preceding 3 species by the fore wing the

white costo-basal streak being confluent to the median fascia into a single curved mark and by the shape of the flap-like 8th sternite of the male.

7. *Phyllonorycter aino* (Kumata)

조팝나무가는나방 [Figs. 8 & 21]

Lithocolletis aino Kumata, 1963, Ins. matsum. 26 : 11, Fig. 7.

Specimens examined: 1♂ & 2♀♀, Suweon, em. 14~22/vii/1977, ex *Spiraea salicifolia*, H. Kuroko leg.

Distribution: Korea (new record) and Japan.

Food plant: *Spiraea salicifolia* Linné (Rosaceae) in Korea and Japan.

Leaf mine: An oblong blotch mine on lower surface of leaf, usually along mid vein; mined part of leaf pale creamy-green, afterwards discoloured into brown; loosened lower epidermis of the mine strongly contorted with silken threads, with 5 or more weak folds.

Comments: The identification of the Korean material is based on the comparison with the type-series. In Korean material examined, the right valva has strong seta at the apex, and the right costal process is a little shorter than 1/2 as long as valva, but the other characters agree with those of the type-series.

8. *Phyllonorycterissikii* (Kumata)

자작나무가는나방 [Figs. 7, 22 & 29]

Lithocolletis issikii Kumata, 1963, Ins. matsum. 25 : 26, Fig. 7; Ermolaev, 1977, Proc. Zool. Inst. Acad. Sci. U.S.S.R. 70 : 112.

Lithocolletis corylifoliella: Issiki, 1957, Icon. Heteroc. Jap. Color. Natur. 1 : 37, pl. 4(99) (misidentification).

Specimens examined: 4♂♂ & 5♀♀, Mt. Sogri, em. 12~19/viii/1977, ex *Tilia mandshurica*, H. Kuroko leg.

Distribution: Korea (new record), U.S.S.R. (Primorskiy Kray) and Japan.

Food plants: *Tilia mandshurica* Ruprecht et Maximowicz (Tiliaceae) in Korea; *Tilia amurensis* Ruprecht and *T. mandshurica* Ruprecht et Maximowicz in U.S.S.R.; and *Tilia japonica* Simonkai, *T. maximowicziana* Shirasawa and *T. kiusiana* Makino et Shirasawa in Japan.

Leaf mine: An oblong to elliptical blotch mine occurring on lower surface of leaf, arbitrary on space between veins, pale green to pale brown; loosened lower epidermis of mine slightly contorted with silken threads, without any distinct fold; sometimes several mines seen on a single leaf. Black excrements gathered in a mass behind rough cocoon.

Comments: This species is represented by the 2 seasonal forms, aestival and autumnal. The Korean materials examined all belong to the aestival form having distinct white marks on the fore wing as follows:—Medio-basal streak extending to about 1/3 length of wing, very narrow, slightly bent upwardly near its apex, without any dark marginal scales; 3 or 4 costal strigulae rather short, finely edged with blackish scales internally, the 1st costal at middle of wing, oblique outwardly, the remainings nearly perpendicular; 2 dorsal strigulae longer than costals, strongly oblique outwardly, more distinctly margined with blackish scales internally, the 1st dorsal more or less opposite to the 1st costal, the 2nd dorsal at tornus; blackish apical spot prolonged into a narrow streak; cilia ochreous-whitish, with a fringe-line blackish and narrow. The thorax has 3 longitudinal, narrow and white

9. *Phyllonorycter koreana* Kumata et Park

사과굴나방붙이 [Fig. 10]

Phyllonorycter koreana Kumata et Park, 1978, Ins. matsum. n.s. 13 : 35, Figs. 2, 9, 10 and 18.

Specimens examined: 1♂ (holotype of *P. koreana*), Suweon, 23/vii/1974, K.-T. Park leg.; 1♂ & 1♀ (paratypes of *P. koreana*), ditto, 10/ix/1973, K.-T. Park leg.

Distribution: Korea.

Food plant and leaf mine: Unknown.

10. *Phyllonorycter pastorella* (Zeller)

포플라가는나방 [Figs. 9 & 24]

Lithocolletis pastorella Zeller, 1846, Linn. Ent. 1 : 250; Kumata, 1963, Ins. matsum. 25 : 54, Fig. 1; Ermolaev, 1977, Proc. Zool. Inst. Acad. Sci. U.S.S.R. 70 : 113; Liu et Bai, 1981, Icon. Heteroc. Sin. 1 : 13, pl. 3(36).

Specimens examined: 2♂♂, Mt. Sogri, em. 10/viii/1977, ex *Salix* sp., H. Kuroko leg.; 1♂ & 1♀,

Suweon, 4~16/vii/1977, K.-T. Park leg.

Distribution: Widely distributed in the Eurasian Continent from Europe to Siberia and Japan, but Korea is a new locality for the species.

Food plants: *Salix* spp. (Salicacae) in all the known countries; and *Chosenia arbutifolia* A. Skvortz. (Salicaceae) in U.S.S.R. (Primorskiy Kray).

Leaf-mine: An oblong, sometimes oval, blotch mine placed on lower surface of leaf, arbitrarily on space between mid vein and leaf-margin; mined part of leaf whitish-green, afterwards changed to pale brownish; loosened lower epidermis of mine slightly contorted, with a moderately strong median fold. Blackish excrements gathered in a mass at side of mine-cavity.

Comments: In colour pattern the present specimens quickly run to *P. apparella* on the lines of the key to the British and French species of the genus *Phyllonorycter* given by Bradley et al. (1969). On the other hand, the genitalia well agree with those of *P. pastorella* figured by Petersen (1927) and Kumata (1963), and differ from those of *P. apparella.* In this paper, however, the specimens is temporally determined with *P. pastorella* according to Petersen, though we have some doubts about this determination.

11. *Phyllonorycter melacoronis* (Kumata)

진달래가는나방 [Figs. 11 & 30]

Lithocolletis melacoronis Kumata, 1963, Ins. matsum. 26 : 37, Fig. 21; Ermolaev, 1977, Proc. Zool. Inst. Acad. Sci. U.S.S.R. 70 : 113.

Specimens examined: 1우, Mt. Bughan, em. 14/vii/1977, ex *Rhododendron* sp., H. Kuroko leg.

Distribution: Korea (new record); U.S.S.R. (Primorskiy Kray); and Japan.

Food plants: Undetermined *Rhododendron* spp. (Ericaceae) in Korea and Japan; and *Rhododendron mucronulatum* Turczaninov in U.S.S.R.

Leaf mine: An elliptical blotch mine on lower surface of leaf, arbitrarily on a space between mid vein and leaf margin; leaf discoloured into brown at a part mined by the insect; loosened lower epidermis of mine strongly contorted by siklen threads, thus the leaf with mines is sometimes completely folded downwards.

Comments: In colour pattern this species is characterized by the black tuft on the head, the blackish antenna with apical 8 or 9 whitish segments, the entirely leaden metallic thorax, and the golden brownish fore wing being blackish at its basal extremity and having a short medio-basal streak, a dorsal spot near the base, a premedian fascia, and 2 costal and 2 dorsal strigulae, all of which are silvery whitish, distinctly edged with black inwardly and shaded with leaden colour outwardly. Moreover, the fore wing has a short leaden metallic subapical streak followed by a blackish apical streak.

12. *Phyllonorycter ringoniella* (Matsumura)

사과굴나방 [Figs. 12, 23 & 31]

Lithocolletis ringoniella Matsumura, 1931, 6000 Ill. Ins. Jap.: 1102; Kumata, 1959, Ins. matsum. 22 : 71, Figs. 1(A) & 2; Ko, 1969, List For. Ins. Pests Korea: 73; Ermolaev, 1977, Proc. Zool. Inst. Acad. Sci. U.S.S.R. 70 : 114; Liu & Bai, 1981, Icon. Heteroc. Sinic. 1 : 12, pl. 3(35).

Phyllonorycter ringoniella: Park, 1975, Korean J. Plant. Prot. 14 : 228; Park et al., 1977, ditto 16 : 36; Ujiye, 1979, Annual Rep. Soc. Plant Prot. N. Japan 30 : 89.

Lithocolletis triflorella: Matsumura, 1910, Dainippon Gaityû Zensyo 1 : 153; Nakayama & Okamoto, 1940, Res. Bull. Chosen Agr. Exp. Stn. 12 : 221 (misidentification).

Lithocolletis blancardella: Issiki, 1957, Icon. Heteroc. Jap. Colour. Natur. 1 : 27, pl. 4(98) (misidentification).

Specimens examined: 3♂♂ & 3우우, Suweon, em. 11/vii~15/ix/1975, ex apple (*Malus domestica*), *pumila* M. K.-T. Park leg.; 2♂♂ & 2우우, ditto, em. 12~22/vii/1977, ex apple, K.-T. Park leg.

Distribution: Korea, China, U.S.S.R. (Primorskiy Kray) and Japan.

Food plants: Apple (*Malus domestica* Borkhausen) *pumila* M. (Rosaceae) in Korea and China; *Malus baccata* Borkhausen var. *mandshurica* C.K. Schnider in U.S.S.R.; and *Malus baccata* Borkhausen var. *mandshurica* C.K. Schnider, *M. domestica* Borkhausen and *Prunus avium* Linné in Japan.

Leaf mine: An oval or elliptical blotch mine situated on lower surface of leaf, mainly on space bet-

ween veins; leaf at mined part brownish in colour, or mottled with green patches on upper surface; loosened lower epidermis of mine rather strongly contorted, with 5 or more folds; when a leaf is mined by many larvae, it is strongly deformed. Blackish excrements gathered behind a very rough cocoon inside the mine cavity.

Comments: This species was recorded from Korea by Nakayama & Okamoto (1940) under the name *Lithocolletis triflorella* for the first time. This determination seems to have followed that of Matsumura (1910). However, in 1931 Matsumura described a new species, *Lithocolletis ringoniella*, based on the material to which he had adopted the name *L. triflorella*. The species has also sometimes been named as *L. blancardella* by some persons such as Issiki (1957), but the true *blancardella* is so far not known from the East Asian countries.

The present species often inflicts severe damage on apple-trees in Korea, China and Japan.

13. *Phyllonorycter ulmi* (Kumata)

느티나무가는나방 [Figs. 13, 25, 26& 32]

Lithocolletis ulmi Kumata, 1963, Ins. matsum. 26 : 4, Fig. 3(A-H).

Specimens examined: 1♂ & 3♀♀, Yongju-sa, Suweon, em. 20~27/vi/1977, ex *Zelkova serrata*, H. Kuroko leg.; 1♂, Mt. Sogri, em. 12/viii/1977, ex *Z. serrata*, H. Kuroko leg.; 1♂ & 2♀♀, Daegu, em. 23/viii/1977, en *Z. serrata*, H. Kuroko leg.

Distribution: Korea (new record) and Japan.

Food plants: *Zelkova serrata* Makino (Ulmaceae) in Korea; and *Ulmus davidiana* Planchon var. *japonica* Nakai and *U. laciniata* Meyr ick in Japan.

Leaf mine: An oblong, sometimes oval or rarely irregular-shaped blotch mine occurring on upper surface of leaf, always on a leaf vein; leaf at mined part whitish and slightly tinged with brown along leaf vein; loosened upper epidermis of mine moderately contrted with silken threads, but without distinct folds. Blackish excrements gathered in a mass behind a very rough and whitish cocoon.

Comments: The present specimens emerged from *Zelkova serrata* are, in reality, identical in every respect with the representatives of *P. ulmi* that attacks the leaf of *Ulmus* spp. in Japan, while they are distinct from *P. tritorrhecta* (Meyrick) which makes a similar upper leaf mine on *Zelkova serrata* in Japan. *P. ulmi* is distinguished from *P. tritorrhecta* by the shape of the valva and the apical barb of the aedoeagus as shown in the Figs. 27 & 28. It is, therefore, very interesting to know what form mines in leaves of *Ulmus* in Korea, but no *Phyllonorycter* species feeding on *Ulmus* is so far found there.

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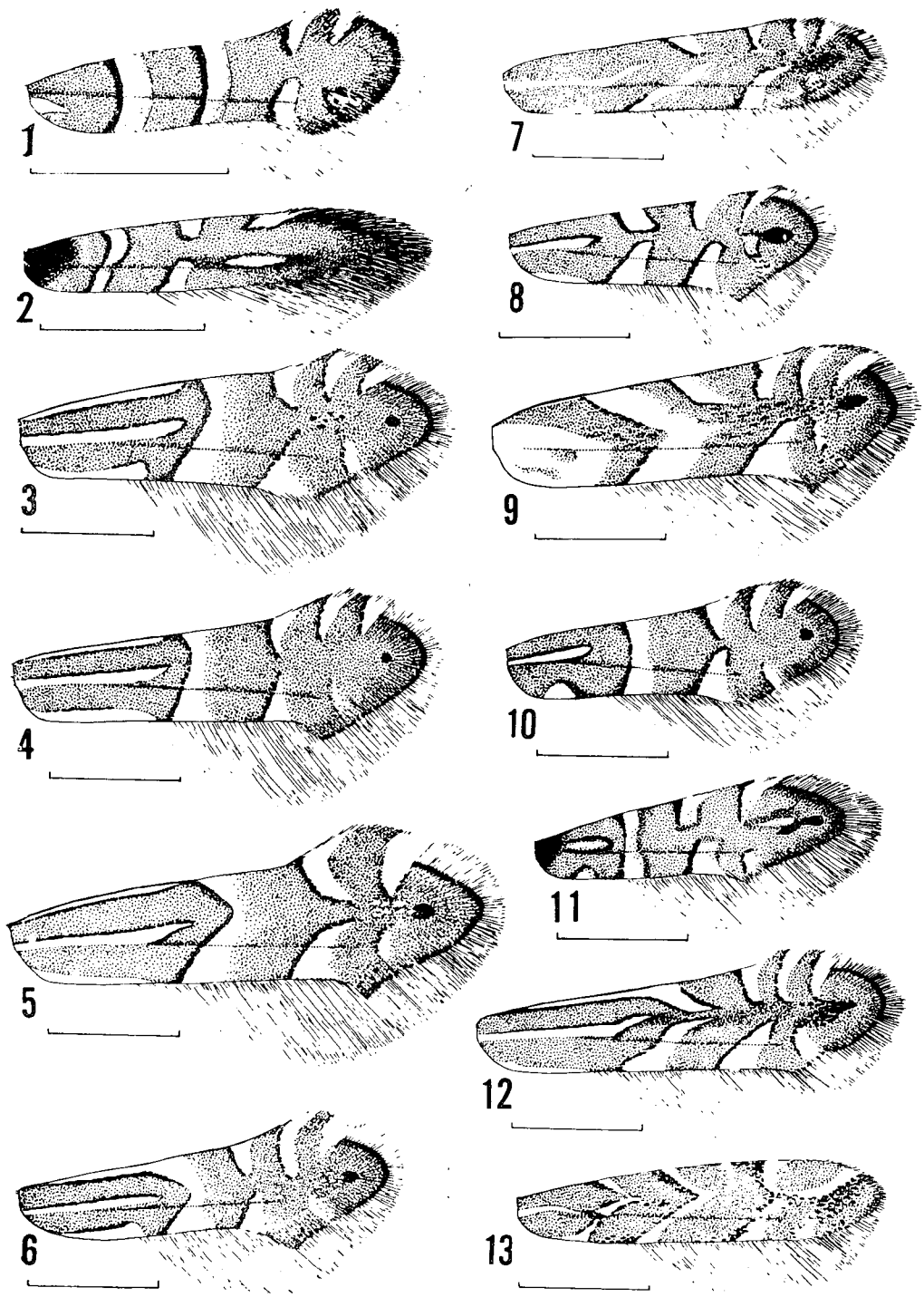
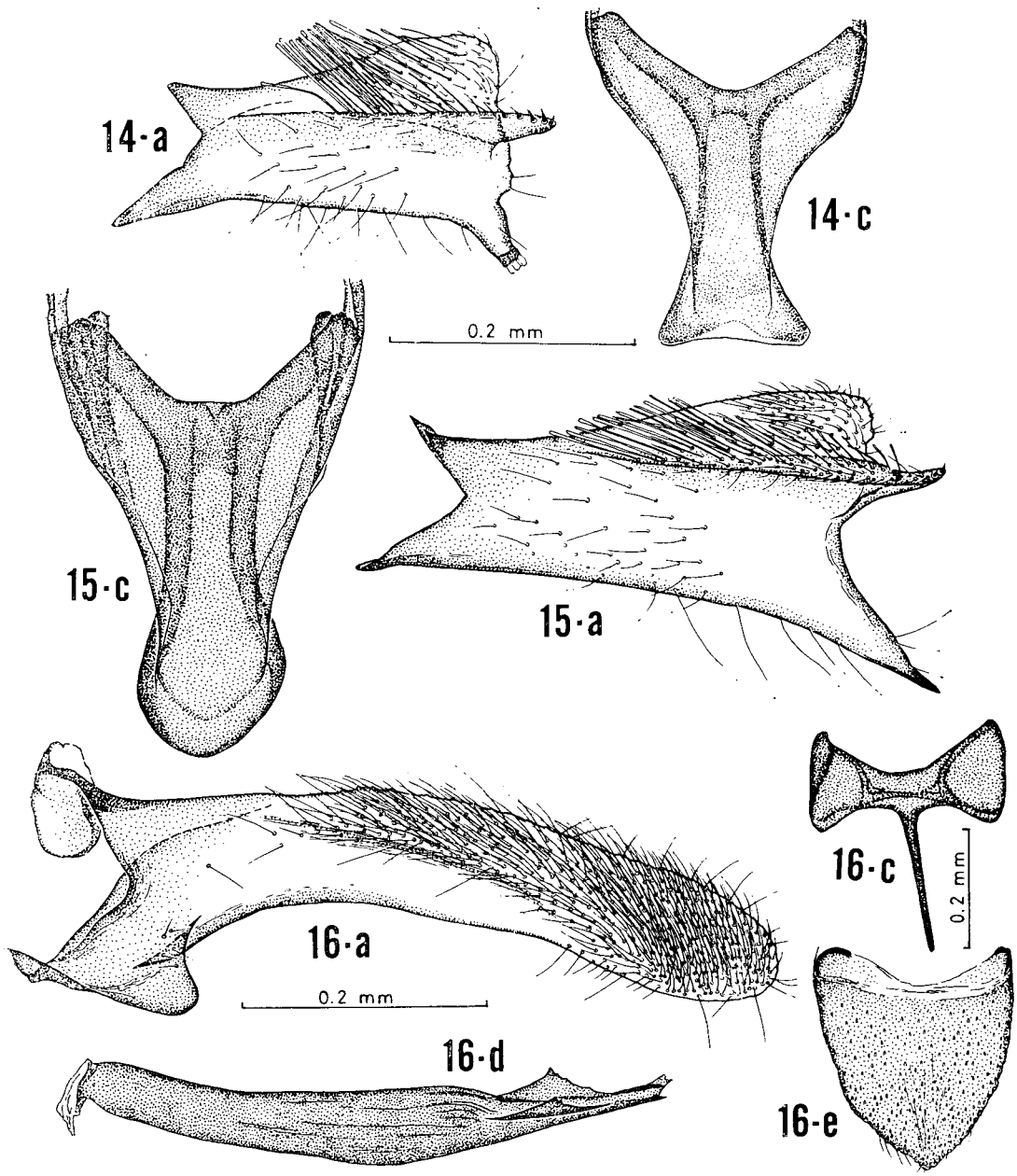
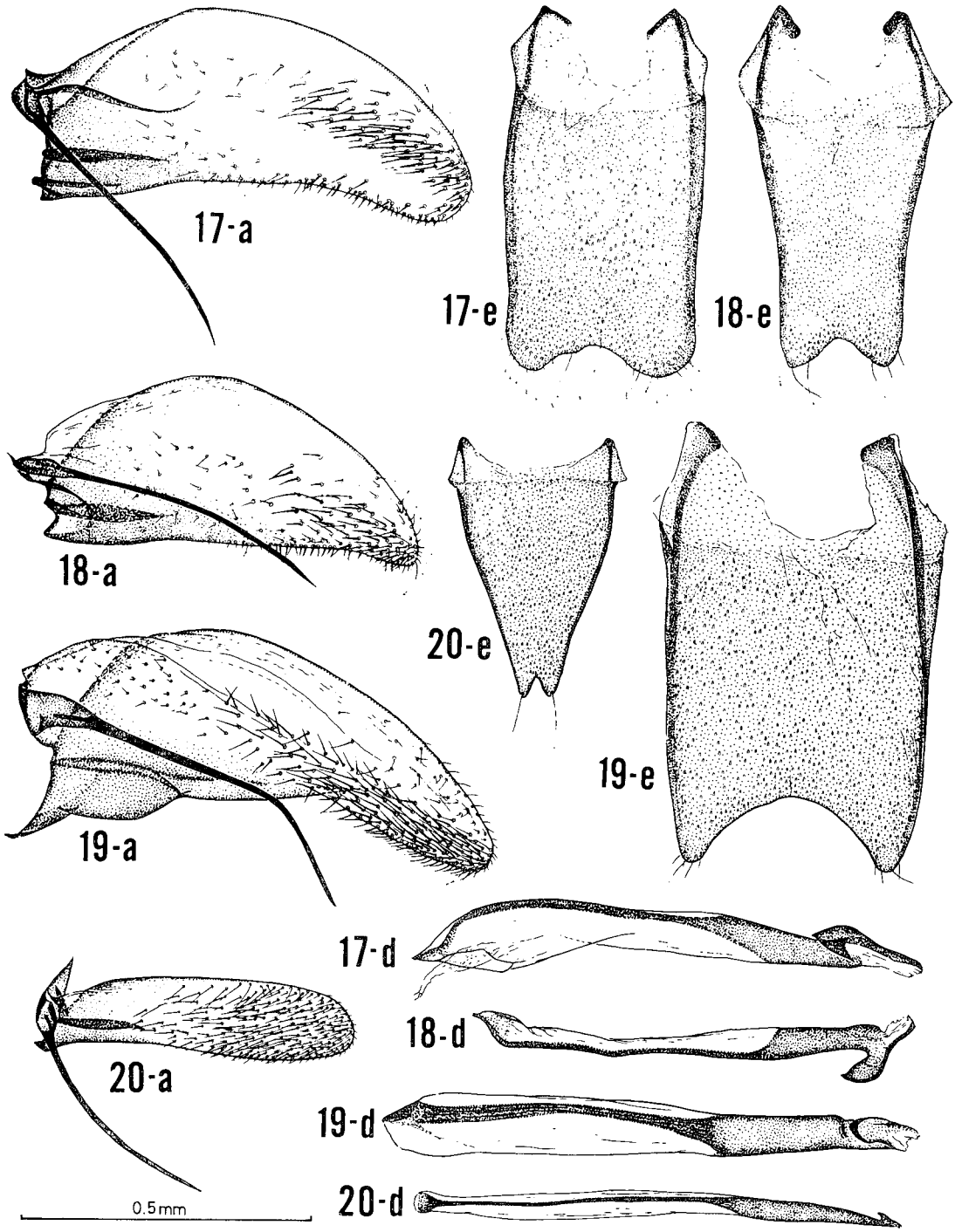


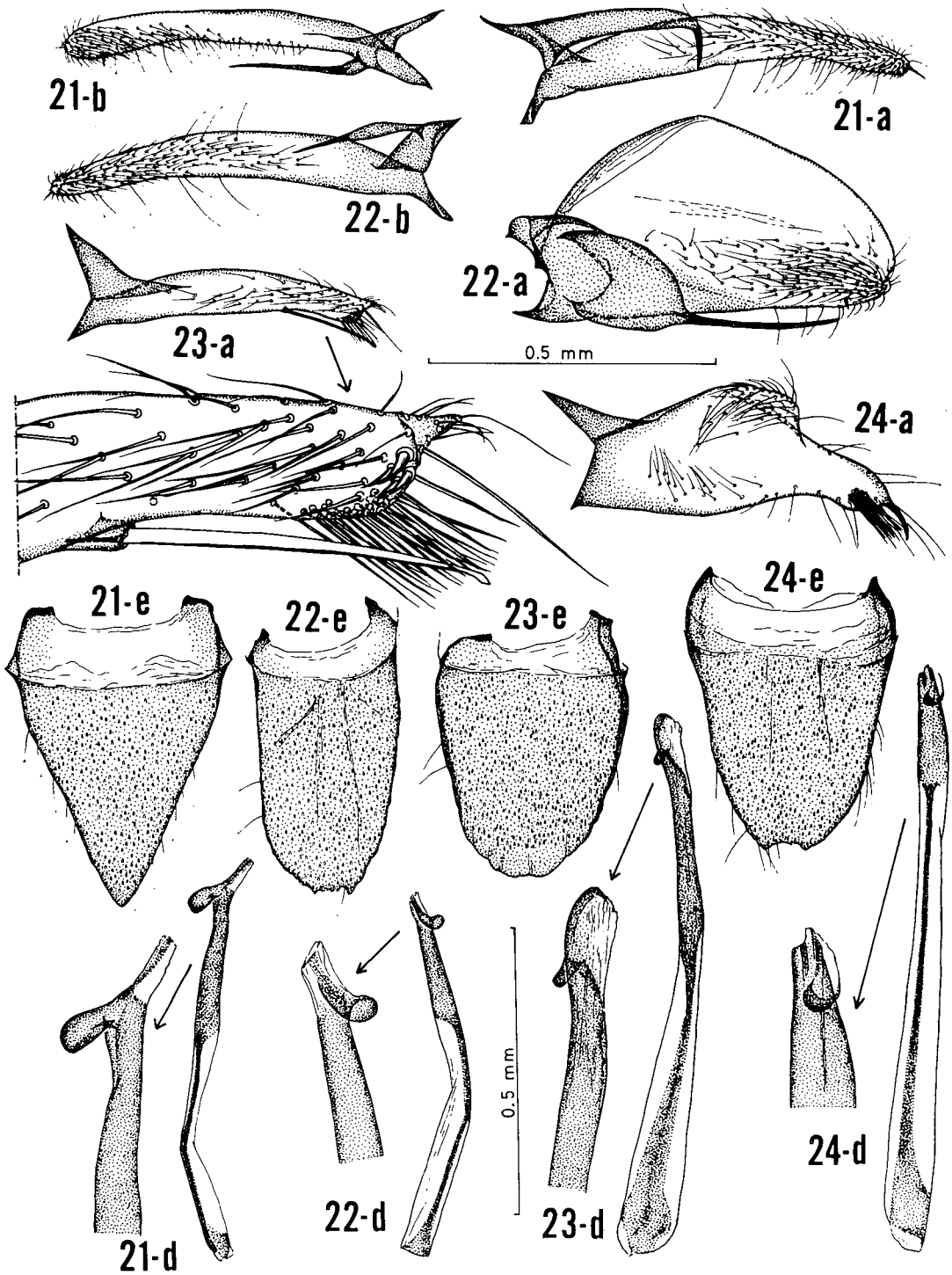
Figs. 1~13. Fore wings of Korean species of Lithocolletinae. 1: *Chrysaster hagicola* Kumata—2: *Hyloconis lespedezae* Kumata—3: *Phyllonorycter nipponicell* (Issiki)—4: *P. similis* Kumata—5: *P. acutissimae* (Kumata)—6: *P. kamijoi* (Kumata)—7: *P. issikii* (Kumata)—8: *P. aino* (Kumata)—9: *P. pastorella* (Zeller)—10: *P. koreana* Kumata et Park—11: *P. melacoronis* (Kumata)—12: *P. ringoniella* (Matsumura)—13: *P. ulmi* (Kumata). (Scale: 1mm)



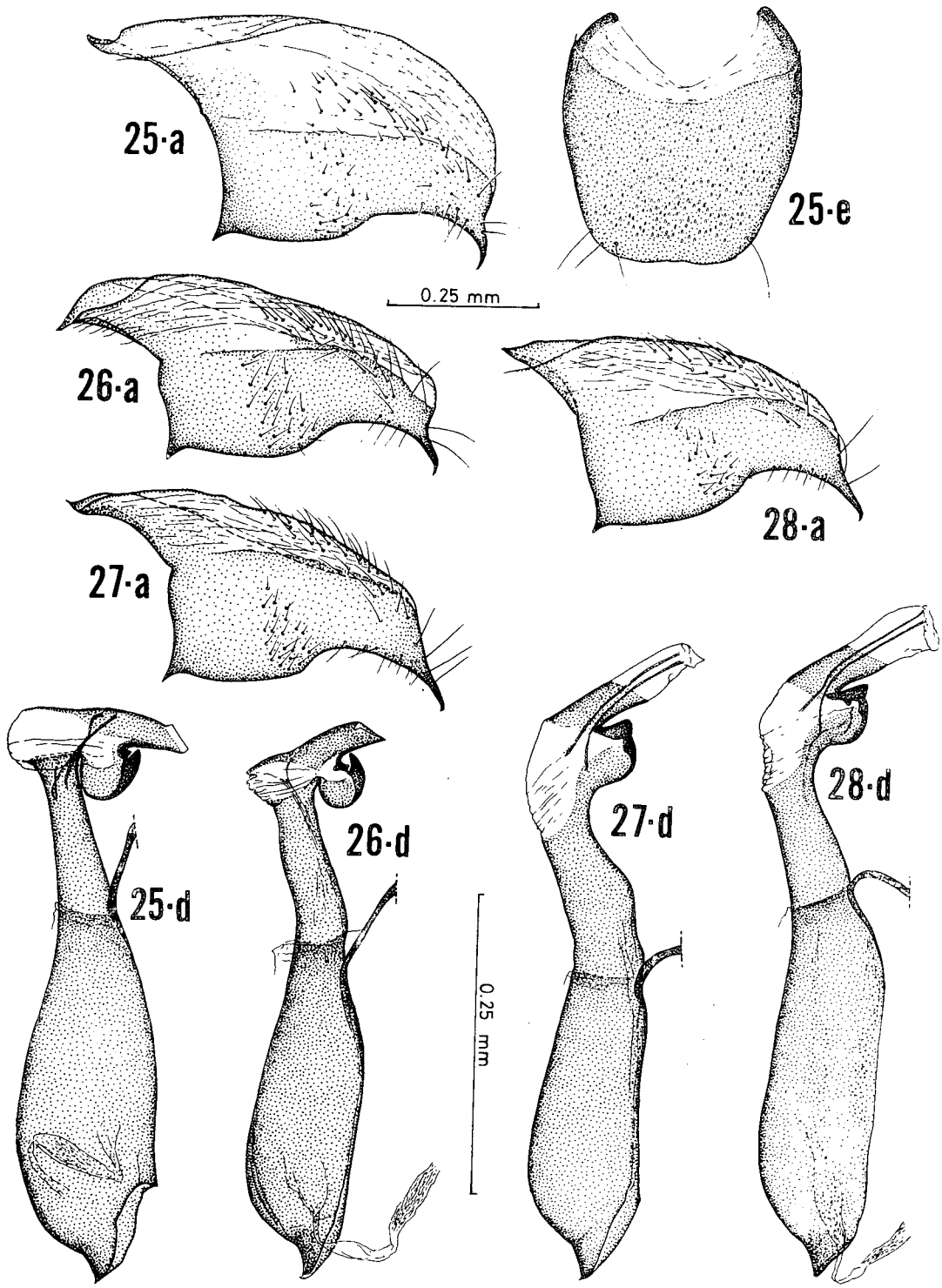
Figs. 14~16. Parts of male genitalia [a: right valva—b: left valva—c: saccus—d: aedoeagus—e: flap-like 8th sternite; the same abbreviations used for the Figs. 14~28]. 14: *Chrysaster ostensackenellus* (Fitcher) (Genitalia sl. no. Grc-517, Ohio, USA)—15: *C. hagicola* Kumata (Grc-2703, Kisohukusima, Honsyû, Japan)—16: *Hyloconis lespedezae* Kumata (Grc-2780, Mt. Seolag, Korea).



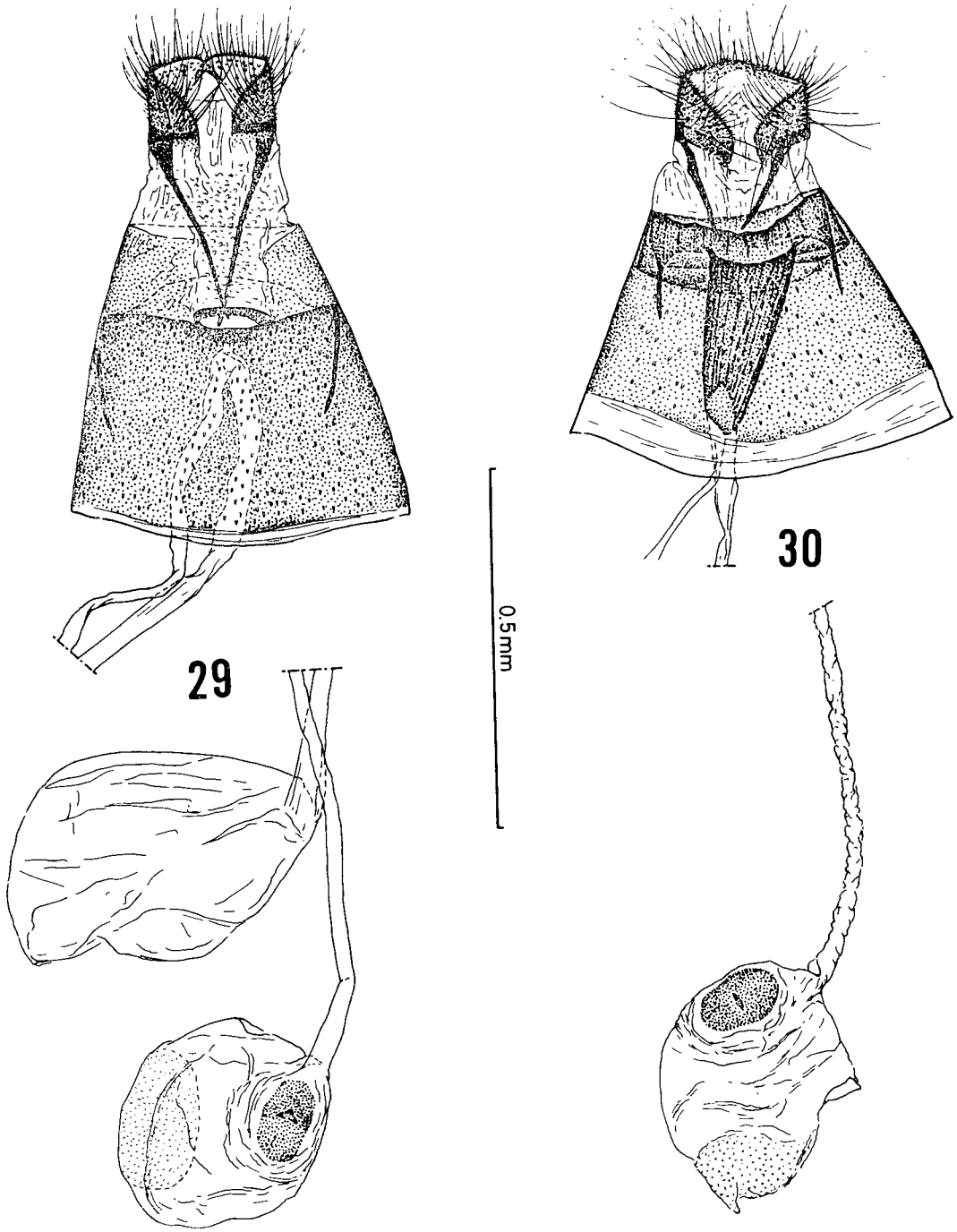
Figs. 17~20. Parts of male genitalia. 17: *Phyllonorycter nipponicella* (Issiki) (Grc-2785, Suweon, Korea)—18: *P. similis* Kumata (Grc-2781, Mt. Sogri, Korea)—19: *P. acutissimae* (Kumata) (Grc-2786, Suweon, Korea)—20: *P. kamijoi* (Kumata) (Grc-2783, Suweon, Korea).



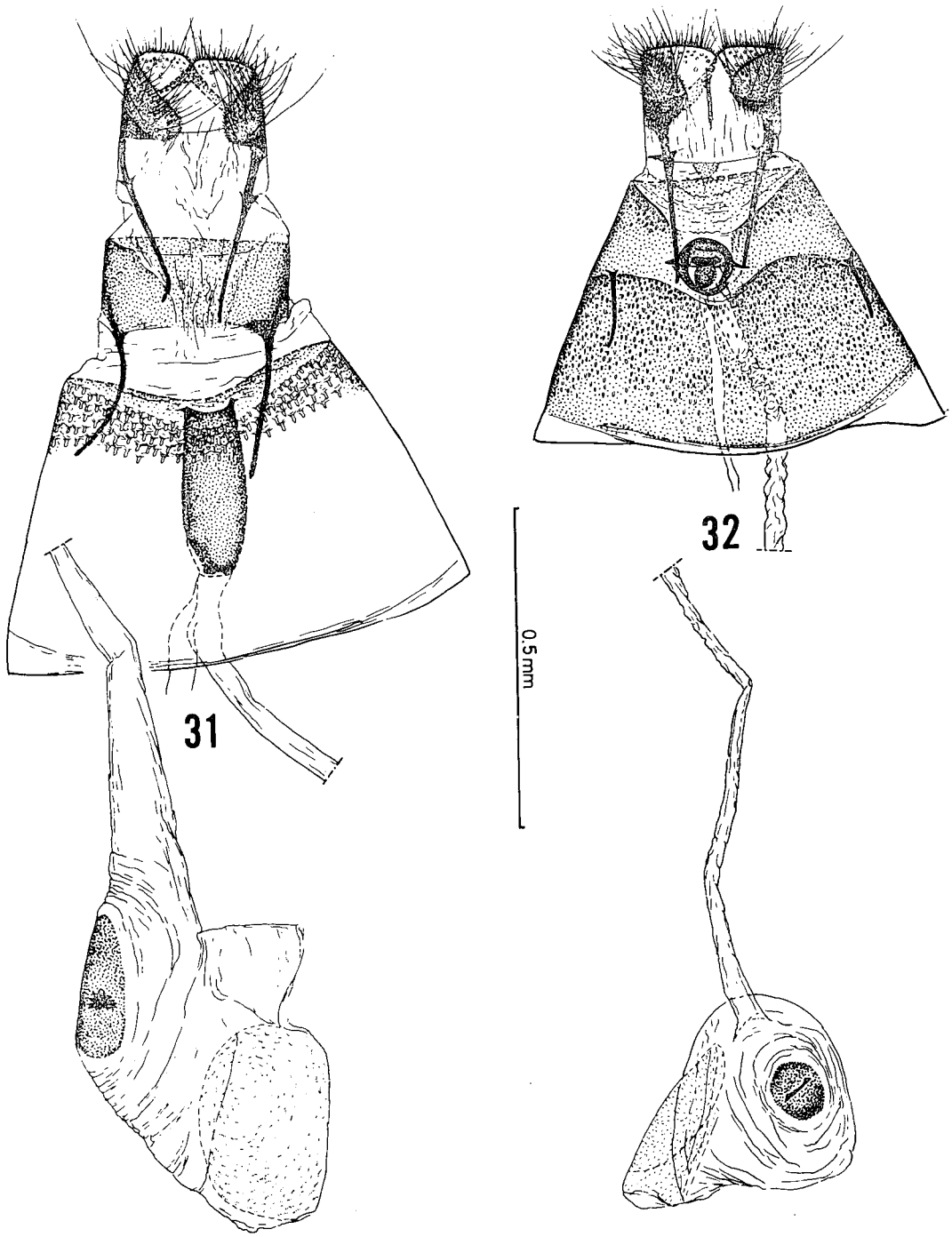
Figs. 21~24. Parts of male genitalia. 21: *Phyllonorycter aino* (Kumata) (Grc-2770, Suweon, Korea) —22: *P. issikii* (Kumata) (Grc-2776, Mt. Sogri, Korea)—23: *P. ringoniella* (Matsumura) (Grc-2172, Suweon, Korea)—24: *P. pastorella* (Zeller) (Grc-2778, Mt, Sogri, Korea).



Figs. 25～28. Parts of male genitalia. 25: *Phyllonorycter ulmi* (Kumata) (Grc-2771, Suweon, Korea, ex *Zelkova serrata*)—26: ditto (Grc-2807, Sapporo, Hokkaidô, Japan, ex *Ulmus davidiana* var. *japonica*)—27: *P. tritorrhecta* (Meyrick) (Grc-2646, Izuhara, Tu-Sima, Japan, ex *Zelkova serrata*)—28: ditto (Grc-2802, Todai, Ina, Honsyû, Japan, ex *Zelkova serrata*).



Figs. 29~30. Female genitalia. 29: *Phyllonorycter issikii* (Kumata) (Grc-2773, Mt. Sogri, Korea)—30: *P. melacoronis* (Kumata) (Grc-2777, Mt. Bughan, Korea).



Figs. 31~32. Female genitalia. 31: *Phyllonorycter ringoniella* (Matsumura) (Grc-1271, Suweon, Korea)—32: *P. ulmi* (Kumata) (Grc-2772, Suweon, Korea, ex *Zelkova serrata*).