

A Systematic Study on the Genus *Caloptilia* Hübner in Korea
(Lepidoptera; Gracillariidae)

Park, Kyu Tek and Han, Sung Sik

(Dept. of Plant Protection, College of Agriculture, Kangweon National University,
Chuncheon, 200 Republic of Korea)

韓國産 *Caloptilia* 屬에 關한 分類學的 研究

朴 奎 澤 · 韓 盛 植

(江原大學校 農科大學 植物保護學科)

적 요

Caloptilia 屬은 굴나방類中의 가늘나방科(Gracillariidae)에 속하며 많은種을 포함하는 큰 屬으로 3~4齡까지의 어린幼蟲時에는 잎組織속에 굴을 만들고 加害하나 4~5齡이 되면 굴에서 나와 그잎 또는 다른잎의 가장자리로 옮겨가 잎을 말고 加害하는 특성을 가지고 있다.

本屬은 筆者(1983)에 의해 우리나라에서는 처음으로 5種이 報告된바 있으며 금번 조사에서 6種이 未記錄種으로 報告됨으로 우리나라産 *Caloptilia* 屬은 總 11種이 된다.

Key words: *Caloptilia*, Systematics, Korea

INTRODUCTION

In general, leaf-miners include all species of the families Gracillariidae, Lyonetidae, Elachistidae, Tischeridae, most species of primitive families, and some of the superfamilies belonging to Gelechoidea and Yponomeutoidea. But this study was conducted to revise only a genus *Caloptilia* Hübner of the family Gracillariidae. Larvae of this group make various forms of miners on the lower or upper surface of leaves of various host plants, thus most of them are treated as pests

This study is a part of work which was conducted under the financial support by Korea Science and Engineering Foundation during 1984-1985.

on crops and forests. In spite of their economic importance as agricultural pests, their small size and secretive habits hindered their taxonomic work in Korea, until one of writers (Park, 1983) reported 5 species of this genus for the first time from Korea.

The genus *Caloptilia* is one of the largest group in Gracillariidae. The genus is closely related to the genus *Gracillaia*, but it is easily separated from the latter by the weakly membraneous 7th and 8th abdominal segments in male. According to Kumata(1982), this genus was subdivided into 8 subgenera based on some superficial and genitalic characters, but in this paper writers did not attempt to divide the genus into subgenus status.

From the result of our recent survey, 11 species including 6 newly reported from Korea were identified and revised in systematic order with some redescriptions, and illustrations of male and female genitalia. Some of illustrations were cited after Kumata (1982).

Finally I wish to express my sincere thanks to Dr. T. Kumata, Institute of Entomology, Faculty of Agriculture, Hokkaido University, Sapporo, Japan, for his kind advice and offering many species of valuable specimens for their comparison.

SYSTEMATICS AND DESCRIPTION

Genus *Caloptilia* Hübner 밤나무가늘나방 (新稱)

Verz. bek. Schmett., [1825], (p. 427).

Type species: *Tinea upupaepennella* Hübner, 1801.

Synonyms. *Pocilloptila* Hübner, [1825], (p. 427); *Ornix* Treitschke, 1833, (p. 194); *Coriscium* Zeller, 1839, (p. 209).

1. *Caloptilia mongolicae* Kumata

Caloptilia mongolicae Kumata, 1982, (p. 70).

There are two colour forms in adult stage, yellow and brown form. According to Kumata (1982), yellow form is slightly larger than the latter and this species is closely related to *Gracillaria mandschurica* which was described from East Siberia.

Male genitalia (Pl. I, Figs. 1-2). Subcaphium slender, T-shaped basally. Aedeagus needle-shaped, with very long phallobase and corniform cornuti arranged in a row.

Female genitalia (Pl. I, Figs. 3-4). Antrum very narrow, weakly sclerotized. Ductus bursae well sclerotized and lined with many spines on caudal part, somewhat membraneous on median part, the remaining part strongly sclerotized, widened straightly. Corpus bursae membraneous with 2 sickle-shaped signa.

Host plants: *Castanea crenata* S. et Z., *Quercus acutissima* C., *Q. dentata* T. and *Q. mongolica* var. *grossescerrata* R. W. in Japan.

Material examined: Chuncheon, 1♂, 1♀, 27. VII. 1975 (K.T. Park).

Distribution: Korea (new record), Japan.

2. *Caloptilia stigmatella* (Fabricius) 양버들가늘나방 (改稱)

Tinea stigmatella Fabricius, 1781, (p. 297).

Gracillaria stigmatica (sic); Matsumura, 1931, (p. 1101, fig. 2285).

Gracillaria alchimilla sensu Matsumura, 1931, (p. 1100, fig. 2283).

Caloptilia stigmatalis; Inoue, 1951, (p. 26); Ermolaev, 1977, (p. 108); Kumata, 1982, (p.32, fig. 10); Kuroko, 1982, (part 1, p. 178, part 2, p. 189, pl. 5, fig. 11); Park, 1983, (p. 62); Shin et al., 1983, (pp. 586 & 940, pl. 38, fig. 661).

This species is well known in the Holarctic region as a pest of *Populus* sp. and *Salix* sp., and can be separated from the related species by the shape of the costal blotch of the forewing; the blotch subtriangular, whitish-yellow, extending from basal 1/4 to about 2/3 of costa, lower angle of it shortly pointing outwardly along wing fold.

Male genitalia (Pl. I, Figs. 5-6). Subscaphium slender, T-shaped. Valva curved, slightly dilated apically, nearly straight on terminal margin. Aedeagus simple, about 3/4 as long as valva, pointed apically, without any cornuti.

Female genitalia (Pl. I, Figs. 7-8). Ductus bursae very narrow, membranous on whole length, faintly scobinated on its basal 1/5.

Host plants: *Populus* sp. in Korea. *Populus nigra* L., *Salix bakko* K., *Populus* sp. and *Betula platyphylla* S. in Japan. *Myrica* spp., *Populus* spp. and *Salix* spp. in other countries.

Material examined: Suweon, 1♂, 1♀, 11. IX. 1977 (K.T. Park).

Distribution: Korea, Japan, E. Siberia to North Asia, India, Asia Minor, Europe and N. America.

3. *Caloptilia zachrysa* (Meyrick) 사과잎가늘나방

Gracillaria zachrysa Meyrick, 1907, (p. 983).

Caloptilia zachrysa; Issiki, 1957, (p. 30); Kumata, 1982, (p. 37, fig. 13); Kuroko, 1982, (part 1, p. 179, part 2, p. 189, pl. 5, fig. 14); Park, 1983, (p. 62); Shin et al., 1983 (pp. 586 & 941, pl. 37, fig. 662).

Male and female, wingspan 10-13 mm. Forewing very narrow, almost parallel-sided; ground colour coppery-brown with slightly darker streaklets on dorsal margin; a brassy-yellow streak extending from basal 1/4 to apex along costa of wing, occupying a little more than half of wing, with a series of coppery-brown dots along its costal margin.

Male genitalia (Pl. II, Figs. 1-2). Subscaphium very slender, knobbed at basal extremity.

Valva very slightly dilated apically, almost straight on terminal margin, partially convex at basal 1/3 of ventral margin. Aedeagus a little shorter than the length of valva, without cornuti.

Female genitalia (Pl. II, Figs. 3-4). Ductus bursae very long, narrow, membranous, sparsely scobinate on its caudal 1/7. Corpus bursae with 2 sickle-shaped signa which are slightly asymmetrical in position.

Host plants: *Malus pumila* M. in Korea. *Malus pumila* M., *Photinia glabra* M. and *Rubus* sp. in Japan. *Photinia* sp. in Taiwan and *Malus pumila* in India.

Material examined: Suweon, 1♂, 1♀, 24. IX. 1980 (K.T. Park).

Distribution: Korea, Japan, Taiwan, India, and Sri-Lanka.

*4. *Caloptilia aceris* Kumata 난중잎가늘나방 (新稱)

Caloptilia aceris Kumata, 1966, (p. 1, pls. 1: 1, 1:25, 13:15); Ermolaev, 1977, (p. 109); Kumata, 1982, (p. 44); Kuroko, 1982, (part 1, p. 181, part 2, p. 190, pl. 5, fig. 29).

Male and female, wingspan 10-12 mm. Forewing brownish-fuscous, rather strongly tinged with bluish-violet reflections, with brassy-yellow in a costal blotch; costal blotch extending from basal

1/5 to 3/5, triangular or semicircular, obtusely truncated just before hind margin, without any dark spot along costa. This species is closely related to *C. theivora* in colouration, but it can be distinguished from the latter by the forewing with a brassy-yellow blotch at base.

Male genitalia (Pl. II, Figs. 5-6). Subscaphium narrow, anchor-shaped with a pair of hooks at basal extremity. Aedeagus bar-shaped, with 4-7 minute, spiniform cornuti.

Female genitalia (Pl. II, Figs. 7-8). Ductus bursae rather slender, membranous, with sclerotized antrum, and of which caudal half is widened towards ostium bursae.

Host plants: *Acer mono* M., *A. palmatum* T. and *A. saccharum* M. in Japan. No host plant has been known from Korea.

Material examined: Gwangrung, 1♂, 1♀, 8. VI. 1977 (K.T. Park).

Distribution: Korea (new record), Japan.

*5. *Caloptilia theivora* (Walsingham) 동백가늌나방 (新稱)

Gracillaria theivora Walsingham, 1893, (p. 49).

Caloptilia theivora; Issiki, 1950, (p. 452); Inoue, 1954, (p. 26); Issiki, 1957, (p. 30, pl. 4, fig. 117); Kumata, 1982, (P. 36, fig. 12); Kuroko, 1982, (part 1 p. 179, part 2, p. 190, pl. 5, fig. 13).

Male and female, wingspan 10-14 mm. This species is very similar to *C. aceris* Kumata, but it can be separated from the latter by the following characters: Head brownish with purplish reflection; labial palpus brownish at apex; forewing without a brassy-yellow hind blotch at base. In male genitalia (Pl. III, Figs. 1-2), vinculum somewhat short; aedeagus without cornuti, and in female genitalia (Pl. III, Figs. 3-4), ductus bursae very slender, long, with large antrum; corpus bursae with a single signum.

Host plants: *Camellia japonica* L., *C. sasangua* T. and *Thea sinensis* L. in Japan. *Thea* sp. in other countries. No host has been known from Korea.

Material examined: Suweon, 1♂, 1♀, 6. VIII. 1983 (Y.I. Lee).

Distribution: Korea (new record), Japan, Taiwan, India and Sri-Lanka.

*6. *Caloptilia leucothoes* Kumata 산진달래가늌나방 (新稱)

Caloptilia leucothoes Kumata, 1982, (p. 68, fig. 24).

Female, wingspan 10 mm. Forewing variable in the ground colour, dark redish-brown with or without deep violet reflection, with darkened area at base and apical, with 7-9 blackish dots along costa and blackish strigulae along dorsal margin. No male has been collected so far.

Female genitalia (Pl. III, Figs. 7-8). According to the description by Kumata (1982), this species can be separated from any other members of the genus *Caloptilia* by the very small hook-shaped signa. The Korean specimen has a little difference in the shape of ductus bursae, thus further study is needed with more materials to confirm it. The writer tentatively placed Korean species in this species.

Host plants: Not known in Korea. *Leucothoe grana* M., *Rhododendron dauricum* M., *R. reticulatum* D. D. and *Rhododendron* sp. in Japan.

Material examined: Chuncheon, 1♀, 27. VII. 1975 (K.T. Park).

Distribution: Korea (new record), Japan.

Remark: The very long spiniferous cornuti on the apex of aedeagus of male genitalia are also characteristics in this species.

*7. *Caloptilia rhois* Kumata 울나무가늌나방 (新稱)

Caloptilia rhois Kumata, 1982, (p. 62).

Female, wingspan 11 mm. According to Kumata (1982), there are two seasonal forms in adult stage, aestival and autumnal form. The ground colour of the latter is much darker on almost the whole surface.

Female genitalia (Pl. III, Figs. 5-6). Antrum about twice as long as wide. Ductus bursae gradually widened towards its terminal part which connected with corpus bursae, with two very large sickle-shaped signa.

Host plants: *Rhus javanica* L. and *R. succedanum* L. in Japan, but no host has been known from Korea.

Material examined: Namhan-san-sung, near Seoul, 1♀, 6. X. 1974 (K.T. Park).

Distribution: Korea, Japan.

8. *Caloptilia sapporella* (Matsumura) 줄참나무가늌나방

Gracillaria sapporella Matsumura, 1931, (p. 1101, fig. 2286).

Caloptilia sapporella: Inoue, 1954, (p. 26); Okano, 1954, (p. 16); Kumata, 1982, (p. 79, fig. 29); Kuroko,

1982, (part 1, p. 180, part 2, p. 190, pl. 5, fig. 21); Park, 1983, (p. 63); Shin et al., 1983, (pp. 587 & 941, pl. 38, fig. 664).

Male and female, wingspan 10-14 mm. Forewing pale reddish-brown, slightly tinged with violet reflections, with goldish yellow costal blotch which is variable in shape.

Male genitalia (Pl. IV, Figs. 1-2). Subscaphium widened triangularly at basal extremity. Vinculum about 2/3 as long as valva, round apically. Aedeagus needle-shaped, with 9-13 minute, spinelike cornuti. Seventh and 8th abdominal segments sparsely covered with scent scales; coremata consisting of hairy scales.

Female genitalia (Pl. IV, Figs. 3-4). Ductus bursae covered with microscopic, hexagonal sclerites on almost whole surface except for elongated antrum.

Host plants: *Quercus acutissima* C. in Korea. *Quercus acutissima* C., *Q. dentata* T., *Q. mongolica* F. var. *grosseserrata* R. et W., *Q. serrata* T. and *Castanea crenata* S. et Z. in Japan.

Material examined: Suweon, 1♂, 19. VIII. 1983 (D.J. Im), 1 ♀, 22. IV. 1976 (K.T. Park); Gwangrung, 1♀, 15. V. 1982 (K.T. Park), 1 ♀, 2. VI. 1982 (K.J. Won); Yongin, 1♂, 19. VI. 1981 (Y.Y. Ha); Chuncheon, 1♂, 5. VIII. 1983, 1♀, 28. VI. 1985 (K.T. Park).

Distribution: Korea, Japan.

9. *Caloptilia alni* Kumata 오리나무가늌나방

Caloptilia alni Kumata, 1966, (p. 12, pl. 2: 13, 8:34, 17:56); Ermolaev, 1977 (p. 109), 1979, (p. 24);

Kumata, 1982, (p. 83); Kuroko, 1982, (part 1, p. 180, part 2, p. 190, pl. 5, fig. 20); Park, 1983 (p. 36); Shin et al., 1983, pp. 587 & 941, pl. 38, fig. 665).

Caloptilia elongella sensu Issiki, 1957, (p. 30).

The present species is very closely related to European species, *C. clongella* in shape and colouration; in most specimens the wing uniformly coloured or having only one inconspicuous, paler costal blotch before middle; in a few specimens having some irregular dark spots along costa and just below fold.

Male genitalia (Pl. IV, Figs. 5-6). Subscaphium widened triangularly at base. Valva about 1.5 times as long as vinculum, strongly dilated apically, round on terminal margin. Vinculum rather narrow, tapering towards pointed apex. Very similar to *C. clongella*, but it can be separated from the latter by the characters of aedeagus as follows: Aedeagus with 2 very slender apical prongs and a double longitudinal row of 20-30 small cornuti on the median area of aedeagus.

Female genitalia (Pl. IV, Figs. 7-8). Well sclerotized ductus bursae irregularly curved and twice coiled on its cephalic part.

Host plants: *Abies japonica* S. and *A. hinusta* T. in Japan.

Material examined: Suweon, 1♀, 28. IX. 1980 (J.C. Paik); 3♂♂, 4♀, 20. VIII 1984 (S.B. Ahn).

Distribution: Korea, Japan, USSR (Far East).

10. *Caloptilia obliquatella* (Matsumura) 빗무늬가늑나방

Caloptilia obliquatella; Inoue, 1954, (p. 26); Kumata, 1982, (p. 101, fig. 38); Kuroko, 1982, (part 1. p. 182, part 2. p. 190, pl. 5, fig. 39); Park, 1983, (p. 63); Shin et al., 1983, (pp. 586 & 941, pl. 38, fig. 663). pl. 5, fig. 39); Park, 1983, (p. 63); Shin et al., 1983, (pp. 586 & 941, pl. 38, fig. 663).

Male and female, wingspan 11-13 mm. Forewing reddish-brown, with a broad, blackish fascia situated at middle of wing, oblique inwardly from before middle of dorsal margin obsolescently towards middle of costa, becoming narrow, sparsely mixed with whitish and brownish scales.

Male genitalia (Pl. V, Figs. 1-2). Subscaphium short, narrow. Tegumen weakly sclerotized, with a pair of peniculi which are about 2/5 as long as valva, curved, and bifurcated apically. Aedeagus tubular, straight, slightly narrowed apically, without cornuti.

Female genitalia (Pl. V, Figs. 3-4). Corpus bursae with 2 short thornlike signa, one of them larger than the other.

Host plants: *Qercus* sp. in Korea. *Qercus acutissima* C. in Japan.

Material examined: Suweon, 1♀, 16. X. 1974 (K.T. Park); 3♂♂, 1♀, 15. IX. 1983.

Distribution: Korea, Japan.

Remark: Kuznetzov(1979) described a new genus *Povolnya* which may be distinguished from the genus *Caloptilia* (s. str.) by the absence of the basal pecten of the antenna, by the presence of a long sacle-tuft on the lower side of the 2nd segment of the labial palpus and by the some separable characters of the male genitalia. Kumata(1982) proposed to treat *Povolnya* Kuznetzov as a subgenus under the genus *Caloptilia*, and *obliquatella* Matsumura was included in the member of this genus. The member of *Povolnya* is a leaf-miner in early instars and a leaf roller in late instars of larva as well as the species of *Caloptilia*. Thus, writer tentatively placed the member of *Povolnya* under the genus *Caloptilia*.

*11. *Caloptilia magnoliae* Kumata 목련가늑나방 (新稱)

Caloptilia magnoliae Kumata, 1966, (p. 17, pls. 3:20, 11:41, 19:61); Kumata, 1982, (p. 91); Kuroko, 1982, (part 1. p. 182, part 2. p. 190, pl. 5, fig. 91).

Male and female, wingspan 14-15 mm. Forewing dark reddish brown in ground colour, with an outwardly oblique streak of white irroration originated from basal 1/3 of costa; the costal margin beyond this streak heavily irrorated with white scales which are alternated with numerous brown-coloured strigulae; cilia around apex of wing ochreous brown, with a pale, straight line at subapex.

Male genitalia (Pl. V, Figs. 5-6). Subcaphium gradually narrowed basally, with transverse wrinkles of tegumen near basal 1/4; aedeagus without cornuti; 7th sternite with an interior process.

Female genitalia (Pl. V, Figs. 7-8). Lamella postivaginalis elongate, triangular; lamella antevaginalis short, band-shaped.

Host plant: *Magnolia* sp. in Korea. *Magnolia kobus* D.C. in Japan.

Material examined: Mt. Deugyu, near Muju, 1♂, 23. II. 1983, 1♀, 1. X. 1984 (S.B. Ahn); Chuncheon, 1♀, 15. V. 1985 (K.T. Park).

Distribution: Korea (new record), Japan.

Remark: Kuata (1982) described a new subgenus *Phylloptilia* with *magnolis* as type species, separating from the nominate subgenus *Caloptilia* by the following points: Vein R_2 of the forewing branches from the cell more distal than the vein Cu_{1b} does; the antenna lacks a basal pecten of hairs or scales and by the larval chaetotaxy. Four other Japanese species were included in this subgenus by him.

ABSTRACT

In total, eleven species of the genus *Caloptilia* Hübner were classified to be distributed in Korea, among them following six species were reported for the first time from Korea; *mongolicae* Kumata, *aceris* Kumata, *thuirora* Walsingham, *rhois* Kumata, *leucothoes* Kumata and *magnoliae* Kumata. And some host plants of the species were investigated in Korea and some already known from abroad were listed together.

REFERENCES

- Ermolaev, V. P., 1977. A review of the fauna and ecology of miner-moth (Lep., Gracillariidae) of the Primorye Territory. *Pro. Zool. Inst. Acad. Sci. USSR.* 70:98-116.
- Ermolaev, V.P., 1979. A contribution to the study on the leaf-mining family Gracillariidae of the southern Far East. In *terrestrial Arthropoda of the Far East*: 23-27.
- Inoue, H. 1954. Check list of Lepidoptera of Japan 1:26.
- Issiki, S. 1957. In Esaki et al., *Icon. Heterocerorum Japonicorum in coloribus naturalibus*. Vol. 1:29-30.
- Kumata, T. 1966. Description of twenty new species of the genus *Caloptilia* Hübner from Japan including Ryukyu Islands. *Ins. Mats.* 29:1-21.
- Kumata, T. 1982. A taxonomic revision of the *Gracillaria* group occurring in Japan. *Ins. Mats.*, ser. 26:1-186.
- Kuroko, H. 1982. In Inoue et al., *Moths of Japan, Gracillariidae*, 1:178-182, 2:189-190.
- Matsumura, S. 1931. *6000 Illustrated Insects of Japan*: 1100-1101.
- Park, K. T. 1983. *Microlepidoptera of Korea*. *Insecta Koreana*, ser. 3:62-63.
- Shin, Y. H., K. T. Park & S. H. Nam. 1983. *Illustrated Flora & Fauna of Korea*, Vol. 27, *Insects (IX)*: 586-587, 940-941.

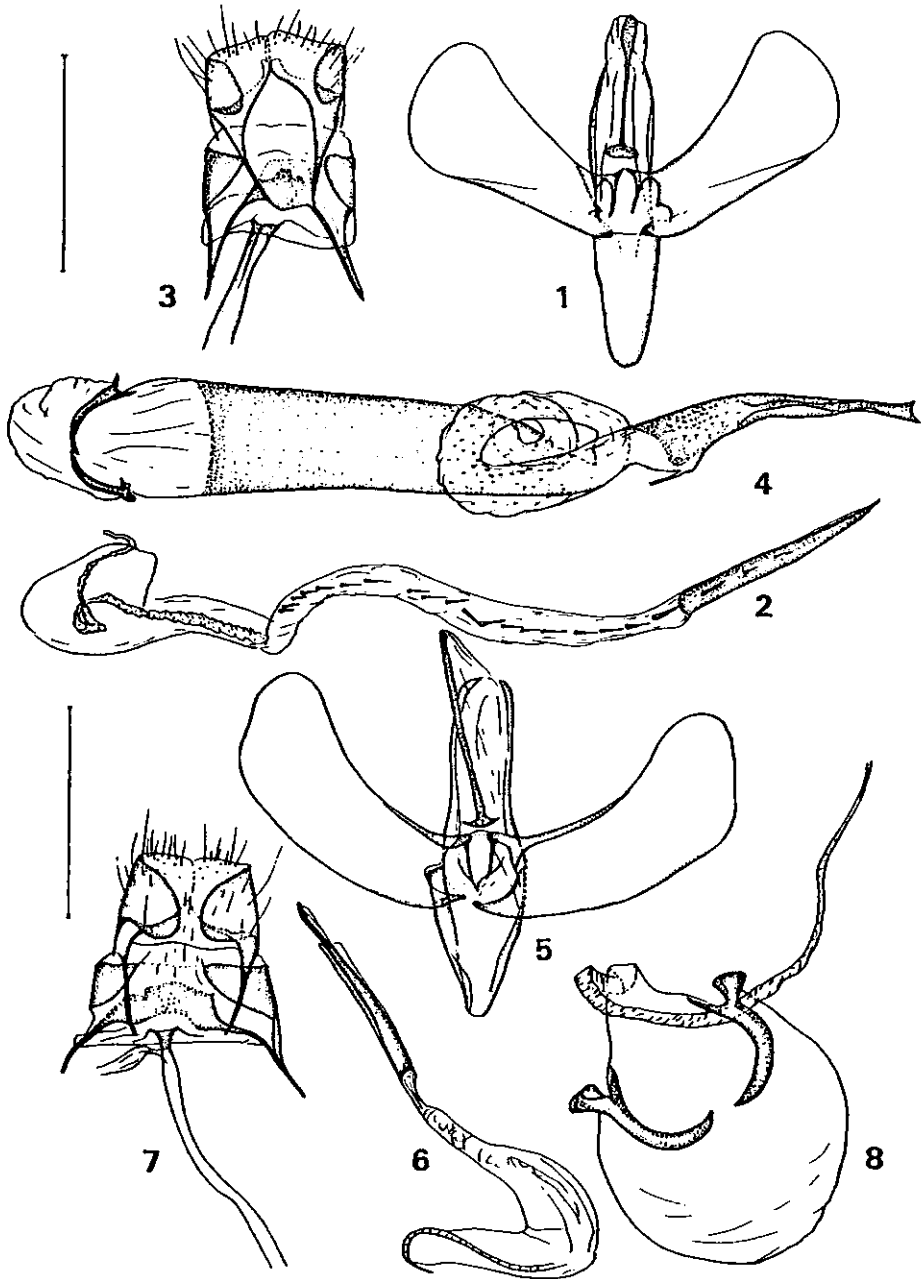


Plate I. Figs. 1-4. *Caloptilia mongolicae* Kumata, 1. Male genitalia 2. ditto, aedeagus, 3 & 4. Female genitalia. Figs. 5-8. *Caloptilia stigmatella* (Fabricius), 5. Male genitalia, 6. ditto, aedeagus, 7 & 8. Female genitalia. (Scale: 0.5mm)

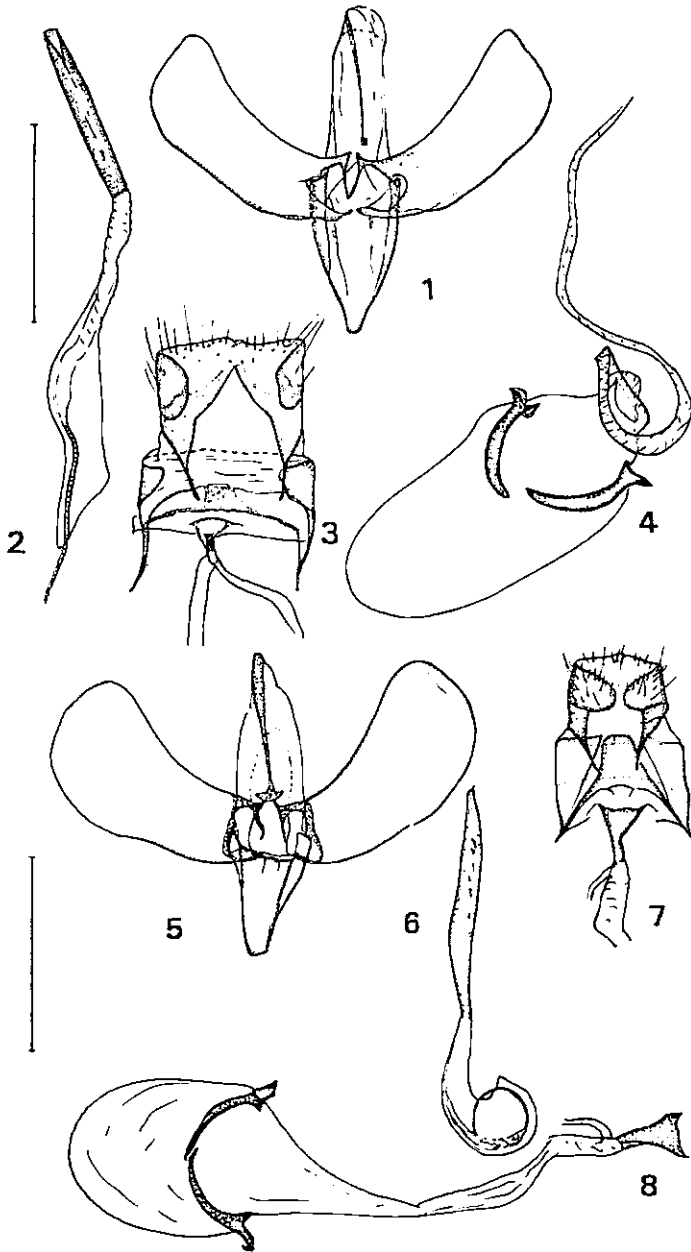


Plate II. Figs. 1-4. *Caloptilia zachrysa* (Meyrick), 1. Male genitalia, 2. ditto, aedeagus, 3 & 4. Female genitalia. Figs. 5-8. *Caloptilia aceris* Kumata, 5. Male genitalia, 6. ditto, aedeagus, 7 & 8. Female genitalia. (Scale: 0.5 mm)

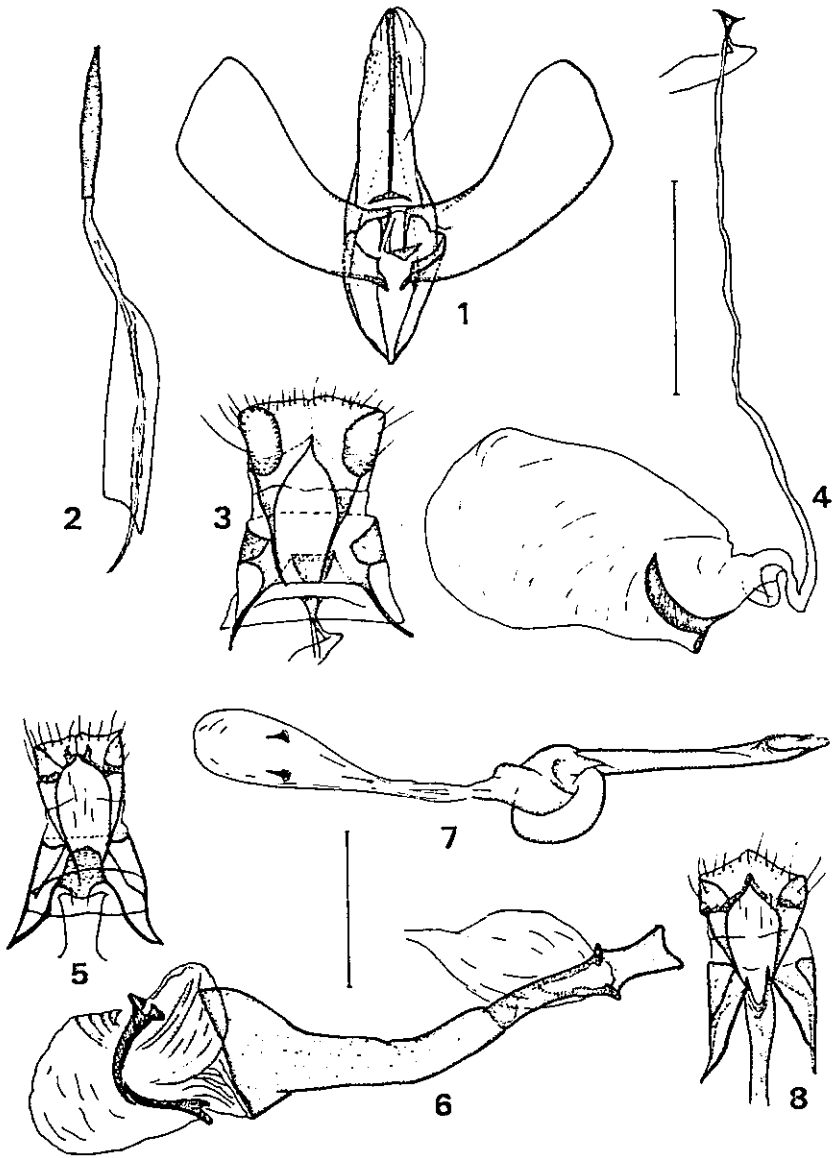
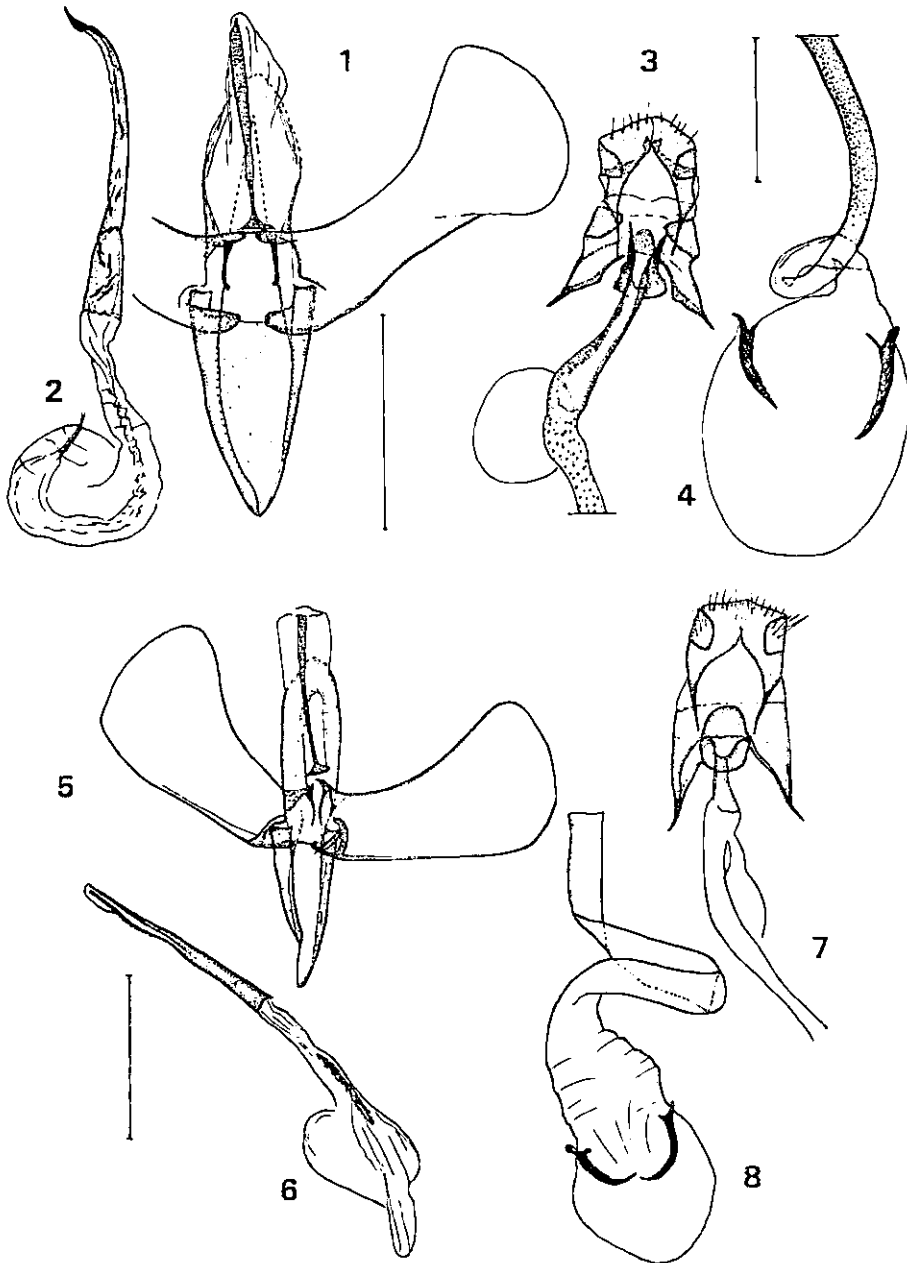


Plate III. Figs. 1-4. *Caloptilia thivora* (Walsingham), 1. Male genitalia 2. ditto, aedeagus, 3 & 4. Female genitalia. Figs. 5-6. *Caloptilia rhois* Kumata, Female genitalia. Figs. 7-8. *Caloptilia leucohoes* Kumata, Female genitalia. (Scale: 0.5 mm)



Plat IV. Figs. 1-4. *Caloptilia sapporella* (Matsamura). 1. Male genitalia, 2. ditto, aedeagus, 3 & 4. Female genitalia. Figs. 5-8. *Caloptilia ala* Kumata, 5. Male genitalia, 6. ditto, aedeagus 7 & 8. Female genitalia. (Scale: 0.5 mm)

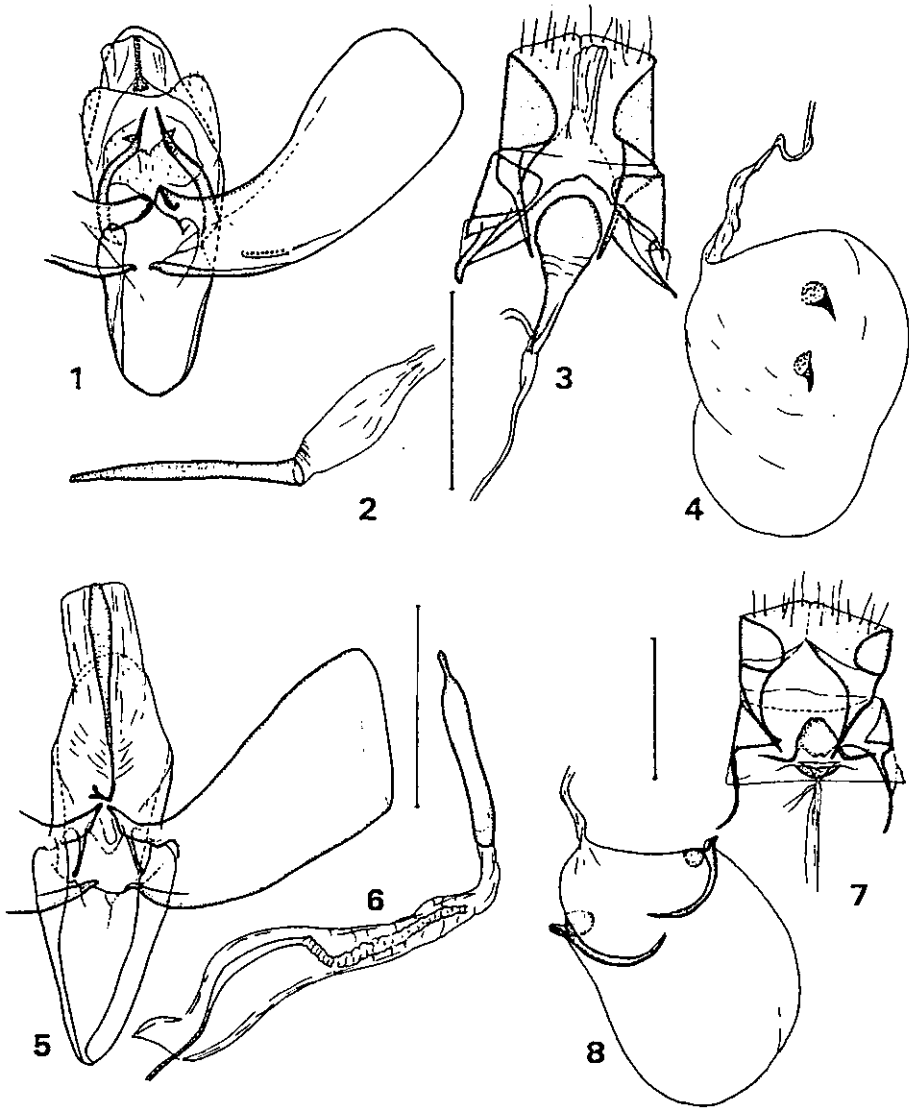


Plate V. Figs. 1-4. *Caloptilia obliquatella* (Matsumura), 1. Male genitalia 2. ditto, aedeagus, 3 & 4. Female genitalia. Figs. 5-8. *Caloptilia magnoliar* Kumata, 5. Male genitalia, 6. ditto, aedeagus, 7 & 8. Female genitalia. (Scale: 0.5 mm)