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TAXONOMIC STUDIES ON  
THE LITHOCOLLETINAE OF JAPAN  
(LEPIDOPTERA: GRACILLARIIDAE)

Part III<sup>1)</sup>

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In the parts I and II are stated 62 species of the subfamily Lithocolletinae occurring in Japan in accordance with the families of their host plants: 54 species belong to the genus *Lithocolletis*, 1 to *Neolithocolletis*, 3 to *Cameraria* and the rest to *Hyloconis*. In this part there is intended the classification of these accompanied by the keys to the genera and species and the host list.

**Classification**

The family Gracillariidae, a large and widely distributed group of leaf-miners, consists of more than 1500 species arranged in about 60 genera. It is a very peculiar family, being distinguished from any other by the basal obsolescence of the upper margin of the cell of the fore wing, the costal termination of the vein  $R_s$ , the three-segmented maxillary palpus, and the larva having only four pairs of prolegs.

This family was divided into two subfamilies by Dr. A. Spuler in 1910, namely Gracillariinae and Lithocolletinae. Since that time some authors have taken somewhat different views about the division of the family. After the careful study of Japanese Gracillariidae I am much inclined to the opinion that the family may be divided into two well-defined and natural groups: one is the subfamily Lithocolletinae containing the genus *Lithocolletis* and its allied genera, and the other the subfamily Gracillariinae including the genera *Parornix* Spuler, *Gracillaria* Haworth, *Parectopa* Clemens, *Acrocercops* Wallengren and their related genera.

These subfamilies are easily distinguished from each other by the venation of the hind wing, the structure of the male genitalia, and the habit of the larva. In the Lithocolletinae the veins  $Cu_1$  and  $M_3$  of the hind wing are usually absent; the ninth sternite of the male is produced into a fairly wide flap; and the larva pupates habitually inside the mine without any opening or tear. On the other hand, in the Gracillariinae the vein  $Cu_2$  of the hind wing is stalked with veins  $Cu_1$  and  $M_3$  ordinarily; the ninth sternite of the male is simple, never produced into a wide flap; the larva pupates outside the mine, but if it

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1) Part I: Insecta Matsumurana 25(2): 53-90, 1963. Part II: ibid. 26(1): 1-48, 1963.

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pupates inside the mine, the mine has openings or tears on its loosened surface (for example, in some species of *Acrocercops*).

#### Subfamily **Lithocolletinae**

The subfamily Lithocolletinae is characterized as follows:—

Head with a tuft or crown of long, slender scales, and without any ocellus. Antenna about as long as fore wing; scape slightly thickened, with a basal pecten of a few hairs. Labial palpus very short, drooping, never curved; maxillary palpus usually almost rudimentary. Venation very simple in both wings: fore wing with seven to nine veins, the veins  $R_1$ ,  $Cu_1$  and  $M_3$  being usually absent; hind wing with only five to six veins, the vein  $Cu_2$  being simple, never stalked with veins  $Cu_1$  and  $M_3$ , which are usually absent in the present subfamily. Ninth sternite of male produced into a fairly wide flap lying under valvae. Uncus weakly developed, without any sclerotized organ. With a few exceptions, signum more or less circularly sclerotized on corpus bursae, bearing cone-shaped, very minute projections in its centre.

So far as their habits are known, the species of the subfamily are leaf-miners. The mines may occur upon either side of leaves, and more or less blotch-formed. During the larval stage there are two types in the form of the body and the structure of the head: in earlier instars the body is flat with a sap-feeding mouth, while in later instars it is more or less cylindrical with a tissue-feeding mouth. The larva pupates usually inside the mine-cavity which has no opening or tear passing to the outside. The pupa is generally enclosed by a silken cocoon.

The following 62 species of this subfamily belonging to four genera have been known to occur in Japan. These genera and species may be classified in the following lines.

#### Genus **Lithocolletis** Hübner

*Lithocolletis* Hübner, 1825, Verz. Bek. Schmett. 27: 423; Zeller, 1846, Linn. Ent. 1: 167; Braun, 1908, Trans. Amer. Ent. Soc. 34: 271 (part.); Spuler, 1910, Schmett. Europ. 2: 412; Meyrick, 1912, Gen. Ins., Gracilariidae: 4 (part.); Hering, 1932, Tierw. Mitteleur. 18: 21. [Type-species: *Tinea alnifoliella* Hübner = *Lithocolletis rajella* (Linné)].

*Phyllonorycter* Hübner, 1822, Syst.-alphab. Verz.: 66 (nomen oblitum); Walsingham, 1908, Proc. Zool. Soc. Lond. 1907: 976; Ely, 1917, Proc. Ent. Soc. Washington 19: 55. [Type-species: *Tinea alnifoliella* (Hübner)].

*Eucetis* Hübner, 1825, Verz. Bek. Schmett. 27: 423. [Type-species: *Tinea ulmifoliella* Hübner].

As regards the external characters of this genus, good statements are given by A. F. Braun, 1908, E. Meyrick, 1912, and C. R. Ely, 1917. Although I have no opportunity to examine the type-species of the genus, will be stated in the following lines the general characters of the genitalia on the basis of the Japanese species and some European and American ones.

Male genitalia: Seventh and eighth abdominal segments without tuft of scales. Valva rather simple, much elongated, mostly bar-shaped or rarely bag-shaped, in most species with a process produced from basal area and a long, filament-like seta. Uncus weakly elongated, very simple, without any sclerotized organ and seta. Transtilla present, quadrate,

and somewhat protruded on either cephalic corner. Saccus small, triangular or spatular, with a long apical projection in a few species. Diaphragma generally wholly membranous; if a sclerotized juxta present, it is very narrow and long, without processes of dorso-laterals. Aedoeagus rather long, slender in whole length or swollen on its basal half, with one to three small barbs or projections on its apical area in both cases.

Female genitalia: Ductus bursae very long and narrow, almost wholly membranous. Ductus seminalis opening from caudal extremity of ductus bursae. Corpus bursae with a more or less circularly sclerotized plate of signum, which bears two cone-shaped projections in the centre in most species.

The larvae of the genus mine mainly into the lower surface or rarely into the upper surface of the leaves of their food-plants, which are many kinds of Dicotyledonous trees and shrubs. In the first three or four instars the body is flat with a sap-feeding mouth, while in the last two instars it is cylindrical with a tissue-feeding mouth. The mine (plates VII & VIII, figs. 1-6) is very small and blotch-formed: it is at first very flat, and then the loosened surface is contracted by silk, and finally becomes a tentiformed blotch (ptychonomous type). The leaf-tissues within the mine are consumed almost wholly, or sometimes fed irregularly in spots. The pupa is usually formed within the mine-cavity, and may be enclosed by a cocoon, which is rather thin and ellipsoidal in form.

This genus is the largest in the subfamily, including more than 400 species described from the world, especially from the Palaearctic and Nearctic regions. In the course of the present study 54 species are known to occur in Japan. On the basis of the genital characters these species, excepting *L. dorinda* Meyrick, can be arranged in the following nine species-groups.

### I. Group of *rajella*

This group agrees with the "Group A" of Pierce & Metcalfe, 1935. Among the species known to occur in Japan the Fagaceae-mining species and most of the Rosaceae- and Betulaceae-mining ones belong to this group.

1. *Lithocolletis strigulatella* Zeller, 1846 (I: 64).\*
2. *Lithocolletis maculata* Kumata, 1963 (I: 65).
3. *Lithocolletis carpini* Kumata, 1963 (I: 68).
4. *Lithocolletis ostryae* Kumata, 1963 (I: 70).
5. *Lithocolletis hikosana* Kumata, 1963 (I: 71).
6. *Lithocolletis nipponicella* Issiki, 1930 (I: 79).
7. *Lithocolletis acutissimae* Kumata, 1963 (I: 81).
8. *Lithocolletis nigristella* Kumata, 1957 (I: 82).
9. *Lithocolletis kamijoi* Kumata, 1963 (I: 82).
10. *Lithocolletis pseudolautella* Kumata, 1963 (I: 84).
11. *Lithocolletis pygmaea* Kumata, 1963 (I: 86).
12. *Lithocolletis fagifolia* Kumata, 1963 (I: 78).

\* This indicates the part and page of the present thesis.

13. *Lithocolletis rostrispinosa* Kumata, 1963 (I : 87).
14. *Lithocolletis cretata* Kumata, 1957 (I : 88).
15. *Lithocolletis mongolicae* Kumata, 1963 (I : 88).
16. *Lithocolletis viburni* Kumata, 1963 (II : 42).
17. *Lithocolletis turugisana* Kumata, 1963 (II : 45).
18. *Lithocolletis watanabei* Kumata, 1963 (II : 13).
19. *Lithocolletis sorbicola* Kumata, 1963 (II : 14).
20. *Lithocolletis aino* Kumata, 1963 (II : 11).
21. *Lithocolletis leucocorona* Kumata, 1957 (I : 90).
22. *Lithocolletis issikii* Kumata, 1963 (I : 62).
23. *Lithocolletis kurokoi* Kumata, 1963 (II : 29).

## II. Group of *jezoniella*

24. *Lithocolletis jezoniella* Matsumura, 1931 (II : 29).

## III. Group of *japonica*

Most species of this group attack plants which belong to Betulaceae.

25. *Lithocolletis uchidai* Kumata, 1963 (II : 16).
26. *Lithocolletis hancola* Kumata, 1958 (I : 66).
27. *Lithocolletis ermani* Kumata, 1963 (I : 72).
28. *Lithocolletis japonica* Kumata, 1963 (I : 73).
29. *Lithocolletis dakekanbae* Kumata, 1963 (I : 75).
30. *Lithocolletis lyoniae* Kumata, 1963 (II : 38).
31. *Lithocolletis styracis* Kumata, 1963 (I : 56).
32. *Lithocolletis juglandis* Kumata, 1963 (I : 59).

## IV. Group of *ulicicolella*

The members belonging to this group are mostly leaf-miners of Salicaceae and Leguminosae. This group agrees with the "Group B" of Pierce & Metcalfe.

33. *Lithocolletis salictella* Zeller, 1846 (I : 54).
34. *Lithocolletis salicicolella* Sircom, 1848 (I : 55).
35. *Lithocolletis viciae* Kumata, 1963 (II : 18).

## V. Group of *orientalis*

36. *Lithocolletis orientalis* Kumata, 1963 (II : 31).

## VI. Group of *pterocaryae*

37. *Lithocolletis pterocaryae* Kumata, 1963 (I : 61).

## VII. Group of *ulmifoliella*

38. *Lithocolletis pastorella* Zeller, 1846 (I : 54).
39. *Lithocolletis cavella* Zeller, 1846 (I : 76).
40. *Lithocolletis ulmifoliella* (Hübner), 1816 (I : 77).

41. *Lithocolletis melacoronis* Kumata, 1963 (II : 37).
42. *Lithocolletis ringoniella* Matsumura, 1931 (II : 11).

#### VIII. Group of *longispinata*

This group contains the following three species, in which the first and third species are known as leaf-miners of *Alnus*.

43. *Lithocolletis longispinata* Kumata, 1958 (I : 66).
44. *Lithocolletis gigas* Kumata, 1963 (II : 46).
45. *Lithocolletis takagii* Kumata, 1963 (I : 67).

#### IX. Group of *trifasciella*

This group agrees well enough with the "Group C" of Pierce & Metcalfe. It is represented by eight species, most of them being leaf-miners of *Ulmaceae*.

46. *Lithocolletis tritorrhecta* Meyrick, 1935 (II : 1).
47. *Lithocolletis ulmi* Kumata, 1963 (II : 4).
48. *Lithocolletis bicinctella* Matsumura, 1931 (II : 7).
49. *Lithocolletis tristrigella* (Haworth), 1828 (II : 6).
50. *Lithocolletis zelkovae* Kumata, 1963 (II : 3).
51. *Lithocolletis lonicerae* Kumata, 1963 (II : 40).
52. *Lithocolletis celtidis* Kumata, 1963 (II : 7).
53. *Lithocolletis pulchra* Kumata, 1963 (II : 9).

#### Species of which the situation is unknown

54. *Lithocolletis dorinda* Meyrick, 1912 (II : 28).

#### Genus *Neolithocolletis* Kumata

*Neolithocolletis* Kumata, 1963, Ins. Mats. 26 : 21. [Type-species : *Neolithocolletis hikomonticola* Kumata].

This genus is very closely related to the genus *Lithocolletis*, from which it is distinguished by the fore wing having the vein  $R_3$  and by the male genitalia having one pair of hairy processes on the sclerotized anellus. From the genera *Cameraria* and *Hyloconis* it differs by the presence of the very wide transtilla.

The genus is monobasic, being represented by the following species, a leaf-miner of *Pueraria lobata* (Leguminosae).

55. *Neolithocolletis hikomonticola* Kumata, 1963 (II : 19).

#### Genus *Cameraria* Chapman

*Cameraria* Chapman, 1902, Entomologist 35 : 141 ; Ely, 1917, Proc. Ent. Soc. Washington 19 : 38. [Type-species : *Lithocolletis guttifinitella* Clemens].

The genus *Cameraria* is distinct from the genus *Lithocolletis* by the very much depressed and flat larva and by the externally dark-margined marks of the fore wing. Although I have not examined the genitalia of the type-species, on the basis of the Japanese species and two American species, *C. saccharella* (Braun) and *C. aceriella* (Clemens), the general

characters of the genitalia may be given below:—

Male genitalia: Transtilla absent. Valva more or less narrowed on median part, with a number of dense, long, slender setae on inner surface of rather widened apical half; costal base of valva produced beyond the basal margin of valva, and forming an oval knob or a slender process. Uncus weakly elongated, with a pair of setae on its apex, and without any sclerotized organ. Aedoeagus usually dilated towards base, without any apical barb. Sclerotized anellus usually present, without hairy process on its dorso-laterals.

Female genitalia: Ductus bursae opening usually at middle of caudal margin of seventh sternite. Ductus seminalis opening at sclerotized antrum, or at antrum-like, sclerotized part placed on middle of ductus bursae.

The larvae of this genus mine usually into the upper side of leaves. In the first four or five instars the body is flat with a sap-feeding mouth, while in the last instar it is sub-cylindrical with a tissue-feeding mouth. The mine (plate VIII, fig. 8) is very flat, sometimes irregularly blotch-formed or rather broad-linear (orthogenous or asteronomous type). In the cross section of the mine the tissues consisting of lower parenchyma cells remain usually within the mine. The cocoon is formed in the centre of the mine-cavity, rather thick, and ellipsoidal in form. The larvae of the present genus differ from those of the genera *Lithocolletis* and *Hyloconis* by the following aspect: that is, the former are subcylindrical with a tissue-feeding mouth only in the last instar, and feed merely upper leaf-tissues within the mine.

This genus has been known to occur only in the New World. In this work the following three species are discovered from Japan for the first time.

56. *Cameraria nipponica* Kumata, 1963 (II: 35).
57. *Cameraria acericola* Kumata, 1963 (II: 33).
58. *Cameraria hikosanensis* Kumata, 1963 (II: 43).

#### Genus *Hyloconis* Kumata

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

The genus *Hyloconis* is readily distinguished from any other genera of the subfamily by the hind wing of which the vein  $M_1$  is present and stalked with the vein  $M_2$ .

The members of the genus are leaf-miners of Leguminosae. There are five larval instars, the first three of which are of a flat type with a sap-feeding mouth, while the last two are of a cylindrical type with a tissue-feeding mouth as in *Lithocolletis*. The mine (plate VIII, fig. 7) is usually found upon the lower side of leaves, being rather small, oval or circular, entirely very flat, and blotch-formed (orthogenous type). The leaf-tissues within the mine are almost destroyed by the larva as in *Lithocolletis*, while the loosened surface is never contracted by silk. The cocoon is placed in the centre of the mine-cavity, being rather thick and orbicular in form. As mentioned above, the present genus may be distinct also from any other genera in the form of the cocoon and in the construction of the mine as well as in the structure of the adult.

The following four species have been known to occur in Japan.

59. *Hyloconis puerariae* Kumata, 1963 (II: 22).

60. *Hyloconis desmodii* Kumata, 1963 (II: 23).
61. *Hyloconis lespedezae* Kumata, 1963 (II: 25).
62. *Hyloconis wisteriae* Kumata, 1963 (II: 26).

#### Key to the genera of *Lithocolletinae* occurring in Japan

1. Fore wing with four veins on costal side (vein  $R_3$  absent). . . . . 2.
- Fore wing with five veins on costal side (vein  $R_3$  present). . . . . 3.
2. Male genitalia with transtilla; whitish marks of fore wing margined with dark scales internally. . . . . *Lithocolletis* Hübner.
- Male genitalia without transtilla; whitish marks of fore wing margined with dark scales externally. . . . . *Cameraria* Chapman.
3. Hind wing with vein  $M_2$  stalked with  $M_1$ ; male genitalia without transtilla. . . *Hyloconis* Kumata.
- Hind wing without vein  $M_2$ ; male genitalia with transtilla. . . . . *Neolithocolletis* Kumata.

#### Key to the species of *Lithocolletis* occurring in Japan

(excluding *L. dorinda* Meyrick)

1. Juxta not sclerotized. . . . . 2.
- Juxta very much sclerotized. . . . . 8.
2. Valva with a costal process produced at base of costa or near base of valva. . . . . 3.
- Valva without costal process. . . . . 4.
3. Costal process of valva with only a very long, filament-like seta on top; flap of ninth sternite without apical projection; aedoeagus with a barb at apex or just before apex or a pair of membranes on apical 1/3. . . . . (Group of *rajella*). . 9.
- Costal process of valva with a few short setae near top; flap of ninth sternite with an apical globular projection; aedoeagus with two outwardly pointed projection just before apex; mine on lower leaf surface of *Acer*. . . . . (Group of *jezoniella*). . *L. jezoniella* Matsumura.
4. Valva with a string-like projection produced at basal corner of hind margin; mine on lower leaf surface of *Acer*. . . . . (Group of *orientalis*). . *L. orientalis* Kumata.
- Valva without such a projection. . . . . 5.
5. Valva with sacculus more or less produced from hind margin. . . . . 6.
- Valva without any process of sacculus. . . . . 7.
6. Left valva more or less wider than the right; process of sacculus with only a long, filament-like seta; aedoeagus very slender in whole length; eighth abdominal segment of female sclerotized only on tergite or wholly membranous; antapophysis very weak and rudimentary or absent; sclerotized signum with a pair of minute, cone-shaped projections. . . (Group of *japonica*). . 31.
- Valvae symmetrical; process of sacculus with a few short, slender setae; aedoeagus rather thick in whole length; eighth abdominal segment of female normally sclerotized; antapophysis present; sclerotized signum with only a long, cone-shaped projection; mine on upper leaf surface of *Pterocarya* and *Juglans*. . . . . (Group of *pterocaryae*). . *L. pterocaryae* Kumata.
7. Valvae asymmetrical; left valva with an inwardly curved, long, spine-like seta at apex; right valva with a rather erect, short, spine-like seta near apex. . . . . (Group of *ulicicolella*). . 38.
- Valvae symmetrical; both valvae without such a seta. . . . . (Group of *ulmifoliella*). . 40.
8. Aedoeagus rather short, globularly much dilated on basal half; valva rather short, conspicuously widened near base; sterigma very minute and perfectly smooth or entirely absent; eighth tergite of female without caudal setae. . . . . (Group of *trifasciella*). . 46.
- Aedoeagus very long, slender in whole length; valva elongated, slender, with a few long, spine-



- like setae on apical half; sterigma usually present, with a number of micro-spines on whole surface; eighth tergite of female with a few caudal setae. . . . (Group of *longispinata*) . . . 44.
9. Male genitalia completely symmetrical. . . . . 10.  
 - Male genitalia asymmetrical in valvae or at least in costal processes of valvae. . . . . 25.
10. Aedoeagus with a pair of longitudinal membranes on apical 1/3 (see part I, figs. 22 & 23). . . 11.  
 - Aedoeagus bar-shaped, with a small barb or incision at apex or just before apex. . . . . 12.
11. Valva with a long, spine-like seta at apical 1/4 to 1/5 of hind margin; sterigma cylindrical, gradually narrowed towards cephalic top; thorax without white median stripe; white median fascia of fore wing margined with dark scales internally and externally; mine on lower leaf surface of *Quercus* and *Castanea*. . . . . *L. pygmaea* Kumata.  
 - Valva with a long, spine-like seta at apical 1/8 to 1/10 of hind margin; sterigma campanulate, suddenly narrowed towards cephalic top; thorax with a white median stripe; white median fascia of fore wing margined with dark scales internally only; mine on lower leaf surface of *Quercus*. . . . . *L. pseudolautella* Kumata.
12. Flap of ninth sternite with apical margin concave, sinuate or incised. . . . . 13.  
 - Flap of ninth sternite more or less pointed or rounded apically. . . . . 18.
13. Aedoeagus obliquely truncated apically (see part I, figs. 8 & 9); antenna black, with apical nine to ten segments white; thorax without median white stripe; mine on lower leaf surface of *Alnus*. . . . . 14.  
 - Aedoeagus not truncated apically; antenna whitish, with an apical segment blackish; thorax with a white median stripe; mine on lower leaf surface of *Quercus* and *Castanea*. . . . . 15.
14. Flap of ninth sternite much elongated, trapezoid in shape; valva much elongated, ending in a sclerotized thorn which is inwardly curved; frontal tuft yellowish-ochreous; thorax golden-ochreous, with two white stripes; fore wing with a white basal streak and seven white blotches or spots, without black basal blotch and white central spot. . . . . *L. strigulatella* Zeller.  
 - Flap of ninth sternite somewhat oval in shape; valva moderately elongated, roundish apically, without apical thorn; tuft of head blackish; thorax entirely leaden-metallic; fore wing with a black basal blotch and nine small, white spots, of which one is placed in the centre of the wing. . . . . *L. maculata* Kumata.
15. Flap of ninth sternite triangular, deeply incised apically, with only a seta on either side of the incision; sterigma somewhat cone-shaped, with its cephalic top obliquely truncated; white costo-basal streak of fore wing widened outwardly, and completely united with a white median fascia in a single mark. . . . . *L. kamijoi* Kumata.  
 - Flap of ninth sternite somewhat rectangular, with its apical margin concave, with more than three setae on either side of the concavity; sterigma semicircular or at least roundish on cephalic margin; white costo-basal streak of fore wing ending just before white median fascia or streak, but if fused with median fascia or streak, conspicuously constricted at the fused portion. . . . . 16.
16. Corpus bursae with an elliptical area dusted with numerous micro-spines on cephalic surface; fore wing with a pair of white costal and dorsal streaks at middle, which are very oblique outwardly. . . . . *L. nigristella* Kumata.  
 - Corpus bursae without such an area dusted with micro-spines; fore wing with a white fascia at middle. . . . . 17.
17. Aedoeagus with a T-shaped barb at apex (see part I, fig. 19); caudal margin of seventh tergite of female straight. . . . . *L. nipponicella* Issiki.  
 - Aedoeagus with a roundish incision near apex (see part I, fig. 20); caudal margin of seventh tergite of female more or less convex medially. . . . . *L. acutissimae* Kumata.

18. Filament-like seta of costal process of valva shorter than or as long as costal process. . . . . 19.
  - Filament-like seta of costal process markedly longer than costal process. . . . . 21.
19. Valva very wide, about  $1/3$  as wide as long; costal process of valva cone-shaped, nearly as long as wide; white medio-basal streak of fore wing without dark marginal scales; mine on lower leaf surface of *Pourthiaea*. . . . . *L. watanabei* Kumata.
  - Valva slender, more than 4 times as long as wide; costal process much elongated, 6 to 7 times as long as wide; white medio-basal streak of fore wing margined with dark scales on upper edge. . . . . 20.
20. Valva very slender in whole length, narrowed towards apex; fore wing with a white fascia at middle; mine on lower leaf surface of *Fagus*. . . . . *L. fagifolia* Kumata.
  - Valva widened towards apex; fore wing with a pair of white costal and dorsal streaks at middle, which are very oblique outwardly. . . . . *L. turugisana* Kumata.
21. Valva with a wart-shaped projection bearing a mass of many spine-like setae; white medio-basal streak of fore wing very short, about  $1/6$  as long as wing; median area of fore wing occupied by a white fascia, and before the fascia first pair of white blotches situated; mine on lower leaf surface of *Viburnum*. . . . . *L. viburni* Kumata.
  - Valva without such a wart-shaped projection; white medio-basal streak of fore wing about  $2/5$  as long as wing; median area of fore wing occupied by first pair of white costal and dorsal streaks, which are very oblique outwardly. . . . . 22.
22. Valva with a much sclerotized thorn near apex and a basally spiraled, long, spine-like seta placed just before the thorn; seventh abdominal segment of female with a long rift on ventrum (see part I, fig. 13); mine on lower leaf surface of *Carpinus*. . . . . *L. hikosana* Kumata.
  - Valva without such a thorn and a seta; caudal margin of seventh sternite of female partially convex, with apex of the convexity incised medially (see part I, figs. 11 & 12). . . . . 23.
23. Saccus rather short, about  $1/3$  as long as flap of ninth sternite; valva with many strong, spine-like setae on apical area; mine on lower leaf surface of *Carpinus*. . . . . *L. carpinii* Kumata.
  - Saccus rather long, about half as long as flap of ninth sternite; valva with only a strong, spine-like seta at apex or just before apex. . . . . 24.
24. Apical  $2/3$  of filament-like seta arched upwardly; valva with a short, spine-like seta at apex; transtilla very slender; mine on lower leaf surface of *Ostrya*. . . . . *L. ostryae* Kumata.
  - Apical half of filament-like seta arched downward; valva with an inwardly curved, long, spine-like seta near apex; transtilla rather wide, rectangular; mine on lower leaf surface of *Quercus*. . . . . *L. rostrispinosa* Kumata.
25. Male genitalia asymmetrical only in costal process of valvae. . . . . 26.
  - Male genitalia asymmetrical both in valvae and in costal process of valvae. . . . . 28.
26. Right costal process shorter than the left; valva with an outwardly curved, long, spine-like seta near apex; saccus with a slender apical projection; thorax with a white median stripe; fore wing with a white costo-basal streak; mine on lower leaf surface of *Quercus*. . . . . *L. cretata* Kumata.
  - Right costal process longer and larger than the left; saccus without apical projection; valva without such a seta; thorax without median white stripe; fore wing without costo-basal streak. . . . . 27.
27. Right costal process tubular, with a filament-like seta very long, slender; sterigma consisting of a lamella antevaginalis and a cylindrical antrum (see part II, fig. 9); median pair of white blotches of fore wing margined with dark scales internally only; mine on lower leaf surface of *Sorbus*. . . . . *L. sorbicola* Kumata.
  - Right costal process compressed-tubular, with a filament-like seta short and hook-shaped; sterigma consisting of a lamella antevaginalis, which is placed on the ventrum of the eighth segment; median

- pair of white blotches of fore wing margined with dark scales internally and externally; mine on lower leaf surface of *Spiraea*. . . . . *L. aino* Kumata.
28. Left valva narrower than the right; left costal process also smaller than the right; saccus without apical projection. . . . . 29.
- Left valva wider than the right; left costal process also larger than the right; saccus with a long, slender apical projection. . . . . 30.
29. Valva with a long, spine-like seta at apex; costal process of right valva rather minute, cone-shaped, about 1/10 as large as the valva itself; caudal margin of seventh sternite of female partially convex medially; thorax and frontal tuft wholly white; fore wing white, with golden-ochreous streaks; mine on lower leaf surface of *Quercus*. . . . . *L. leucocorona* Kumata.
- Valvae without such a seta at apex; costal process of right valva very large, ellipsoidal, about 1/6 as large as the valva itself; caudal margin of seventh sternite of female partially concave medially; frontal tuft golden-ochreous; thorax golden-ochreous, with three white stripes in aestival form, or dusted with many white scales in autumnal form; ground colour of fore wing golden-ochreous, with white and blackish streaks; mine on lower leaf surface of *Tilia*. . . . . *L. issikii* Kumata.
30. Valvae rounded apically, with one or two short, spine-like setae at apex; costal process of left valva about 1/6 as long as the valva itself; female genitalia symmetrical; fore wing with three white, longitudinal basal streaks; mine on lower leaf surface of *Quercus*. . . . . *L. mongolicae* Kumata.
- Valvae obliquely truncated apically, with a mass of some short, spine-like setae on apical corner of hind margin; costal process of left valva about 1/2 as long as the valva itself; female genitalia asymmetrical; fore wing with a white, longitudinal basal streak; mine on lower leaf surface of *Acer*. . . . . *L. kurokoi* Kumata.
31. Right valva with a small process of ampulla bearing a few setae; fore wing with a white angulated fascia at basal 1/4. . . . . 37.
- Right valva without such a process of ampulla; fore wing without such a fascia at basal 1/4. . . . . 32.
32. Left valva slightly wider than the right; both valvae widened apically; ninth abdominal segment of female less than 1/3 as long as papillae anales, without sclerotized dorsal band; ground colour of fore wing reddish-brown; mine on upper leaf surface of *Sorbus*. . . . . *L. uchidai* Kumata.
- Left valva at least more than 1.5 times as wide as the right; both valvae narrowed apically; ninth abdominal segment of female more than half as long as papillae anales, with a sclerotized, narrow dorsal band; ground colour of fore wing golden-ochreous. . . . . 33.
33. Aedoeagus with three triangular barbs on apical 1/5; ninth abdominal segment of female about 4 times as long as papillae anales; white median fascia of fore wing dislocated on fold; mine on lower leaf surface of *Alnus*. . . . . *L. hancola* Kumata.
- Aedoeagus with a barb at apex or just before apex; ninth abdominal segment of female as long as papillae anales; white median fascia of fore wing not dislocated on fold, or entirely absent. . . . . 34.
34. Right valva rounded or truncated apically, without spine-like seta at apex; antapophysis present, but very weak and rudimentary; fore wing with termen paler than ground colour; mine on lower leaf surface of *Betula*. . . . . *L. ermani* Kumata.
- Right valva pointed apically, with a spine-like seta at apex; antapophysis entirely absent; fore wing with a dark marginal line along apex. . . . . 35.
35. Right valva bent upwardly near apex; left valva with a large lobe on apical half of ventral margin (see part II, fig. 22); aedoeagus with a globose barb at apex; mine on lower leaf surface of *Lyonia*. . . . . *L. lyoniae* Kumata.
- Right valva rather straight; left valva without such a lobe; aedoeagus with a hook-shaped barb

- just before apex. . . . . 36.
36. Sacculus of left valva fairly produced towards apex of valva, with a filament-like seta extending far beyond apex of valva; right valva with two rows of spine-like setae on median area; fore wing without any white costal blotch at basal 1/4; mine on upper leaf surface of *Carpinus*, *Ostrya* and *Corylus*. . . . . *L. japonica* Kumata.
- Sacculus of left valva slightly widened, with a filament-like seta extending nearly to apex of valva; right valva scattered with many slender setae on median area; fore wing with a white costal blotch at basal 1/4; mine on upper leaf surface of *Betula*. . . . . *L. dakekanbae* Kumata.
37. Filament-like seta of left valva strongly curved upwardly, and then extending beyond costal margin of valva; filament-like seta of right valva originating more apically than process of ampulla; ductus bursae opening at left side of dorsum; thorax with three white stripes; fore wing blackish-brown, with a white median fascia acutely angulated outwardly; mine on upper leaf surface of *Styrax*. . . . . *L. styracis* Kumata.
- Filament-like seta of left valva circularly curved on apical 1/3; filament-like seta of right valva originating more basally than process of ampulla; ductus bursae opening at left side of ventrum; thorax with two white stripes and one minute, white spot; fore wing golden-ochreous, with a white median fascia straight or gently arched outwardly; mine on lower leaf surface of *Juglans* and *Pterocarya*. . . . . *L. juglandis* Kumata.
38. Apical projection of saccus more than 5 times as long as saccus itself; right valva apically pointed; eighth tergite, of female with several scales; fore wing with a pair of white, outwardly oblique streaks on middle; mine on lower leaf surface of *Salix*. . . . . *L. salicella* Zeller.
- Apical projection of saccus less than 4 times as long as saccus itself; right valva apically rounded or truncated; eighth tergite of female without scales or setae; fore wing with a whitish median fascia. . . . . 39.
39. Flap of ninth sternite spatulate, with apical margin rounded; right valva truncated apically; lamella antevaginalis subpentagonal in shape; fore wing with pure white markings; white medio-basal streak somewhat sinuate, without marginal dark scales; mine on lower leaf surface of *Salix*. . . . . *L. salicicolella* Sircom.
- Flap of ninth sternite rectangular, with apical margin nearly straight; right valva apically rounded; lamella antevaginalis fan-shaped; fore wing with silvery-white markings; medio-basal streak straight, margined with dark scales on whole edge; mine on lower leaf surface of *Vicia* and *Lathyrus*. . . . . *L. viciae* Kumata.
40. Valva much widened or dilated at median part, usually less than 5 times as long as wide; caudal area of seventh abdominal segment of female bearing acute, spinal projections, or the whole surface imbricate-sculptured. . . . . 41.
- Valva wholly slender, much elongated, more than 5 times as long as wide; seventh abdominal segment of female wholly smooth, without projections or sculptures. . . . . 42.
41. Valva with four to eight much sclerotized thorns on inner surface of apical half; caudal area of seventh abdominal segment of female and whole surface of the eighth bearing many acute spinal projections; fore wing golden-ochreous, with markings white; mine on lower leaf surface of *Betula*. . . . . *L. cavella* Zeller.
- Valva with a tuft of slender setae at apex; eighth abdominal segment of female smooth, but the seventh imbricate-sculptured; fore wing white, with markings brownish; mine on lower leaf surface of *Populus* and *Salix*. . . . . *L. pastorella* Zeller.
42. Aedoeagus about as long as valva, somewhat truncated apically; valva rounded or truncated apically, less than 6 times as long as wide; sterigma semicircular, placed on ventrum of eighth

- abdominal segment; fore wing with a dark apical bar in whitish cilia; mine on lower leaf surface of *Betula*. . . . . *L. ulmifoliella* (Hübner).
- Aedoeagus 1.5 to 2 times as long as valva, with an ovate or ellipsoidal barb near apex; valva more or less pointed apically, more than 6 times as long as wide; sterigma tubular or fusiform, inserted into seventh abdominal segment; fore wing with cilia wholly whitish. . . . . 43.
  - 43. Valva gradually narrowed and pointed apically, with slender setae on its inner surface; cephalic half of eighth abdominal segment of female firmly inserted into the seventh; frontal tuft black; thorax wholly leaden-metallic; mine on leaf of *Rhododendron*. . . . . *L. melacoronis* Kumata.
    - Valva evenly narrow, the costal apex being slightly produced and somewhat pointed, with a very strong seta at apical 1/4, a tuft of slender setae at hind half of apex, and many slender setae on inner surface; eighth segment of female normally separated from the seventh; tuft of head golden-ochreous, mixed with white scales in centre; thorax golden-ochreous, with three white stripes; mine on lower leaf surface of *Malus*. . . . . *L. ringoniella* Matsumura.  - 44. Juxta with many acute spines near apex; valva straight, fusiform, with a much sclerotized, hook-shaped projection at apical 1/5; corpus bursae without signum; fore wing with a triangular, black spot at base; mine on lower leaf surface of *Alnus*. . . . . *L. takagii* Kumata.
    - Juxta smooth; valva much elongated, arched upwardly, without such a projection; corpus bursae with a signum; fore wing without black spot at base. . . . . 45.  - 45. Valva with six to eight very long, spine-like setae, one placed at basal 1/4 and others scattered on inner surface between apex and apical 1/4; base of fore wing golden-ochreous, with two longitudinal, silvery-white streaks; thorax golden-ochreous, with two white stripes; expanse of fore wings, 7-8 mm; mine on lower leaf surface of *Alnus*. . . . . *L. longispinata* Kumata.
    - Valva with three or four very long, spine-like setae, one placed at apex and others together on top of small projection at apical 2/5; base of fore wing yellowish-brown, sprinkled with blackish-brown scales on surface, without longitudinal, white streaks; thorax wholly golden-brownish, without any white stripe; expanse of fore wings, 11 mm. . . . . *L. gigas* Kumata.  - 46. Valva much narrowed towards apex, somewhat truncated apically, markedly twisted inwardly and bent downward at apical 1/3, with an acute costal process, which is also twisted and bent at apical 2/3; aedoeagus without any projection or lobe at apex; flap of ninth sternite deeply incised on apical margin; second white fascia at apical 1/3 of fore wing obliquely crossed with black streak, which runs along the inner edge of the dorsal half of the fascia and along the outer edge of the costal half; mine on lower leaf surface of *Celtis*. . . . . *L. celtidis* Kumata.
    - Valva ending in an acutely pointed and much sclerotized spine or spine-like seta, not twisted nor bent, without costal process; aedoeagus with one or two projections or lobes near apex; flap of ninth sternite straight, rounded or somewhat sinuate on apical margin; second whitish fascia of fore wing margined with black scales internally only. . . . . 47.  - 47. Valva ending in a long, spine-like seta, with two hind processes, one produced from basal 1/3 and the other from basal 2/3; aedoeagus with a pair of flap-like lobes on lower side of apex; mine on lower leaf surface of *Lonicera*. . . . . *L. loniceræ* Kumata.
    - Valva ending in an acutely pointed spine, without hind processes; aedoeagus with only a barb or spine. . . . . 48.  - 48. Valva with a small tuft of many setae on apex; aedoeagus with a minute, upwardly pointed spine on apex; juxta very wide, touching about apical 1/3 of aedoeagus; sclerotized area of eighth abdominal segment normally separated from that of the seventh; fore wing with a triangular, black costo-basal blotch; mine on leaf of *Rubus*. . . . . *L. pulchra* Kumata.
    - Valva without such a tuft of setae; aedoeagus with a rather large or long spine or barb near apex;

- juxta very narrow, touching about middle of aedoeagus; sclerotized area of eighth abdominal segment of female tightly fused with that of the seventh; fore wing without black costo-basal blotch. . . . . 49.
49. Costal area of valva weakened and wrinkled; aedoeagus with a circular or subrectangular barb just before apex; ostium bursae opening in a large, circular hole on ventrum of eighth abdominal segment. . . . . 50.
- Costal area of valva not weakened nor wrinkled; aedoeagus with an elongated and slender barb just before apex; ostium bursae opening at deep concavity of seventh sternite or on top of caudally produced seventh sternite. . . . . 51.
50. Barb of aedoeagus somewhat subrectangular in shape (see part II, fig. 3, I & J); apical spine of valva straight; flap of ninth sternite subrectangular, with apical margin slightly convex; mine on upper leaf surface of *Zelkova*. . . . . *L. tritorrhecta* Meyrick.
- Barb of aedoeagus somewhat circular in shape (see part II, fig. 3, G & H); apical spine of valva a little inwardly curved; flap of ninth sternite circular; mine on upper leaf surface of *Ulmus*. . . . . *L. ulmi* Kumata.
51. Valva somewhat triangular, with top outwardly pointed; barb of aedoeagus more than 6 times as long as wide, acutely pointed, arched upwardly (see part II, fig. 2, G); caudal margin of seventh sternite of female deeply concave; fore wing with two white fasciae; mine on lower leaf surface of *Ulmus*. . . . . *L. bicinctella* Matsumura.
- Valva somewhat hook-shaped, with top narrowed, and drooping downward; barb of aedoeagus less than 6 times as long as wide, bluntly pointed, straight or slightly arched downward; seventh sternite of female fairly produced caudad; fore wing with three white fasciae. . . . . 52.
52. Barb of aedoeagus curved downward, gradually narrowed apically (see part II, fig. 2, H); flap of ninth sternite with apical margin rather straight or slightly convex; white medio-basal streak of fore wing very minute, somewhat indistinct, less than 1/4 as long as width of thorax; mine on lower leaf surface of *Ulmus*. . . . . *L. tristrigella* (Haworth).
- Barb of aedoeagus straight, dilated near apex (see part II, fig. 2, F); flap of ninth sternite with apical margin rather sinuate; white medio-basal streak of fore wing very conspicuous, placed on fold, 1/2 as long as width of thorax; mine on lower leaf surface of *Zelkova*. . . . . *L. zelkovae* Kumata.

#### Key to the species of *Cameraria* occurring in Japan

1. Aedoeagus becoming gradually narrower and pointed apically; sclerotized anellus extending to apex of aedoeagus; caudal margin of seventh sternite of female deeply concave or incised; white dorsal streak at tornus of fore wing apparently oblique outwardly, with its dark-marginal line united with that of last white costal streak. . . . . 2.
- Apical half of aedoeagus becoming suddenly slender and truncated apically; sclerotized anellus never extending to apex of aedoeagus; caudal margin of seventh sternite of female straight; white dorsal streak at tornus of fore wing perpendicular or slightly oblique outwardly, with its dark-marginal line not extending to last costal streak; mine on upper leaf surface of *Viburnum*. . . . . *C. hikosanensis* Kumata.
2. Apical half of valva subtriangular; flap of ninth sternite triangular, and bluntly pointed apically; corpus bursae with an elliptical and an annular signa; fore wing with a fascia just before middle; mine on upper leaf surface of *Acer Mono*. . . . . *C. acericola* Kumata.
- Apical half of valva ovate or ellipsoidal; flap of ninth sternite subrectangular, with apical margin deeply concave; corpus bursae with only a rectangular signum; fore wing with two fasciae, one placed at basal 1/5 and the other just before middle; mine on upper leaf surface of *Acer palmatum*

and *Acer japonicum*. . . . . *C. nipponica* Kumata.

#### Key to the species of *Hyoconis*

1. Male and female genitalia asymmetrical; sclerotized anellus absent; valvae with five to six stout spines on apical margin; antapophysis short and globose; corpus bursae with a long signum which is trifurcate in cross section; tuft of head yellowish-brown; antenna brown, annulated with dark brown; fore wing golden-brown, without black basal blotch; mine on lower leaf surface of *Wisteria*. . . . . *H. wisteriae* Kumata.
- Male and female genitalia symmetrical; anellus fairly sclerotized; valva without spines; antapophysis long, slender; corpus bursae without signum; tuft of head black; antenna black, with apical ten to thirteen segments white; fore wing orange-yellow, with a triangular, black blotch at base. . . . . 2.
2. Valva with a triangular costal process; process of saccus less than 1/5 as long as valva; sclerotized antrum less than 1/10 as long as seventh segment; dorsal area of base of fore wing occupied by a silvery-white or leaden-metallic spot; mine on lower leaf surface of *Pueraria* and *Amphicarpa*. . . . . *H. puerariae* Kumata.
- Costal process of valva absent; process of saccus more than 1/3 as long as valva; antrum more than 1/3 as long as seventh abdominal segment; whole basal area of fore wing occupied by a black blotch. . . . . 3.
3. Aedoeagus with two very minute projections near apex; antrum 3/4 as long as seventh abdominal segment; tornus of fore wing occupied by a wedge- or hook-shaped, silvery-white blotch; a longitudinal, silvery-white streak placed in disc near apex of fore wing, less than 1/6 as long as wing; mine on lower leaf surface of *Desmodium*. . . . . *H. desmodii* Kumata.
- Aedoeagus with two large, triangular lobes at apical 1/5; antrum half as long as seventh abdominal segment; fore wing without such a blotch on tornus; a longitudinal silvery-white streak placed on apical 1/4, more than 1/6 as long as wing; mine on lower leaf surface of *Lespedeza*. . . . . *H. lespedezae* Kumata.

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<i>Spiraea salicifolia</i> L. . . . .	<i>Lithocolletis aino</i> Kumata	II: 11
<i>Styrax japonica</i> Sieb. et Zucc. . . . .	<i>Lithocolletis styracis</i> Kumata	I: 56
<i>Tilia japonica</i> Simonkai . . . . .	<i>Lithocolletis issikii</i> Kumata	I: 62
<i>Tilia kiusiana</i> Makino . . . . .	<i>Lithocolletis issikii</i> Kumata	I: 62
<i>Tilia Maximowicziana</i> Shirasawa . . . . .	<i>Lithocolletis issikii</i> Kumata	I: 62
<i>Ulmus Davidiana</i> Planch. var. <i>japonica</i> Nakai . . . . .		
	<i>Lithocolletis bicinctella</i> Matsumura	II: 7
	<i>Lithocolletis ulmi</i> Kumata	II: 4
<i>Ulmus laciniata</i> Mayr . . . . .	<i>Lithocolletis tristrigella</i> (Haworth)	II: 6
	<i>Lithocolletis ulmi</i> Kumata	II: 4
<i>Viburnum dilatatum</i> Thunb. . . . .	<i>Lithocolletis viburni</i> Kumata	II: 42
<i>Viburnum erosum</i> Thunb. . . . .	<i>Cameraria hikosanensis</i> Kumata	II: 43
	<i>Lithocolletis viburni</i> Kumata	II: 42
<i>Viburnum Sieboldi</i> Miq. . . . .	<i>Cameraria hikosanensis</i> Kumata	II: 43
<i>Viburnum Wrightii</i> Miq. . . . .	<i>Lithocolletis viburni</i> Kumata	II: 42
<i>Vicia japonica</i> A. Gray . . . . .	<i>Lithocolletis viciae</i> Kumata	II: 18
<i>Wisteria floribunda</i> DC. . . . .	<i>Hyloconis wisteriae</i> Kumata	II: 26
<i>Zelkova serrata</i> Makino . . . . .	<i>Lithocolletis tritorrhecta</i> Meyrick	II: 1
	<i>Lithocolletis zelkovae</i> Kumata	II: 3

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### Explanation of plates

#### Plates I-V: fore wings

1: *Lithocolletis strigulatella* Zeller; 2: *L. maculata* Kumata (holotype); 3: *L. carpini* Kumata (holotype: aestival form); 4: ditto (paratype: autumnal form); 5: *L. ostryae* Kumata (paratype: aestival form); 6: ditto (holotype: autumnal form); 7: *L. hikosana* Kumata (holotype: aestival form); 8: ditto (paratype: autumnal form); 9: *L. nipponicella* Issiki; 10: *L. acutissimae* Kumata (paratype); 11: *L. nigristella* Kumata (allotype); 12: *L. kamijoi* Kumata (paratype); 13: *L. pseudolautella* Kumata (paratype); 14: *L. pygmaea* Kumata (paratype); 15: *L. fagifolia* Kumata (holotype); 16: *L. rostrispinosa* Kumata (holotype); 17: *L. cretata* Kumata (allotype); 18: *L. mongolicae* Kumata (paratype); 19: *L. viburni* Kumata (paratype); 20: *L. turugisana* Kumata (holotype); 21: *L. watanabei* Kumata (paratype); 22: *L. sorbicola* Kumata (holotype); 23: *L. aino* Kumata (paratype); 24: *L. leucocorona* Kumata (paratype); 25: *L. issikii* Kumata (paratype: aestival form); 26: ditto (paratype: autumnal form); 27: *L. kurokoi* Kumata (paratype); 28: *L. jezonella* Matsumura; 29: *L. uchidai* Kumata (paratype); 30: *L. hancola* Kumata (allotype); 31: *L. ermani* Kumata (holotype); 32: *L. japonica* Kumata (paratype); 33: *L. dakekanbae* Kumata (holotype); 34: *L. lyoniae* Kumata (paratype); 35: *L. styracis* Kumata (paratype); 36: *L. juglandis* Kumata (paratype); 37: *L. salictella* Zeller; 38: *L. salicicolella* Sircom; 39: *L. viciae* Kumata (paratype); 40: *L. pterocaryae* Kumata (paratype); 41: *L. orientalis* Kumata (paratype: aestival form); 42: ditto (paratype: autumnal form); 43: *L. pastorella* Zeller (host: *Populus*); 44: ditto (host: *Salix*); 45: *L. cavella* Zeller; 46: *L. ulmifoliella* (Hübner); 47: *L. melacoronis* Kumata (paratype); 48: *L. ringoniella* Matsumura; 49: *L. longispinata* Kumata (paratype); 50: *L. gigas* Kumata (holotype); 51: *L. takagii* Kumata (paratype); 52: *L. bicinctella* Matsumura; 53: *L. tritorrhecta* Meyrick (aestival form); 54: ditto (autumnal form); 55: *L. ulmi* Kumata (paratype: aestival form); 56: ditto (paratype: autumnal form); 57: *L. tristrigella* (Haworth); 58: *L. zelkovae* Kumata (holotype); 59: *L. lonicerae* Kumata (paratype); 60: *L. celtidis* Kumata (paratype); 61: *L. pulchra* Kumata (paratype); 62: *Neolithocolletis hikomonticola* Kumata (paratype); 63: *Cameraria nipponica* Kumata (paratype); 64: *C. acericola* Kumata (holotype); 65: *C. hikosanensis* Kumata (paratype); 66: *Hyloconis puerariae* Kumata (holotype); 67: *H. desmodii* Kumata (holotype); 68: *H. lespedezae* Kumata (holotype); 69: *H. wisteriae* Kumata (paratype).

#### Plate VI: venation of wings

1: fore wing of *Lithocolletis hancola* Kumata; 2: fore wing of *L. issikii* Kumata; 3: fore wing of *Cameraria acericola* Kumata; 4: hind wing of the same species; 5: fore wing of *Neolithocolletis hikomonticola* Kumata; 6: hind wing of the same species; 7: fore wing of *Hyloconis puerariae* Kumata; 8: hind wing of the same species.

#### Plates VII-VIII: mines

1: *Lithocolletis nipponicella* Issiki; 2: *L. issikii* Kumata; 3: *L. cavella* Zeller; 4: *L. ringoniella* Matsumura; 5: *L. longispinata* Kumata; 6: *L. ulmi* Kumata; 7: *Hyloconis puerariae* Kumata; 8: *Cameraria acericola* Kumata. Ic & IIc: lower wall of young mine-cavity, black spots showing frasses; IIa: upper side of young mine; IIIa: upper side of full grown mine; IIIb: lower side of full grown mine; IIIc: frasses, cocoon and pupa in full grown mine-cavity; IV: cross section of full grown mine.

## ADDENDUM

63. *Lithocolletis spinolella* (Duponchel)

*Elachista spinolella* Duponchel, 1838, Hist. Nat. Léop. 11: 555, pl. 308, f. 8.

*Lithocolletis spinolella*: Herrich-Schäffer, 1855, Schmett. Europa 5: 332; Wocke, 1877, In Hein., Schmett. Deutsch. 2: 680; Petersen, 1927, Stett. Ent. Zeit. 88: 139, f. 19; Pierce & Metcalfe, 1935, Genit. Tin. Brit.: 76, pl. 47; Hering, 1957, Bestimm. Blattminen Europa 2: 920.

The present specimens from Japan agree well enough with the authentic ones from Europe in most details except for the slightly paler ground colour of the fore wing. This species belongs to the species-group of *ulicicolella*, being readily distinguished from the related species, *salicicolella* and *salictella*, by the following features:— antenna grey, with its apical 1/3 white except for a blackish terminal segment; thorax without white median stripe; white medio-basal streak of fore wing straight, much widened apically; white median fascia of fore wing very broad, never interrupted by ground colour; dark line in cilia almost obsolete; eighth abdominal segment of female very narrow, with lamella antevaginalis somewhat trapezoid; right valva rounded apically; apical projection of saccus about as long as saccus itself, very wide, narrowed apically.

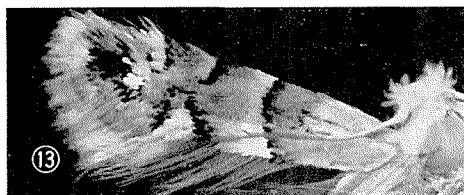
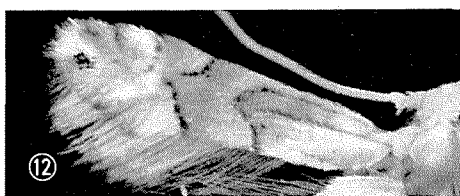
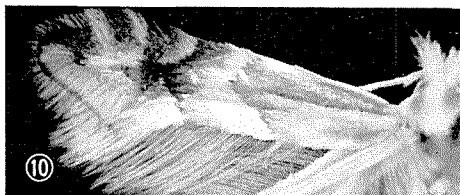
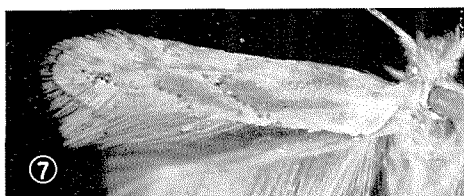
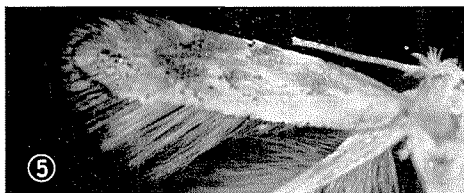
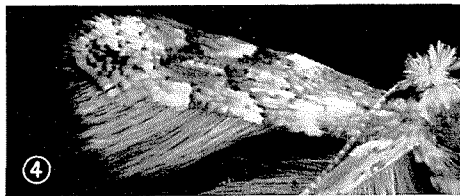
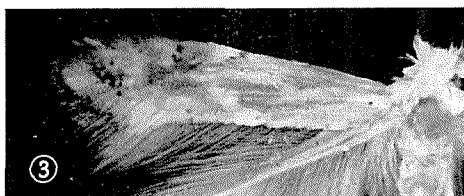
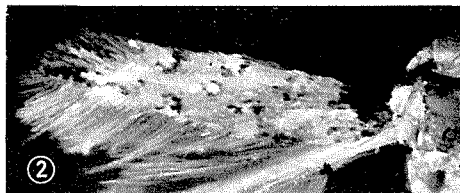
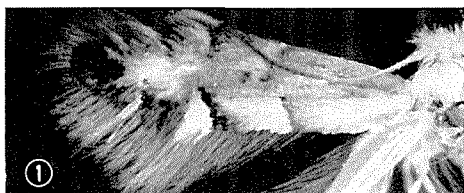
Specimens examined: 2 ♀♀, 13. VI, 1959, 1 ♀, 30. VI, 1959, Teine, Hokkaido, T. Kumata leg.; 1 ♂ & 1 ♀ (determined by E. M. Hering as *L. spinolella*), Neuenhag, Germany, E. M. Hering leg., ex *Salix caprea*.

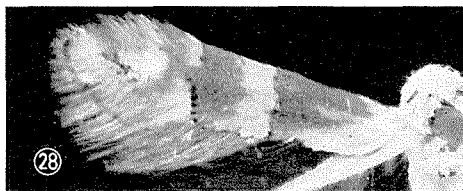
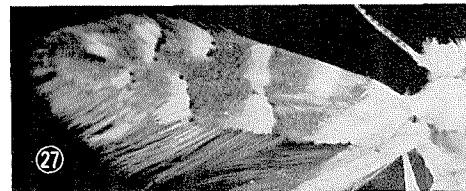
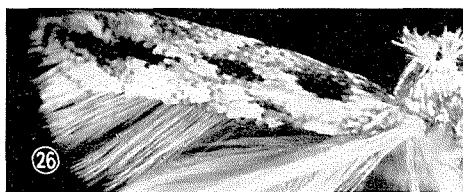
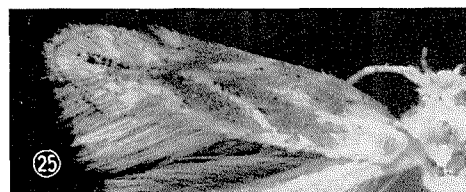
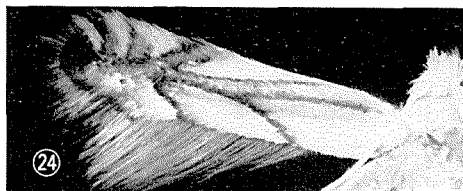
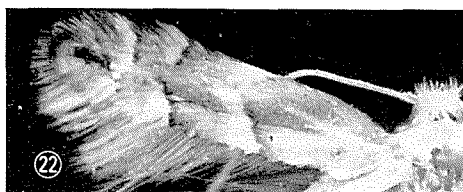
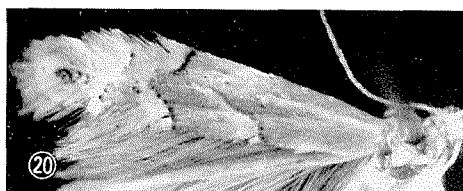
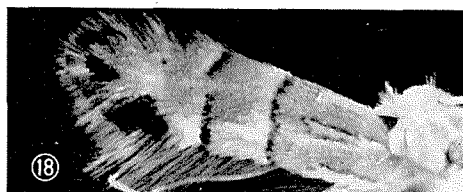
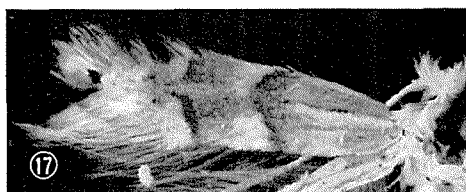
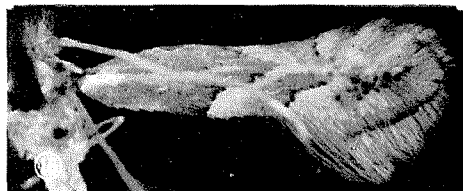
Host plants: Unknown in Japan; *Salix* spp. in Europe.

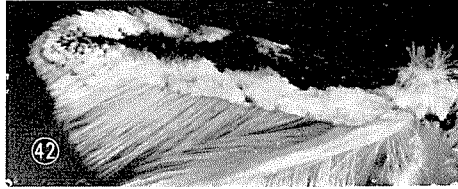
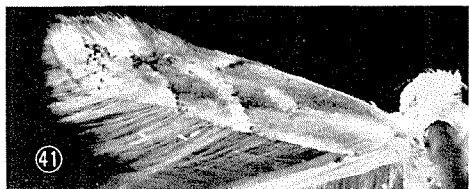
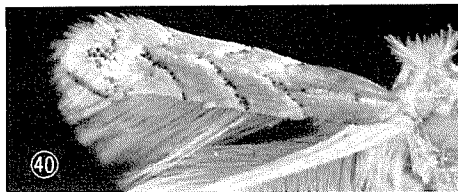
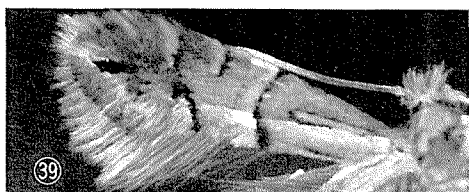
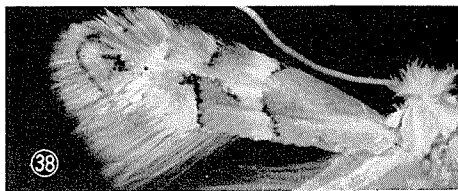
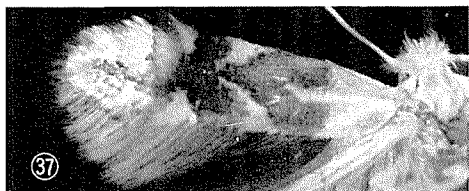
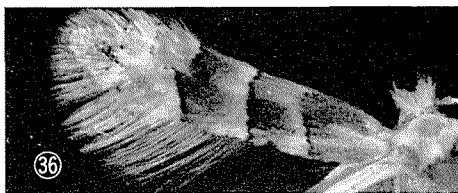
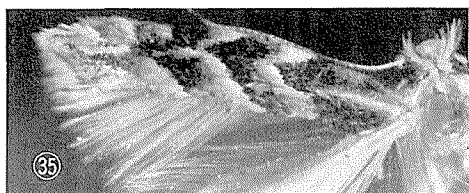
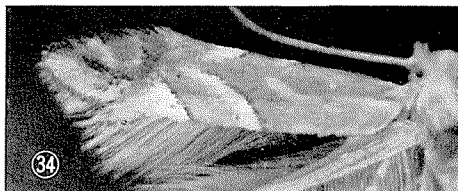
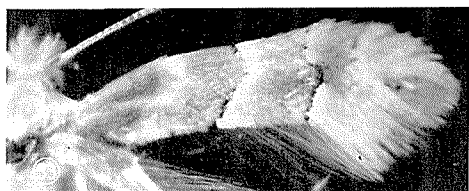
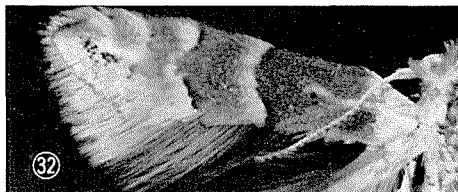
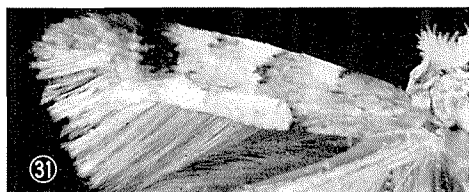
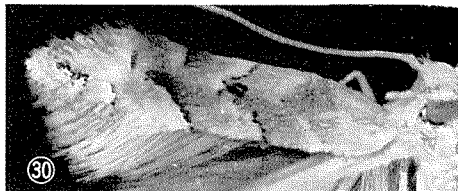
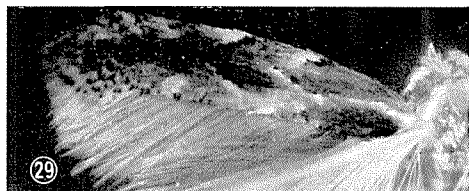
Distribution: Japan (Hokkaido); Central and North Europe.

This species runs easily in my key to couplet 39 (page 79), which will have to be altered as follows:—

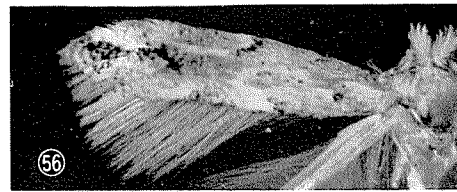
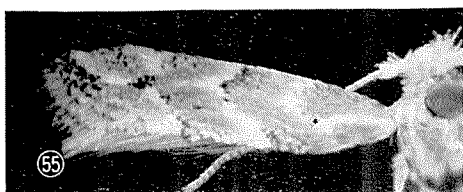
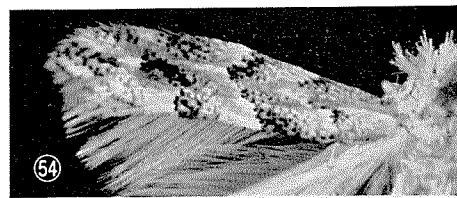
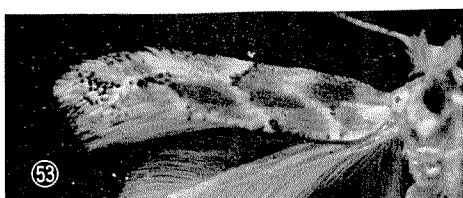
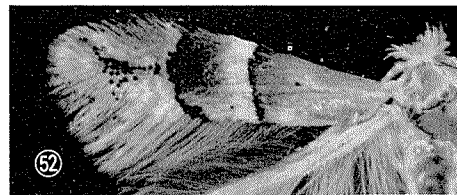
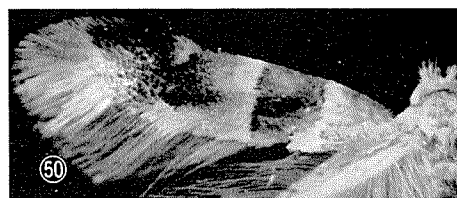
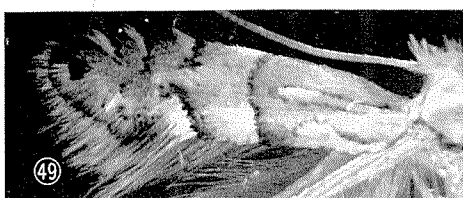
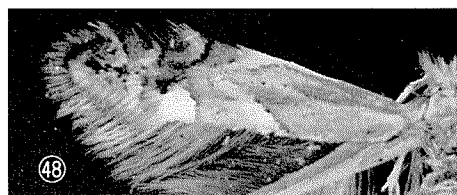
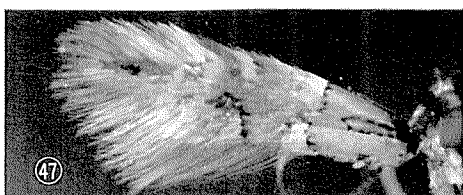
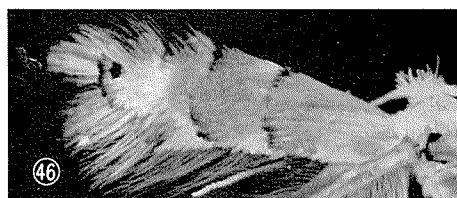
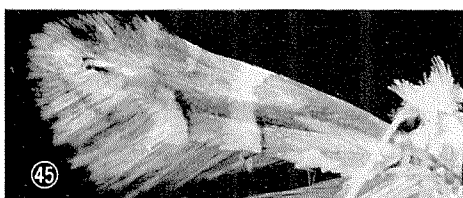
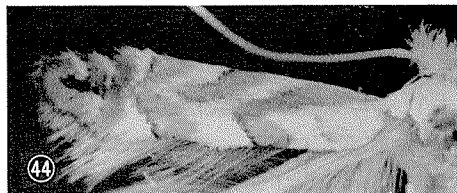
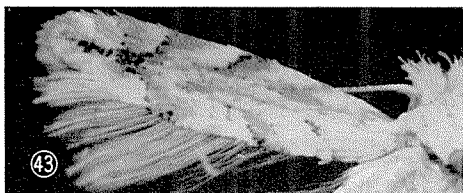
39. Flap of ninth sternite spatulate, with apical margin somewhat rounded; lamella antevaginalis subpentagonal or trapezoid in shape; fore wing with pure white markings; medio-basal streak without marginal dark scales . . . . . 39a.
- Flap of ninth sternite rectangular, with apical margin nearly straight; lamella antevaginalis fan-shaped; fore wing with silvery-white markings; medio-basal streak margined with dark scales on whole edge; mine on lower leaf surface of *Vicia* and *Lathyrus* . . . . . *L. viciae* Kumata.
- 39a. Apical projection of saccus rather narrow, dilated apically; eighth abdominal segment of female more than 1/2 as long as antapophysis; lamella antevaginalis subpentagonal; medio-basal streak somewhat sinuate, evenly narrow; median fascia rather narrow, somewhat narrowly interrupted by ground colour near costa; mine on lower leaf surface of *Salix* . . . . . *L. salicicolella* Sircom.
- Apical projection of saccus rather wide, narrowed apically; eighth abdominal segment of female less than 1/2 as long as antapophysis; lamella antevaginalis somewhat trapezoid; medio-basal streak straight, much widened apically; median fascia rather broad, never interrupted . . . . . *L. spinolella* (Duponchel).

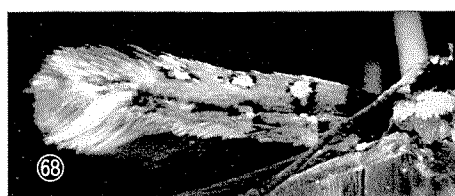
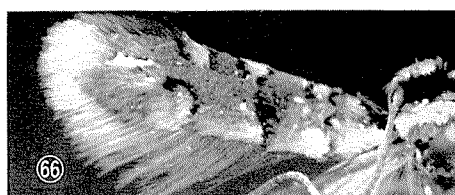
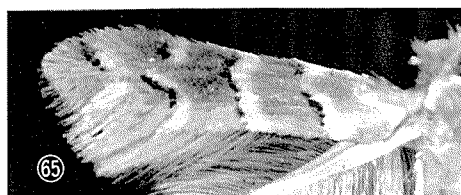
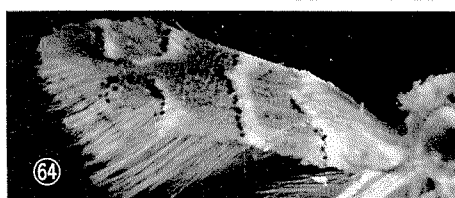
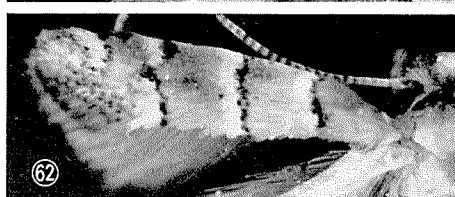
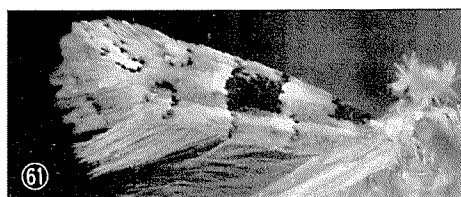
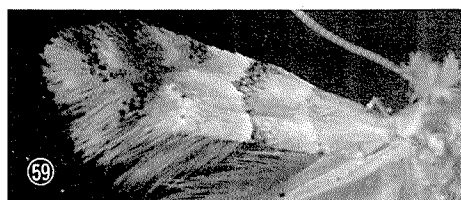
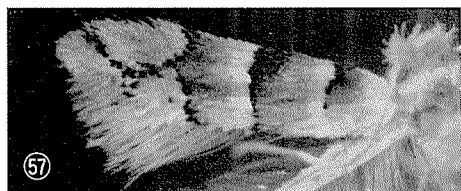


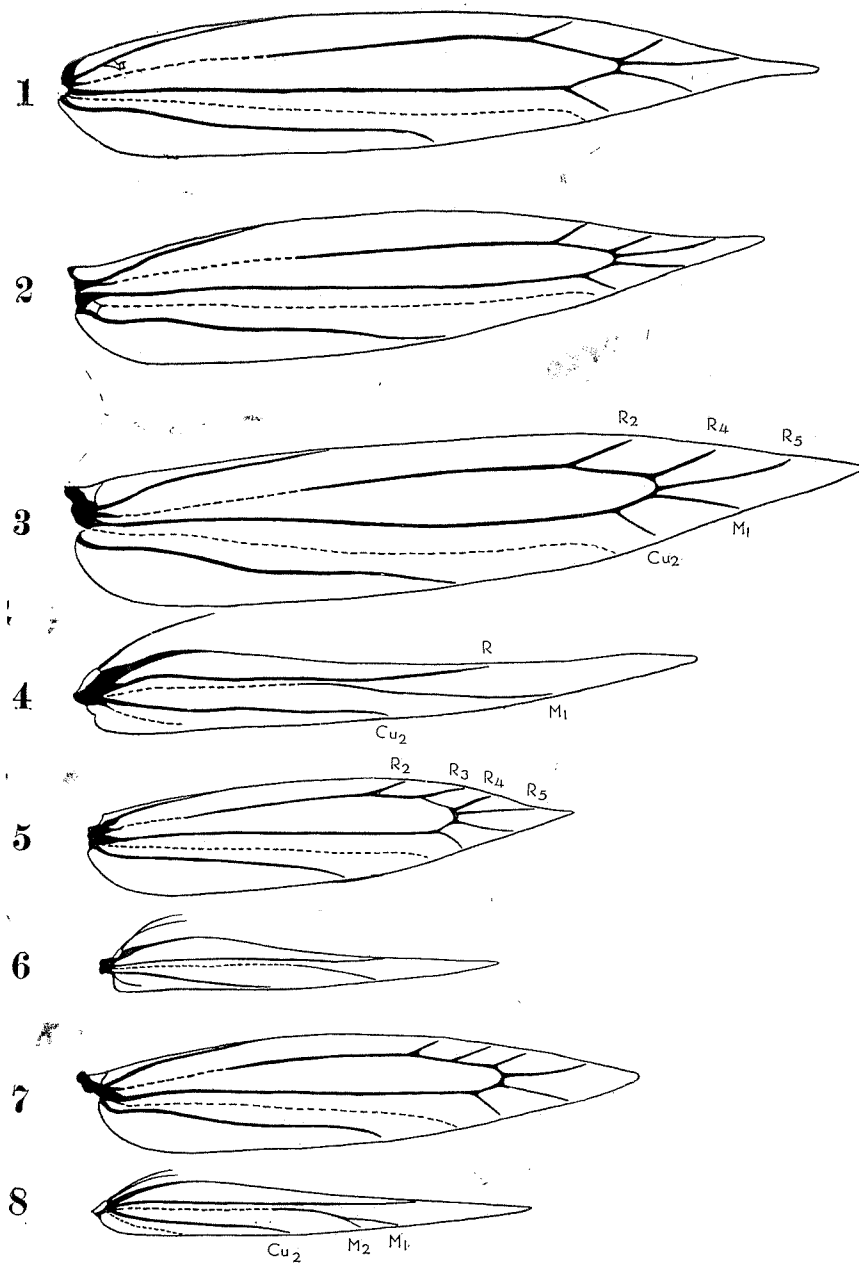


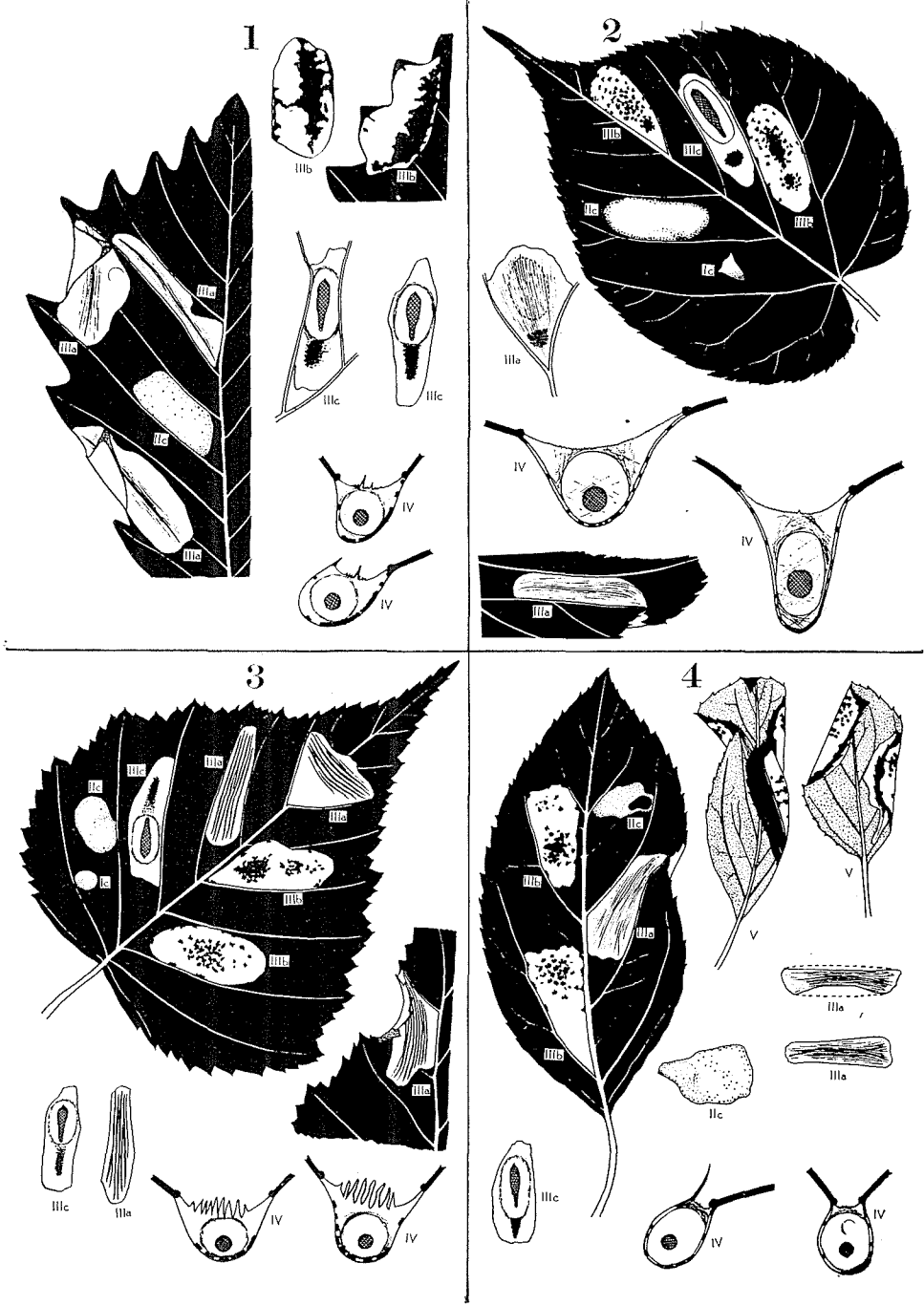


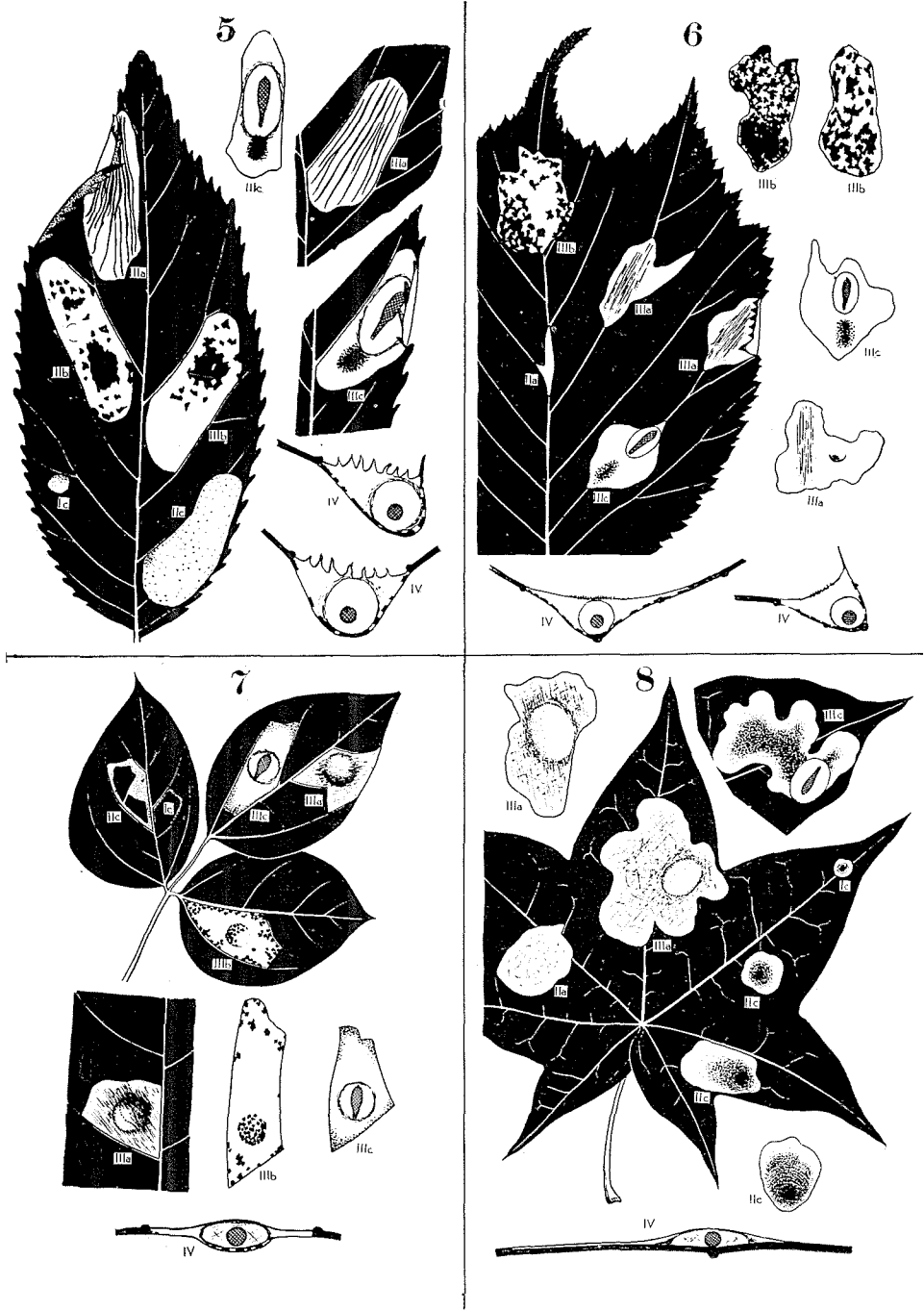












### **Errata**

Vol. 26, No. 1, 1963, p. 37, line 11 from bottom, for "ing" read "shading".  
Vol. 26, No. 2, 1963, p. 79, line 10 from top, for "apically" read "basally".  
Vol. 26, No. 2, 1963, p. 79, line 15 from top, for "basally" read "apically".  
Vol. 27, No. 2, 1965, p. 82, line 9 from top, for "VII" read "VIII".  
Vol. 27, No. 2, 1965, p. 98, between lines 3 and 4 from bottom add  
"Distribution: Marshall Is. and Caroline Is."  
Vol. 27, No. 2, 1965, p. 114, line 10 from bottom; p. 115, line 15 from  
top; p. 116, line 7 from bottom; p. 117, line 17 from top and line 3 from  
bottom; p. 118, line 14 from bottom; p. 119, line 12 from bottom; p. 121,  
lines 8 and 11 from top; p. 122, lines 5 and 8 from top, for "ocellus" read  
"eye".

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