

Larval Observation of Two Species of the Tribe Archipini in Korea (Tortricinae: Tortricidae: Lepidoptera)*

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2종의 한국산 잎말이나방속 유충에 대한 형태적 관찰*

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ABSTRACT

The larval external morphologies of *Pandemis heparana* (Denis et Schiffermüller) and *P. cinnamomeana* (Treitschke) of Archipini were described.

Key words : Larvae, Morphology, Archipini, Tortricidae, Lepidoptera, Korea

요 약

잎말이나방속의 갈색잎말이나방(*Pandemis heparana*)과 흰머리잎말이나방(*P. cinnamomeana*) 유충의 형태적 특징을 관찰하였다.

INTRODUCTION

The Tortricidae are composed of three subfamilies that included 284 species in Korea (Check List of Insects from Korea 1994) and many agriculture and forestry pests. The larval morphological study is important because of the potential value of characters of the larvae for the phylogenetic classification and their

identification in the larvae stage is also necessary for the species of economic importance. We here provide detailed descriptions and illustrations of the larvae of *Pandemis heparana* (Denis et Schiffermüller) and *P. cinnamomeana* (Treitschke).

The body setal map, head chaetotaxy and pattern, proleg crochets of *Pandemis heparana* and

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12 species of Tortricidae infesting apple trees in Japan were reported by Tuyosi (1956). The larval color pattern, head and body chaetotaxy, spinneret, leg, anal fork, proleg crochets of *Pandemis* and 21 genera (97 species) larvae of the North American Tortricinae were described and illustrated by Mackay (1962). Only major features of *Pandemis* and 27 genera (36 species) of Tortricidae were briefly described by Issiki (1969). Life history and immature stages of *Pandemis cerasana* (Hübner) were reported by Evans (1970).

MATERIALS AND METHODS

The gross morphological feature of entire larvae were examined on alcohol-preserved materials. Then, they were macerated in 10% KOH for a few minutes and dissected under a stereoscopic microscope.

The head capsule with attached mouthpart was first removed from the body by a cut made with a fine forceps around the edges of the occipital foramen. The maxillae and labium as a unit were removed from the head capsule. The head was sketched by this condition from dorsal and ventral sides. Then the mandibles with attached tendons were removed from the head capsule. Mouthpart and skin were mounted on microscopic slides for detailed examinations.

The description are based on 10 field collected specimens. In the following description, we follow Hinton (1946) and Heinrich (1916) for the terminology of chaetotaxy.

DESCRIPTION OF LARVAE

The tribe Archipini: Mature larvae small, varying from slender to rather stout; body more or less uniform in color, near white, pink, green, purple, or brown; secondary setae absent.

Head: Often darkly pigmented in early instars, lighter in final instar; adfrontals reaching or nearly reaching epicranial notch; epicranial suture usually short; six ocelli, usually unevenly distributed, with VI always close to IV and V.

Thorax: T1 shield variably pigmented, T1 with trisetose L group; T2 and T3 with SV group unisetose, L1 closer to L2 than to L3.

Abdomen: L group setae adjacent to each other and obliquely or vertically placed; SD1 on A8 usually anterior or somewhat anterodorsal or anteroventral from spiracle; A9 with D2's usually on same pinaculum and closer together than D2's on A8; D1 usually closer to SD1 than to D2, frequently on same pinaculum as SD1. Spiracles broadly elliptical, with eighth pair usually somewhat larger and more dorsal. Prolegs on A3-6 and A10; uniordinal, biordinal, or triordinal crochets in complete circles on A3-6 prolegs; A10 prolegs with crochets in continuous row, and with central crochets same length as those at either end. Anal shield variably pigmented. Anal fork present or absent.

KEY TO SPECIES EXAMINED

1. Adfrontal sutures reaching epicranial triangle; SV group on abdominal

- segments 1, 2, 7, 8 and 9 usually 3 : 3 : 3 : 2 : 2; SD2 on A1-8 always on the SD1 pinaculum.....2
2. Mandible with three internal teeth; AF1 closer to F1 than to AF2; anal fork with 7 prongs.....
.....*Pandemis cinnamomeana*
- . Mandible with four internal teeth; AF1 closer to AF2 than to F1; anal fork with 8 prongs.....
.....*Pandemis heparana*

1. *Pandemis heparana* (Denis et Schiffermüller)
(갈색일말이나방 Figs. 1-12)

Body usually blackish brown, spinulation of integuments darker than body colours apparently and usually easily seen; head yellowish brown, head posterolateral view with a pair black spots, ocellar areas darker; thoracic shield reddish brown and with black marking laterally; thoracic legs blackish yellow; anal shield lighter than body colour; setae moderate in long; spiracles yellowish brown with black peritremes.

Head (Figs. 4, 5): Ocellar areas rounded; ocelli III, IV and V about equal in size, distinct, convex and which are often developed; ocellus II closer to III than to I, ocellus VI equidistant from ocelli IV and V. The adfrontals ecdysial lines reaching to vertical triangle; the front extends three-fourths of the distance to vertical angle and that attenuated posteriorly. AF2 and P1 below level of front apex, Pb almost level with front apex, AF2, P1 and P2 forming a right angle and P1 equidistant from P2 and AF2; A1, A2 and A3 forming a obtuse angle at A2 and A2 about

equidistant from A1 and A3, Aa straight above A1 and directly mesad of A2; L1 posterolateral to A3 and almost straight above ocellus I; O1 equidistant from I and III, O2 posterolateral to ocellus I, O3 remote from O1 and ventral to O2; subocellar setae triangularly placed.

Mouthpart (Figs. 1, 6, 7, 8, 9, 10): Labrum anterolateral margin rounded, emargination about one-thirds deep, a acute angled, M2 directly behind to M1, P closer to M1 than to M2, L1 and L2 close approximate, L1 dorsal to L2; epipharynx with small spinules, epipharyngeal shield defined, and epipharyngeal setae triangularly grouped near anterolateral margin of epipharynx. Mandible with five apical teeth on cutting edge, fifth tooth rounded; inner surface with small four inner teeth and three distinct ridges. Labium with membranous postmentum, on the near center with two conspicuous setae; mentum is weakly sclerotized and pale brown, the anterior margin of mentum with two inconspicuous setae; prementum with median spinneret distally and labial palpi laterally; the apex of spinneret is rounded, about six times as long as median breadth, the length of spinneret shorter than tip of seta on apical segment of labial palpi. Maxillae with cardo weakly delineated, mostly membranous bearing a hook-like sclerites basally; stipes mostly membranous, with a large transverse sclerites, and two setae; palpifer sclerotized, bearing one seta; palpus: basal segment with one seta and a lobe, on the lobe bearing three sensilla trichodea, two sensilla styloconica, and three sensilla basiconica and one

puncture; median segment is two times as long as apical segment and with one companiformium; apical segment with eight sensilla basiconica apically. Antenna: the first segment short and wider than long; the second segment much longer than the first segment, bears a companiformium, two sensillum trichodeum, one (long hair) longer than antennal segments combined, the other (short hair) subequal to third antennal segment, the third segment 3-4 times as long as first segment in length, with two sensillum basiconicum and one sensillum styloconicum.

Thorax (Figs. 2, 3): Thoracic shield is smooth and weakly sclerotized. T1: D1 closer to D2 than to XD1; XD2, SD1 and SD2 forming a right angle at SD1; L group is trisetose, SV group is bisetose. T2 and T3: D2 anteroventral to D1; SD2 anterodorsal to SD1; L3 posterolateral to L1, L2 anteroventral to L1; SV group is unisetose. Thoracic legs: coxa with seven setae (two setae very small); femur with two setae; tibia with six setae and one puncture; tarsus with small four setae, claws slender.

Abdomen (Figs. 2, 11, 12): On A1-8, D1 slightly shorter than D2; SD1 pinacula dorsal from spiracle in A1-7, anterior to spiracle in A8; SD2 on abdominal segments 1-8 always on the SD1 pinaculum; SD2 anteroventral to SD1; L1-L2 pinacula anteroventral from spiracle, both similar in length, L3 posteroventral to L1-L2 and is the longest. On A9, D2 pinacula fused dorsum, D1 anterodorsal to SD1, equidistant from D2 and SD1; L group is trisetose. Anal shield is rounded

posteriorly, SD1 is the longest, D2 is the shortest and usually about one-thirds as long as SD1; D1's usually closer to corresponding SD2 than to each others, and anterior to a straight line joining SD2's, D1, SD2 and SD1 forming a obtuse angle at SD2; anal legs with nine setae and one puncture, anal fork well developed with 8 prongs. SV group on abdominal segments 1, 2, 7, 8 and 9 usually 3:3:3:2:2. Crochets of A3-6 prolegs inner center uniordinal, others biordinal, arranged in complete circle. All spiracles oval, and on T1 and A8 about same size and that is the largest, the spiracle of A1 is slightly larger than others.

Larva length: 20.0 mm

Head width: 2.0 mm.

Materials examined: Experiment Forest of Kangwon National University, Chunchon City, Kangwon Do, 11. VI. 1998, larvae collected from leaves of *Quercus mongolica* FISCH.

Remarks: The larvae of this species can be characterized by the following: Adfrontal sutures reaching epicranial triangle; seta SD2 on the segments 1-8 always on the SD1 pinaculum; SV group on segments 1, 2, 7, 8 and 9 usually 3:3:3:2:2; mandible with five apical teeth on cutting edge, inner surface with small four inner teeth; crochets of A3-6 prolegs inner center uniordinal, others biordinal, arranged in complete circle; anal fork well developed with 8 prongs.

2. *Pandemis cinnamomeana*(Treitschke)
(흰머리잎말이나방 Figs. 13-24)

Body light yellowish brown with grayish

black mid-dorsal band and subdorsal band, spinulation of integument darker than body colour, the spinules apparently short, and usually easily seen; head yellowish brown, thoracic shield pale brown with black marking in anteroposteral margin; thoracic legs brown; anal shield light yellowish brown; pinacula light yellowish brown; setae of body brown; spiracles yellow with dark brown peritremes.

Head (Figs. 16, 17): Ocellar areas always somewhat rounded; ocelli I-V darker pigmented; ocellus II closer to III than to I; ocelli III, IV and V about equal in size, distinct. The adfrontals ecdysial lines reaching to vertical triangle; the front extends three-fifths of the distance to vertical angle and that attenuated posteriorly. AF2 and P1 below level of front apex; A1, A2 and A3 forming a obtuse angle at A2, A2 posterolateral to A1, Aa venteromesad of A2; P2 and Pb posterolateral to P1, Pa lateroventrad of P1; L1 posterolateral to A3 and almost straight above ocellus I; O1 closer to ocellus II, O2 posterolateral to ocellus I and closer to I; O3 remote from O1 and ventrad of O2, Oa midway between O3 and VI; subocellar setae triangularly placed, SOa closer to SO3.

Mouthpart (Figs. 13, 18, 19, 20, 21, 22): Labrum anterolateral margin rounded, emargination about one-thirds deep, a acute angled; M2 directly behind to M1, P closer to M1 than to M2, L1 and L2 closely approximate, L1 dorsal to L2; epipharynx with small spinules, epipharyngeal shield defined and epipharyngeal setae triangularly grouped near anterolateral margin of

epipharynx. Mandible with five apical teeth on cutting edge, fifth tooth rounded; inner surface with three internal teeth and three distinct ridges. Labium with membranous postmentum, on the near center with two conspicuous setae; mentum sclerotized and pale brown, the anterior margin of mentum with two inconspicuous setae; prementum with median spinneret distally and labial palpi laterally; the apex of spinneret is rounded, about 5 times as long as median breadth, the length of spinneret shorter than tip of seta on apical segment of labial palpi. Maxillae with cardo weakly delineated, mostly membranous bearing a hook-like sclerites basally; stipes mostly membranous, with a large sclerites and bears two setae; palpifer sclerotized, bearing one seta; palpus: basal segment with one seta and a lobe, on the lobe bearing three sensilla trichodea, two sensilla styloconica, and three sensilla basiconica and one companiformium; apical segment with eight sensilla basiconica apically. Antenna: the first segment short and the width is two times as long as length; second segment much longer than first segment, bears a companiformium, two sensillum trichodeum, one (long hair) longer than antennal segments combined, the other (short hair) subequal to third antennal segment, three sensillum basiconicum, one very small, others slightly shorter than the third antennal segment; third segment three times as long as first segment in length, with two sensillum basiconicum and one sensillum styloconicum.

Thorax (Figs. 14, 15): Thoracic shield smooth and weakly sclerotized. T1: D1

closer to D2 than to XD2; XD2, SD1 and SD2 forming a right angle; L group is trisetose; SV group is bisetose. T2 and T3: D2 anteroventral to D1; SD2 anterodorsal to SD1; L3 posterolateral to L1, L2 anteroventral to L1; SV group is unisetose. Thoracic legs: coxa with seven setae (two setae very small); femur with two setae; tibia with six setae and one puncture; tarsus with four small setae, claws slender.

Abdomen (Figs. 14, 23, 24): On A1-8, D1 slightly shorter than D2; SD1 pinacula dorsal from spiracle in A1-7, directly anteral to spiracle in A8; L1-L2 pinacula anteroventral to spiracle and similar in length, L3 posteroventral to L1-L2 and is the longest. On A9, D2 pinacula fused from dorsum, D1 anteroventral to D2; SD1 posteroventral to D1 and straight below D2. Anal shield rounded posteriorly, D2 is the shortest and about one-thirds as long as SD1, D1's usually closer to corresponding SD2 than to each others, and anterior to a straight line joining SD2's, D1, SD2 and SD1 forming a obtuse angle at the SD2; anal legs with nine setae and one puncture; anal fork will developed and with 7 prongs. SV group on segments 1, 2, 7, 8 and 9 usually 3:3:3:2:2. Crochets of A3-6 prolegs inner center uniordinal, others biordinal, arranged in complete circle, anal prolegs inner center uniordinal, others biordinal, arranged in semi-circle. All spiracles circle, and on T1 and A8 about same size and that is the largest, the spiracle on A1 is slightly larger than others.

Larva length: 16.7 mm.

Head width: 2.0 mm.

Materials examined: Experiment Forest

of Kangwon National University, Chunchon City, Kangwon Do, 22. VII. 1998, larvae collected from leaves of *Lespedeza bicolor* TURCZ.

Remarks: The larvae of this species can be characterized by the following: Adfrontal sutures reaching epicranial triangle; seta SD2 on segments 1-8 always on the SD1 pinaculum; SV group on segments 1, 2, 7, 8 and 9 usually 3:3:3:2:2; mandible with five apical teeth on cutting edge, inner surface with three internal teeth; crochets of A3-6 prolegs inner center uniordinal, others biordinal, arranged in complete circle, anal fork will developed and with 7 prongs.

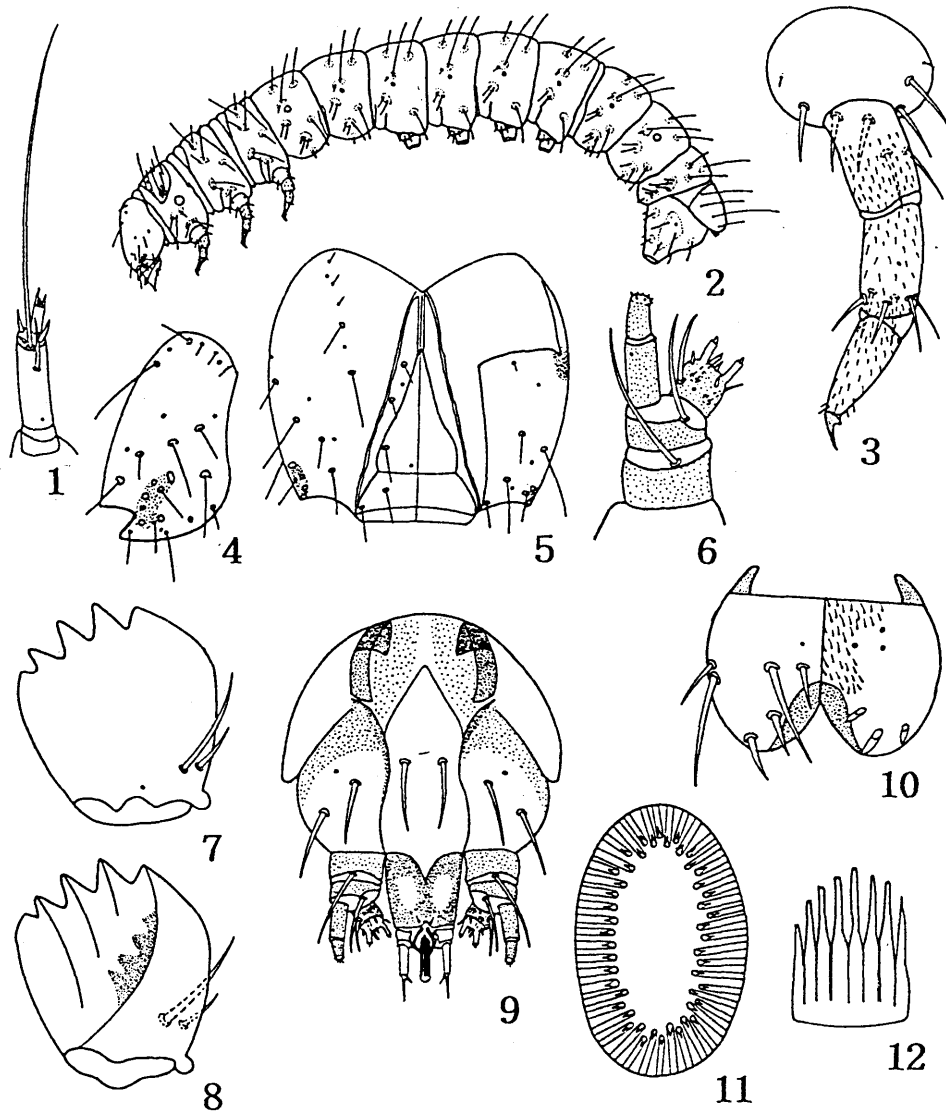
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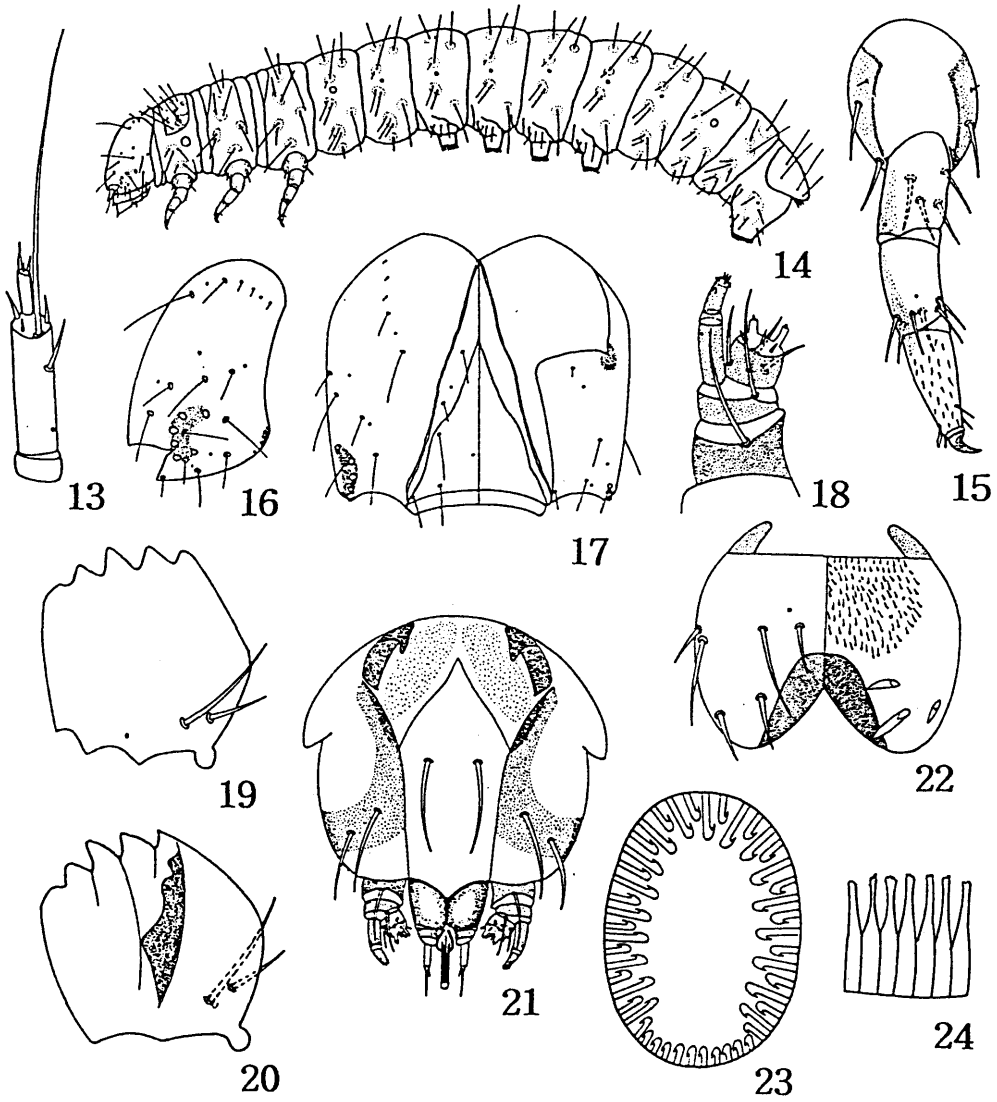
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Figs. 1-12. *Pandemis heparana* (Denis et Schiffermüller)

1. antenna, 2. larva, 3. leg, 4. head(lateral view), 5. head(frontal and ventral view), 6. maxillary palpus, 7. mandible(dorsal view), 8. mandible(ventral view), 9. maxillae and labium, 10. labrum and epipharynx, 11. crochets, 12. anal fork.



Figs. 13-24. *Pandemis cinnamomeana*(Treitschke)

13. antenna, 14. larva, 15. leg, 16. head(lateral view), 17. head(frontal and ventral view), 18. maxillary palpus 19. mandible(dorsal view). 20. mandible(ventral view), 21. maxillae and labium, 22. labrum and epipharynx, 23. crochets, 24. anal fork.