

Morphological Observation on the Two Species of Hypeninae Larvae in Korea (Noctuidae: Lepidoptera)*

PIAO Mei-hua¹⁾ and Chan-young LEE²⁾

2종의 한국산 수염나방아과 유충에 대한 형태적 관찰*

박미화¹⁾ · 이찬용²⁾

ABSTRACT

The external morphologies of *Hypena tristalis* Lederer and *Bomolocha nigrobasalis* Herz larvae of Hypeninae were observed.

Key words: Larvae, Morphology, Hypeninae, Noctuidae, Lepidoptera, Korea

요 약

수염나방아과의 검은무늬수염나방(*Hypena tristalis*)과 왕무늬수염나방(*Bomolocha nigrobasalis*) 유충의 형태적 특징을 관찰하였다.

INTRODUCTION

The Noctuidae comprise a very large family, with the majority of the described larvae being medium-sized, having hypognathus heads, lacking secondary setae. Noctuid larvae may have two, three, or four pairs of abdominal prolegs in addition to the caudal pair. The caudal

prolegs generally are amply developed and bear crochets. Korea 961 species have been described from adult specimens, but larvae are known a few species. Many of the documented larvae are so poorly understood that redescrptions, more host plant data, and direct, field behavioral observations are needed. This paper detailly describe and

1) 강원대학교 대학원: Dept. of Forestry, Graduate School, Kangwon National University, Chunchon 200-701, Korea

2) 강원대학교 산림과학대학 삼림자원보호학과: Dept. of Forest Resources Protection, College of Forest Sciences, Kangwon National University, Chunchon 200-701, Korea

* 이 논문은 1997년도 한국학술진흥재단 대학부설연구소지원 연구비에 의하여 수행된 연구결과의 일부임.

illustrate larvae of *Bomolocha nigrobalis* Herz and *Hypena tristalis* Ledrer.

Mature larvae of *Hypena* (7 species) and *Bomolocha* (2 species) and others 2 genera (2 species) of Noctuidae group B II reported by Gardner (1946). Larval color pattern, distribution, food plant of *Hypena* Schrank (4 species), *Bomolocha* Hbn (3 species) and *Legna* Wlk (1 species) of Hypeninae published by Crumb (1956). Larvae color, major chaetotaxy, mandible of *Bomolocha stygiana* Butler, *Hypena indicatalis* Walker, *H. hamptonialis* Wileman and *H. belinda* Butler of Hypeninae described by Issiki (1965). The larvae morphologies of *Hypena humuli* Harris and 70 others species of Noctuidae provided by Stehr (1987).

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

Mature larvae small to medium. Head rounded. Body of the normal lepidopteran type, usually cylindrical and stout; cuticle smooth or bearing granules or spinules. Primary and subprimary setae present, secondary setae also present in a few subfamilies. Body concolorous, marked with chevrons or triangles, or longitudinally striped. Spiracles basically elliptical, sometimes with emarginate ends; those T1 and A8 usually larger than those on A1-7.

Head: Frontoclypeus triangular with lateral margins slightly incurved to excurved and extending 0.50 to 0.88 of distance from base of frontoclypeus to epicranial notch. Adfrontal ecdysial lines close to frontoclypeus margins, merging cephalad with them; meeting each other above apex of frontoclypeus, sometimes near or at epicranial notch; six ocelli, I-IV in semicircle with variable spacing from species to species, V and VI removed from I-IV semicircle, line extending through V and VI not passing through semicircle.

Thorax: T1 shield usually well formed, may be concolorous with rest of body, in which case it may be indistinct. T1: setae XD1 and XD2 positioned near anterior margin and D1 and D2 close to

posterior margin of T1 shield; SD1 and SD2 approximate to each other, SD1 usually thinner than SD2; L1 and L2 arise close to each other, cephalad of spiracle, L2 usually thinner than L1; SV1 and SV2 present above leg. T2 and T3: D1, D2, and SD2 insertiones approximate a straight line; SD1 usually hairlike, situated below and usually separated from SD2; L1, L2 and L3 present; SV group usually unisetose.

Abdomen: D1 and D2 present, D1 dorsocephalad of D2 in A1-8, on A9 D1 ventrocephalad of D2; SD1 basically dorsad and SD2 cephalad of spiracle, SD2 absent on A9; L group with three setae on A3-6, L1 directly caudad of spiracle on A3-6, but usually ventrocaudad of spiracle on A7; SV group with two or three setae on A1, three on A2, three or more on A3-6, one on A7-9. A9 with only one seta in L group. A10 bearing anal shield, sometimes concolorous with body. Prolegs on A3-6 and A10, A4-6 and A10, or A5-6 and A10. A5 and A6 prolegs subequal; pairs on A3 and A4, when present, may decrease in size cephalad. Crochets uni- or less commonly biordinal, usually in homoideous mesoserries.

KEY TO SPECIES EXAMINED

1. T2 and T3, SD1 usually hairlike, situated below and usually separated from SD2; on T1, SD1 and SD2 approximate to each other, and below shield, SD1 usually thinner than SD2; crochets of proleg uniordinal, homoideous mesoserries.....2
2. The base of setae A2 and A3 is black;

front extends about half of distance to vertical triangle; mandible with four apical teeth; spinneret longer than labial palpi; on A3 prolegs absent.....

.....*Hypena tristalis*

- The base of setae A1, A2, A3, P1, P2, L1, O1, O2 and O3 is black; front extends about two-fifths of distance to vertical triangle; mandible with five apical teeth; spinneret equal to labial palpi; on A3 prolegs present.....

.....*Bomolocha nigrobasalis*

1. *Hypena tristalis* Lederer

(검은무늬수염나방 Figs. 1-12)

Body blackish yellow; head yellow, reticulation blackish brown, base of seta A2 and A3 black; thoracic shield and anal shield yellow; thoracic legs yellow with brown claws; setae of the body long and blackish yellow; pinacula is small tubercles; spiracles yellow with black peritrems; cuticle is smooth.

Head (Figs. 4, 5): Wider than long; vertical angle obtuse angled; ocelli I and II close approximate, ocellus III closer to IV than to III, V closer to VI than to IV. The adfrontal ecdysial line indistinct; the front extends about half of the distance to vertical angle. AFa above level of front apex, AF1 below level of front apex; Fa anterior to F1; A1, A2 and A3 forming a obtuse angle at A2, A2 equidistant from A1 and A3, Aa lateroventral to A2 and closer to A2 than to A1; P2 posterolateral to P1, Pb slightly closer to P1; L1 posterolateral to A3 and almost above ocellus I; O1 closer to ocellus IV, O2 posterolateral to ocellus I and closer to I, O3 remote from O1, Oa equidistant

from ocellus VI and O3; subocellar setae triangularly placed, SOa closer to SO3.

Mouthpart (Figs. 1, 6, 7, 8, 9, 11, 12): Labrum anterolateral margin rounded, emargination two-fifths deep, forming an acute angle; M2 lateroventral to M1, P equidistant from M1 and M2; L1 and L2 close approximate, L1 directly lateral to L2. Epipharynx with much small spines; epipharyngeal shield defined; epipharyngeal setae small and triangularly grouped near anterolateral margin. Mandible with four apical teeth on cutting edge, first, second and third teeth are sharpened, fourth tooth rounded distally; inner surface with a large and triangle internal tooth. Labium with membranous postmentum, on the near center with two conspicuous setae; mentum is sclerotized and aple brown, the anterior margin with two inconspicuous setae; prementum with median spinneret distally and labial palpi laterally; spinneret rounded apically, slender and long, the length of spinneret about 8 times as long as median breadth and 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 two setae; palpifer sclerotized and with one seta; palpus: basal segment bearing one seta, three sensilla trichodea and a lobe, on the lobe with two sensilla styloconica, three sensilla basiconica and one companiformia; apical segment with eight sensilla basiconica. Distal region of hypopharynx with stout spines and separated from proximal region by distinct medial transverse cleft, proximal

spines is large. Antenna: the first segment short and wider than long; the second segment 5 times as long as the first segment, bears one companiformium, two sensillum trichodeum, one (long hair) 2.5 times as long as antennal segments combined, the other (short hair) slightly longer than the third segment, three sensillum basiconicum, one very small, others each nearly as long as the third segment; the third segment small, bearing two sensillum basiconicum and one sensillum styloconicum.

Thorax (Figs. 2, 3): Thoracic shield is smooth. T1: D1 closer to D2 than to XD1; SD1 and SD2 on the one pinaculum, SD1 usually thinner than SD2, both positioned below of T1 shield; L1 and L2 arise close to each other, anterior to the spiracle, L2 usually thinner than L1; SV1 and SV2 present above leg. T2 and T3: D1 and D2 frequently on one pinaculum; SD2 dorsal to SD1, SD1 usually hair like; L1, L2 and L3 present; SV group is unisetose. Thoracic leg: coxa with seven setae (two setae minute); femur with two setae; tibia with six setae and one puncture; tarsus with four setae (one seta lanceolate, one seta falcate, others bristlelike).

Abdomen (Figs. 2, 10): On A1-8, D1 anterodorsal to D2 and shorter than D2; SD1 anterodorsal to the spiracle in A1-6 and A8, dorsal to the spiracle in A7; L1 directly lateral to the spiracle in A1 and A8, posteroventral to the spiracle in A2-7; L2 anteroventral to the spiracle; L3 posteroventral to L2 in A1-6 and A8, straight below from L2 in A7. On A9, D1 equidistant from D2 and SD1, L group is

unisetose. Anal shield rounded posteriorly, D1 is the shortest, SD1 and SD2 same size and about 3 times as long as the D2 in length; anal leg with nine setae. SV group on abdominal segments 1, 2, 7, 8 and 9 usually 3:3:1:1:1. Prolegs on A4-6 and A10, proleg of A4 slightly slender than prolegs of A5-6, the crochets uniordinal, arranged in homoideous mesoseries. All spiracles oval, the spiracles on T1 and A8 is the largest, those of A1 and A7 about same size and slightly larger than others.

Larva length: 22.0mm.

Head width: 1.7 mm.

Materials examined: Experiment Forest of Kangwon National University, Chunchon City, Kangwon Do, 30. VI. 1998, larvae collected from leaves of *Impatiens textori* Miq.

Remarks: The larvae of this species are characterized by the following points: Base of setae A2 and A3 is black; front extends about half of distance to vertical triangle; mandible with four apical teeth, inner surface with a large internal tooth; the length of spinneret longer than tip of seta on apical segment of labial palpi; on A3 prolegs absent; crochets uniordinal homoideous mesoseries; SV group on abdominal segments 1, 2, 7, 8 and 9 usually 3:3:1:1:1.

2. *Bomolocha nigrobasalis* Herz

(왕무늬수염나방 Figs. 13-24)

Body blackish yellow; head yellow, base of setae black, each ocelli with a black spots; thoracic shield and anal shield slightly lighter than the body colour; thoracic legs yellow with brown claws;

setae of body brown and moderately long; pinacula distinct, slightly lighter than body colour and somewhat arised; integument is smooth; spiracles yellow with blackish brown peritremes.

Head (Figs. 16, 17): Wider than long; vertical angle obtuse angled; ocelli I and II close approximate; ocellus III slightly closer to II than to IV; ocellus V separated from ocelli I~IV. The adfrontal sutures indistinct; the front extends about two-fifths of the distance to vertical angle. AFa above level of front apex, AF1 below level of front apex; A1, A2 and A3 forming a obtuse angle at A2, A2 slightly closer to A1 than to A3, Aa lateroventral to A2; P2 slightly posterolateral to P1, Pb closer to P1 than to P2; L1 posterolateral to A3 and almost above ocellus I; O1 closer to ocellus IV, O2 posterolateral to ocellus I, O3 remote from O1, Oa closer to ocellus VI than to O3; subocellar setae triangularly grouped, SOa closer to SO3.

Mouthpart (Figs. 13, 18, 19, 20, 21, 22, 23): Labrum anterolateral margin rounded, emargination one-fifths deep, forming a almost right angle; M2 lateroventral to M1, P closer to M1 than to M2; L1 and L2 close approximate, L1 slightly posterolateral to L2. Epipharynx with small spines; epipharyngeal setae triangularly grouped near anterolateral margin. Mandible with five apical teeth on cutting edge, fifth tooth small; inner surface with a large internal tooth. Labium with membranous postementum, on the center with two conspicuous setae; mentum is sclerotized and aple brown, the anterior margin with two inconspicuous setae; prementum with

median spinneret distally and labial palpi laterally; distal lip of the spinneret rounded, the length of spinneret about 5 times as long as median breadth and almost equal to 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 two setae; palpifer is sclerotized and with one seta; palpus: basal segment bearing one seta, three sensilla trichodea and a lobe, on the lobe with two sensilla styloconica, two sensilla basiconica and one companiformia; apical segment with eight sensilla basiconica. Distal region of hypopharynx with spines, proximomedial region without spines, proximolateral region with spines and lateral spines is large. Antenna: the first segment is short and wider than long; the second segment 5 times as long as first segment, bears one companiformium, two sensillum trichodeum, one (long hair) 2.5 times as long as antennal segments combined, the other (short hair) longer than the third segment, three sensillum basiconicum, one very small, others each nearly as long as the third segment, the third segment small, bearing three sensillum basiconicum and one styloconicum.

Thorax (Figs. 14, 15): Thoracic shield is smooth. T1: D1 equidistance from D2 and XD1; SD1 and SD2 on the same pinaculum, SD1 usually thinner than SD2, both positioned below of T1 shield; L1 and L2 arise close to each other, anterior to the spiracle, L2 usually thinner than L1; SV1 and SV2 present above leg. T2 and T3: D1 and D2 frequently on the same pinaculum, SD2

and SD1 on another; SD2 dorsal to SD1, SD1 usually hair like; L1, L2 and L3 present; SV group unisetose. Thoracic leg: coxa with seven setae (two setae minute); femur with two setae; tibia with six setae; tarsus with four setae (TS1 spatulate, TS2 lanceolate, TS3 thick, tapering distad, TS4 narrow tapering distad).

Abdomen (Figs. 14, 24): On A1-8, D1 anterodorsal to D2 and shorter than D2; SD1 dorsal to the spiracle in A1 and A7, slightly anterodorsal to the spiracle in A2-6 and A8; L1 directly lateral to the spiracle in A1, posteroventral to the spiracle in A2-8; L2 anteroventral to the spiracle; L3 posteroventral to L2 in A1-6 and A8, straight below from L2 in A7. On A9, D2 posterodorsal to D1; L group is unisetose. Anal shield rounded posteriorly, D2 is the shortest, SD1 and SD2 almost equal in length, SD1 is 4 times as long as D2 in length; anal legs with nine setae. SV group on abdominal segments 1, 2, 7, 8 and 9 usually 3:3:1:1:1. Prolegs on A3-6 and A10, proleg of A3 smaller than the others prolegs, prolegs of A4-6 almost equal in size, the crochets uniordinal, arranged in homoideous meseries. All spiracles oval, spiracles on T1 and A8 same size, larger than the others, the spiracle of A1 slightly larger than the spiracles of A2-7.

Larva length: 15.0mm.

Head width: 1.8 mm.

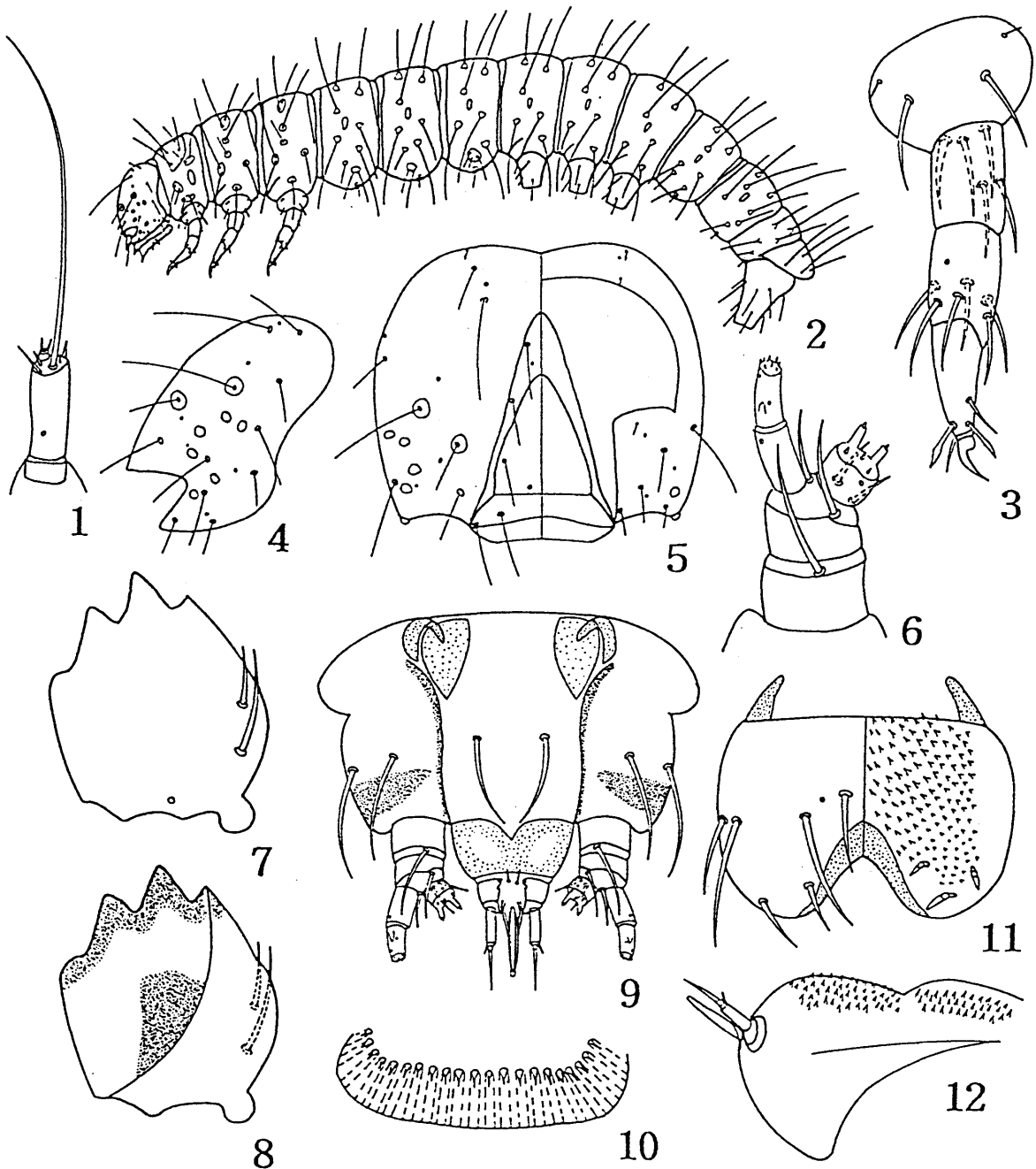
Materials examined: Experiment Forest of Kangwon National University, Chunchon City, Kangwon Do, 30. VI. 1998, larvae collected from leaves of *Impatiens textori* M₁Q.

Remarks: The larvae of this species are

characterized by the following points: Base of setae A1, A2, A3, P1, P2, L1, O1, O2 and O3 is black; front extends about two-fifths of distance to vertical triangle; mandible with five apical teeth, inner surface with a large internal tooth; the length of spinneret equal to tip of seta on apical segment of labial palpi; on A3 proleg present; crochets uniordinal, homoideous mesoserries; SV group on abdominal segments 1, 2, 7, 8 and 9 usually 3 : 3 : 1 : 1 : 1.

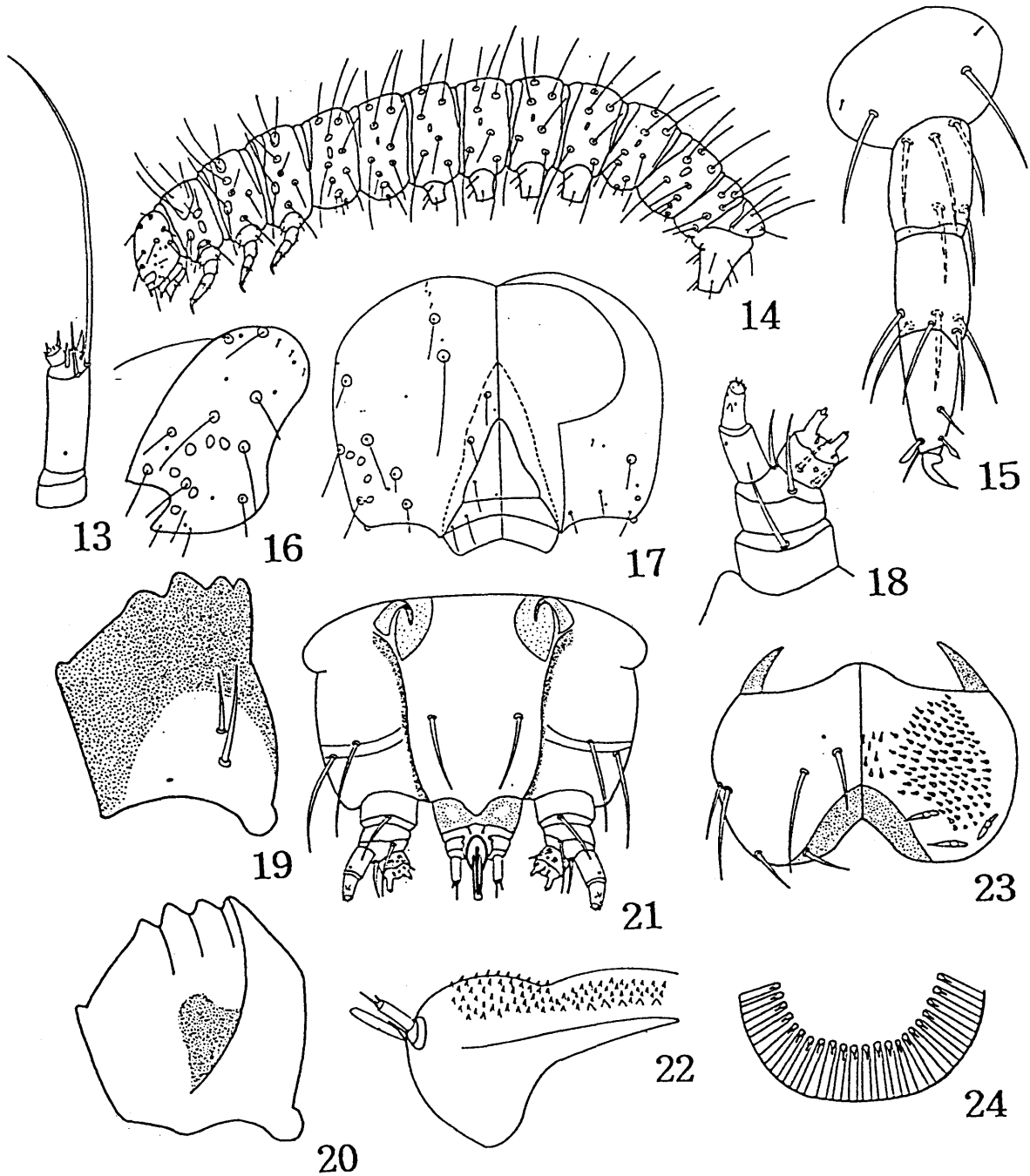
REFERENCES

1. Crumb, S.E. 1956. The larvae of the Phalaenidae. U.S. Dept. Agric. Tech. Bull. 1135: 1-386.
2. Gardner, J.C.M. 1946. On larvae of the Noctuidae (Lepidoptera) II. Trans. Roy. Ent. Soc. Lond. 97: 237-252.
3. Heinrich, C. 1916. On the taxonomic value of some larvae characters in the Lepidoptera. Pro. Ent. Soc. 18: 154-164.
4. Hinton, H.E. 1946. On the homology and nomenclature of the setae of Lepidoptera larvae. with some notes on the phylogeny of the setae of Lepidoptera. Trans. Roy. Ent. Soc. Lond. 97: 1-37.
5. Issiki, S. 1965. Early Stages of Japanese Moths in Color. vol. 1. Hoikusha Publishing Co., Ltd. Osaka. pp. 155-159.
6. Stehr, F.W. 1987. Noctuidae (Noctuoidea). In Stehr, F.W. (ed), Immature Insects. vol. 1. Kendall/Hunt Publishing Company, Iowa. pp. 549-578.



Figs. 1-12. *Hypena tristalis* Lederer

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. crochets, 11. labrum and epipharynx, 12. hypopharynx.



Figs. 13-24. *Bomoloca nigrobasalis* Herz

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. hypopharynx, 23. labrum and epipharynx, 24. crochets.