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DIVERSITY OF THE LARVAL CRANIAL SETAE IN PALEARCTIC NOTODONTIDAE (NOCTUOIDEA) AND THEIR TAXONOMIC DISTRIBUTION

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Diversity of the Larval Cranial Setae in Palaearctic Notodontidae (Noctuoidea) and and their Taxonomic Distribution. Dolinskaya I. V. — Larval cranial setae of each larval instar of 66 species belonging to 35 genera of Palaeartic Notodontid moths from Ukraine and Far East of Russia (Primorskii krai) was examined with the use of a scanning electron microscope. A comparison with outgroup species — Lasiocampoidea (Lasiocampidae), Sphingoidea (Sphingidae) and Noctuoidea (Erebidae: Lymantriinae, Arctiinae; Noctuidae) is conducted. Main kinds of setae during larval development and their transformation are discussed. Possible apomorphic and plesiomorphic states of the different characters are discussed in relation to the different taxa.

Key words: Notodontidae, Lepidoptera, larvae, morphology, larval cranial setae, classification, scanning electron microscopy.

Разнообразие щетинок головы палеарктических хохлаток (Notodontidae, Noctuoidea) и их таксономическое распределение. Долинская И. В. — С помощью сканирующего электронного микроскопа изучены щетинки головы гусениц всех возрастов 66 видов из 35 родов палеарктических хохлаток из Украины и Приморского края России. Проведено сравнение с представителями внешней группы — Lasiocampoidea (Lasiocampidae), Sphingoidea (Sphingidae) и (Erebidae: Lymantriinae, Arctiinae; Noctuidae). Рассмотрены вероятные направления преобразований в волосяном покрове головы у гусениц различных возрастов. Обсуждаются возможные апоморфные и плезиоморфные состояния признаков различных таксонов.

Ключевые слова: Notodontidae, Lepidoptera, гусеницы, морфология, щетинки головы, классификация, сканирующий электронный микроскоп.

Introduction

The larval head microsculpture and morphology of the larval mandibles allows unraveling related groups within the family that can be used to accomplish classification of the family (Dolinskaya, 2008, 2011). While studying these structures we noted the great variety of setae on the larval head. Taking as examples the notodontid caterpillars we intended to show the changes in the shape, disposition and other characters of the head setae during the larval development.

Hinton (1946), Beck (1960), Merzheevskaya (1967) and Stehr (1987) characterized the chaetotaxy of the lepidopteran caterpillars in details. Miller (1991) described chaetotaxy of some notodontid caterpillars of the final instars. Earlier we analized the chaetotaxy of the notodontid first instar larval head (Dolinskaya, Pljushch, 2003). Thus, we did not incorporate the chaetotaxy of the larval head in this paper.

Material and methods

This research is based on material collected in Ukraine and Far East of Russia (Primorskii Krai). Eggs were obtained from females captured at light. Hatched larvae were reared to pupae. The epicrania left by caterpillars after moulting, as well as fresh material preserved in alcohol, were studied. The epicranium was examined with a scanning electron microscope (SEM) and a binocular light microscope (MBS 9). The microsculpture of the head of 1st through 5th larval instars belonging to 66 notodontid species from the following genera were studied: *Euhampsonia*, *Cerura*, *Furcula*, *Uropyia*, *Dicranura*, *Harpyia*, *Stauropus*, *Cnethodonta*, *Fentonia*, *Neopheosia*, *Drymonia*, *Notodonta*, *Peridea*, *Nerice*, *Pheosia*, *Leucodonta*, *Lophocosma*, *Ellida*, *Pheosiopsis*, *Shaka*, *Pterostoma*, *Ptilodon*, *Lophontosia*, *Hagapteryx*, *Togepteryx*, *Semidonta*, *Allodonta*, *Epodonta*, *Phalera*, *Spatalia*,

Gluphisia, *Gonoclostera*, *Pygaera*, *Clostera*, and *Micromelalopha*. Terminology for larval structures follows Hinton (1946) and Stehr (1987). The taxonomic arrangement of these genera follows Schintlmeister (2008).

In order to clarify the character states and polarity within Notodontidae, representatives of related families belonging to Lasiocampoidea, Sphingoidea, as well as other members of Noctuoidea (Kuznetzov, Stekolnikov, 2001; Zahiri and other, 2011, 2012), arre used as outgroup taxa. The following species were studied*: Euthrix potatoria* Linnaeus, *Gastropacha quercifolia* Linnaeus (Lasiocampidae), *Agrius convolvuli* Linnaeus, *Smerinthus planus* Walker (Sphingidae), *Teia dubia* Tauscher, *Arctornis l-nigrum* Müller (Erebidae: Lymantriinae), *Rhyparioides amurensis* Bremer, *Chionarctia nivea* Mėnėtriės, *Phragmatobia amurensis* Seitz (Erebidae: Arctiinae) and *Calocasia coryli* Linnaeus (Noctuidae).

Results

Comparative Morphology of Larval Head Setae

The taxa and characters examined are listed in table 1. Covering of the head setae varies from instar to instar. Head setae of the notodontid larvae in the 1st to 2nd instars are most distinct.

First instar of notodontid caterpillars have mostly or only primary setae. These setae are typical for many species. Primary setae are simple, mainly firm, with smooth sculpture, thinned towards their apices (*Fentonia, Furcula, Gluphisia* and others, fig. 1). In the genera *Stauropus, Cnethodonta* and *Harpyia*, the setae have small mace-shaped bulge in the apical part (figs 2, 3). In the genus *Phalera* the setae are plumose (fig. 4). In the genus *Uropyia,* sculpture of the primary setae looks like well developed apically rounded spines (figs 5–7).

Primary setae are mainly short, their length not expanded of the half of width of head capsule (figs 1, 2). Species of some genera have very long, hairlike setae many times longer than the width of head capsule (*Uropyia*, *Ptilodon, Hexafrenum, Allodonta,* fig. 8).

The 1st instar caterpillars posess numerous, small, secondary setae only in one genus *Harpyia* (figs 9, 10).

Many genera have setae of the 2nd instar identical to that of the preceding instar.

However, sometimes the larval head of some genera is covered with numerous secondary setae (*Stauropus*, *Dicranura, Phalera*, *Pygaera* and *Clostera*). These setae are either very short, slightly visible (*Dicranura*, *Stauropus*, figs 11, 12, 15), moderately short (*Pygaera*, fig. 13) or very long (*Phalera*, *Clostera*, figs 4, 14). Primary setae are longer and stronger than secondary setae and more distinct.

In the 3rd to 5th instars no significant transformations are observed, except species with short setae which become shorter, thinner and less visible on the head (*Peridea, Lophontosia, Lophocosma* and others); at the same time in the species with long setae, they are very distinct (*Phalera*, *Clostera* and others). In the representatives of some genera (*Stauropus, Harpyia*), where the sculpture looks conical the setae replaced to the tubercles (fig. 16).

The setae are mostly located on the distinct pinacula. It must be noted that the primary setae have larger pinacula than secondary setae (fig. 17). In some genera the setae are located on the chalaza (*Uropyia, Pygaera*, fig. 6).

Main types of larval setae

The setae occuring in different instars of notodontids can be grouped in 13 types as follows.

1. Primary setae in all instars (*Euhampsonia, Cerura, Furcula, Uropyia, Cnethodonta, Fentonia, Drymonia, Notodonta, Peridea, Pheosia, Nerice, Leucodonta, Lophocosma, Ellida, Pheosiopsis, Shaka, Pterostoma, Ptilodon, Lophontosia, Hagapteryx, Togepteryx, Semidonta, Allodonta, Epodonta, Spatalia, Gluphisia, Gonoclostera*, *Micromelalopha*).

2. Primary setae in 1st instar, secondary setae appearing in 2nd to 5th instars (*Stauropus*, *Dicranura*, *Phalera*, *Pygaera* and *Clostera*).

Table 1. Character states of the larval cranial setae of the Palaearctic Notodontidae
Таблица 1. Признаки щетинок головы гусениц палеарктических хохлаток

Species	Instar 1	Instar 2	Instars 3–5
Notodontidae			
Euhampsonia cristata (Butler)	P, A, H	P, A, H	P, A, H
Euhampsonia splendida (Oberthür)	P, A, H	P, A, H	P, A, H
Cerura erminea (Esper)	P, A, H	P, A, H	P, A, H
Furcula furcula (Clerck)	P, A, H	P, A, H	P, A, H
Furcula bicuspis (Borkhausen)	P, A, H	P, A, H	P, A, H
Furcula bifida (Brahm)	P, A, H	P, A, H	P, A, H
Uropyia meticulodina (Oberthür)	P, A, L	P, A, L	P, A, L
Dicranura ulmi (Denis et Schiffermüller)	P, A, VH	S, A, VH	S, A, VH
Harpyia milhauseri (Fabricius)	S, PCL, VH	S, PCL, VH	S, A, VH
Harpyia umbrosa (Staudinger)	S, PCL, VH	S, PCL, VH	S, A, VH
Stauropus fagi (Linnaeus)	P, PCL, VH	S, PCL, VH	S, A, VH
Stauropus basalis Moore	P, PCL, VH	S, PCL, VH	S, A, VH
Cnethodonta grisescens Staudinger	PCL, VH	PCL, VH	P, A, VH
Fentonia ocypete (Bremer)	P, A, H	P, A, H	P, A, H
Neopheosia mandschurica (Oberthür)	P, A, H	-	-
Drymonia dodonaea (Denis et Schiffermüller)	P, A, H	P, A, H	P, A, H
Notodonta torva (Hübner)	P, A, H	P, A, H	P, A, H
Notodonta dromedarius (Linnaeus)	P, A, H	P, A, H	P, A, H
Notodonta dembowskii Oberthür	P, A, H	P, A, H	P, A, H
Notodonta tritophus phoebe (Siebert)	P, A, H	P, A, H	P, A, H
Notodonta ziczac (Linnaeus)	P, A, H	P, A, H	P, A, H
Peridea anceps (Goeze)	P, A, H	P, A, H	P, A, H
Peridea lativitta (Wileman)	P, A, H	P, A, H	P, A, H
Peridea elzet Kiriakoff	P, A, H	P, A, H	P, A, H
Peridea graeseri (Staudinger)	P, A, H	P, A, H	P, A, H
Peridea gigantea (Butler)	P, A, H	P, A, H	P, A, H
Peridea oberthueri (Staudinger)	P, A, H	P, A, H	P, A, H
Peridea moltrechti (Oberthür)	P, A, H	P, A, H	P, A, H
Nerice leechi Staudinger	P, A, H	P, A, H	P, A, H
Nerice davidi Oberthür	P, A, H	P, A, H	P, A, H
Pheosia tremula (Clerck)	P, A, H	P, A, H	P, A, H
Pheosia grummi (Christoph)	P, A, H	-	-
Pheosia gnoma (Fabricius)	P, A, H	P, A, H	P, A, H
Pheosia rimosa Packard	P, A, H	P, A, H	P, A, H
Leucodonta bicoloria (Denis et Schiffermüller)	P, A, H	P, A, H	P, A, H
Lophocosma atriplaga Staudinger	P, A, H	P, A, H	P, A, H
Ellida branickii (Oberthür)	P, A, H	-	-
Pheosiopsis cinerea (Butler)	P, A, H	P, A, H	P, A, H
Shaka atrovittatus (Bremer)	P, A, H	P, A, H	P, A, H
Pterostoma palpina (Clerck)	P, A, H	P, A, H	P, A, H
Pterostoma gigantina Staudinger	P, A, H	P, A, H	P, A, H
Pterostoma griseum (Bremer)	P, A, H	P, A, H	P, A, H
Ptilodon capucina (Linnaeus)	P, A, L	P, A, L	P, A, L
Ptilodon saturate hoegei (Graeser)	P, A, L	P, A, L	P, A, L
Ptilodon cucullina (Denis et Schiffermüller)	P, A, L	P, A, L	P, A, L
Ptilodon ladislai (Oberthür)	P, A, L	P, A, L	P, A, L
Lophontosia cuculus (Staudinger)	P, A, H	P, A, H	P, A, H
Hagapteryx admirabilis (Staudinger)	P, A, H	P, A, H	P, A, H
Togepteryx velutina (Oberthür)	P, A, H	P, A, H	P, A, H
Semidonta biloba (Oberthür)	P, A, H	P, A, H	P, A, H
Allodonta plebeja (Oberthür)	P, A, L	P, A, L	P, A, L
Allodonta leucodera (Staudinger)	P, A, L	P, A, L	P, A, L
Epodonta lineata (Oberthür)	P, A, H	P, A, H	P, A, H
Phalera bucephala (Linnaeus)	P, B, L	S, B, L	S, B, L
Spatalia argentina (Denis et Schiffermüller)	P, A, H	P, A, H	P, A, H
Spatalia doerriesi Graeser	P, A, H	P, A, H	P, A, H

Table 1 continuation
Окончание табл. 1

Species	Instar 1	Instar 2	Instars 3–5
Spatalia plusiotis Oberthür	P, A, H	-	-
Spatalia dives Oberthür	P, A, H	P, A, H	P, A, H
Gluphisia crenata (Esper)	P, A, H	P, A, H	P, A, VH
Gonoclostera timoniorum (Bremer)	P, A, H	P, A, H	P, A, H
Pygaera timon (Hübner)	P, A, H	S, A, H	S, A, VH
Clostera albosigma curtuloides (Erschoff)	P, C, L	S, C, L	S, C, L
Clostera pigra (Hufnagel)	P, C, L	S, C, L	S, C, L
Clostera anachoreta (Denis et Schiffermüller)	P, C, L	S, C, L	S, C, L
Clostera anastomosis (Linnaeus)	P, C, L	S, C, L	S, C, L
Micromelalopha troglodyta (Graeser)	P, A, H	P, A, H	P, A, H
Lasiocampidae			
Euthrix potatoria (Linnaeus)	S, C, L	S, C, L	S, C, L
Gastropacha quercifolia (Linnaeus)	S, C, L	S, C, L	S, C, L
Sphingidae			
Agrius convolvuli (Linnaeus)	-	-	S, A, H
Smerinthus planus Walker	-	S, T, H	S, A, H
Erebidae: Lymantrinae			
Teia dubia (Tauscher)	-	-	S, B, L
Arctornis l-nigrum (Müller)	-	S, B, L	S, B, L
Erebidae: Arctiinae			
Rhyparioides amurensis (Bremer)	S, B, L	S, B, L	S, B, L
Chionarctia nivea (Mėnėtriės)	-	S, C, L	S, C, L
Phragmatobia amurensis Seitz	P, B, L	-	S, B, L
Noctuidae			
Calocasia coryli (Linnaeus)	P, B, H	P, B, H	S, B, H

P — primary setae; S — secondary setae; A — simple setae; B — plumose setae; L — long setae; H — short setae; VH — very short setae; PCL — primary setae with mace-shaped bulge in the apical part, T — tre-elike setae; C — hairlike setae.

3. Primary setae in 1st and 2nd instars with small mace-shaped bulge in the apical part (*Stauropus, Cnethodonta, Harpyia*).

4. Numerous secondary setae in all instars (*Harpyia*).

5. Secondary setae long (*Phalera*, *Clostera*).

6. Secondary setae very short (*Harpyia, Stauropus*, *Dicranura*, *Pygaera*). In *Pygaera*, setae become very short in 4–5th instars.

7. Simple setae in all instars (*Euhampsonia, Cerura, Furcula, Fentonia, Drymonia, Notodonta, Peridea, Pheosia, Nerice, Leucodonta, Lophocosma, Ellida, Pheosiopsis, Shaka, Pterostoma, Ptilodon, Lophontosia, Hagapteryx, Togepteryx, Semidonta, Allodonta, Epodonta, Spatalia, Gluphisia, Gonoclostera*, *Micromelalopha*).

8. Plumose setae in all instars (*Phalera*).

9. Sculpture of the setae in all instars with well developed spines rounded apically (*Uropyia*).

10. Setae moderately short in 1st and 2nd instars, becoming smaller and thinner in 3rd to 5th instars (*Euhampsonia, Cerura, Furcula, Fentonia, Drymonia, Notodonta, Peridea, Nerice, Pheosia, Leucodonta, Lophocosma, Ellida, Lophontosia, Hagapteryx, Togepteryx, Semidonta, Epodonta, Spatalia, Gluphisia, Gonoclostera, Pygaera, Micromelalopha*).

11. In all instars, primary and secondary setae very long, many times longer than width of head capsule (*Ptilodon, Hexafrenum, Allodonta*, *Phalera, Clostera*).

12. In all instars, primary and secondary setae very short, poorly visible (*Harpyia, Stauropus, Cnethodonta*, *Dicranura*).

13. In different instars setae are located on chalaza (*Uropyia*, *Pygaera).*

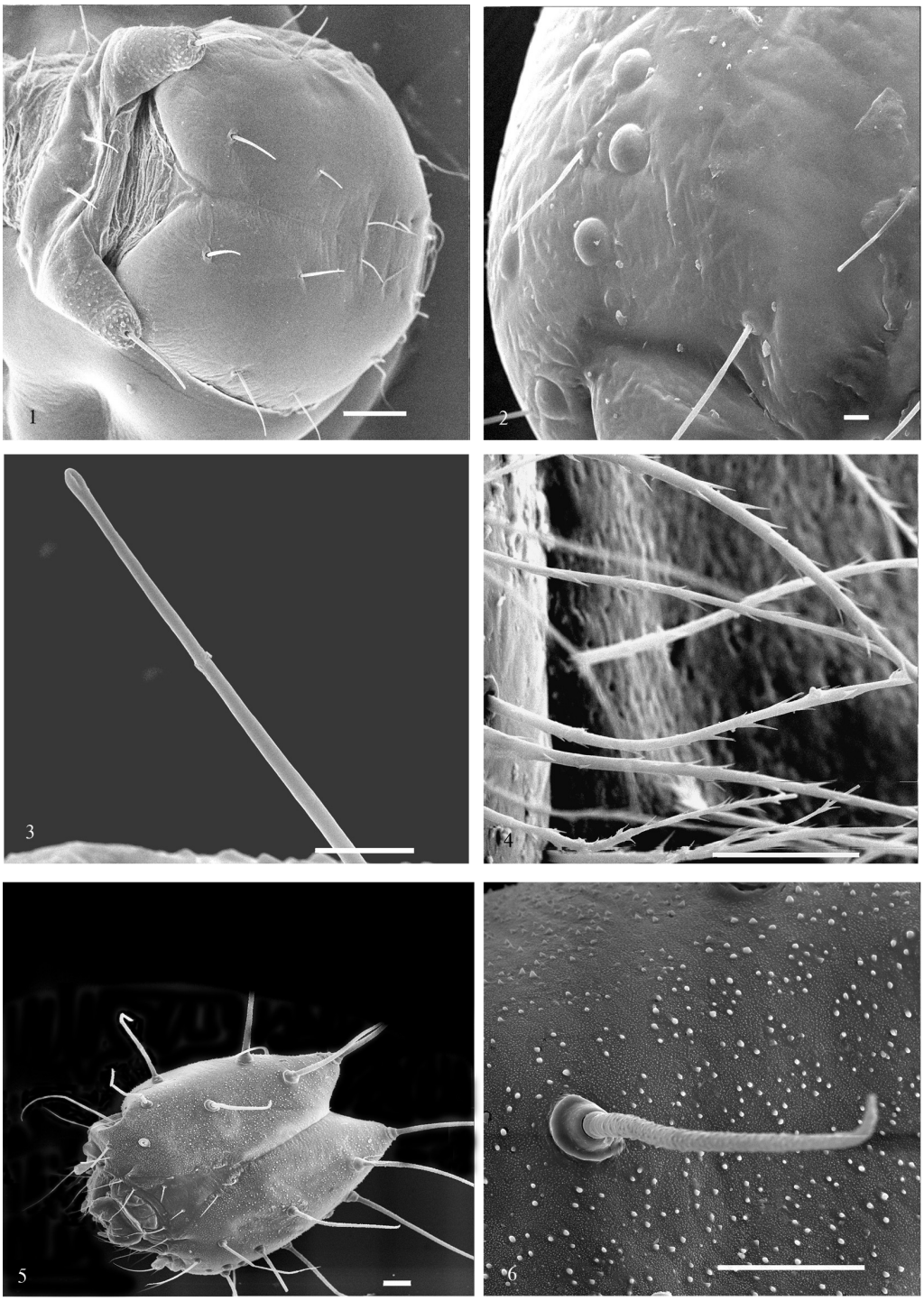

Fig. 1–6. Larval head of Notodontidae: 1 — head capsule of 1st instar *Fentonia ocypete*; 2 — head capsule of 1st instar *Stauropus fagi*; 3 — setae with small mace-shaped bulge of 1st instar *Cnethodonta grisescens*; 4 — plumose setae of 5th instar *Phalera bucephala*; 5 — head capsule of 2nd instar *Uropyia meticulodina*; 6 — cranial seta of 2nd instar *U. meticulodina*. Scale bars: 1, 2, 4, 5, 6 — 100 μ; 3 — 10 μ.

Рис. 1–6. Голова гусениц Notodontidae: 1 — головная капсула 1-го возраста *Fentonia ocypete*; 2 — головная капсула 1-го возраста *Stauropus fagi*; 3 — щетинка с небольшим булавовидным утолщением у гусениц 1-го возраста *Cnethodonta grisescens*; 4 — перистые щетинки у гусениц 5-го возраста *Phalera bucephala*; 5 — головная капсула 2-го возраста *Uropyia meticulodina*; 6 — краниальная щетинка гусениц 2-го возраста *U. meticulodina*. Масштабные линейки: 1, 2, 4, 5, 6 — 100 мкм; 3 — 10 мкм.

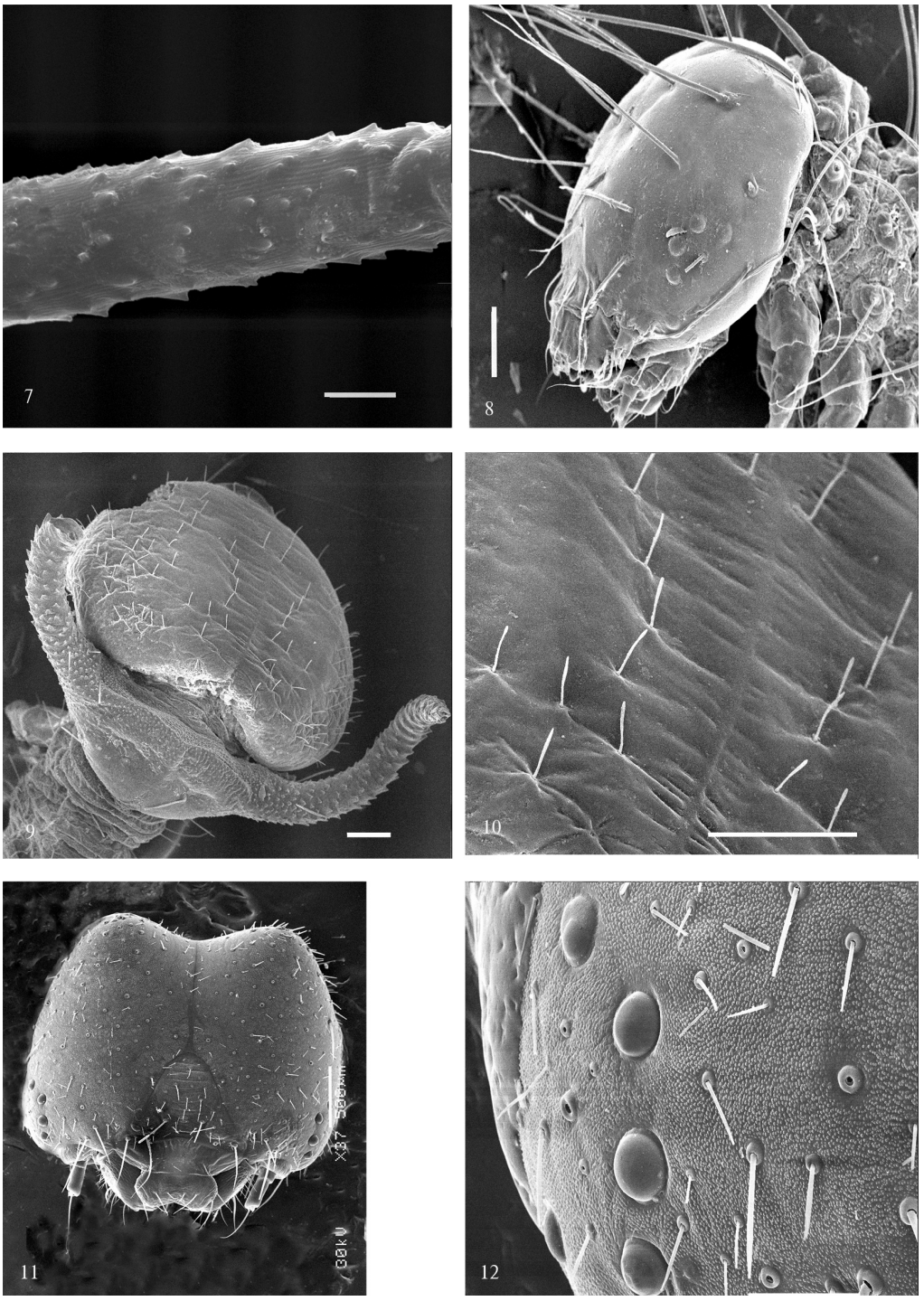

Fig. 7–12. Larval head of Notodontidae: 7 — fragment of seta of 2nd instar *Uropyia meticulodina*; 8 — head capsule of 1st instar *Ptilodon saturate hoegei*; 9 — head capsule of 1st instar *Harpyia umbrosa*; 10 — setae with small mace-shaped bulge of 1st instar *Harpyia umbrosa*; 11 — head capsule of 2nd instar *Dicranura ulmi*; 12 — head capsule of 4th- instar *Dicranura ulmi*. Scale bars: 11 — 1000 μ; 8, 9, 10, 12 — 100 μ; 7 — 10 μ.

Рис. 7–12. Голова гусениц Notodontidae: 7 — фрагмент щетинки 2-го возраста *Uropyia meticulodina*; 8 — головная капсула 1-го возраста *Ptilodon saturate hoegei*; 9 — головная капсула 1-го возраста *Harpyia umbrosa*; 10 — щетинки с небольшим булавовидным утолщением у гусениц 1-го возраста *Harpyia umbrosa*; 11 — головная капсула 2-го возраста *Dicranura ulmi*;12 — головная капсула 4-го возраста *Dicranura ulmi*. Масштабные линейки: 11 — 1000 мкм; 8, 9, 10, 12 — 100 мкм; 7 — 10 мкм.

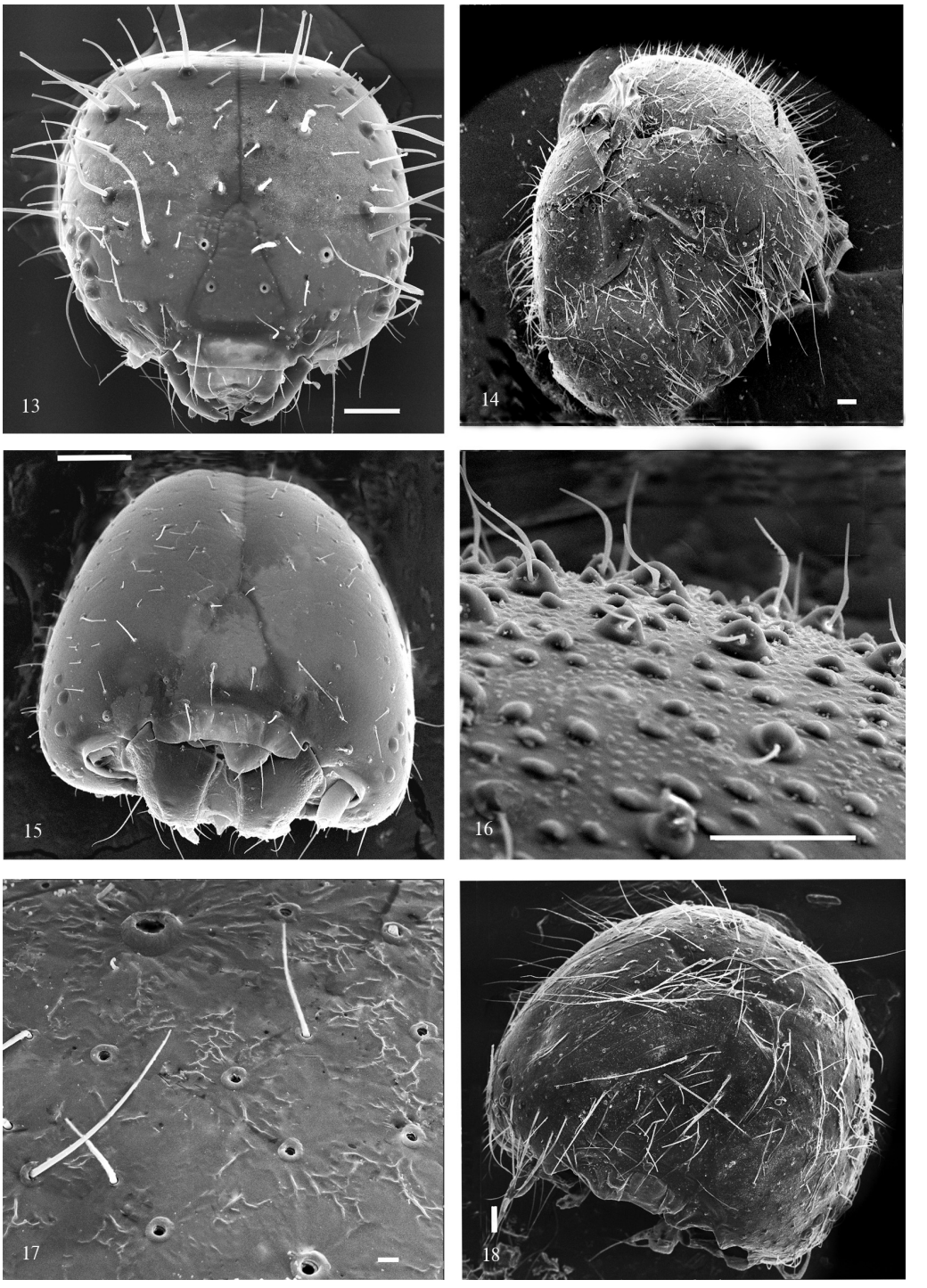

Fig. 13–18. Larval head: 13 — head capsule of 2nd instar *Pygaera timon*; 14 — head capsule of 2nd instar *Clostera anastomosis*; 15 — head capsule of 2nd instar *Stauropus basalis*; 16 — head capsule of 4th- instar *Stauropus fagi*; 17 — pinacula on the setae on the head capsule of 4th- instar *Clostera pigra*; 18 — head capsule of 2nd instar *Euthrix potatoria* (Lasiocampidae). Scale bars: 13, 15, 18 — 100 μ; 14, 16, 17 — 10 μ.

Рис. 13–18. Голова гусениц: 13 — головная капсула 2-го возраста *Pygaera timon*; 14 — головная капсула 2-го возраста *Clostera anastomosis*; 15 — головная капсула 2-го возраста *Stauropus basalis*; 16 — головная капсула 4-го возраста *Stauropus fagi*; 17 — теки щетинок на головной капсуле 4-го возраста *Clostera pigra*; 18 — головная капсула 2-го возраста *Euthrix potatoria* (Lasiocampidae). Масштабные линейки: 13, 15, 18 — 100 мкм; 14, 16, 17 — 10 мкм.

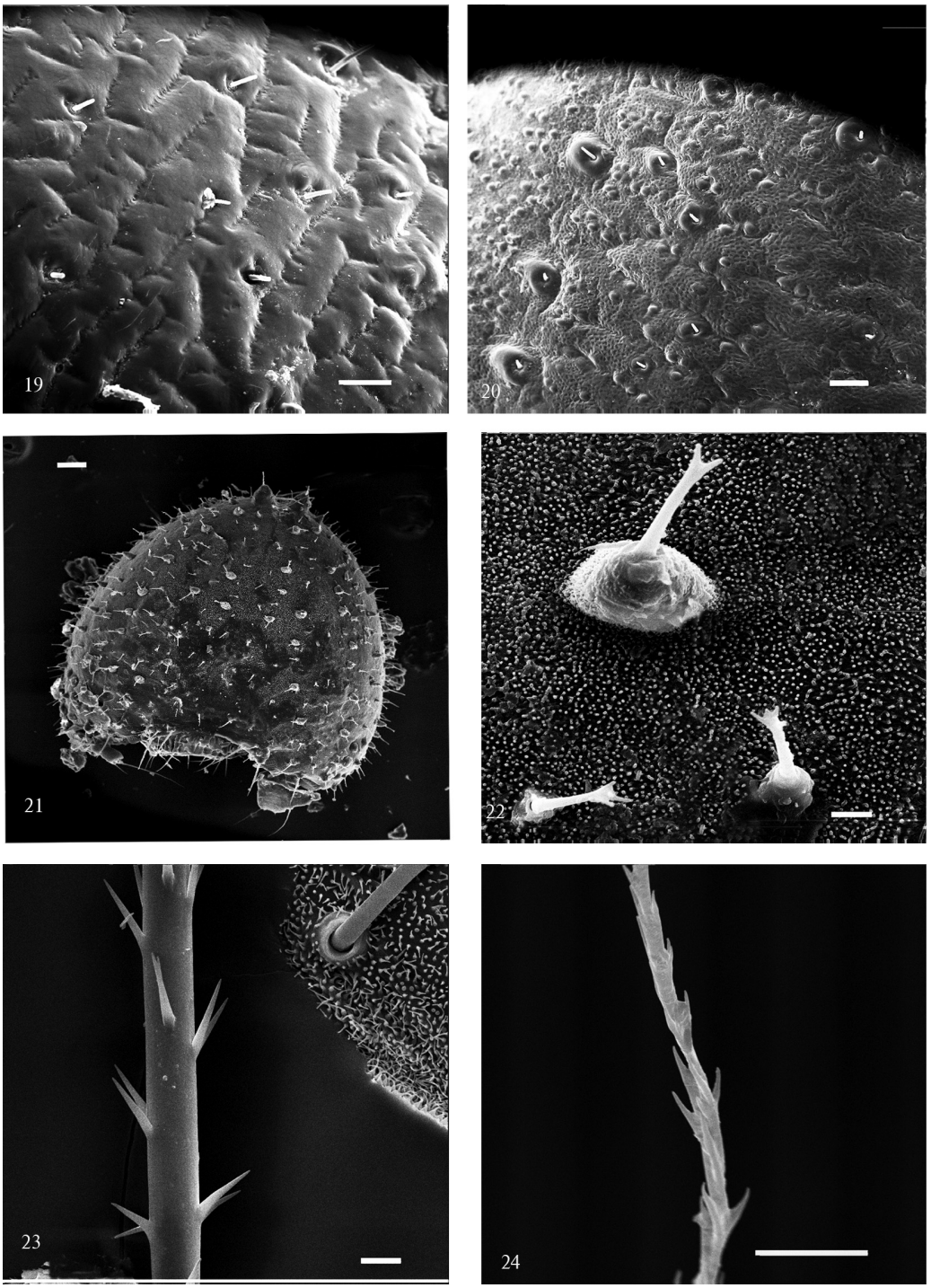

Fig. 19–24. Larval head: 19–22 — Sphingidae; 23–24 — Erebidae: Lymantrinae; 19 — head capsule of 5th instar *Agrius convolvuli*; 20 — head capsule of 5th instar *Smerinthus planus*; 21 — head capsule of 2nd instar *Smerinthus planus*; 22 — setae of 2nd instar *Smerinthus planus*; 23 — plumose setae of 4th instar *Teia dubia*; 24 — plumose setae of 2nd instar *Arctornis l-nigrum*. Scale bars: 19–21 — 100 μ); 22–24 — 10 μ.

Рис. 19–24. Голова гусениц: 19–22 — Sphingidae; 23–24 — Erebidae: Lymantrinae; 19 — головная капсула 5-го возраста *Agrius convolvuli*; 20 — головная капсула 5-го возраста *Smerinthus planus*; 21 — головная капсула 2-го возраста *Smerinthus planus*; 22 — щетинки 2-го возраста *Smerinthus planus*; 23 — перистые щетинки 4-го возраста *Teia dubia*; 24 — перистые щетинки 2-го возраста *Arctornis l-nigrum*. Масштабные линейки: 19–21 — 100 мкм; 22–24 — 10 мкм.

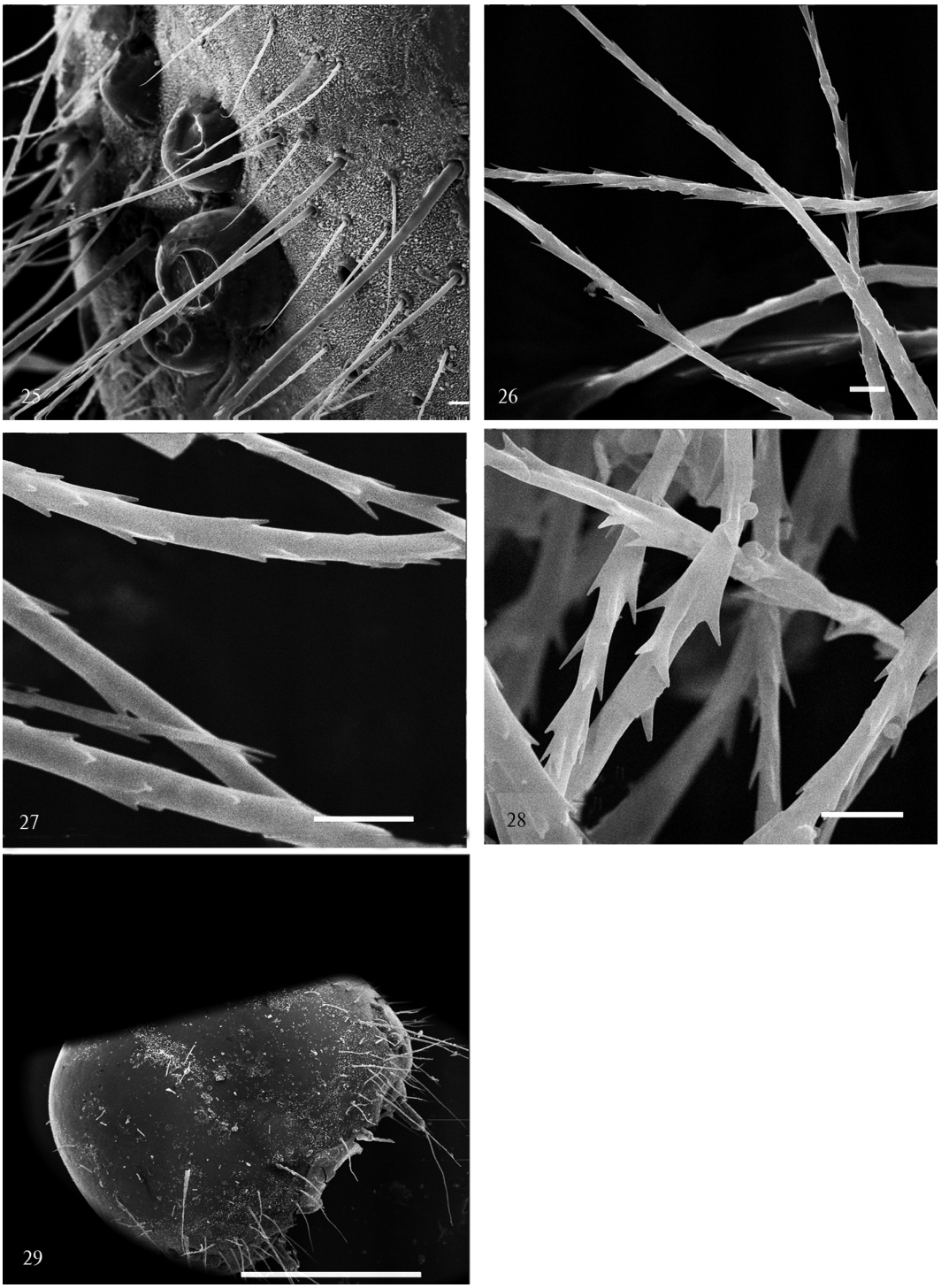

Fig. 25–29. Larval head: 25 — head capsule of 4th instar *Arctornis l-nigrum* (Erebidae: Lymantrinae); 26 — plumose setae of 1st instar *Rhyparioides amurensis* (Erebidae: Arctiinae); 27–29 — *Calocasia coryli* (Noctuidae); 27 — plumose setae of 1st instar; 28 — plumose setae of 2nd instar; 29 — head capsule of 4th instar. Scale bars: 29 — 1000 μ; 25 — 100 μ; 26–28 — 10 μ.

Рис. 25–29. Голова гусениц: 25 — головная капсула 4-го возраста *Arctornis l-nigrum* (Erebidae: Lymantrinae); 26 — перистые щетинки 1-го возраста *Rhyparioides amurensis* (Erebidae: Arctiinae); 27–29 — *Calocasia coryli* (Noctuidae); 27 — перистые щетинки 1-го возраста; 28 — перистые щетинки 2-го возраста; 29 — головная капсула 4-го возраста. Масштабные линейки: 29 — 1000 мкм; 25 — 100 мкм; 26–28 — 10 мкм.

Comparative Morphology of Larval Head Setae in Other Families (table 1)

In Lasiocampidae that were examined, the secondary setae are present in all instars, however in 2nd instar they become more numerous (*Euthrix potatoria*, *Gastropacha quercifolia*). Secondary setae are hairlike and long (fig. 18).

One species of Sphingidae (*Agrius convolvuli*) has the numerous, short and simple secondary setae in 5th instar (fig. 19*)*. Another species (*Smerinthus planus*) has treelike secondary setae in 2nd instar and simple secondary setae in 5th instar (fig. 20–22).

Two species of Erebidae: Lymantriinae (*Teia dubia* — 4th to 5th instars and *Arctornis l-nigrum* — 2nd to 5th instars) have numerous, secondary, plumose, long setae (fig. 23–25).

In examined Erebidae: Arctiinae primary and secondary setae are plumose (*Rhyparioides amurensis, Phragmatobia amurensis*) or hairlike (*Chionarctia nivea*). In *Rhyparioides amurensis* secondary setae there are from 1st instar (fig. 26).

The setae of the examined Erebidae: Noctuidae (*Calocasia coryli*) are primary, plumose and short in 1st and 2nd instars. In 3rd to 5th instarsthere are a few secondary plumose setae (fig. 27–29).

Discussion

The numerous secondary setae are widespread among the lepidopteran caterpillars (Packard, 1895; Kozhanchikov, 1950; Beck, 1960; Merzheevskaya, 1988; Singh, 1991; Danner et al., 1998; Lemaire, Minet, 1999; Kitching, Rawlins, 1999 and others). From this, Packard (1895) and then Miller (1991) consider the presence the secondary setae to be a primitive character of notodontids.

Among all of studied genera of notodontids the numerous secondary setae are typical for six genera — *Clostera, Pygaera, Dicranura, Phalera, Stauropus* and *Harpyia*. In addition, the *Phalera* and *Clostera* have long setae and at the others have short setae.

In general, for many notodontids are typical primary simple setae in all instars. Only the species of some genera have their own peculiarities.

Genera *Harpyia*, *Stauropus* and *Cnethodonta* have the primary setae in 1st and 2nd instars with the mace-shaped bulge. This form of setae is absent in the rest of the notodontids and outgroup species examined. Therefore, such a character is considered derived state in relation to the typical primary simple setae most genera notodontids. Miller (1991) included only these three genera into the tribe Stauropini of the subfamily Heterocampinae. In the same time the presence of numerous secondary setae of *Harpyia* and *Stauropus* and their absence at *Cnethodonta* can be testify as derived states of this character for *Cnethodonta*.

Genus *Phalera* is unique in the family. The plumose setae are found only in this genus. The same setae are found in the outgroup species. Therefore, such a character is considered to be a generalized state in relation to the typical primary simple setae most notodontid genera . In the 2nd to 5th instars *Phalera* have numerous secondary setae and this character is considered generalized state for the genus. These data are also supported by examination of the larval head microsculpture (Dolinskaya, 2011), where the smooth head microsculpture is recorded only in this genus of the Notodontidae, and this state is considered plesiomorphic relative to other states.

There are no disagreements among researchers as to taxonomic composition of the subfamily Pygaerinae. Tikhomirov (1981) and Schintlmeister (2008) included the genera *Clostera, Pygaera*, *Gonoclostera* and *Micromelalopha* in here. The mandibular characters and head sculpture of the caterpillars (Dolinskaya, 2008, 2011) also support this placement. However, the characters of the cranial larval setae show rather puzzle distribution pattern. Of all these genera, the secondary setae appear only in *Clostera* and *Pygaera* L. Species of the genus *Clostera* have long setae, whereas in *Pygaera* the setae are short. As the numerous secondary setae are typical for the outgroup species, we consider this character state to be plesiomorphic for these genera.

Genus *Dicranura* has numerous, simply, short secondary setae. Same setae are typical for *Pygaera*. Our previous studies (Dolinskaya, 2008, 2011) show strong similarity of *Dicranura* to the Pygaerinae and especially with the genus *Pygaera*.

Summarizing these data, I consider the larval cranial setae to provide useful phylogenetic information about relationships within and between genera.

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