

Contribution to the knowledge of pupae of the Western Palaearctic erebids (Lepidoptera: Erebidae: Herminiinae) and noctuids (Lepidoptera: Noctuidae: Acronictinae and Bryophilinae)

Jan PATOČKA¹ & Marek TURČÁNI²

¹*Institute of Forest Ecology, Slovak Academy of Sciences, Štúrova 2, SK-96053 Zvolen, Slovakia;
e-mail: patocka@sav.savzu.sk*

²*Czech University of Life Sciences, Faculty of Forestry and Wood Sciences, Kamýcká 1176, CZ-16521 Praha 6 – Suchbát, Czech Republic; e-mail: turcani@fd.czu.cz*

Abstract: The descriptions of pupae of three Western Palaearctic species of Erebidae (subfamily Herminiinae), namely *Idia calvaria* (Denis et Schiffermüller, 1775), *Pechipogo flavicrinalis* (Andreas, 1910), and *Nodaria nodosalis* (Herrich-Schäffer, 1851), and three species of Noctuidae (subfamilies Acronictinae and Bryophilinae), namely *Oxicesta geographica* (F., 1787), *Simyra dentinosa* (Freyer, 1839), and *Cryphia ochsi* Boursin, 1940 are given. The main morphological features are described, compared with those of the related taxa and also illustrated in 57 line drawings. The systematic status and position of the described species present in the current systems are also discussed from the point of view of morphology of their pupae.

Key words: Lepidoptera; Erebidae; Noctuidae; pupae; comparative morphology; taxonomy

Introduction

The taxonomic position of several Noctuidae and Erebidae taxa is still disputed, therefore certain authors place the same species into different families, subfamilies, tribes or genera, e.g., Beck (2000) vs. Fibiger & Skule (2007), Fibiger & Lafontaine (2005), Fibiger & Hacker (2005). Both named families were previously unified in family Noctuidae (in this paper labeled as Noctuidae s.l.) in Patočka & Turčáni (2005) and we present representatives of both families in this paper. The lepidopteran pupa is the stage of development in which external morphological features are not covered by hairs and/or scales and, thus, it is relatively easy to find characters which may be used for identification but also classification (Patočka & Turčáni 2005).

This paper is a continuation of the previous work of Patočka (1995, 1996) and Patočka & Turčáni (2005). The main aim of this paper is to study the external morphology of pupae and apply results in subsequent analyses concerning with the taxonomic position of species/genera of Erebidae/Noctuidae. Here, we mainly describe species which have not been described in previous papers, or which were described incompletely, due to lack of material and/or publishing possibilities. We also discuss suggestions or recommendations for the experts of the Erebidae/Noctuidae taxonomy who may accept or reject these results in their future taxonomic concepts.

Material and methods

Pupal material was loaned from two large museum collections from the National Museum of Natural History (Naturalis, Leiden, The Netherlands) and the Zoological Museum (ZMA, Amsterdam). Additional material was found and studied in the Hungarian Natural History Museum (HNHM, Budapest, Hungary), the Zoological Museum of the Alexander v. Humboldt University (ZMHB, Berlin) and the Phyletical Museum Jena (PMJ, Jena, Germany); besides the above-mentioned material, additional specimens preserved in the collection of the senior author. The methodology used is the same as described in Patočka (1995) and Patočka & Turčáni (2005).

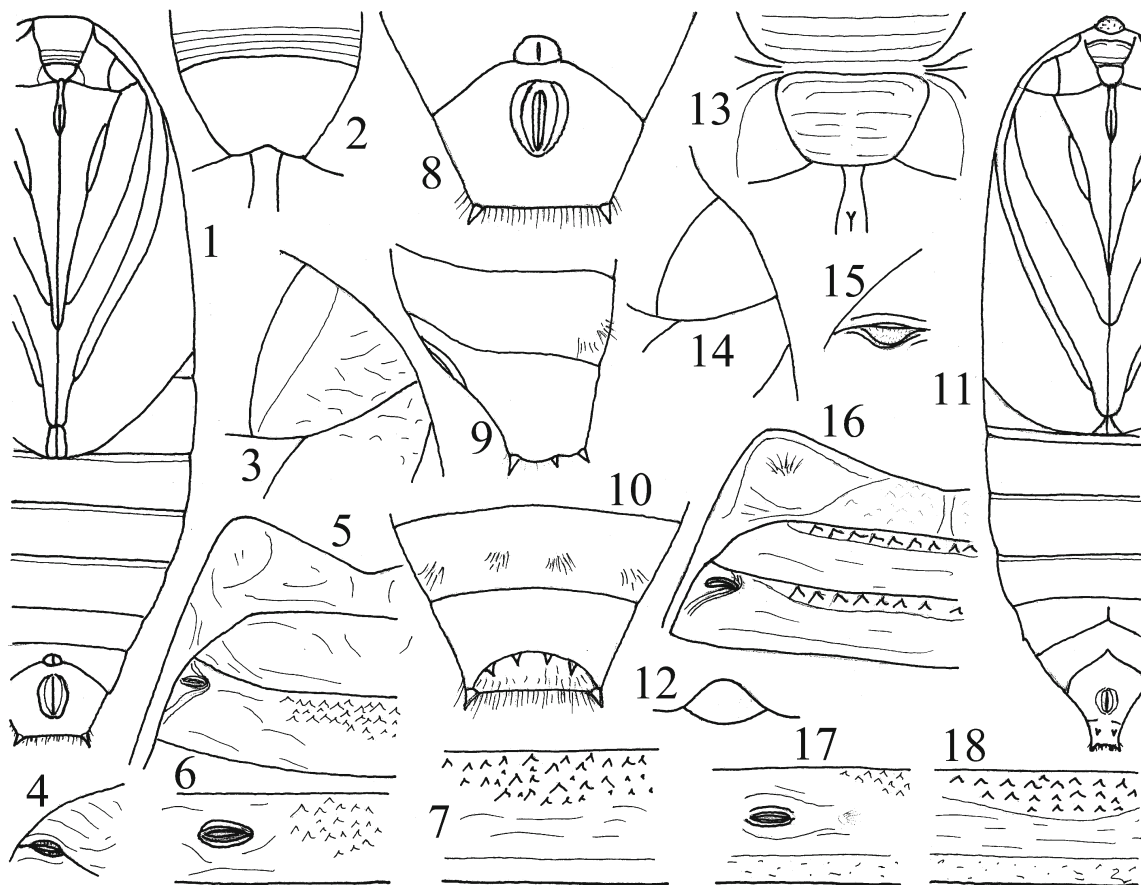
Family Erebidae

Subfamily Herminiinae

Genus *Idia* Hübner, 1813

For identification of this genus use the key to the genera of the family Noctuidae s.l. in Patočka & Turčáni (2005). Hereto we present additional information to the formerly given description of genus *Idia* (see Patočka 1995) according to newly acquired individuals.

Pupae smaller in size, cylindrical, rounded anteriorly and tapered to the end of abdomen (Fig. 31). Sculpture minute. Setae on body inconspicuous, obtuse at the end (Fig. 36). Labrum wide, not convergent, rounded posteriorly and slightly cut out at the centre (Fig. 33). Labium big, with labial palpi (Fig. 31).



Figs 1–18. 1–10: *Oxicesta geographica*; 11–18: *Simyra dentinosa*. Figs 1, 11 – pupa ventrally; 2, 13 – labrum and vicinity; 3, 14 – oculus and vicinity; 4, 15 – thoracic spiracle and vicinity; 5, 16 – metanotum, base of abdomen, left side; 6, 17 – spiracle on the 5th abdominal segment and vicinity; 7, 18 – the 5th abdominal segment, dorsally; 8 – end of abdomen, ventrally; 9 – ditto, laterally; 10 – ditto, dorsally; 12 – tubercle on front.

(note: this is the only Herminiinae genus studied by us having visible labial palpi). Prothoracic legs medium in length, mesothoracic legs and proboscis at same level, extending conspicuously antennae, metathoracic legs concealed (Fig. 31). Prothoracic legs obviously merge to genae, mesothoracic legs to oculi (Fig. 32). Metanotum deeply cut-out with pointed frontal projections (Fig. 35). Anal field elevated in lateral view (Fig. 38). Cremaster medium in length, tapering, with reticular-ribbed sculpture and with four pairs of slender, hooked setae, D2 setae being stronger and much longer than the other ones (Figs 37–39).

The genus *Idia* is represented by one species in Europe which is distributed widely in Central Europe.

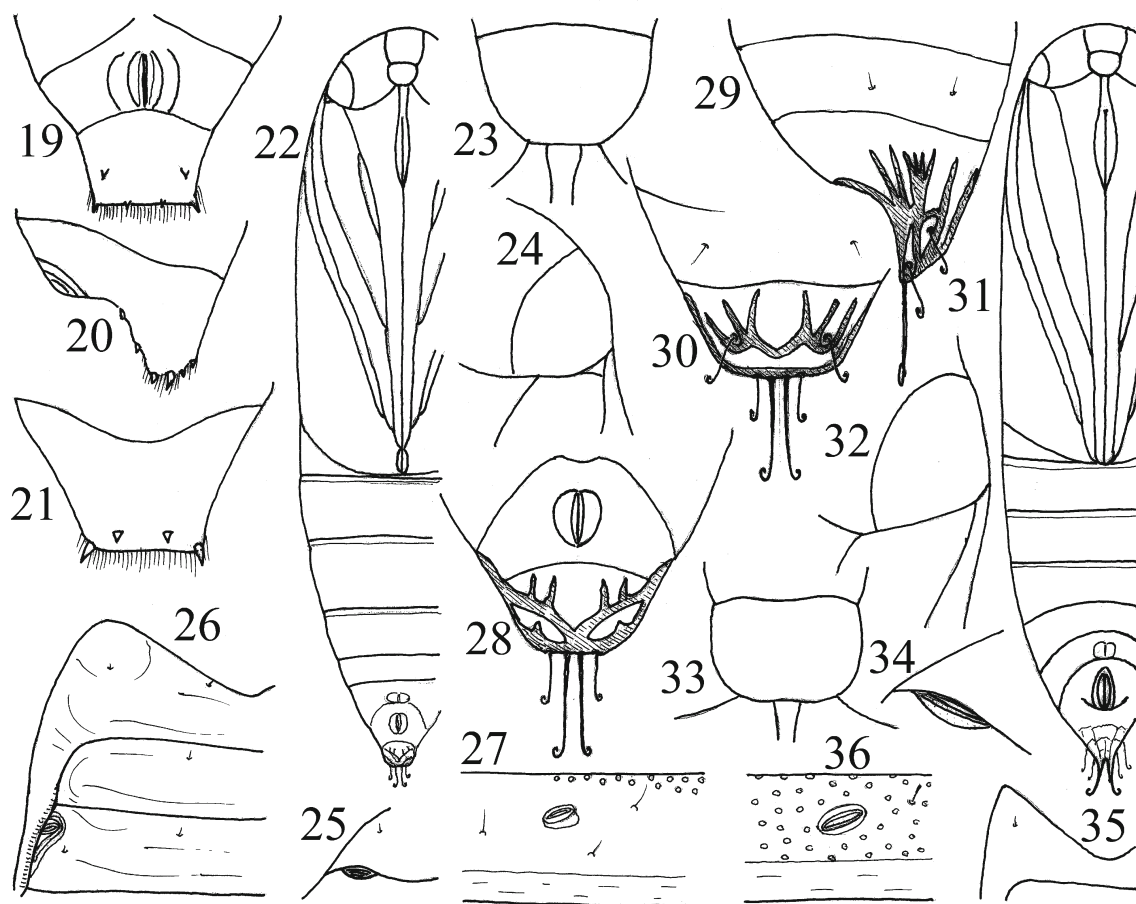
Idia calvaria (Denis et Schiffermüller, 1775)

(Figs 31–39)

Pupa: 12–13 × 3.9–4.1 mm, brown, sculpture rather fine. Base of labrum transversely furrowed. Abdominal segments 5–7 with shallow, medium large puncturation. Colour dark brown, exuvia brighter. Labrum relatively long and wide with slightly domed and not tapering sides, caudal corners rounded and slightly cut out at the centre. Labium tapered behind its base, then inflated, rather long, labial palpi present. Prothoracic legs and antennae pointed. Prothoracic femora concealed. Genae

join to mesothoracic legs at approximately the same distance as mesothoracic legs to oculi. Proboscis and mesothoracic legs reach to the ends of forewings, ends of metathoracic legs concealed. Pronotum domed caudally and rounded widely. Thoracic spiracle long, slit-like, its edges dark and elevated, caudal margin indented. Metanotum deeply cut out in almost 90° angle, slightly rounded at the tip of angle. Its anterior lobes acute-angular and almost pointed. Abdominal spiracles narrow, skewed in elliptical courts. Anal area large and strongly elevated to the end in lateral view. Cremaster tapering with slightly domed sides, almost pointed in ventral, dorsal and lateral views, bearing sparse reticular-ribbed dark-brown sculpture on whole dorsal side, and on ventral side except of base. Setae D1 situated close to base of cremaster, Sd1 located approximately at the middle of its length, L1 close to the tip and to D2. All mentioned setae are approximately the same in size, slender and hooked at the ends, only D2 stronger and approximately by 1/3 longer than other ones, sitting close to each other at the end of cremaster. They diverge only slightly and are hooked prior the ends

Material examined: 1 male (coll. PMJ, Jena), 1 male from Slovakia.



Figs 19–36. 19–21: *Simyra dentinosa*; 22–30: *Cryphia ochsi*; 31–36: *Idia calvaria*. Figs 19, 28 – end of abdomen, ventrally; 20, 29 – ditto, laterally; 21, 30 – ditto, dorsally; 22, 31 – pupa ventrally; 23, 33 – labrum and vicinity; 24, 32 – oculus and vicinity; 25, 34 – thoracic spiracle and vicinity; 26, 35 – metanotum, base of abdomen, left side; 27, 36 – spiracle on the 5th abdominal segment and vicinity.

Genus *Pechipogo* Hübner, 1825

The pupa of this genus is described by Patočka (1995). According Fibiger & Skule (2007), the Central European species *P. strigilata* (L., 1758) belongs not to this genus but to *Polypogon* Schrank, 1802. The pupa of *Polypogon strigilata* differs from *Pechipogo flavicrinalis* by the conspicuous border between genae and prothoracic legs, finer sculpture on dorsal side of cremaster and by the longer cremaster (considering the length of its setae D2, which are not longer than cremaster itself).

The genus *Pechipogo* comprises two South European species. We investigated one of them, the recognised generic features are as follows:

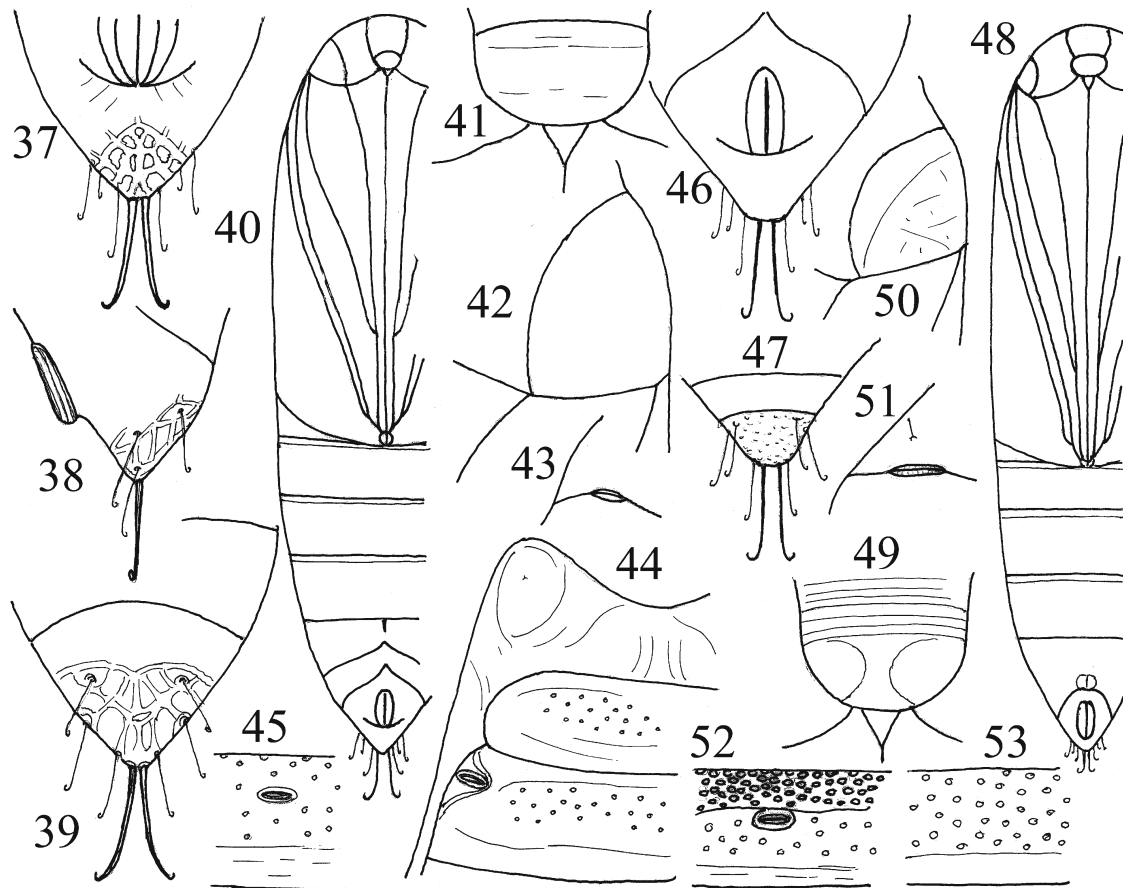
Pupae medium-sized, cylindrical, rounded anteriorly, and pointed caudally. Palpi labiales and prothoracic legs concealed (Fig. 40). Border of genae and mesothoracic legs almost point-like; mesothoracic legs join to oculi, however, shortly (Fig. 42). Cremaster shorter than wide at base (Fig. 46). Border of abdominal segment 10 and cremaster bears little teeth-like structure (Fig. 47). Cremaster almost smooth on ventral side (Fig. 46), rasp-like scabrous on dorsal surface (Fig. 47). All setae of cremaster slender, hooked, D2 approximately twice as long as other setae and significantly extend over the length of cremaster; se-

tae Sd1 and D1 shifted to base of cremaster (Figs 46, 47).

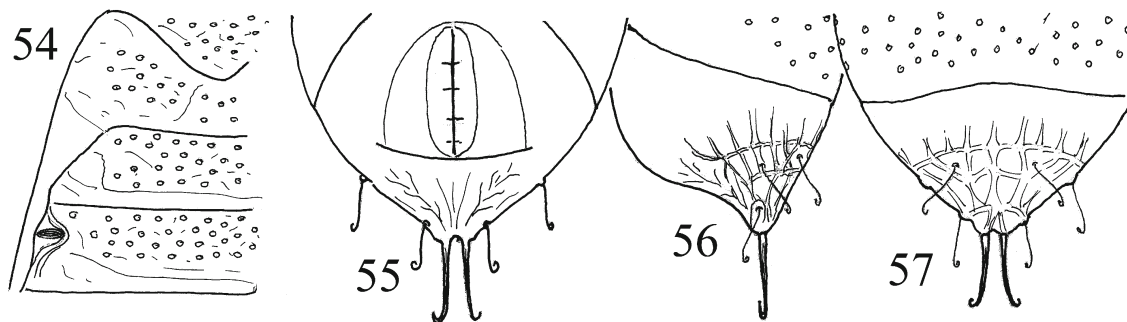
Pechipogo flavicrinalis (Andreas, 1910) ssp. *gigantea* (Turati, 1911) (Figs 40–47)

Pupa yellow-brown with dark sutures, incisions, frames of spiracles, some structures on dorsal side of end of body and setae D2 on cremaster. Sculpture fine, locally scabrous, wrinkled. Punctuation present on abdominal segments 1–7, more robust in basal part of segments 5–7. Labrum rounded posteriorly, labium triangular and rather big. Genae join to prothoracic legs very shortly or at point, mesothoracic legs join to oculi shortly and obliquely. Prothoracic legs medium in length, mesothoracic legs slightly shorter than proboscis, touching small ends of metathoracic legs. Antennae slightly shorter than mesothoracic legs. Thoracic spiracles slit-like. Metanotum with medium deep cut-out, this cut-out more strongly rounded at middle; frontal projections rounded. Setae D2 on cremaster situated close to each other, L2 situated close to them. D1 and Sd1 situated close to each other by the base of cremaster.

P. flavicrinalis is distributed in Spain, the insular subspecies ssp. *gigantea* on Sardinia.



Figs 37–53. 37–39: *Idia calvaria*; 40–47: *Pechipogo flavicrinalis* ssp. *gigantean*; 48–53: *Nodaria nodosalis*. Figs 37, 46 – end of abdomen, ventrally; 38 – ditto, laterally; 39, 47 – ditto, dorsally; 40, 48 – pupa ventrally; 41, 49 – labrum and vicinity; 42, 50 – oculus and vicinity; 43, 51 – thoracic spiracle and vicinity; 44 – metanotum, base of abdomen, left side; 45, 52 – spiracle on the 5th abdominal segment and vicinity; 53 – the 5th abdominal segment, dorsally.



Figs 54–57. *Nodaria nodosalis*. Fig. 54 – metanotum, base of abdomen, left side; 55 – end of abdomen, ventrally; 56 – ditto, laterally; 57 – ditto, dorsally.

Material examined: 1 female, Sardinia (col. Naturalis, Leiden).

Genus *Nodaria* Guenée, 1854

The morphological structures of the pupae of *Nodaria* refer to couplet 4 and to genus *Simplicia* Guenée, 1854 when using the key to the genera of the family Noctuidae s.l. in Patočka & Turčáni (2005) for identification. Genus *Nodaria* differs from this genus mainly by its rounded, not angular labrum, the basally equally long and wide labium (Fig. 49; it is much longer than wide

at base in *Simplicia*), and by the shorter seta D2 on cremaster, which is approximately two times longer than L1 (this ratio is approximately 3 : 1 in *Simplicia*). The cremaster is much shorter and wider than that of the genus *Simplicia* (Figs 55–57).

Pupae medium large, cylinder-like, relatively slender, rounded anteriorly, tapered caudally (Fig. 48). Sculpture medium fine, locally medium scabrous on notum and with punctuation on abdominal segments 1–9 (Figs 52–54). Labrum relatively big, rounded (semi-circular), labium approximately as long as wide at its

base, palpi labiales concealed (Fig. 49), prothoracic femora concealed (Fig. 48). Proboscis joins ends of metathoracic legs and slightly extends mesothoracic legs, these ones slightly extend antennae (Fig. 48). Cremaster much shorter than the width at base, tapering towards tip, with less conspicuous oblique and reticular ribbing. Segment 10 merges cremaster rather abruptly on ventral side. Cremaster with hooked setae. Seta D2 approximately 2x longer and conspicuously more robust as other ones. Sd1 and D1 sit in basal quarter of cremaster far from each other, L1 closer to L2 (Figs 55–57).

A large, mainly subtropical-tropical genus with a single European species which is distributed in the Mediterranean region.

***Nodaria nodosalis* (Herrich-Schäffer, 1851)** (Figs 48–57)

Pupa: dark red-brown, exuvia slightly brighter. Sutures, incisions, frames of spiracles, ribbing on segment 10, cremaster and its setae darker. Shine weak. Sculpture medium scabrous, finer on ventral side. Puncturation on notum and abdominal segment 1–9 rather big, shallow, and denser close to base of medium abdominal segments. Labrum rounded, labium big and triangular. Genae join to prothoracic legs at rather long distance, shortly to mesothoracic legs and obliquely to oculi. Thoracic spiracle slit-like with elevated and furrowed margins. Metanotum relatively deeply cut out in semi-circle shape, frontal projections wide and rounded. Abdominal segment 10 sparsely, longitudinally ribbed from the half of its length. Cremaster short and wide at base, with oblique sides, sparsely reticularly ribbed everywhere. Strong setae D2 sit close to each other, parallel and hook-like bent from each other at the end.

N. nodosalis is distributed in Southern Europe.

Material examined: 1 male (coll. ZMHB, Berlin).

Family Noctuidae

Subfamily Acronictinae

Genus *Oxicesta* Hübner, 1819

For identification of the genus *Oxicesta* use the key to the genera of the family Noctuidae s.l. in Patočka & Turčáni (2005). The formal, detailed description has not been published yet, therefore it is presented here. Pupae stout and obtusely tapered anteriorly and posteriorly (Fig. 1). Dorsal side of central abdominal segments with scabrous rasp-like sculpture (Fig. 7). Abdominal segments 8–9 bearing more conspicuous groups of secondary setae (Figs 9, 10). Labrum cut-out at the end (Fig. 2). Proboscis extends prothoracic legs, not reaching level of antennae. Antennae visibly shorter than mesothoracic legs, which join ends of metathoracic legs. Labium and prothoracic femora visible (Fig. 1). Cremaster short, wide also in lateral view, slightly differentiated since segment 10. Transition from segment 10 to the base of cremaster slightly steep on ventral side.

End of cremaster with sharp teeth on dorsal and lateral sides and numerous short and straight setae, which are medium in length (Figs 8–10).

The genus *Oxicesta* is represented by three species in Europe, one of which occurs in Central Europe.

***Oxicesta geographica* (F., 1787)** (Figs 1–10)

Pupa: 11–13 × 4.5–5.0 mm, stout, slightly spindle-like, rounded anteriorly, cut posteriorly, reddish black-brown, exuvia brighter. Sculpture medium scabrous to scabrous, wrinkled irregularly and furrowed, ends of central abdominal segments relatively smooth. Base of central segments has scabrous rasp-like to listel-like sculpture on dorsal side. Secondary setae more conspicuous on segments 8–9. Clypeus furrowed, labrum strongly tapered and cut out posteriorly. Labium and prothoracic femora medium in length and relatively wide. Proboscis short but extends prothoracic legs, joining oculi at longer distance. Antennae significantly shorter than mesothoracic legs which join to relatively long ends of metathoracic legs. Pronotum very long in centre, mesonotum cut out anteriorly. Thoracic spiracles slit-like. Metanotum medium shallow, obtusangular cut out; its frontal projections rounded. Abdominal spiracles narrow and irregularly elliptical. Cremaster short and wide, little tapered ventrally and dorsally, without remarkable sculpture; with 1 sharp tooth laterally and 4 teeth dorsally; covered by medium long and dark secondary setae in caudal part. Cocoon of pupa formed by silk and secretion, and it is dense, medium stiff, brown-grey.

O. geographica is distributed in South-eastern Europe and on extreme South-eastern of Central Europe, occurring in steppe habitats.

Material examined: 5 males, 5 females, from Slovakia and Hungary.

Genus *Simyra* (Ochsenheimer, 1816)

The pupal morphology of the genus is described in Patočka (1996). From its three European species, two occur in Central Europe.

***Simyra dentinosa* (Freyer, 1839)** (Figs 11–21)

This species is rather similar to the Central European *S. nervosa* (Denis & Schiffermüller, 1775), differs from it by the presence of the central frontal tubercle (Figs 11, 12), the less tapered and more rounded labrum (Fig. 13) and the shorter proboscis which does not extend beyond the ends of prothoracic legs (Fig. 11). The comparatively larger differences between *S. dentinosa* and *S. albovenosa* (Goeze, 1781) are described in Patočka & Turčáni (2005).

Pupa: 16–18 × 4.9–6.1 mm, stout, bearing strong and rounded tubercle on front. Colour brownish black, sutures partially red. Sculpture medium scabrous, locally scabrous, transversally wrinkled at majority. Sculpture rasp-like scabrous in centre of metanotum and on base of abdominal segments 1–7, smoother

in caudal part of segments 1–3 and also on last segments. Segment 8 with lateral tubercle at the position of spiracle. Metanotum and abdomen with groups of minute secondary setae. Clypeus and labrum strongly, transversally wrinkled; labrum trapezoidal and slightly tapered with rounded caudal corners. Labium and prothoracic femora rather big. Proboscis short, far not reaching area of prothoracic legs, and joins oculi. Prothoracic legs join antennae rather shortly. Ends of metathoracic legs conspicuous, touching mesothoracic legs. Thoracic spiracle slit-like, oblong, tomentose tubercle sits behind it. Metanotum medium slightly cut out with longitudinal furrow in centre. Abdominal spiracles irregular and narrow elliptical with robust frame and narrow slit. Abdominal segment 10 merges base of cremaster steeply on ventral side. Cremaster wide with slightly convergent sides and cut at the end in ventral and dorsal view, and more convergent and skewed on dorsal side in lateral view. Its sculpture slightly conspicuous, bearing sharp teeth on caudal corners, behind the half of its length on ventral side and prior the end of length on dorsal side. Tip of cremaster covered by numerous rather short, stiff (bristle-like) and dark yellow-brown setae unequal in length.

Larva feeds on *Tithymalus* spp. This species is distributed in the Balkans, Eastern Europe, Asia Minor and locally in central Asia.

Material examined: 2 males, 2 females, from Turkey and Kazakhstan.

Subfamily Bryophilinae

Genus *Cryphia* Hübner, 1818

The main features of the pupae of the genus are described in Patočka (1996). There are about a dozen of species known in Central Europe since more than 30 taxa occur in Europe.

Cryphia ochsi Boursin, 1940 (Figs 22–30)

For identification of the pupae of *C. ochsi* use the key to the species of the genus *Cryphia* in Patočka & Turčáni (2005) and refer to the couplet 1:

- 1 Setae D2 on cremaster very long, longer than cremaster itself, setae L1 shorter, both bristle-like, setae D1 and Sd1 absent *C. raptricula* (Denis et Schiffermüller, 1775)
 *C. raptricula* (Denis et Schiffermüller, 1775)
 – Setae D2 on cremaster as long as cremaster, setae D1 and L1 present, much shorter, terminal parts of all setae rolled in spiral-like shape (Figs 28–30) .. *C. ochsi*
 – Cremaster with 4 pairs of setae: D2, D1, L1 and Sd1, all bristle-like or spine-like, not rolled at the end 2

Pupa: 9 × 2.5 mm, medium slender, roundly anteriorly, tapered caudally and obtuse at the end. Colour brown; exuvia yellow-brown, ribs on cremaster black. Sculpture fine, slightly wrinkled. Base of abdominal segments 5–7 with tiny punctuation. Setae small, visible also on abdominal segment 9. Labrum rounded caudally, almost semi-circular. Labium rather wide,

prothoracic femora narrow. Proboscis joins rather big ends of metathoracic legs. Mesothoracic legs slightly shorter than proboscis, antennae shorter than mesothoracic legs. Proboscis shortly joins to oculi as well as oculi to mesothoracic legs. Border of oculi and prothoracic leg Y-like at dorsal end. Thoracic spiraculum slit-like; its margins enlarged and dark. Frontal projections of metanotum rounded. Abdominal spiracles little elevated, skewed and narrowly elliptical. Segment 10 steeply merges cremaster on ventral side. Cremaster short with medium tapered sides and obtuse at the end in ventral and dorsal side. It is narrow in lateral view and obliquely cut at the end on dorsal side. Cremaster ribbed longitudinally at base, and rather transverse and sparsely reticular ribbed at the end. Setae D2 long, D1 and L1 much shorter, terminal parts of all setae spiral-like rolled.

C. ochsi is distributed in the entire Mediterranean region; it is recorded only from Switzerland in Central Europe.

Material examined: 1 male from Croatia.

Discussion

We would like to stress that we are aware that it is not possible to classify some insect group only on the basis of pupal morphology and with using species from one geographical region. We only offer suggestions and provide recommendations for taxonomists to consider pupal morphology in the future placement of the species described in this paper.

Subfamily Herminiinae is classified by majority of authors (Beck 2000; Leraut 1997; Berio 1991; Novacki & Fibiger 1996; Fibiger & Skule 2007) to family Noctuidae s.l. However, Fibiger & Hacker (2005), Fibiger & Lafontaine (2005) and Kravchenko et al. (2007) classify it with majority of quadrifin subfamilies to separate family Erebiidae. Certain authors (e.g., Berio 1991; Huemer & Tarmann 1993) considered only subfamily Herminiinae as a separate family Herminiidae of superfamily Noctuoidea. These concepts are relatively well acceptable from the point of pupal morphology. However, there are some exceptions, e.g., the here described *Idia calvaria*, which has visible labial palpi and is more similar to species of subfamily Hypeninae from the point of pupal morphology. In contrast, the species *Trisateles emortualis* (Denis et Schiffermüller, 1775) is similar to species of subfamily Herminiinae by morphology of head, but cremaster resembles rather some of Catocalinae (see Patočka 1995). Its current position in subfamily Eublemminae (in sense of Fibiger & Skule, 2007) is less acceptable from the point of pupae morphology. Beck (2000) listed this species in a specific tribe of subfamily Rivulinae, what would be a more acceptable position. In contrast, the species *Drasteria cailino* (Lefebvre, 1827), from subfamily Catocalinae, has labial palpi concealed; however, additional pupal characters resemble the subfamily Catocalinae.

Pupae of subfamily Herminiinae have some characters which resemble the family Geometridae. They are slender, labium is usually triangular and not concealed, but they have concealed labial palpi. Their oculi are separated at majority from, or merge proboscis only at point, as in family Geometridae. The rest of Noctuidae s.l. have, except for several species, labial palpi visible and their oculi merge proboscis at longer distance. Also shape of cremaster resembles the pupae of many Geometridae with cremaster adapted to fixing function mainly (wedge-like and with full number of hooked fixing setae, adapted to life into softer cocoon on ground or in litter). Pupae of this subfamily of Erebidae differ from pupae of Geometridae mainly by the fact that their mesothoracic legs merge to oculi; in Geometridae they are always separated from oculi.

Subfamily Acronictinae is rather heterogeneous from the point of pupal morphology, although pupae have typical stout shape and secondary setae are present at majority. There are some exceptions, e.g., the genus *Craniophora* Snellen, 1867 does not match these criteria very well. Beck (2000) established a separate tribe within the subfamily Acronictinae for *Craniophora*, and we agree with this concept from the point of pupal morphology. Mainly, genus *Acronicta* is heterogeneous in the system according to Nowacki & Fibiger (1996) and Fibiger & Skule (2007). Leraut (1997) and also Beck (2000) and several earlier authors separated group *Viminia* Chapman, 1890 from genus *Acronicta* Ochsenheimer, 1816, which was moreover (e.g., by Kozhanchikov, 1950; Beck, 2000) separated to additional genera.

From the point of pupal morphology, group *Viminia* is much more similar to genera *Simyra* or *Oxicesta* (and even more also to genus *Sedina* Urbahn, 1933, which is actually placed into the subfamily Hadeninae, tribe Apameini!) than to genus *Acronicta* and thus its position from the point of pupal morphology is better in the system of Beck (2000). *Simyra dentinosa*, which we describe here, is listed by Beck (2000) in the specific genus *Parasimyra* Beck, 1996. Its pupa differs from genus *Simyra* (in narrower sense) less, however, and significantly also from genus *Arsilonche* Lederer, 1857 in sense of Beck (2000), and from pupa of *Oxicesta geographica*. From the point of pupal morphology, it may be more correct to speak only about subgenus *Parasymira* inside of genus *Symira*. Kozhanchikov (1950) listed the subfamily Acronictinae to family Orgyidae (presently Lymantriidae), what can not be accepted from the point of pupal morphology and this concept has never been adopted. Pupae of subfamily Bryophilinae significantly differ from pupae of family Acronictinae. Separation of these two large clades (which were listed in older literature together as Acronictinae) at subfamily level is fully acceptable from the point of pupal morphology and is accepted by all present authors. Here, the described pupa of *Cryphia ochsi* differs significantly from other species studied (compare Patočka & Turčáni 2005). Only a few species of this subfamily have been inspected by us and

thus it is difficult to discuss final taxonomy position of *C. ochsi*.

Acknowledgements

The authors are grateful to the National Museum of Natural History in Leiden, the Zoological Museum in Amsterdam, the Hungarian Natural History Museum Budapest, the Zoological Museum of the Alexander v. Humboldt University, Berlin and the Phyletical Museum Jena (Germany) for loan of study material of Lepidoptera pupae and in particular thank our colleagues from these museums (namely to E. van Nieukerken, W. Hogenes, L. Ronkay, L. Peregovics, A. Kuhn and W. Mey), who helped in preparation of materials and provided support for our visitations. This research received support from the SYNTHESIS Project <http://www.synthesis.info/> which is financed by European Community Research Infrastructure Action under the FP6 "Structuring the European Research Area" Programme. The senior author thanks to V. Červenka (Prague), J. Kulfan (Zvolen), K. Spitzer (České Budějovice) and L. Traxler (Pardubice) for material of pupal exuviae of several species described in the paper. We also thank M. Honey who provided editorial support and the reviewers for their comments and suggestions. The senior author worked on the paper with partial support of VEGA (Nos 2/6007/6 and 2/5152/25). This research was supported by project of the Ministry of Agriculture of the Czech Republic QH 71094 "The use of dendrochronology for reconstruction of fluctuation cycles of nun moth and gypsy moth in Central Europe".

References

- Beck H. 2000. Die Larven der europäischen Noctuidae. Vol. III. Farbabbildband. Herbiopoliana, Buchreihe zur Lepidopterologie, Herausgeber Dr. Ulf Eitschberger, Marktleuthen, 335 pp., 99 plates.
- Berio E. 1991. Fauna d'Italia, Vol. XXVII. Lepidoptera Noctuidae. II. Sezione Quadrifide. Calderini, Bologna, 708 pp., 16 plates.
- Fibiger M. & Hacker H.H. 2005. Systematic list of the Noctuoidea of Europe (Notodontidae, Nolidae, Arctiidae, Lymantriidae, Erebidae, Micronoctuidae, and Noctuidae). Esperiana, Buchreihe zur Entomologie, Bd. 11, pp. 93–184.
- Fibiger M. & Lafontaine J.D. 2005. A review of the higher classification of the Noctuoidea (Lepidoptera) with special reference to the Holarctic fauna. Esperiana, Buchreihe zur Entomologie, Bd. 11, pp. 7–82.
- Fibiger M. & Skule B. 2007. Fauna Europaea: Noctuidae. In: Karsholt O. & Nieukerken E.J. van (eds), Fauna Europaea: Lepidoptera, Moths, Fauna Europaea version 1.3, <http://www.faunaeur.org> (accessed 30.12.2007)
- Huemer P. & Tarmann G. 1993. Die Schmetterlinge Österreichs (Lepidoptera): Systematisches Verzeichnis mit Verbreitungangaben für die einzelnen Bundesländer. Tiroler Landesmuseum Ferdinandeum, Innsbruck, 224 pp.
- Kozhanchikov I.V. 1950. Lepidoptera, Orgyiidae. Fauna SSSR. Publishing House of the Academy of Sciences of SSSR, Moskva, Leningrad (St. Petersburg), 581 pp.
- Kravchenko D., Fibiger M., Hausmann A. & Müller G.C. 2007. The Lepidoptera of Israel, Vol. 1, Erebidae. Pensoft, Sofia-Moscow, 167 pp.
- Leraut P. 1997. Liste systématique et synonymique des Lépidoptères de France, Belgique et Corse. 2nd ed. Alexanor, Supplément, 556 pp.
- Nowacki J. & Fibiger M. 1996. Family Noctuidae, pp. 251–293. In: Karsholt O. & Razowski J. (eds), The Lepidoptera of Europe, A distributional checklist, Apollo Books, Stenstrup.

- Patočka J. 1995. Die Puppen der mitteleuropäischen Eulen: Unterfamilien Herminiinae, Rivulinae, Hypeninae und Catocalinae (Lepidoptera, Noctuidae). *Entomofauna, Zeitschrift für Entomologie* **16** (15): 317–368.
- Patočka J. 1996. Die Puppen der mitteleuropäischen Eulen. Unterfamilien Euteliinae, Nolinae, Sarrothripinae, Chloephorinae, Pantheinae, Dilobinae und Acronictinae (Lepidoptera, Noctuidae). *Entomofauna, Zeitschrift für Entomologie* **17** (3): 37–72.
- Patočka J. & Turčáni M. 2005. *Lepidoptera Pupae, Central European Species*. Apollo Books, Stenstrup, Text volume 542 pp., Plate volume 321 pp.

Received September 9, 2007

Accepted October 10, 2008