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## **Uncus as an useful auxiliary device for the determination of the males of the genus *Eupithecia* CURTIS 1825**

**(Lepidoptera, Geometridae)**

**Vladimír KUBÍN & Josef PROCHÁZKA**

### **Abstract**

A survey of the morphology of the uncus is given for the determination of the genus *Eupithecia* CURTIS 1825 (Lepidoptera). Five groups are recognised on the basis of morphology of uncus showing characteristic features. These features, characteristic for the respective groups, are described. A special study is presented on feature variations of the uncus with regard to determination of species. Information is given on laboratory preparations and photography of uncus. The physiological significance of uncus is calling for further research.

**Key words:** Lepidoptera, *Eupithecia*, Taxonomy, Male genitalia, Uncus, European species, Variability

## Zusammenfassung

Bei der Bestimmung der Blütenspanner ist die Form des Uncus im männlichen Genital als ein Hilfsmerkmal brauchbar. Nach seiner Morphologie ist es möglich, die *Eupithecia*-Arten in fünf Gruppen aufzuteilen. Diese Gruppen unterscheiden sich durch die Gestalt des Corpus unci sowie in der Anzahl und Form der kaudalen Fortsätze. Die Technik der Präparation und der fotografischen Dokumentation wird beschrieben.

## Introduction

Some species of genus *Eupithecia* CURTIS 1825 have typical habitual characters explicitly applicable for final determination (WEIGT 1987, 1990, 1991, 1993). On the other hand, for a number of other species this habitual criterion is not credible. In these cases, other features, primarily the morphology of genitalia, are to be used. In males, the anatomy of aedeagus and the 8<sup>th</sup> abdominal segment are most important (WEIGT 1987 - 1993, PETERSEN 1910, MIRONOV 2003). A useful supplement for determination is the morphology of the uncus, especially in lateral aspect (BOLTE 1990, MIRONOV 2003). The classification into 5 groups, presented in our work, was made only on the basis of the morphological character of the uncus. We recommend to use this classification as an assisting device for the determination of the species of the genus *Eupithecia*.

## Material and methods

74 species of the genus *Eupithecia* were used in our research (Tab. 1). This material was treated with hot 5% NaOH and washed in water. Extracted genitalia were deposited in a drop of water in lateral position (Fig. 7). Uncus and tegumen are connected relatively firmly with rectum (Figs. 9, 10, 11). The shape of uncus is then distinguishable only with difficulties (POVOLNÝ 1956, SCOBLE 1995, KRISTENSEN 2004). To disengage the uncus, preparation needles and fine brushes were used under stereoscopic microscope. The same technique was used to straighten the cranially hooked uncus, which appears in some specimens (Fig. 8).

The anatomy of uncus is relative simple. We proposed new nomenclatorial supplements for some details (Fig. 1).

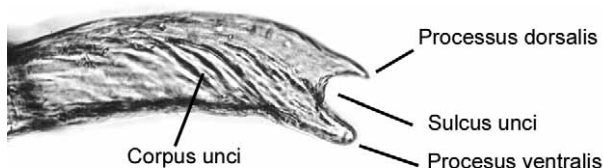


Fig. 1. Nomenclatorial supplements to uncus morphology

Photographs were made in light microscope in constant magnification for all species (obj. 20x, projective 3,2 : 1) using black – and – white film. Photographic processing was also performed in the same magnification.

No cover glasses were used. Condensation of evaporated water on the frontal lens of objective reduces the sharpness of the picture. That is why it is important to work fast and carefully clean the frontal lens.

For scanning electron microscope specimens were transferred to absolute acetone and dried in CO<sub>2</sub>. They were coated with gold and observed on TESLA BS 300 (KUBÍN 2003).

Tab. 1 List of species used in present work in alphabetical order.

| Species                                              | Group | Figs |
|------------------------------------------------------|-------|------|
| <i>E. abbreviata</i> STEPHENS, 1831                  | 2     | 26   |
| <i>E. abietaria</i> (GOEZE, 1781)                    | 4     | 76   |
| <i>E. absinthiata</i> (CLERCK, 1759)                 | 2     | 27   |
| <i>E. actaeata</i> WALDERDORFF, 1869                 | 1     | 12   |
| <i>E. alliaria</i> STAUDINGER, 1870                  | 2     | 28   |
| <i>E. analoga</i> DJAKONOV, 1926                     | 4     | 77   |
| <i>E. assimilata</i> DOUBLEDAY, 1856                 | 2     | 29   |
| <i>E. breviculata</i> (DONZEL, 1837)                 | 2     | 30   |
| <i>E. cauchiata</i> (DUPONCHEL, 1831)                | 2     | 31   |
| <i>E. centaureata</i> (DENIS & SCHIFFERMÜLLER, 1775) | 2     | 32   |
| <i>E. cocciferata</i> MILLIÈRE, 1864                 | 2     | 33   |
| <i>E. denotata</i> (HÜBNER, 1813)                    | 3     | 62   |
| <i>E. denticulata</i> (TREITSCHKE, 1828)             | 3     | 63   |
| <i>E. distinctaria</i> HERRICH-SCHÄFFER, 1848        | 2     | 34   |
| <i>E. dodoneata</i> GUENÉE, 1857                     | 2     | 35   |
| <i>E. egenaria</i> HERRICH-SCHÄFFER, 1848            | 2     | 36   |
| <i>E. ericeata</i> (RAMBUR, 1833)                    | 2     | 37   |
| <i>E. exigua</i> (HÜBNER, 1813)                      | 4     | 78   |
| <i>E. expallidata</i> DOUBLEDAY, 1856                | 1     | 13   |
| <i>E. extraversaria</i> HERRICH-SCHÄFFER, 1852       | 2     | 38   |
| <i>E. gelidata</i> MÖSCHLER, 1860                    | 2     | 39   |
| <i>E. gemellata</i> HERRICH-SCHÄFFER, 1861           | 1     | 14   |
| <i>E. graphata</i> (TREITSCHKE, 1828)                | 2     | 40   |

|                                                    |   |    |
|----------------------------------------------------|---|----|
| <i>E. haworthiata</i> DOUBLEDAY, 1856              | 5 | 85 |
| <i>E. icterata</i> (VILLERS, 1789)                 | 3 | 64 |
| <i>E. immundata</i> (LIENIG & ZELLER, 1846)        | 1 | 15 |
| <i>E. impurata</i> (HÜBNER, 1813)                  | 3 | 65 |
| <i>E. indigata</i> (HÜBNER, 1813)                  | 1 | 16 |
| <i>E. innotata</i> (Hufnagel, 1767)                | 1 | 17 |
| <i>E. insigniata</i> (HÜBNER, 1790)                | 1 | 18 |
| <i>E. intricata</i> (ZETTERSTEDT, 1839)            | 4 | 79 |
| <i>E. inturbata</i> (HÜBNER, 1817)                 | 2 | 41 |
| <i>E. irriguata</i> (HÜBNER, 1813)                 | 2 | 42 |
| <i>E. lanceata</i> (HÜBNER, 1825)                  | 1 | 19 |
| <i>E. laquaearia</i> HERRICH-SCHÄFFER, 1848        | 2 | 43 |
| <i>E. lariciata</i> (FREYER, 1841)                 | 3 | 66 |
| <i>E. linariata</i> (DENIS & SCHIFFERMÜLLER, 1775) | 2 | 44 |
| <i>E. millefoliata</i> RÖSSLER, 1866               | 2 | 45 |
| <i>E. nanata</i> (HÜBNER, 1813)                    | 2 | 46 |
| <i>E. orphnata</i> W. PETERSEN, 1910               | 3 | 67 |
| <i>E. oxycedrata</i> (RAMBUR, 1833)                | 3 | 68 |
| <i>E. pauxillaria</i> BOISDUVAL, 1840              | 2 | 47 |
| <i>E. pimpinellata</i> (HÜBNER, 1813)              | 2 | 48 |
| <i>E. plumbeolata</i> (HAWORTH, 1809)              | 2 | 49 |
| <i>E. pulchellata</i> STEPHENS, 1831               | 2 | 50 |
| <i>E. pusillata</i> (DENIS & SCHIFFERMÜLLER, 1775) | 2 | 51 |
| <i>E. pygmaeata</i> (HÜBNER, 1799)                 | 4 | 80 |
| <i>E. pyreneata</i> MABILLE, 1871                  | 2 | 52 |
| <i>E. santolinata</i> MABILLE, 1871                | 1 | 20 |
| <i>E. satyrata</i> (HÜBNER, 1813)                  | 2 | 53 |
| <i>E. scalptata</i> CHRISTOPH, 1885                | 3 | 69 |
| <i>E. scopariata</i> (RAMBUR, 1833)                | 1 | 21 |
| <i>E. selinata</i> HERRICH-SCHÄFFER, 1861          | 2 | 54 |
| <i>E. semigraphata</i> BRUAND, 1850                | 3 | 70 |
| <i>E. schiefereri</i> BOHATSCH, 1893               | 4 | 81 |

|                                                     |   |    |
|-----------------------------------------------------|---|----|
| <i>E. silenata</i> ASSMANN, 1848                    | 3 | 71 |
| <i>E. silenicolata</i> MABILLE, 1867                | 4 | 82 |
| <i>E. simpliciat</i> a (HAWORTH, 1809)              | 2 | 55 |
| <i>E. sinuosaria</i> (EVERSMANN, 1848)              | 1 | 22 |
| <i>E. spissilineata</i> (METZNER, 1846)             | 1 | 23 |
| <i>E. subfuscata</i> (HAWORTH, 1809)                | 1 | 24 |
| <i>E. subumbrata</i> (DENIS & SCHIFFERMÜLLER, 1775) | 3 | 72 |
| <i>E. succenturiata</i> (LINNAEUS, 1758)            | 2 | 56 |
| <i>E. tantillaria</i> BOISDUVAL, 1840               | 2 | 57 |
| <i>E. tenuiata</i> (HÜBNER, 1813)                   | 2 | 58 |
| <i>E. tripunctaria</i> HERRICH-SCHÄFFER, 1852       | 3 | 73 |
| <i>E. trisignaria</i> HERRICH-SCHÄFFER, 1848        | 2 | 59 |
| <i>E. ultimaria</i> BOISDUVAL, 1840                 | 1 | 25 |
| <i>E. undata</i> (FREYER, 1840)                     | 4 | 83 |
| <i>E. valerianata</i> (HÜBNER, 1813)                | 3 | 74 |
| <i>E. venosata</i> (FABRICIUS, 1787)                | 4 | 84 |
| <i>E. veratraria</i> HERRICH-SCHÄFFER, 1850         | 2 | 60 |
| <i>E. virgaureata</i> DOUBLEDAY, 1861               | 3 | 75 |
| <i>E. vulgata</i> (HAWORTH, 1809)                   | 2 | 61 |

#### List of localities and collectors of used species.

*E. abbreviata* STEPHENS, 1831, Bohemia, Družec, KUBÍN V.; *E. abietaria* (GOEZE, 1781), Bohemia, Šumava - Nová Pec, KUBÍN V.; *E. absinthiata* (CLERCK, 1759), Bohemia, Družec, KUBÍN V.; *E. actaeata* WALDERDORFF, 1869, Bohemia, Červená n. Vltavou, NOVÁK I.; *E. alliararia* STAUDINGER, 1870, Slovakia, Slov. Kras - Vidová, LIŠKA J.; *E. analoga* DJAKONOV, 1926, Bohemia, Šumava - Jelení Vrchy, KUBÍN V.; *E. assimilata* DOUBLEDAY, 1856, Bohemia, Družec, KUBÍN V.; *E. breviculata* (DONZEL, 1837), Greece, Parga, PROCH. J.; *E. cauchiata* (DUPONCHEL, 1831), France, NOVÁK I.; *E. centaureata* (DENIS & SCHIFFERMÜLLER, 1775), Bohemia, Družec, KUBÍN V.; *E. cocciferata* MILLIÈRE, 1864, France, Gourdon, SKYVA J.; *E. denotata* (HÜBNER, 1813), Bohemia, Družec, KUBÍN V.; *E. denticulata* (TREITSCHKE, 1828), Greece, Smolikas, SKYVA J.; *E. distinctaria* HERRICH-SCHÄFFER, 1848, Bohemia, Krkonoše - Černý důl, SKYVA J.; *E. dodoneata* GUENÉE, 1857, Bohemia, Družec, KUBÍN V.; *E. egenaria* HERRICH-SCHÄFFER, 1848, Bohemia, Písek, NOVÁK I.; *E. ericeata* (RAMBUR, 1833), Slovakia, Medovarce, SKYVA J.; *E. exigua* (HÜBNER, 1813), Bohemia, Družec, KUBÍN V.; *E. expallidata* DOUBLEDAY, 1856, Bohemia, Krkonoše - Lánov, SKYVA J.; *E.*

*extraversaria* HERRICH-SCHÄFFER, 1852, Bohemia, Družec, KUBÍN V.; *E. gelidata* MÖSCHLER, 1860, Bohemia, Červené Blato, JAROŠ J.; *E. gemellata* HERRICH-SCHÄFFER, 1861, Spain, Palomera, PROCH. J.; *E. graphata* (TREITSCHKE, 1828), Hungary, Csákberény, SKYVA J.; *E. haworthiata* DOUBLEDAY, 1856, Bohemia, Družec, KUBÍN V.; *E. icterata* (VILLERS, 1789), Bohemia, Družec, KUBÍN V.; *E. immundata* (LIENIG & ZELLER, 1846), Bohemia, Řevničov, PROCH. J.; *E. impurata* (HÜBNER, 1813), Slovenia, Julské Alpy - Vršič, SKYVA J.; *E. indigata* (HÜBNER, 1813), Bohemia, Družec, KUBÍN V.; *E. innotata* (Hufnagel, 1767), Bohemia, Družec, KUBÍN V.; *E. insigniata* (HÜBNER, 1790), Bohemia, Družec, KUBÍN V.; *E. intricata* (ZETTERSTEDT, 1839), Bohemia, Družec, KUBÍN V.; *E. inturbata* (HÜBNER, 1817), Bohemia, Teptín, Číla P.; *E. irriguata* (HÜBNER, 1813), Greece, Pelopones, SKYVA J.; *E. lanceata* (HÜBNER, 1825), Bohemia, Družec, KUBÍN V.; *E. laquaearia* HERRICH-SCHÄFFER, 1848, Spain, Ejulve, PROCH. J.; *E. lariciata* (FREYER, 1841), Bohemia, Družec, KUBÍN V.; *E. liniata* (DENIS & SCHIFFERMÜLLER, 1775), Bohemia, Družec, KUBÍN V.; *E. millefoliata* RÖSSLER, 1866, Bohemia, Družec, KUBÍN V.; *E. nanata* (HÜBNER, 1813), Bohemia, Červené Blato, JAROŠ J.; *E. orphnata* W. PETERSEN, 1910, Moravia, Podyjí - Šobes, MAREK J.; *E. oxycedrata* (RAMBUR, 1833), Greece, Pelopones, SKYVA J.; *E. pauxillaria* BOISDUVAL, 1840, Italy, Ligurské Alpy, SKYVA J.; *E. pimpinellata* (HÜBNER, 1813), Bohemia, Družec, KUBÍN V.; *E. plumbeolata* (HAWORTH, 1809), Bohemia, Družec, KUBÍN V.; *E. pulchellata* STEPHENS, 1831, Bohemia, Jizerské h. - Bukovec, NM Praha; *E. pusillata* (DENIS & SCHIFFERMÜLLER, 1775), Bohemia, Družec, KUBÍN V.; *E. pygmaea* (HÜBNER, 1799), Moravia, Lednice, NM Praha; *E. pyreneata* MABILLE, 1871, Bohemia, Brná n. Labem, NOVÁK I.; *E. santolinata* MABILLE, 1871, Spain, ŠUMPICH J.; *E. satyrata* (HÜBNER, 1813), Bohemia, Družec, KUBÍN V.; *E. scalptata* CHRISTOPH, 1885, Greece, Diakofto, PROCH. J.; *E. scopariata* (RAMBUR, 1833), France, Cogolin, PETRŮ M.; *E. selinata* HERRICH-SCHÄFFER, 1861, Bohemia, Krkonoše - Dvoračky, NOVÁK I.; *E. semigraphata* BRUAND, 1850, Croatia, Murter, KUBÍN V.; *E. schiefereri* BOHATSCH, 1893, Greece, Pelopones, SKYVA J.; *E. silenata* ASSMANN, 1848, Bohemia, Lány, KUBÍN V.; *E. silenicolata* MABILLE, 1867, Greece, Leptokaria, SKYVA J.; *E. simplicata* (HAWORTH, 1809), Bohemia, Družec, KUBÍN V.; *E. sinuosaria* (EVERSMANN, 1848), Bohemia, Družec, KUBÍN V.; *E. spissilineata* (METZNER, 1846), Greece, Pelopones, SKYVA J.; *E. subfuscata* (HAWORTH, 1809), Bohemia, Družec, KUBÍN V.; *E. subumbrata* (DENIS & SCHIFFERMÜLLER, 1775), Bohemia, Šumava - Jelení Vrchy, KUBÍN V.; *E. succenturiata* (LINNAEUS, 1758), Bohemia, Družec, KUBÍN V.; *E. tantillaria* BOISDUVAL, 1840, Bohemia, Družec, KUBÍN V.; *E. tenuiata* (HÜBNER, 1813), Bohemia, Družec, KUBÍN V.; *E. tripunctaria* HERRICH-SCHÄFFER, 1852, Bohemia, Družec, KUBÍN V.; *E. trisignaria* HERRICH-SCHÄFFER, 1848, Bohemia, Družec, KUBÍN V.; *E. ultimaria* BOISDUVAL, 1840, Italy, Portogruaro - Brussa, SKYVA J.; *E. undata* (FREYER, 1840), Italy, Ortler Grup. - Stelvio, SKYVA J.; *E. valerianata* (HÜBNER, 1813), Slovakia, NM Praha; *E. venosata* (FABRICIUS, 1787), Bohemia, Šumava - Jelení Vrchy, KUBÍN V.; *E. veratraria* HERRICH-SCHÄFFER, 1850, Bohemia, Novohradské Hory, JAROŠ J.; *E. virgaureata* DOUBLEDAY, 1861, Bohemia, Družec, KUBÍN V.; *E. vulgata* (HAWORTH, 1809), Bohemia, Družec, KUBÍN V.

## Results

On the basis of the morphology of the uncus, the genus *Eupithecia* was classified into 5 groups:

Group 1 - Corpus unci is narrow as far as to the caudal bifurcation (19 %, Figs. 2, 12 - 25)

Group 2 - Corpus unci is broader than caudal bifurcation (49 %, Figs. 3, 26 – 61)

Group 3 - Corpus unci is broad especially in the dorsal margin (19 % Figs. 4, 62–75)

Group 4 - Uncus ends caudally with one solitary lobe only (12 % Figs. 5, 76 – 84)

Group 5 - Uncus is anatomically not developed (1 %, Figs. 6, 85)

Morphological variability was studied in 6 species: *E. satyrata* (Figs. 86 - 91), *E. tantillaria* (Figs. 92 - 97), *E. vulgata* (Figs. 98 - 103), *E. pimpinellata* (Figs. 104 - 109), *E. subfuscata* (Figs. 110 - 117), *E. intricata* (Figs. 118 – 121).

It is relatively limited and does not affect the final species determination.

The following composition of the groups could be determined:

### **Group 1. Corpus unci is narrow as far as to caudal bifurcation (Fig. 2).**

*E. actaeata* WALDERDORFF, 1869

*E. expallidata* DOUBLEDAY, 1856

*E. gemellata* HERRICH-SCHÄFFER, 1861

*E. immundata* (LIENIG & ZELLER, 1846)

*E. indigata* (HÜBNER, 1813)

*E. innotata* (Hufnagel, 1767)

*E. insigniata* (HÜBNER, 1790)

*E. lanceata* (HÜBNER, 1825)

*E. santolinata* MABILLE, 1871

*E. scopariata* (RAMBUR, 1833)

*E. sinuosaria* (EVERSMANN, 1848)

*E. spissilineata* (METZNER, 1846)

*E. subfuscata* (HAWORTH, 1809)

*E. ultimaria* BOISDUVAL, 1840

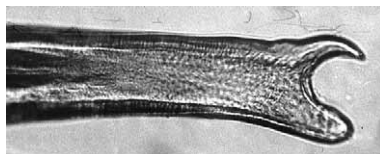


Fig. 2. *E. insigniata*

**Group 2. Corpus unci is broader than caudal bifurcation (Fig. 3).**

- E. abbreviata* STEPHENS, 1831  
*E. absinthiata* (CLERCK, 1759)  
*E. alliaria* STAUDINGER, 1870  
*E. assimilata* DOUBLEDAY, 1856  
*E. breviculata* (DONZEL, 1837)  
*E. cauchiata* (DUPONCHEL, 1831)  
*E. centaureata* (DENIS & SCHIFFERMÜLLER, 1775)  
*E. cocciferata* MILLIÈRE, 1864  
*E. distinctaria* HERRICH-SCHÄFFER, 1848  
*E. dodoneata* GUENÉE, 1857  
*E. egenaria* HERRICH-SCHÄFFER, 1848  
*E. ericeata* (RAMBUR, 1833)  
*E. extraversaria* HERRICH-SCHÄFFER, 1852  
*E. gelidata* MÖSCHLER, 1860  
*E. graphata* (TREITSCHKE, 1828)  
*E. inturbata* (HÜBNER, 1817)  
*E. irriguata* (HÜBNER, 1813)  
*E. laquaearia* HERRICH-SCHÄFFER, 1848  
*E. linariata* (DENIS & SCHIFFERMÜLLER, 1775)  
*E. millefoliata* RÖSSLER, 1866  
*E. nanata* (HÜBNER, 1813)  
*E. pauxillaria* BOISDUVAL, 1840  
*E. pimpinellata* (HÜBNER, 1813)  
*E. plumbeolata* (HAWORTH, 1809)  
*E. pulchellata* STEPHENS, 1831  
*E. pusillata* (DENIS & SCHIFFERMÜLLER, 1775)  
*E. pyreneata* MABILLE, 1871  
*E. satyrata* (HÜBNER, 1813)  
*E. selinata* HERRICH-SCHÄFFER, 1861  
*E. simpliciata* (HAWORTH, 1809)  
*E. succenturiata* (LINNAEUS, 1758)  
*E. tantillaria* BOISDUVAL, 1840  
*E. tenuiata* (HÜBNER, 1813)  
*E. trisignaria* HERRICH-SCHÄFFER, 1848  
*E. veratraria* HERRICH-SCHÄFFER, 1850  
*E. vulgata* (HAWORTH, 1809)

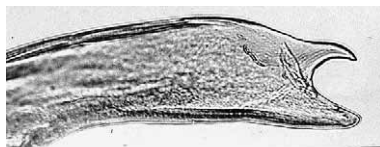


Fig. 3. *E. pusillata*

**Group 3. Corpus unci is broad, especially in dorsal margin (Fig. 4).**

- E. denotata* (HÜBNER, 1813)  
*E. denticulata* (TREITSCHKE, 1828)  
*E. icterata* (VILLERS, 1789)  
*E. impurata* (HÜBNER, 1813)  
*E. lariciata* (FREYER, 1841)  
*E. orphnata* W. PETERSEN, 1910  
*E. oxycedrata* (RAMBUR, 1833)  
*E. scalptata* CHRISTOPH, 1885  
*E. semigraphata* BRUAND, 1850  
*E. silenata* ASSMANN, 1848  
*E. subumbrata* (DENIS & SCHIFFERMÜLLER, 1775)  
*E. tripunctaria* HERRICH-SCHÄFFER, 1852  
*E. valerianata* (HÜBNER, 1813)  
*E. virgaureata* DOUBLEDAY, 1861

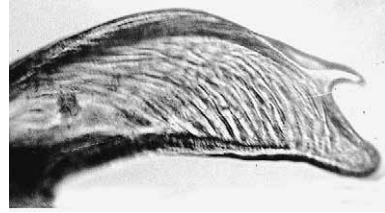


Fig. 4. *E. subumbrata*

**Group 4. Uncus ends caudally only in a solitary lobe (Fig. 5).**

- E. abietaria* (GOEZE, 1781)  
*E. analoga* DJAKONOV, 1926  
*E. exigua* (HÜBNER, 1813)  
*E. intricata* (ZETTERSTEDT, 1839)  
*E. pygmaeata* (HÜBNER, 1799)  
*E. schiefereri* BOHATSCH, 1893  
*E. silenicolata* MABILLE, 1867  
*E. undata* (FREYER, 1840)  
*E. venosata* (FABRICIUS, 1787)

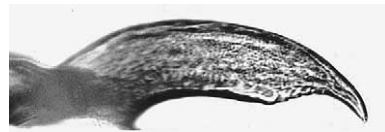


Fig. 5. *E. intricata*

**Group 5. Uncus is anatomically not developed (Fig. 6).**

- E. haworthiata* DOUBLEDAY, 1856

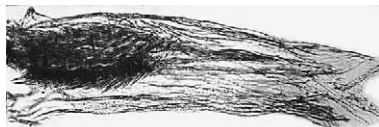


Fig. 6. *E. haworthiata*

## Discussion

Lateral morphology of uncus is an useful supplement in the determination of species of the genus *Eupithecia* (MIRONOV 2003, BOLTE 1990). Our results support it univocally. The interspecies similarity of uncus limits the use of this organ alone for determination. This is why we divided the species of genus *Eupithecia* into 5 groups according to morphologically similar uncus-structures.

In some species (*E. intricata*, *E. lariciata* and others) the shape of uncus is very typical. Final determination is then possible according to the morphology of the uncus, naturally in regard with other determination-characters.

Cranially hooked uncus is a possible result of muscle contraction appearing during the killing process.

The morphological variability of the uncus is relatively limited and does not influence the species determination. Nevertheless, it may happen that the localization of genitalia during the preparation does not correctly correspond with a lateral position. In these cases, the optical aspect may alter the real shape of the uncus.

Our five-group classification of the genus *Eupithecia* does not correspond with groups described by MIRONOV (2003).

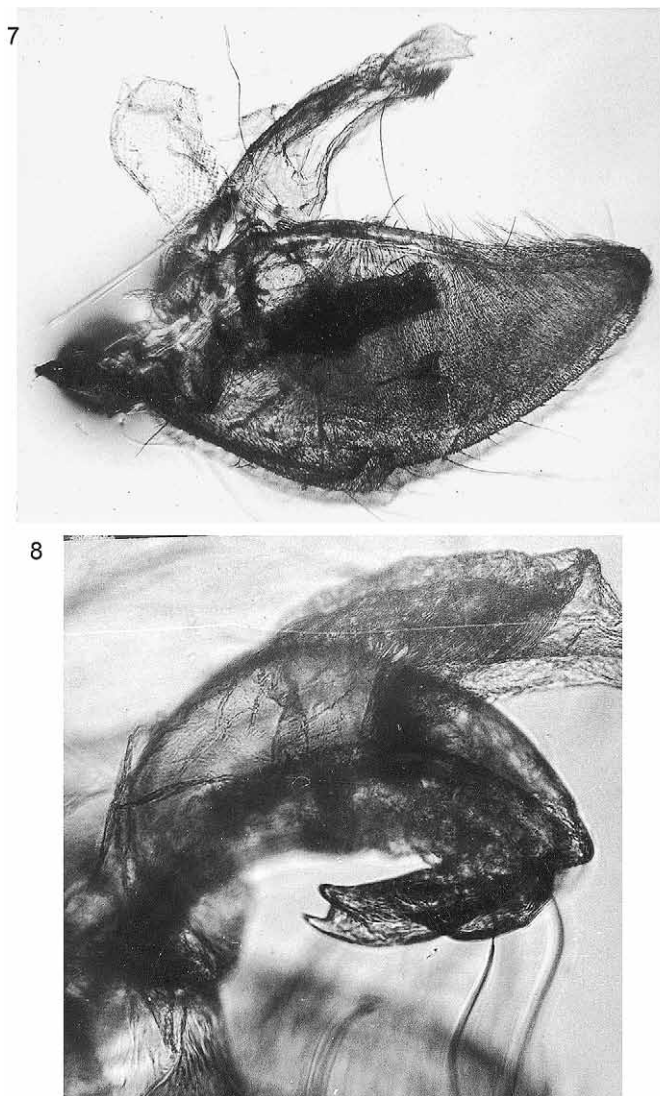
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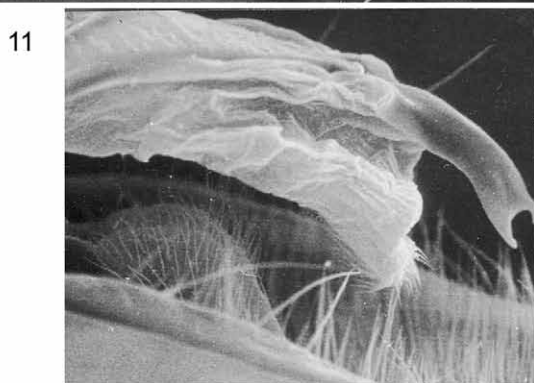
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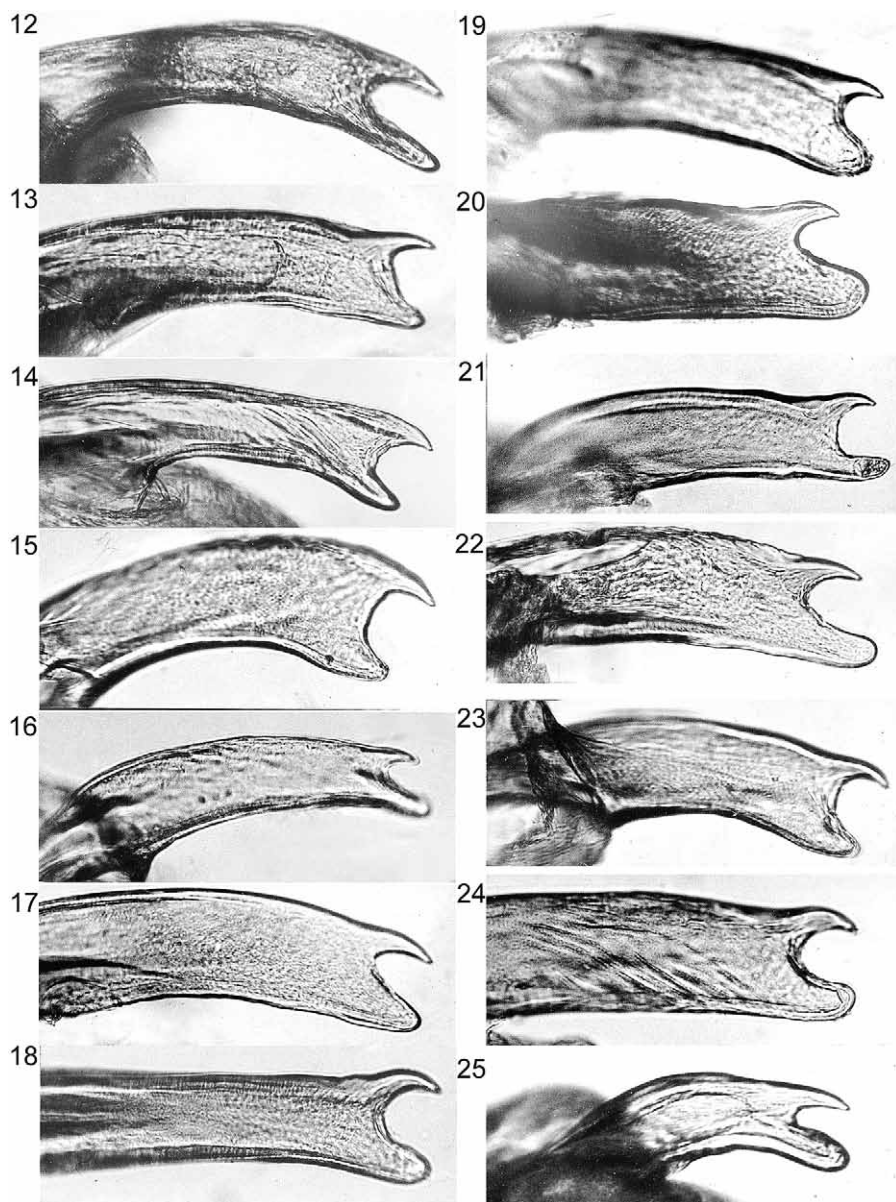
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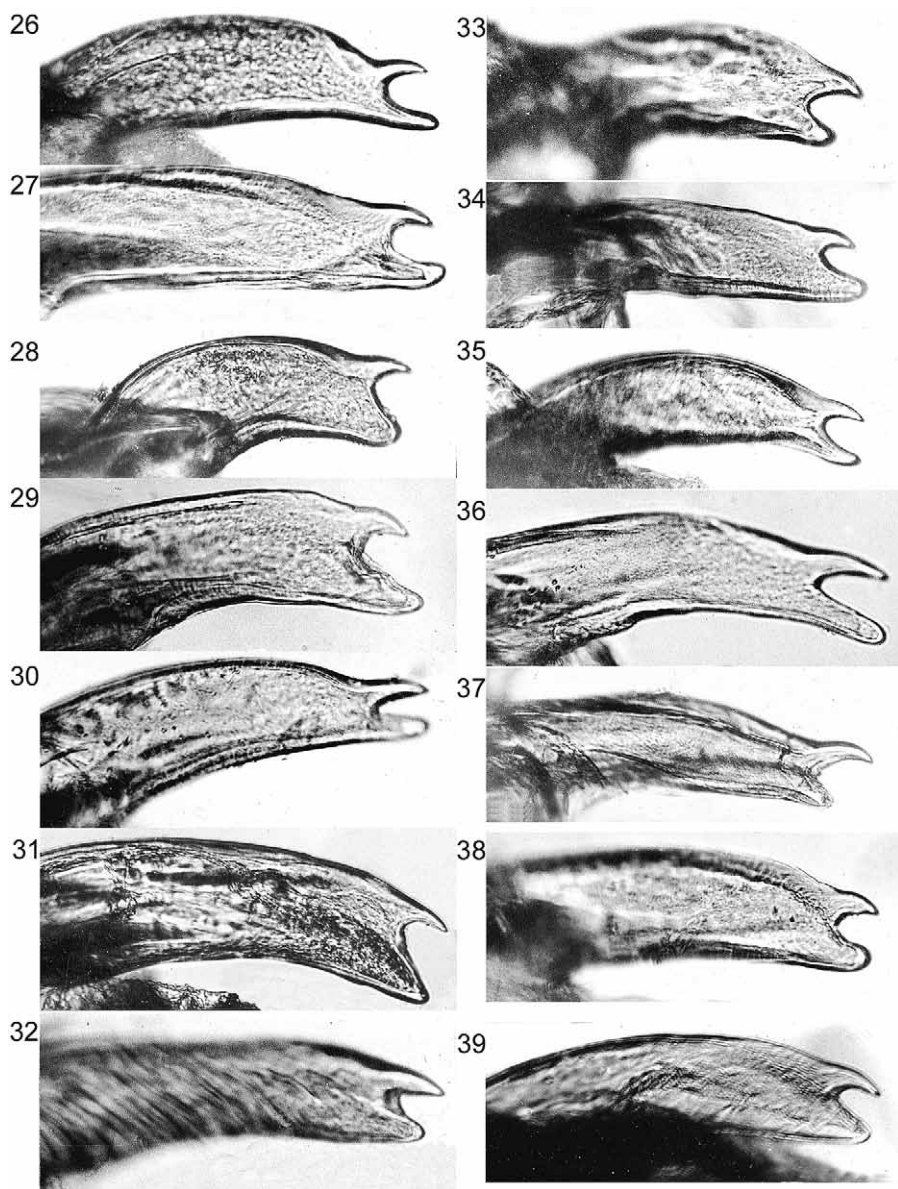
Figs 7-8. 7. *E. denotata*. Total view of the separated genitalia in lateral position. 8. *E. vulgata*. Cranially hooked uncus as a possible muscle contraction appearing in the killing process.



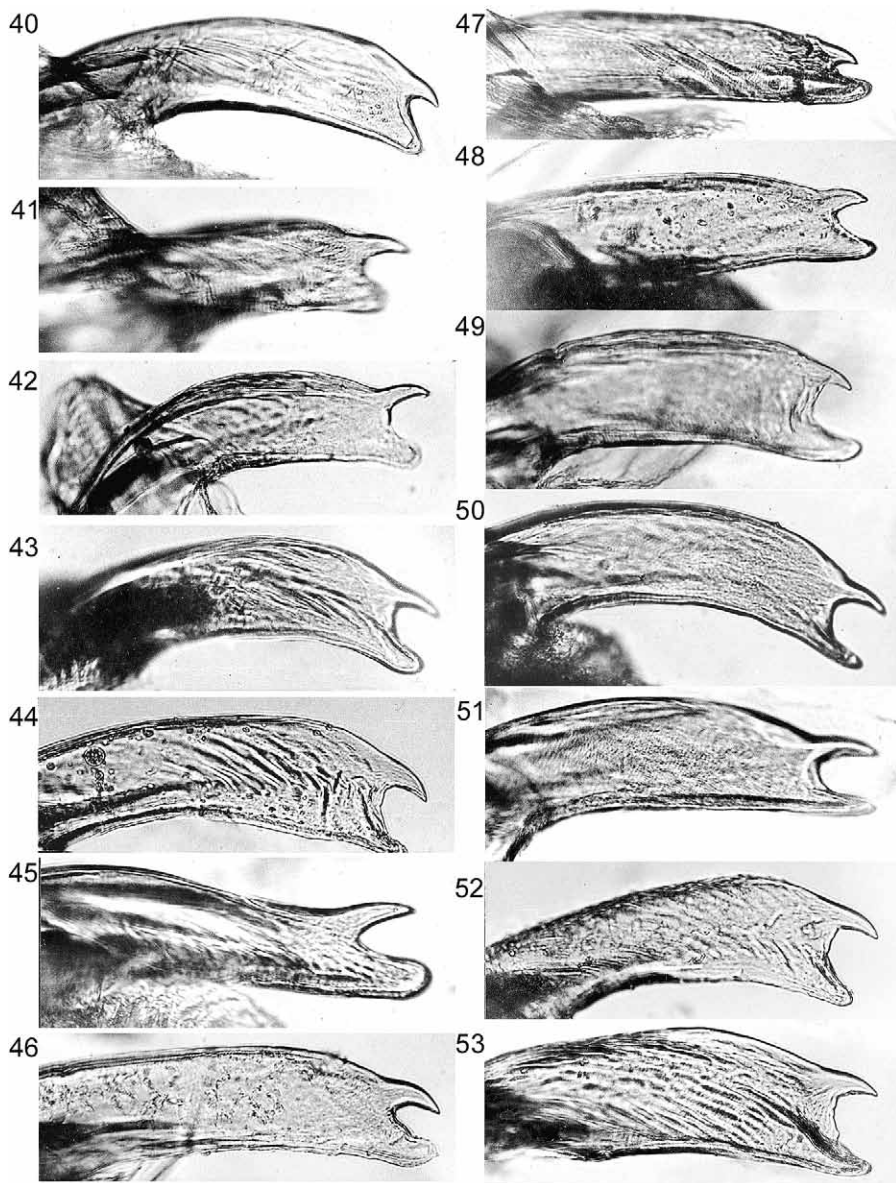
Figs 9-11. Conjunction of uncus and rectum cone. Scanning electron microscope. 9. *E. tripunctaria* magn. 600x. 10. *E. ericeata* magn. 320x. 11. *E. assimilata* magn. 270x.



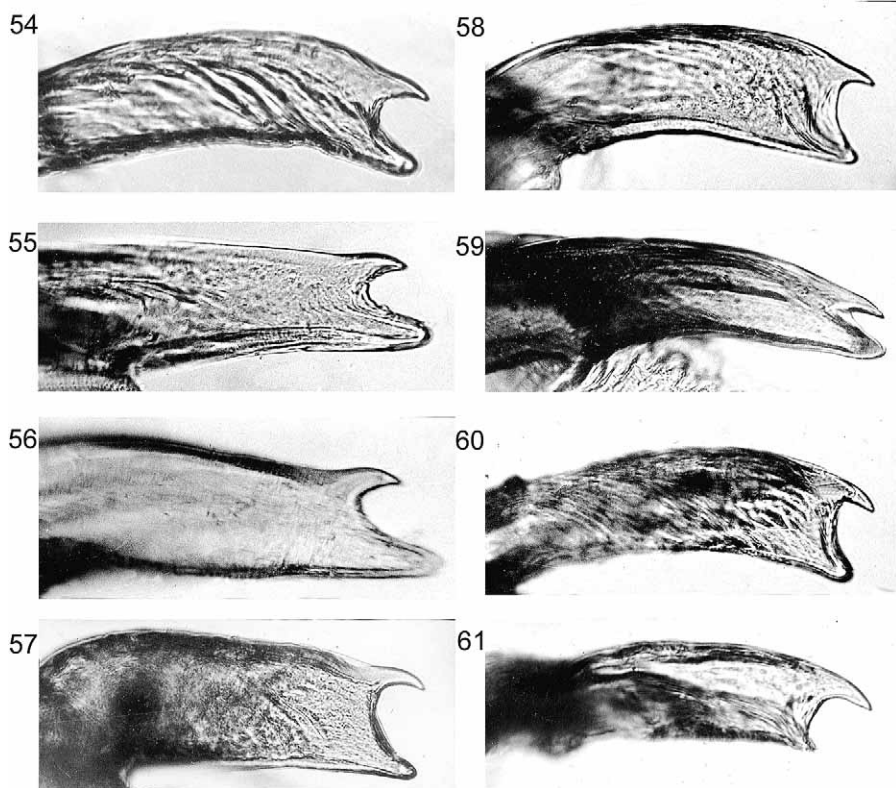
Figs 12-25. **Group 1. Corpus unci narrow until caudal bifurcation.** 12: *E. acteata*. 13. *E. expallidata*. 14. *E. gemellata*. 15. *E. immundata*. 16. *E. indigata*. 17. *E. innotata*. 18. *E. insigniata*. 19. *E. lanceata*. 20. *E. santolinata*. 21. *E. scopariata*. 22. *E. sinuosaria*. 23. *E. spissilineata*. 24. *E. subfuscata*. 25. *E. ultimaria*.



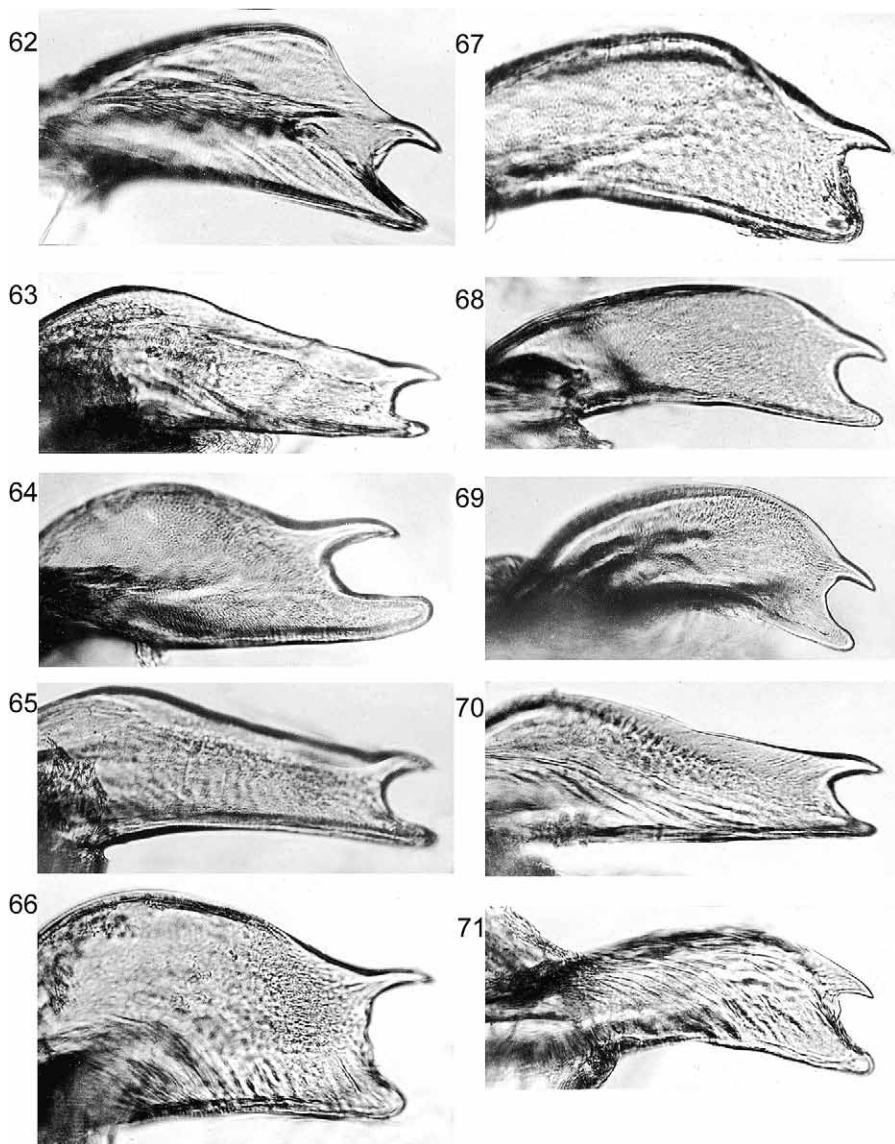
Figs 26-39. **Group 2. Corpus unci broader than caudal bifurcation.** 26. *E. abbreviata*. 27. *E. absinthiata*. 28. *E. alliaria*. 29. *E. assimilata*. 30. *E. breviculata*. 31. *E. cauchiata*. 32. *E. centaureata*. 33. *E. cocciferata*. 34. *E. distinctaria*. 35. *E. dodoneata*. 36. *E. egenaria*. 37. *E. ericeata*. 38. *E. extraversaria*. 39. *E. gelidata*.



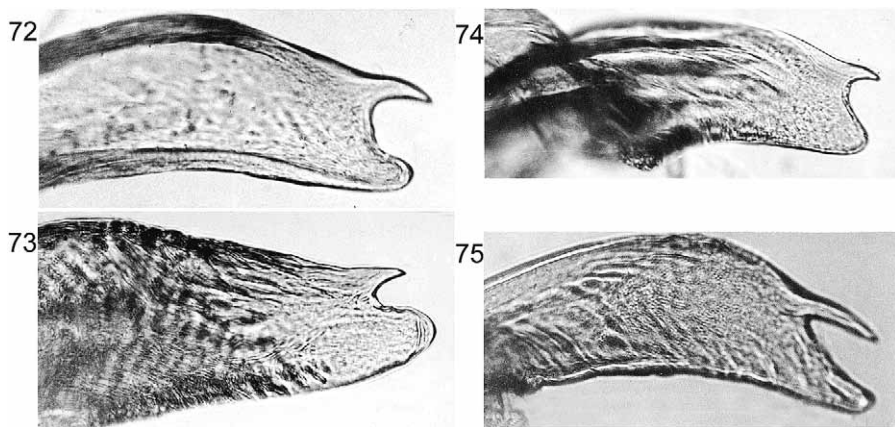
Figs 40-53. **Group 2. Corpus unci broader than caudal bifurcation.** 40. *E. graphata*. 41. *E. inturbata*. 42. *E. irriguata*. 43. *E. laquearia*. 44. *E. linariata*. 45. *E. millefoliata*. 46. *E. nanata*. 47. *E. pauxillaria*. 48. *E. pimpinellata*. 49. *E. plumbeolata*. 50. *E. pulchellata*. 51. *E. pusillata*. 52. *E. pyreneata*. 53. *E. satyrata*.



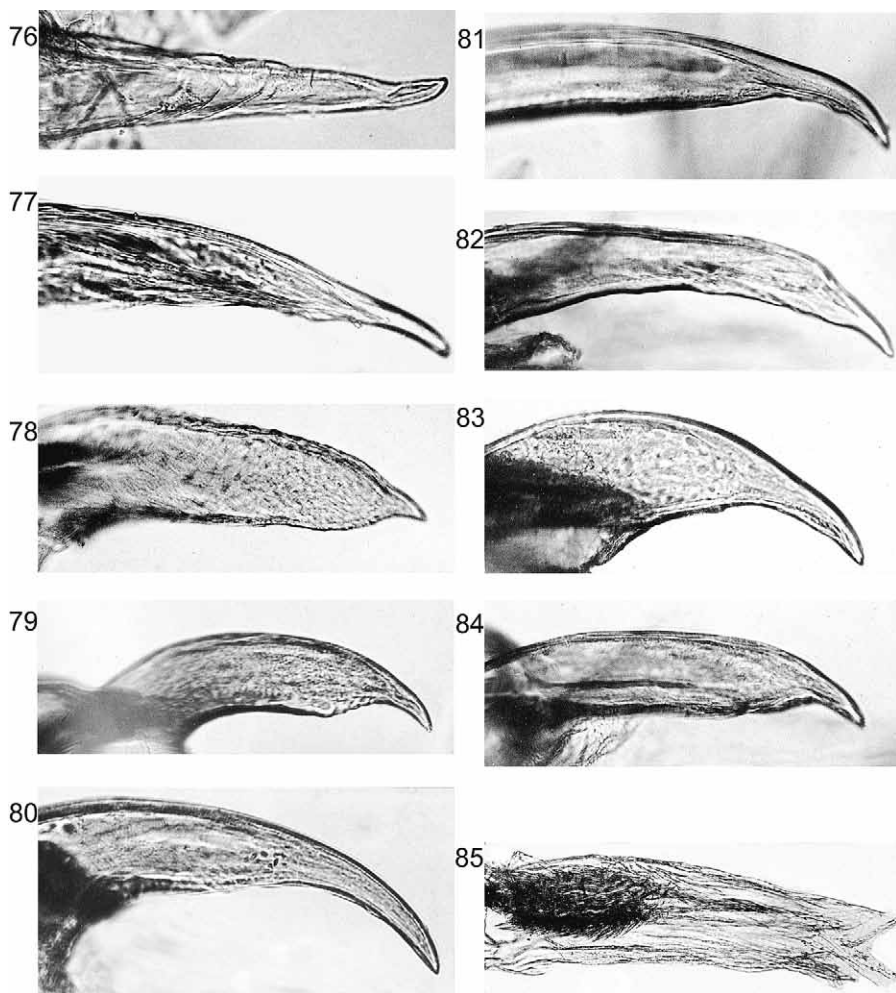
Figs 54-61. **Group 2. Corpus unci broader than caudal bifurcation.** 54. *E. selinata*. 55. *E. simpliciata*. 56. *E. succenturiata*. 57. *E. tantillaria*. 58. *E. tenuiata*. 59. *E. trisignaria*. 60. *E. veratraria*. 61. *E. vulgata*.



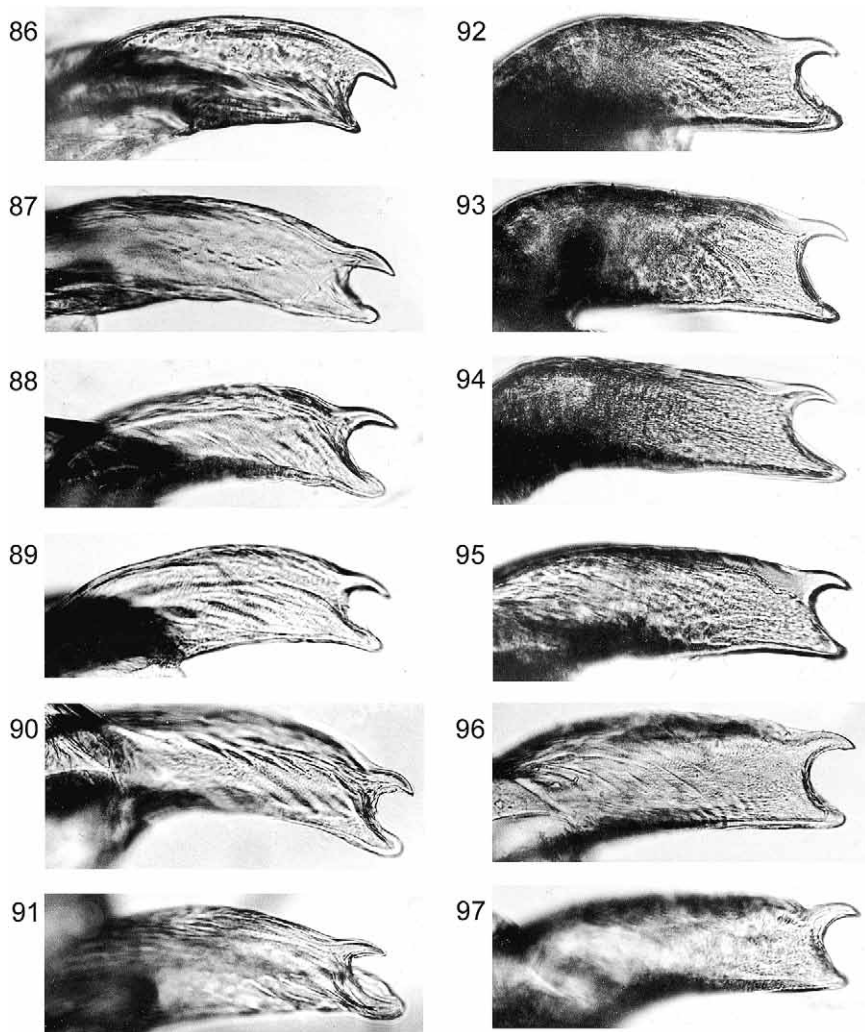
Figs 62-71. **Group 3. Corpus unci broad, especially in dorsal margin.** 62. *E. denotata*. 63. *E. denticulata*. 64. *E. icterata*. 65. *E. impurata*. 66. *E. lariciata*. 67. *E. orphnata*. 68. *E. oxycedrata*. 69. *E. scalptata*. 70. *E. semigraphata*. 71. *E. silenata*.



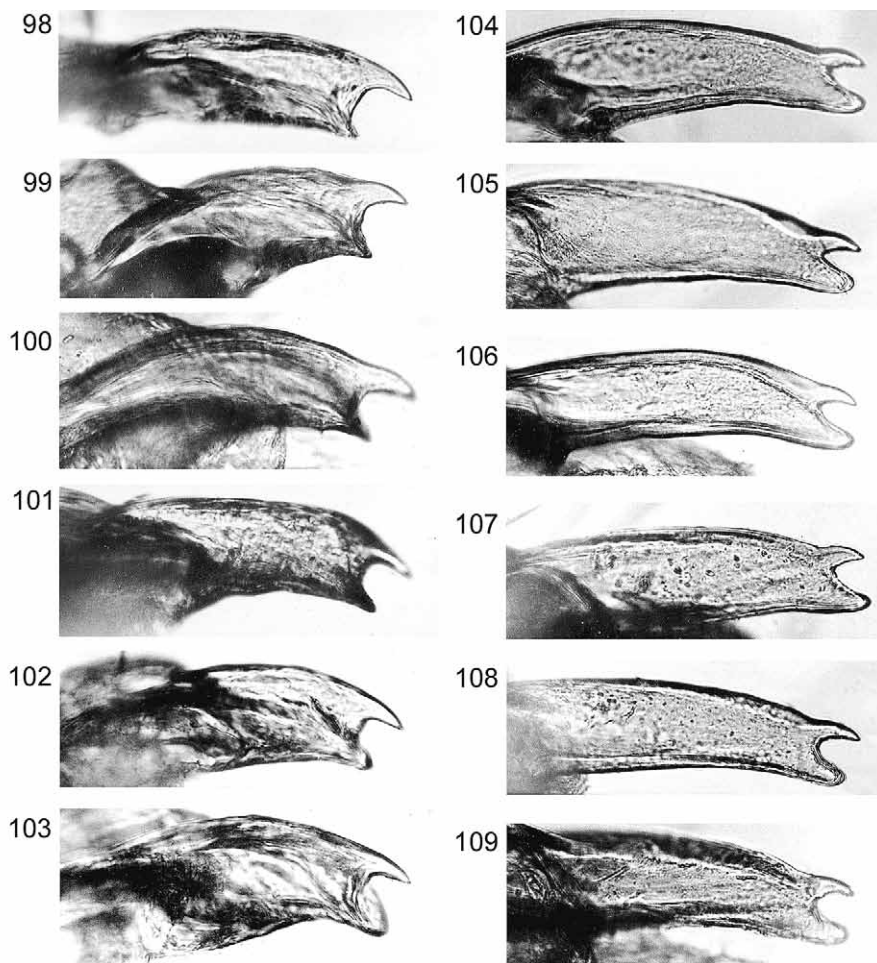
Figs 72-75. **Group 3. Corpus unci broad, especially in dorsal margin.** 72. *E. subumbrata*. 73. *E. tripunctaria*. 74. *E. valerianata*. 75. *E. virgaureata*.



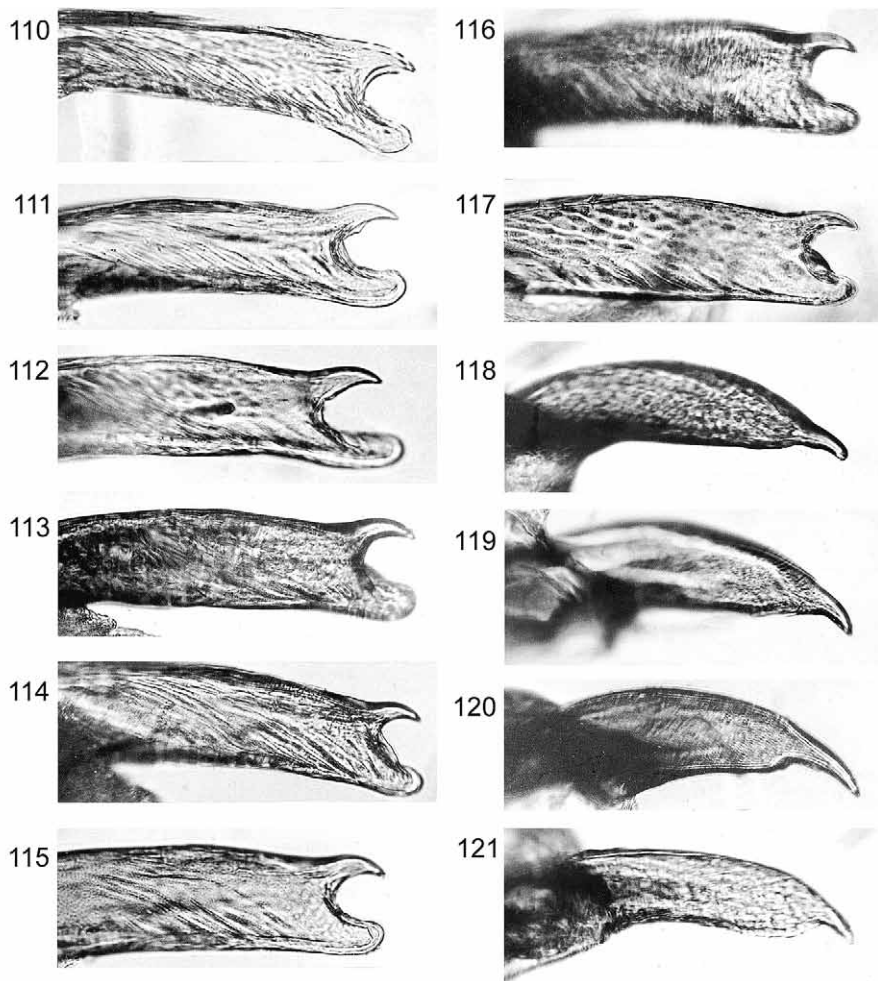
Figs 76-85. Figs. 76-84. **Group 4. Uncus caudally ending in only a single lobe.** 76. *E. abietaria*. 77. *E. analoga*. 78. *E. pygmaeata*. 79. *E. intricata*. 80. *E. pygmaeata*. 81. *E. schiefereri*. 82. *E. silenicolata*. 83. *E. undata*. 84. *E. venosata*. Fig. 85. **Group 5. Uncus anatomically not developed.** 85. *E. haworthiata*.



Figs 86-97. **Uncus – Morphological variability.** 86-91. *E. satyrata*. 92-97. *E. tantillaria*.



Figs 98-109. **Uncus – Morphological variability.** 98-103. *E. vulgata*. 104-109. *E. pimpinellata*.



Figs. 110-121. **Uncus – Morphological variability.** 110-117. *E. subfuscata*. 118-121. *E. intricata*.

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