

Part 2

The male genitalia of other Noctuoidea

Families: Notodontidae, Erebidae, Nolidae

Having examined the genitalia of Family: Noctuidae in part 1, part 2 examines the other three British Noctuid families. Part 2 is divided into 4 sections numbered to correspond with the divisions of Part 1:

- 1) The vinculum-tegumen ring
- 2) The valva
- 3) The diaphragm
- 4) The aedeagus

Each section is examined in turn for Families: Notodontidae, Erebidae and Nolidae and some comparison with features already seen in the Noctuidae is given where appropriate.

1) The VT-ring in Superfamily: Noctuoidea

Overview

1. The gnathos is absent from all species in superfamily: Noctuoidea
2. Socii are present only in *Colocasia coryli* (Family: Noctuidae, Subfamily: Pantheinae) and *Stauropus fagi* (Family: Notodontidae, Subfamily: Dicranurinae)
3. Vinculum-valva articulation. In the Noctuidae the articulation between a lateral arm of the vinculum and the base of the external lamina of the valva is sufficiently constant that the lateral arm could be defined by the area in close contact with the valva. In other families the situation is much more variable, sometimes with very little connection between vinculum and valva.
4. The vinculum-tegumen articulation is generally much simpler in other families than it is in Family: Noctuidae. The most common arrangements are:
 - a. Simple abutment of the ends of the vinculum and tegumen
 - b. Fusion of vinculum and tegumen into a complete ring
 - c. Simple overlap of the ends of the vinculum and tegumen
 - d. Overlap with modification of the posterior end of the vinculum as a simple articulating segment, with or without modification of the anterior end of the tegumen as a pedunculus.
5. A valva-tegumen articulation is seen in Family: Notodontidae, but not in the other Noctuoid families
6. VT-ring with an external groove. In all species in Family: Noctuidae and most species from other Noctuoid families the laminae of the VT-ring curve such that the fold is external/lateral and the edges are internal/medial. However, in Subfamily: Dicranurinae (eg *Stauropus fagi*) (Family: Notodontidae) and some species in Tribe: Arctiini (Family: Erebidae) the laminae are curved such that the fold is predominantly internal/medial and the edges external/lateral – so creating an external groove. Such VT-rings are always strongly sclerotised and rigid.
7. The body of the tegumen may be divided into three general types by the extent of midline sclerotization of the dorsal lamina:
 - a. A simple narrow arch, continuous across the midline, with little sclerotization of the dorsal lamina (the commonest type seen in the majority of Noctuoid species)
 - b. An arch formed of two plates more or less divided by the uncus in the midline (eg most species in Family: Notodontidae)
 - c. An arch formed of two plates connected at a dorsal midline suture (eg Tribe: Lithosiini in Family: Erebidae)

The VT-ring in Family: Notodontidae

The VT-ring in Family: Notodontidae is characterised by:

- A complex bulky uncus,
- Little or no differentiation of a saccus
- A vinculum-tegumen articulation (VTA) which is either fused (eg *Ptilodon capucina*, fig. 2) or a simple abutment of the vinculum and tegumen (eg *Drymonia dodonaea*, fig. 1).
- A tegumen-valva articulation is present in at least some species.
- The body of the tegumen consists of a pair of lateral plates with little or no attachment to each other as they are separated at the apex of the arch by their attachment to the uncus.
- The uncus-tegumen articulation usually shows a clear suture line either side of the uncus.

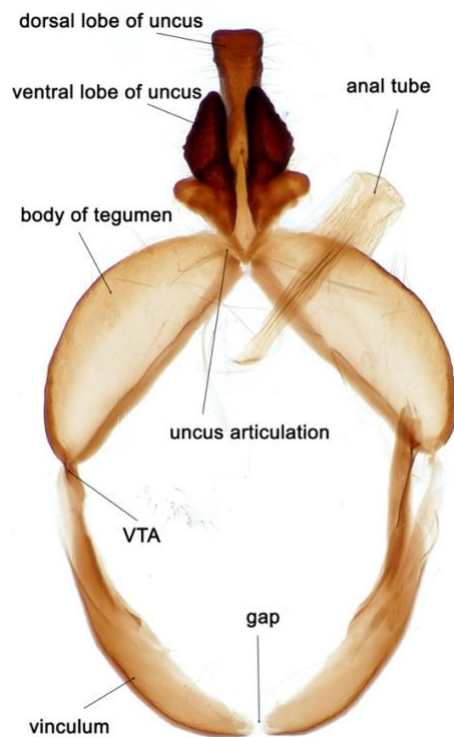


Figure 1: VT-ring of *Drymonia dodonaea* (Marbled Brown)

In several species sclerotization of the vinculum is deficient in the midline - this being associated with a broad juxta fused with the valval bases and usually also fused to the vinculum (making dissection difficult). *Ptilodon capucina* (fig. 2) has a bilobed saccus.

The bulky uncus is usually composed of a strong dorsal lobe which may be bifid, and a pair of strong ventral lobes. In *Ptilodon capucina* (fig. 2) there is a tongue-like median lobe between the dorsal and ventral lobes. In some species there is an additional pair of basal lobes either at the base of the uncus and clearly attached to it, or in the diaphragm immediately anterior to (the rest of) the uncus (eg *Clostera curtula*, fig. 3). In *Pterostoma palpina* (fig. 3) the uncus is completely bifid.

The anal tube is usually diffusely sclerotised and without any strong supports.

In Subfamilies Dicranurinae (e.g. *Stauropus fagi*, fig. 2) and Pygaerinae (e.g. *Clostera curtula*, fig. 3) there is a sclerotised plate extending medially from the anterior ends of the tegumen which provides an attachment for the valvae – this plate looks like a transtilla and it is possible that it is derived from the valval costa.

Stauropus fagi (fig. 2) is exceptional in having the arch of the tegumen continuous across the dorsal midline, with a pair of very elaborate bulky socii and no uncus (although these socii could be interpreted as a bifid uncus in which the two halves had become widely spaced). It is also unusual in having the whole VT-ring with an external groove.

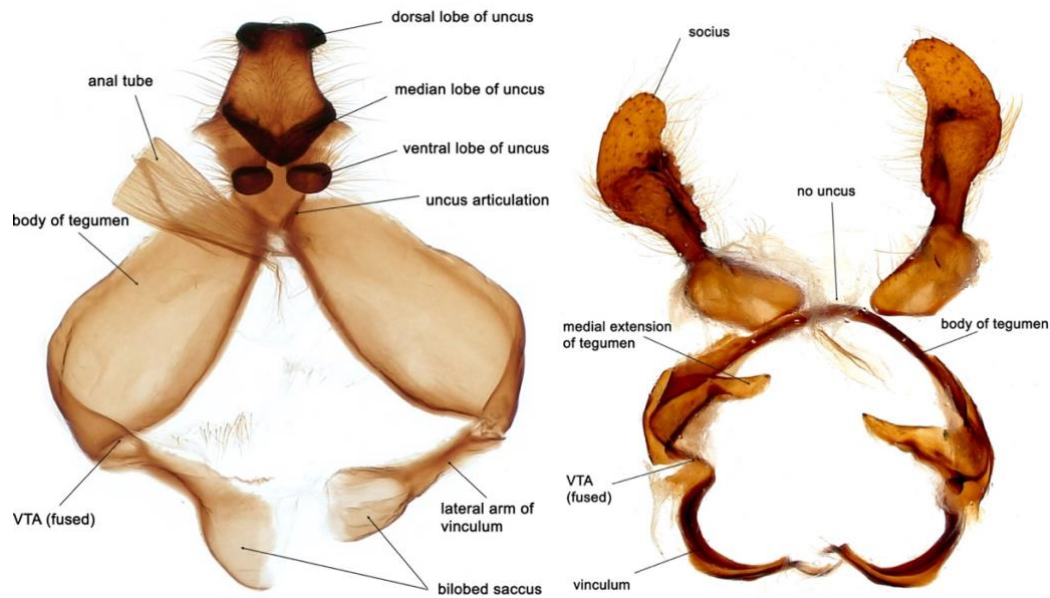


Figure 2: VT-rings. Left – *Ptilodon capucina* (Coxcomb Prominent), right – *Stauropus fagi* (Lobster Moth)

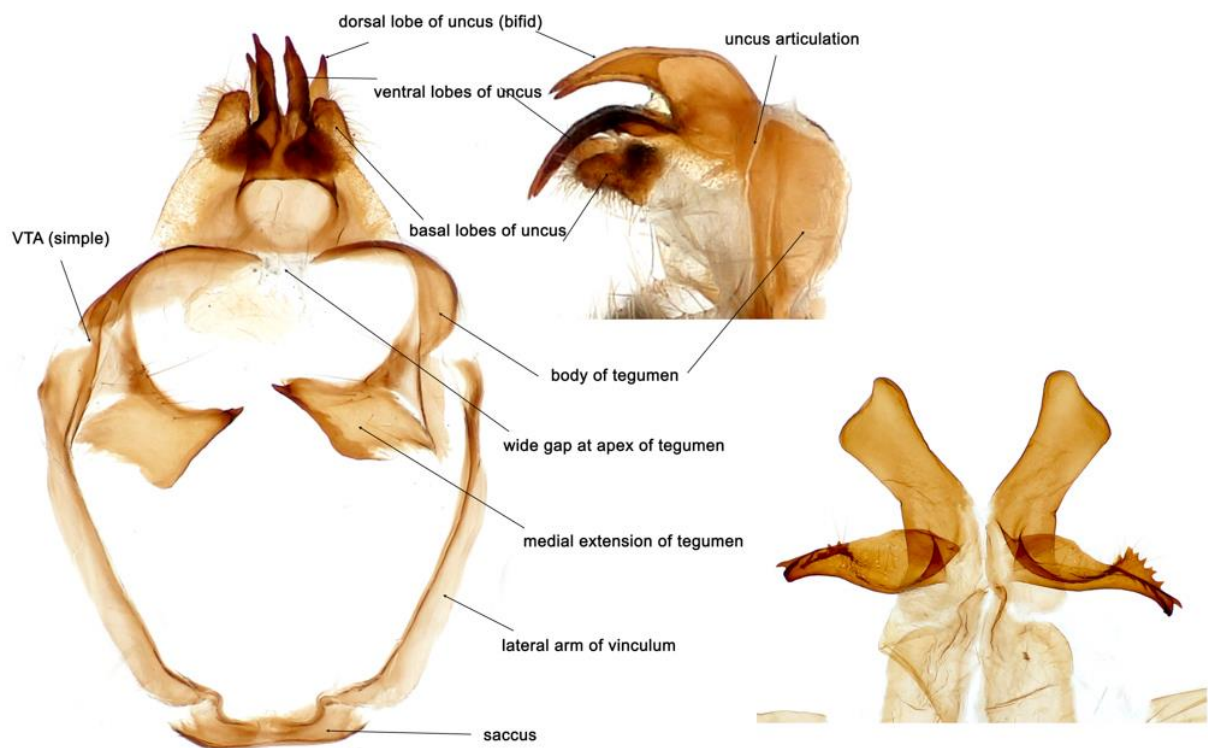


Figure 3: Left & top centre – VT-ring of *Clostera curtula* (Chocolate-tip) & lateral view of uncus. Right – uncus of *Pterostoma palpina* (Pale Prominent)

In *Ptilodon capucina* (figs. 2&4) (and other species in Subfamily; Notodontinae) the tegumen has a single sclerotised lamina with dorsal and ventral edges, continuous anteroventrally with the lateral arms of the vinculum. The dorsal edge connects to the A8-9 intersegmental membrane. The main articulation between the valva and the VT-ring is the standard one, between the external lamina of the valva and the ventral edge of the lateral arm of the vinculum via a narrow hyaline membrane, similar to what is seen in the Noctuidae. However, in the Notodontinae this connection is short and the articulation between the

valva and the VT-ring continues posterodorsally across the fused vinculum-tegumen articulation via a looser attachment to the ventral edge of the tegumen.

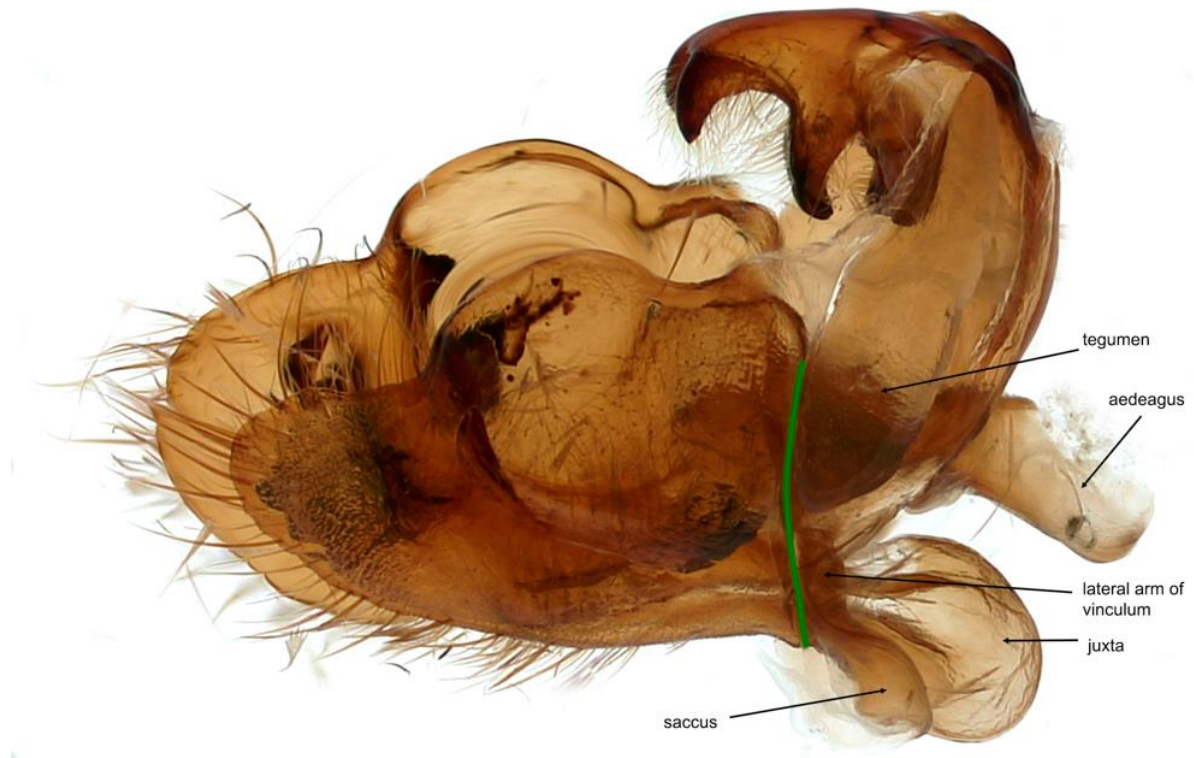


Figure 4: *Ptilodon capucina* (Coxcomb Prominent) lateral view of genitalia (natural) with valval articulation marked green

The VT-ring in Family: Erebidae

In Family: Erebidae there is usually some development of the *saccus* which may have a sclerotised dorsal lamina (eg *Tyria jacobaea* (fig.5), *Hypena proboscidalis* (fig. 6)) and the lateral arms of the vinculum are usually long.

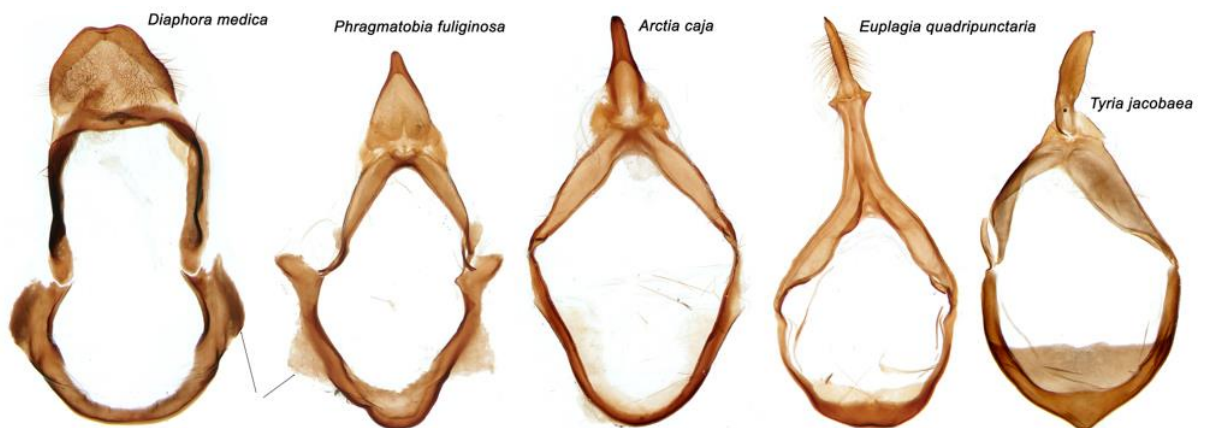


Figure 5: VT-rings of species from Tribe Arctiini (left to right: Muslin Moth, Ruby Tiger, Garden Tiger, Jersey Tiger, Cinnabar)

The vinculum of some species in Tribe: Arctiini shows a sclerotised expansion of the ventral lamina (arrowed in fig. 5) that appears to strengthen the connection to the A8-9 intersegmental membrane (eg *Diaphora mendica*, *Phragmatobia fuliginosa*, fig. 5).

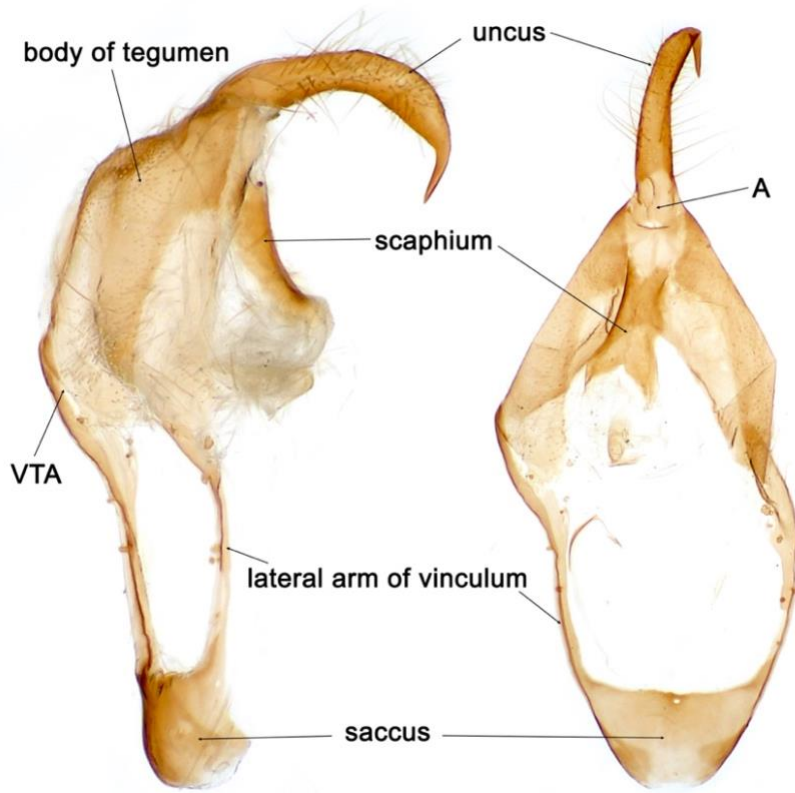


Figure 6: VT-ring of *Hypena proboscidalis* (Snout). Left – dorsolateral view (natural), right – ventral view (set). A – marks a deficiency of sclerotization at the base of the uncus.



Figure 7: Vinculum-Tegumen Articulation (VTA) of *Diaphora mendica* (Muslin Moth), *Nudaria mundana* (Muslin Footman) and *Tyria jacobaea* (Cinnabar)

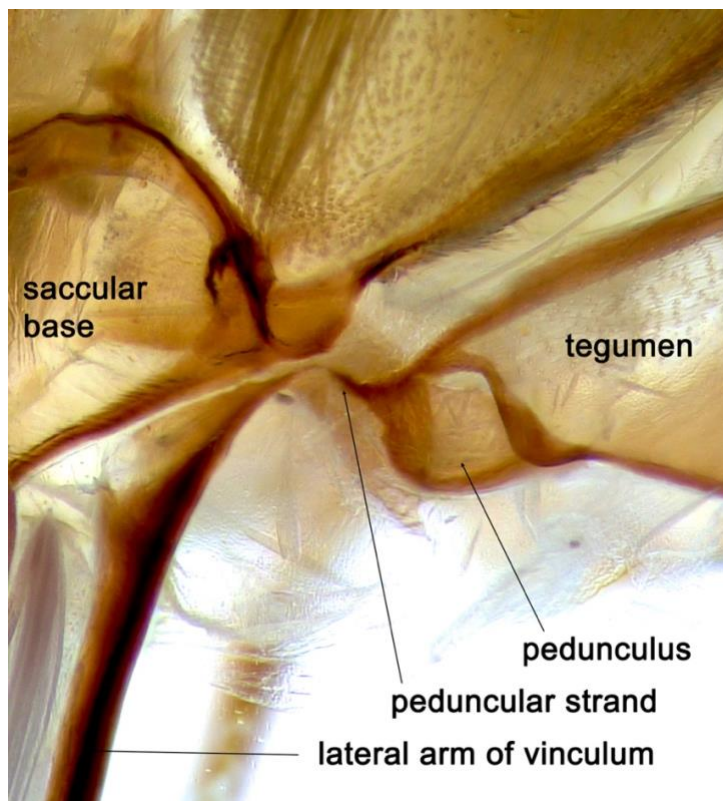
In some species the VTA is formed by a simple abutting of ends without overlap (eg *Diaphora mendica* (fig. 7), *Phragmatobia fuliginosa*). The most common arrangement involves a simple overlap, with the tapered end of the lateral arm of the vinculum abutting against the (natural) anterodorsal edge of the tegumen (in a set specimen the dorsal edge

usually becomes lateral) (eg *Hypena proboscidalis*, fig. 6). In some species the overlapping segment of the vinculum is modified as an articulating segment, generally by allowing greater flexibility of movement at its anterior end. In *Nudaria mundana* (fig. 7) this is achieved by a simple narrowing and a small kink (arrowed); in *Tyria jacobaea* (fig. 7) and *Schrankia costaestrigalis* there is a more obvious and distinct articulating segment.



The vinculum of *Eilema* species is modified to accommodate coremata. These species also have a distinctive VTA (figs. 8-10). The saccus is long, angular-U-shaped with narrow sclerotised margins, the anterior margin very narrow; with coremata set in a pouch at the anterior end of the dorsal lamina. The posterior ends of lateral arms expand a little to abut against the base of the sacculus near its junction with the costa, and there is no other sclerotised connection between valvae and vinculum.

Figure 8: Genitalia of *Eilema complana* (Scarce Footman) (natural)



The posterior edge of the hyaline dorsal lamina of the saccus attaches to the bases of the sacculi. The anterior ends of the tegumen are modified to form small pedunculi from which emerge a short peduncular strand. The VTA is represented by the tenuous connection between the posterior angle of the lateral arm of the vinculum and the apex of this peduncular strand (fig. 9).

Figure 9: VTA of *Eilema complana* (Scarce Footman)

In most species the tegumen is a simple quadrate to elongate arch with sclerotization of fairly constant width. In Tribe: Lithosiini the tegumen is composed of two plates connected by a dorsal midline suture (e.g. *Eilema complana*, fig. 10).



Figure 10: *Eilema complana* (Scarce Footman). Left - vinculum, right – tegumen

In *Phragmatobia fuliginosa* (Tribe: Arctiini) the tegumen has an external groove (as in *Stauropus fagi* in Family Notodontidae).

In most species the uncus is narrow-based, curved or flexed ventrally, laterally compressed in its apical half and has an apical point. These narrow-based unci are fused to the body of the tegumen dorsally but often show some deficiency of sclerotization at the base on the ventral side, which presumably facilitates articulation (arrowed A in fig. 6).

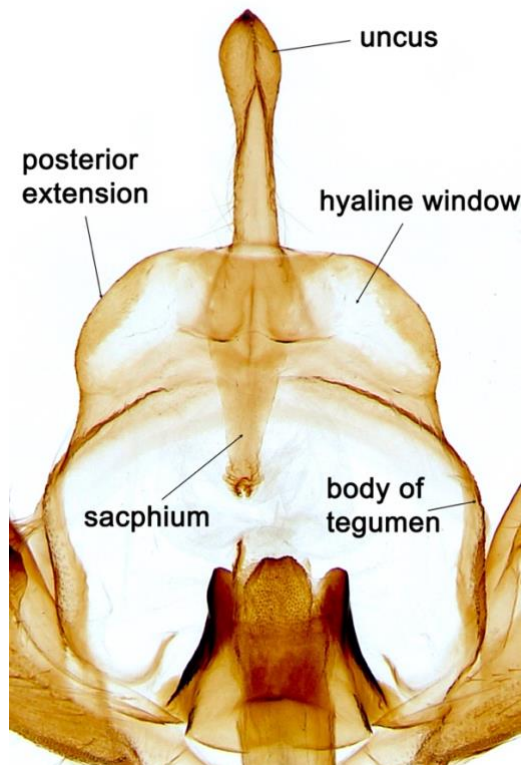


Figure 11: *Scoliopteryx libatrix* (Herald) - tegumen

In Tribes: Scoliopteryginae and Lithosiini there are well-developed posterior extensions with hyaline windows and a median band supporting the base of the uncus. These posterior extensions also curve ventrally, converge in the midline at the base of the uncus and then continue as a scaphium into the posterodorsal surface of the anal tube. The posterior extensions of *Scoliopteryx libatrix* (fig. 11) are exceptionally broad and strong. Posterior extensions are also seen in species of Tribe: Arctiini with a narrow uncus (eg *Tyria jacobaea*, fig. 5). Other species in Tribe: Arctiini have the uncus in the form of a broad hood with a more or less distinct line of articulation (e.g. *Phragmatobia fuliginosa*, fig. 5).

The anal tube in subfamilies: Hypeninae (e.g. *Hypena proboscidalis*, fig. 6) and Erebininae also has a strong scaphium but it is not supported by a posterior extension in these cases. Other species either have a diffuse scaphium or an anal tube without any sclerotised support.

Work to do:

Examine SF Lymantriinae

Especially Pale Tussock – which appears to lack an uncus, but Pierce says has a trifurcate uncus. Previous examination suggests that the trifurcate structure is a modification of dorsal

A8

The VT-ring in Family: Nolidae

In Subfamily: Nolinae (fig. 12) the vinculum is largely represented by the saccus with very short lateral arms. In *Meganola* the saccus is elongate V-shaped; in *Nola* it is shorter shield-shaped, with a sclerotised dorsal lamina. In Subfamily: Chloephorinae (e.g. *Pseudoips prasina*, fig. 13) the vinculum is narrow, elongate and simply rounded anteriorly, with little if any development of a saccus.

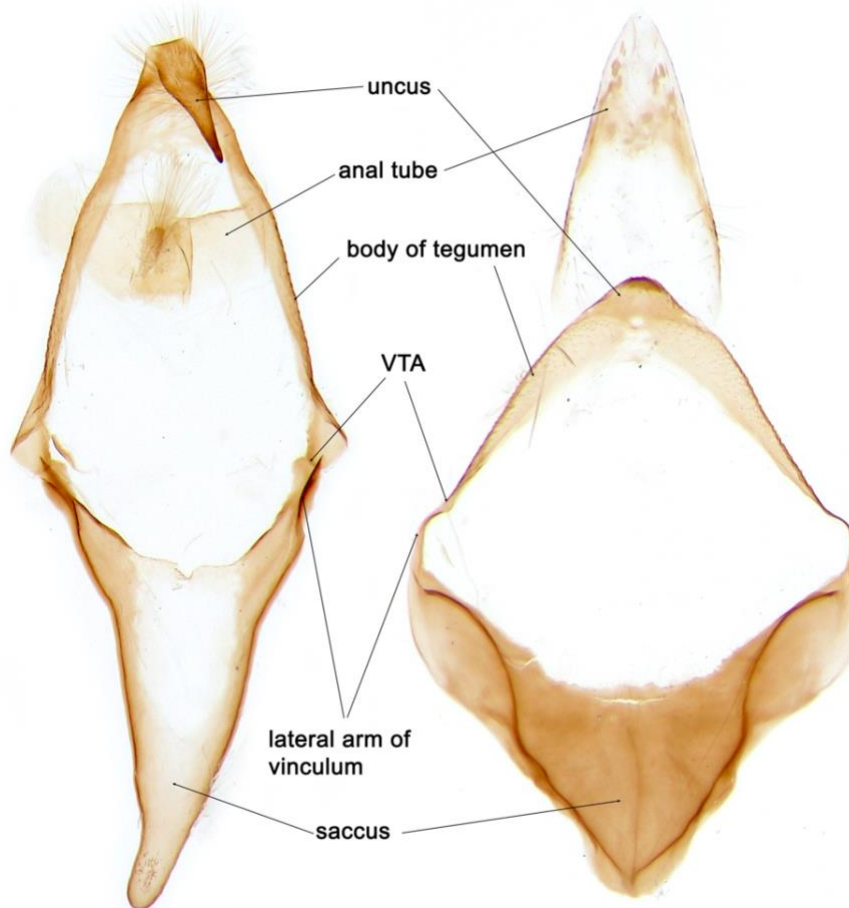


Figure 12: VT-rings of *Meganola albula* (Kent Black Arches) and *Nola cucullatella* (Short-cloaked Moth)

In the species examined in Subfamily: Nolinae, the VTA is formed by a simple abutment of the end of the vinculum and tegumen.

In Subfamily: Chloephorinae (fig. 14) the anterior end of the tegumen broadens such that in lateral view it has ventral and dorsal folds. The dorsal fold overlaps with the posterior end of the vinculum to form the articulation. (Although the ventral fold looks like it might connect to the costa, it doesn't).

In all species in Family: Nolidae the tegumen is a simple arch with a fused uncus. In *Meganola* and in Tribe: Chloephorini the uncus is narrow and elongate; in *Nola* (fig. 12) it is rudimentary and continuous with the contour of the body of the tegumen; in *Nycteola* (fig. 13) it is broad-based and tongue-shaped and in *Earis* (fig. 13) it is bifid.

The anal tube is fairly prominent in Subfamily: Nolinae (in *Nola* (fig. 12) it could be mistaken for an uncus); but is largely hyaline in Subfamily: Chloephorinae.



Figure 13: Left – *Pseudoips prasina* (Green Silver-lines) VT-ring (set); centre – *Earias chlorana* (Cream-bordered Green Pea) VT-ring (set); top right – *Earias chlorana*, uncus in ventrolateral view (natural); bottom right – *Nycteola revayana* (Oak Nycteoline) – apex of tegumen to show uncus (set)

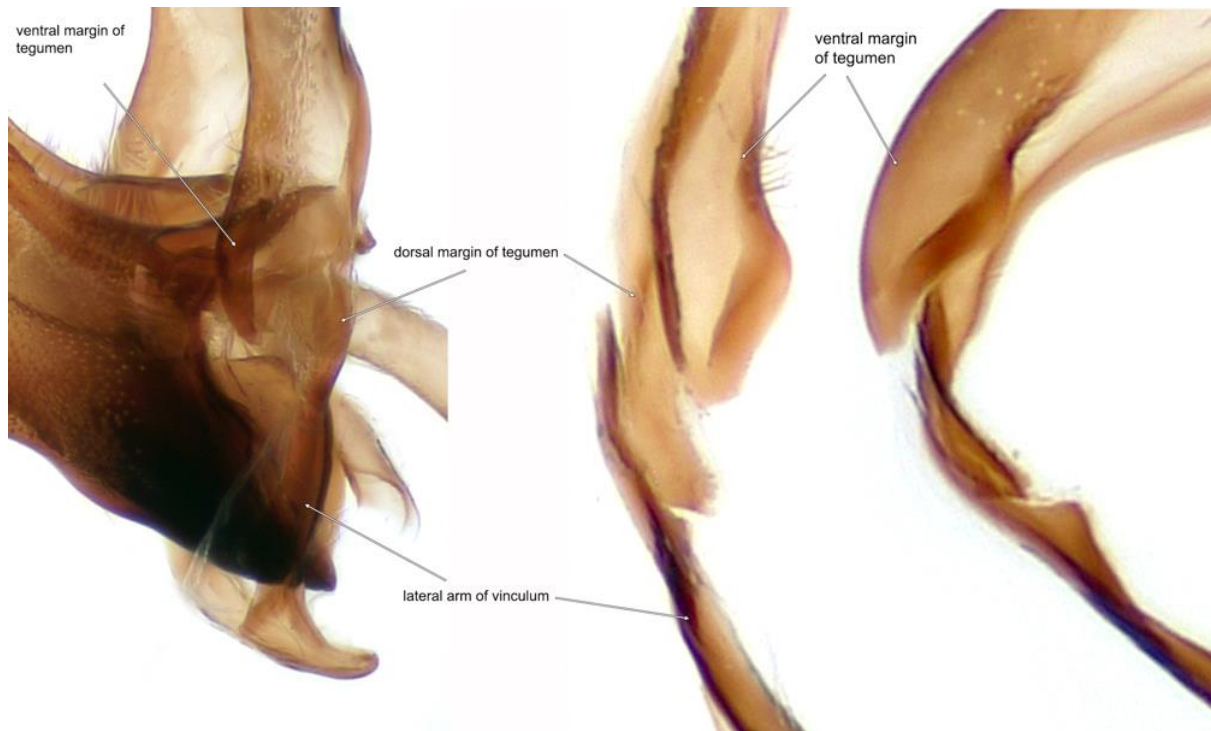


Figure 14: *Earias chlorana* (Cream-bordered Green Pea) vinculum-tegumen articulation. Left – detail of genitalia in lateral view (natural); centre – detail of VT-ring in ventrolateral view (natural); right – detail of VT-ring in ventral view (set)

2) The valva in Superfamily: Noctuoidea

Overview

There is almost limitless variation in valval form amongst the species in the superfamily. The degree of differentiation of parts ranges from a simple undifferentiated sac to almost complete division into saccular and costal components. Within the superfamily, development of a cucullus is only seen in Family: Noctuidae.

The valva in Family: Notodontidae

Valval features vary considerably amongst the species of Family: Notodontidae. Some of these variations follow subfamily taxonomic lines. A particular feature seen in many species is a strong fusion of the valvae to the juxta such that the valvae and juxta operate as a single unit and the valvae have limited ability to open out one from the other.

In subfamily: Thaumetopoeinae the valva is a simple undifferentiated flap, with no significant areas of strengthening. ([get image](#))

In subfamily: Cerurinae (e.g. *Furcula furcula*, fig. 15) the valva is strengthened in a continuous strong band extending from the base of the saccular margin, along the basal margin of the external lamina and along the costal margin. In *Cerura* the strengthening doesn't reach the apex of the costal margin and there is no further strengthening of the internal lamina. In *Furcula* the costal strengthening extends to the valval apex where it is produced as a short apical process; and there is an additional sclerotised arc on the internal lamina extending from the costal margin proximally, subbasally and then along the saccular margin.

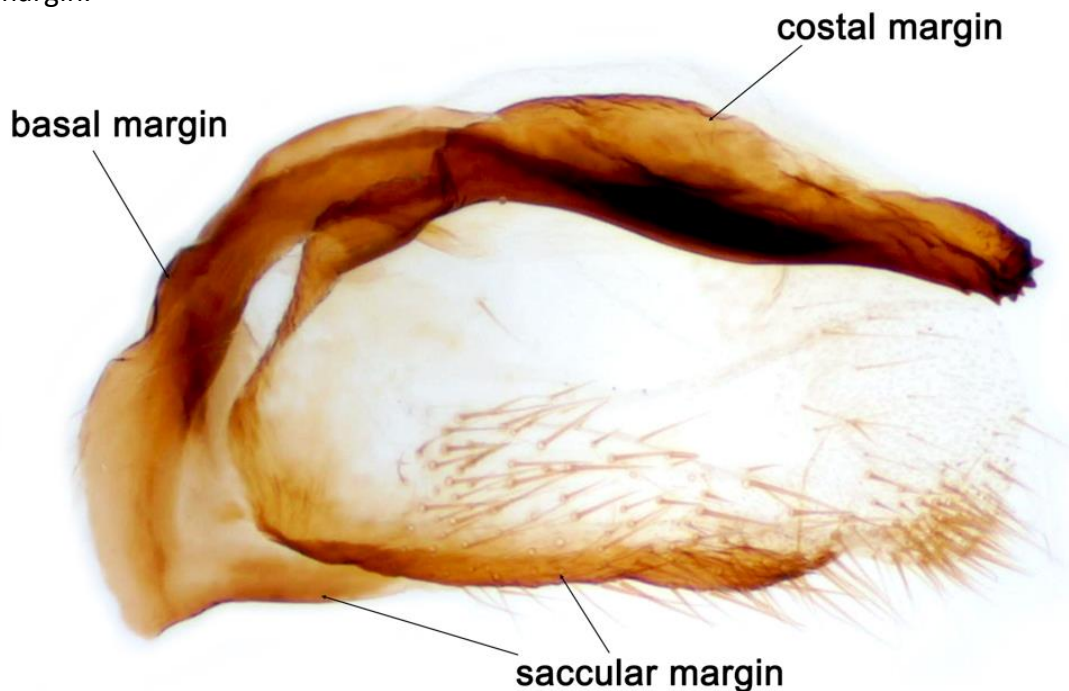


Figure 15: Valva of *Furcula furcula* (Sallow Kitten)

In subfamily: Dicranurinae (e.g. *Stauropus fagi*, fig. 16) the valvae are firmly, extensively and inseparably fused to the juxta. Some attempt can be made to identify the components of this fused structure, as indicated in fig. 16. The only close connections between the fused valvae/juxta and the VT-ring are a sclerotised but separable connection between the anterior margin of the juxta and the saccus and a hyaline connection between the costal component of the valva and a medial extension of the tegumen. The lateral arms of the vinculum are connected to the valvae by a broad loose hyaline membrane.

Subfamily: Notodontinae (e.g. *Drymonia dodonaea*, fig. 17) also has the valvae inseparably fused to the juxta with the fused structure strongly connected to the vinculum in the midline. The valvae usually show strengthening of the costal and saccular margins and a, usually limited, degree of differentiation of costal and saccular sclerotisations. Most species show some ornamentation of the internal lamina or apex, usually in the form of strongly raised carinae, but it is often not possible to assign this ornamentation as saccular or costal in origin.

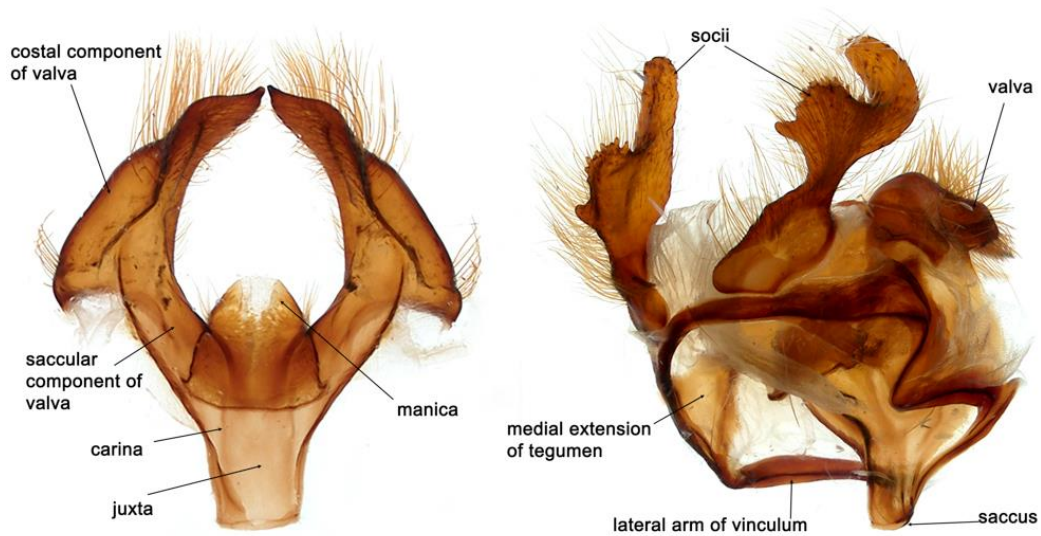


Figure 16: *Stauropus fagi* (Lobster Moth) left – valvae and juxta (set), right – dorsolateral view of genital capsule (natural)

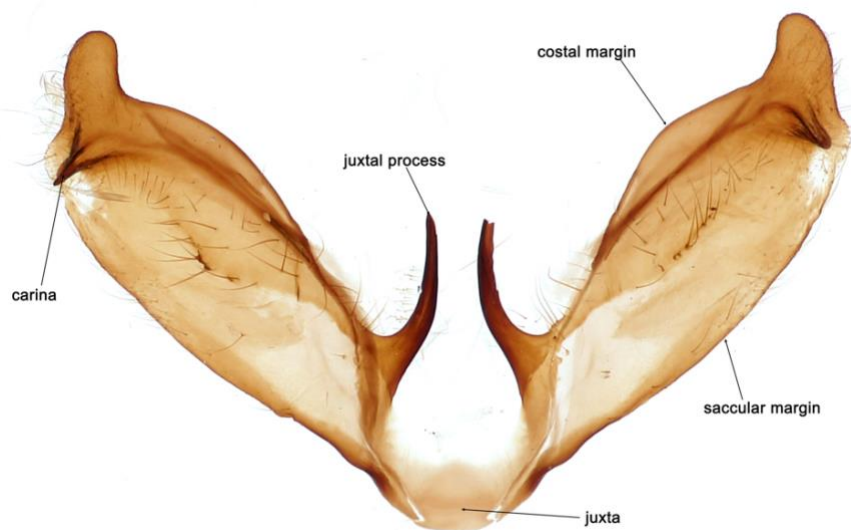


Figure 17: *Drymonia dodonaea* (Marbled Brown) - Valvae and juxta

In most species with this fused arrangement the juxta completely separates the valvae such that the midline connection is between the juxta and the vinculum. In *Notodonta dromedarius* (fig.18), however, the saccular margins of the two valvae meet anterior to the juxta, such that the midline connection is between the saccular margins and the vinculum (A in fig. 18). This species has a hyaline fold on the internal lamina between the saccular margin and the opposing edge of the costal sclerotization – the base of the sclerotization of this opposing edge attaches to the lateral margin of the juxta (B in fig. 18) (as does the base of the hyaline fold between this point and the saccular margin).

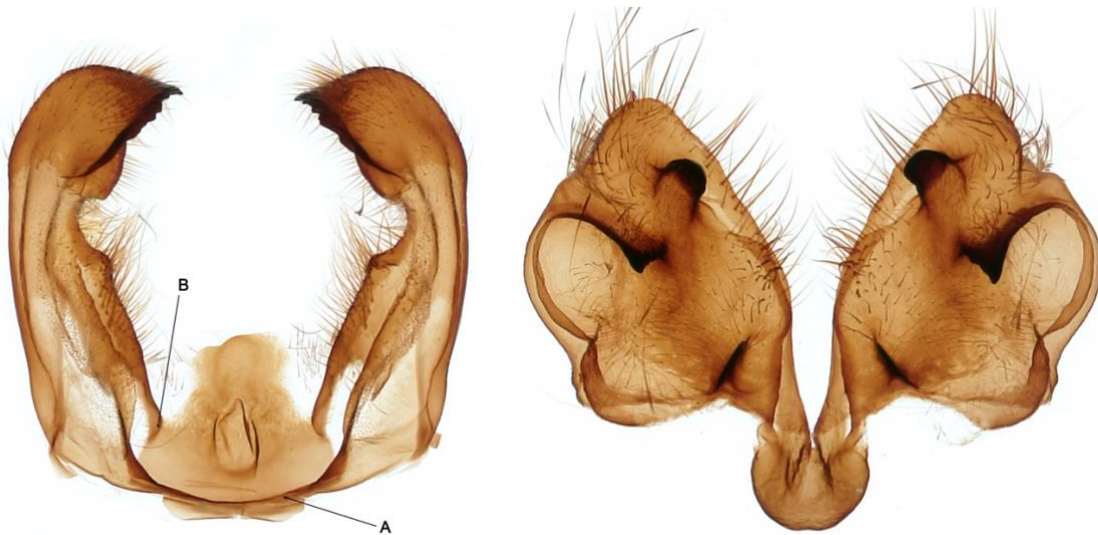


Figure 18: Valvae and vinculum of: left – *Notodonta dromedarius* (Iron Prominent), right – *Ptilodon capucina* (Coxcomb Prominent).

Pterostoma palpina (fig. 19) is unusual amongst the Notodotidae. The valvae are not fused with the juxta and are more clearly differentiated, with a distinct strong saccular sclerotization.



Figure 19: *Pterostoma palpina* (Pale Prominent) valva

In *Odontisia carmelita* (fig. 20) and *Ptilophera plumigera* there is a strong connection between a large juxta and the valvae. The juxta has a broad hyaline connection to the saccus and the valvae appear to have the more usual close connection between their external laminae and the lateral arms of the vinculum.

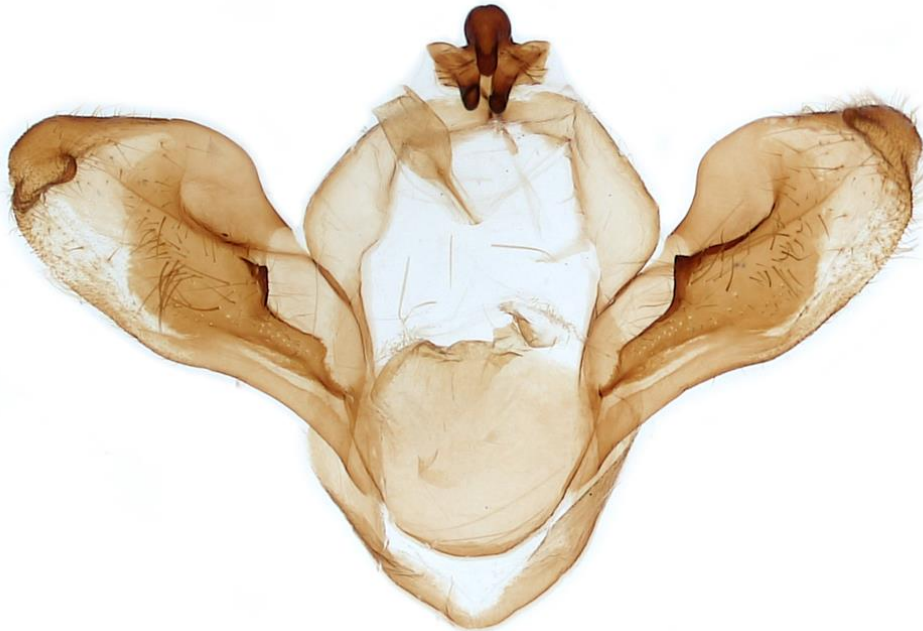


Figure 20: *Odontisia carmelita* (Scarce Prominent) genitalia with aedeagus removed (set)

In subfamily: Pygaerinae (e.g. *Clostera curtula*, fig. 21) the valvae are again fused very strongly to the juxta, and there is little indication as to the limits of each component structure. The valvae have a flimsy hyaline external lamina and a strongly ridged and darkened internal lamina; the ridges are densely set with hair scales. The sclerotised components appear to be entirely saccular in origin; the costal area being entirely hyaline but connected to a medial extension of the tegumen – leading to the possibility that this medial extension is derived from the costa.



Figure 21: *Clostera curtula* (Chocolate-tip) left – valvae and juxta, right – VT-ring

The valva in Family: Erebidae

There is considerable variation in valval form in Family: Erebidae. Most species show some differentiation of costal and saccular components and a standard articulation between the external lamina and the lateral arm of the vinculum. Some of the variation follows subfamily taxonomic lines.

Subfamily: Scoliopteryginae

In *Scoliopteryx libatrix* (fig. 22) the valva is almost completely divided into costal and saccular components.



Figure 22: *Scoliopteryx libatrix* (Herald) valva (detail of set specimen of genitalia)

Subfamily: Rivulinae

In *Rivula sericealis* (fig. 23) the valvae are simple and poorly sclerotised, with just a little strengthening at the bases of the costal and saccular margins. The saccular margin extends anterior to the juxta but does not quite meet its partner in the midline.



Figure 23: *Rivula sericealis* (Straw Dot) valva and juxta (set)

Subfamily: Hypeninae

In *Hypena* species (e.g. *Hypena proboscidalis*, fig. 24) the valva is simple in outline but shows some differentiation of the internal lamina into costal and saccular sclerotisations.

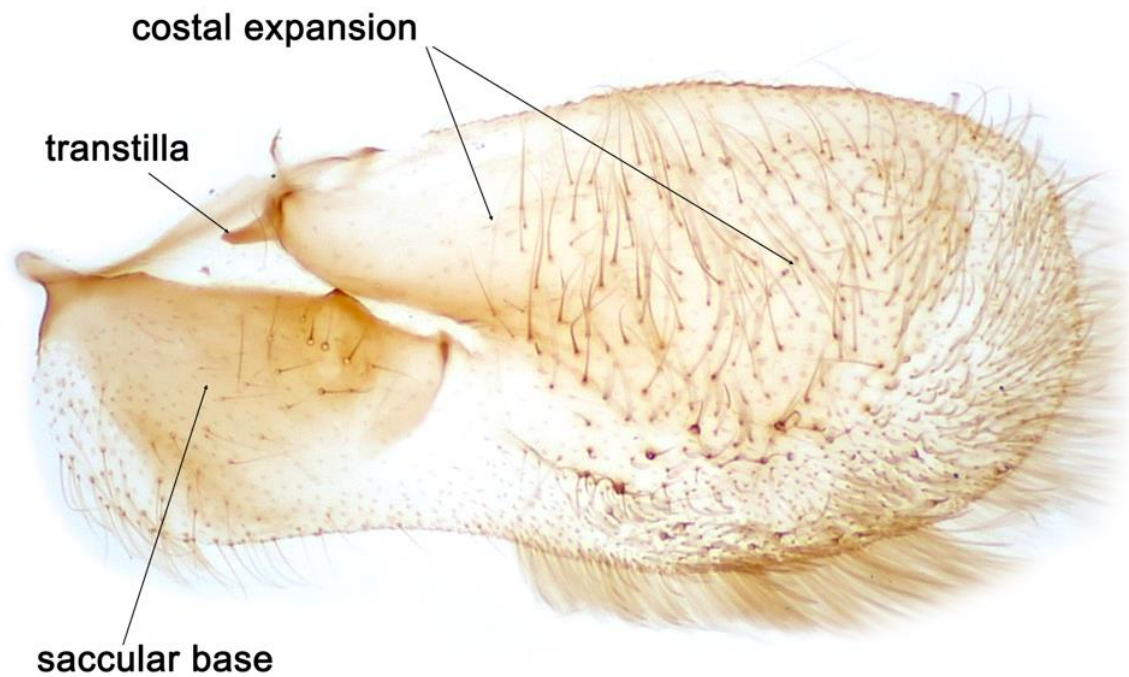


Figure 24: *Hypena proboscidalis* (Snout) valva

Subfamily: Lymantriinae

In most species in the valva is strongly sclerotised.

Tribe: Leucomini

In Tribes: Lymantriini (e.g. *Lymantria dispar*, fig. 25) and Nygmiini (e.g. *Euproctis chrysorrhoea*, fig. 25) the valva is ~fully sclerotised on both laminae, has a bluntly produced costal margin but is otherwise undifferentiated.

The species in tribe: Orgyiini (fig. 26) have a more differentiated valva, but the pattern of differentiation differs considerably between the genera. *Calliteara pudibunda* has a well-demarcated, well-sclerotised saccular base and a simple rounded largely hyaline costal region. *Dicallomera fascelina* has a short well-sclerotised costal base, the remainder of the valva being largely undifferentiated, but continuous with the sclerotised saccular base. *Orgyia antiqua* has a complete division of the apical half of the valva into a well-sclerotised curved costal process and a less well-sclerotised broader saccular extension.

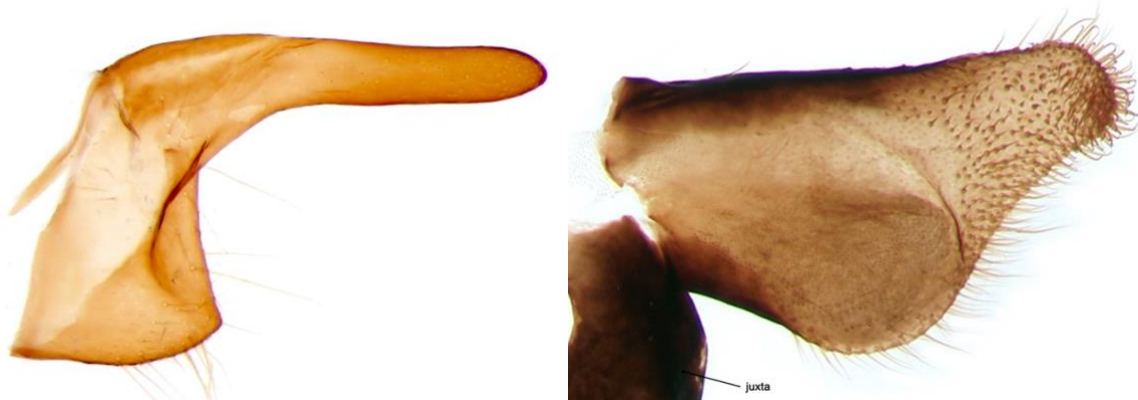


Figure 25: valvae. Left – *Lymantria dispar* (Gypsy Moth), right – *Euproctis chrysorrhoea* (Brown-tail)



Figure 26: Valvae. Left – *Calliteara pudibunda* (Pale Tussock), centre – *Dicallomera fascelina* (Dark Tussock) and right – *Orgyia antiqua* (Vapourer)

Subfamily: Arctiinae

The valvae in Tribe: Arctiini are well-sclerotised, especially on the external lamina. In most species there is a strong connection to the juxta such that it is not possible to set the valvae in the standard internal lamina up position without considerable disruption of the connections between valvae, juxta and vinculum.

In most species the base of the saccular margin extends medially to attach to the anterior edge of the juxta. In *Phragmatobia fuliginosa* the two saccular margins meet in the midline but in most species there is a short midline gap between them (e.g. *Spilosoma lubricipeda*, fig.27).

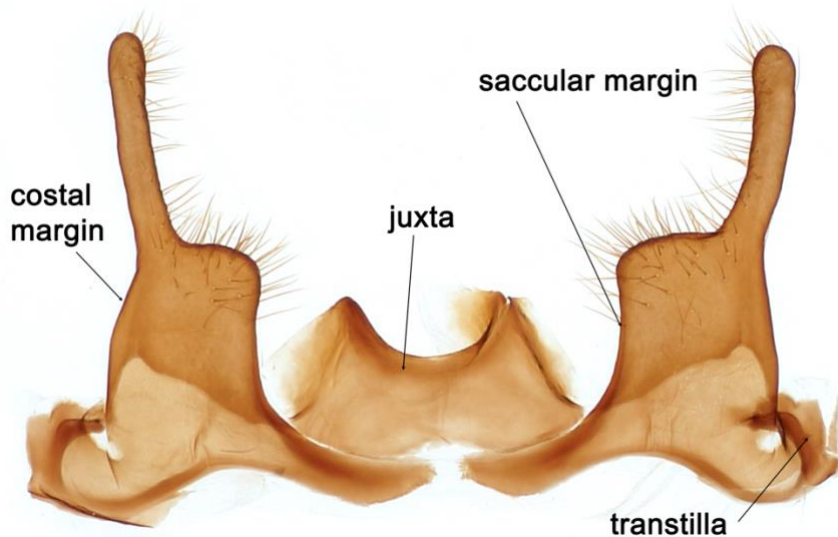


Figure 27: *Spilosoma lubricipeda* (White Ermine) – valvae and juxta (set with external lamina up)

Species show a range of variation in the degree of differentiation from largely undifferentiated (e.g. *Spilosoma* (fig. 27), *Phragmatobia* (fig. 28)) through limited differentiation (e.g. *Arctia* species, fig. 29)) to almost complete differentiation (eg *Euplagia quadripunctaria* (fig. 30), *Tyria jacobaea* (fig.31)).

In *Arctia caja* (fig. 29) the costa is strongly developed and supports an equally strong transtilla; the remainder of the sclerotization is largely on the external lamina, and on the fold at the saccular margin; the two margins meeting in a rounded apical process.

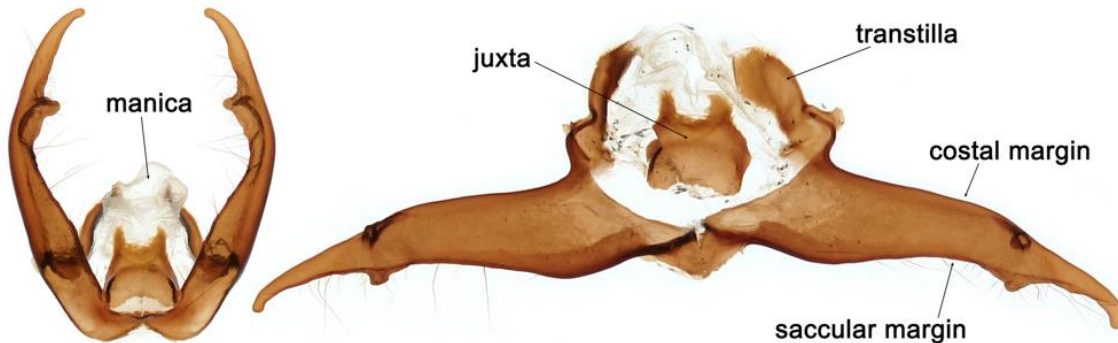


Figure 28: *Phragmatobia fuliginosa* (Ruby Tiger) valvae and anellus. Left – natural, right – set

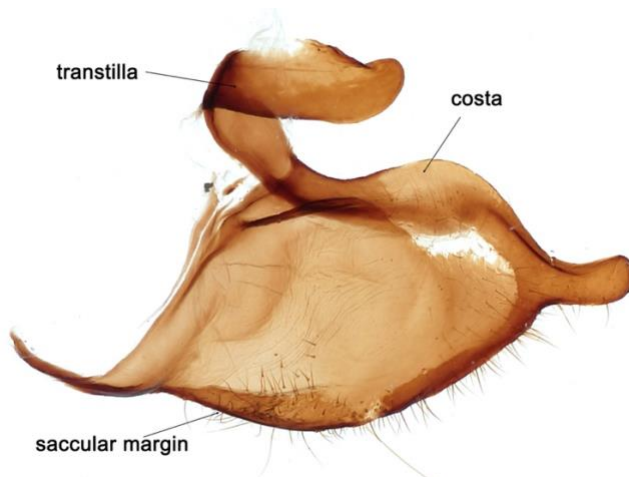


Figure 29: *Arctia caja* (Garden Tiger) valva

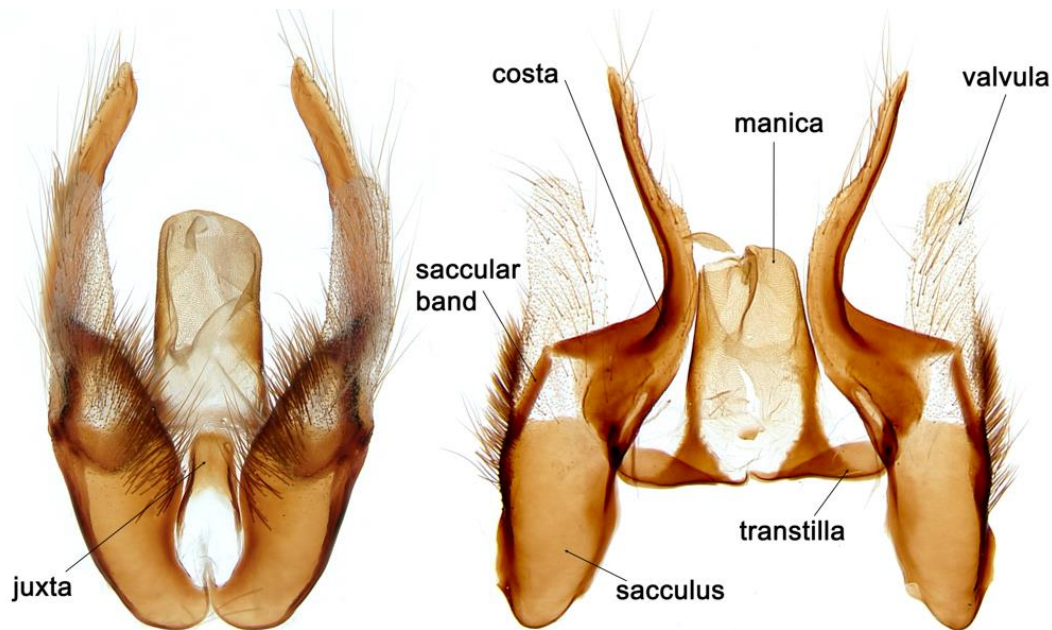


Figure 30: *Euplagia quadripunctaria* (Jersey Tiger) left – valvae and anellus (natural), right – valvae, transtilla and manica (juxta removed) (set)

In *Euplagia quadripunctaria* (fig. 30) the saccular base is sclerotised on its external lamina and on the saccular margin; at the distal end of this sclerotised area a saccular band extends from the saccular margin to meet the costal sclerotization; distal to this the sacculus forms a long stippled hyaline valvula. The costa is strongly sclerotised, produced distally as a long apical process, proximally/medially as a strong transtilla and extends into both laminae in its basal region.

In *Tyria jacobaea* (fig. 31) the valvae are almost completely differentiated into costal and saccular plates. The saccular base has a well-sclerotised external lamina and margin and a largely hyaline internal lamina apart from a small saccular band; distal to this sclerotised region the sacculus forms a broad valvula. The costa is well-sclerotised at the margin, extending distally to a blunt apical process and proximally/medially into a strong transtilla; it also expands into the internal lamina where it forms a distinct opposing edge.

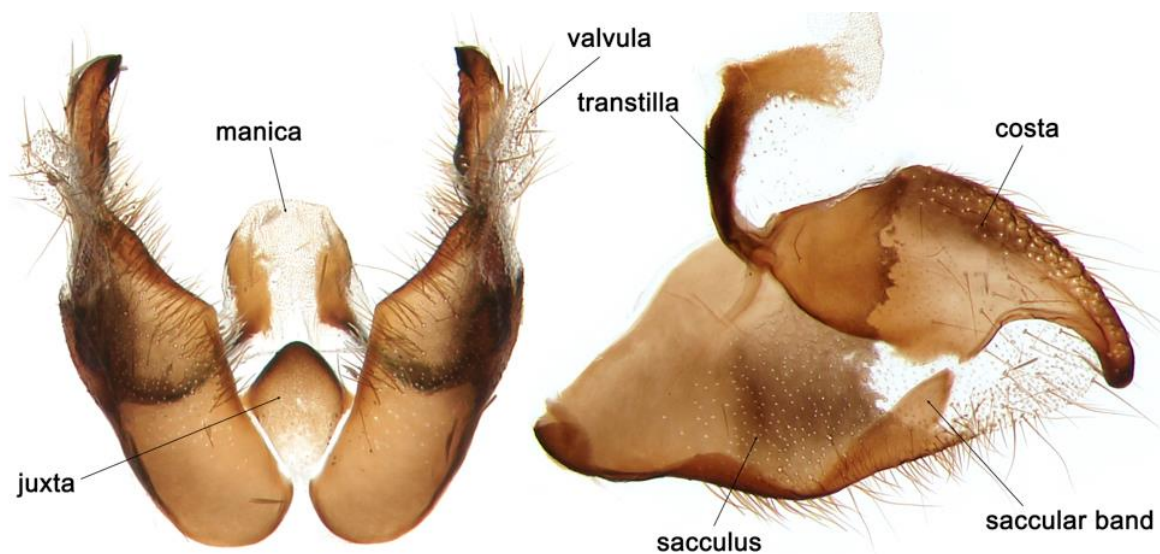


Figure 31: *Tyria jacobaea* (Cinnabar) left – valvae and anellus (natural), right – valva (set)

Parasemia plantaginis has a free process at the proximal end of the costal margin (arrowed "X" in fig. 32), the nature of which is open to interpretation. If it was not present, I would have no hesitation in labelling "Y" as the costa. This valva looks similar to how that of *Arctia caja* (fig. 29) would look if the transtilla had become detached from the costal base. On this basis I think that "X" is a free transtilla and a feature of the diaphragm rather than the valva. However, it should be noted that Pierce interprets it as a free costa and a glance at fig. 34 gives some credence to that view.

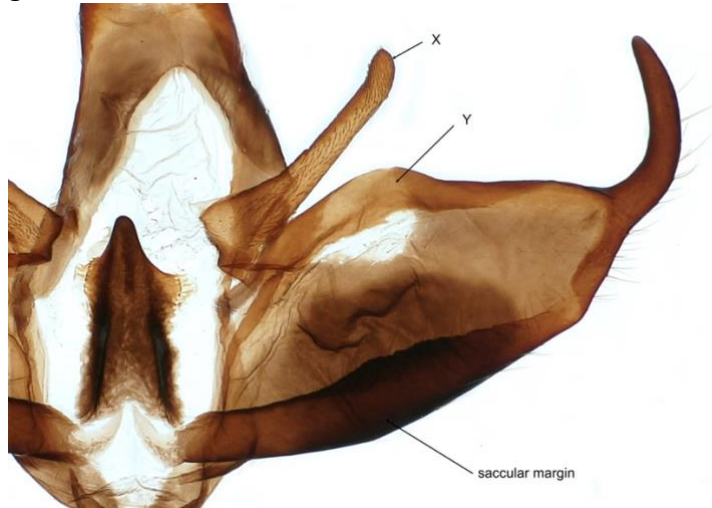


Figure 32: *Parasemia plantaginis* (Wood Tiger) valva

Most species in tribe: Lithosiini show some degree of valval differentiation, a weakly sclerotised costa (and a correspondingly weak transtilla) and a saccular apical process. In *Nudaria mundana* this is the other way round with a weakly sclerotised saccular region and a costal apical process (fig. 33).



Figure 33: Valvae of *Nudaria mundana* (Muslin Footman) and *Eilema complana* (Scarce Footman)

Atolmis rubricollis (fig. 34) has an additional saccular marginal process.

Eilema griseola (fig. 34) is unusual amongst the Eribidae in having a consistent asymmetry of the valvae (see also subfamilies: Herminiinae and Erebiniae). It has an expanded quadrangular saccular plate with a short anterolateral process on the right and longer posterolateral processes on both sides. The costal sclerotization is reduced to a narrow finger along the costal margin, almost completely separated from the saccular sclerotisation by a stippled-hyaline membrane, with a small setose carina at its base where the two sclerotisations meet on the internal lamina. (It differs from other *Eilema* species by sufficient a degree to question its inclusion in the same genus).

In most *Eilema* species the saccular bases are firmly connected in the midline.

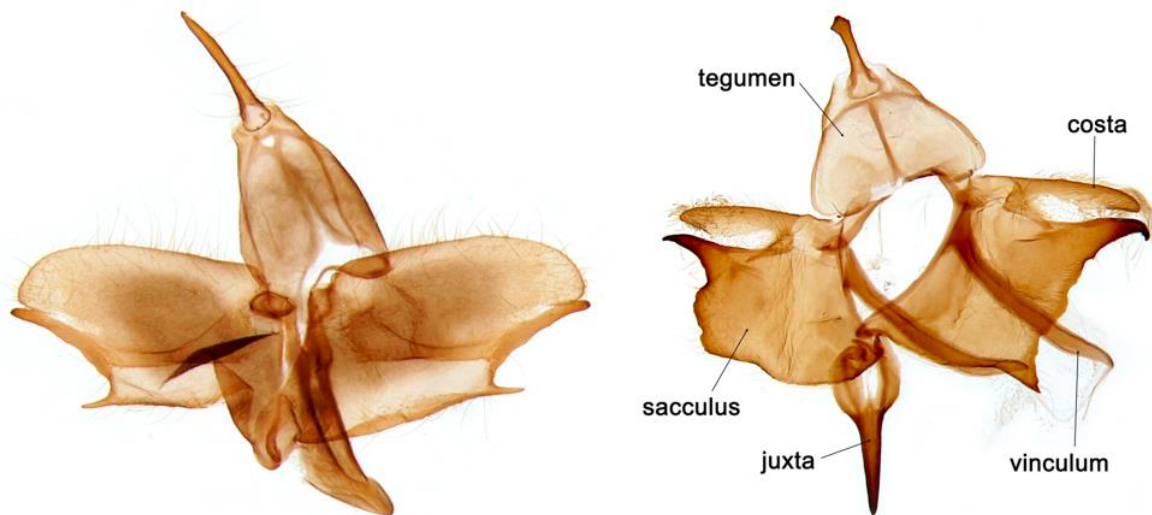


Figure 34: Left – *Atolmis rubricollis* (Red-necked Footman), right – *Eilema griseola* (Dingy Footman) genitalia, aedeagus removed (set)

Thumatha senex and *Lithosia quadra* (fig. 35) both show a carinate process on the internal lamina arising from the base of the costa; in the former the process is bifid, in the latter it is dentate.



Figure 35: Valvae. Left – *Thumatha senex* (Round-winged Muslin), right – *Lithosia quadra* (Four-spotted Footman)

Subfamily: Herminiinae

The valvae are connected to each other in the midline and also have a sclerotised connection to the juxta, such that it is impossible to set the valvae in the standard position without considerable disruption. Some species show (intraspecific) variability in the detail of the shape of the distal valval edge and of papillae arising from the costal sclerotisation, including asymmetry between the two valvae of an individual – but this does not amount to a consistent asymmetry between right and left valva in any one species.

In *Herminia tarsipennalis* and *Pechipogo plumigeralis* (fig. 36) sclerotisation of the valvae is almost entirely on the external lamina. There is little differentiation as such, but there is a concavity of the distal margin between extensions at the distal end of both saccular and costal margins. Note that the male genitalia of these two species are more similar to each other than the *Herminia* species are to each other (compare with fig. 37).

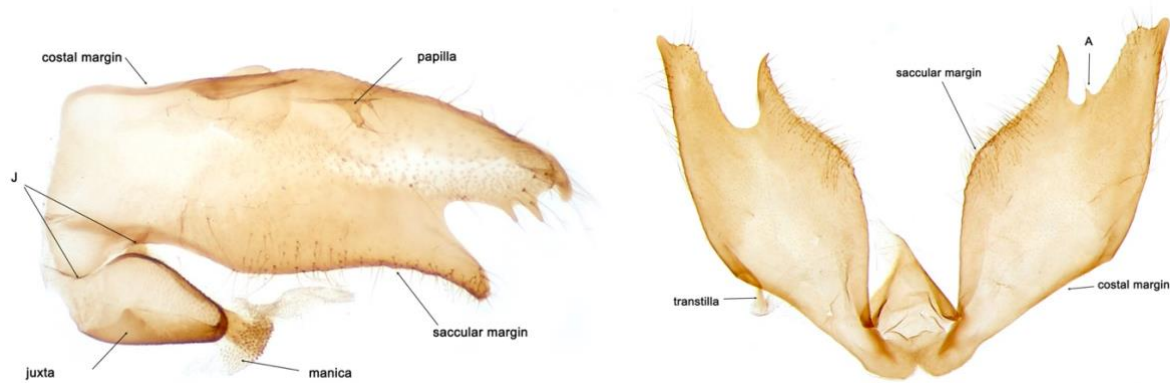


Figure 36: Left – *Herminia tarsipennalis* (Fan-foot) valva and juxta (set), J shows connection points between juxta and valva. Right – *Pechipogo plumigeralis* (Plumed Fan-foot) valvae and juxta (set, external laminae up), A shows a variable asymmetry

Herminia tarsicrinalis (fig. 37) has a discrete short thickening of the costal margin (and a correspondingly strong transtilla) and the rest of the valva is a simple long stippled hyaline sac with a rounded apex. *Herminia grisealis* (fig. 37) has a longer more expanded costal sclerotization with a small apical process and also shows some development of a saccular sclerotization.



Figure 37: Left – Genitalia with aedeagi removed. Left – *Herminia tarsicrinalis* (Shaded Fan-foot), right – *Herminia grisealis* (Small Fan-foot).

Subfamily: Hyenodinae

These species have a well-developed sacculus and little strengthening of the costa. In *Schrankia* species (fig. 38) there is a well-sclerotised saccular base which is produced distally as a saccular flap which crosses a saccular band which gives origin to a strong broad saccular process. The remainder of the valva is an undifferentiated stippled-hyaline sac.

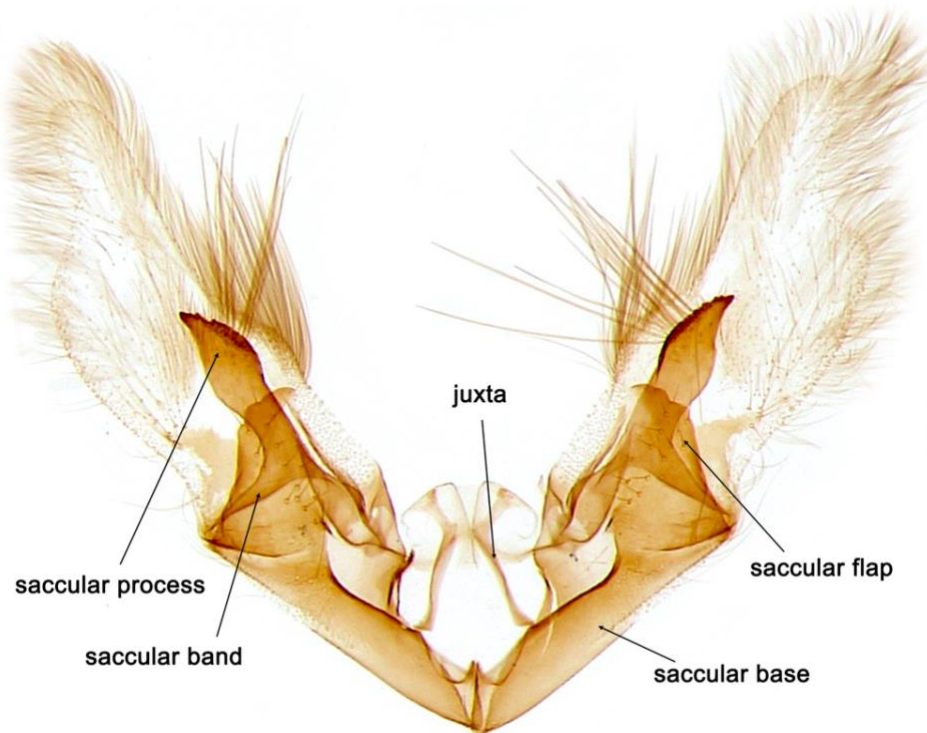


Figure 38: *Schrankia taenialis* (White-lined Snout) valvae and juxta

Subfamily: Toxocampinae

In *Lygephila pastinum* (fig. 39) the valva is almost completely divided into saccular and costal sclerotizations in the long axis of the valva. There is little adornment, but the sacculus has a fish-tail shaped subapical process and the costa has a basal carina supporting a short transtilla.

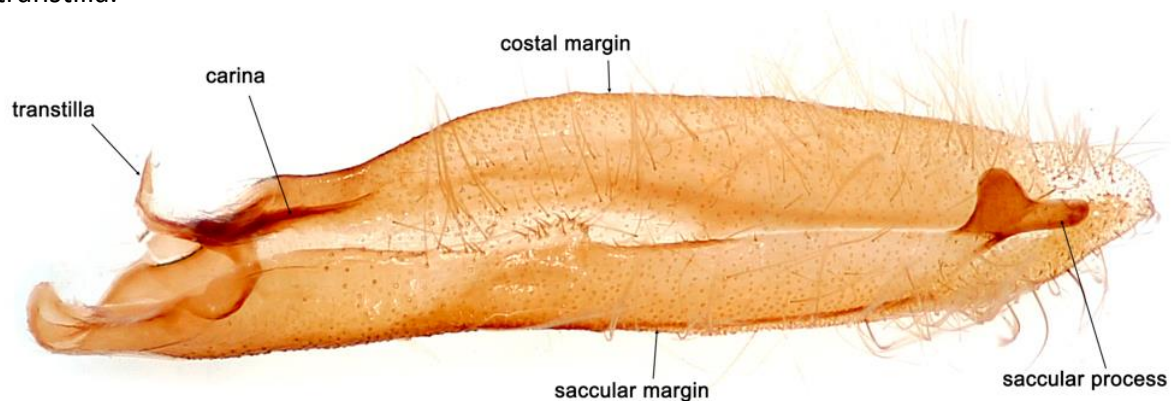


Figure 39: *Lygephila pastinum* (Blackneck) valva

Subfamily: Boletobiinae

There is little consistency of valval form amongst the genera in this subfamily. In *Parascotia fuliginaria* (fig. 40) the external lamina and saccular margin are well-sclerotised but the internal lamina is largely hyaline. There is a fully sclerotised process at the distal end of the saccular margin; a smaller sclerotised process midway along the costal margin; in the concavity between these two processes is an unsclerotised digitate process; and proximal to the costal process, with a sclerotised attachment to it, is a protrusion from the costal margin with an unsclerotised base and a sclerotised setose apex. The costal margin is otherwise unstrengthened.

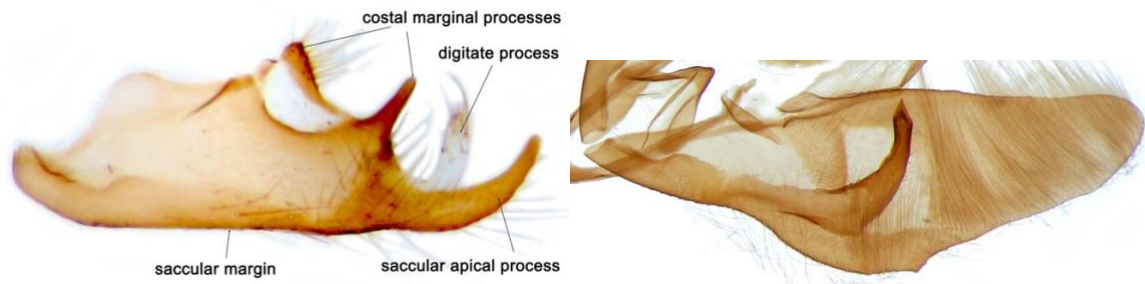


Figure 40: valvae. Left – *Parascotia fuliginara* (Waved Black), right – *Phytometra viridaria* (Small Purple-barred)

Phytometra viridaria (fig. 40) has a substantial saccular process arising from a saccular band.

In *Laspeyria flexula* the valva is unadorned apart from a small broad rounded process protruding from the base of the costal margin. In *Trisateles emortualis* (fig. 41) the long well-sclerotised saccular base ends in a saccular band with a pair of process at its distal end, one broad, the other narrow; the costa is strengthened in its basal half and has a weakly sclerotised apical process.

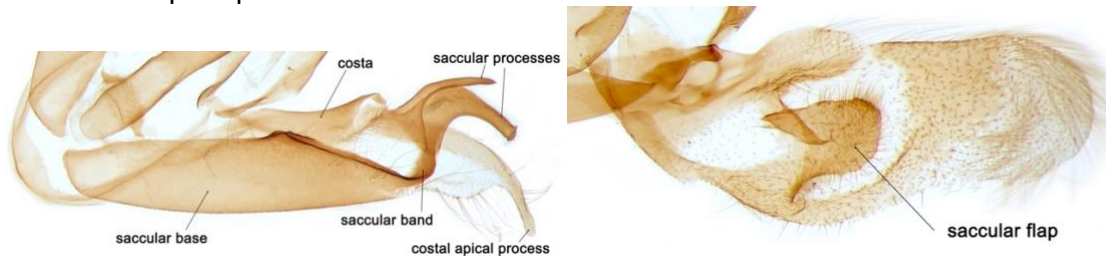
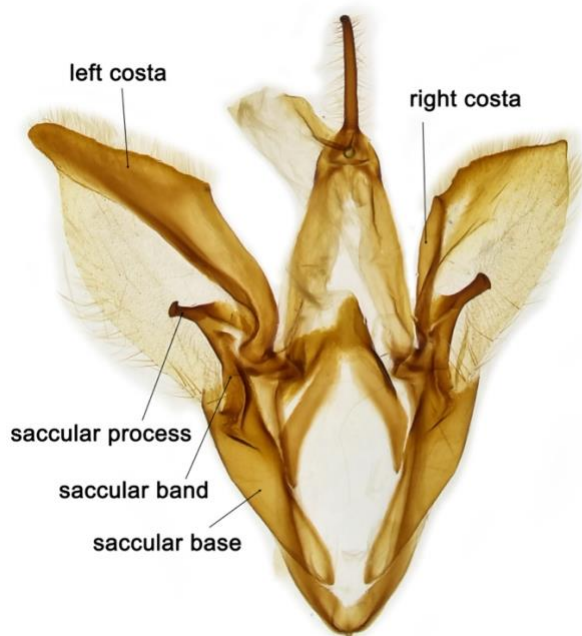


Figure 41: valvae. Left – *Trisateles emortualis* (Olive Crescent), right – *Eublemma ostrina* (Purple Marbled)

Eublemma species (e.g. *Eublemma ostrina*, fig. 41) have generally weakly-sclerotised valvae with a broad saccular flap extending distally from the saccular base.

Subfamily: Erebinae



In Tribe: Catocalinae the well-sclerotised saccular base gives rise to a saccular band with a strong process and the costal margin is well-sclerotised to the apex. In *Catocala nupta* and *Catocala electa* (fig.42) (and possibly in other members of the genus) this costal sclerotization is asymmetrical with the left costa longer and stronger than the right.

Figure 42: *Catocala electa* (Rosy Underwing) genitalia, aedeagus removed (set)

In Tribe: Euclidiini, *Euclidia glyphica* shows extreme valval asymmetry ([examine this](#)) and *Callistege mi* ([examine this](#))

The valva in Family: Nolidae

Subfamily: Nolinae

The valvae are well-differentiated. In *Meganola* (e.g. *Meganola albula*, fig.43) the saccular sclerotisation has a small saccular base, with the two sides connected in the midline and a strong basal margin on the external lamina; and a short saccular band with a strong complex process. The costal component of the valva is almost entirely distal to the saccular component. The costal margin is strengthened almost to the apex and has an expansion in the internal lamina, the base of which approaches the saccular band.

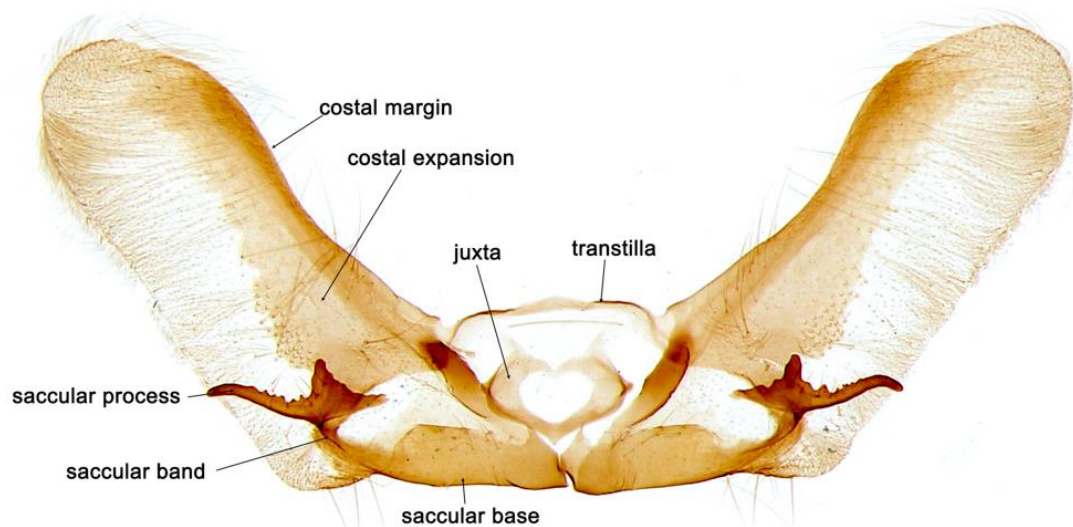


Figure 43: *Meganola albula* (Kent Black Arches) valvae, juxta and transtilla

In *Nola* (e.g. *Nola cucullatella*, fig. 44) the valva is almost completely divided into sacculus and costa.

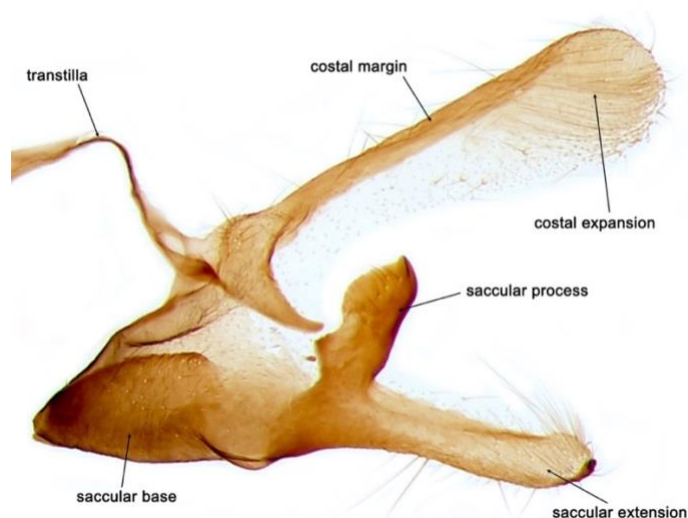


Figure 44: *Nola cucullatella* (Short-cloaked Moth) – valva

Subfamily Chloephorinae

The valvae in this small subfamily shows an astonishing diversity of valval features.

Tribe Chloephorini (fig. 45)

Bena bicolorana has a weakly sclerotised and almost entirely undifferentiated and unornamented valva, the only significant sclerotisation being at the base of the costa in support of a relatively strong transtilla.

Pseudoips prasina has the saccular base expanded anteriorly to form a corematal pouch.

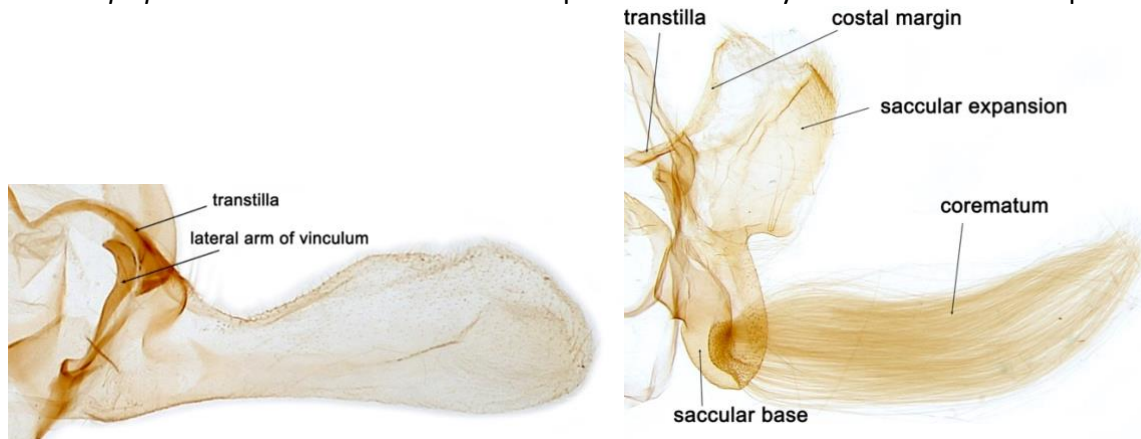
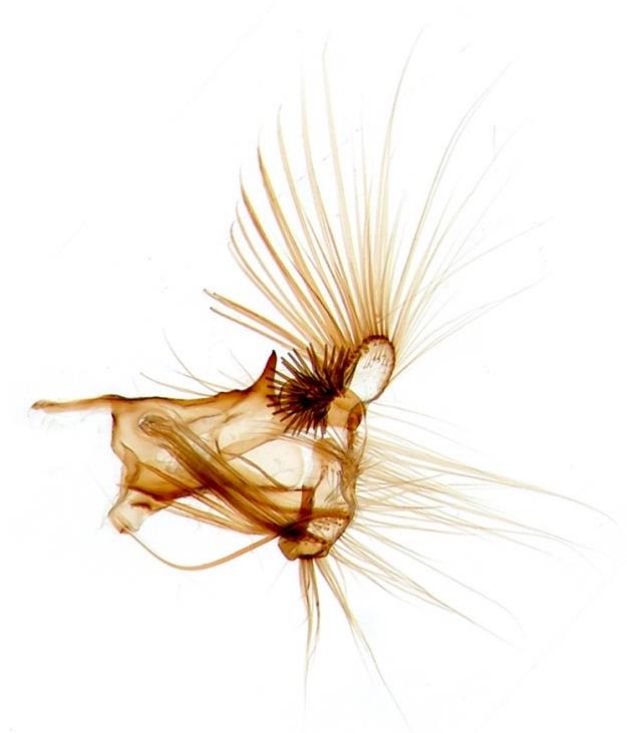


Figure 45: valvae. Left – *Bena bicolorana* (Scarce Silver-lines), right *Pseudoips prasina* (Green Silver-lines)

Tribe Sarothripini

The valvae of the two genera of this tribe are somewhat complex and are characterised by development of the apical angle.



In *Nycteola revayana* (fig. 46) the costal margin has a process at $\sim\frac{2}{3}$ and an apical valvula set with long setae. There is a substantial cluster of shorter stronger setae on the costal margin between the process and the valvula. The tornal angle is bluntly produced and set with long setae

Figure 46: *Nycteola revayana* (Oak Nycteoline) valva

In *Earias chlorana* (fig. 47) the saccular base is sclerotised in continuity with the basal margin of the external lamina and with a saccular expansion in the external lamina of the distal half of the valva. The costal margin is thickened to a little more than half the length of the valva. Just proximal to where this costal thickening ends is a moderate costal process. The costa continues medially as a broad transtilla which abruptly narrows to connect with its partner in the midline. A complex structure is loosely attached (there is no sclerotised connection) to the apical angle of the valva; it has a broad base set with fine spines and a narrow moderate-length curved process.



Figure 27: *Earias chlorana* (Cream-bordered Green Pea) valva. Right – detail with apical process rotated.

3) The diaphragm in Superfamily: Noctuoidea

Overview

1. The **juxta** is usually a discrete plate, supporting the anellus but not usually contributing to it other than at its posterior margin. The juxta in Family: Notodontidae differs and is usually fused with the sacculi or vinculum. In a few species the juxta is modified to form most of the anellus e.g. *Furcula* spp. (Family: Notodontidae), *Scoliopterix libatrix* (Family: Erebidae). Juxta processes are nearly always absent but are found in *Drymonia* spp. (Family: Notodontidae) and *Orthosia gothica* (Family: Noctuidae).
2. The **transtilla** is usually well-developed in Family: Noctuidae, where it commonly has fused costal and anellar components. A similar arrangement is found in several species in Family: Erebidae (e.g. *Hypona crassalis* and several species in Tribe: Arctiini). Most species in Tribe: Lithosiini (Family: Erebidae) have a narrow costal transtilla, supporting but not contributing to the anellus. In *Herminia tarsicrinalis* the transtilla forms a complete transverse bar connecting the costae. This arrangement is also seen in Family: Nolidae but here it is positioned some distance posterodorsal to the anellus (e.g. *Meganola albula*). In most other species in Family: Erebidae and in Family: Notodontidae the transtilla is rudimentary or absent.
3. The sclerotised parts of the **anellus** in Family: Noctuidae usually consist of the anellar component of the transtilla and sometimes a posterior extension of the juxta. A similar arrangement is seen in those species of Family: Erebidae that have costal and anellar components of the transtilla. In most other Noctuid species any sclerotised component of the anellus is contributed by the juxta.
4. The **manica** is usually either entirely hyaline or finely stippled. In a few species there is a coarser stippling or fine spiculation but more elaborate ornamentation is seldom seen in the Noctuoidea. Small patches of fine setae are often seen in the manica either side of the aedeagus in Family: Noctuidae and in some species in Family: Notodontidae

The diaphragm in Family: Notodontidae



In general, the juxta is large, the transtilla rudimentary or not discernible and the manica entirely hyaline. In *Furcula* species the juxta is modified to form a complete sclerotised ring around and attached to the aedeagus. In several species the juxta is firmly and inseparably fused with the sacculi such that the juxta and valvae operate as a single unit. In some of these species the juxta is also firmly but separably fused with the dorsal lamina of the saccus/vinculum. In *Drymonia* spp. the juxta has a pair of strong processes. Juxtas from this family are illustrated in figs. 16-21. The diaphragm of some species has a patch of fine setae either side of the aedeagus (e.g. *Ptilodon capucina*, fig. 48)

Figure 48: *Ptilodon capucina* (Coxcomb Prominent) aedeagus showing setose patches in manica

The diaphragm in Family: Erebidae

As with the valvae the diaphragm varies considerably between the subfamilies.

Subfamily Scoliopteryginae

In *Scoliopteryx libatrix* (fig. 49) the juxta is modified into a nearly complete sclerotised ring; the transtilla is rudimentary; the manica is coarsely stippled.

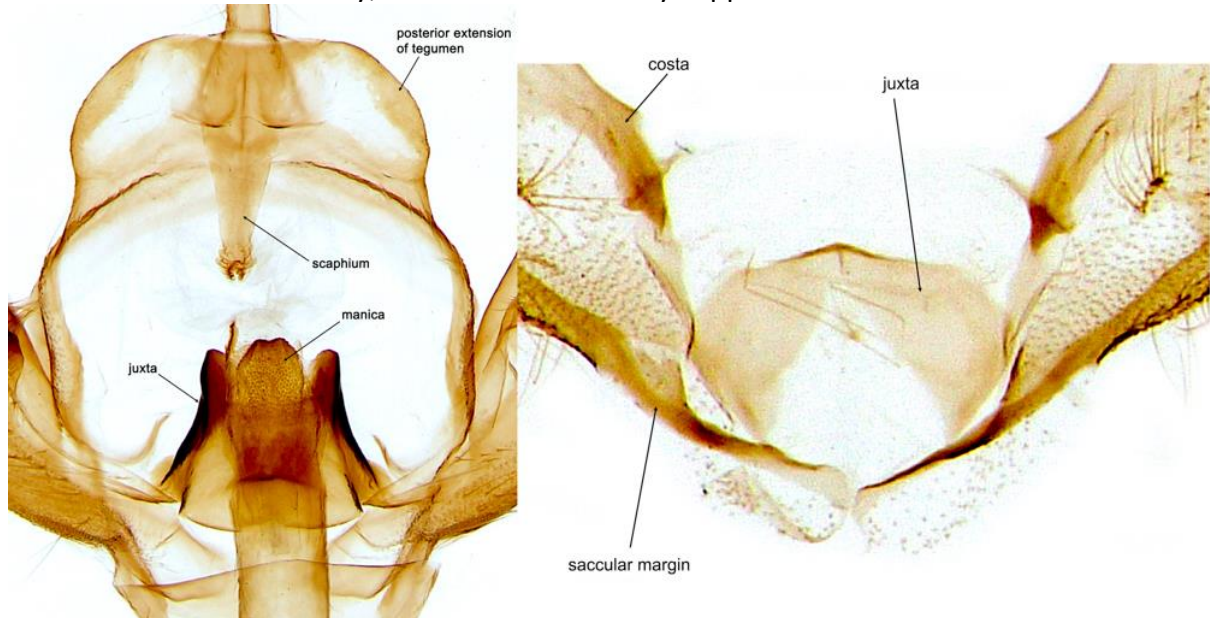


Figure 49: Diaphragm. Left – *Scoliopteryx libatrix* (Herald), right – *Rivula sericealis* (Straw Dot)

Subfamily: Rivulinae

In *Rivula sericealis* (fig. 49) the juxta is small and weak; the transtilla is absent; the manica is hyaline.

Subfamily: Hypeninae

The juxta is a discrete plate; the transtilla ranges from rudimentary in *Hypena proboscidalis* to well-developed with costal and anellar components in *Hypena crassalis*; the manica is spiculate.

Images needed

Subfamily: Lymantriinae

The juxta is either a discrete plate with a concavity of the posterior margin e.g. *Leucoma salicis* (fig. 50) or a similar plate firmly fused with the internal laminae of the saccular bases e.g. *Euproctis chrysorrhoea* (fig. 50); the transtilla is absent or rudimentary; the manica is hyaline.

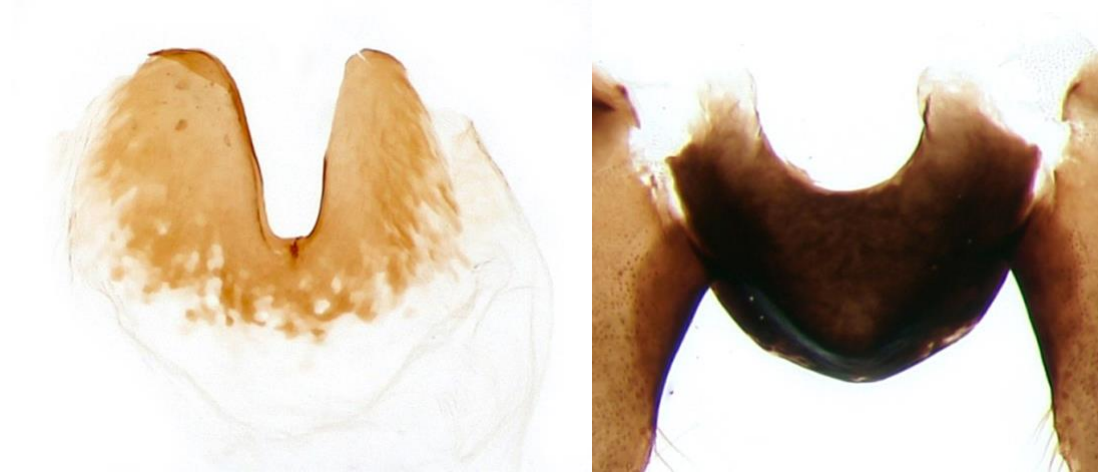


Figure 50: Juxta. Left – *Leucoma salicis* (White Satin Moth), right – *Euproctis chrysorrhoea* (Brown-tail)

Subfamily Arctiinae

Tribe: Arctiini

In most species the juxta is a medium-sized discrete plate, the posterior margin concave or rounded (fig. 51). The transtilla is absent in *Spilosoma* spp., *Diaphora mendica* and *Diacrisia sannio*, but well-developed with costal and anellar components in other genera. The manica is mostly hyaline, but in *Euplagia quadripuncta* (fig. 52) it is coarsely stippled.



Figure 51: Juxta. Left – *Diaphora mendica* (Muslin Moth), right – *Arctia caja* (Garden Tiger)

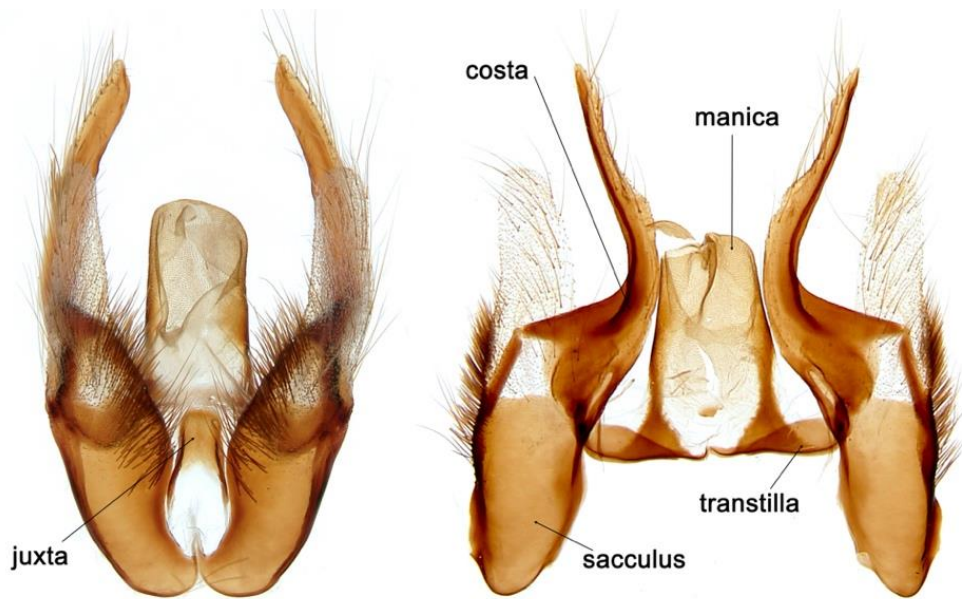


Figure 52: *Euplagia quadripunctata* (Jersey Tiger) valvae and diaphragm. Left – natural position, right – set with sacculi separated and juxta removed

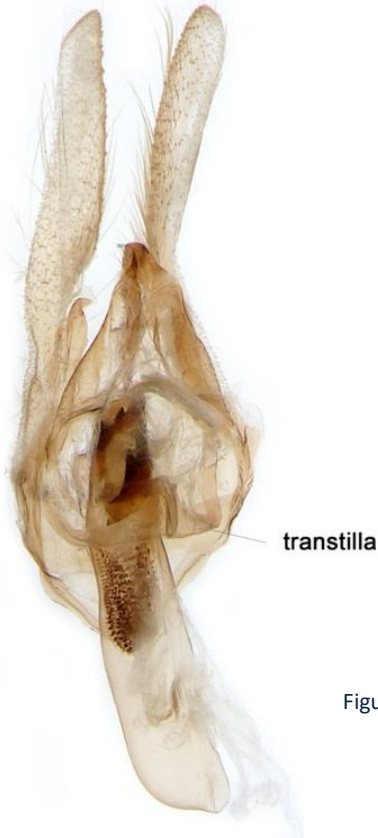
Also see comments above concerning a possible free transtilla in *Parasemia plantaginis* (fig. 32).

Tribe: Lithosiini

In most species the juxta is a simple plate, but it is more complex in some *Eilema* species (fig.53). In *Eilema complana* the juxta is a plate with 3 branches, 2 attached to the bases of the sacculi, the 3rd which is topologically apico-posterior, naturally folds dorsally to become anterior. In *Eilema griseola* the juxta also has three branches with two of them connecting the sacculi, but here the third branch is strongly developed as a posteriorly-directed midline process, which seems to provide no support to the aedeagus. The transtilla is absent in *Nudaria*, but most species have a transtilla with a narrow costal component and no anellar component. The manica is mostly hyaline.



Figure 53: Juxta. Left – *Eilema complana* (Scarce Footman), centre – *Eilema griseola* (Dingy Footman), *Herminia tarsipennalis* (Fan-foot) A=extension into anellus, B=connection to sacculus



Subfamily: Herminiinae

The juxta forms a rounded sac, convex ventrally, open dorsally, attached to the sacculi laterally and sometimes also to the saccus/vinculum anteriorly eg *Herminia tarsipennalis* (fig.53). In *H.tarsipennalis* it also has a diffuse midline extension into the anellus.

The transtilla is rudimentary in most species, but in *Herminia tarsicrinialis* (fig. 54) it forms a complete bar, somewhat expanded in the midline, connecting the costae. The manica is largely hyaline.

Figure 54: *Herminia tarsicrinialis* (Shaded Fan-foot) genital capsule in dorsal view (natural)

Subfamily: Hypenodinae

In *Hypenodes humidalis* the juxta is a standard plate and the transtilla forms a narrow complete bar connecting the costae. In *Schrankia* spp. (fig.55) the juxta is sclerotised only as a pair of marginal lines that converge posteriorly from their attachment to the sacculi and then diverge into the anellus/manica; the transtilla has a weak costal component not meeting in the midline and not extending into the anellus.

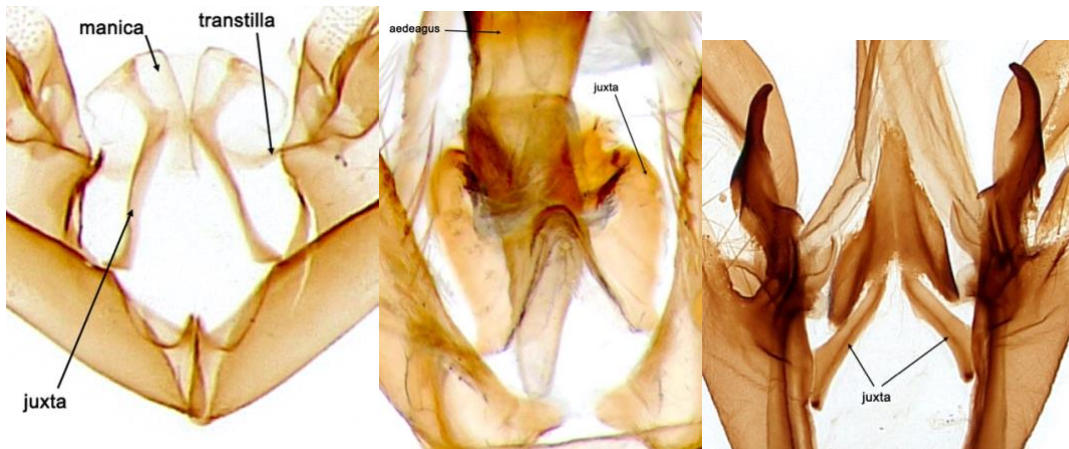


Figure 55: diaphragms. Left – *Schrankia taenialis* (White-line Snout) (set preparation of valvae and diaphragm), centre – *Parascotia fuliginaria* (Waved Black) (natural), right – *Catocala nupta* (Red Underwing) (set)

Subfamily: Toxocampinae

Need material

Subfamily: Boletobiinae

In *Parascotia fuliginaria* (fig.55) the juxta is pleated with posterodorsally directed lobes extending on either side of the aedeagus and fused to its tunica; the transtilla is absent. In *Trisateles emortualis* the juxta is simple and the transtilla well-developed.

Subfamily: Erebininae

The juxta is composed of a pair of strong marginal lines converging posteriorly from their attachment to the sacculi. The two sides meet in the midline either simply, as in *Catocala electa* or to form a more complex sclerotization supporting the aedeagus; e.g. in *Catocala nupta* (fig.55) the two sides meet in a strong arrow-head-shaped midline plate that folds around the aedeagus to support it ventrally and laterally. [Transtilla??](#)

The diaphragm in Family: Nolidae

Subfamily: Nolinae (fig. 56)

The juxta is a discrete plate the posterior angles of which extend dorsally either side of the aedeagus to provide the major aedeagal support. The transtilla forms a complete or nearly complete band connecting the costal bases but does not form part of the anellus. The manica is largely hyaline.

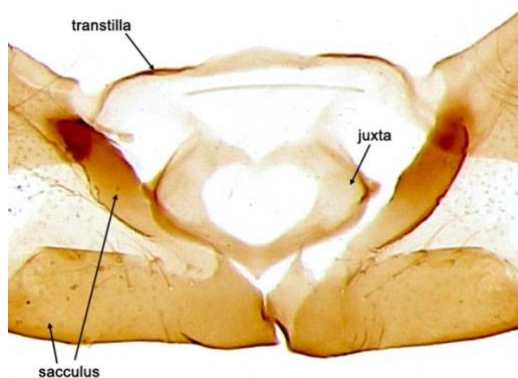


Figure 56: *Meganola albula* (Kent Black Arches) – diaphragm

Subfamily Chloephorinae

Tribe: Chloephorinae

In *Bena bicolorana* (fig. 57) the juxta forms a small sac extending anteriorly (dorsal to the saccus) from its attachments to the bases of the valvae. The transtilla is well-developed and extends medially from the costal bases; it attenuates but meets its partner in the midline.

Tribe: Sarrothripini

In *Earias chlorana* (fig. 57) the juxta forms a discrete plate, its lateral edges broadly attached to the bases of the valvae. The transtilla is well-developed and extends medially from the costal bases to reach its partner in the midline.

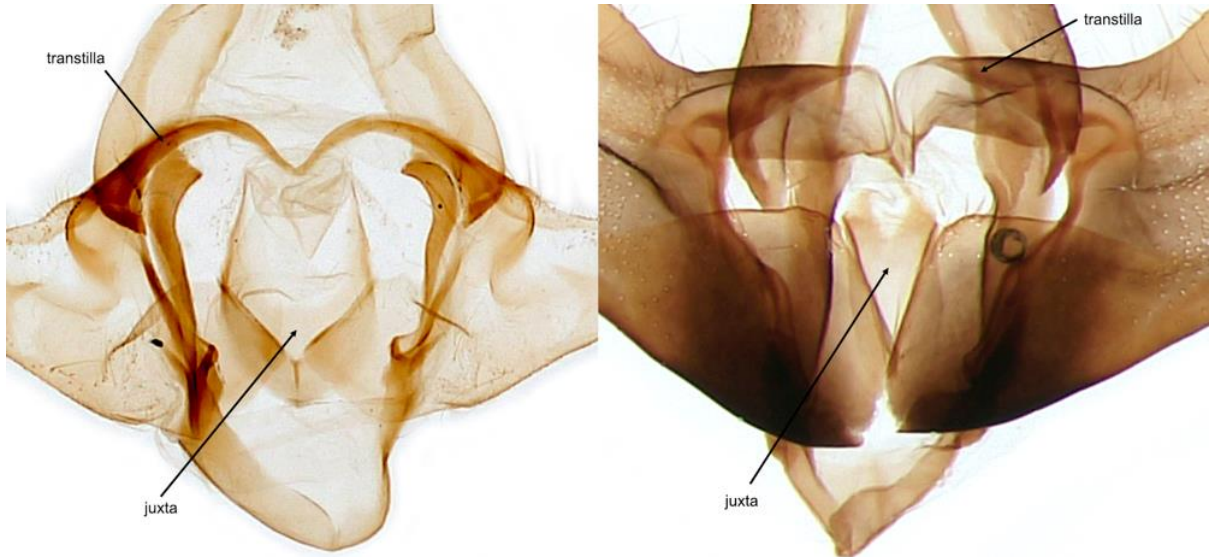


Figure 57: Diaphragms. Left – *Bena bicolorana* (Scarce Silver-lines), right – *Earias chlorana* (Cream-bordered Green Pea)

Check *Nycteola*

4) The aedeagus in Superfamily: Noctuoidea

Overview

There is great variety within Noctuid families in the form of the aedeagus and few generalisations can be made.

In Family: Noctuidae the tunica is most usually of moderate length, breadth and strength of sclerotisation; adornment of the apex is usually in the form of simple carinae, or absent; junctional bands are often present and recurve into the vesica; the vesica is eversible and most species have cornuti.

Whilst many species in the other Noctuid families have aedeagi that would not look out of place in the Noctuidae, some contrasts can be observed. In several species the tunica is narrow, long and strongly sclerotised; very robust apical adornment is seen in some species in Family: Notodontidae; junctional bands when present do not usually recurve into the vesica; the vesica is often not eversible or eversible to a much lesser degree than is seen in the Noctuidae; and many species lack cornuti.

The aedeagus in Family: Notodontidae (fig.58)

In nearly all species the vesica is largely hyaline and shows little propensity for eversion.

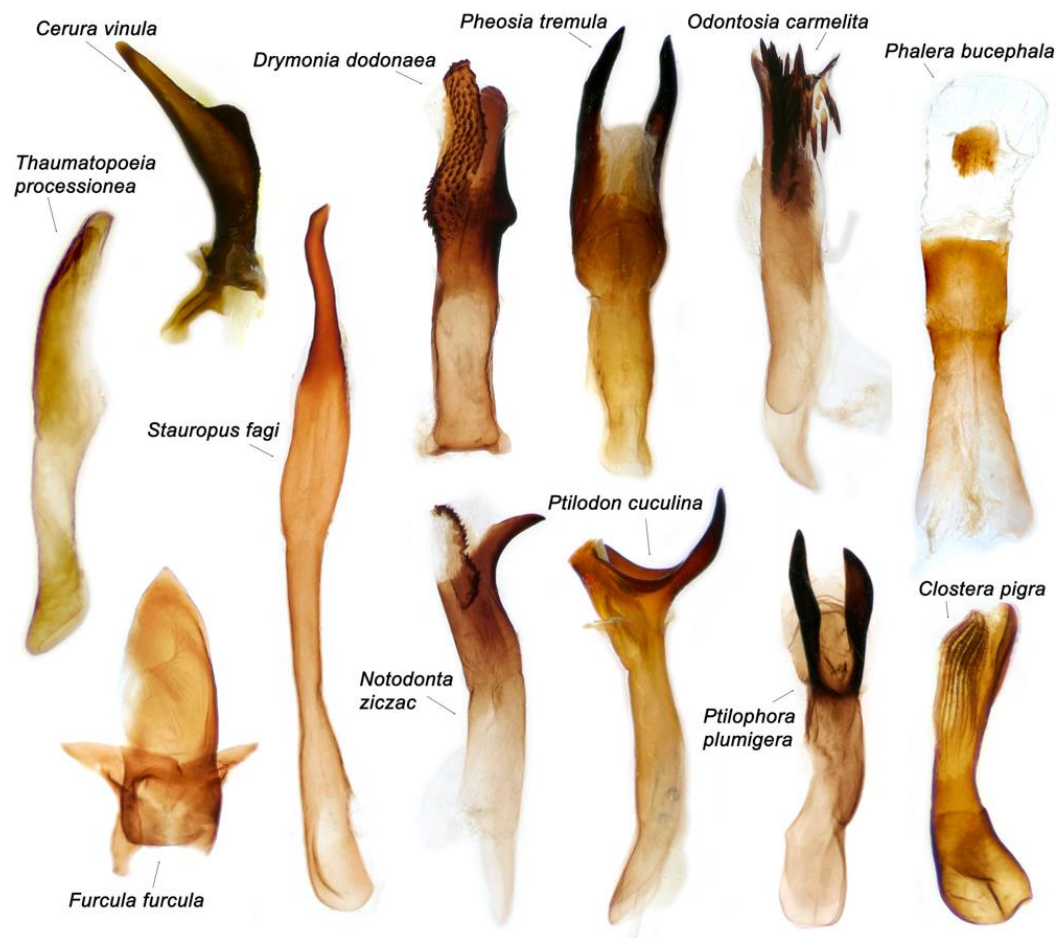


Figure 58: Notodontid aedeagi

Subfamilies Thaumtopoeinae, Cerurinae and Dicranurinae

The tunica is simple and there are no cornuti. In subfamily Cerurinae the aedeagus is short and stout (~½ as long as the armature) and in subfamily Dicranurinae it is long and narrow (~1½x as long as the armature). In *Cerura* the tunica has a subapical boss and an apical process.

Subfamily Notodontinae

Several species have one or two strong processes at the apex of the tunica. In *Notodonta ziczac* and *Ptilodon cuculina* a process is formed as a simple curved extension of one side of the tunica. In *Drymonia* there are two strong broad sclerotised processes, one of which is scobinate/dentate. It seems likely that these are homologous with junctional bands. *Pheosia* spp. and *Ptilophera plumigera* have a narrower pair of apical process. Cornuti are absent in ~half the species. *Notodonta ziczac* has a short comb of short spines which are discrete in some specimens and joined by a sclerotised basal band in others. *Odontosia carmelita* has a substantial mat of moderate spines. *Peridea anceps* has a substantial plaque which surrounds a variable mat of short spines.

Subfamily Phalerinae

Phalera bucephala has a small plaque cornutus

Subfamily Pygaerinae

The vesica is stippled and lacks cornuti. In *Clostera pigra* the apical half of the tunica is ridged on one side.

The aedeagus in family Erebidae

Subfamily Scoliopteryginae

In *Scoliopteryx libatrix* the tunica simple, the vesica largely hyaline and without cornuti.

Subfamily Rivulinae

In *Rivula sericealis* (fig. 59) the tunica has an apical scobinate patch; the vesica has a junctional plaque, and moderate stippling merging into a mat of numerous small thorns/studs.

Subfamily Hypeninae

In *Hypena* species (e.g. *Hypena probiscidalis* (fig. 59) the aedeagus is distinctly angulate (~110°); the tunica has a substantial apical/junctional mat of moderate spines; the vesica is mostly stippled, some areas are spiculate, a there is a mat of short and very short spines.

Subfamily Lymantriinae (fig. 59)

In most species the tunica is strongly sclerotised, short and stout; and the vesica is predominantly hyaline, without cornuti and with little eversibility. In *Leucoma salicis* there is a strong junctional band, the vesica is eversible and has a substantial patch of stippling. In *Euproctis chrysorrhoea* the tunica has a scobinate apical patch and in *E.similis* a distinct apical carina. *Calliteara pudibunda* has a moderate mat of short spines in the vesica.

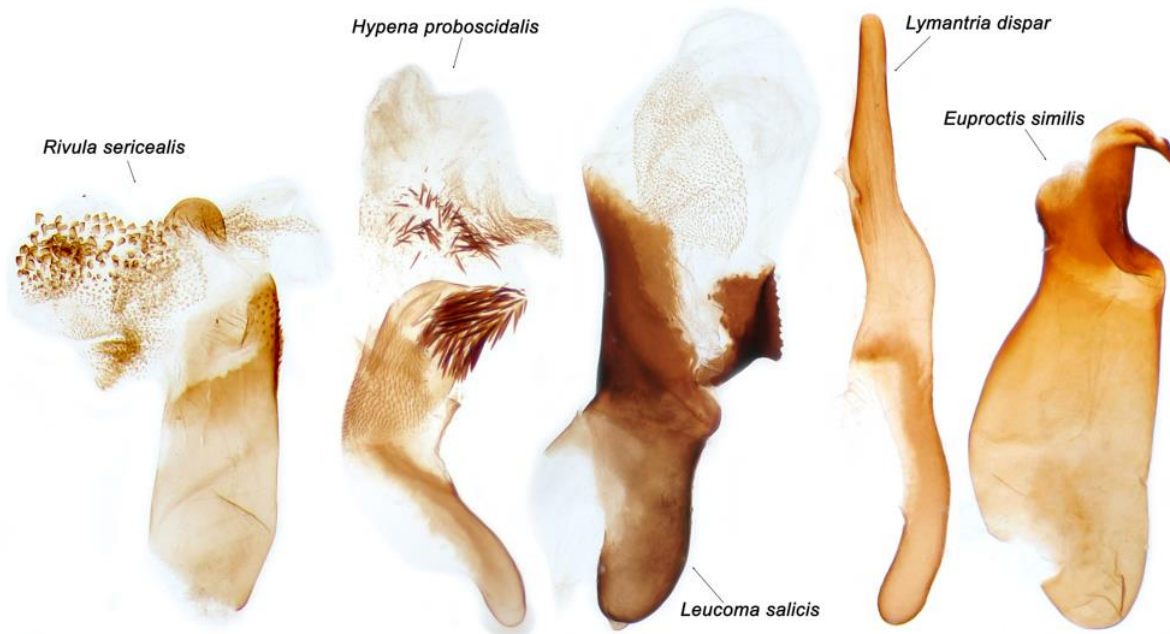


Figure 59: Erebid aedeagi (subfamilies Rivulinae, Hypeninae and Lymantriinae)

Subfamily Arctiinae, Tribe Arctiini (fig. 60)

In most species the aedeagus is fairly straight to somewhat curved or sinuate; the tunica is usually moderately well sclerotised with a small, not especially distinctive, scobinate apical patch; and a small junctional band is usually present. Sclerotisation of the vesica ranges from mostly hyaline to coarsely stippled. Cornuti are absent in most species, but some have a small mat of short spines or a small plaque. *Phragmatobia fuliginosa* has two dentate junctional bands and a mat of small studs in the vesica. *Parasemia plantaginis* has a substantial spined apical carina. *Arctia villica* has a strongly sclerotised distinctly angulate aedeagus

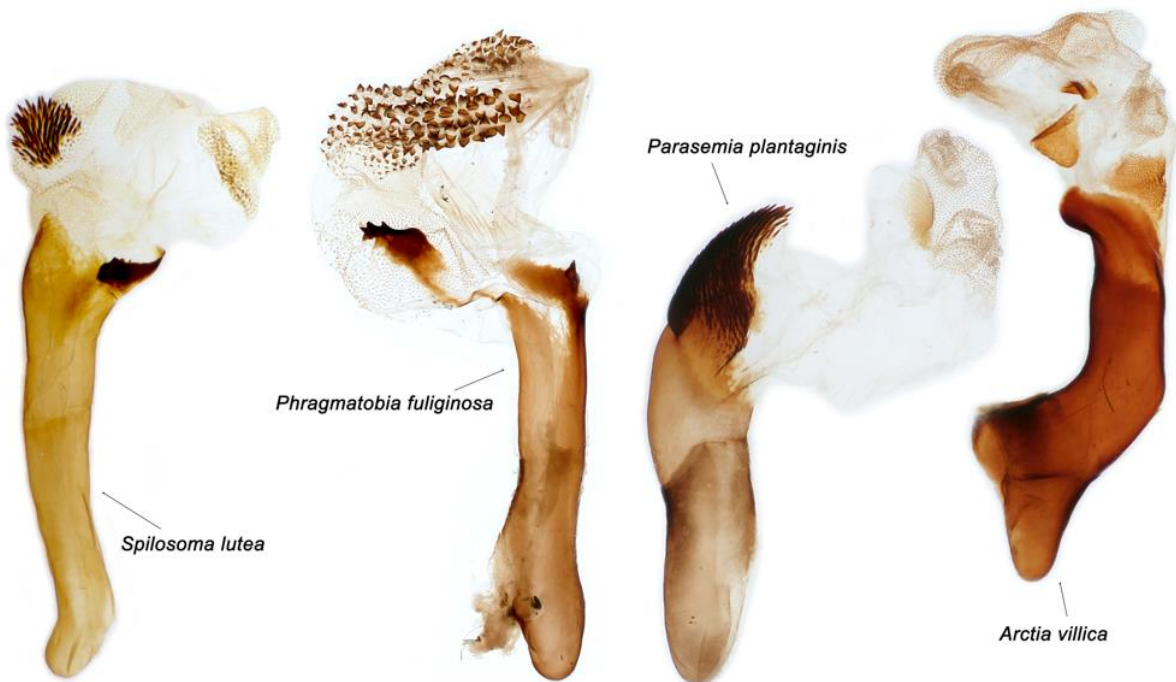


Figure 60: Erebid aedeagi (Subfamily Arctiini, tribe Arctiini)

Subfamily Arctiinae, Tribe Lithosiini (figs. 61, 62)

In most species the aedeagus is fairly straight or shallowly curved; the tunica is weakly to moderately sclerotised, usually with some apical adornment; the vesica is finely stippled and contains a variety of cornuti. In *Miltocrista miniata* the tunica has a scobinate apex, a simple junctional band, a largely hyaline vesica with a comb of ~7 moderate spines and a small patch of smaller spines. *Nudaria mundana* has a pair of strong junctional cornuti and a substantial rugose spiculate area in the vesica. *Thumatha senex* has a mat of short spines. *Cybosia mesomella* has ~ 8 moderate thorns. *Pelosia* species lack cornuti, but *P.obtusa* has a strong apical spine. *Lithosia quadra* and *Eilema depressa* both have a single moderate spine cornutus. Most other *Eilema* species have 2 or 3 moderate horns and a non-recurving simple junctional band. In *Eilema griseola* the tunica has a strong apical tooth, the vesica is coarsely stippled and has a large mat of short spines and ~6 moderate thorns.

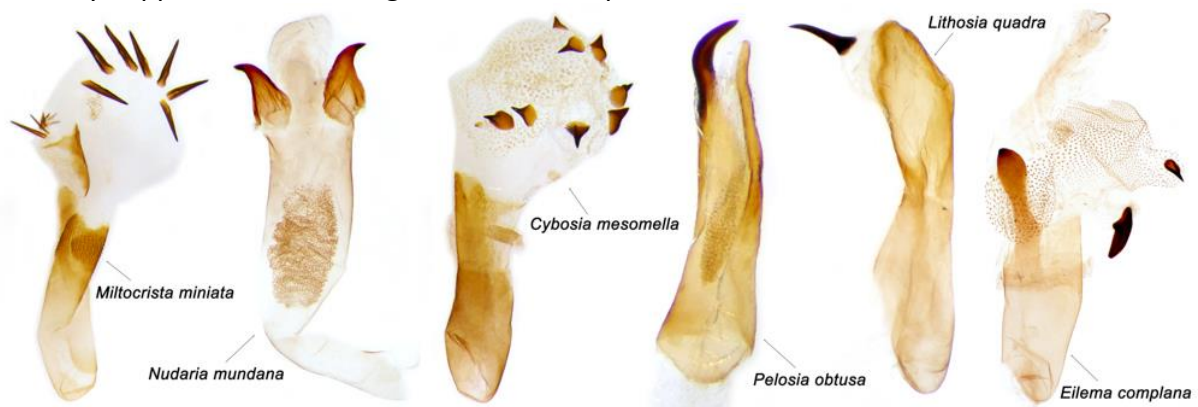


Figure 61: Erebid aedeagi (Subfamily Arctiinae, tribe Lithosiini)



Figure 62: Left – *Eilema griseola* (Dingy Footman) apex of tunica and everted vesica. Right – *Pechipogo plumigeralis* (Plumed Fan-foot) detached junctional bands

Subfamily Herminiinae

Macrochilo cribrumalis (fig. 63) is atypical in having a moderately well-sclerotised narrow curved aedeagus. In other species the aedeagus is stout and the tunica is weakly sclerotised apart from ornamentation at the apex. In *Herminia* species (e.g. *H.tarsipennalis*, fig. 63) this involves one or two scobinate/dentate carinae; in *Pechipogo plumigeralis* (fig. 62) there is one smaller dentate carina and one larger spined carina. The vesica has large areas of coarse stippling phasing into densely spiculate and studded areas and small thorns.

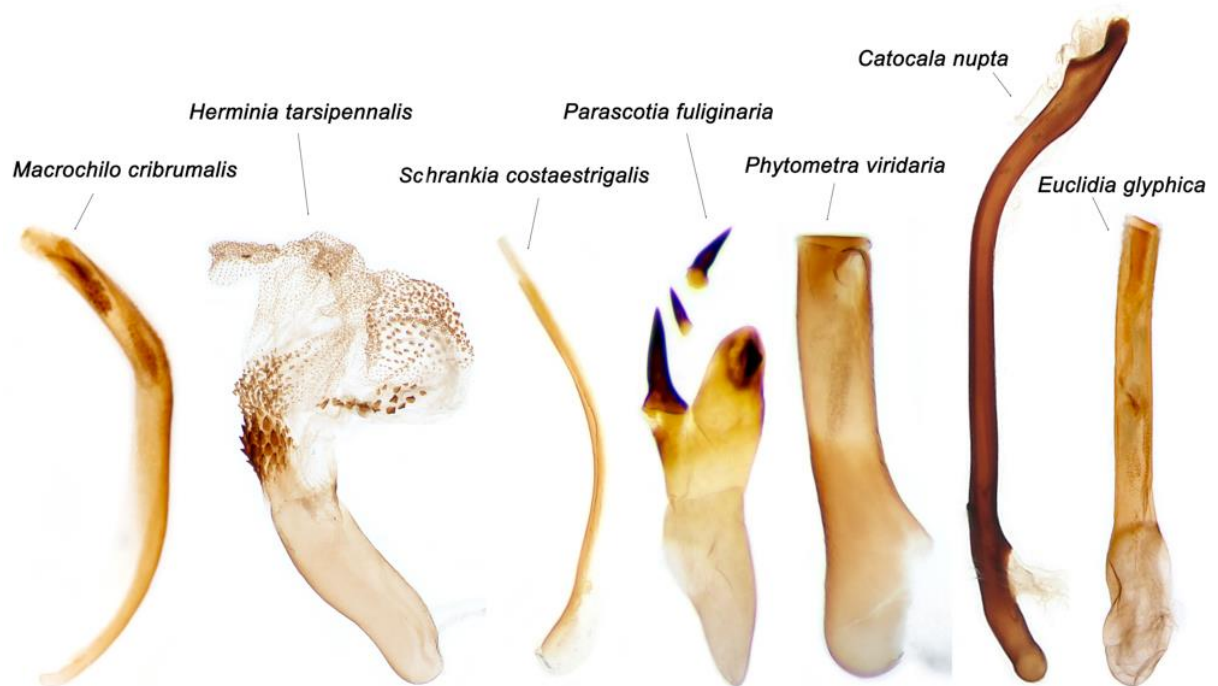


Figure 63: Erebid aedeagi (Subfamilies Herminiinae, Hypenodinae, Boletobiinae and Erebinae)

Subfamily Hypenodinae

The tunica is without adornment and the vesica without cornuti. *Hypenodes humidalis* has a stout aedeagus and coarse stippling of the vesica. *Schrankia* species (e.g. *Schrankia costaestrigalis*, fig. 63) have an elongate narrow aedeagus.

Subfamily Toxocampinae

Material needed

Subfamily Boletobiinae

Aedeagus simple in most species. *Parascotia fuliginaria* (fig. 63) is atypical in having a tunica with a strong apical boss on one side and a strong apical spine on the other, and two moderate spines in the vesica.

Subfamily Erebinae (fig. 63)

In tribe Catocalini the aedeagus is long, slender and sinuate; the tunica is strongly sclerotised and the vesica is without cornuti.

In tribe Euclidiini the aedeagus is fairly simple with no tunical adornment, some dense stippling of the vesica, but no cornuti.

The aedeagus in family Nolidae (fig. 64)

Subfamily Nolinae

In *Meganola albula* the aedeagus is slender, the tunica has a tapered apex, the vesica is hyaline and contains a single moderate thorn. *Nola cucullatella* has a junctional band and a junctional cornutus.

Subfamily Chloephorinae

In Tribe Chloephorini the tunica is stout and simple and the vesica finely stippled. *Bena bicolorana* has three fine spine cornuti; *Pseudoips prasina* has a single stout spine and a plaque.

In tribe Sarothripini: *Nycteola revayana* has a small slender aedeagus with a curved junctional cornutus. *Earias clorana* is unusual in having the base of the tunica narrowed and strengthened proximal to the emergence of the ductus ejaculatorius and a sinuate tapered apex.

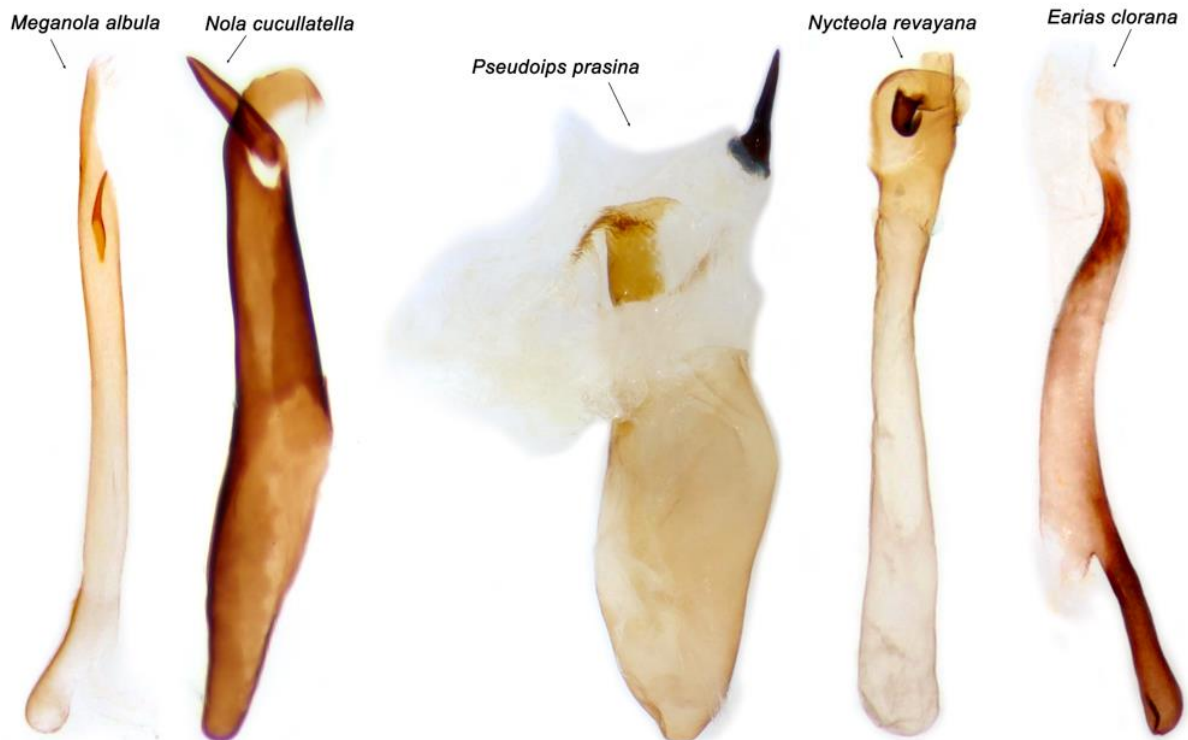


Figure 64: Nolid aedeagi