Part 1.2
Valvae

The description and terms used here have been developed for use with the Family: Noctuidae. My intention is that the definitions will become applicable to all Lepidopteran families and so should be regarded as propositional until other families have been subject to detailed examination.

Natural vs set position of the valvae (Fig. 1)
The descriptive problem resulting from the altered position of the parts in the set position compared to the natural position is greatest when it comes to describing the parts of the valvae.

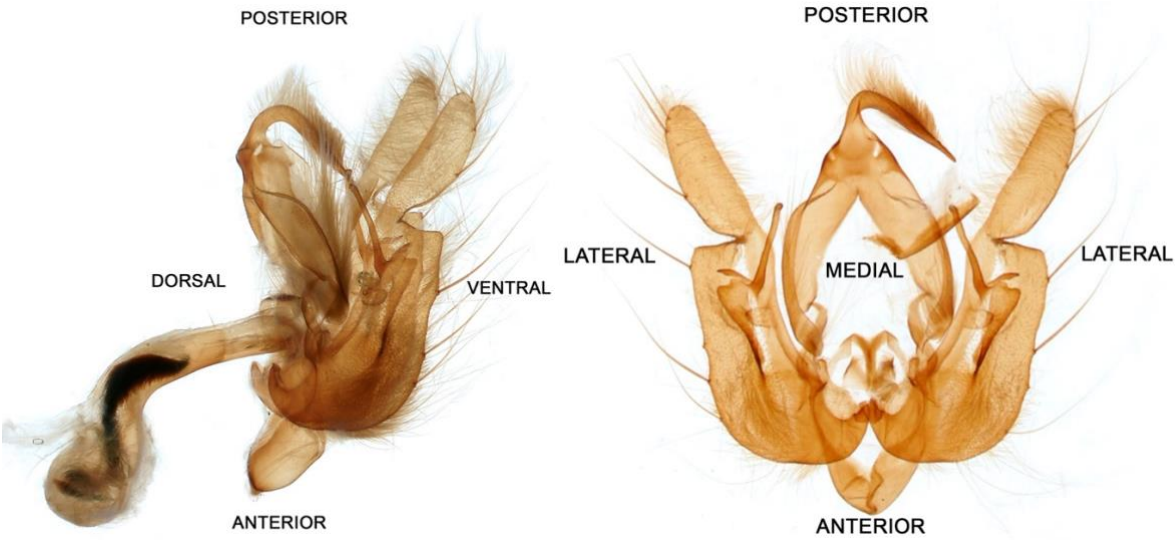


Figure 1: male genitalia of *Leucania comma* (Shoulder-striped Wainscot). Left - lateral view in natural position with aedeagus in situ. Right - set position with aedeagus removed

It can be difficult to visualise the exact relationship between parts of the genitalia from a slide preparation. The orientation of parts becomes distorted during the processes of slide preparation and parts overlap in the set position. To describe the natural relationship between parts it is necessary to examine those parts prior to exposing them to chemical processes that allow deformation (notably isopropyl alcohol). These relationships and parts may be described in the natural position of the unopened genital capsule and/or in the set position with the valvae opened out.

The valvae of the Noctuidae are usually positioned naturally such that they have a ventral and a dorsal margin, with the valval base anterior and its apex posterior. When the valvae can be fully opened out, the ventral edge becomes to varying degrees anterolateral (largely depending on the shape of the sacculus); the dorsal edge becomes posteromedial; the base remains anterior but also becomes medial as the ventral margin becomes anterior; and the apex usually remains posterior but also becomes lateral as the ventral margin becomes anterior. To some extent, I have overcome this descriptive difficulty by referring to the natural ventral margin as the "**saccular margin**" and the natural dorsal margin as the "**costal margin**". Note that, the

saccular margin is the margin on which the saccular sclerotization folds; it does not necessarily imply that the whole of that margin is part of the sacculus (the apical portion is often associated with the costal sclerotisation). Similarly, the apical portion of the costal margin may not be part of the "costa", but any sclerotisiation of the costal margin is nearly always associated with the costa rather than the sacculus.
With regard to the valvae I have also avoided the problem of 'medial/lateral' by referring to the valval 'base' and 'apex' or by using 'proximal/distal'.

This leaves a difficulty in describing the position of the opposing margins of the sacculus and costa on the internal lamina. Having tried several options, I have been unable to find anything better than "opposing margin" or "opposing edge". So, the "opposing margin of the sacculus" is its margin on the internal lamina away from the "saccular margin of the valva" and facing the "opposing margin of the costa". For the saccular base I have used the term "free edge of the sacculus", partly because there is usually considerable freedom of movement of this edge and partly because it sometimes extends as a flap over the costa and so is not "opposing".

Definitions:

Valvae
A pair of structures of the male genitalia, derived from appendages (gonopods) of A9, composed of internal and external laminae with a fold from one lamina to the other on all margins except the base. The base of the external lamina is connected to and articulates with the vinculum; the base of the internal lamina is connected in varying degrees to its partner and to the diaphragm. The valva often shows some differentiation into costal and saccular components.

Costal margin
The margin of the valva that has its base furthest from the midline. In most species this margin is posterior to the saccular margin in the set position.

Saccular margin
The margin of the valva that has its base closest to the midline. In most species this margin is anterior to the costal margin in the set position.

Costa (pl.costae)
A thickening at the base of the costal margin, extending for a variable distance distally.
May also include sclerotised extensions and processes continuous with the costal margin.

Sacculus (pl. sacculi)
Any differentiation of the basal portion of the saccular margin of the valva, extending for a variable distance distally and towards the costa.
Usually also includes the base of the external lamina of the valva.

Opposing margin/edge of the costa
The margin/edge of the costal sclerotization on the internal lamina of the valva that is closest to the saccular sclerotization.

Opposing margin/edge of the sacculus
The margin/edge of the saccular sclerotization on the internal lamina of the valva that is closest to the costal sclerotization.

Saccular base
The basal portion of the sacculus. In the Noctuidae this is usually a well-sclerotised folded plate, extending from an inseparable fusion to the costal base on the external lamina, along the articulation with the vinculum, folded around the saccular margin and extending a variable distance towards the costa and apex on the internal lamina.

Free edge of the sacculus
The edge of the saccular base on the internal lamina of the valva.

Saccular flap
An extension of the free edge of the sacculus over other parts of the internal lamina.

Saccular extension
A sclerotised extension along the saccular margin distal to the saccular base. Usually narrower and more diffusely sclerotised than the base.

Saccular band
A sclerotised band in the internal lamina of the valva, originating in the angle between the saccular base and the saccular extension and extending distally and towards the costa. May be carinate.

Saccular process
A process arising from the saccular sclerotization. Most often arises from the costal end of the saccular band.

Costal process
A process arising from the costal sclerotization.

Saccular expansion
A sclerotised expansion of the saccular extension on the internal lamina of the apical portion of the valva.

Costal expansion
A sclerotization of the internal lamina of the valva in continuity with the costal margin.

Intersaccular sclerite
A small sclerite connecting the sacculi at the base of the saccular margin. (Note that when a juxta connects the saccular bases it does so on the internal lamina and not at the saccular margin).

Clavus
Any ornamentation of the angle between basal and free edges of the internal lamina of the sacculus. Ranges from simple rugosity to an elaborate process.

Costal hump
A distinct protrusion of the costal margin

(Apex) / Apical angle
An angle formed at the distal end of the costal margin where it meets the saccular margin or the apical/distal margin. The term "apex" may also be used to indicate the apical portion of the valva.

Tornus / tornal angle (of the valva)
An angle formed at the distal end of the saccular margin where is meets the apical/distal margin.

Apical/distal margin
The portion of the valval margin between apical and tornal angles.

Cucullus
Any differentiation of the valval apex demarcated by a neck or a costo-cucullar carina.

Neck (of the valva)
A narrowing of the valva distal to the saccular sclerotization and distal to which the costal sclerotization expands to form a cucullus.

Costo-cucullar carina
A carina on the internal lamina of the costal sclerotization distal to which is an identifiable cucullus.

Corona
A series of spines on the apical margin of the valva or on the internal lamina of the apical portion of the valva

Pollex
A discrete marginal process on the saccular margin of the valva, distal to the saccular extension. It occurs where the proximal edge of a costal expansion reaches the saccular margin and its origin shows continuity with the costal expansion. Most often present when a cucullus is identifiable.

Valvula
A flap-like distal appendage of both laminae of the valva, lacking any confluent sclerotization (hyaline or stippled-hyaline) but attached to a well-sclerotised basal valval component. Usually tongue-shaped, with a rounded apex, often covered with hair scales and/or setae, and may have a costal or saccular origin.

Harpe / ampulla
These terms have been applied historically, inconsistently, to several different valval parts. I have avoided them altogether.

1) Introduction

A valva is in essence a more or less flattened sac, open at its base. It has internal and external laminae, margins, a base, an apex and a usually one or more projections. The open basal end is attached medially, the external lamina to the lateral arm of the vinculum, the internal lamina, in varying proportions, to the other valva and to the diaphragm. The margins are costal and saccular and sometimes apical. At least the basal portion of the costal margin is usually thickened, while the basal portion of the saccular margin is a fold in a sclerotised sheet, continuous from the external lamina onto the internal lamina. The space between the laminae is usually 'real' at the base of the valva but towards the apex the two laminae are usually much more closely appressed.

In most species the valvae are symmetrical, the right being a mirror image of the left and vice versa, but in some they are asymmetrical.

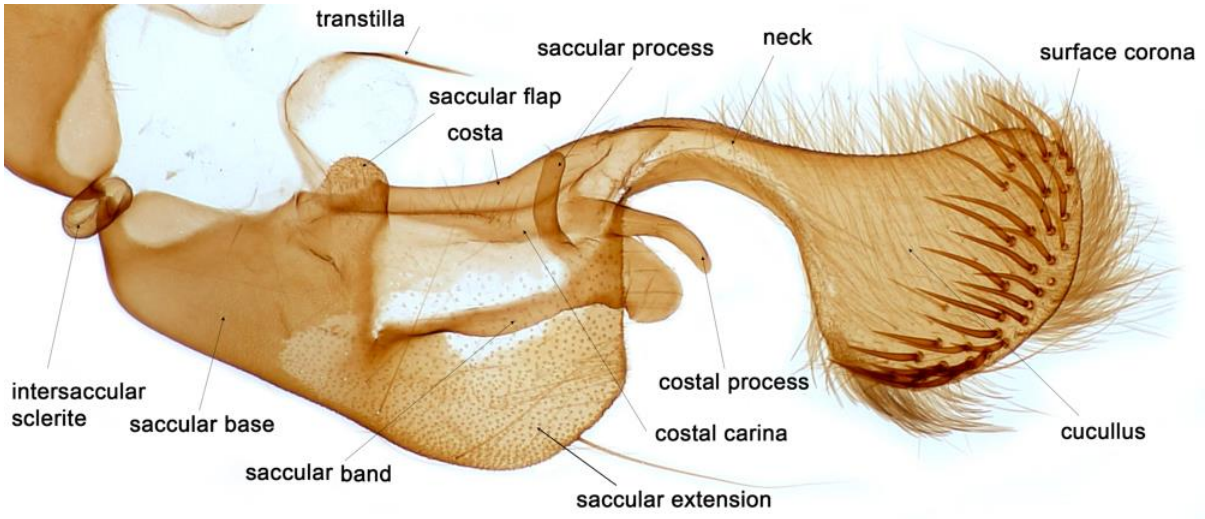


Figure 2: Valva of *Mythimna albipuncta* (White Point)

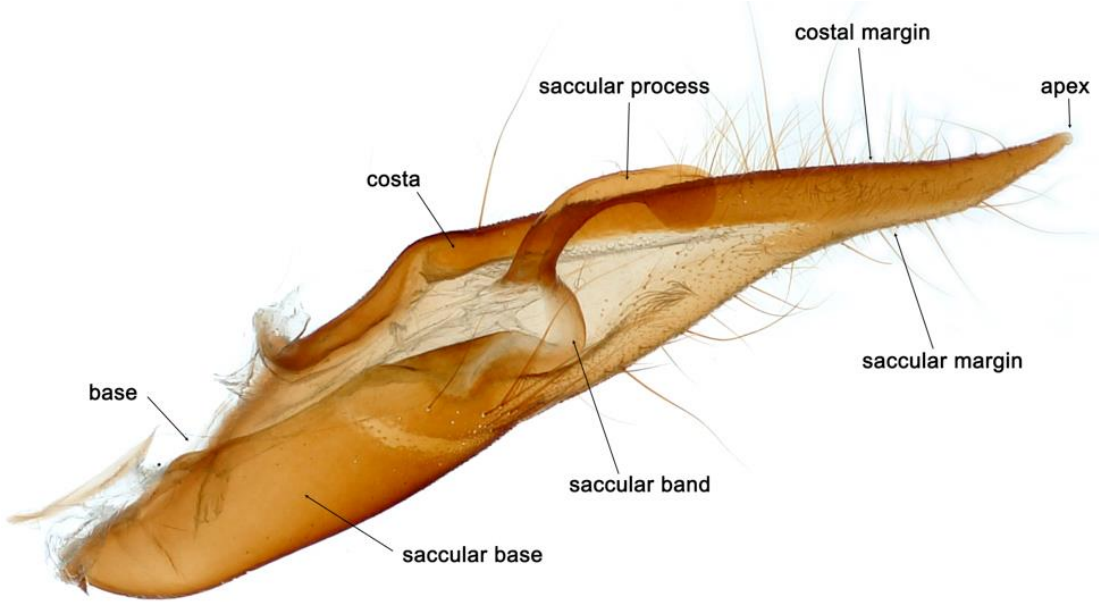


Figure 3: Valva of *Noctua comes* (Lesser Yellow Underwing)

The connections of the valval base are illustrated in Fig. 4

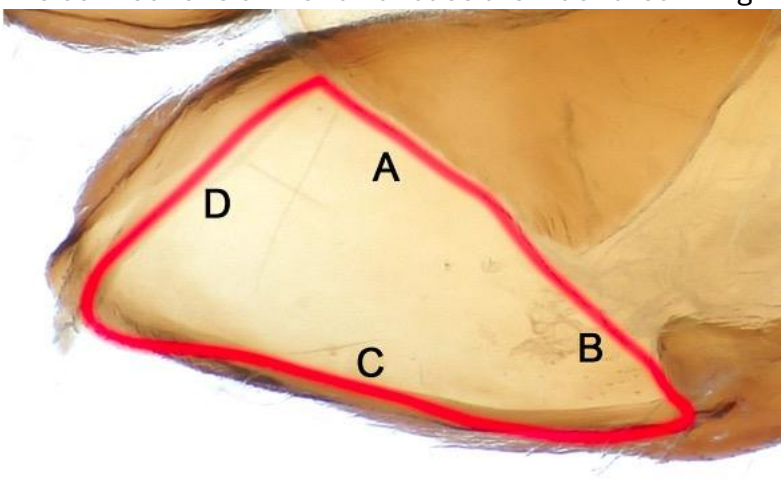


Figure 4: base of valva of *Noctua comes* (dorsal view) to show connections

A: part of the base of the internal lamina of the sacculus connects to the juxta
B: part of the sacculus, the base of the costa and the hyaline membrane between them connect to the diaphragm.
C: the base of the external lamina of the sacculus connects to the lateral arm of the vinculum
D: part of the base of the internal lamina of the sacculus connects to the other sacculus

The external lamina of the valva is usually an entire and unornamented, sclerotised, or partially sclerotised sheet. The internal lamina has various forms of ornamentation which provide distinctive features that are very variable from species to species.

2) The Sacculus (pl. sacculi)

In some species of the micro-moth families the “sacculus” may be completely differentiated as a discrete structure, but in most moths, including the Noctuidae, it is only partially differentiated from the remainder of the valva. It may be more accurately thought of and termed the “saccular region” of the valva.

In the Noctuidae, the sacculus is best understood as a folded sclerotised plate. On the external lamina: the base of this plate articulates with the lateral arms of the vinculum and is inseparably fused to the costal base. At the fold the bases of the two sacculi may come into close approximation and are occasionally attached to each other by an **inter-saccular sclerite**. On the internal lamina: the base is attached to the diaphragm, usually with a strong hyaline attachment to the juxta; and it has a ‘free’ edge with only a weak and flexible hyaline attachment to the costa.

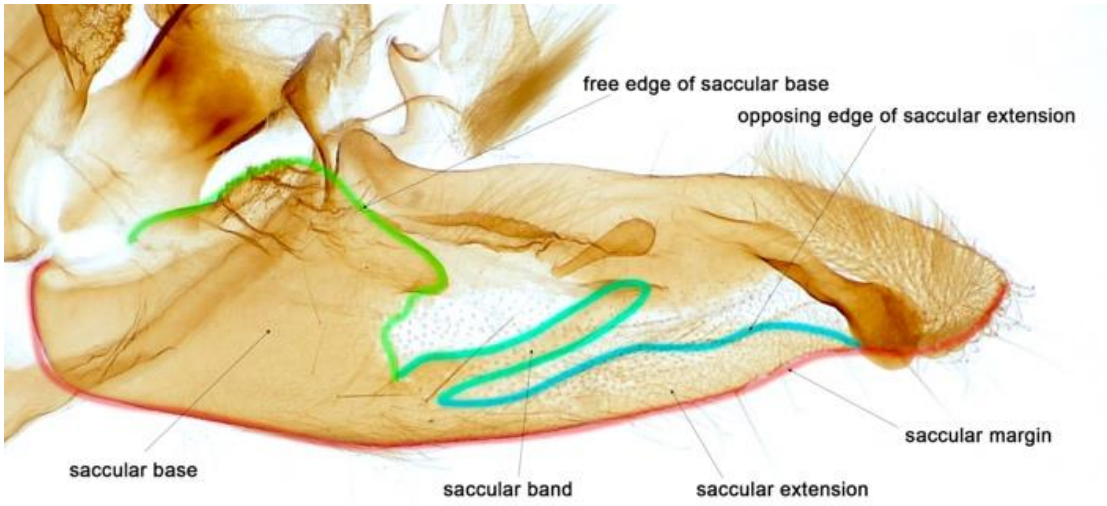


Figure 5: *Gortyna flavago* (Frosted Orange) - saccular sclerotisation on internal lamina

On the internal lamina the Noctuid sacculus generally consists of a broad well-sclerotised base (**saccular base**), a narrower more diffusely sclerotised extension along the saccular margin (**saccular extension**). Often there is a band of sclerotization (**saccular band**), originating in the angle between the saccular base and the saccular extension. Occasionally the sclerotization of the saccular extension expands in the distal half of the valva (**saccular expansion**).

Ornamentation of the internal lamina of the sacculus may occur with one or more of the following features:

- The **clavus** (pl clavi) is a development of (or near to) the angle between the basal and free edges of the saccular base, usually close to its attachment to the juxta. This development ranges from a simple rugosity of the saccular margin to production of a long or stout process.
- A **saccular flap** occurs on the free edge of the saccular base and may be produced towards or across the costa, or it may be produced distally. In either case the whole flap or its margins may be thickened as a carina or boss.
- The saccular band may be raised as a carina (**carinate saccular band**).
- A **saccular process** may be present, most often at the distal end of the saccular band.

The range of variation of the saccular features mentioned above is extensive. Illustration of the terms mentioned is shown in the images below:

In *Amphipyra berbera* (Fig. 6) the sacculus is hardly differentiated and completely unornamented

Figure 6: Valva of *Amphipyra berbera* (Svensson's Copper Underwing)

In *Abrostola tripartita* (fig. 7) the saccular base is well-sclerotised, fairly narrow and tapers distally towards the saccular margin; it has a moderate rounded clavus and a distinct saccular flap which is produced across the costal margin. The saccular extension is less well-sclerotised and is indistinguishable from a saccular expansion; it gives origin to a saccular process from its opposing margin (and merges with the costal expansion in the valval apex).

Figure 7: Valva of *Abrostola tripartita* (Spectacle)

In *Acronicta tridens* (fig. 8) the saccular margin is well sclerotised from base to apical process; the opposing half of the saccular base is relatively weakly sclerotised; there is no significant development of a clavus or saccular flap (although the whole free margin is flap-like). The saccular extension bears two additional processes, the proximal of which abuts against a costal expansion.

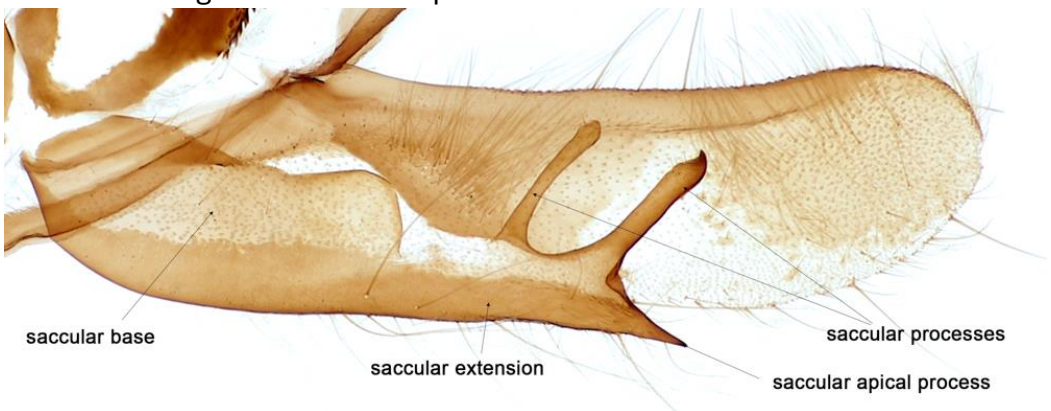


Figure 8: Valva of *Acronicta tridens* (Dark Dagger)

In *Eupsilia transversa* (Fig. 9) the saccular extension is entirely replaced by a strong process

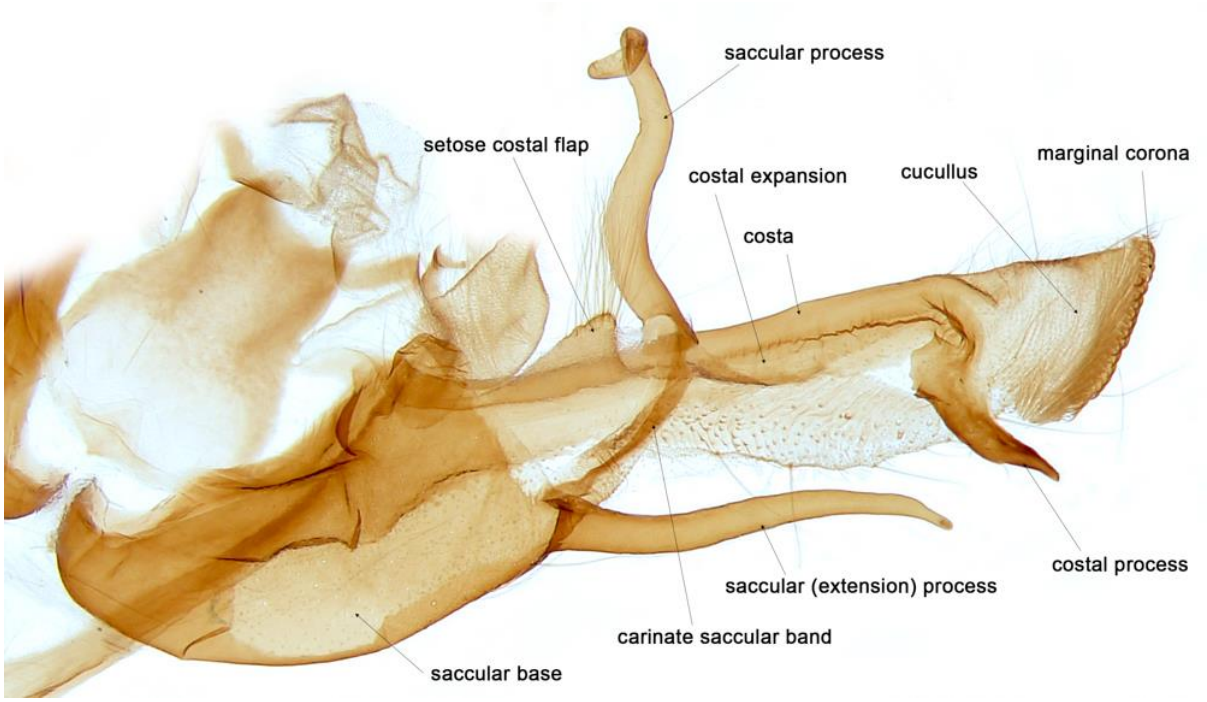


Figure 9: Valva of *Eupsilia transversa* (Satellite)

In *Rusina ferruginea* (Fig.10) the saccular base is well-sclerotised; there is little development of the clavus (some very fine spines and setae only), there is a substantial boss on the distal margin (it is not clear whether this is a true flap). The saccular extension forms a distinct sclerotised band along the saccular margin and has a carinate saccular band on its opposing edge; this band becomes quite irregular distally, is produced as a rounded flap over the saccular margin and as a substantial saccular process over the costal margin.

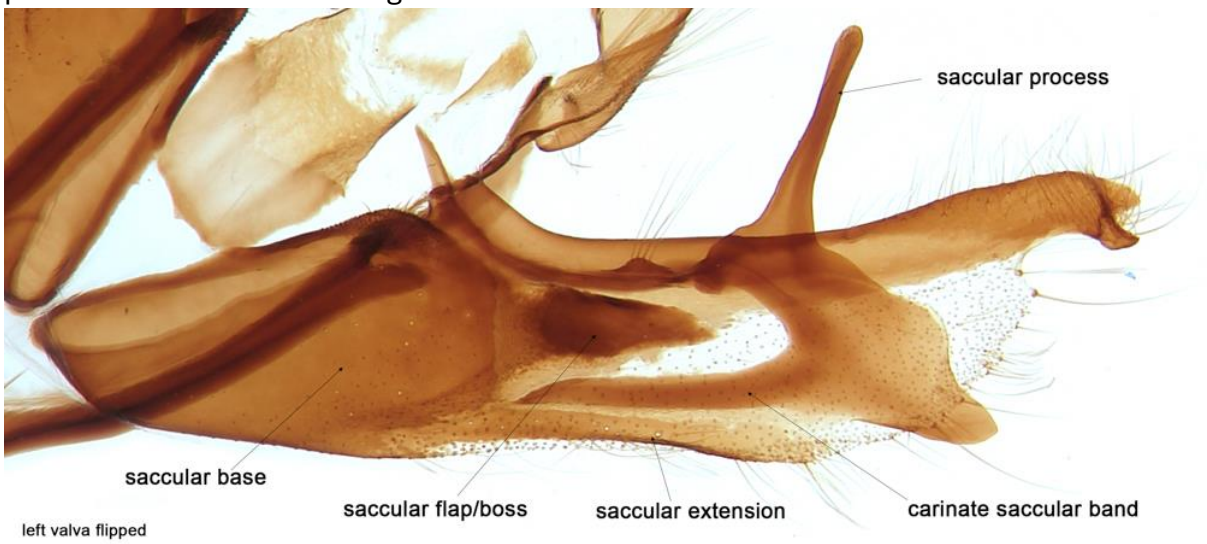


Figure 10: Valva of *Rusina ferruginea* (Brown Rustic)

In *Orthosia incerta* (Figs.11,12) the saccular base has a broad flap on its free margin and a substantial boss on its distal margin. The saccular extension is weakly sclerotised. There is a typical saccular band extending towards the costa, with a setose papilla at its apex. (The large process is costal). The connection on the internal lamina between the free edge of the saccular base and the costa is sufficiently tenuous that it is possible to unfold the saccular base to demonstrate the nature of its structure as a folded sclerotised sheet. In Fig. 12 the saccular flap has been pulled down such that the sacculus is unfolded and the inner surface of both laminae is up. Note that on the external lamina the sclerotisation of the saccular base is continuous with a sclerotised expansion from the costa at A.

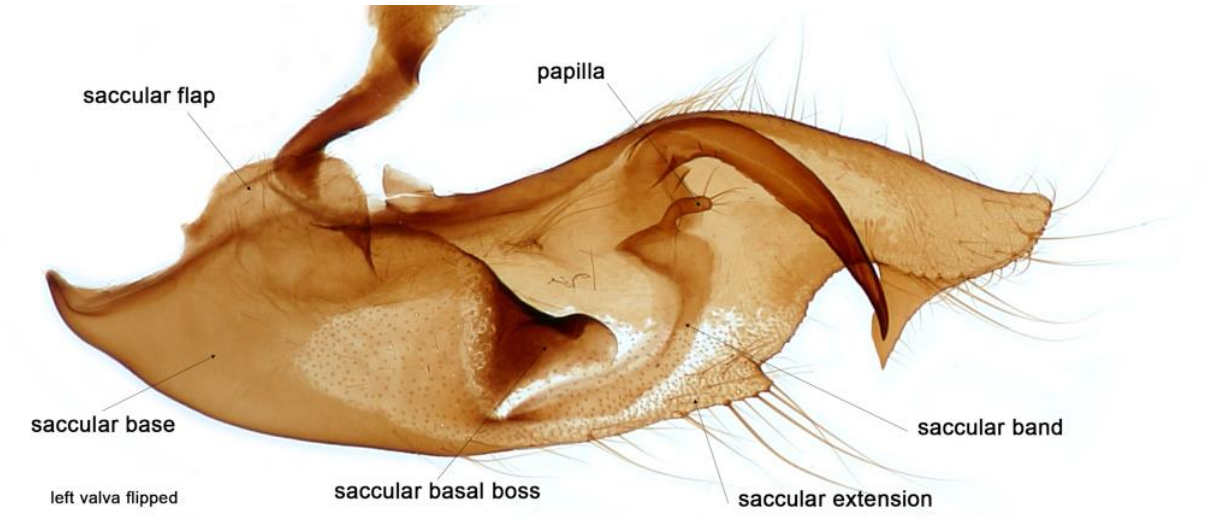


Figure 11: Valva of *Orthosia incerta* (Clouded Drab)

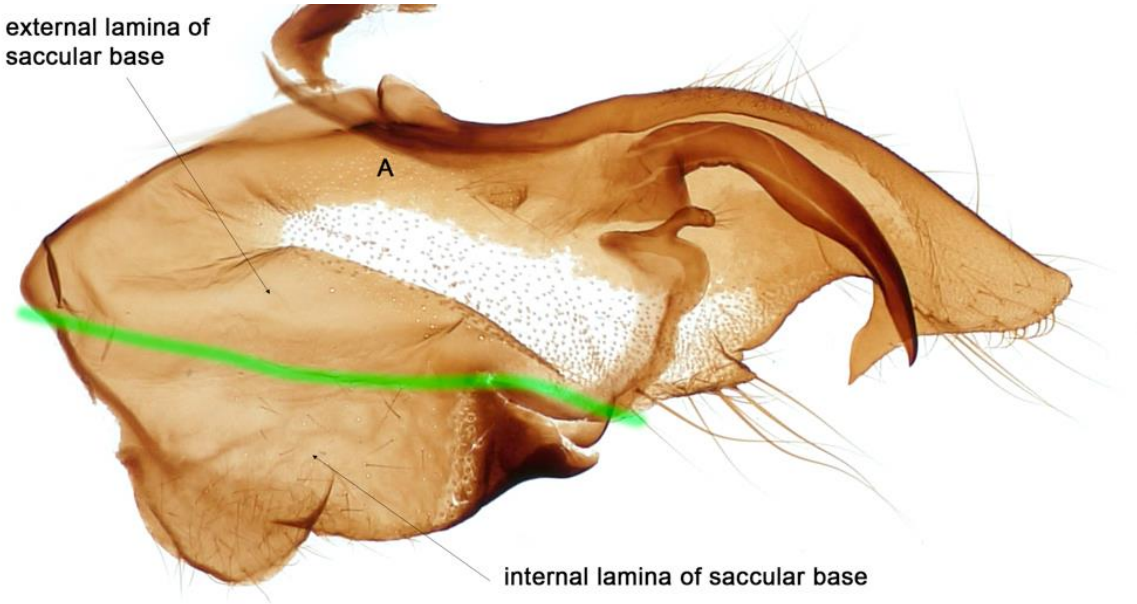


Figure 12: Valva of *Orthosia incerta* with sacculus unfolded and position of the saccular margin shown as a green line

In *Anorthoa mundi* (Fig. 13) as well as a forming a saccular boss the free edge of the saccular flap is produced into a substantial **saccular basal process**

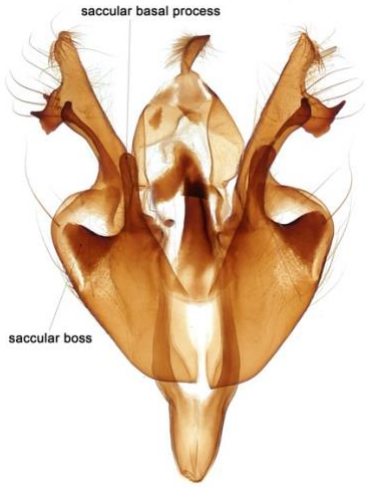


Figure 13: *Anorthoa mundi* (Twin-spotted Quaker)

Figure 14: *Polymixis xanthomista* (Black-banded)

Particularly where the saccular base is bulky, its appearance can vary considerably depending on the extent to which the valvae are opened out and flattened. In the example of *Polymixis xanthomista* (Fig. 15) the right saccular base appears more elongate than the left. This is not a real difference between the sides but an artefact of the preparation, the left valva having been opened out more completely than the right. This illustration emphasises a caution when describing genitalia from a single set specimen.

3) **The Costa** (pl.costae)

The costal margin is usually well-sclerotised and thickened, at least in its basal portion. A sclerotised plate usually extends from it over the internal and external laminae of the valva and into the apex of the valva. There are no terms to distinguish between the costa as a whole, including these extensions, and the more restricted reference to the costa as just the thickened part of the costal margin. In general, this does not cause any particular descriptive problem as it should be clear which is meant.

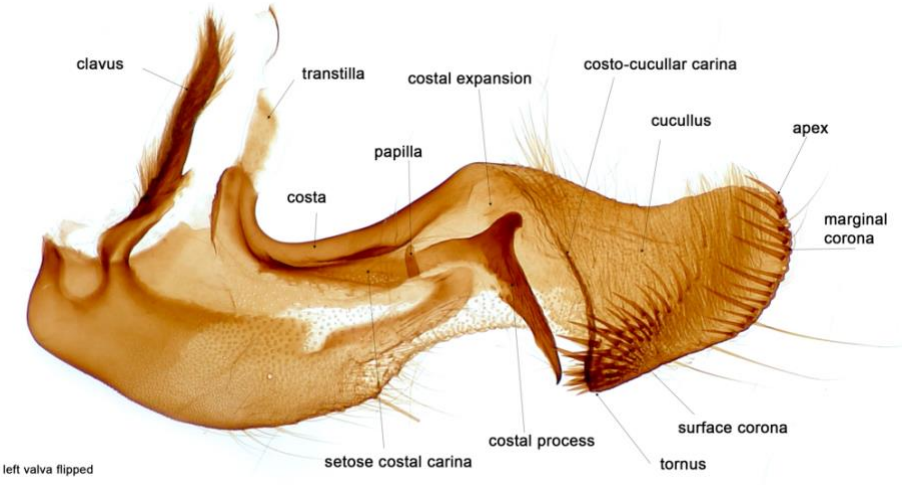


Figure 15: *Amphipoea fucosa* (Saltern Ear) – valva with costal parts labelled (+ an exceptionally elaborate clavus)

On the external lamina any extension of a sclerotised plate from the costal margin is continuous at its base with the external lamina of the saccular base; although the amount of sclerotization varies from species to species such sclerotization is otherwise featureless.
On the internal lamina I have termed a sclerotised plate extending from the costal margin a **costal expansion**. There is very often ornamentation of this plate.

The base of the costa is continuous with the transtilla (see Part 3 - Diaphragm) and has a strong hyaline connection to the junction of the vinculum with its articulating segment. Thus, the mechanisms that move the tegumen away from the vinculum and those that separate the valvae are articulated at the same point.

Ornamentation of the internal lamina of the costa may occur with one or more of the following features:

- A **carina**. There are two specific locations where costal carinae are commonly found. A '**setose costal carina**' runs along the opposing margin near the base of the costal expansion and has a raised setose area. A '**costo-cucullar carina**' marks the division between a cucullus and the (rest of) the costa.
- A process. **Costal process**es most commonly appear at the distal end of a setose costal carina, on the costal margin and/or at the apex of the opposing edge of the costal expansion.
- A **setose patch** – in the same location as a setose costal carina but without the carina.
- A **costal hump** is a short, rounded protrusion from the costal margin seen in a few species.

The strengthening of the costal margin usually thins distally and merges with the costal expansion as a plate through the internal lamina of the valval apex.

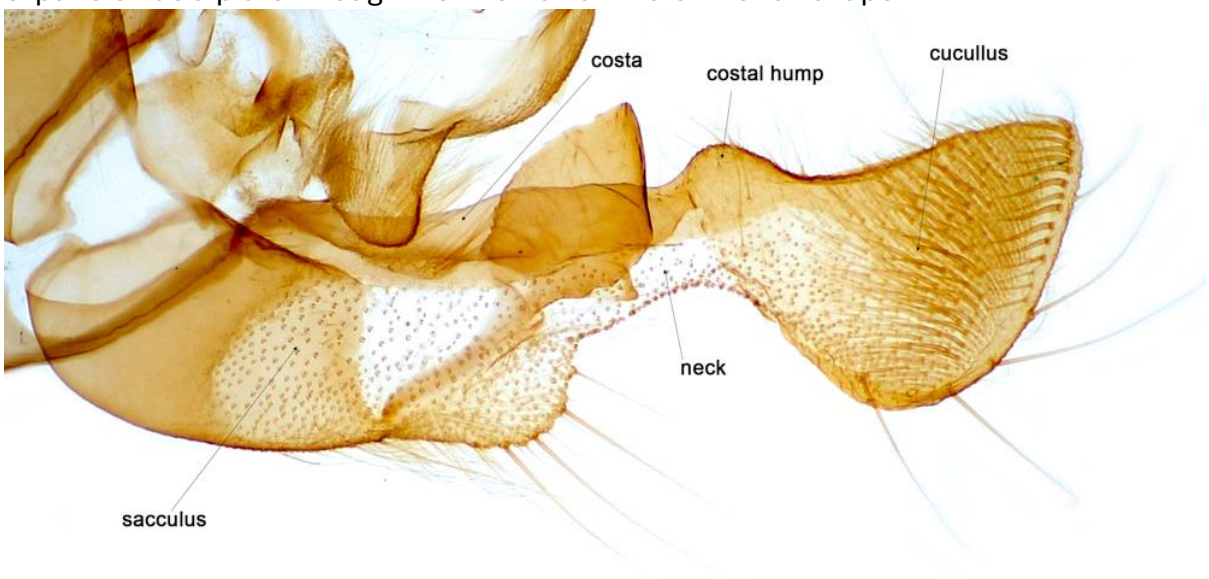


Figure 13: Valva of *Eremobia ochroleuca* (Dusky Sallow)

4) The valval apex

In many cases the distal margin of the valva is a simple rounded continuation of the costal and saccular margins and it suffices to say that the apex is rounded. In other cases there may be one or two distinct angles or points at the distal end of the valva. There are two common patterns. i) The apex forms an angle, most often this is at the distal end of the costal margin while the saccular margin is relatively smoothly rounded, such that there is no clear demarcation of a distal margin from the saccular margin. ii) The apex of both costal and saccular margins may form angles that demarcate a distal/apical valval margin. Where there is only one angle this is the 'apex'. Where there are two angles there is no clear nomenclature. I propose that in this situation we use the same terminology as for the wings and call the angle at the distal end of the costal margin the apex and the angle at the distal end of the saccular margin the '**tornus**'.

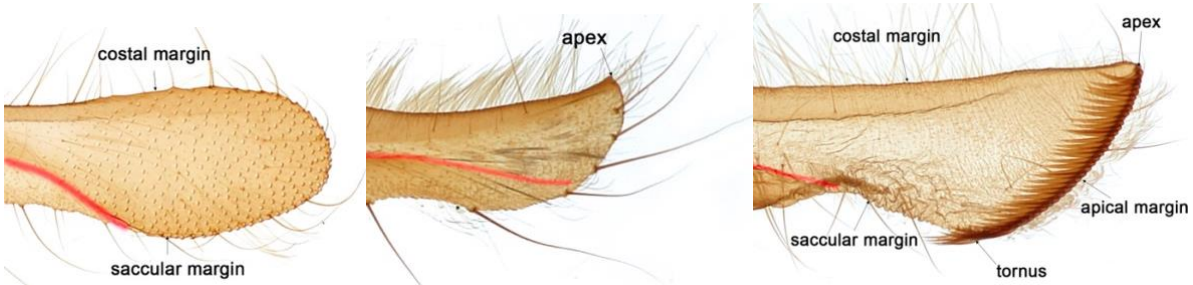


Figure 14: Valval apices of: *Thysanoplusia ochricalcea* (Slender Burnished Brass), *Syngrapha interogationis* (Scarce Silver Y) and *Cucullia umbratica* (Shark). The red line indicates the division between saccular and costal components of the valva

There is a possibility for confusion between the use of the term 'apex' for the apical region of the valva and for the apical angle. Such confusion does not often arise in practice, but the term '**apical angle**' is applied to the latter if such a possibility does arise.

The valval apex may be ornamented in various ways (Fig. 18), nearly always by modification of the costal expansion. The three main features that may be seen are:

1. A **cucullus** is essentially a special case of a 'costal expansion' at the apex of the valva differentiating it from the (rest of) the costa. Where there is a distinct basal sacculus and a distinct apical cucullus, a narrowed area connecting them, predominantly formed from the costa, is termed the **neck**. Where there is no significant neck a cucullus may be clearly defined by the medial edge of the costal expansion as it broadens into the apex, or by a **costo-cucullar carina** which, when complete, runs from the costa across the internal surface of the valva to reach the saccular margin.
2. A **pollex** is a discrete marginal process on the saccular margin of the valva, distal to the saccular extension and continuous with the costal expansion. It is most often present when a cucullus is identifiable.
3. A **corona** is series of spines at the apex of the valva. There are three basic types:
    - A marginal corona is a line of spines along the distal margin of the valva. The spines are most often reflexed over the internal surface of this margin (rather than protruding out). Sometimes a linear corona of this sort is "submarginal" following the distal edge of the costal expansion at the apex, with a narrow rim of the saccular extension distal to it.[8]

- A surface corona has spines in a line or cluster on the internal surface of the apical portion of the valva. Both marginal and surface coronas may be present on the same valva (see Fig.).
- A compound corona involves a band of spines on the internal surface of the valval apex in continuity with spines at the margin.

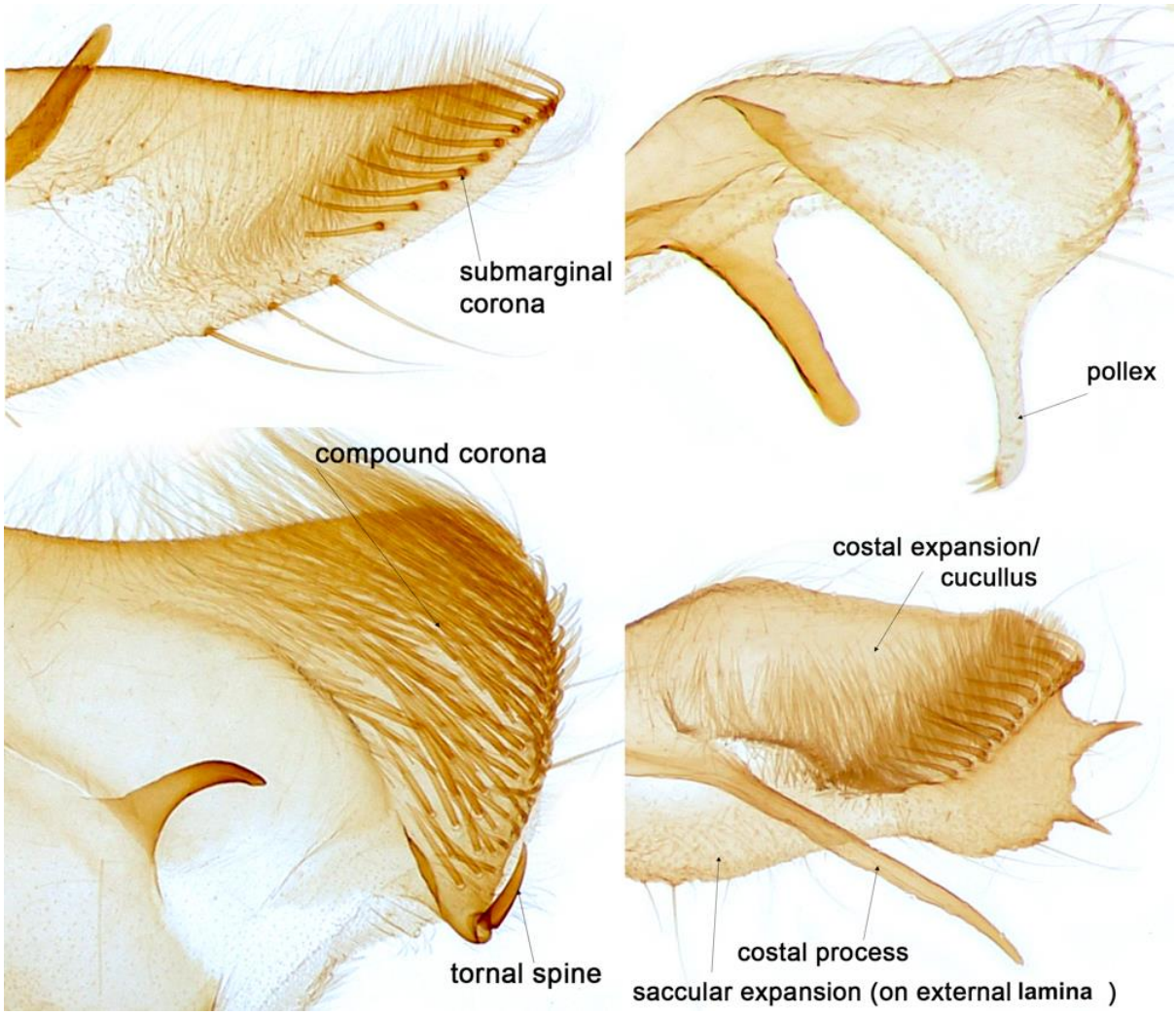


Figure 15: Valval apices: top left – *Phlogophora meticulosa* (Angle Shades), top right – *Oligia fasciuncula* (Middle-barred Minor), bottom left – *Dypterygia scabriuscula* (Bird's Wing), bottom right – *Dryobotodes eremita* (Brindled Green)

An extreme example of a submarginal corona is provided by *Dryobotodes eremita*. This also demonstrates that the cucullus is formed from an expansion at the apex of the costal sclerotization.

[8] Note that in a set specimen a marginal corona may appear to be submarginal if the apex has not been completely flattened and so is viewed partially end-on with a crescent of the external lamina extending distal to the true apical edge.

5) Mid-valva and the boundaries of the sacculus and costa

We have already noted (*Orthosia incerta* Fig. 12) that on the external lamina the costa and sacculus are fused to the extent that there is no clear boundary between them. For the most part, the limits of the sacculus and costa on the internal lamina are fairly clearly defined using the terms and definitions above. The distal extent of the sacculus is less clearly defined with the saccular extension often diffusely sclerotised but usually traceable to between ½ and ⅔ the length of the valva, and sometimes it can be traced to the apex. Where the internal lamina of the apex is fully sclerotised, the sclerotisation is most often entirely costal in origin; but in some species there is a fusion of the costal and saccular sclerotisations which may render any boundary indiscernible. In most such cases, however, there is some feature permitting differentiation. This may take the form of different degrees of sclerotization (usually with the costa more strongly sclerotised) or different orientation of hair-scales (eg costal hairs in the transverse axis, saccular hairs in the long axis of the valva).

We are left with two further mid-valval problems to resolve:

i. Is a hyaline membrane between the saccular and costal sclerotisations part of the sacculus, part of the costa or neither?
ii. What terms should we use to describe structures arising from such a membrane?

Since the opposing edge of the costal expansion is generally quite distinct, and the margin of the saccular extension is often diffuse, an argument could be made to define such a hyaline membrane as being part of the sacculus. However, this would mean that structures arising from it are 'saccular' and this may result in confusion with structures arising from the sclerotised parts of the sacculus and further clarification of the 'opposing edge of the sacculus'. My inclination is to regard it as a connecting membrane between sacculus and costa and so part of neither. The significant structures sometimes arising from this membrane will be referred to as '**mid-valval papillae**' and '**mid-valval processes**'.

Papillae (s. papilla)

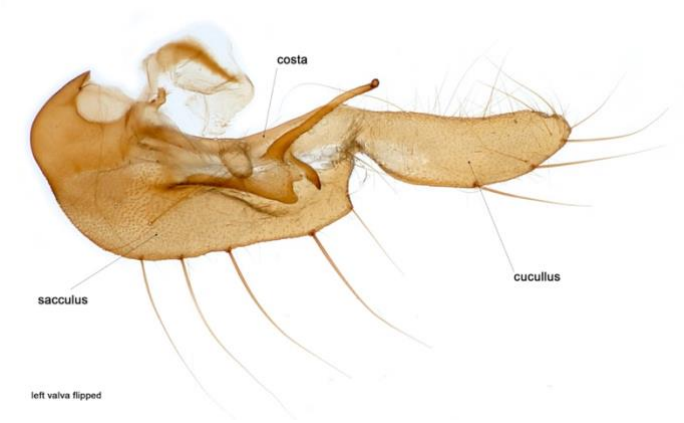
Small projections from the internal surface of the valva most commonly occur in the mid-valval hyaline membrane, near the apex of a saccular band or proximal to a costal process. They are usually single, poorly sclerotised or unsclerotised, narrow, sometimes stalked and often setose.

Appendix to part 2: Illustrated dissections

The next few pages provide some illustrated dissections to demonstrate the application of the terms used to describe the features of the valva and its associated structures.

There is almost limitless variation in detail of the valval features amongst the Noctuidae. Note that in most of these dissections the transtilla (see Part 3 - Diaphragm) has been retained and its division into costal and manical parts is evident.

Leucania comma (Figs. A1, A2):



Valvae symmetrical; sacculus, costa, neck and cucullus fairly clearly differentiated; basal articulation of sacculus short (lateral arms of vinculum correspondingly short); small clavus; raised flap-like carinate saccular band with long saccular process; short costal process without carina; 2 setose papillae; long marginal setae on sacculus and cucullus; no corona

Figure A116: *Leucania comma* (Shoulder-striped Wainscot) Valva

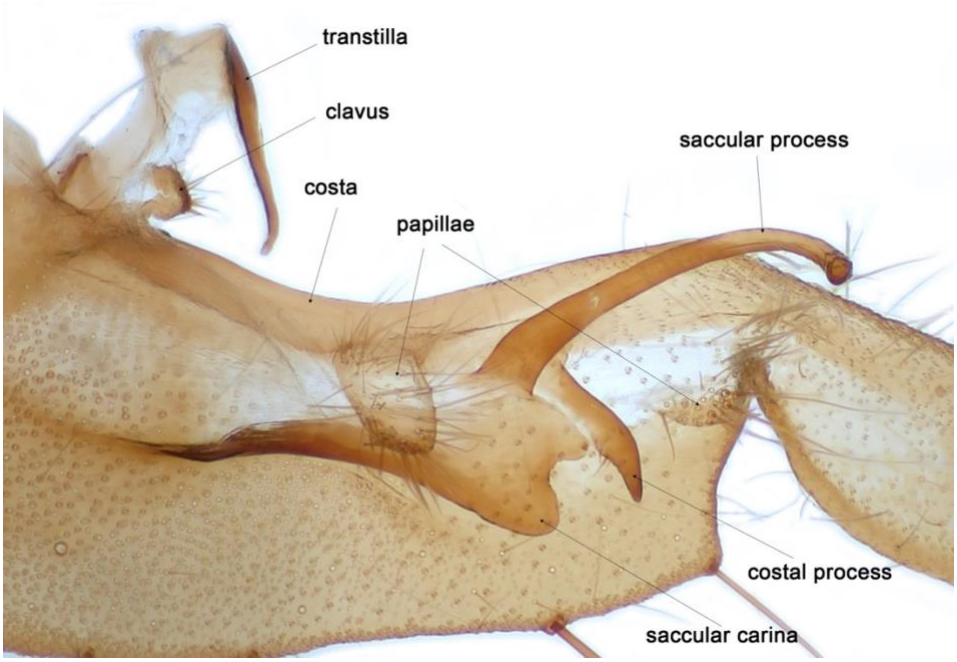


Figure A2: *Leucania comma* (Shoulder-striped Wainscot) central area of valva

It is a somewhat arbitrary decision as to when a raised flap-like carina becomes a process. In *L.comma* the rounded protrusion at the distal end of the carina seems to be part of the carina. Compare this with *Diarsia mendica* (Fig. A3) where there is clearly a second saccular process in this position.

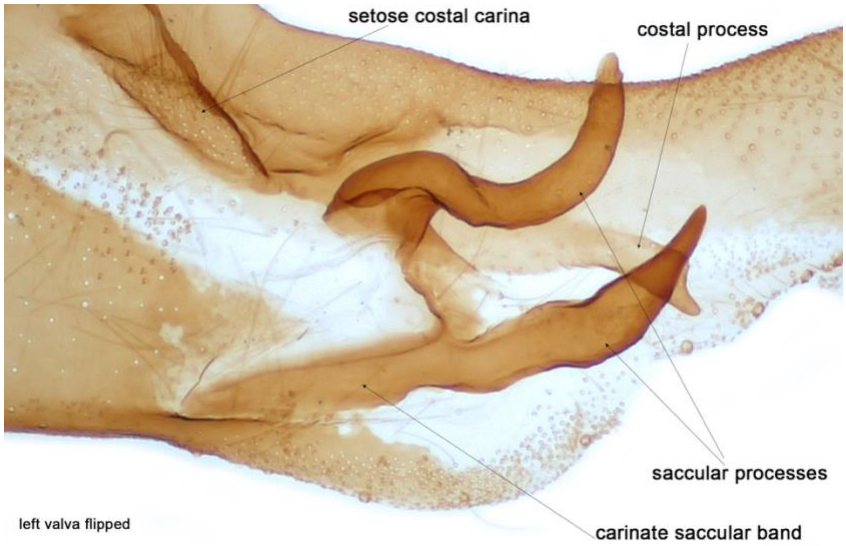


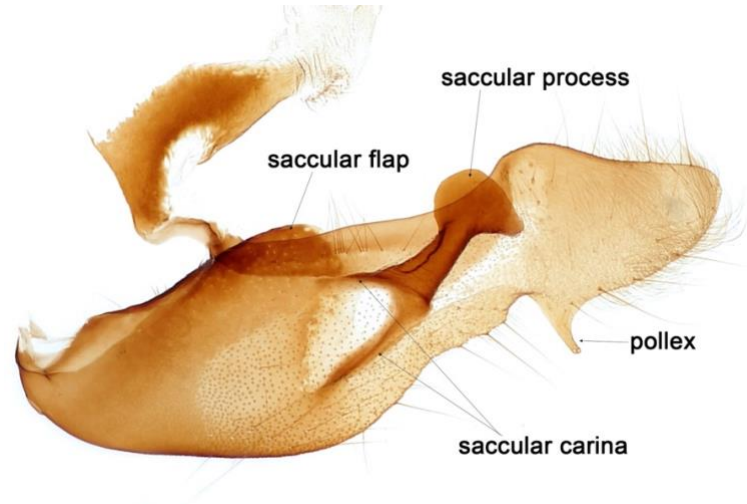
Figure 17: *Diarsia mendica* (Ingrailed Clay) central region of valva

Mesapamea secalis (Fig. A4)

Valvae symmetrical; differentiated with identifiable sacculus, costa, neck and cucullus; clavus with a finely spined, well-sclerotised, apex; no saccular or costal carinae or processes; surface corona

Figure 18: *Mespamea secalis* (Common Rustic) valva

Tholera decimalis (Fig. A5)



Valvae symmetrical; sacculus with a large saccular flap extending over costa; saccular carina originates as a carinate saccular band in the angle between the saccular base and a diffuse saccular extension. The carina extends distally submarginally and then curves back towards the costa and ends subcostally with some tethering to the costa – (it does not attach to the saccular flap which overlies it). The carina gives origin to a saccular process with an expanded apex; no costal process; cucullus without a neck, with a small pollex; no corona.

Figure 19: *Tholera decimalis* (Feathered Gothic) valva

Bryopsis muralis (fig. A6)

Sacculus with a large apical process; costa almost entirely distal to the base of the saccular process and essentially articulated on its external surface; no cucullus; the external surface of the valva is entirely stippled-hyaline.

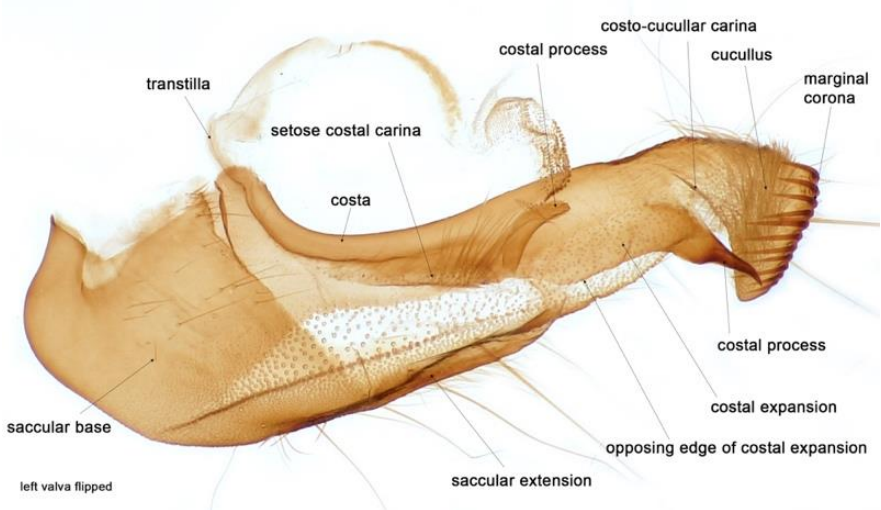
Figure A6: *Bryopsis muralis*. Right valva: above - standard ventral view, below - costal view

Anarta trifolii (fig. A7)

One of the few Noctuids to have asymmetrical valvae – the right valva having a distinct saccular flap (completely absent on the left) and a longer more serrate saccular apical process.

Figure 20: *Anarta trifolii* (Nutmeg) valvae

Hydraecia micacea (fig. A8)



Sacculus unornamented but shows a standard arrangement of broad sclerotised base and narrow extension along saccular margin. Costal expansion with a setose costal carina proximal to a costal process. This process is in a position where a papilla is often found but it is too large to call it a papilla. Costal expansion broadens towards apex, with a well-sclerotised process at the apex of its opposing margin, that crosses the saccular margin; cucullus with marginal corona.

Figure A8: *Hydraecia micacea* (Rosy Rustic) valva

Calophasia lunula (fig. A9)

In the 4 images of the valvae of this species the left two are internal lamina up and the right two are external lamina up. These images demonstrate:

- In a standard slide preparation, it can be difficult to know whether a structure is on the internal or external lamina from a photograph.
- Almost every significant feature of the Lepidopteran valva is on the internal lamina - but in this species there is a carina at the base of the external surface of the costa which is continuous with the transtilla.
- The base of the external lamina of the sacculus (which articulates with the vinculum) is thickened in a fashion that is more usually seen in the costa and not usually seen in the sacculus; this thickening is continuous with the carina bearing the transtilla; and the costal margin is a simple sclerotised fold (similar to the saccular margin), rather than a thickened bar.
- The sclerotised edge of the sacculus on the internal lamina is not coincident with its sclerotised edge on the external lamina (blue lines in fig. A9).
- The saccular carina directed proximally and towards the costa, across the centre of the valva, which bears a small papilla, is separated from the costa by a narrow hyaline gap.

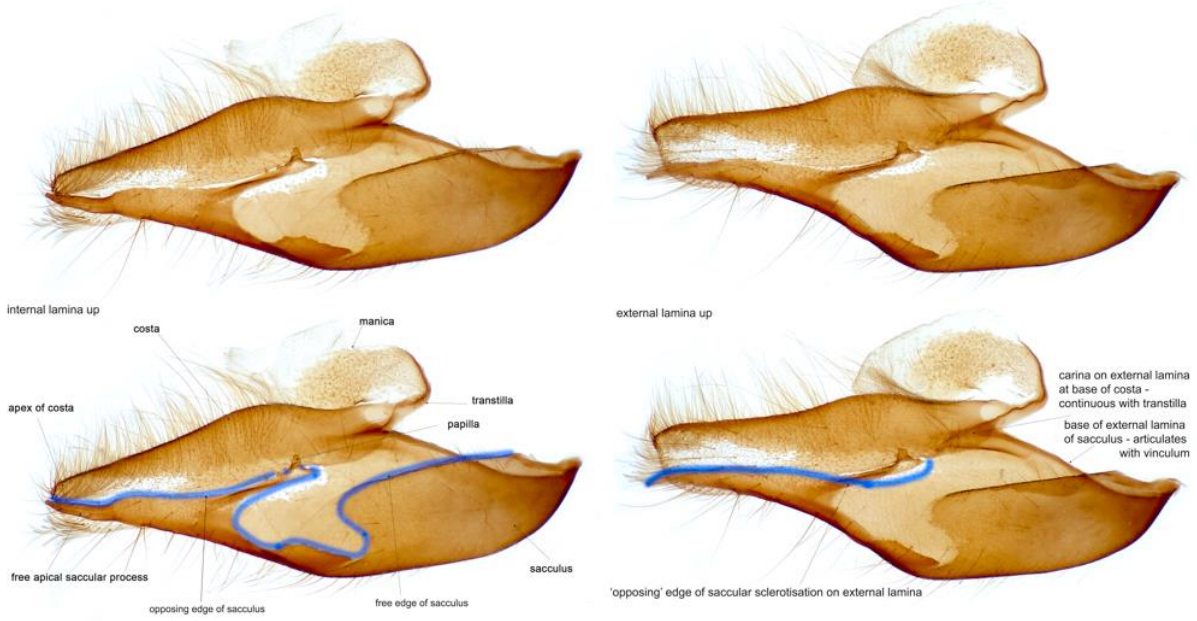


Figure A9: *Calophasia lunula* (Toadflax Brocade) valva – see text for explanation

In this species the sacculus extends unusually far along the saccular margin and is produced into an apical process; the edges of both laminae of the sacculus converge at the base of this process, such that distal to this point the only part of the valva that is part of the sacculus is the apical process. The costa is sclerotised all along the costal margin to the apex (and there is no differentiation of a cucullus).

Lithophane socia (fig. A10)

- The costal processes arise on the opposing edge of the costal expansion
- The external lamina of the valva distal to the saccular base is largely stippled-hyaline.
- On the apical margin the sclerotisation of the costa folds onto the external lamina (arrowed in the right-hand fig.) and the costal expansion twists onto the internal surface to end in a short straight edge that bears a corona. This corona is 'submarginal' - on the edge of the costal sclerotization, rather than on the edge of the valva.
- The costal processes are symmetrical but may appear to be asymmetrical in a slide preparation due to differential deformation following compression under a cover slip. The smaller process is naturally directed perpendicular to the valval surface.

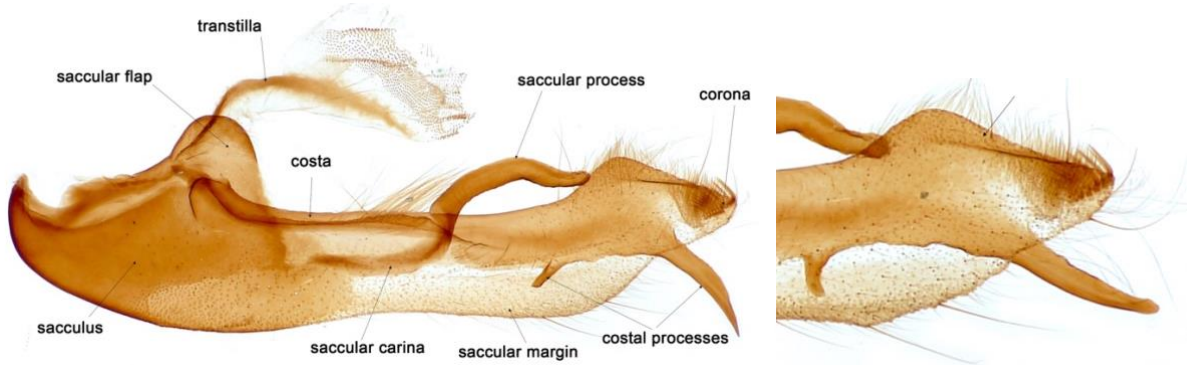


Figure A10: *Lithophane socia* (Pale Pinion). Left - standard view of right valva. Right - apex of right valva with external lamina up

Hyppa rectilinea (fig. A11)

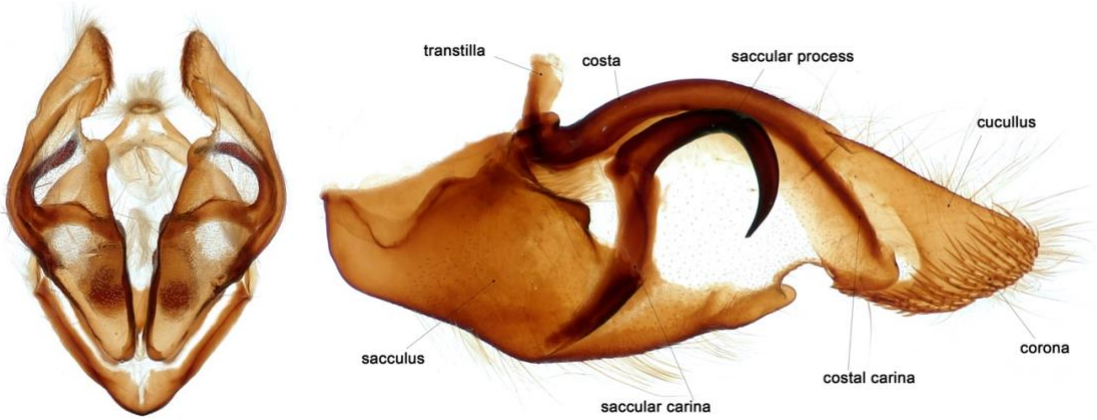


Figure A11: *Hyppa rectilinea* (Saxon). Left - armature in natural position. Right - right valva in set position

- This species shows a well-demarcated sacculus and demonstrates the continuity of costa and cucullus.
- It also shows extreme curvature of the external lamina of the valva from base to apex, a feature that is lost in a slide preparation.
- The saccular process is directed away from the internal surface of the valva and is directed distally at its base and then curves towards the saccular margin at ~⅔ of its length. In a slide preparation (fig 32 right) the basal portion of the process is foreshortened, such that the division between the distally and anteriorly directed portions appears to be at ½.
- The corona is a 'compound corona'

Panolis flammea (fig. A12)

This valva demonstrates several atypical features

- The apex is tubular
- The costal expansion has reduced sclerotization around the origin of the costal process
- The saccular band is continuous with the free edge of the saccular base

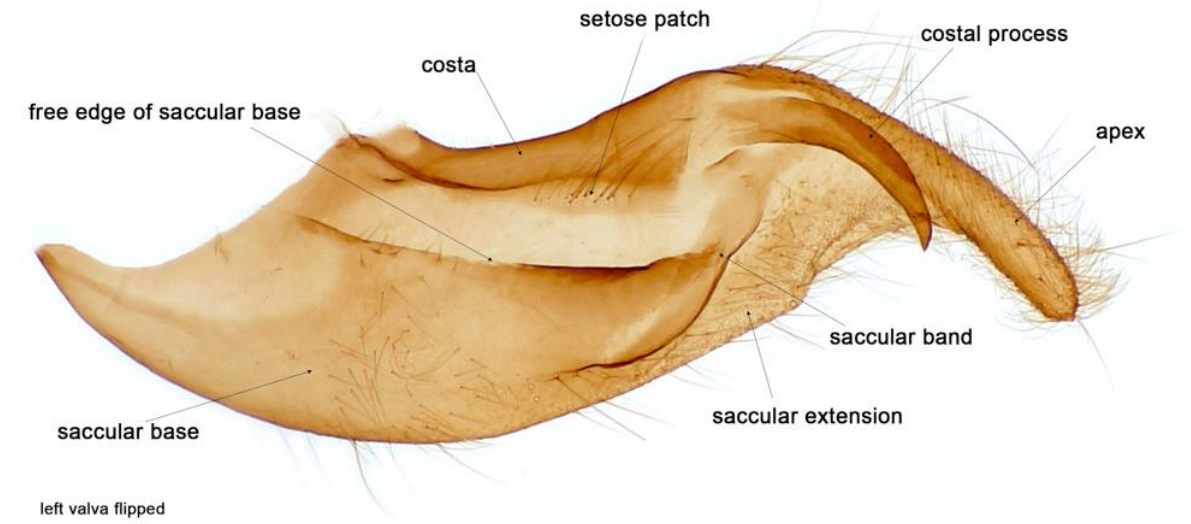


Figure A12: *Panolis flammea* (Pine Beauty) valva

Noctua janthe (fig. A13)

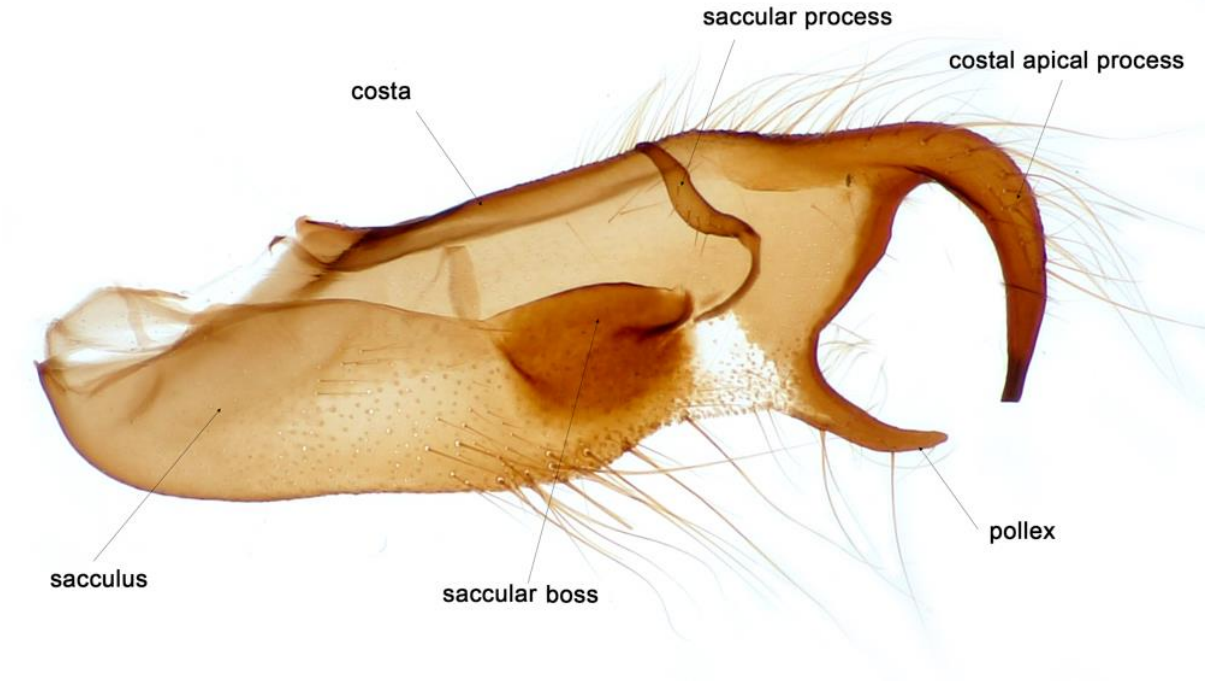


Figure A13: *Noctua janthe* (Lesser Broad-bordered Yellow Underwing) valva

- The costa becomes tubular at the apex and forms a strongly sclerotised apical process.
- The saccular base has a strong boss at its distal end.
- The saccular process has a tenuous connection to the saccular base and is rather flimsy.
- There is no saccular extension.
- The pollex is clearly continuous with the costal expansion

Eugnorisma glareosa (fig. A14)

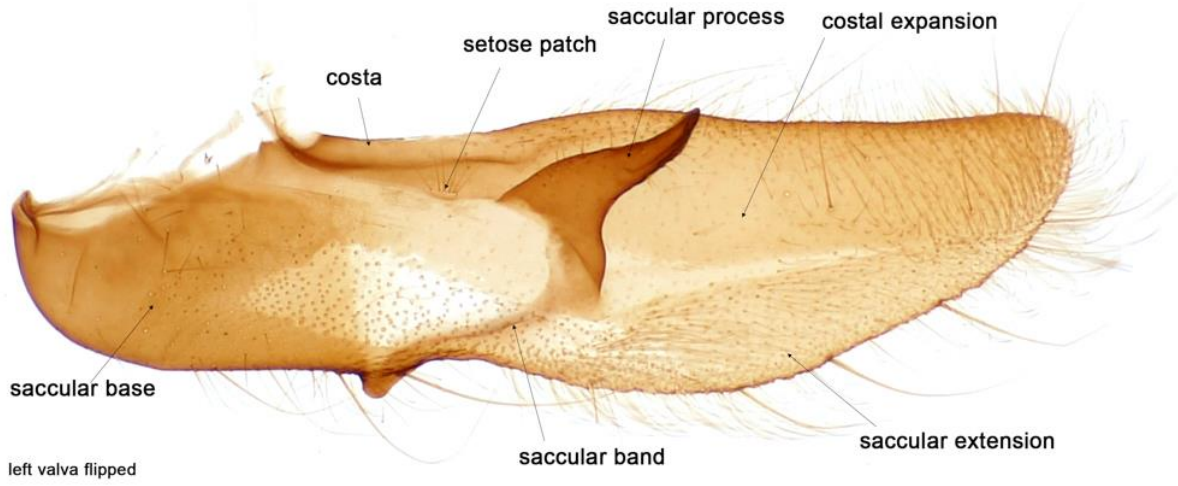


Figure A14: *Eugnorisma glareosa* (Autumnal Rustic) valva

- The valva is fairly simple, the saccular process being the only significant feature.
- The saccular band is produced as a small carina from the saccular margin
- The costa is minimally thickened in its basal portion.
- Although the distal half of the valva appears undifferentiated at first sight, it is possible to trace a division between costal and saccular portions on the internal surface. The sclerotization of the costal portion is slightly denser, and the hair scales on the costa are directed towards the costal margin while those of the sacculus are directed towards the apex.

Rhizedra lutosa (fig. A15)

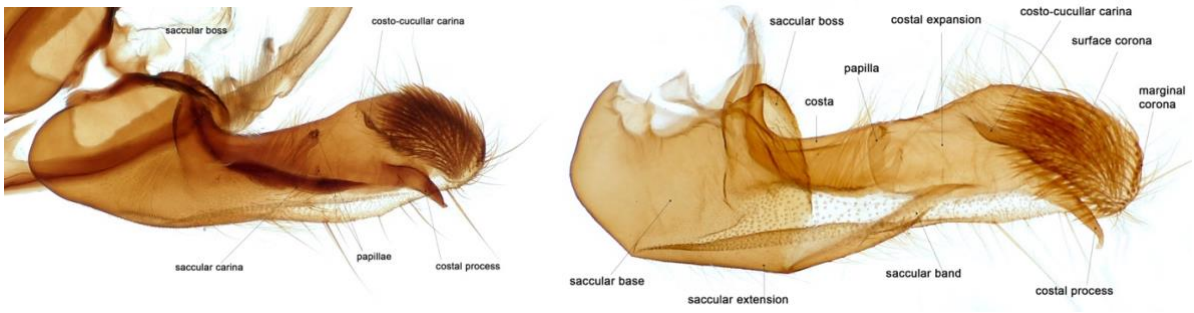


Figure 21: *Rhizedra lutosa* (Large Wainscot) valva – see text for explanation

Fig. A15 illustrates the difference in appearance that can occur with variation in rotation of the valva. The left image is a set specimen of the armature, the right image is a set specimen of the detached valva. In left image, the valva is tethered by its attachments to the juxta and the other valva, such that the saccular margin, as seen on the detached valva, appears to be near the centre of the internal lamina. This alters the apparent position of the saccular band and obscures the saccular boss. The distal part of the valva is relatively unaffected.

Axylia putris (fig. A17&18)

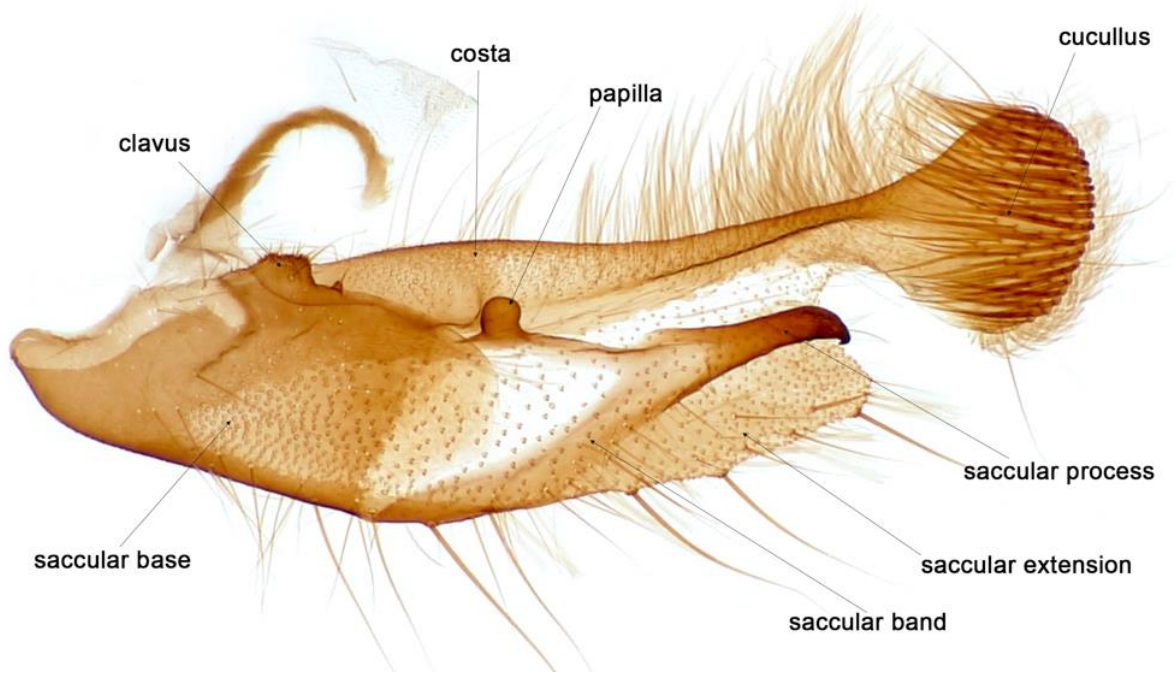


Figure 22: *Axylia putris* (Flame) valva

- Almost complete separation of sacculus and costa
- The saccular band leads to a saccular process and a carina returns proximally from the base of this process towards the costa. The fact that this carina does not connect either to the costa or the saccular flap is not apparent in a standard slide preparation (fig. A17), but can be readily perceived with the base of the sacculus unfolded (fig. A18)
- Where a carina returns in this way there is commonly a papilla or sclerotised bump close to its medial end and close to the costa. It seems that this contributes to some degree of tethering of the saccular carina and process to the costa.
- The cucullus shows another example of a compound corona.

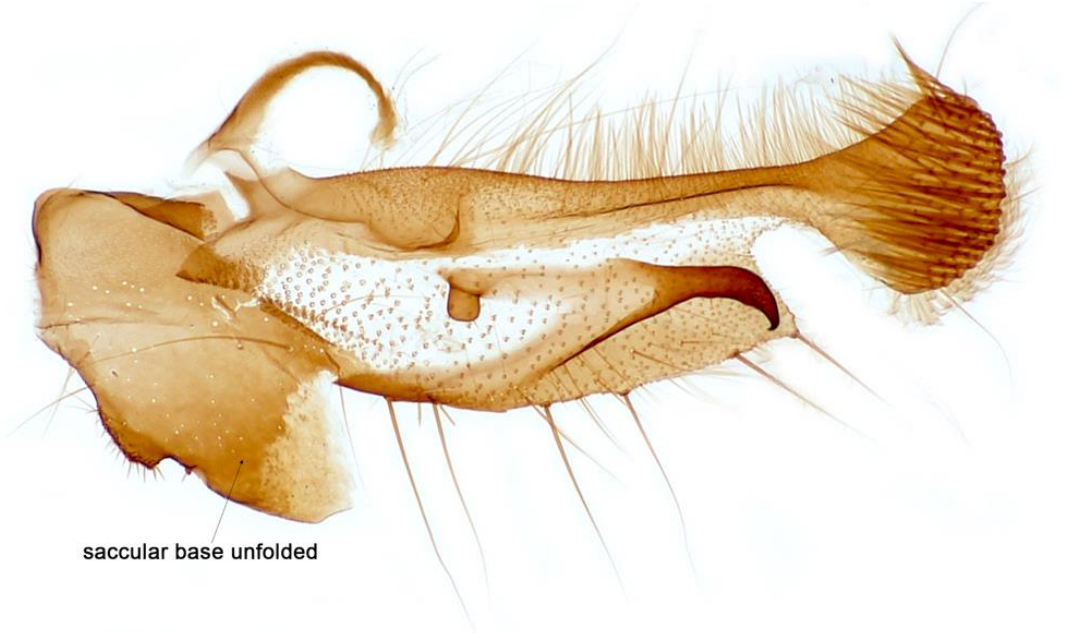


Figure 23: *Axylia putris* (Flame) valva with base of sacculus unfolded

Arenostola phragmitidis (figs. A19-21)

- Almost complete differentiation of sacculus, costa and cucullus
- No carinae or processes, only a small, clubbed mid-valval papilla
- Cucullus without a 'neck' but clearly defined by a costo-cucullar carina
- Cucullus with a marginal corona

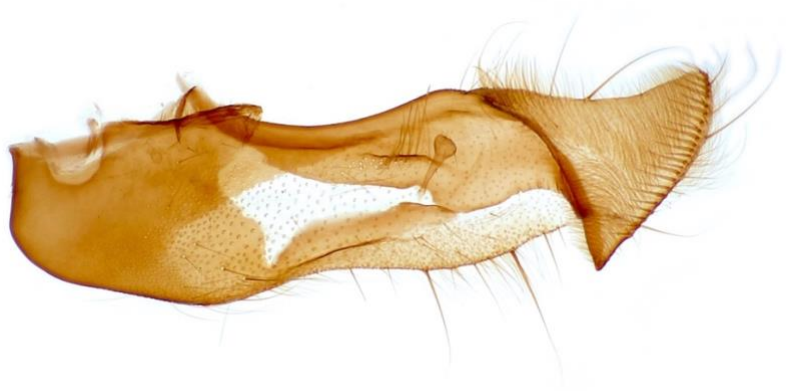


Figure 24: *Arenostola phragmitidis* (Fen Wainscot) valva

Fig. A20 shows the division of the component parts of the valva. In this species it was possible to remove most of the sacculus (fig. A21). This demonstrates clearly that the cucullus is differentiated from the apical portion of the costa and has no saccular origin. It also demonstrates that, while much of the sacculus and costa can be separated, the connection between the external lamina of the base of the sacculus

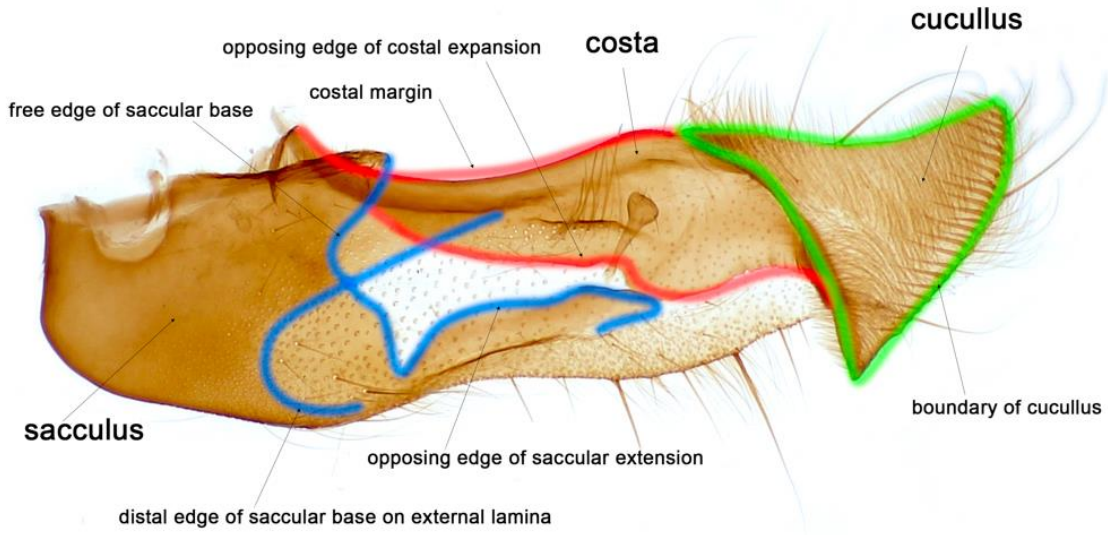


Figure 25: *Arenostola phragmitidis* (Fen Wainscot) valva showing division of component parts

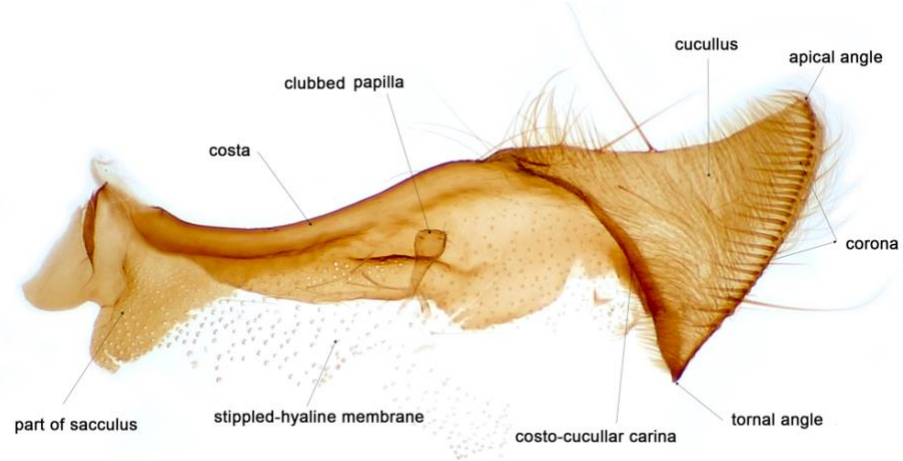


Figure 2621: *Arenostola phragmitidis* (Fen Wainscot) valva with most of sacculus removed