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Vestiture of Papilla analis in Tortricidae (Insecta: Lepidoptera)

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ABSTRACT. The vestiture and sculpture of papilla analis of the three types of ovipositor in Tortricidae is described and illustrated.

Key words: entomology, morphology, papilla analis, Insecta, Lepidoptera, Tortricidae.

INTRODUCTION

In Tortricidae there are three types of papilla analis, viz., the generalized type, the floricomous type, and the telescopic type. The first of them is known throughout the family, the floricomous type developed independently in some Tortricini, a majority of Cnephasiini, and is exceptionally found in Polyorthini and Eucosmini; the telescopic type, also directly adapted to the mode of oviposition, was found in Tortricini and Cnephasiini (RAZOWSKI in press). There are also some intermediate forms.

The setae of papilla analis were treated only by FAUCHEAUX (2000) in one Olethreutinae species, *Lobesia botrana* (DENIS & SCHIFFERMÜLLER). The authors studied numerous species belonging to all the three subfamilies of Tortricidae and provide a selection of scanning electron microscope photographs as well as characteristics of chaetae. The terminology of parts of papillae anales follows RAZOWSKI (in press).

TYPES OF SENSILLAE

FAUCHEAUX (2000) distinguished four types of sensillae in *Lobesia botrana*: three earlier known in other lepidoptera (Noctuidae, Acrolepidae, Pyralidae) and one with inner channel called by him the uniporous sensilla chaetica. In 1999 the same author (FAUCHEAUX 1999) discussed the ultrastructure of simple chaetae. In the examined species we found three trichoid sensillae both plain and with inner channel. Some of them may belong to the type D but unfortunately we could not confirm the presence of apical pore. We also studied some specialized chaetae whose chief function is scraping off the debris. All of them are articulate, set in large alveolae on the processus externi. The sensillae chaeticae without porus are as follows:

- Long chaetae (type A according to Fauchaud) situated at the outer edges of papillae in various numbers. They can be also found on other parts of genitalia, similarly as the setae of type B).
- Medium sized chaetae (type B) are numerous and often found on dorsal surface of papillae.
- Small sized chaetae (type C) ; numerous, distributed between the chaetae of the two former types, perpendicular or oblique.
- The uniporous sensilla chaetica (D) characterized by a terminal pore extending basally and with outer sculpture in form of longitudinal concavities. They are few (in *botrana* FAUCHEAUX found 12 setae per papilla)
- The scraping setae are broad, flat, usually with specialized apical parts which are spoon-like (type E) or weakly expanding terminally, provided with a pin-shaped process (type F) .The setae of type E form large agglomerations usually in median, often specialized, portions of papillae (ventral lobe) .They may also be accompanied by simple, long flat setae (G). The third type (H) includes short rigid setae not expanding terminally, provided with sharp, short ends. In one case (cf. *Tortrix viridana*) the scraping setae (I) are simple, bent, resembling those of type A.

An unexamined type of sensilla appears as a very broad, almost conical seta on a large alveole. It was observed in a few species e.g. in some Cochylini (*Eugnosta*; RAZOWSKI 1970).

THE CUTICULAR PROCESSES

The processes usually found on the ventral surfaces of papillae anales not articulated with cuticula are of various sizes and shapes. Usually these are slender microtrichia, minute aculei or thorn-like spines, often characteristic of the species.

THE SCULPTURE

The cuticula of various parts of papilla analis is characterized by a presence of various ribs, ridges or other protuberances free of spines, thorns or similar

processes, or with such elements. They are sometimes species-specific, however, variable or irregular in size and distribution.

SYSTEMATIC EXAMPLES

Tortricini (Tortricinae)

Tortrix viridana (LINNAEUS) (Figs 1-5) has long and medium sized chaetae (sensillae of types A and B) situated mainly on the edges of both posterior and anterior part of papilla; scraping chaetae (H) are simple, long, slender, however, in basal halves much thicker than in posterior, characteristically bent parts. The sculptures: The outer portions of posterior parts of papillae are distinctly ribbed and the ribs or rolls have additional transverse rumples. The sculpture of anterior part of papilla occurs especially at bases of articulation of setae.

In *Aleimma loeflingianum* (LINNAEUS) (Figs 6-9) the chaetae of type B are numerous, situated mainly on lateral portions of posterior and anterior parts of papilla analis. Scraping setae occur on an elongate field in the proximal portion of papillae. The spoon-like setae (E) appear anteriorly and are followed by rather uniformly broad setae, both being in distal portion accompanied by sensillae of type A. The ventral surface of posterior part of papilla shows dense spiny convexities and more lateral parts, bordered by the setae, show numerous irregular folds also armed with spines.

Cnephasiini (Tortricinae)

Papilla analis of *Cnephasia stephensiana* (DOUBLEDAY) (Figs 10-15) is characterized by both setae A (in posterior part) and B (mainly in anterior part); slender sensillae with inner channels are situated laterally. Scraping chaetae belong to three groups: Uniformly broad, short setae of type H, spoon-like setae (E), and long flat setae (G). Minute spiniform sculpture is present on hairless areas, larger few thin processes are situated between sensilla of type A and B.

Cnephasia incertana (TREITSCHKE) has a with telescopic ovipositor (Figs 16, 17) with few sensillae of types A and B accompanied by minute setae belonging probably to this last type. The outer surface of papilla is strengthened by longitudinal ribs.

Archipini (Tortricinae)

Papilla analis of *Archips podanus* (SCOPOLI) (18-20) is characterized by rather sparse hair cover and distinct, dense sculpture. Three types of chaetiform sensilla (A,B,C) and long, apically hooked microspines are present.

Eucosmini (Olethreutinae)

On the papilla analis of *Epiblema sticticanum* (FABRICIUS) (Figs 21, 22) three chaete (A,B,C) are present, all on rather flat, broad tubercles. The sculpture is represented by irregular folds. Dense, long, slender microspinulae are present.

Papilla analis in *Epiblema foenellum* (LINNAEUS) (Fig.23) is clothed with numerous chaetae some of which have inner channels seen in their broken basal portions. Long spinulae strongly expanding basally occur.

The chaetae of papilla analis in *Epinotia abbreviana* (FABRICIUS) (Figs 24-26) belong in the first two types (A,B) and flat scraping chaetae of type F are provided with spine-shaped terminations. The sculpture consists of ribs (e.g. longitudinal ones of tubercules) and slender, weakly curved spines expanding basally.

Grapholitini (Olethreutinae)

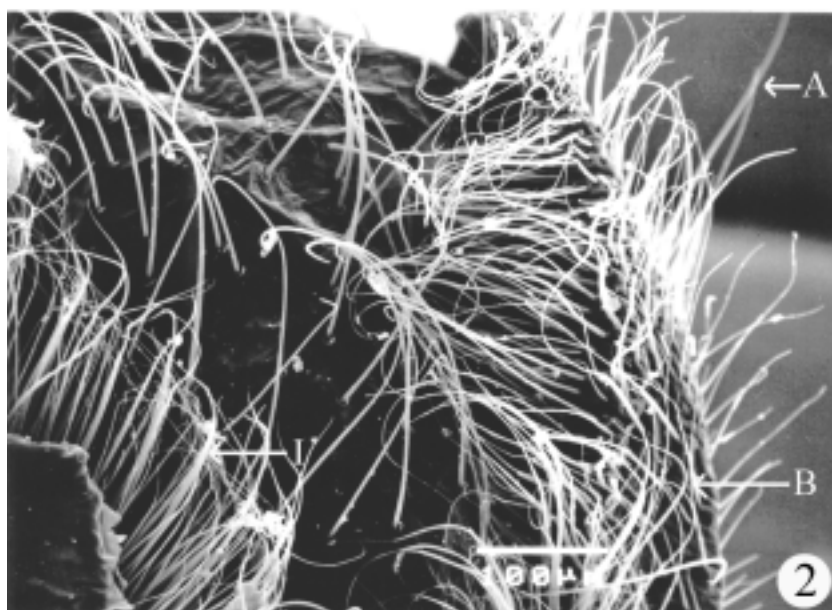
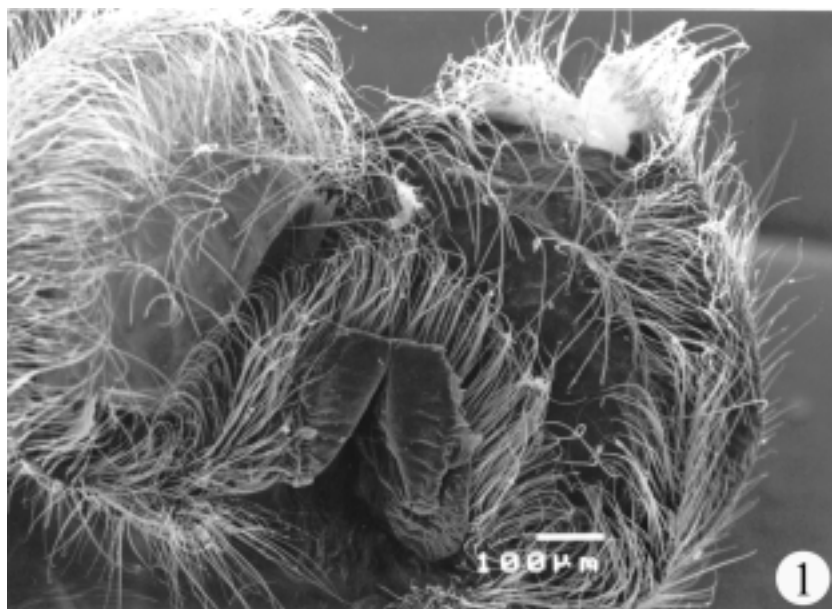
In papilla analis of *Cydia pomonella* (LINNAEUS) (Figs 24,25) both simple chaetae of various sizes and slender chaetae with inner channels are found. The sculpture is represented by more or less complicated ribs often connecting lateral parts of pinacula and long (some very long) spines.

ACKNOWLEDGMENTS

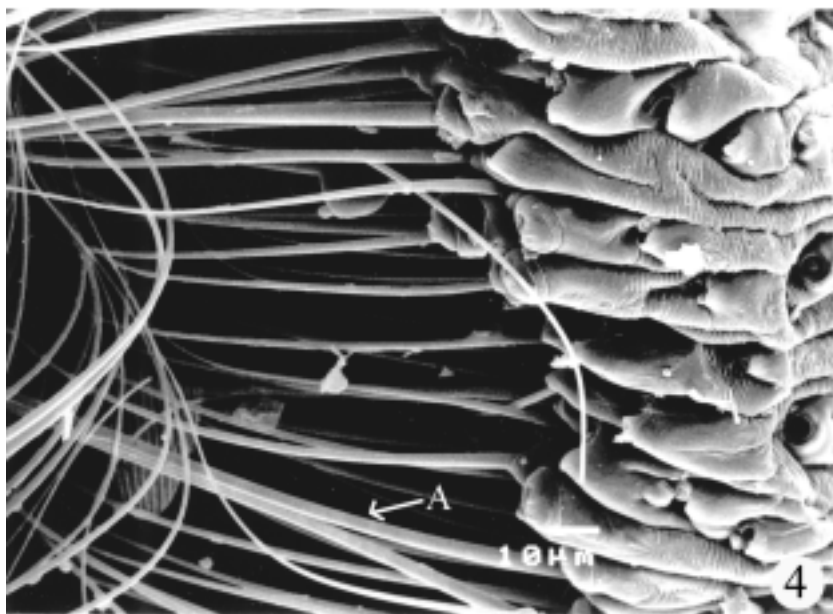
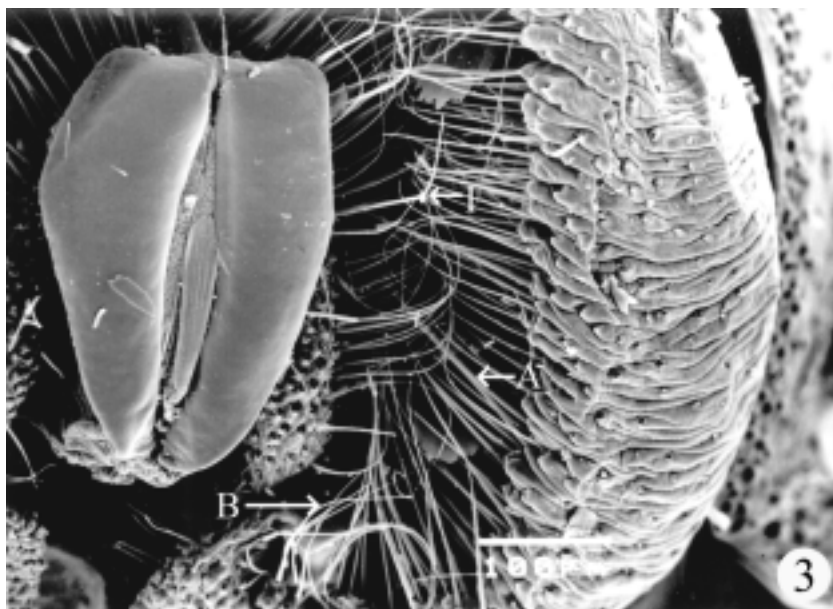
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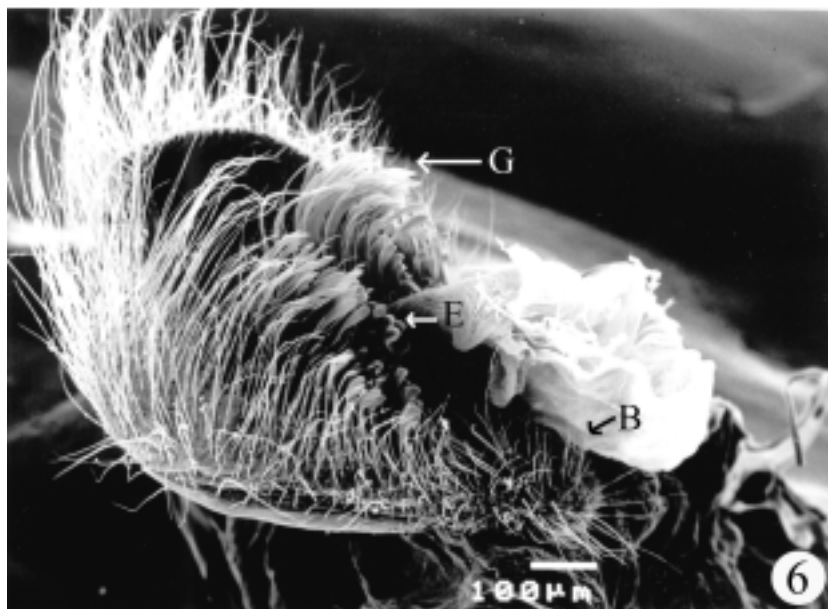
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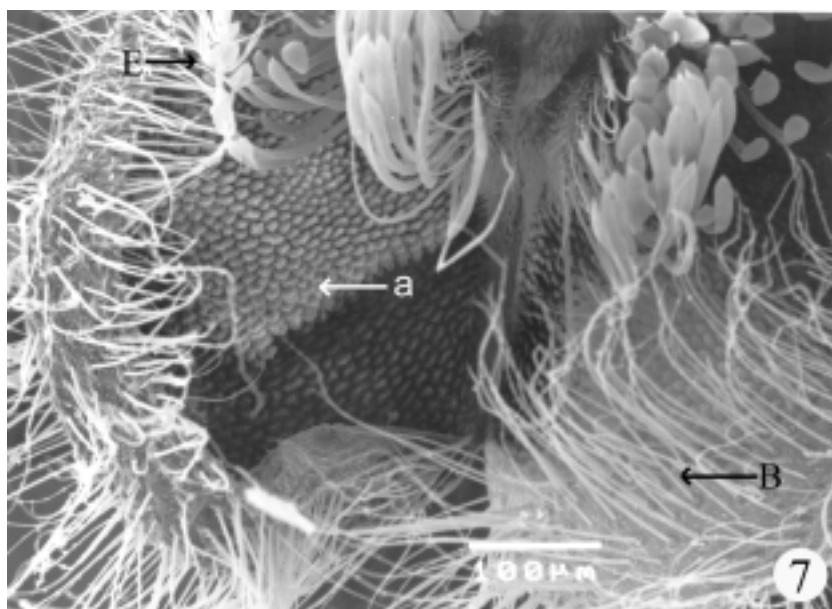
1-2. Papillae anales of *Tortrix viridana* (LINNAEUS): 1 - general view, ventral, 2 -setae of ventral lobe and larin of posterior part of papilla analis



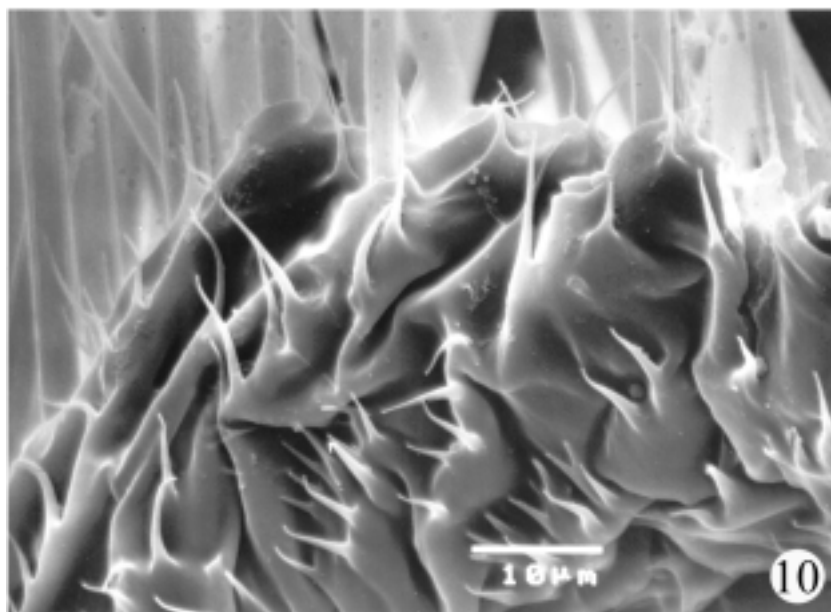
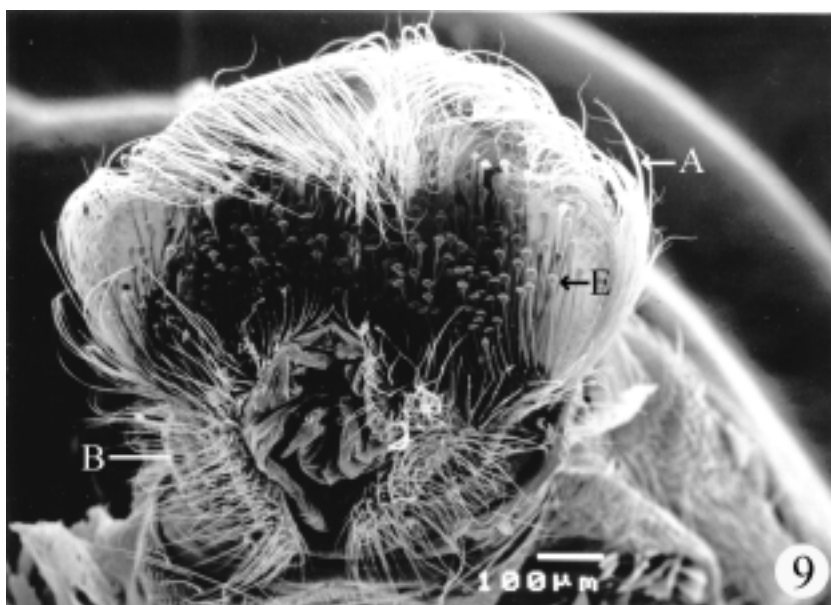
3-4. Papillae anales of *Tortrix viridana* (LINNAEUS): 3 - setae of ventral lobe and margin of posterior part of papilla analis, enlarged - ventral ribs of marginal part of posterior part of papilla, 4 - same, fragment of marginal ribs with secondary transverse strigate microsculpture



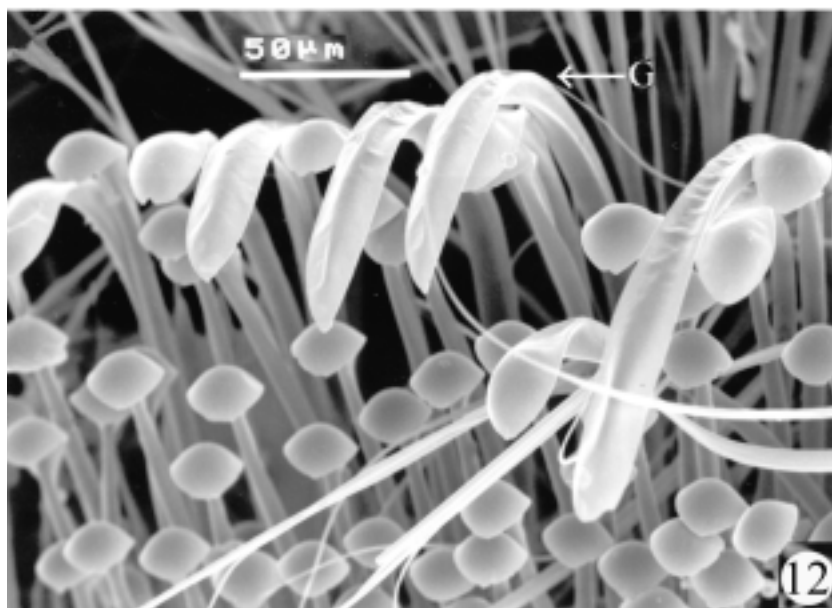
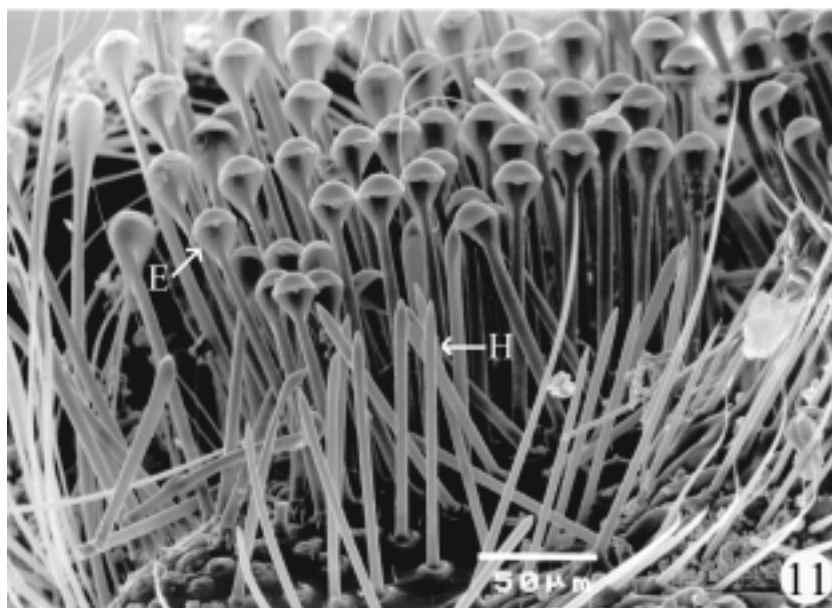
5-6. Papillae anales of *Tortrix viridana* (LINNAEUS): 5 - setae of ventral lobe and margin of posterior part of papilla analis, processus externi (some chaetae removed) with subperpendicular ribs; for explanation of characters see text; 6. Papillae anales of *Aleimma loeflingianum* (LINNAEUS), ventro-lateral



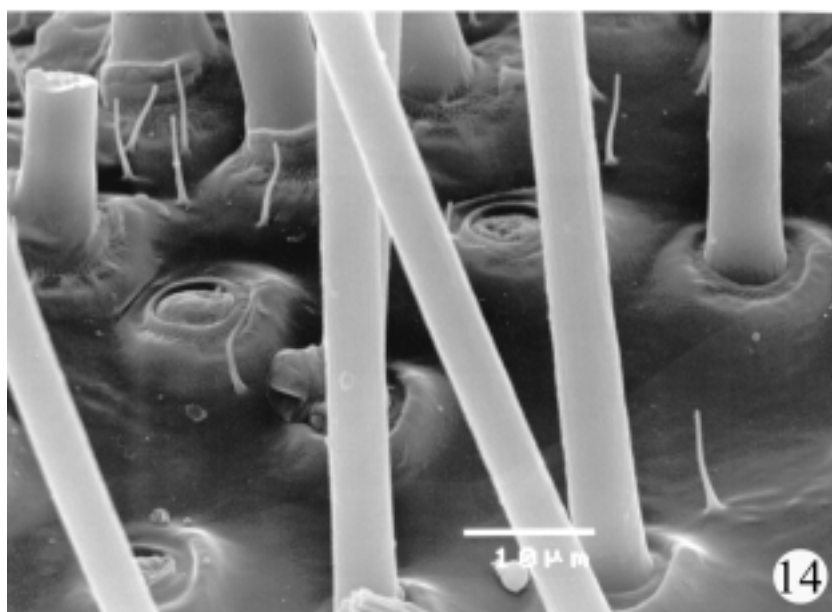
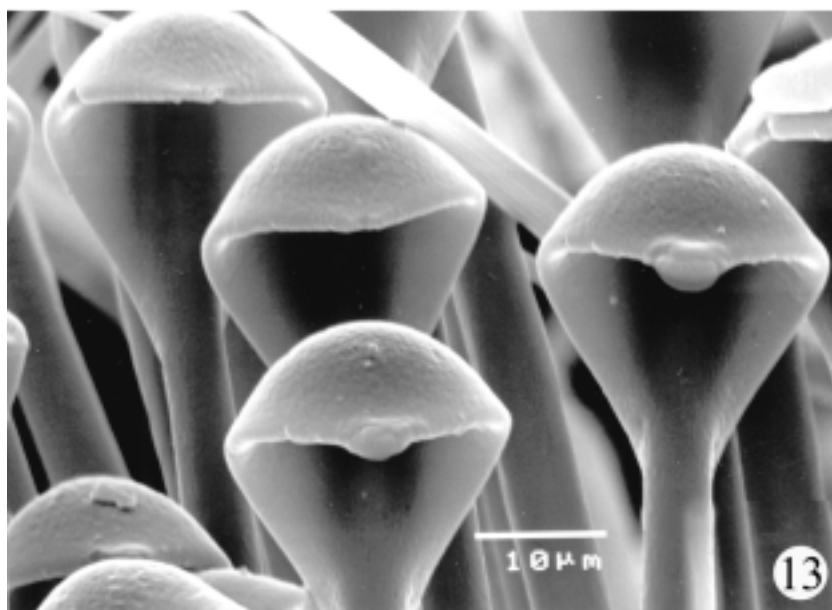
7-8. Papillae anales of *Aleimma loeflingianum* (LINNAEUS): 7 - distal part of papilla (a -area of verrucose-spiny surface) , 8 - spiny verrucae at the border of the preceding area



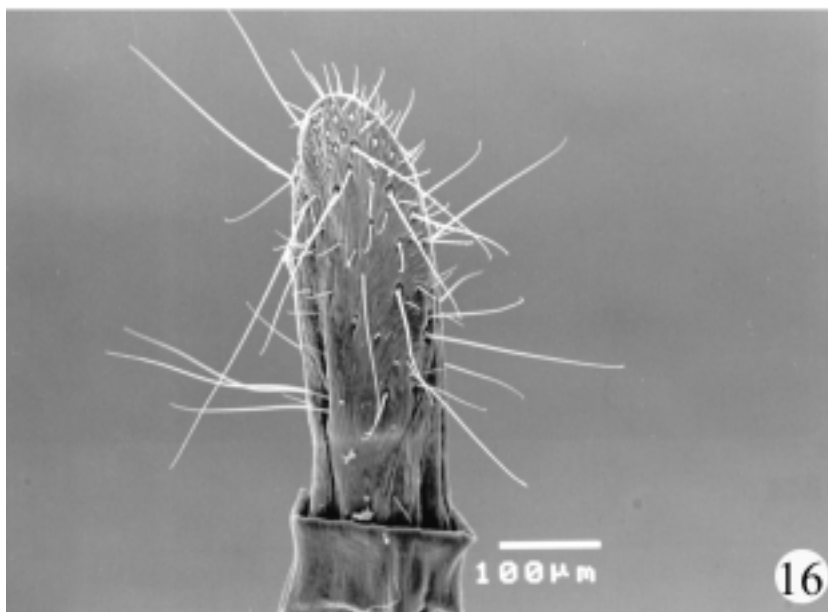
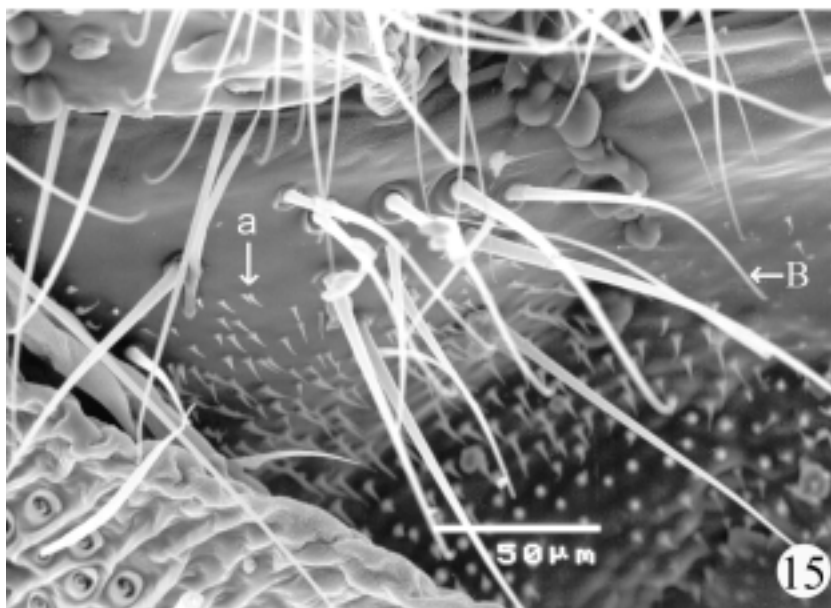
9-10. 9 - *Cnephasia stephensiana* (DOUBLEDAY), papillae anales, ventral; 10 - *Aleimma loeflingianum* (LINNAEUS), surface near lateral margin of posterior part of papilla



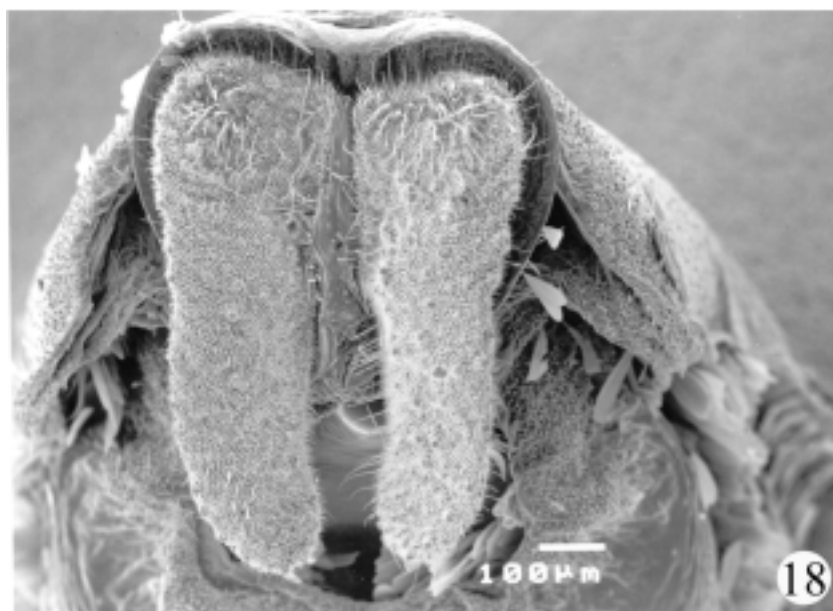
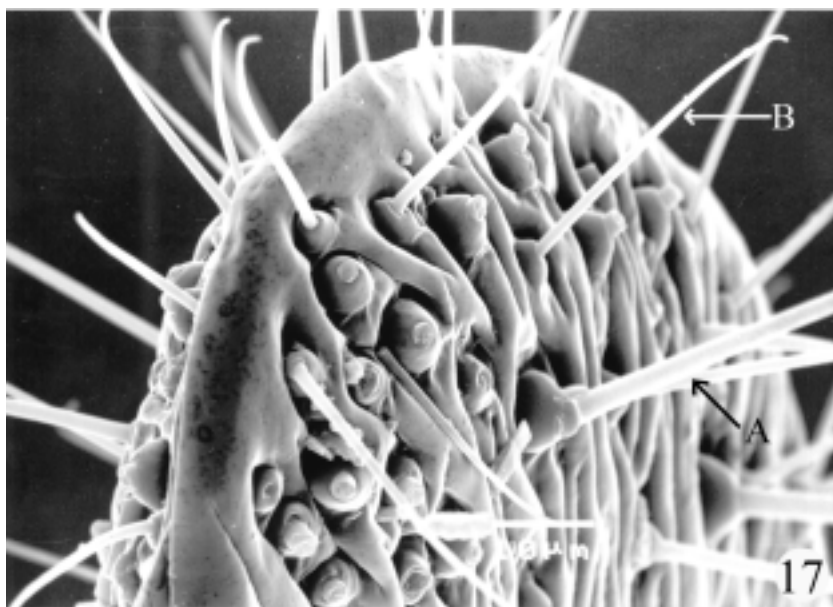
11-12. Papillae anales of *Cnephasia stephensiana* (DOUBLEDAY): 11 - proximal part of ventral lobe with scraping chaetae; for explanation of characters see text; 12 - vestiture of papilla analis, distal portion of ventral lobe



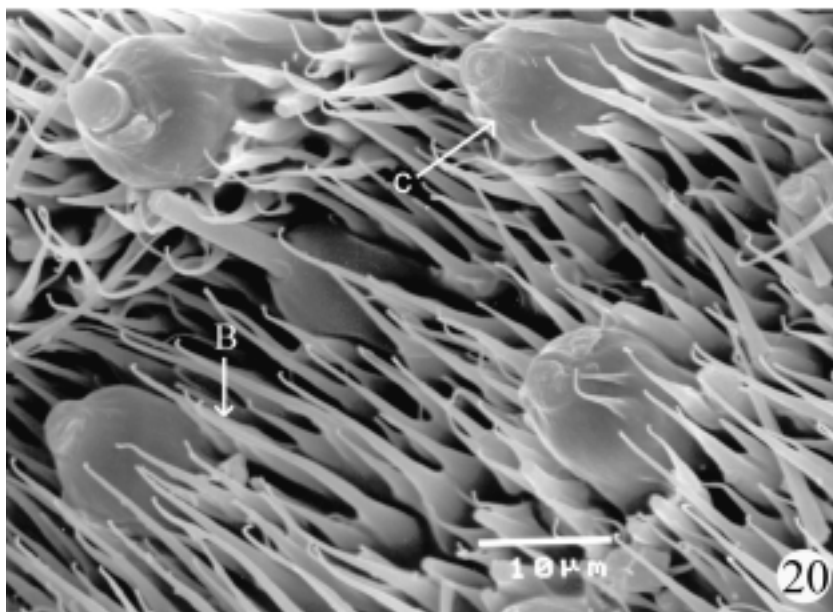
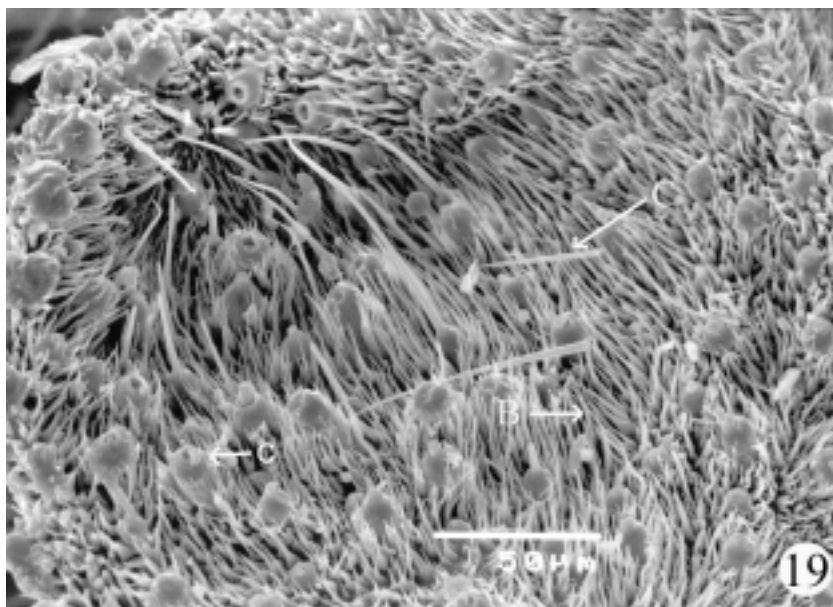
13-14. Papillae anales of *Cnephasia stephensiana* (DOUBLEDAY): 13 - terminal parts of chaetae of type E, 14 - chaetae B anterior to ventral lobe and microtrichia



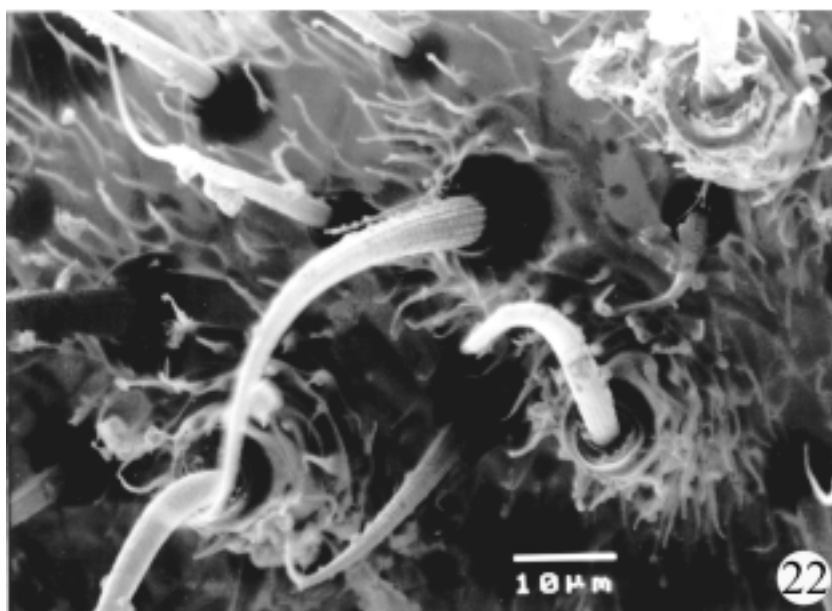
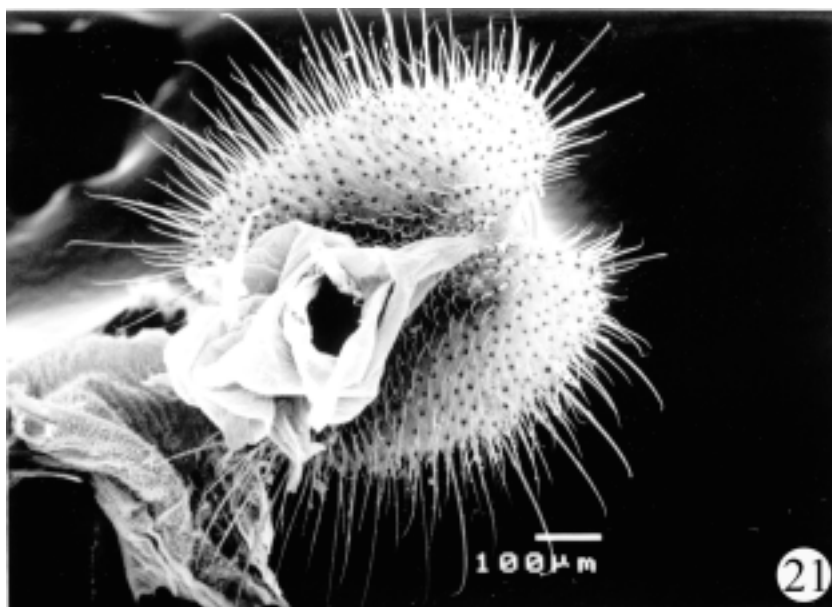
15-16. 15 - Papillae anales of *Cnephasia stephensiana* (DOUBLEDAY): 15 - chaetae of ventral surface of posterior part of papilla close to lateral margin, and thorn-like microspines (a); 16 - *Cnephasia incertana* (TREITSCHKE): papillae anales, general view, lateral



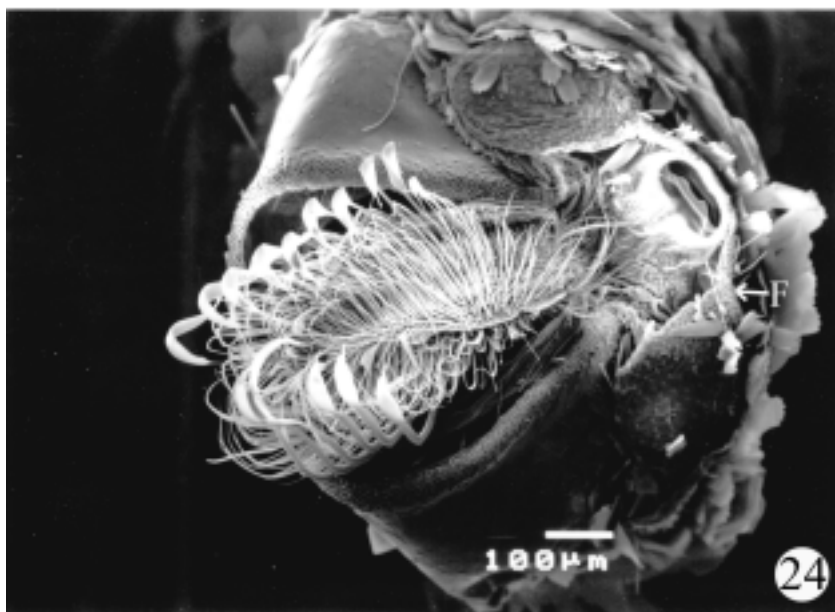
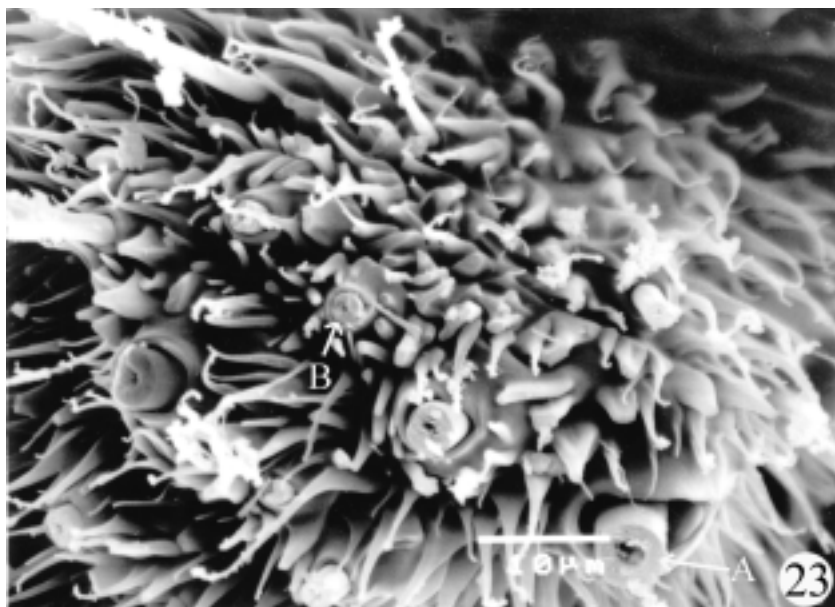
17-18. Papillae anales of *Cnephasia incertana* (TREITSCHKE): 17 - end of papillae, for explanation of other characters see text; 18. *Archips podanus* (SCOPOLI): papillae, general view, ventral



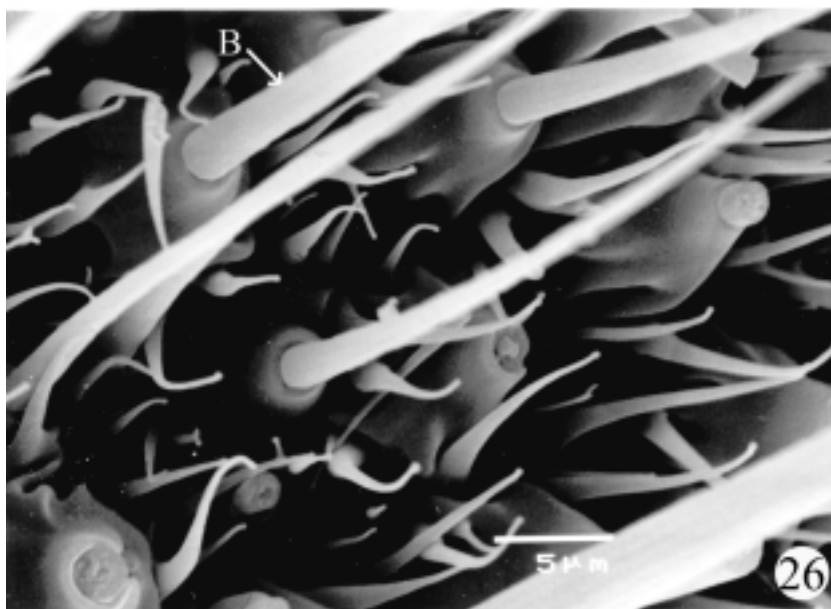
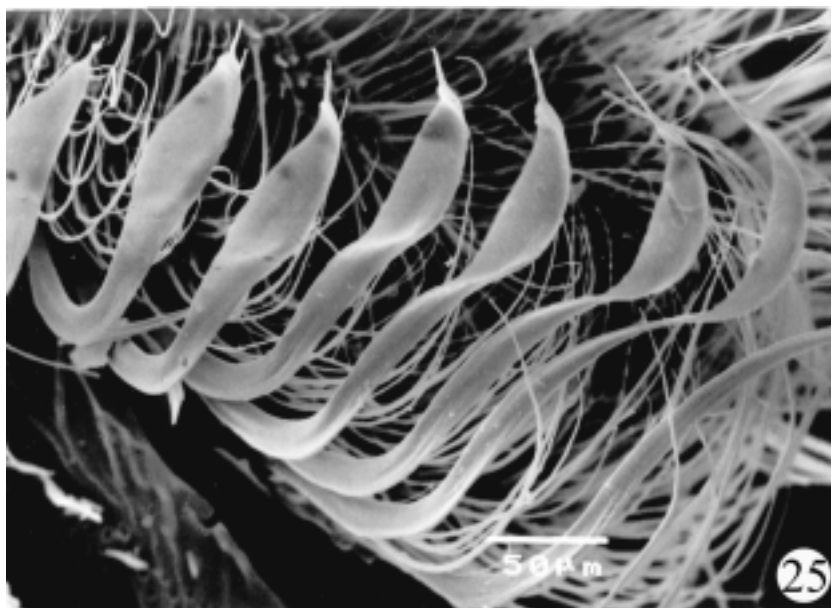
19-20. Papillae of *Archips podanus* (SCOPOLI): 19 - large thorn-like spines (b), majority of chaetae cut off at the level of their processus externi (c), 20- the same



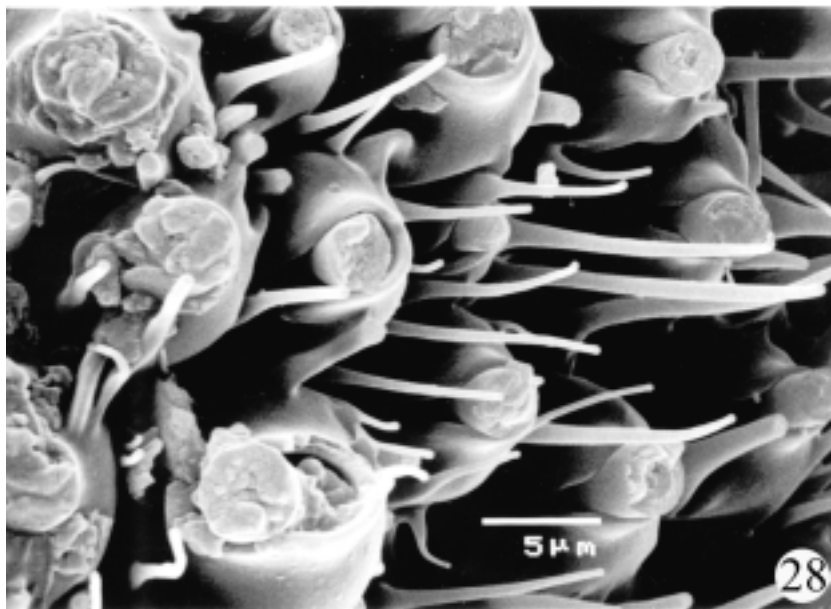
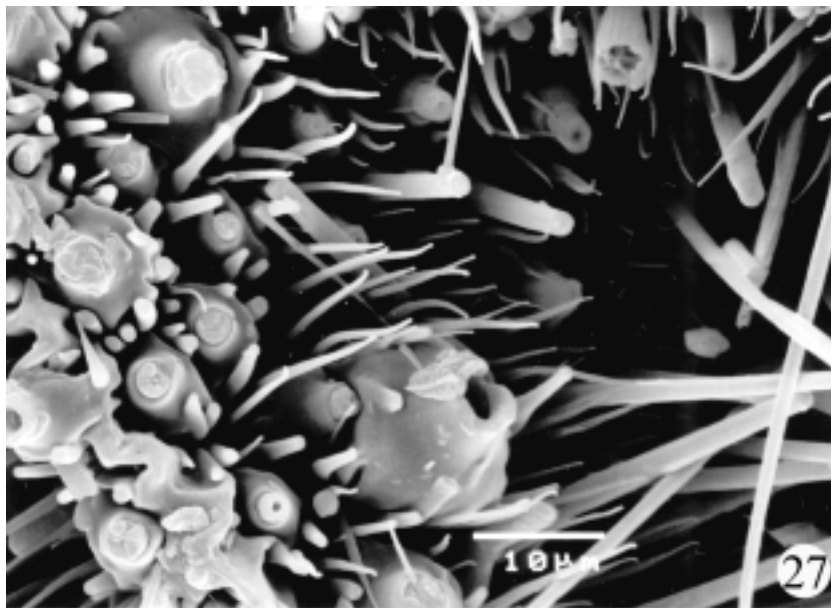
21-22. Papillae of *Epiblema sticticanum* (FABRICIUS): 21 - general view, ventral, 22 - setae and microtrichia of median part of papilla



23-24. 23 - *Epiblema foenellum* (LINNAEUS): chaetae broken at their bases, with median channels exposed, and thorn-like microspines; for explanations of other characters see text; 24 - *Epinotia abbreviana* (FABRICIUS): end of ovipositor with papillae anales of, general view, ventral



25-26. *Epinotia abbreviana* (FABRICIUS): 25 - scraping chaetae of type F of the margin of papilla,
26 - median part of papilla with chaetae and microtrichia



27-28. *Cydia pomonella* (LINNAEUS): 27 - chaetae of types A and B and spines of median part of papilla, 28 - the same, processus externi of plain and channelled chaetae; for explanation of other characters see text