Taxonomy and Morphology of *Cactoblastis cactorum* and other *Opuntia*-feeding Lepidoptera in the U.S.

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Native Lepidoptera on *Opuntia*

Tineidae
- *Dyotopasta yumaella* Kft. (Tineidae)

Gracillaridae
- *Marmara opuntiella* (cladole miner)

Scythrididae
- *Scythris mixaula*

Crambidae
- *Dicymolomia julianalis* (stems)
- *Dicymolomia opuntialis*
- *Loxomorpha flavidissimalis*
- *Pseudoschinia elautalia*

Pyralidae
- *Erelieva quantulella* (flowers/seeds)
- *Sosipatra anthophila* (flowers)
- *Eurythmia hospitella* (polyphagous)
- *Homoeosoma electellum* (polyphagous)
- *Laetilia coccivora* (scales on cactus)

Pyralidae (species related to *Cactoblastis*)
- *Melitara dentata* (cladoles)
- *Melitara prodenialis* (cladoles)
- *Melitara apicigrammella (?)*
- *Melitara texana (?)*
- *Melitara doddalis* (cladoles)
- *Melitara junctolineella* (cladoles)
- *Melitara subumbrella* (stems/fruit)
- *Ozamia fuscomaculella (fruit)*
- *Ozamia lucidalis (?)*
- *Ozamia clarefacta* (flowers/fruit)

(Neunzig, 1997; Robinson et al, 2002)

Dyotopasta yumaella (Tineidae) on *Opuntia engelmannii* (TX)

Cactoblastis cactorum

Melitara prodenialis

Melitara in Western U.S.

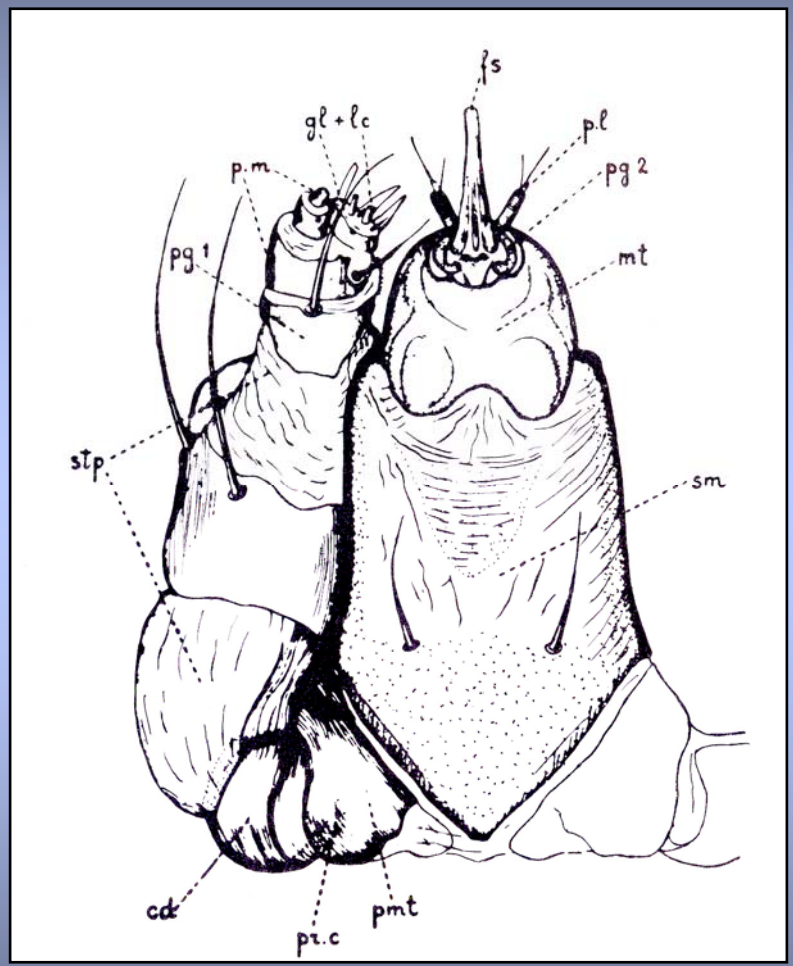
Melitara species on *Opuntia engelmannii* (AZ)

Melitara species on *Opuntia phaecantha* (AZ)

Melitara species on *Opuntia macrorhiza* (NM)

How do these larvae differ beyond the superficial?

Sensory Structures of Larvae



Dampf, 1910

Sensory Structures of Lepidoptera Larvae EM Studies

Tortricidae: *Olethreutes cespitana* (Baker & Chan 1987) (A, M)*

Pyralidae: *Galleria melonella* (Schoonhoven & Dethier 1966) (A, M)

Sphingidae: *Manduca sexta* (Schoonhoven & Dethier 1966) (A, M)

Saturniidae: *Philosamia cynthia* (Schoonhoven & Dethier 1966) (A, M)
Hyalophora gloveri (Schoonhoven & Dethier 1966) (A, M)

Noctuidae: *Euxoa messoria* (Devitt & Smith 1982 (M)
Mamestra brassicae (Gaffal 1979) (M)
Mamestra configurata (Schields 1994) (M)
Heliocoverpa zea (Baker et al 1986) (M)
Heliothis virescens (Baker et al 1986) (M)

(see Hallberg et al, 2003)

*Antenna (A); Mouthparts (M)

Functions and Types of Sensilla

- Chemoreceptors
  - pored
- Mechanoreceptors
  - poreless

- Trichoid - mechanosensory and/ or chemosensory
- Basiconic - olfactory
- Styloconic - gustatory
- Plate - unknown
- Thick-walled - gustatory

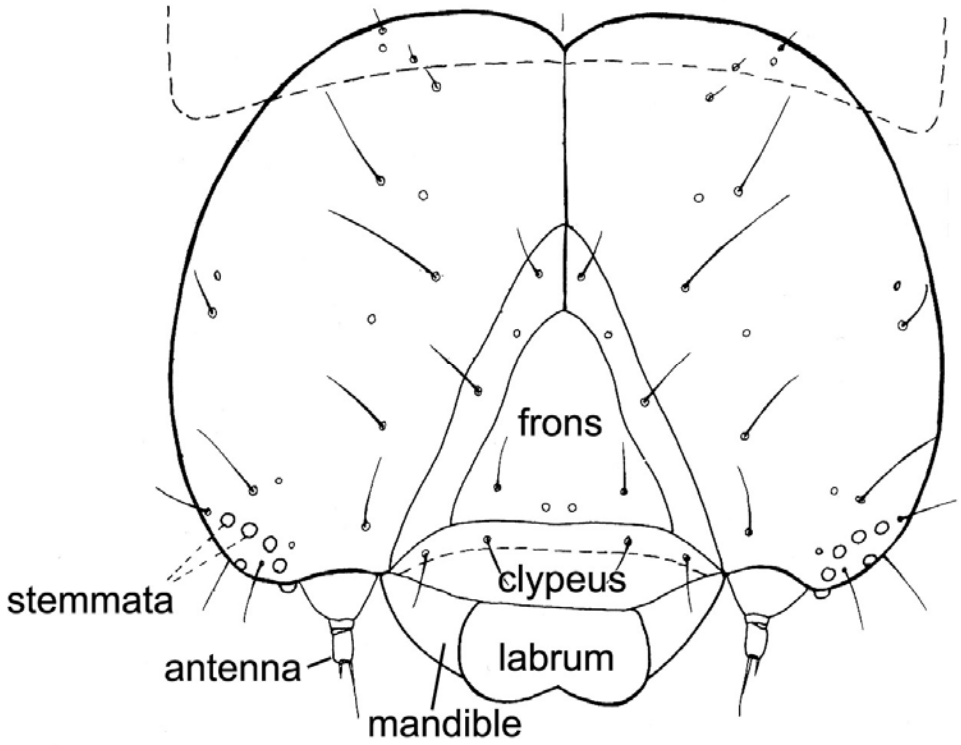
Larval Sensilla - SEM Methods

1. Fixed in ETOH-Bouin's fixative or Bouin-Hollande fixative
2. Washed in distilled H_20, placed in detergent for 2-4 hours, sonicated, and washed in H_20.
3. Placed in 2% osmium tetroxide overnight
4. Washed in distilled H_20 and dehydrated in graded series of ETOH or Acetone
5. Air dried from HMDS
6. Mounted on aluminum stubs with carbon tape
7. Coated with gold-palladium
8. Examined with JEOL-JSM6500F SEM

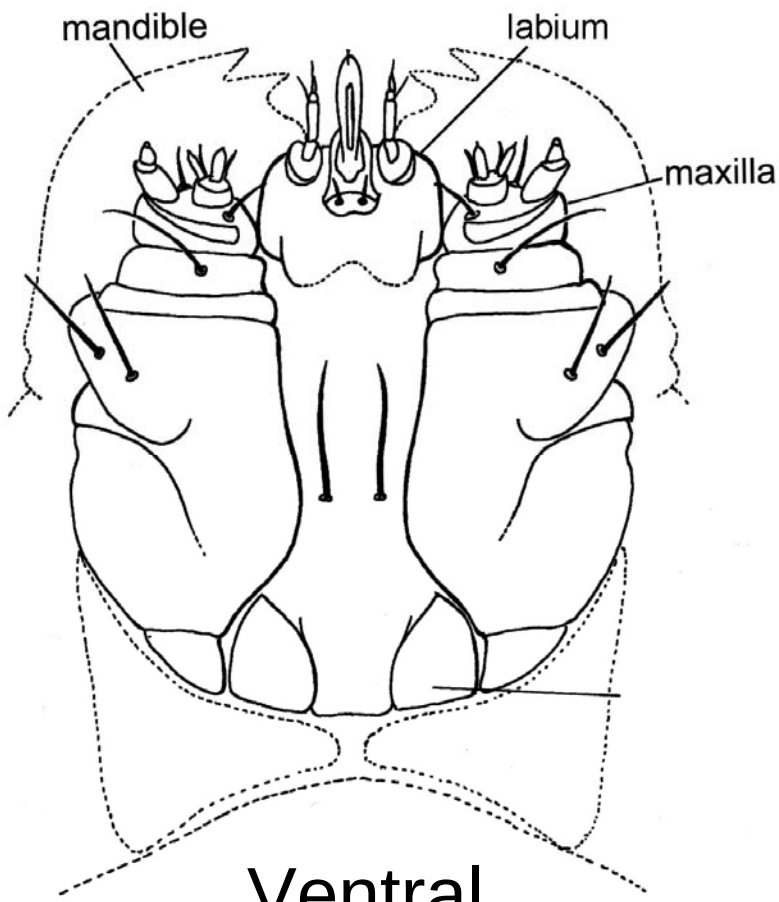
Larval Sensilla - Staining Methods

1. Two heads of each species from ETOH-Bouin's fixative washed in distilled H_20
2. Stained with crystal violet by Slifer 1960) technique to show if sensilla were pored or poreless

Larval Head

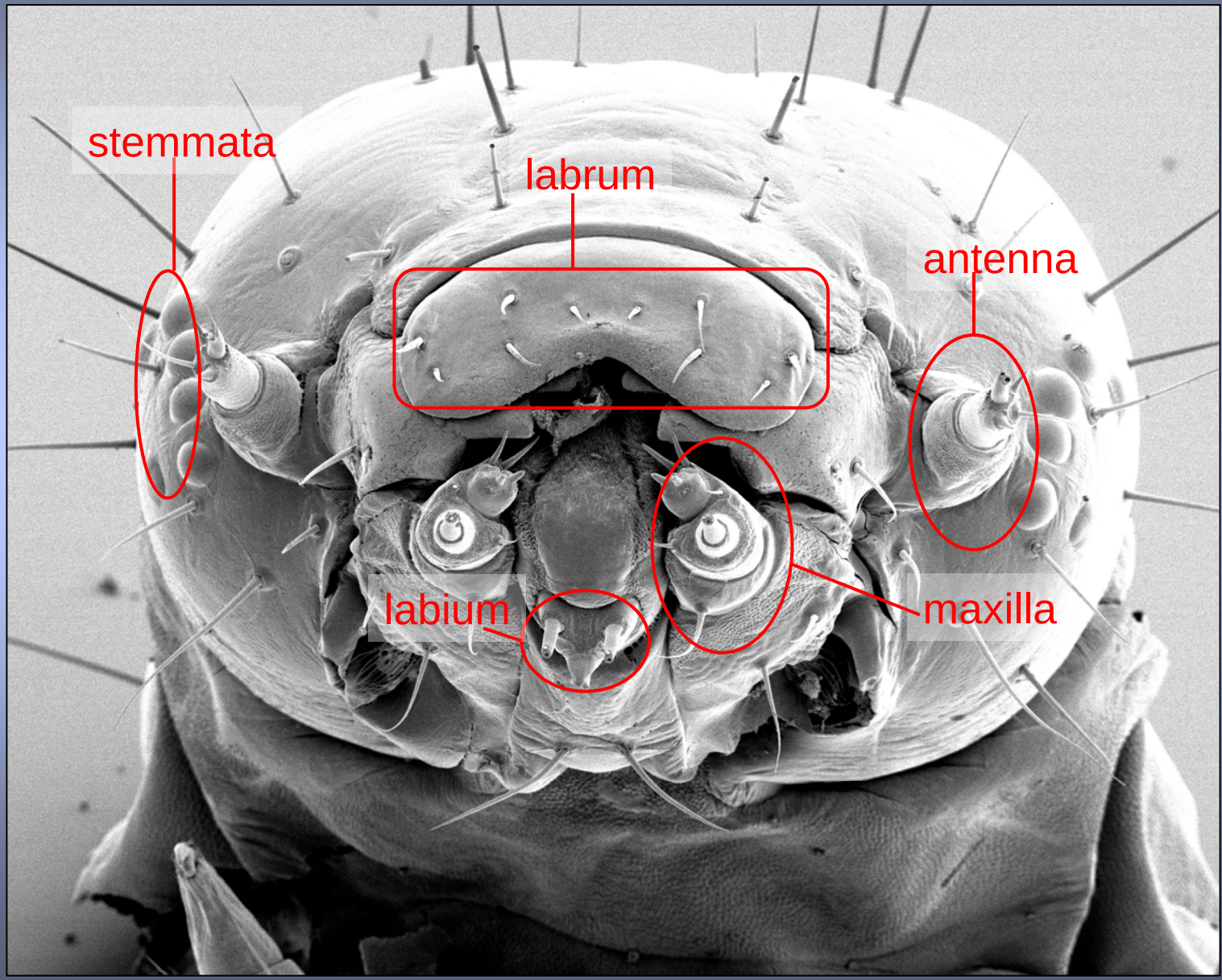


Frontal



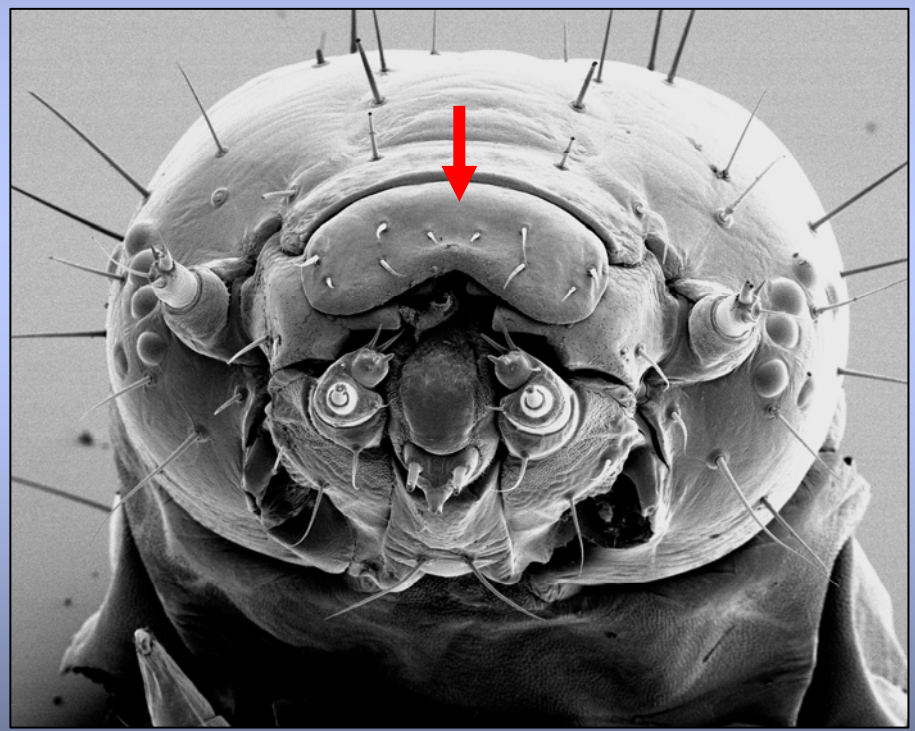
Ventral

Cactoblastis cactorum - frontal view

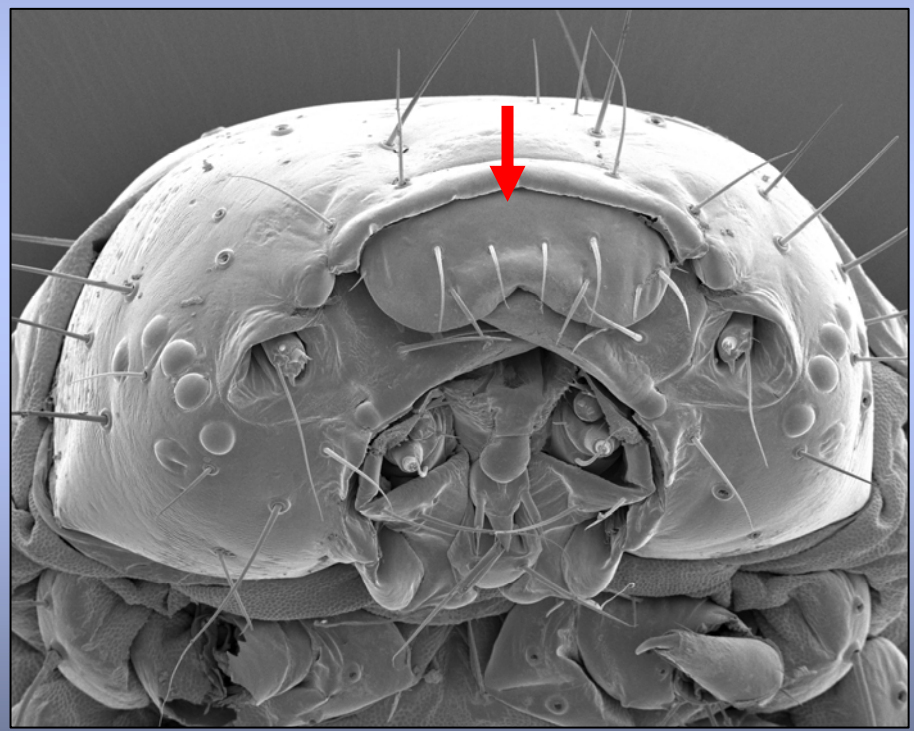


Head -frontal

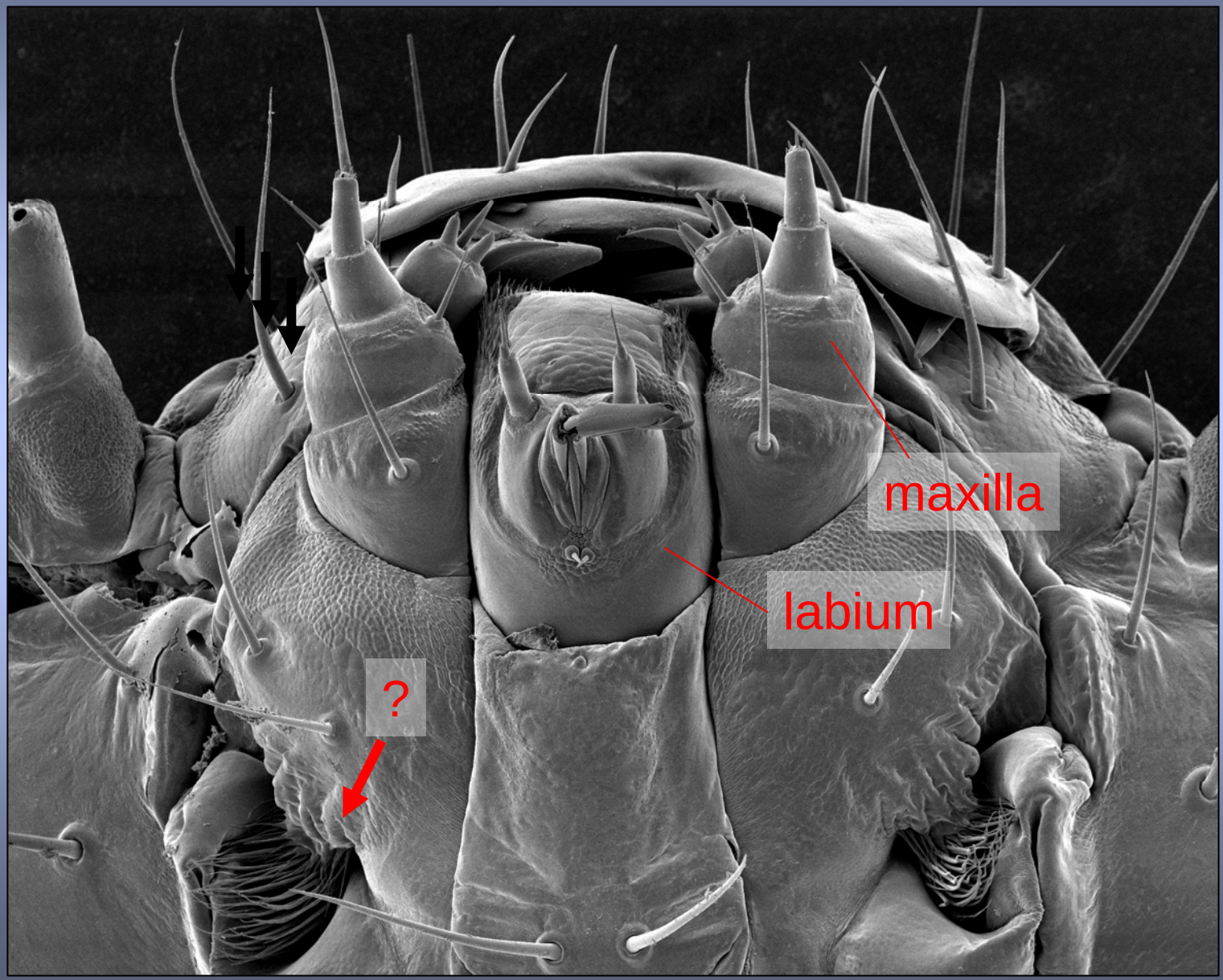
Cactoblastis cactorum



Melitara prodenialis



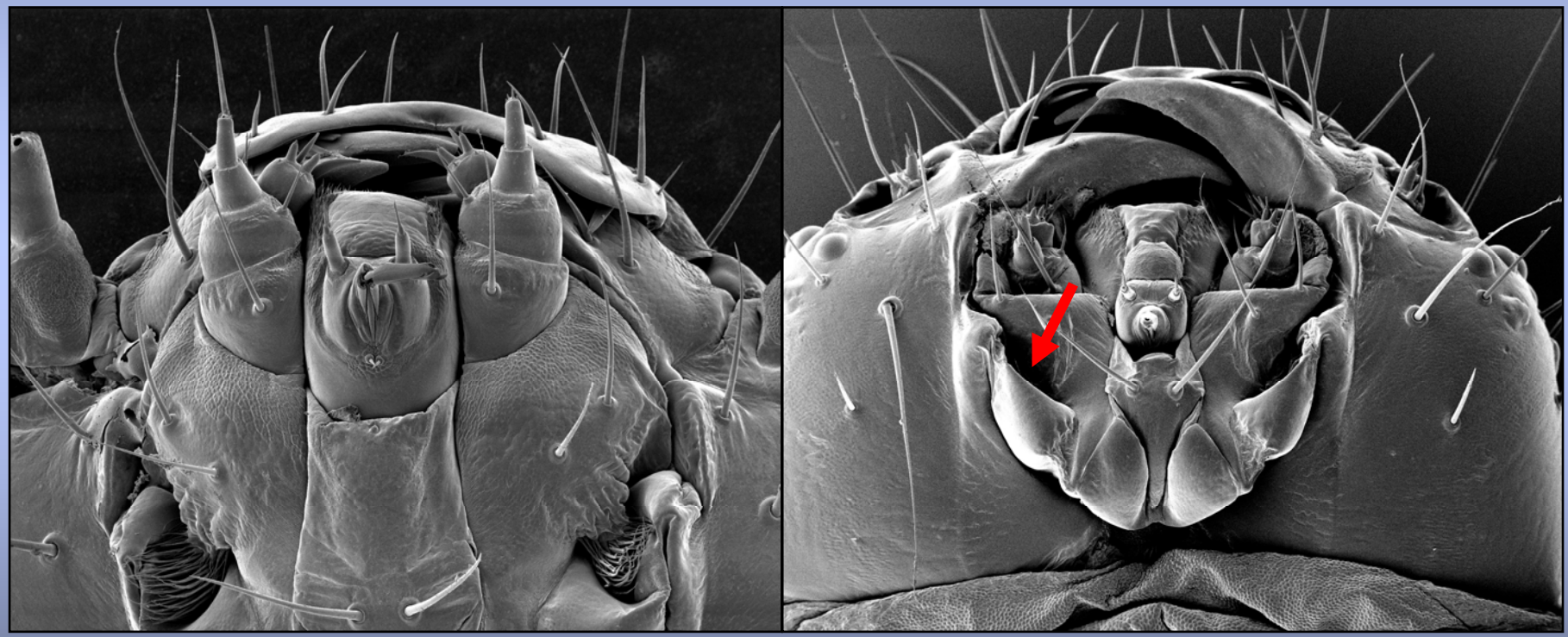
Cactoblastis cactorum - ventral



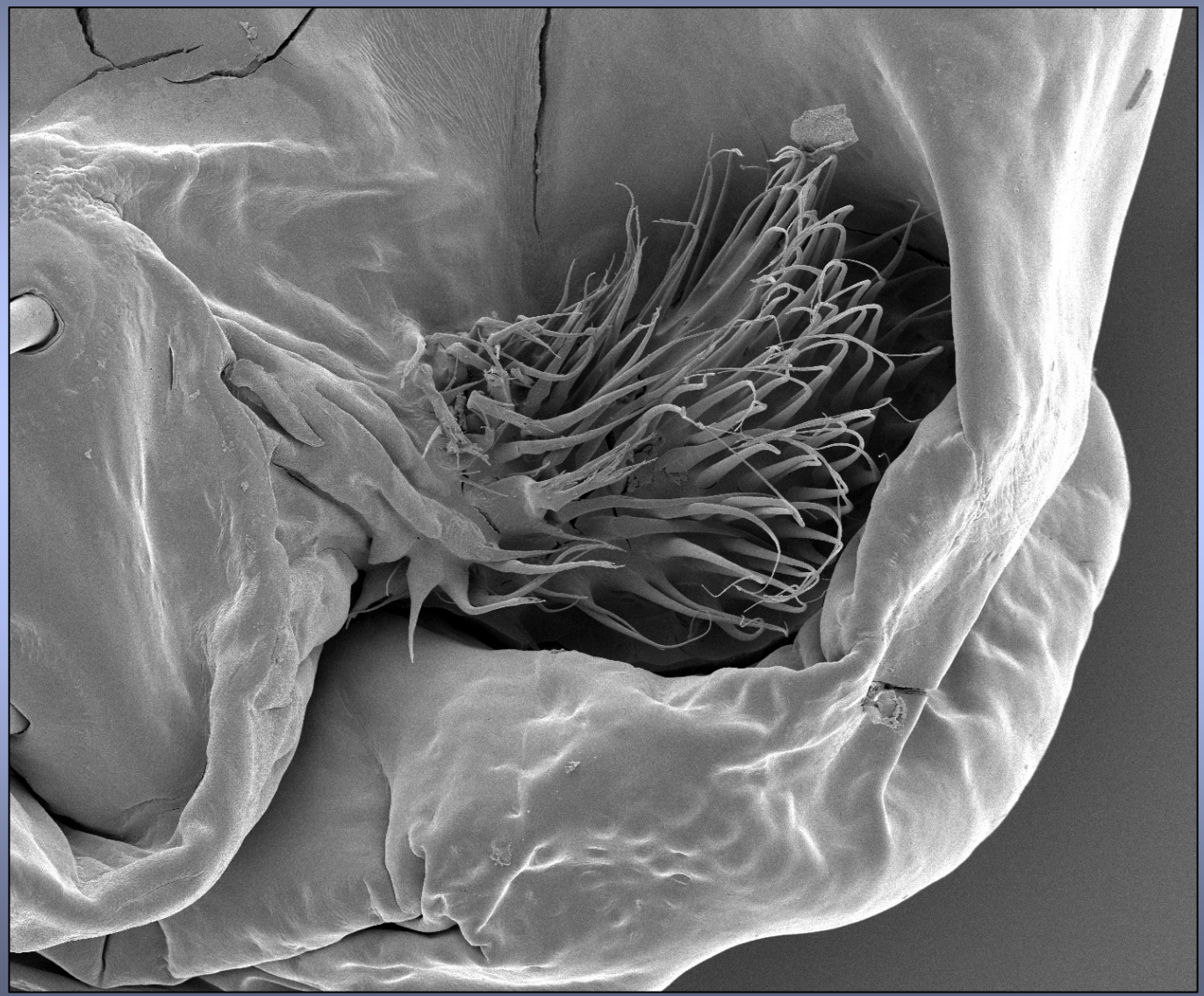
Head - ventral

Cactoblastis cactorum

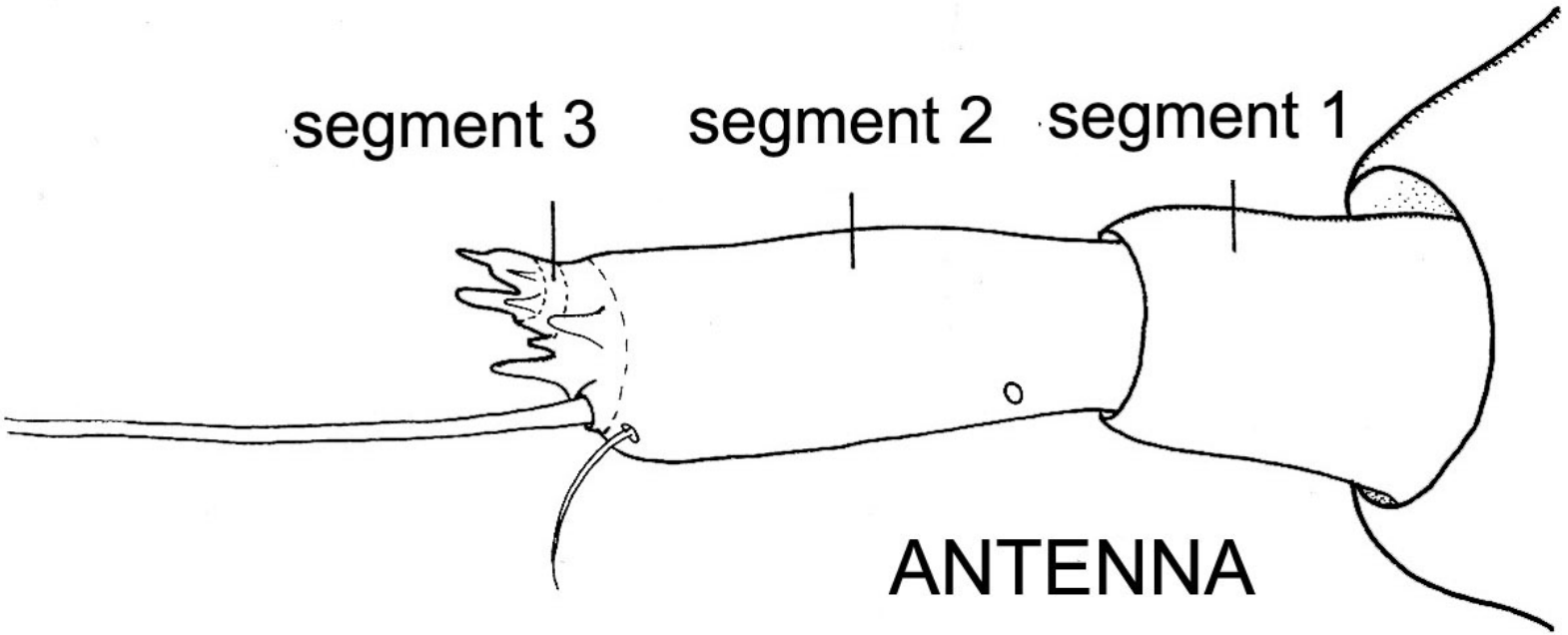
Melitara prodenialis



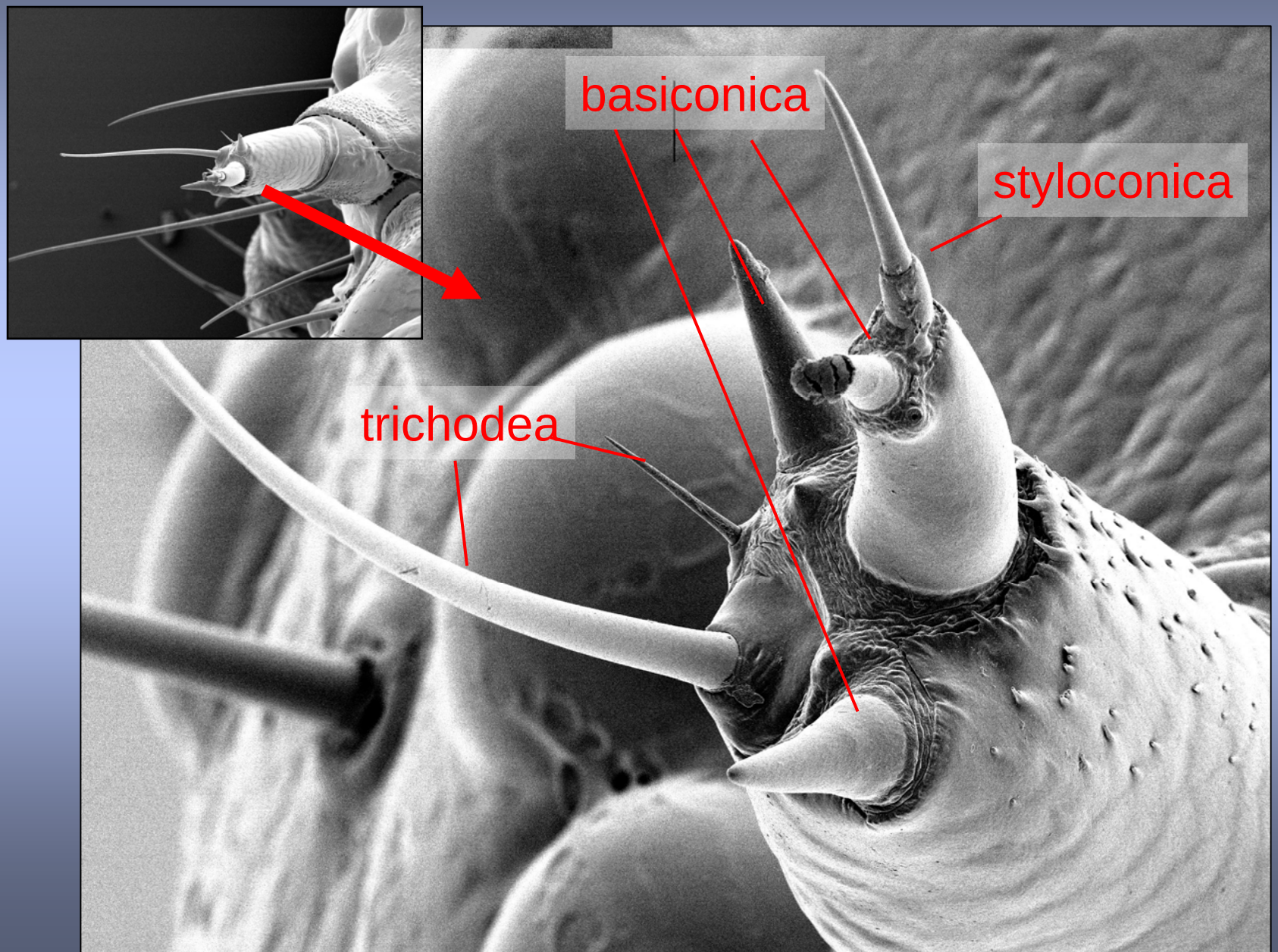
Basistipal Fimbria



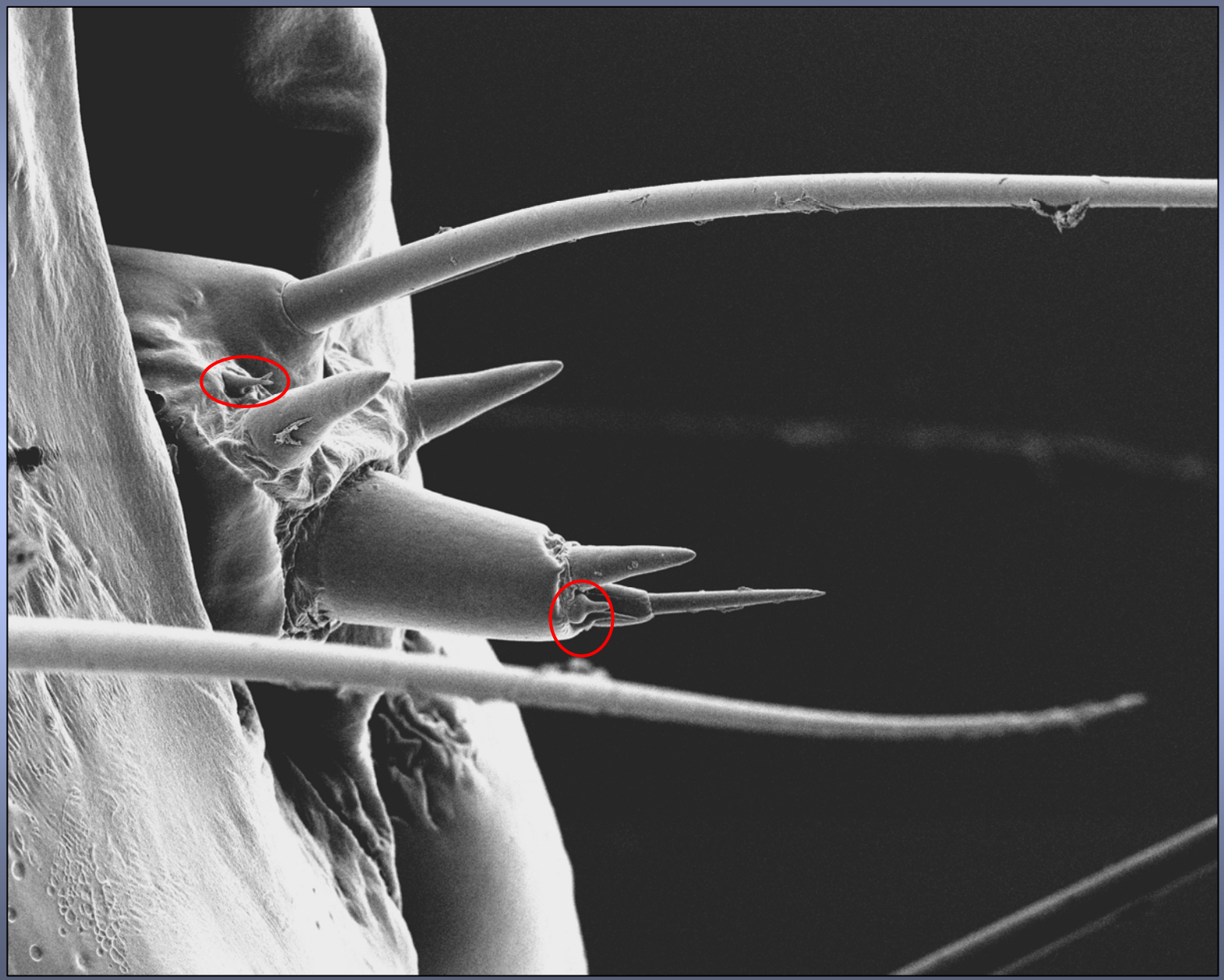
Antenna



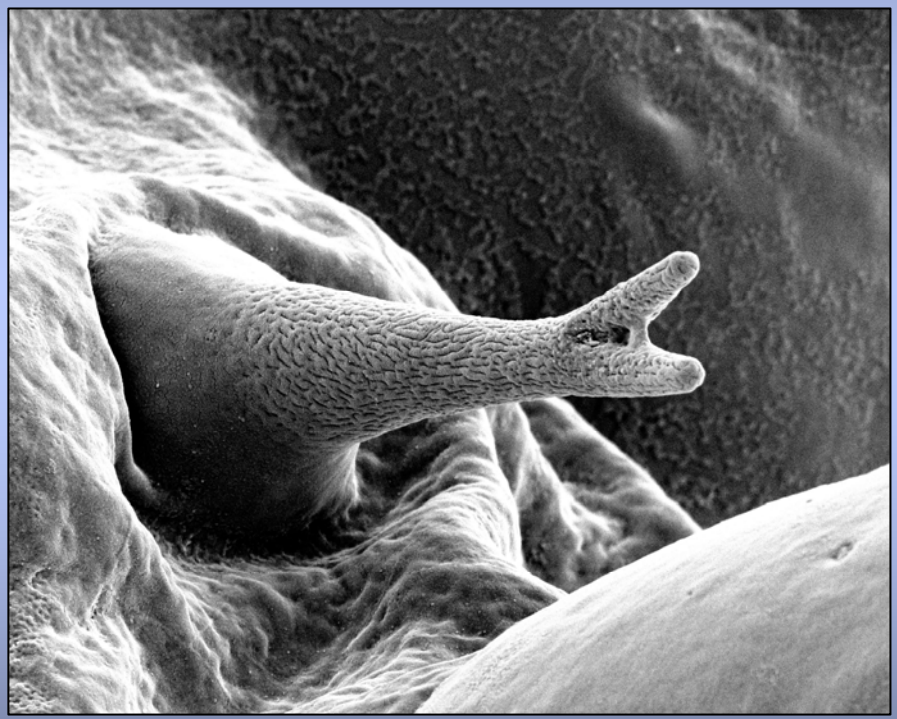
Cactoblastis Antennal Sensilla

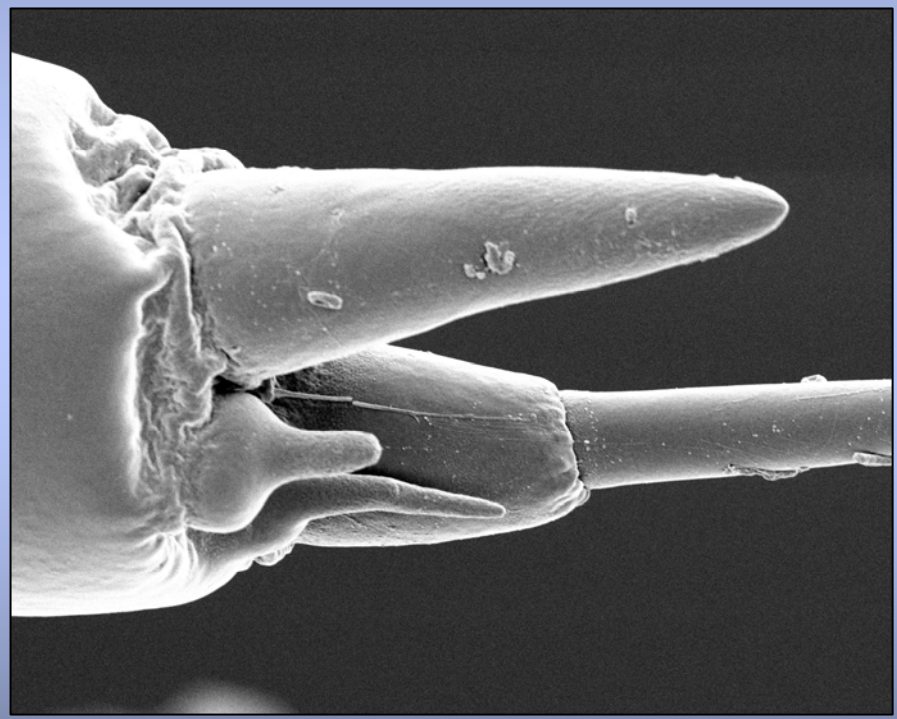


Melitara Antenna

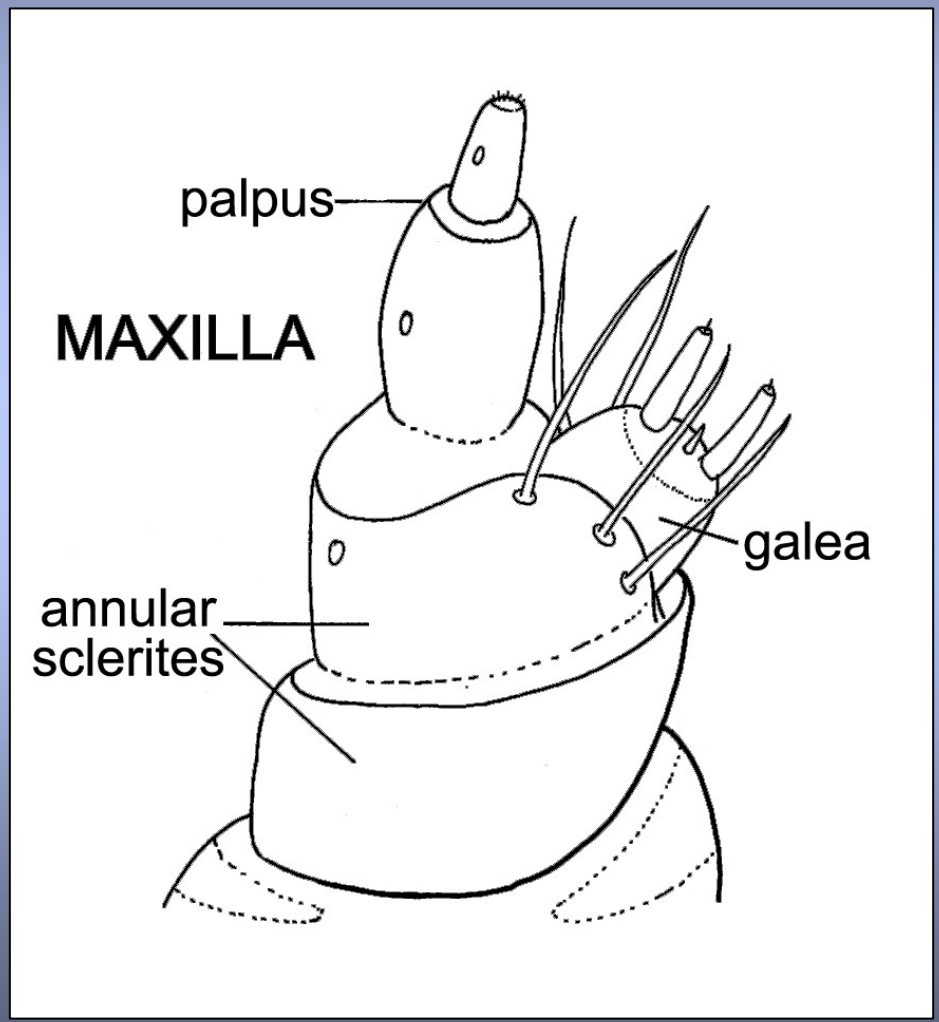


Thick Walled Sensilla on *Melitara* Antenna

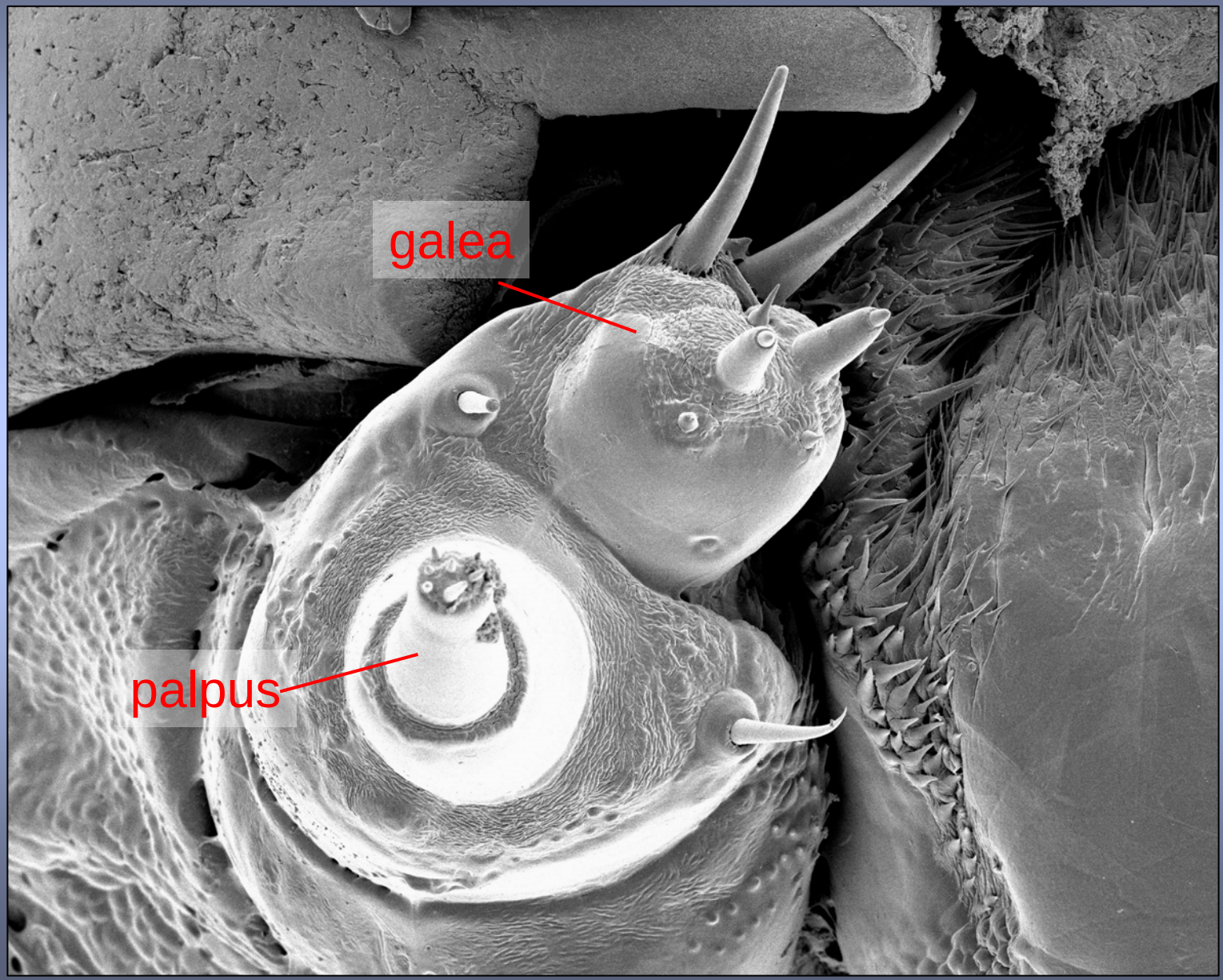




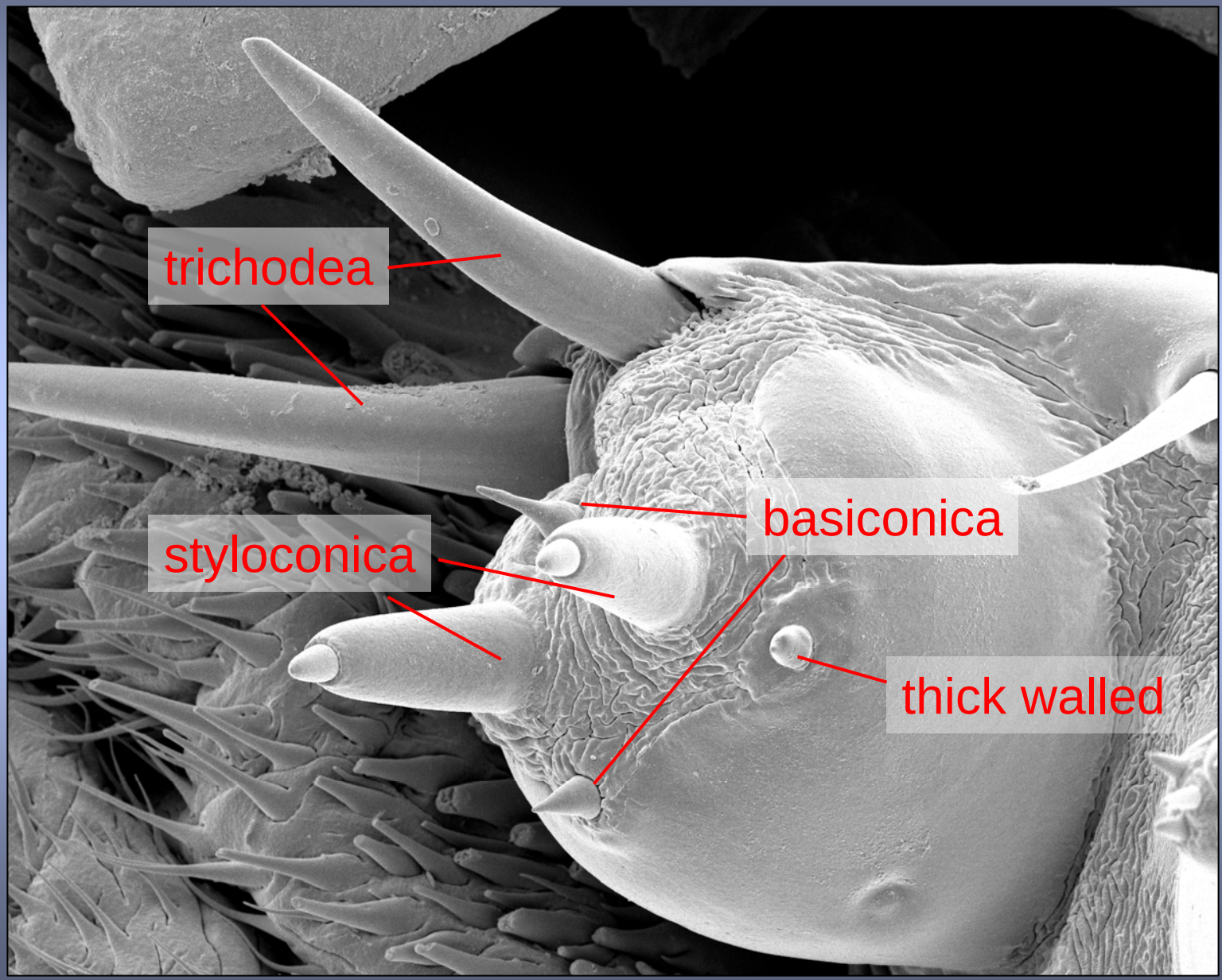
Maxilla



Cactoblastis Maxilla

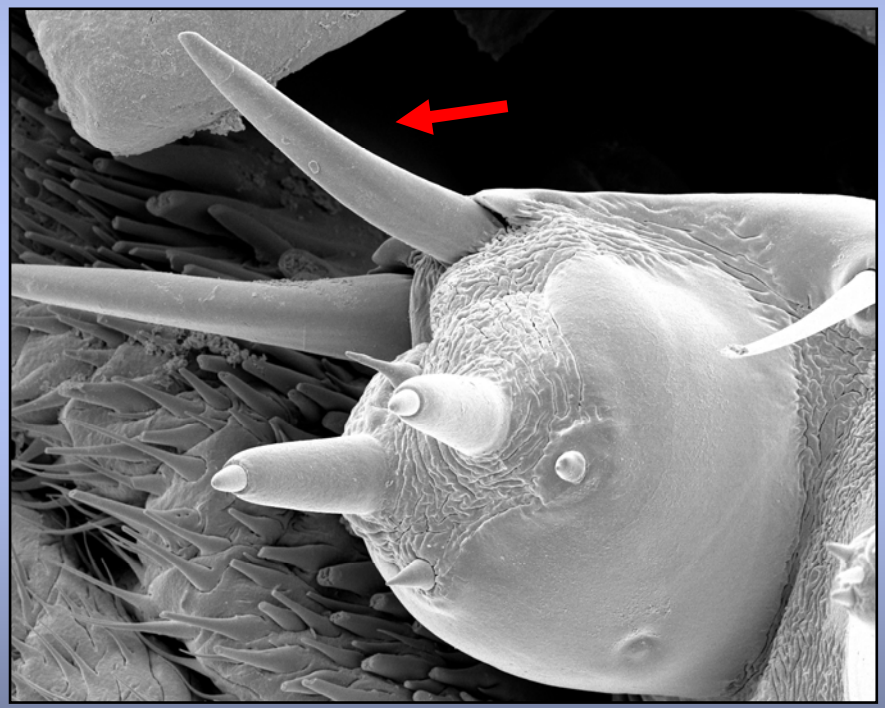


Cactoblastis Galea

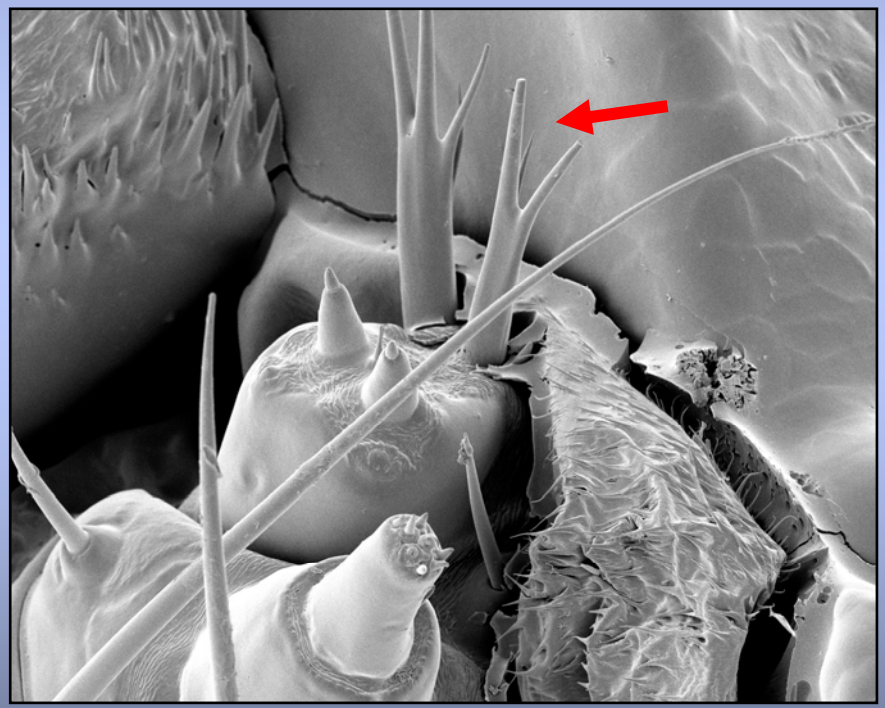


Galea

Cactoblastis cactorum

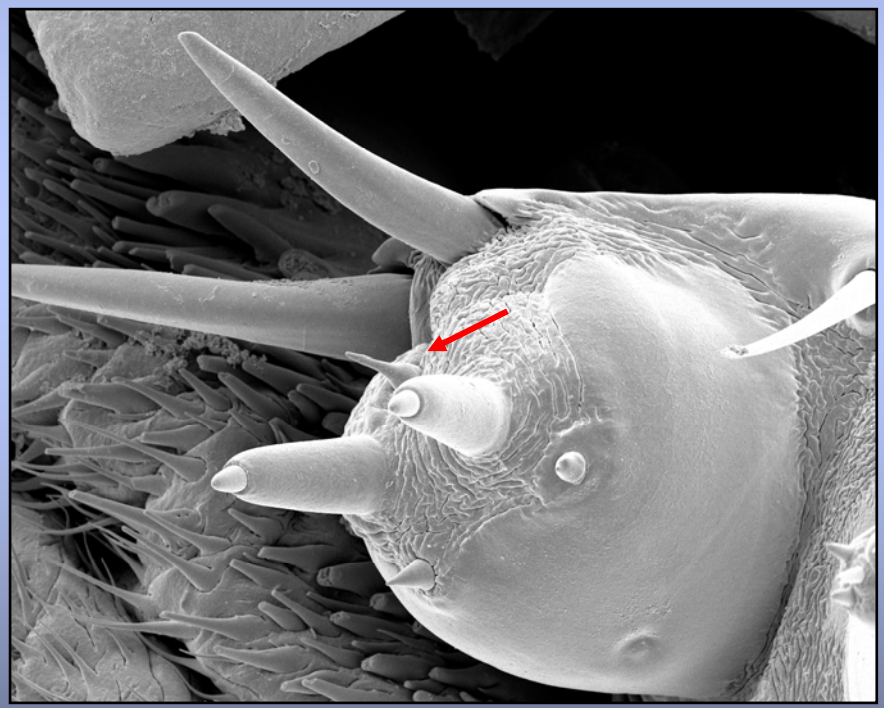


Melitara prodenialis

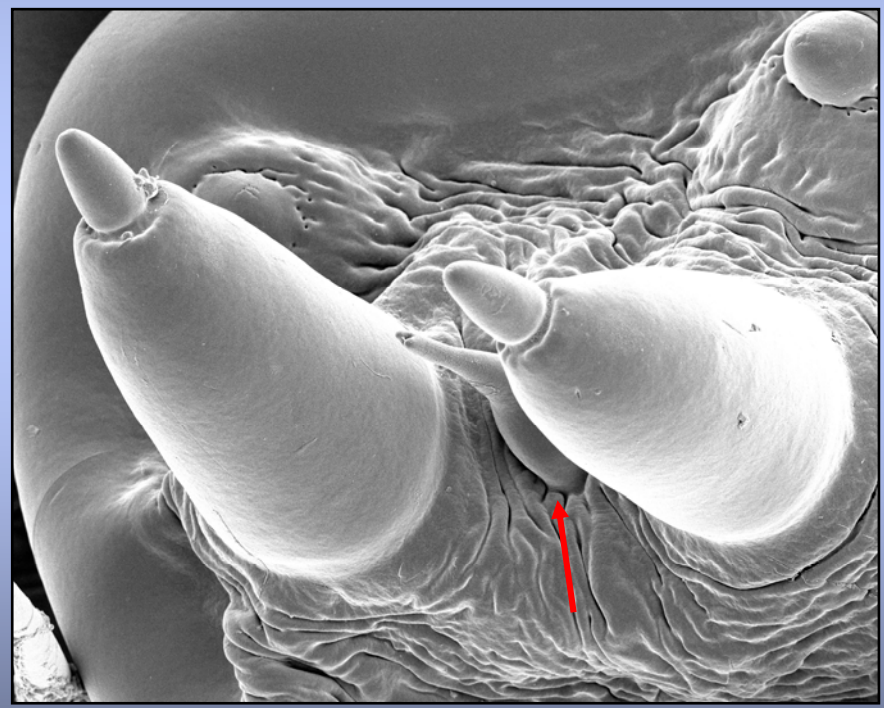


Maxillary Galea

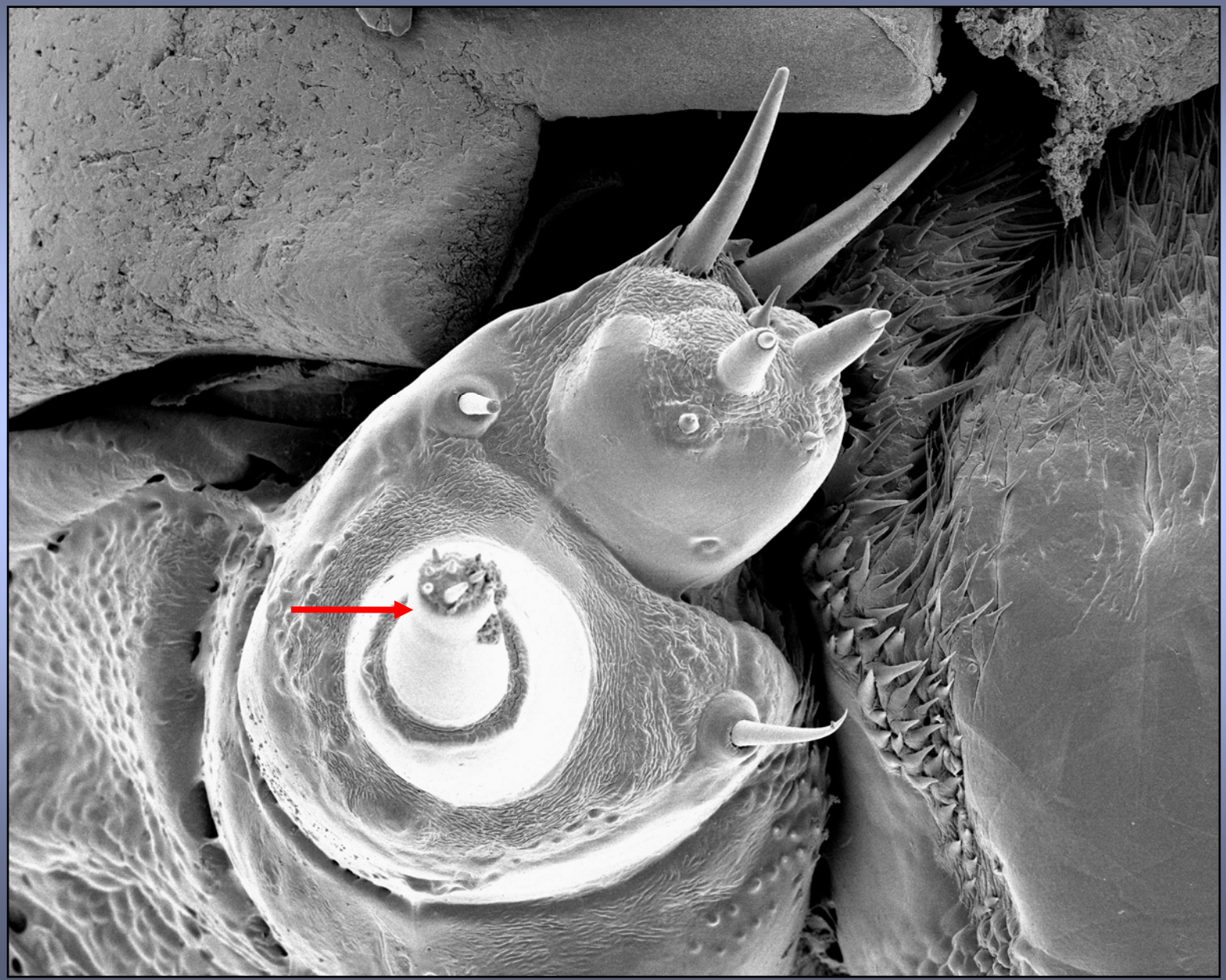
Cactoblastis cactorum



Melitara prodenialis

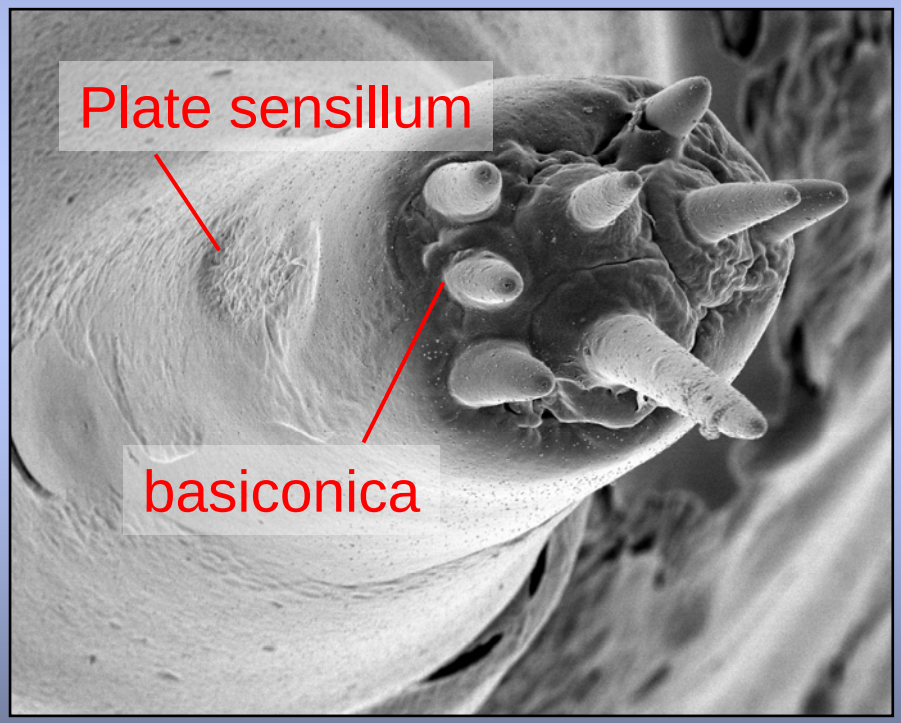


Cactoblastis Maxillary Palpus

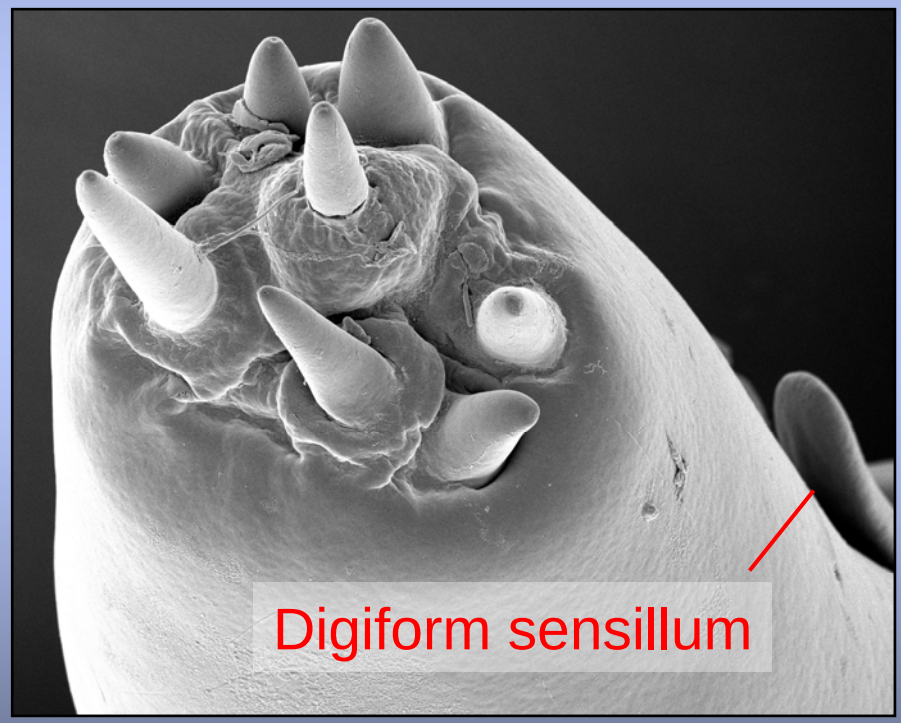


Maxillary Palpus

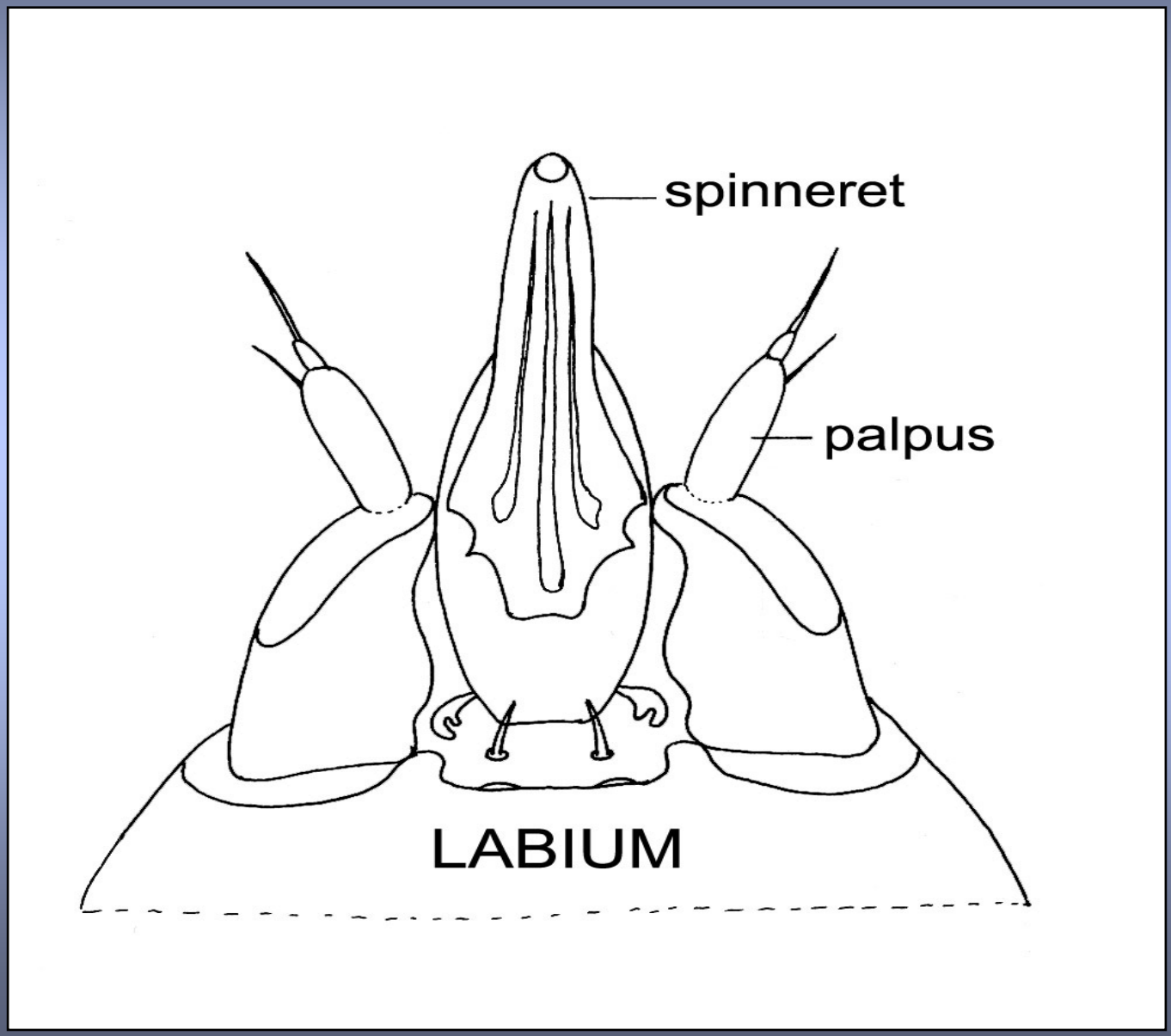
Cactoblastis cactorum



Melitara prodenialis

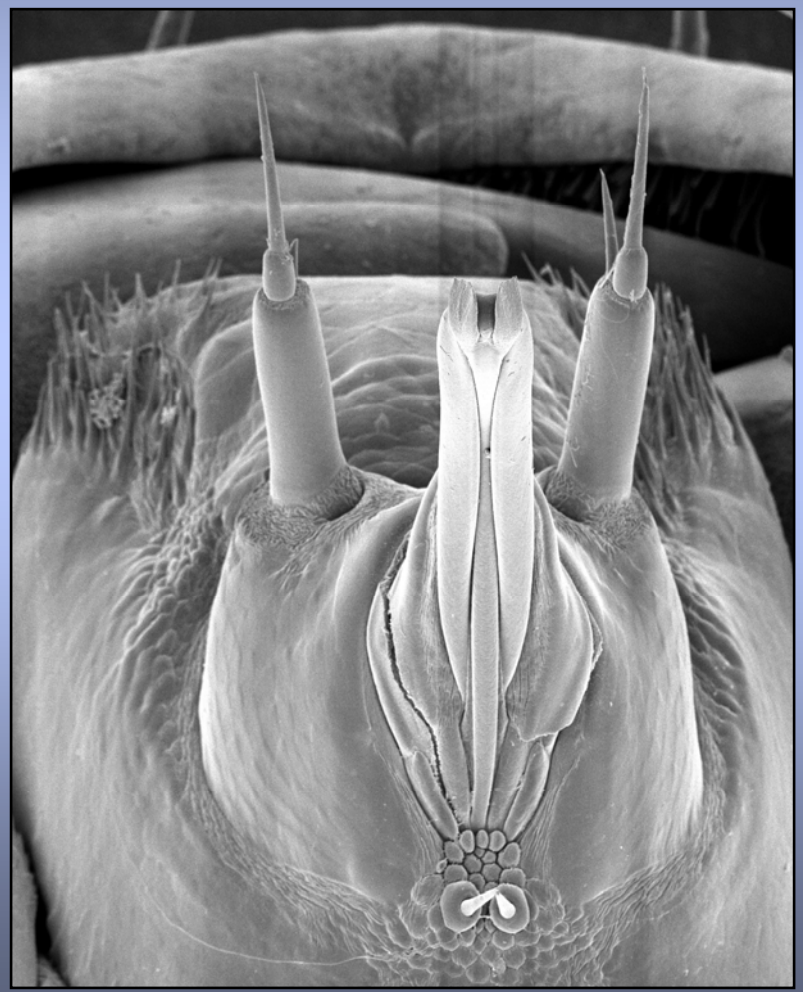


Labium

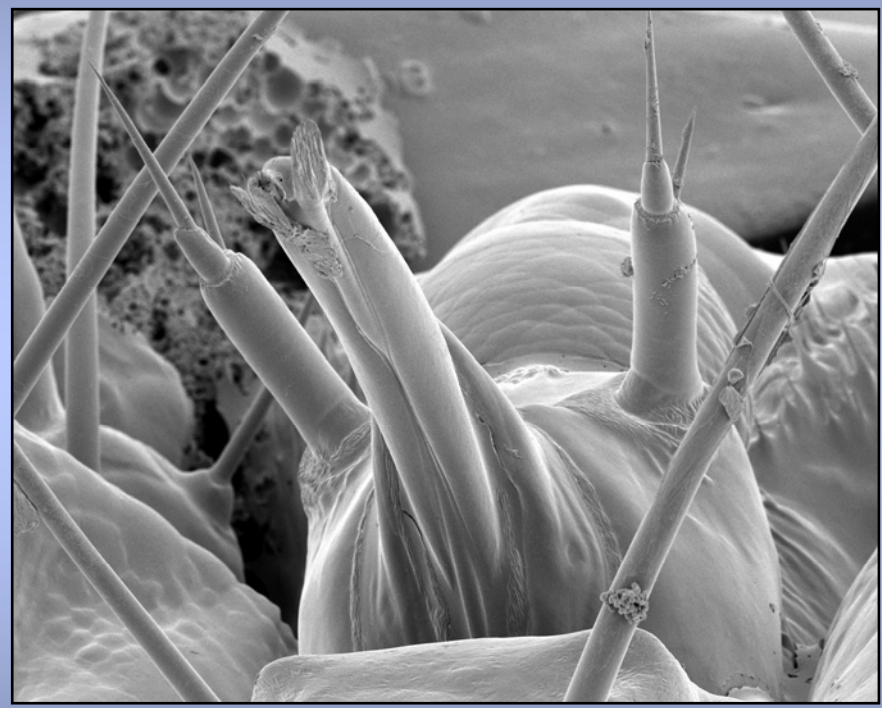


Labium

Cactoblastis cactorum

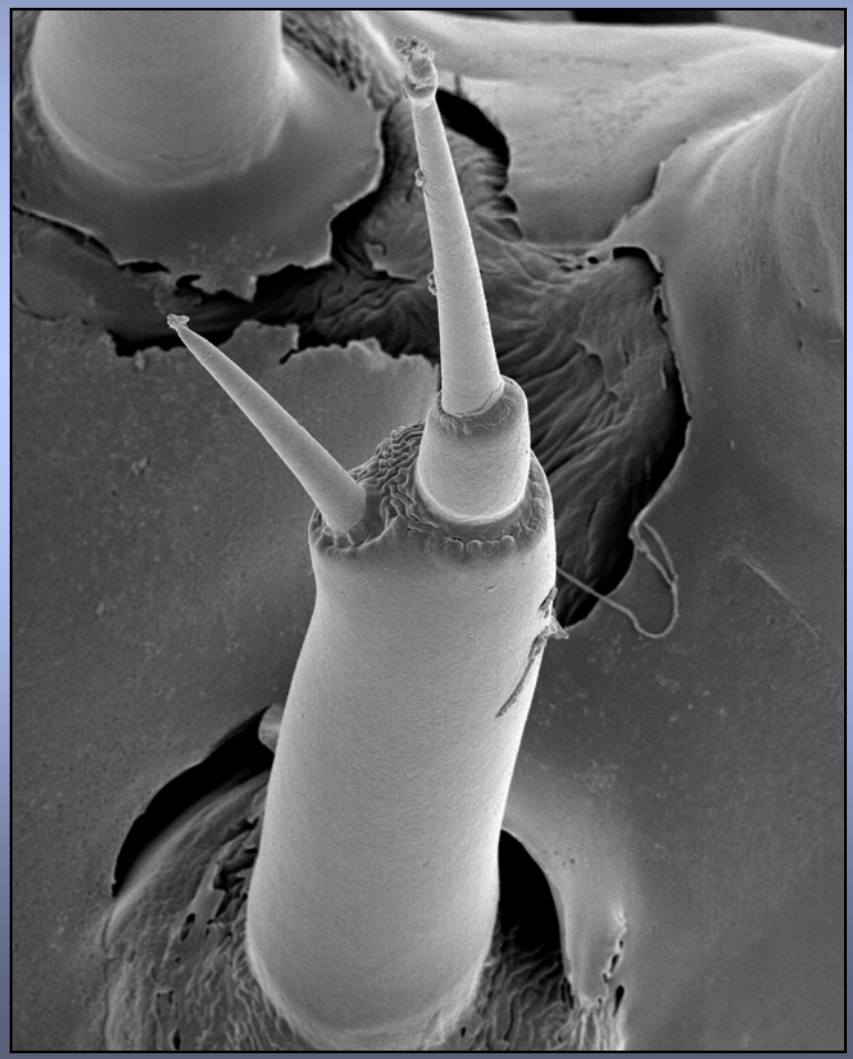


Melitara prodenialis

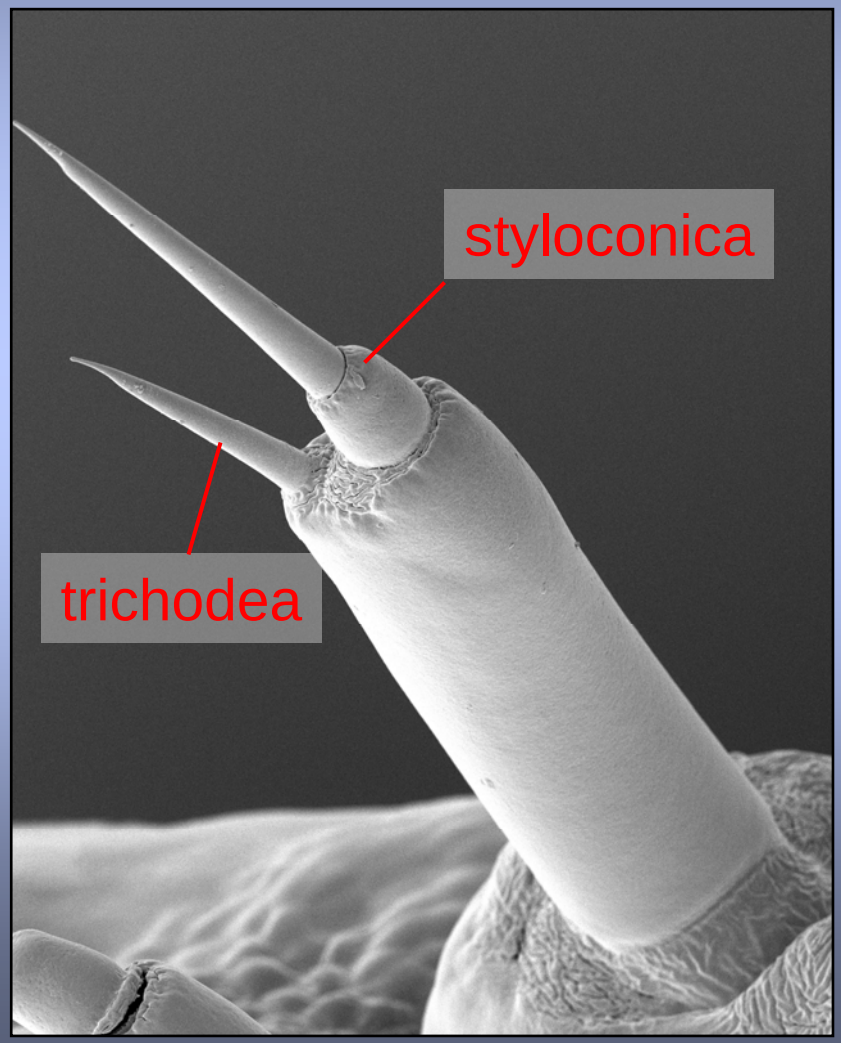


Labial Palpus

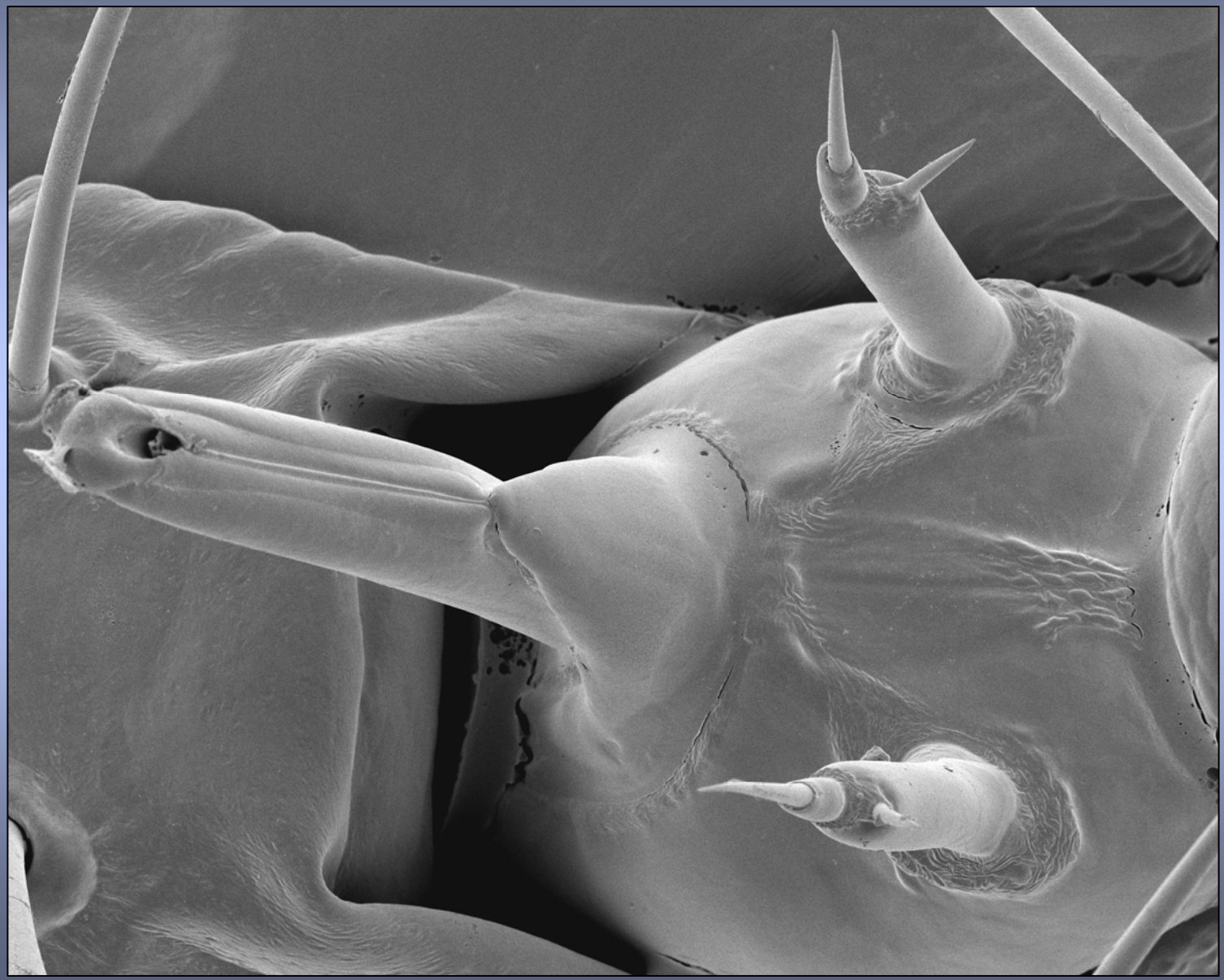
Cactoblastis cactorum



Melitara prodenialis

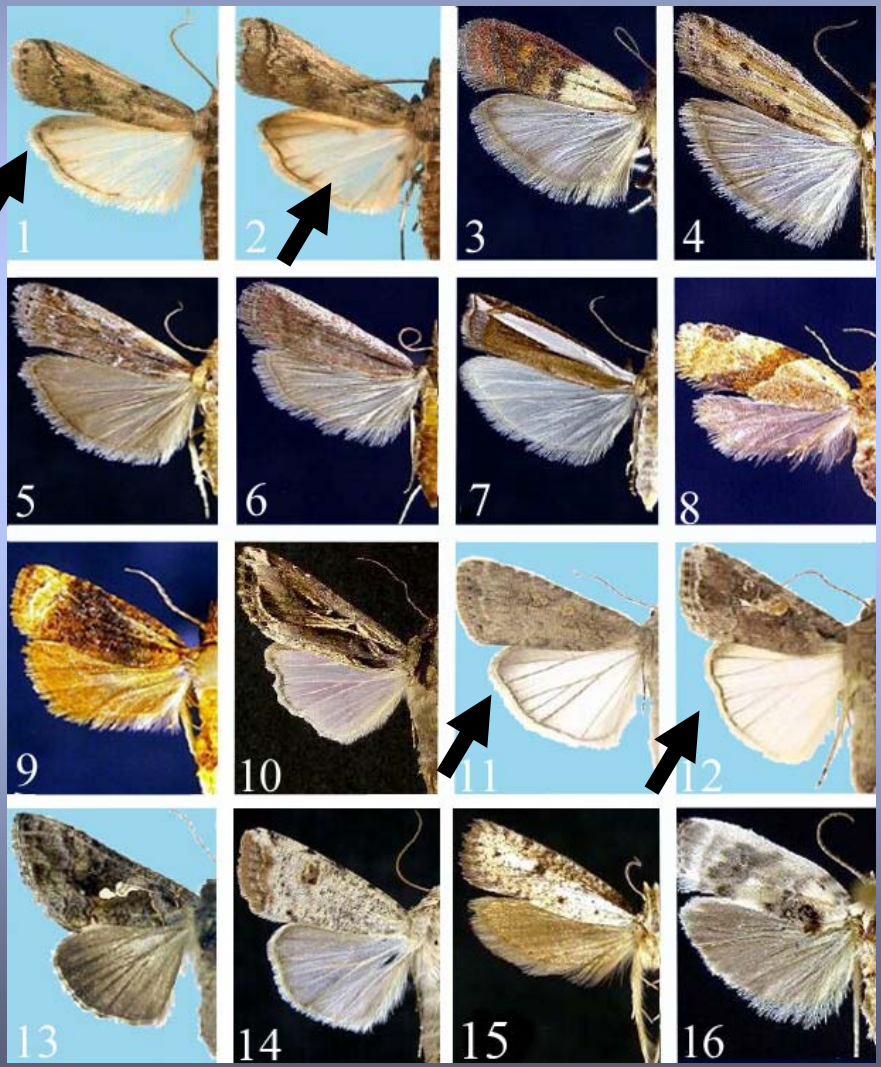


Melitara prodenialis Spinneret - dorsal



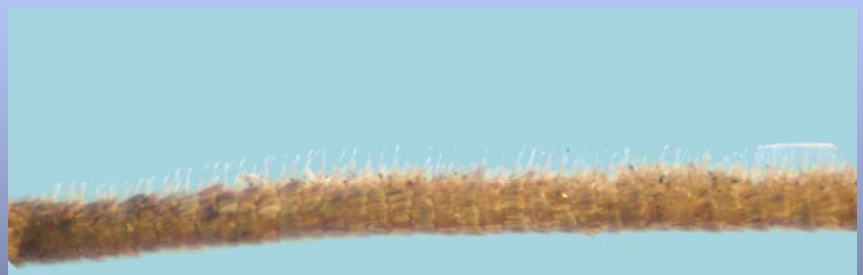
Pheromone trap identifications

Selected Species Collected in Pheromone Traps in Five States, 2005-2006

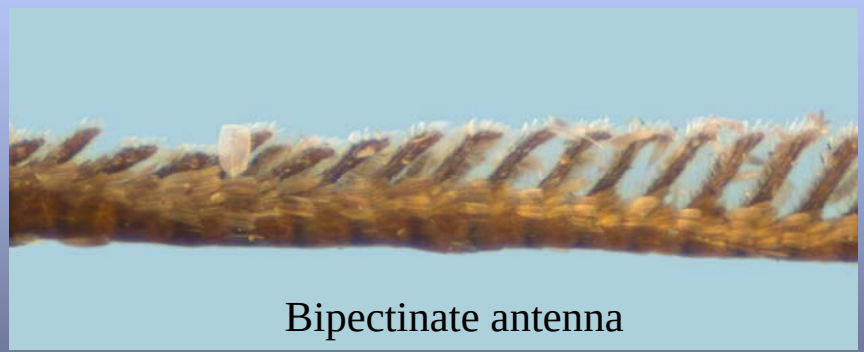


Plodia interpunctella	Fig. 3	1129
Spodoptera exigua	Fig. 11	706
Melitara spp.	Fig. 2	20
Cactoblastis cactorum	Fig. 1	16
Platynota flavedana	Fig. 9	12
Ptycholoma peritana	Fig. 8	11
Spodoptera frugiperda	Fig. 12	5
Spodoptera dolichos	Fig. 10	4
***Acrolophus* sp.**	Fig. 15	2
Atascosa glareosella	Fig. 6	2
Crambus quinquareatus	Fig. 7	2
Elasmopalpus lignosellus	Fig. 4	2
Pseudoplusia includens	Fig. 13	2
Adelphia petrella	Fig. 5	1
Anicla infecta	Fig. 14	1
Antaeotricha lucillana	Fig. 16	1

Identification of Adult Cactus Moths



Simple antenna

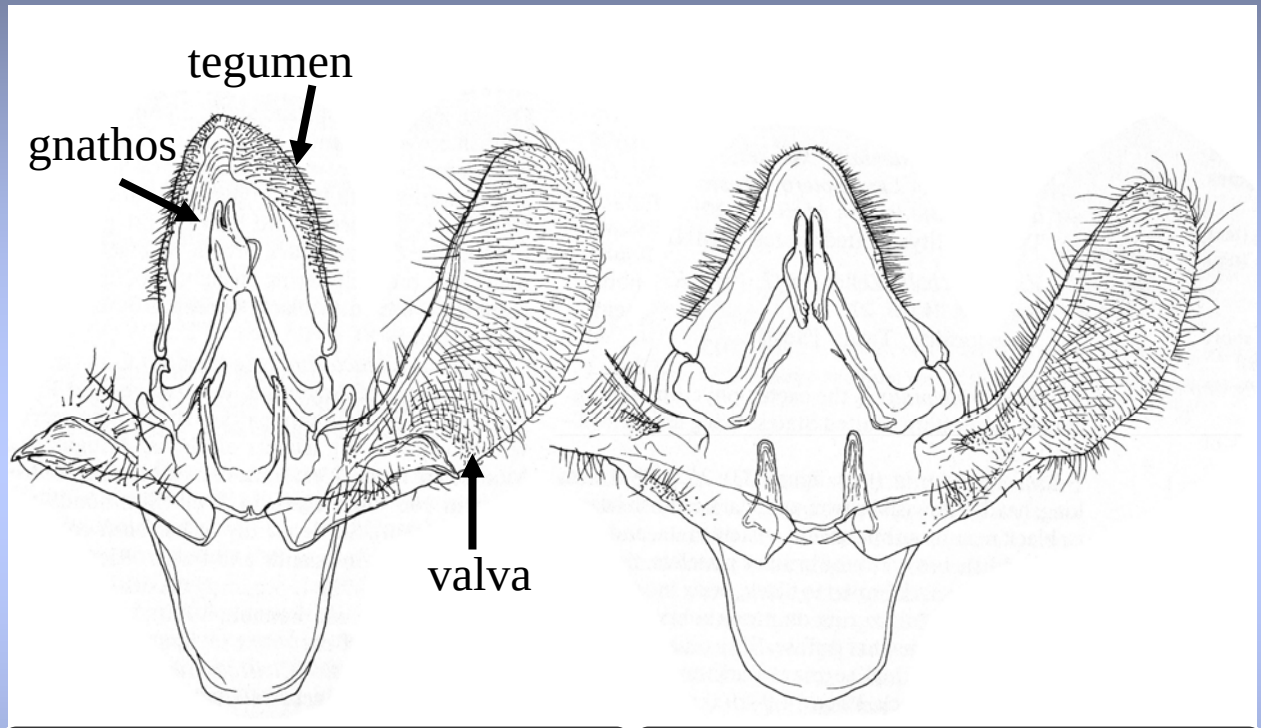


Bipectinate antenna

Cactoblastis

Melitara

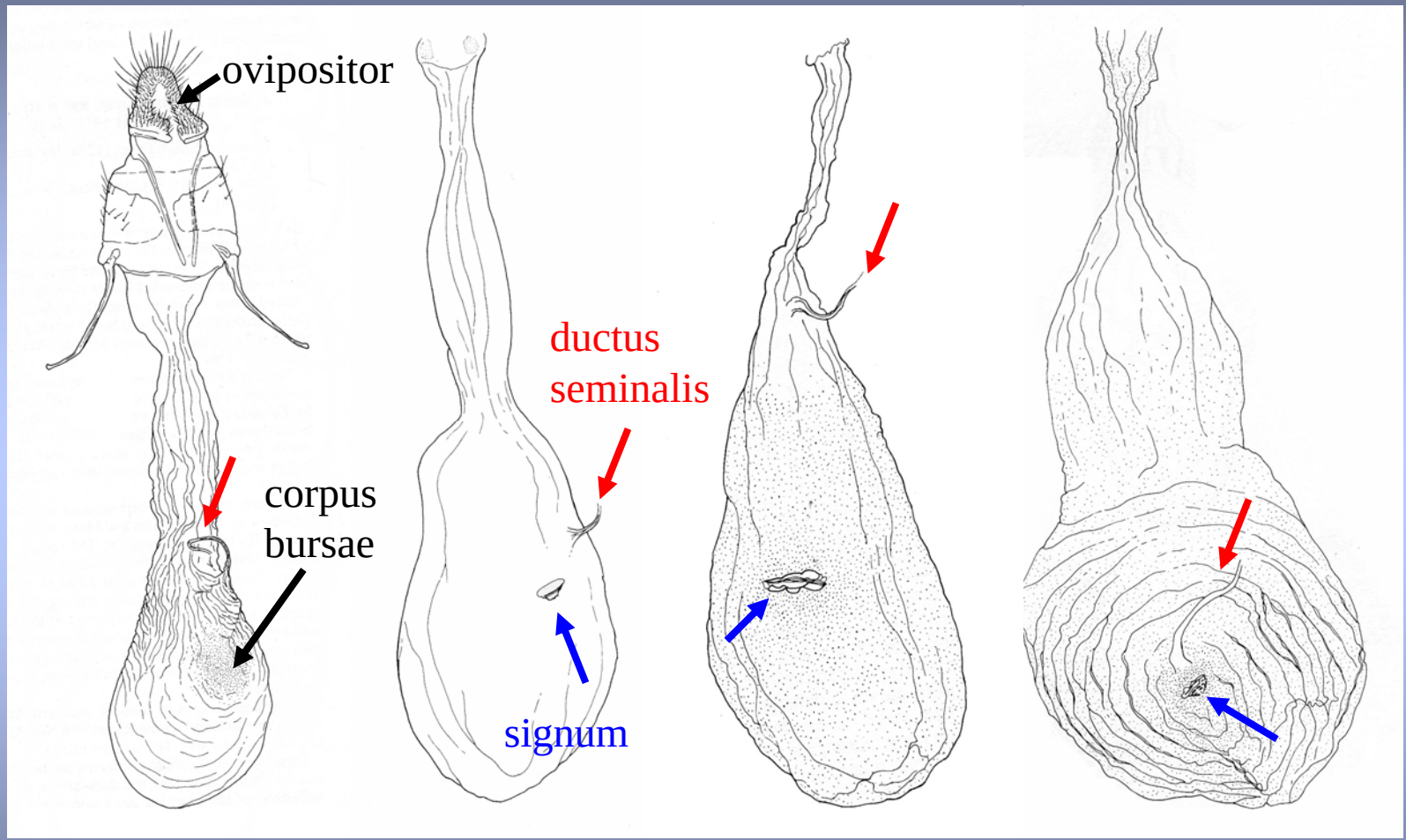
Identification of Cactus Moths - Male Genitalia



Cactoblastis | *Melitara*

H. Neunzig, 1997

Identification - Female Genitalia



Melitara texana | M. texana | Cactoblastis | Alberada

H. Neunzig, 1997

Know the invader!

Acknowledgements

- Stephen Hight, USDA-ARS, Tallahassee, FL
- Todd Gilligan, Ohio State University
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- Joe MacGown, Mississippi Entomological Museum
- JoVonn Hill, Mississippi Entomological Museum
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- Joel Floyd, USDA, APHIS, PPQ
- Victor Maddox, GeoResources Institute
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