

Ultrastructural investigation of antennae in bot flies (Diptera: Oestridae)

Authors: Li Xin-yu, Liu Xian-hui, Wang Qi-ke, Zhang Dong



School of Nature Conservation,
Beijing Forestry University, Beijing 100083, China



Content



- I Introduction
- II Material and Methods
- III Results
- IV Discussion

WHY Oestridae?



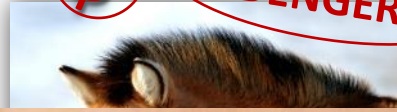
Introduction



Rodents



African



ENDANGERED



ENDANGERED

Rhinoceros



Caprine



Antelopes



Bovine



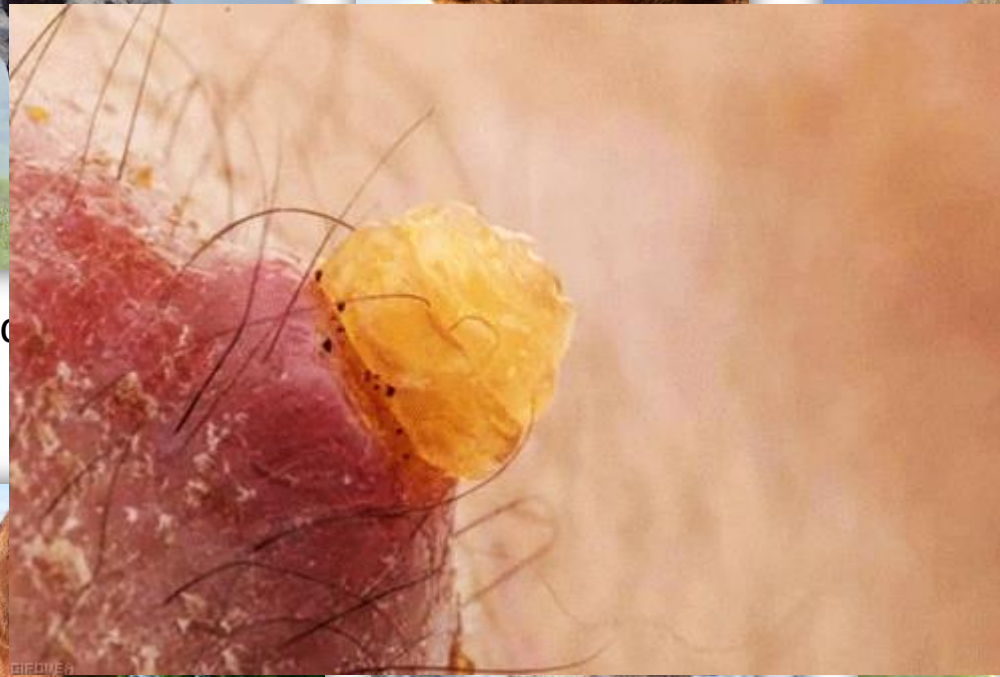
Cervidae



Kangaroos



Human



WHY Antenna?



Introduction

- Limited number
- Scattered distribution

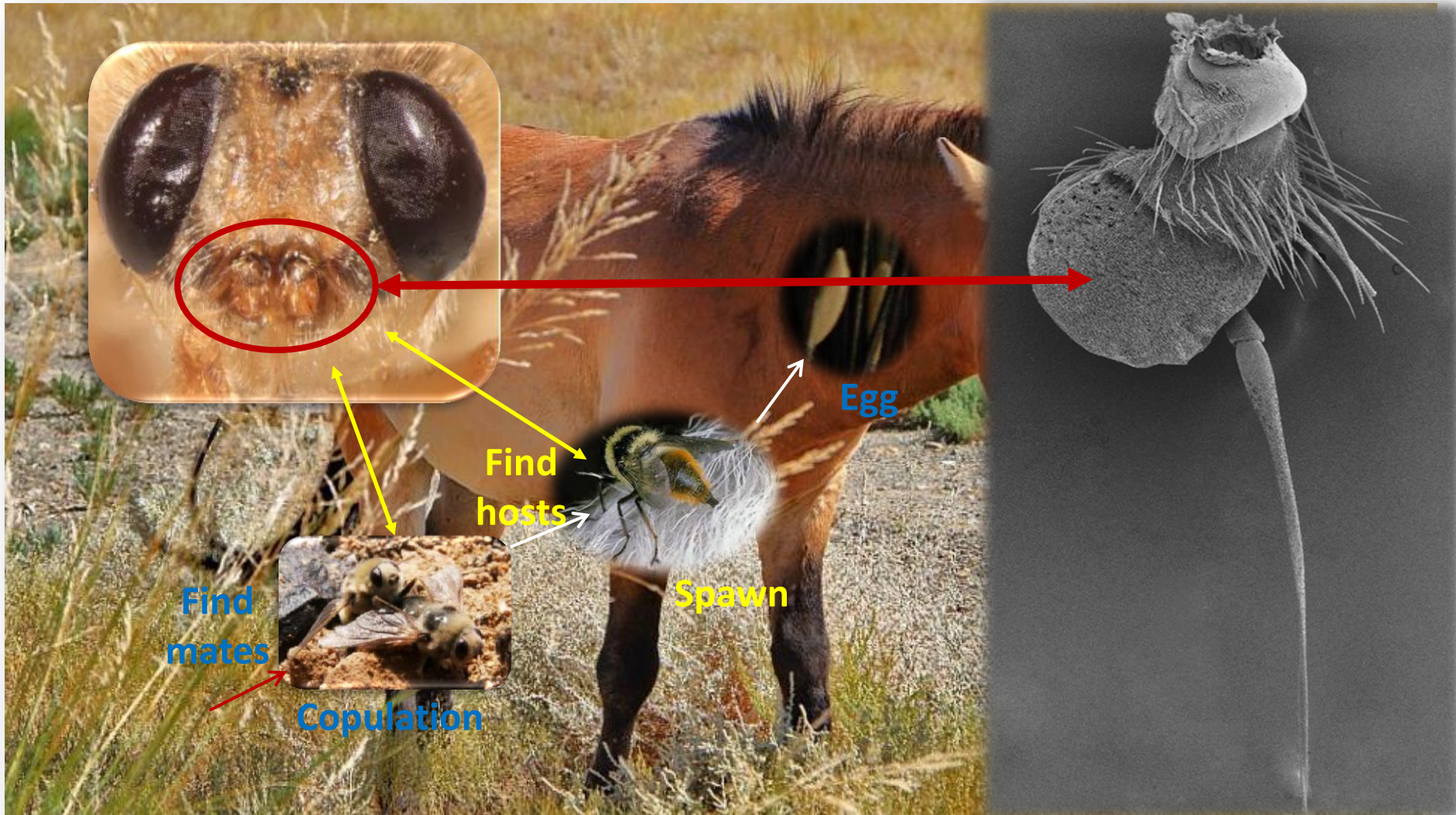


- Short life span
- Limited amount of non-renewable energy (attracting mouthparts)



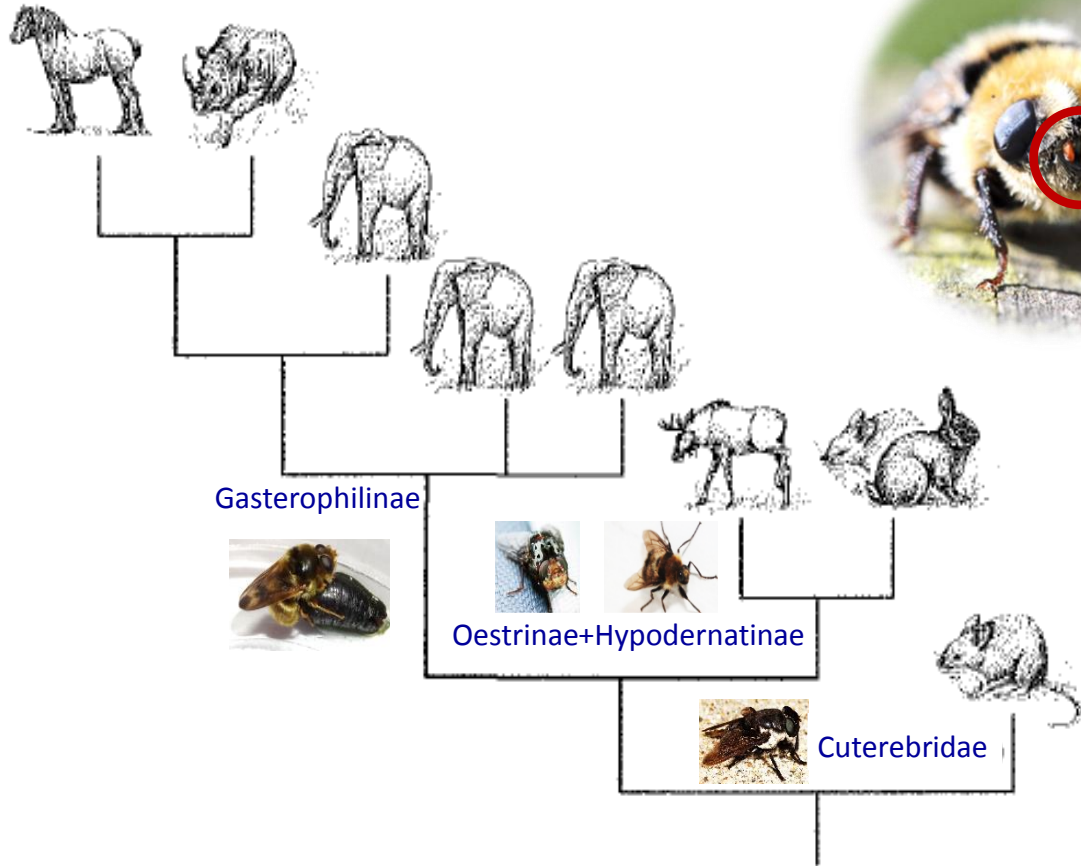
Introduction

How *Gasterophilus* spp. find their mate and host?

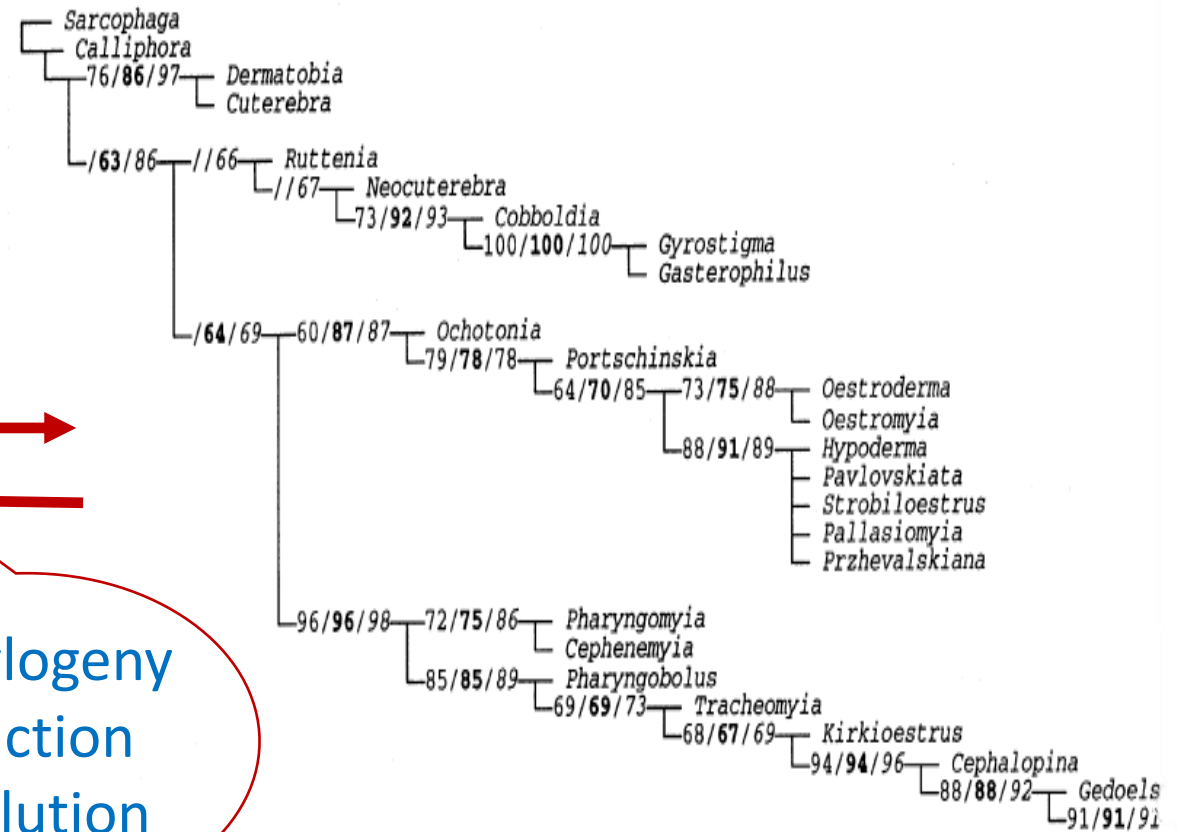


Emerged

Introduction



- ✓ Phylogeny
- ✓ Function
- ✓ Evolution



Material and methods

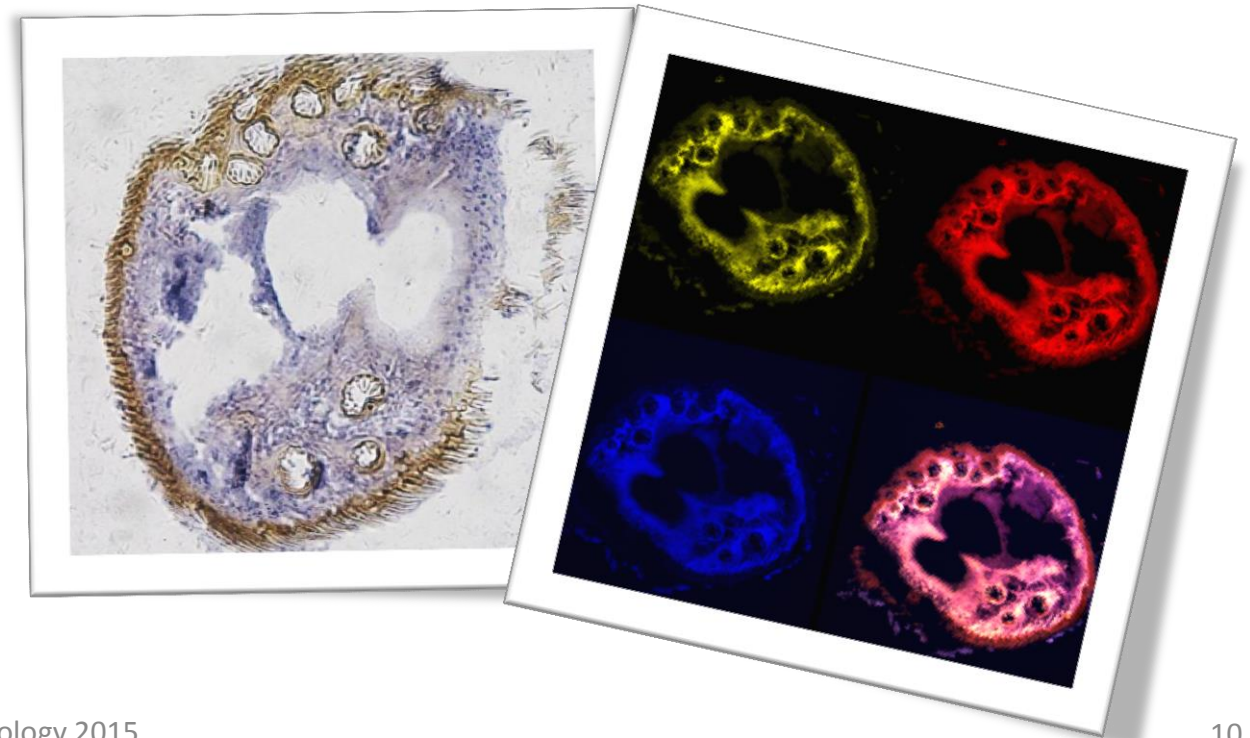
➤ Material

Table 1 Oestridae specises investigated in this study

Subfamily	Species	Origin
Gasterophilinae	<i>Gasterophilus haemorrhoidalis</i>	This study
	<i>Gasterophilus intestinalis</i>	This study
	<i>Gasterophilus nasalis</i>	This study
	<i>Gasterophilus nigricornis</i>	Zhang et al. 2012a
	<i>Gasterophilus pecorum</i>	This study
	<i>Gyrostigma rhinocerontis</i>	This study
	<i>Cobboldia elephantis</i>	This study
Oestrinae	<i>Oestrus ovis</i>	Poddighe et al. 2010
	<i>Rhinoestrus purpureus</i>	Liu et al. 2015
Hypodernatinae	<i>Hypoderma bovis</i>	Hunter & Adserballe 1996
	<i>Hypoderma lineatum</i>	Li et al. 2015
	<i>Portschinskia magnifica</i>	Zhang et al. 2012b
Cuterebrinae	<i>Dermatobia hominis</i>	Fernandes et al. 2002
	<i>Cuterebra sp.</i>	This study

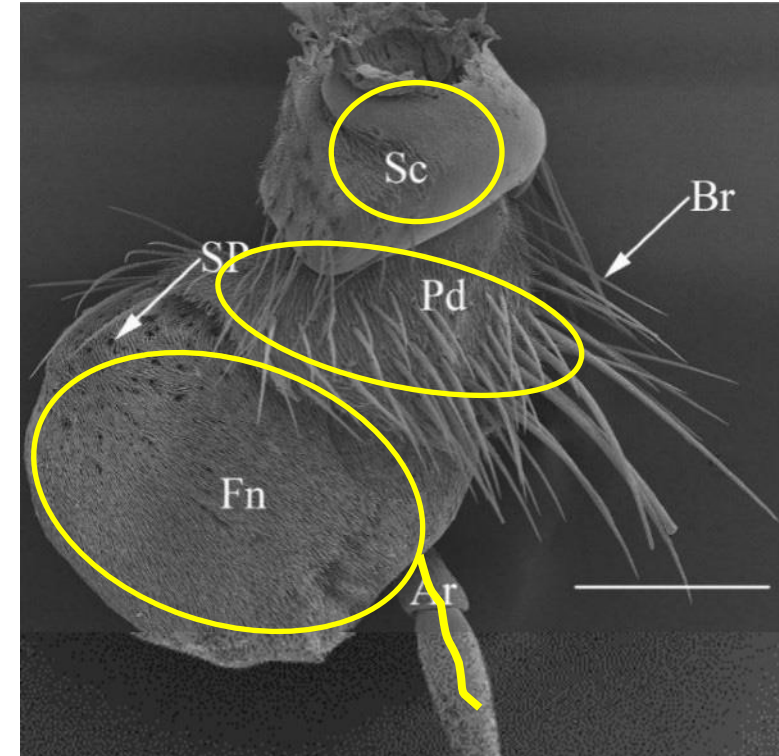
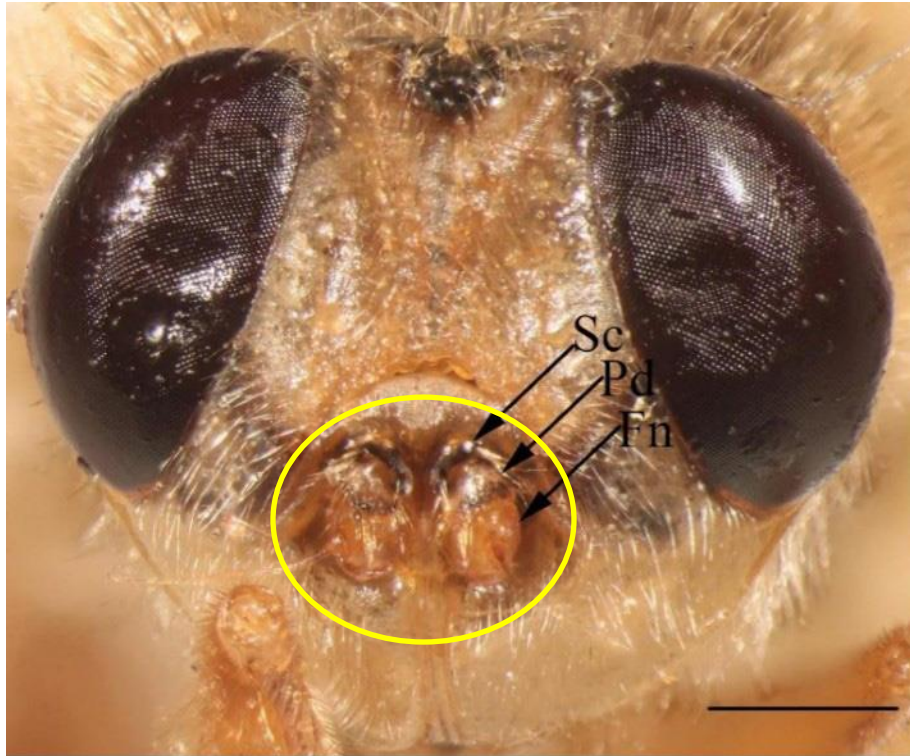
➤ Methods

- Stereoscope
- Scanning electron microscope
- Optical microscope
- Laser scanning confocal microscope



➤ General morphology of antenna in Oestridae

- Sc (Scape); Pd (Pedicel); Fn (Funiculus)+ Ar (Arista) .

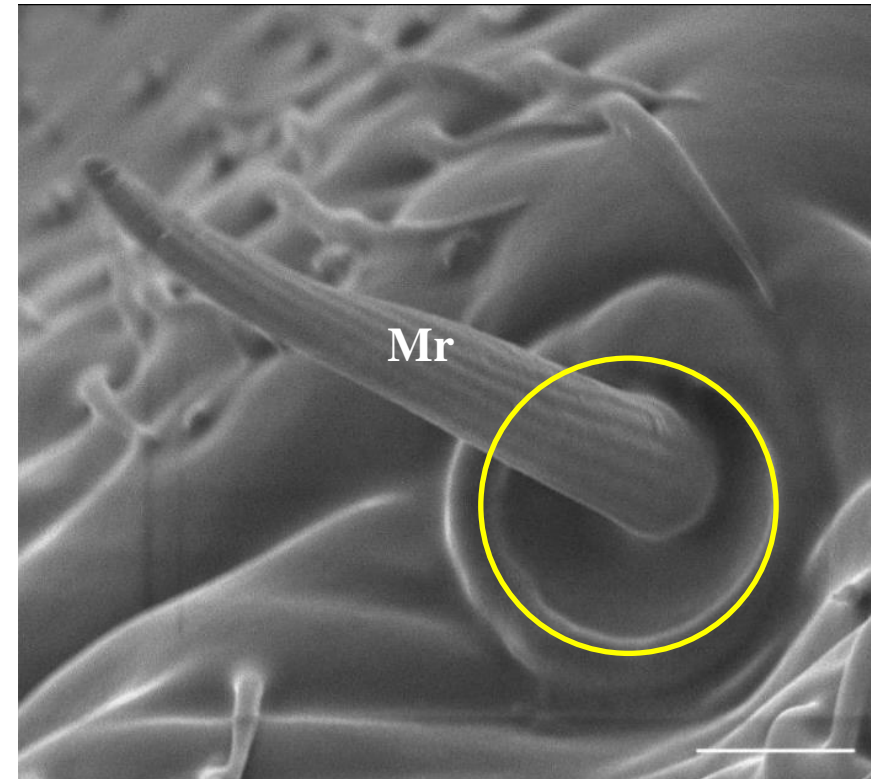
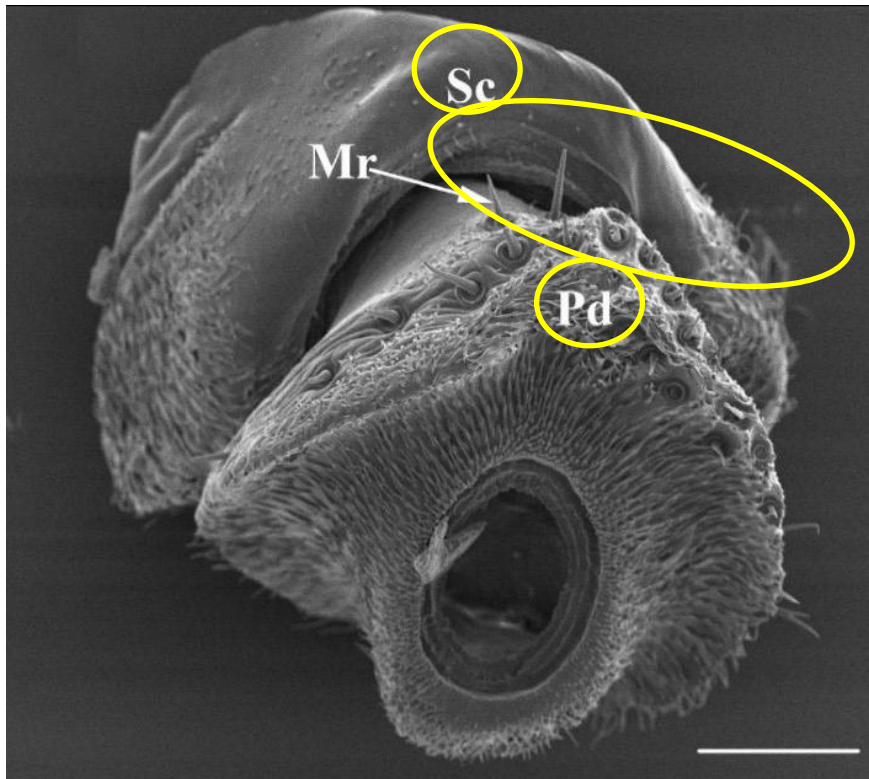


Gasterophilus intestinalis

➤ Morphology of Antennal **SCAPE** and **PEDICEL**

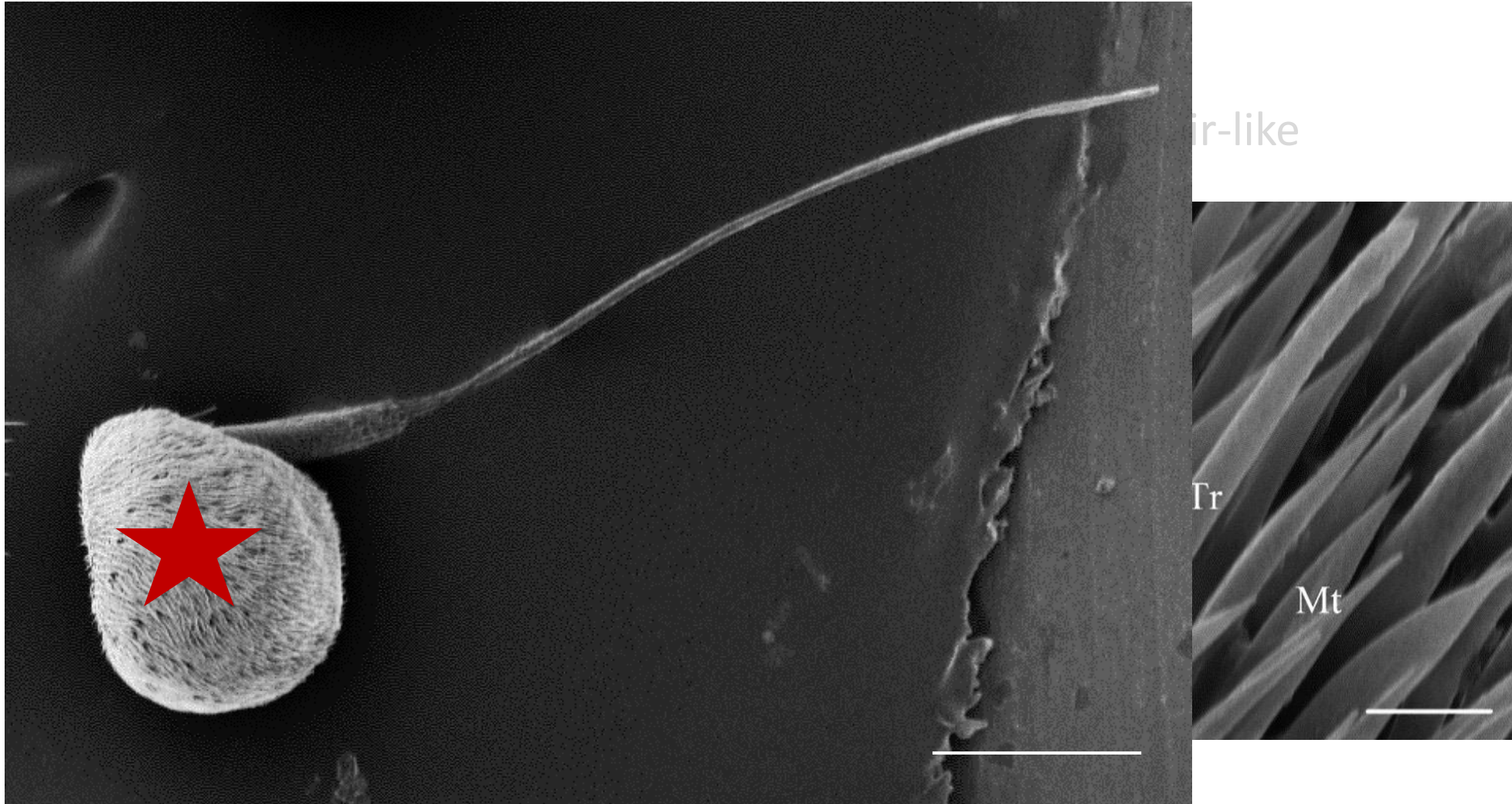
- Mechanoreceptor

1) Long and straight ; 2) Socket; 3) Longitudinal grooves.



Rhinosternus purpureus

➤ Morphology of Antennal FUNICULUS

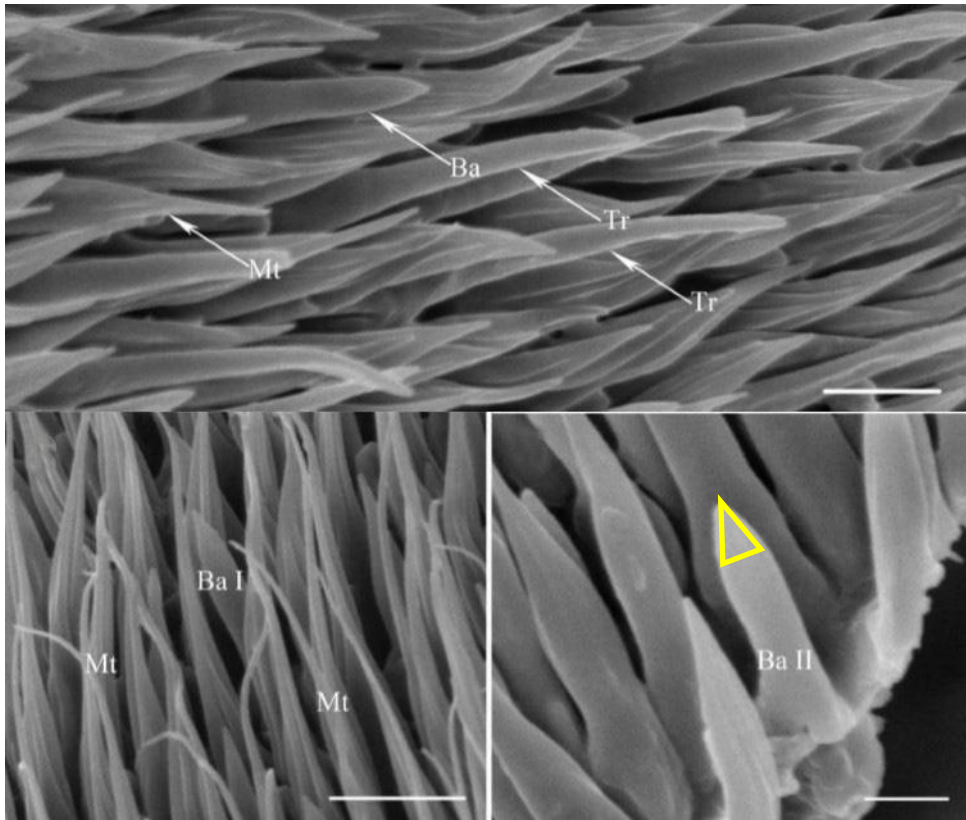


➤ Sensory organs on Antennal FUNICULUS

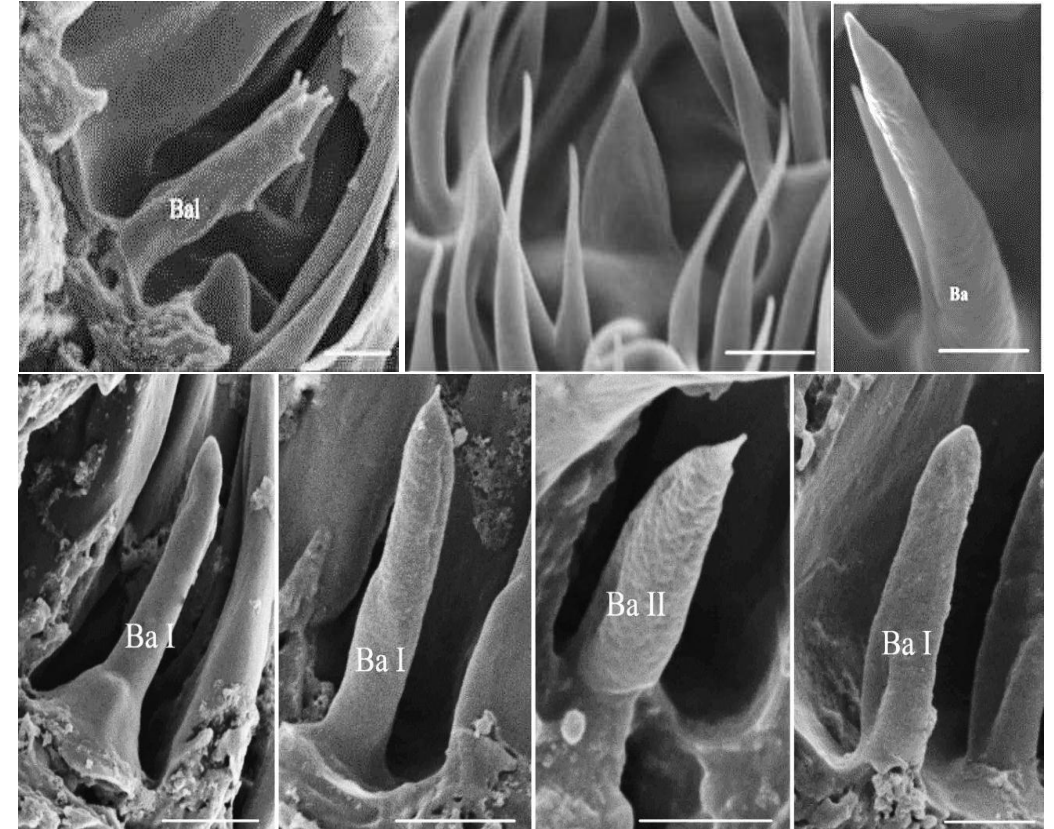
- Basiconic sensilla (Ba)

- Different subtypes of Basiconic sensilla

1) < 15 μm; 2) Sharp tipped ; 3) Various subtypes



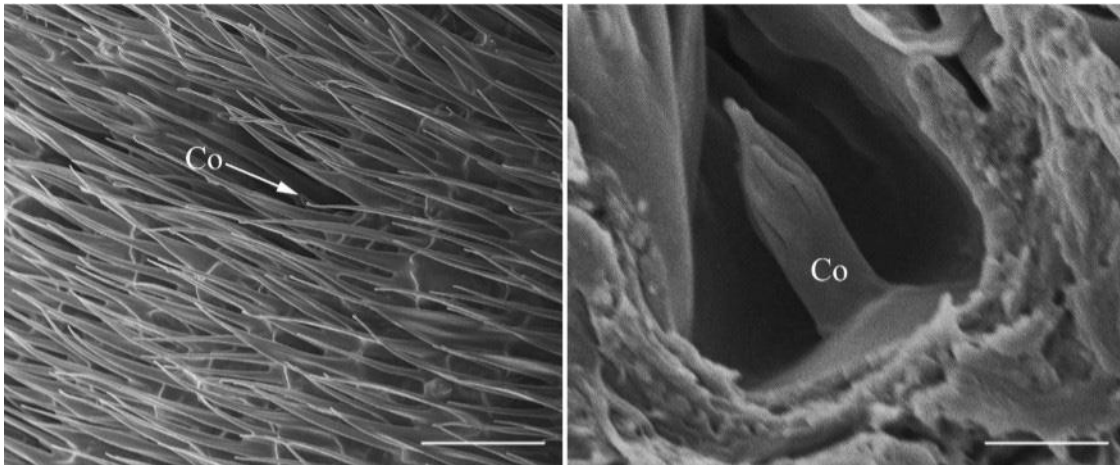
Gasterophilus nasalis



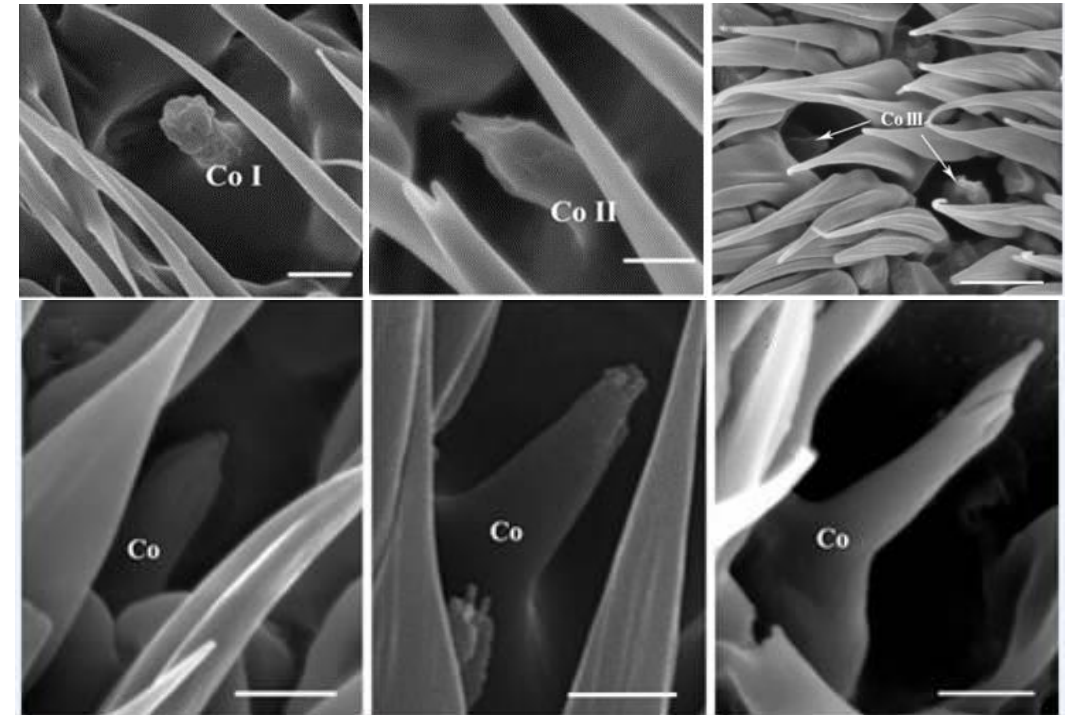
➤ Sensory organs on Antennal FUNICULUS

- Coeloconic sensilla (Co)
- Different subtypes of coeloconic sensilla

1) Length: 2~5 μm ; 2) Depressions or cavities;
3) Longitudinal ridges; 4) Various subtypes.



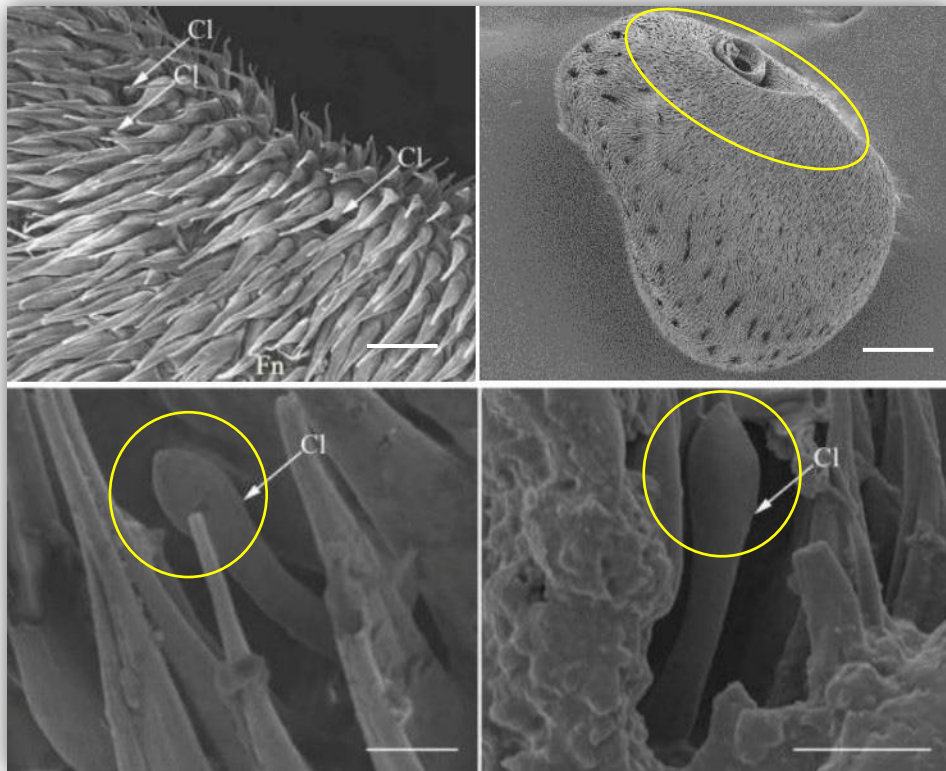
Hypoderma lineatum



➤ Sensory organs on Antennal **FUNICULUS**

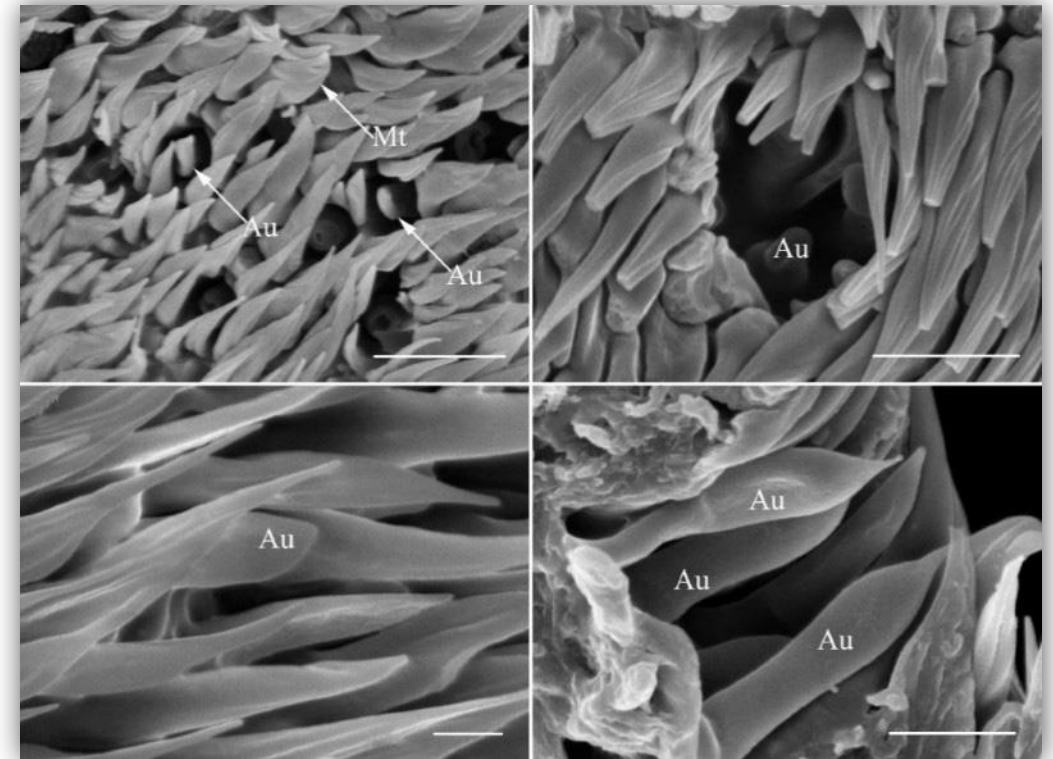
- Clavate sensilla (Cl)

- 1) Distal dilatation; 2) Superficial cavity;
- 3) Proximal region.



- Auriculate sensilla (Au)

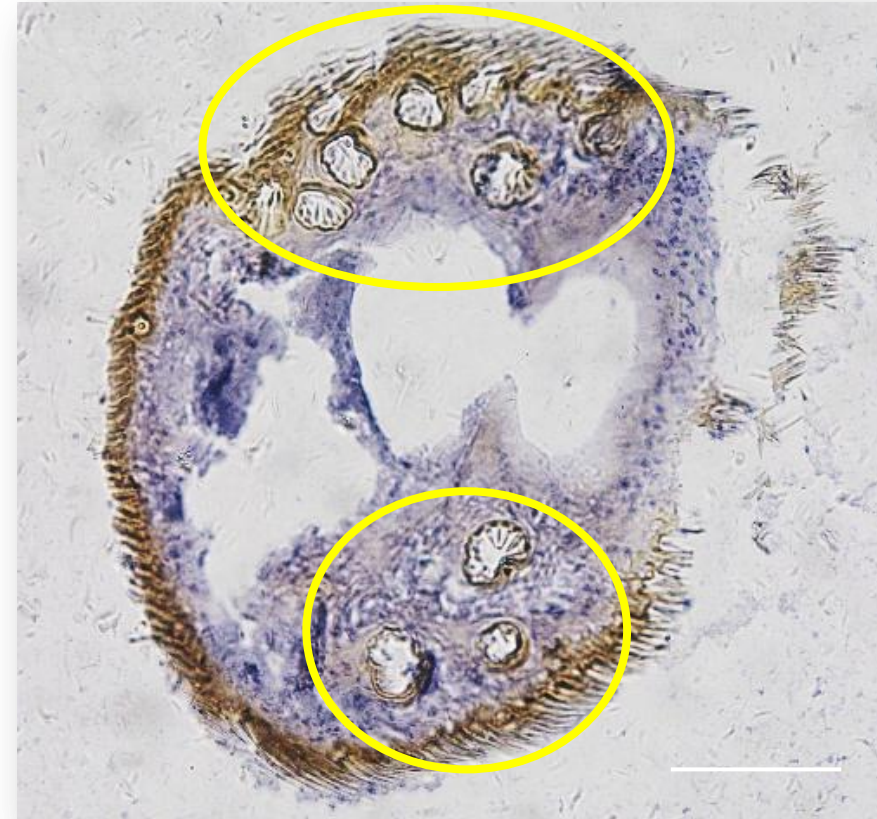
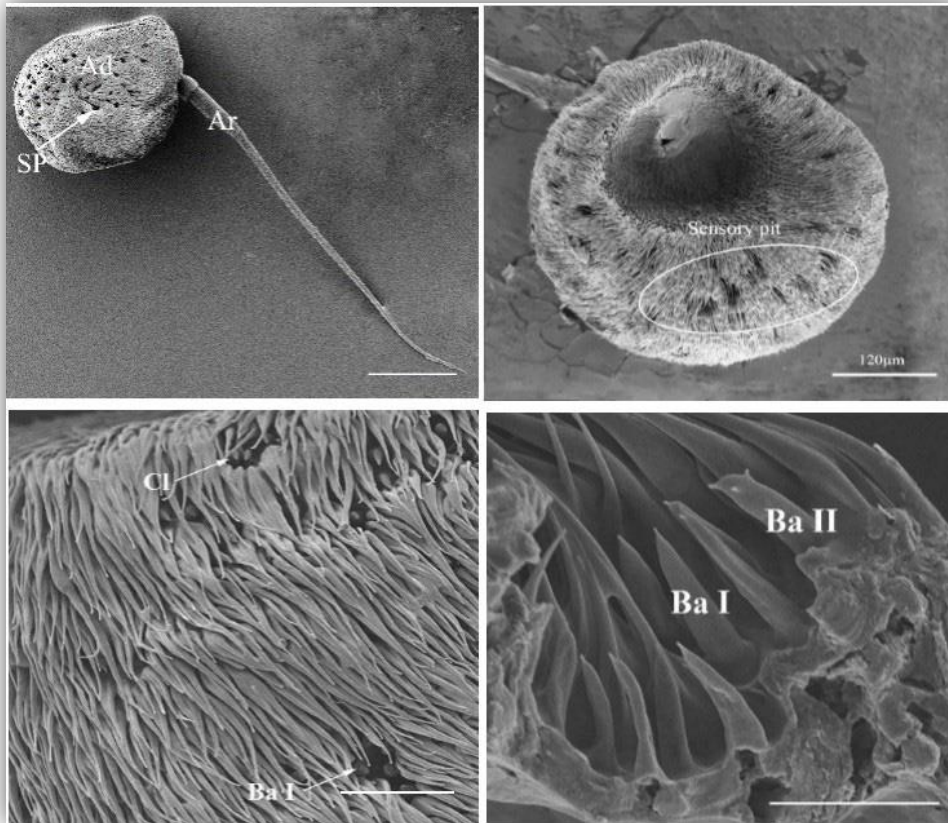
- 1) Ear- or spoon-like; 2) Surface or pits .



➤ Sensory organs on Antennal FUNICULUS

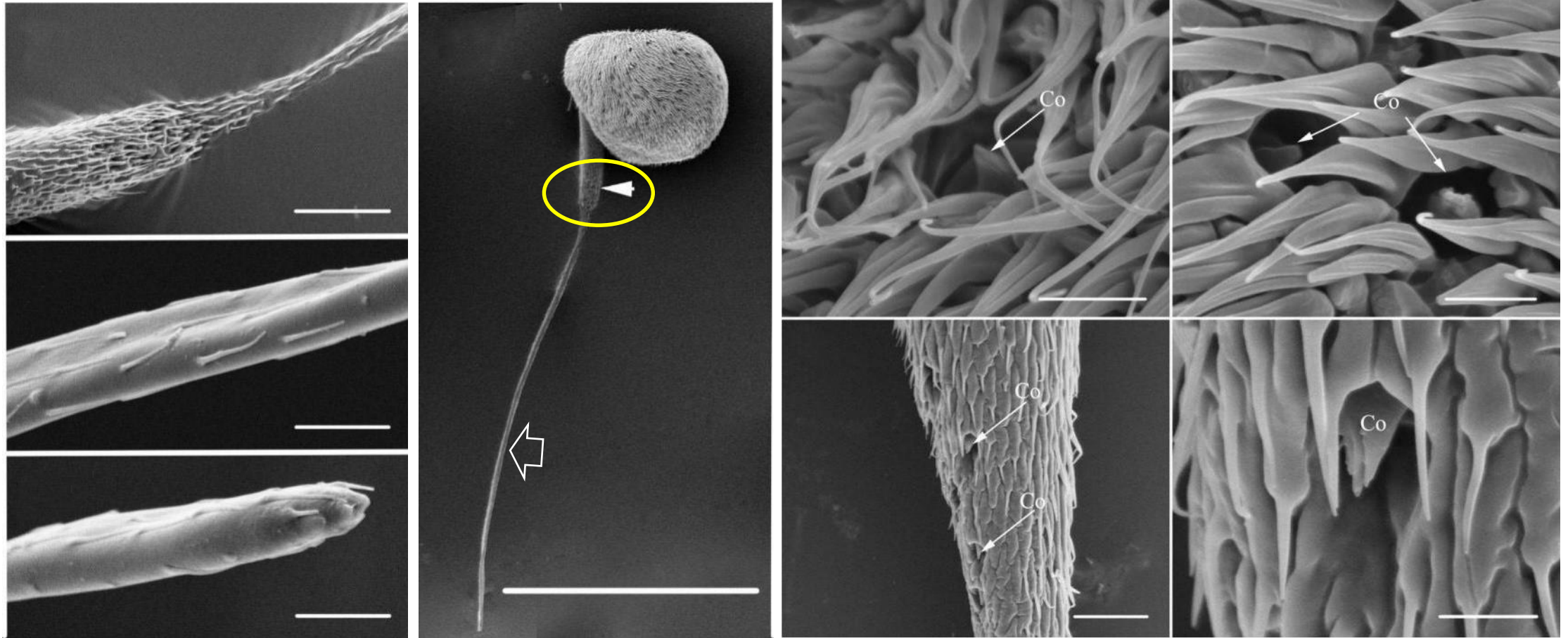
- Sensory pit

1) Single-chambered; 2) Cuticular invagination; 3) Congregation of sensilla.

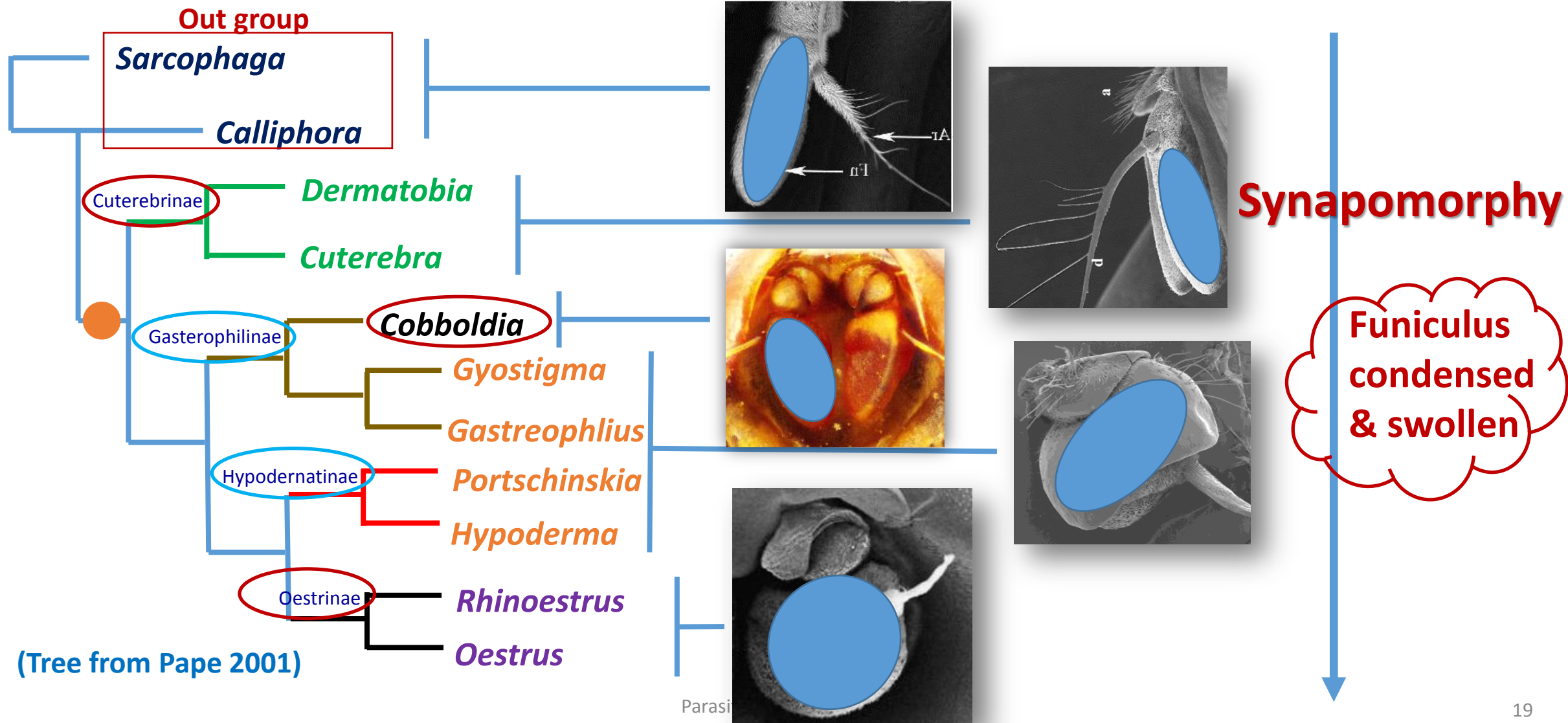


➤ Antennal sensilla on spiral **ARISTA**

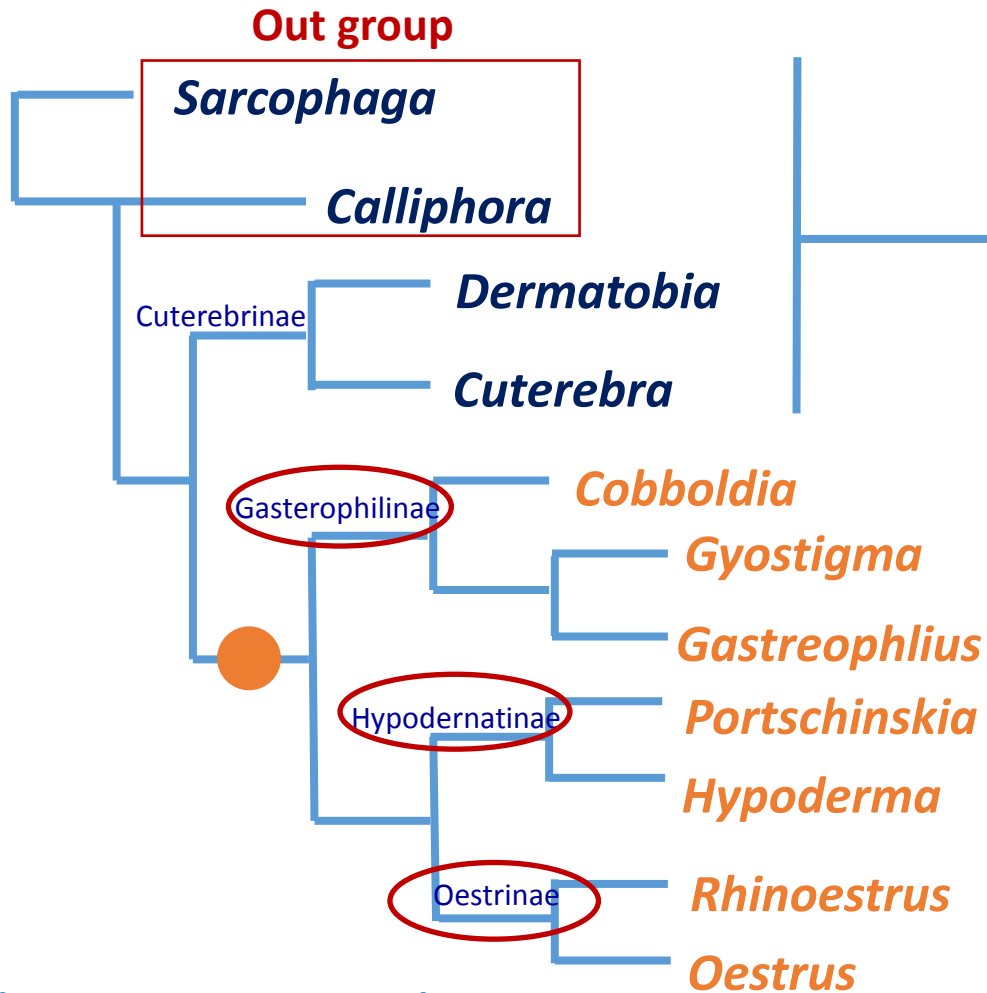
1) Long and spiral; 2) Coeloconic sensilla.



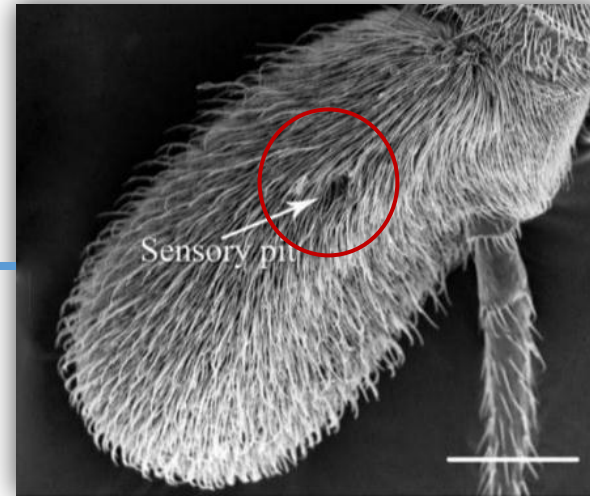
➤ Antennal structures give **PHYLOGENETIC IMPLICATIONS**



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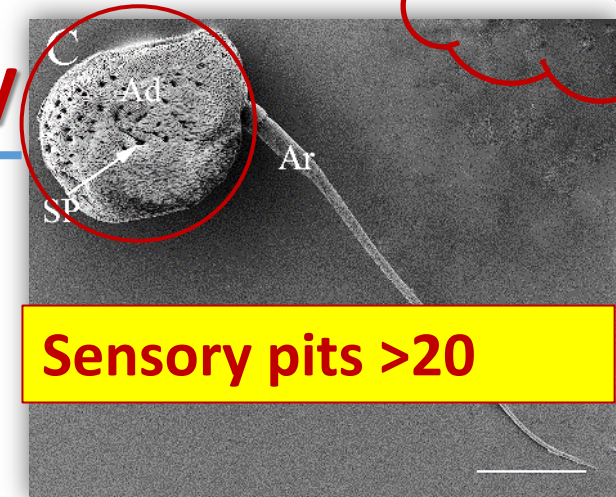


(Tree from Pape 2001)

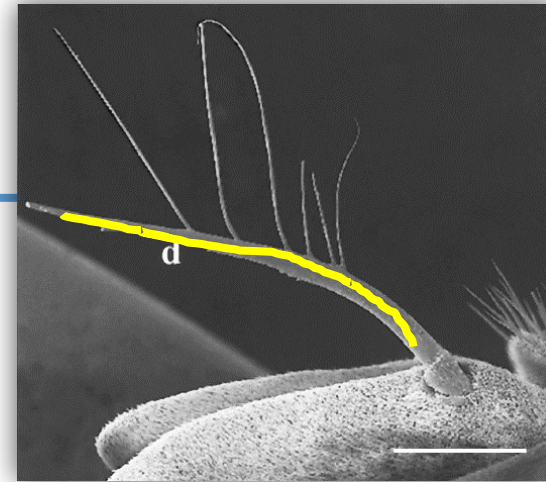
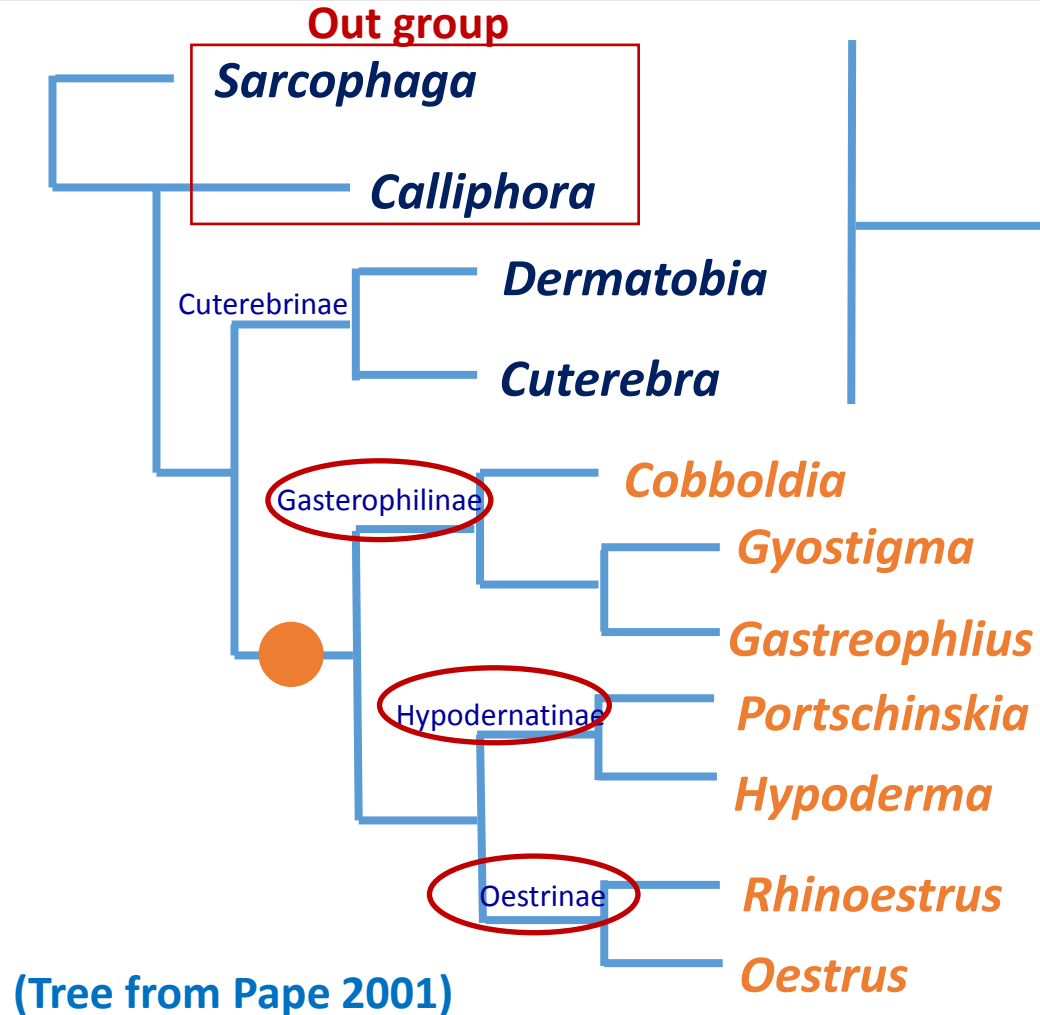


Numerous sensory pits

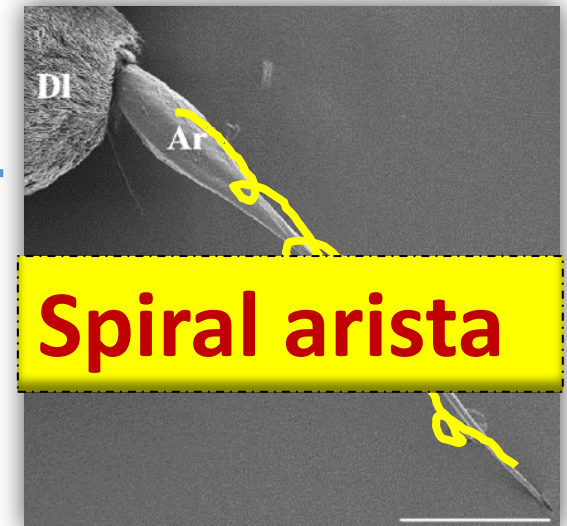
Synapomorphy



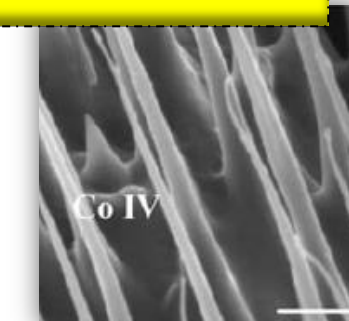
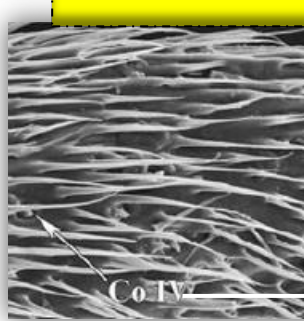
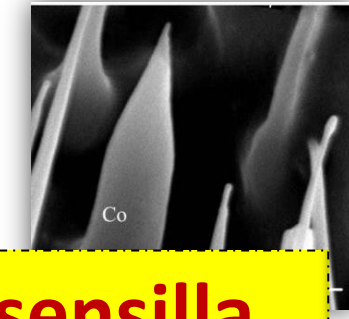
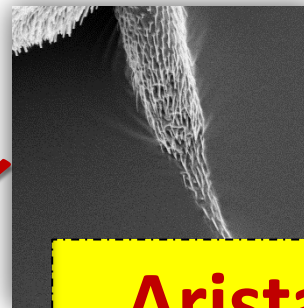
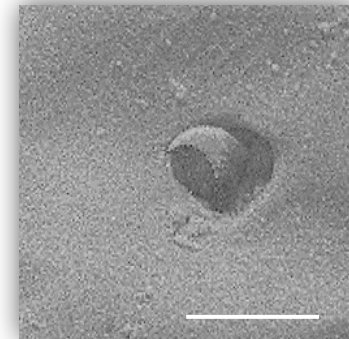
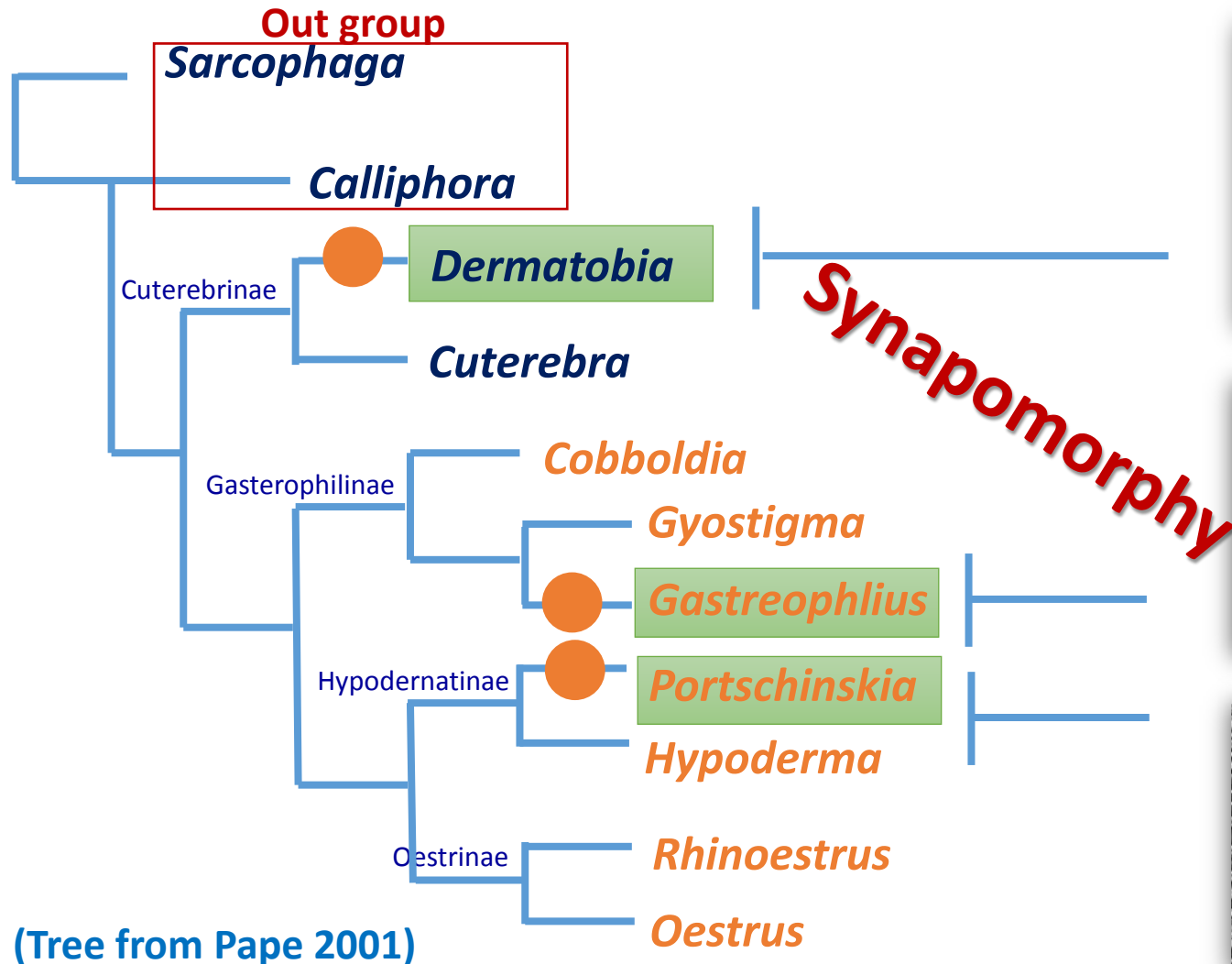
➤ Antennal structures give **PHYLOGENETIC IMPLICATIONS**



Synapomorphy

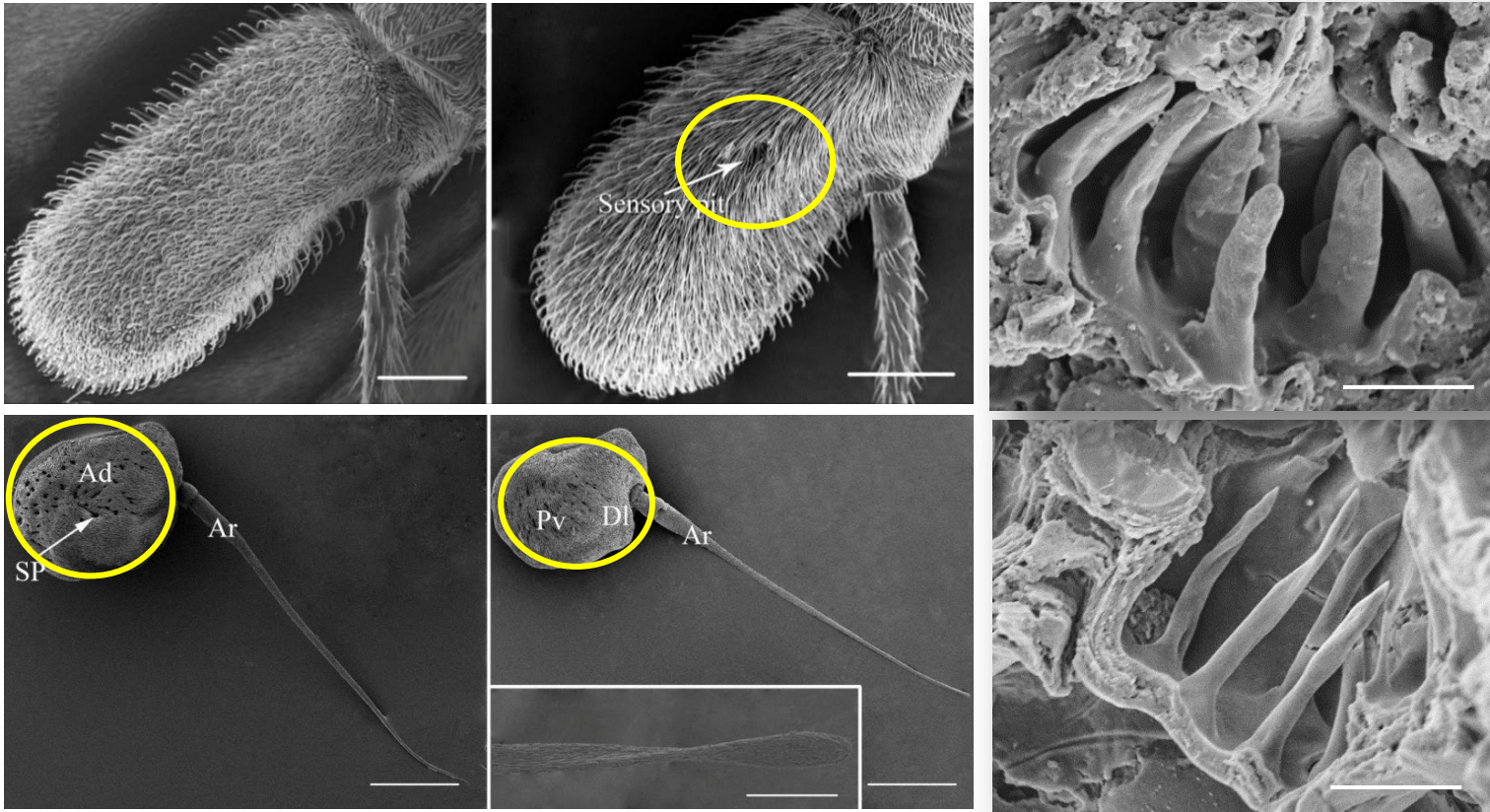


➤ Antennal structures give **PHYLOGENETIC IMPLICATIONS**



➤ Antennal structures give **FUNCTIONAL IMPLICATIONS**

- More sensory pits



- ✓ Trap odor molecules;
- ✓ Facilitate odor detection;
- ✓ Enhance olfactory sensitivity;
- ✓ Protect fragile antennal sensilla.

(Ross 1992; Hunter and Adserballe 1996; Bruyne et al. 2001; Zhang et al. 2012a, b, 2013a, b, 2014a, b, c)

➤ Antennal structures give **FUNCTIONAL IMPLICATIONS**

- More diverse sensilla in **sensory pits**

Table 2 Types of sensilla in sensory pits

Object \ Type	Tr	Ba	Co	Cl	Au
Sarcophagidae	0	1-2	0	0	0
Calliphoridae	0	1-2	0	0	0
Gasterophilinae	0	2-4	2-3	1	0-1
Oestrinae	0	1	1	1	1
Hypodernatinae	0-1	1-2	1-4	1	1
Other calyptrates	0	1-2	1	0-1	0

- ✓ Specific function;
- ✓ Enhancement of olfactory accuracy to distinct molecules.

(Hunter and Adserballe 1996; Bruyne et al. 2001; Sukontason et al. 2004; Poddighe et al. 2010; Zhang et al. 2012a, 2014b, c)

Conclusion



- Crucial implications on taxonomy, phylogeny and evolution.
- Monitoring studies: synthetic attractants.

(Hall 1995; Colwell et al. 2007)



Medical and Veterinary Entomology

Medical and Veterinary Entomology 2014, 28: 111-112

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W. WANG
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Antennal sensilla of the green bottle fly, *Lucilia sericata* (Meigen) (Diptera: Calliphoridae)

Sensilla on a

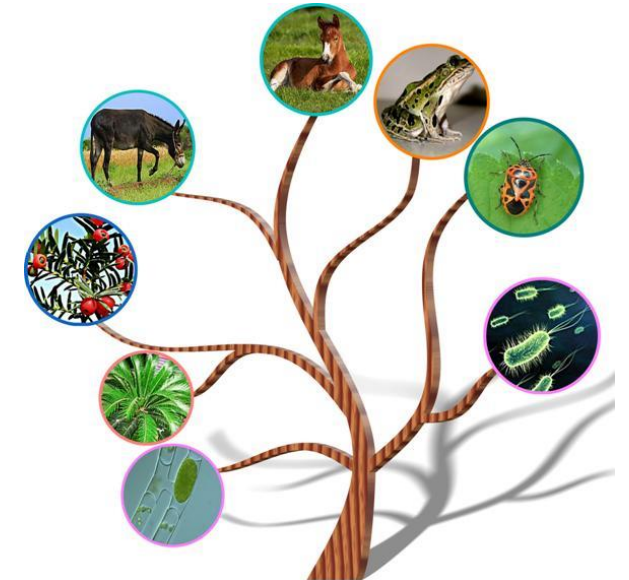
Medical and Veterinary Entomology

Sensilla on the antennal funiculus of the horse stomach bot fly, *Gasterophilus nigricornis*

D. ZHANG, Q. E. WANG, D. F. HU and K. LI

Department of Zoology, College of Biological Sciences and Biotechnology, Beijing Forestry University, Beijing, China

Abstract. *Gasterophilus nigricornis* (Larval) (Diptera: Gasterophilidae) is one of the most



Acknowledgement



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- The Chinese Postdoctoral Science Foundation (No. SFG-201104059)

Thank you for your attention!