

**A SEM STUDY ON AEDEAGUS AND SPERMATHECA OF
CASSIDA SERAPHINA MÉNÉTRIES, 1836 (COLEOPTERA:
CHRYSOMELIDAE: CASSIDINAE) FROM TURKEY**

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ABSTRACT: The paper presents ultrastructures observed by SEM of aedeagus and spermatheca of *Cassida seraphina* Ménétries, 1836 (Coleoptera: Chrysomelidae: Cassidinae) from Turkey for the first time. Male genitalia are not diagnostic, spermathecae are partly diagnostic within the genus *Cassida* Linnaeus, 1758. Accordingly, ultrastructural investigations of aedeagus and spermatheca are very important to obtain new diagnostic characters in the genus *Cassida*. Photos of aedeagus and spermatheca in SEM as well as photos of aedeagus and spermatheca in stereo microscope are also given in the text.

KEY WORDS: *Cassida seraphina*, SEM, ultrastructures, aedeagus, spermatheca, Turkey

Cassida seraphina Ménétries, 1836 is in the subgenus *Alledoya* Hincks, 1950 of the genus *Cassida* Linnaeus, 1758 (Chrysomelidae: Cassidinae).

The Cassidinae fauna of Turkey includes 51 species of 6 genera. The genus *Cassida* Linnaeus, 1758 numbers 41 species (Ekiz et al., 2013; Özdikmen et al., 2014; Özdikmen & Kaya, 2014).

The Western Palaearctic subgenus *Alledoya* Hincks, 1950 numbers only two species. It includes both species in Turkey as *Cassida seraphina* Ménétries, 1836 and *Cassida habitziae* Motschulsky, 1838 (Ekiz et al., 2013; Özdikmen et al., 2014; Özdikmen & Kaya, 2014).

The aim of this work, ultrastructures observed by SEM of aedeagus and spermatheca of *Cassida seraphina* Ménétries, 1836 (Coleoptera: Chrysomelidae: Cassidinae) from Turkey reveal for the first time.

MATERIAL AND METHODS

The available specimens (a total of 119 specimens) for the present work were collected from Ankara, Düzce and Çankırı provinces in Turkey in 2000, 2003, 2014, 2015. The specimens are deposited at Gazi University (Turkey, Ankara).

The spermathecae and aedeagi were dissected from abdomen, remaining tissue were removed with fine tweezers.

For light microscopic examination after cleaning, the samples were placed 70% ethanol and examined with Olympus SZX7 stereomicroscope.

For scanning electron microscopy (SEM), cleaned samples were dehydrated using an ascending series of ethanol (70%, 80%, 90%, and 100%) and then air dried. After that the specimens were mounted onto SEM stubs using a double-sided adhesive tape, coated with gold using a Polaron SC 502 Sputter Coater, and examined with a JEOL JSM 6060 Scanning Electron Microscope (SEM) at 10 kV.

RESULTS

Cassida seraphina Ménétries, 1836

= *Cassida testudo* Suffrian, 1844

Cassida seraphina Ménétries, 1836 is a SW-Asiatic species. It is distributed in Armenia, Greece, South European Russia and Turkey of Western Palaearctic region (Borowiec, 2007a,b; Warchalowski, 2010; Borowiec & Sekerka in Löbl & Smetana (2010)).

The species is rather widely distributed in Turkey. It has been recorded from 25 provinces in 6 of 7 Turkish regions except for South-East Anatolian region. It is reported from Amasya, Ankara, Antalya, Balıkesir, Bilecik, Bolu, Burdur, Bursa, Çankırı, Çorum, Düzce, Erzurum, Eskişehir, Isparta, İstanbul, İzmir, Kastamonu, Kırşehir, Konya, Kütahya, Sakarya, Samsun, Sivas, Tokat and Uşak provinces in Turkey (Ekiz et al., 2013; Özdikmen & Kaya, 2014).

Material examined: Turkey, Ankara prov.: Eryaman, 01.V.2000, 850 m, 1 specimen; **Düzce prov.:** Karakaş env., to Yedigöller, 12.V.2003, 510 m, 1 specimen; **Çankırı prov.:** Kızılırmak, between Kemallı-Halaçlı villages, 40°18' N 33°58' E, 24.IV.2014, 608 m, 1 specimen; Kızılırmak, entry of Aşağıovacık village, 40°26' N 33°53' E, 25.IV.2014, 576 m, 1 specimen; Şabanözü, entry of Kamış village, 40°33' N 33°20' E, 23.V.2014 and 09.V.2015, 1208-1221 m, 100 specimens; Kurşunlu, 4 km to Dağören, 40°48' N 33°16' E, 10.V.2015, 1110 m, 1 specimen; Çerkeş, entry of Gelik district, 40°50' N 32°55' E, 20.VI.2015, 1318 m, 1 specimen; Çerkeş, between Cedine-Kabakköy, 40°53' N 32°55' E, 20.VI.2015, 1355 m, 1 specimen; Bayramören, entry of Dereköy, 41°1' N 33°14' E, 21.VI.2015, 1048 m, 1 specimen; Şabanözü, exit of Kamış village (Maruf road), 40°33' N 33°20' E, 28.VI.2015, 1217 m, 11 specimens.

According to Bordy & Doguet (1987), Borowiec & Świętojańska (2001) and Borowiec (2007a), male genitalia are not diagnostic within the genus *Cassida* Linnaeus, 1758. Spermathecae in the genus *Cassida* are partly diagnostic. With this reason, ultrastructural investigations of aedeagus and spermatheca are very important in the genus *Cassida*.

Aedeagus and spermatheca of *Cassida seraphina* Ménétries, 1836 were studied with both stereo microscope and SEM for the first time. Obtaining observations on ultrastructures of them are presented as follows:

Aedeagus: In lateral view, median lobe distinctly curved median foramen to apex. More or less sharpened towards to apex (Figs. 1, 3, 4, 15).

In dorsal view, median lobe at the apex curved to backward and so apex seems like truncated (Figs. 1, 10, 11, 15-17, 19-20). Upper and lateral margins of orifice more or less rounded (Figs. 1, 10, 15-17, 19-20). Dorsal plate distinct and largish bipartite basally (Figs. 1, 10, 15-17, 19-20). Median lobe in lateral parts and fore part of orifice thickened. Thickening in lateral parts smaller than the fore part (Figs. 1, 10, 15-20). Median lobe behind the orifice more or less flattened (Figs. 1, 15-17, 19-20). Flattened part closed V-shaped basally (Figs. 1, 15, 19).

Median lobe especially in anterior half with scattered, irregular and sparsely ultrastructural pits (Figs. 6-9, 12-14, 16-20). The pits on ventral parts of median lobe much more than on dorsal parts (Figs. 6-10, 13-14, 16-20). The pits located only in lateral parts of terminal part of median lobe in dorsal view (Figs. 7-9, 16-20). Dorsal plate and flattened area behind it without ultrastructural pits in dorsal

view (Figs. 15-17, 19-20). Also the terminal area from upper margin of orifice to aedeagal apex without ultrastructural pits in dorsal view (Figs. 10-11).

Spermatheca: General view of spermatheca falcate like a fish hook (Figs. 2, 21). Cornu C-shaped. Cornu gradually narrowed towards to apex and apex of cornu strongly sharpened (Figs. 2, 21). Nodulus swollen like a thigh (Figs. 2, 21-23, 34). Collum + ramus reduced and hardly visible (Figs. 2, 21-25, 30-32). Ductus spermatheca long, thick and distinctly spiral (Figs. 2, 21-24, 26). Nodulus, cornu, collum + ramus and spermathecal gland with scattered, irregular and sparsely ultrastructural pits (Figs. 28-29, 31-33, 35-37, 39-41). Ductus spermatheca without ultrastructural pits (Figs. 26-27).

Note: This work is based on a part of the Master Thesis of the first author.

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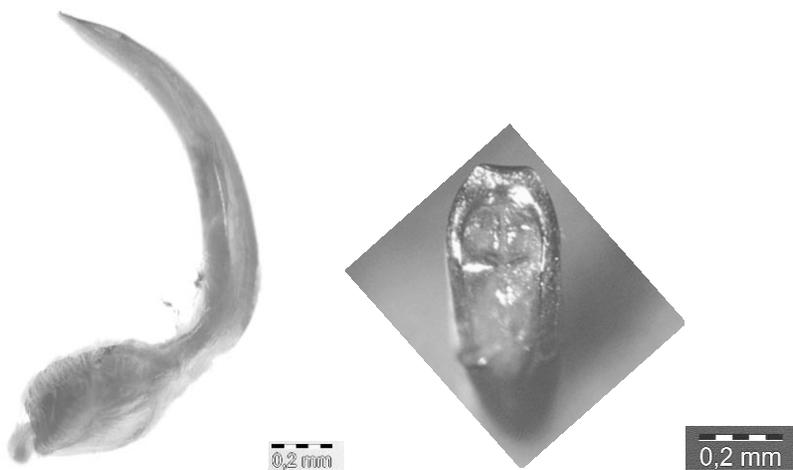


Figure 1. Aedeagus in stereo microscope, Lateral view (left), Dorsal view (right).



Figure 2. Spermatheca in stereo microscope, Lateral view.

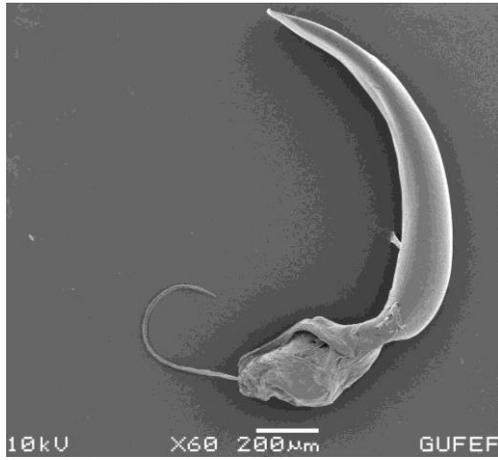


Figure 3. Aedeagus, lateral view.

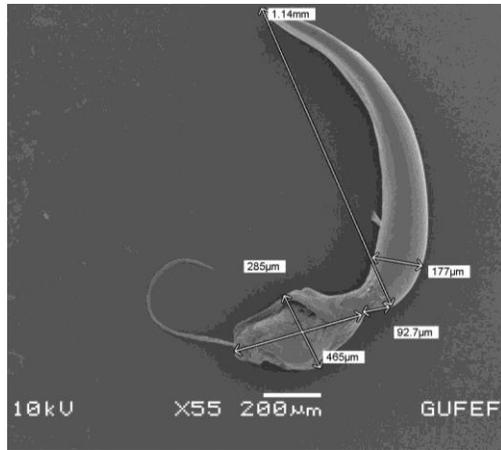


Figure 4. Aedeagus, lateral view.



Figure 5. Aedeagus, lateral view of basal part.

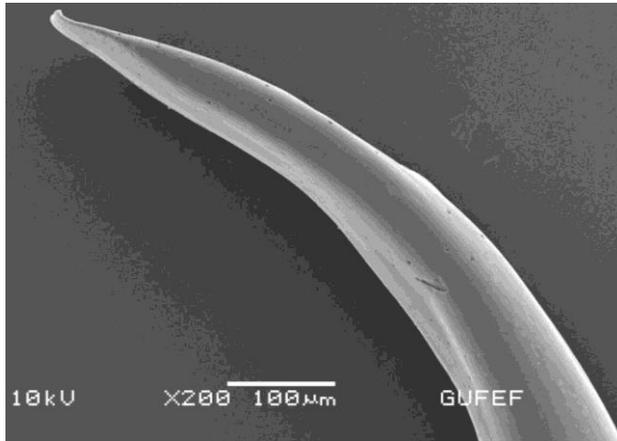


Figure 6. Aedeagus, ventro-lateral view of anterior half of median lobe.

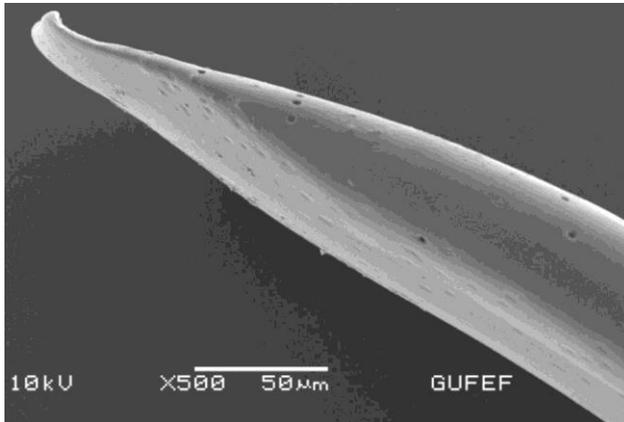


Figure 7. Aedeagus, ventro-lateral view of terminal part of median lobe.

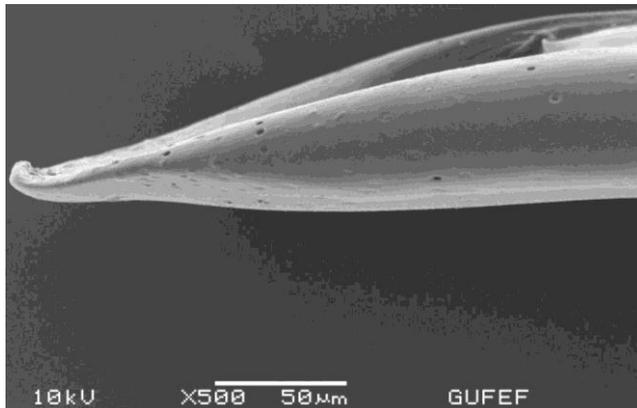


Figure 8. Aedeagus, lateral view of terminal part of median lobe.

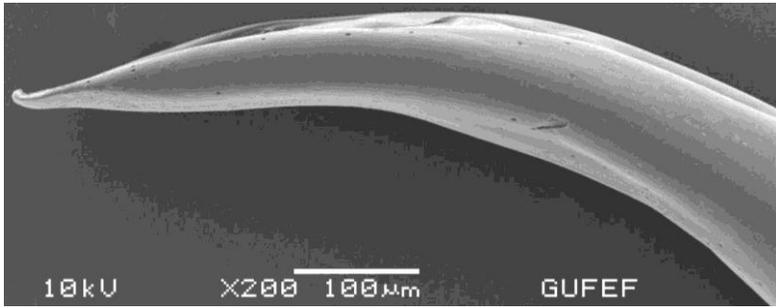


Figure 9. Aedeagus, lateral view of anterior half of median lobe.

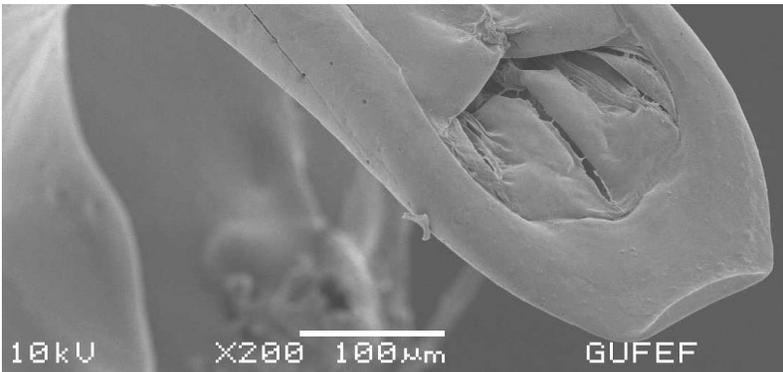


Figure 10. Aedeagus, dorsal view of terminal part of median lobe.

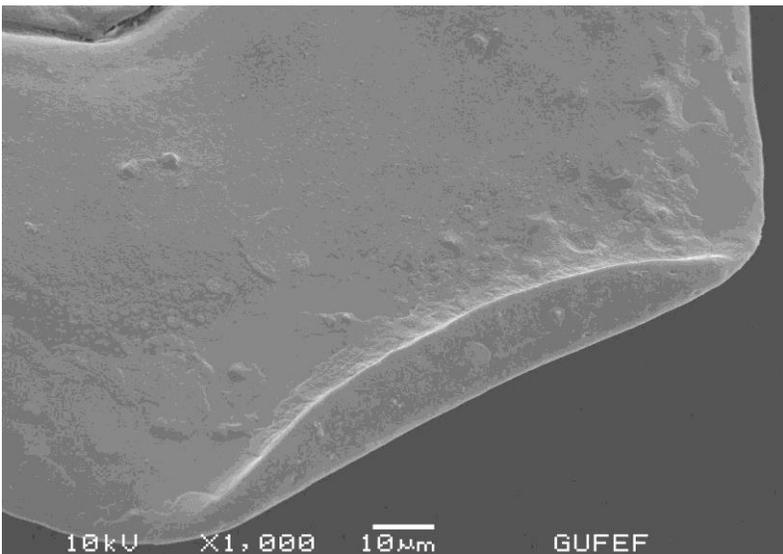


Figure 11. Aedeagus, dorsal view of flexure at apex of median lobe.

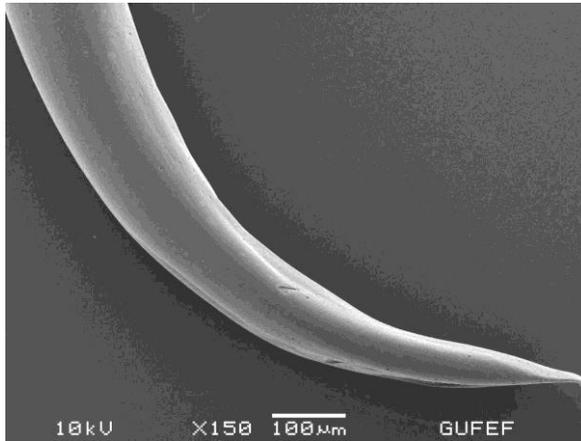


Figure 12. Aedeagus, lateral view of anterior half of median lobe.

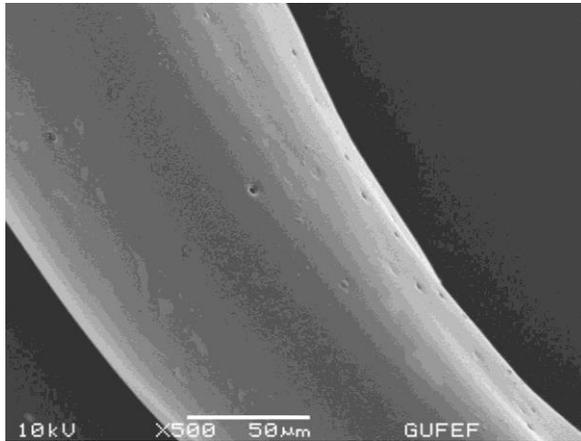


Figure 13. Aedeagus, the pits in ventro-lateral view of median lobe.

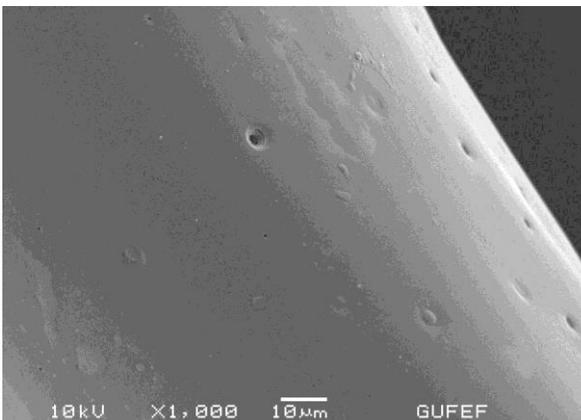


Figure 14. Aedeagus, the pits in ventro-lateral view of median lobe.

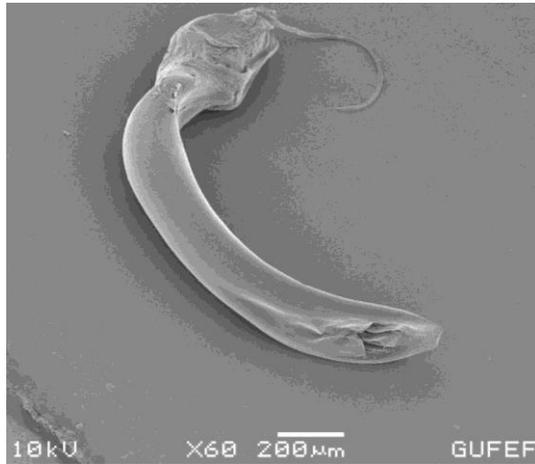


Figure 15. Aedeagus, dorso-lateral view.

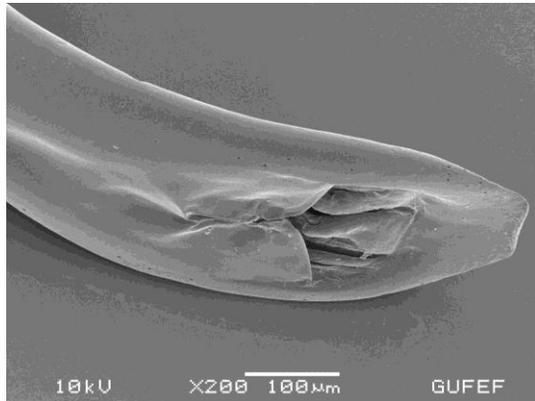


Figure 16. Aedeagus, dorsal view of terminal part of median lobe.

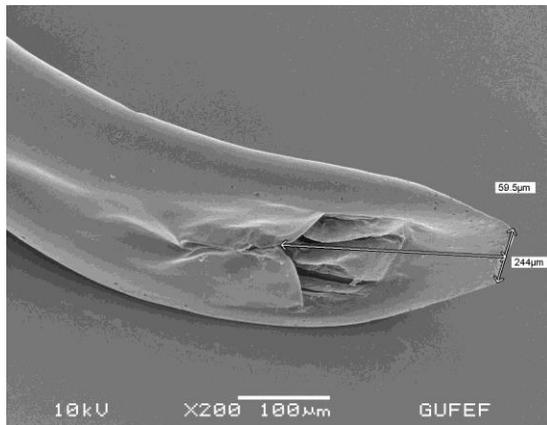


Figure 17. Aedeagus, dorsal view of terminal part of median lobe.

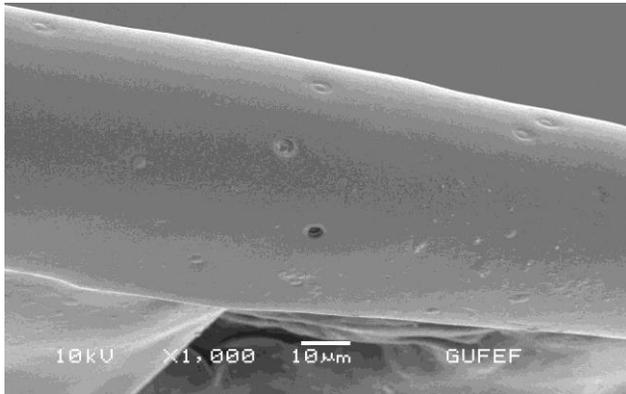


Figure 18. Aedeagus, the pits on lateral part of terminal part of median lobe in dorsal view.

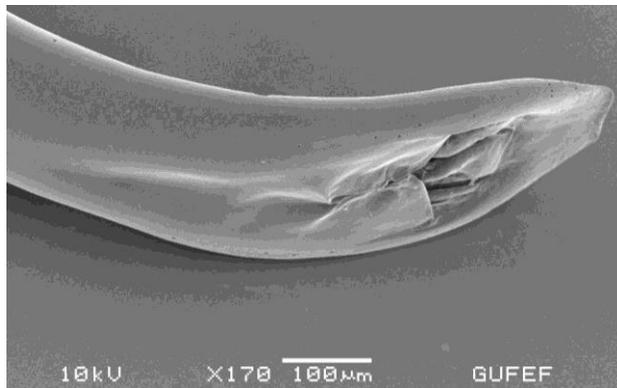


Figure 19. Aedeagus, dorso-lateral view of anterior half of median lobe.

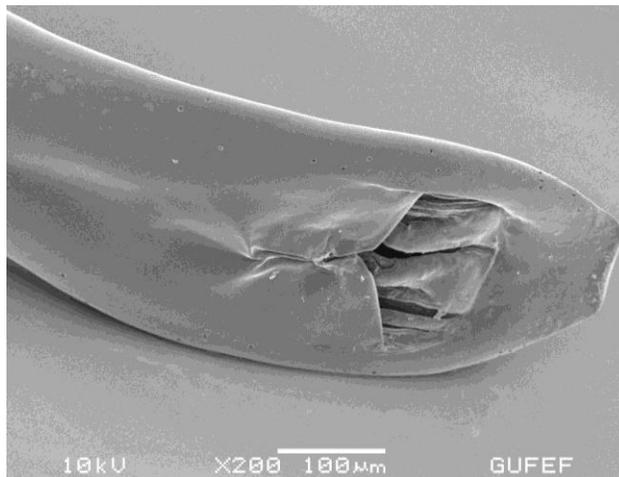


Figure 20. Aedeagus, dorsal view of terminal part of median lobe.

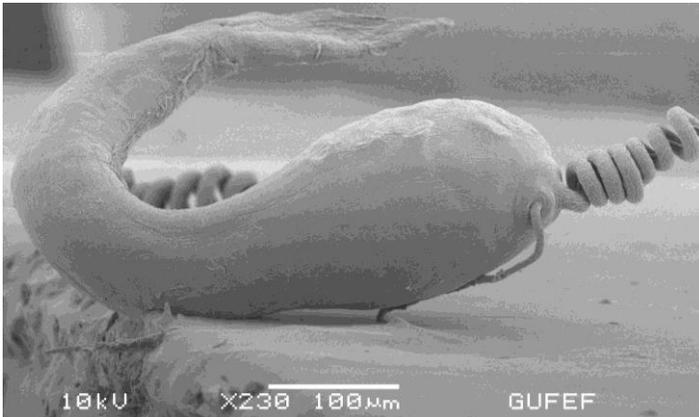


Figure 21. Spermatheca, dorso-lateral view.

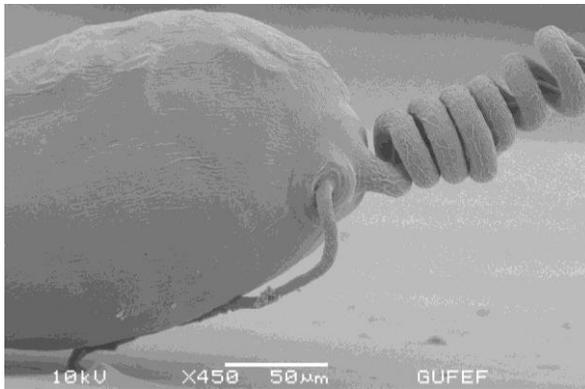


Figure 22. Spermatheca, nodulus, reduced collum + ramus, spermathecal gland, ductus spermatheca.

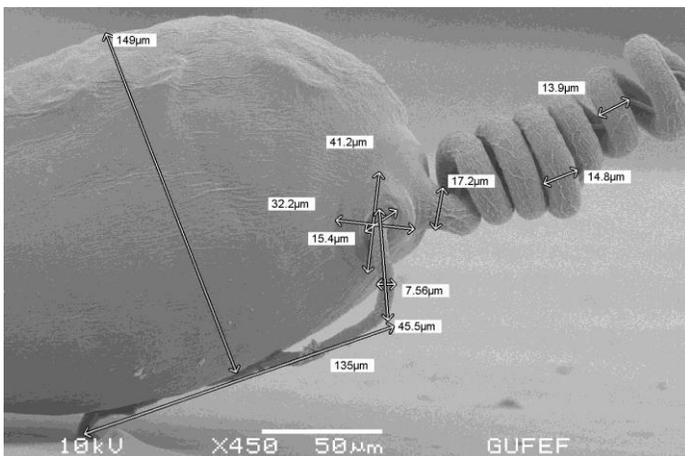


Figure 23. Spermatheca, nodulus, reduced collum + ramus, spermathecal gland, ductus spermatheca.

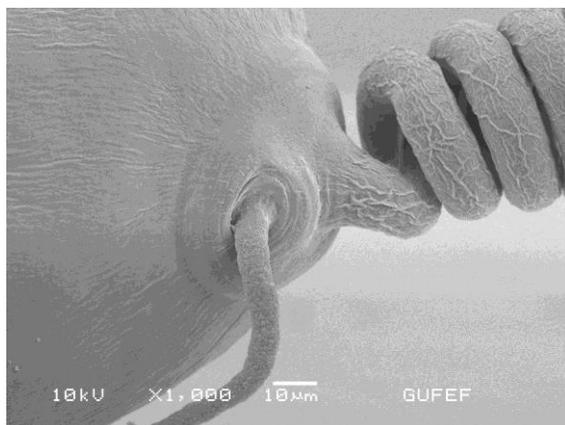


Figure 24. Spermatheca, nodulus, reduced collum + ramus, spermathecal gland, ductus spermatheca.

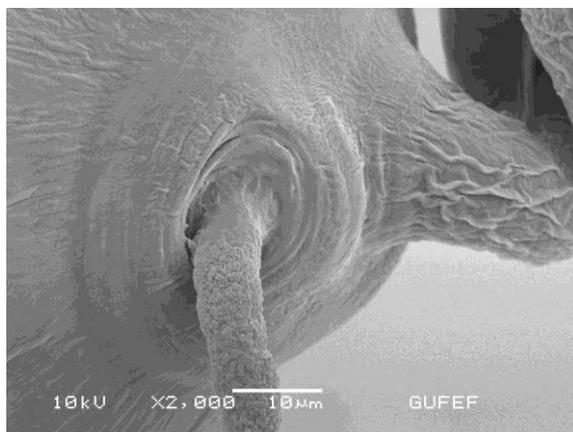


Figure 25. Spermatheca, reduced collum + ramus, spermathecal gland, ductus spermatheca.

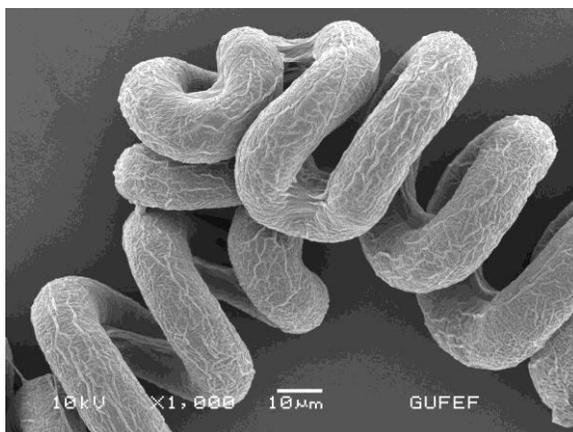


Figure 26. Spermatheca, ductus spermatheca.

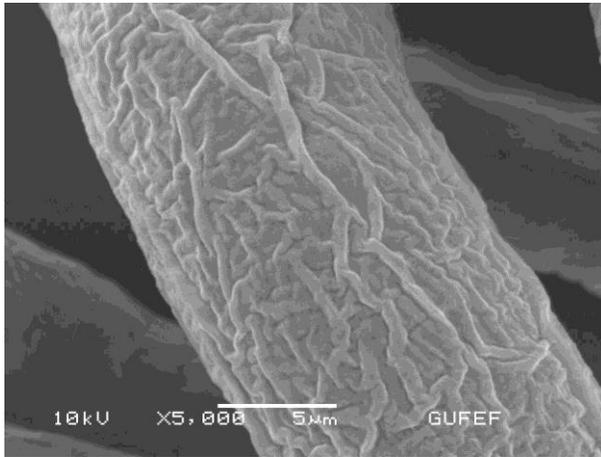


Figure 27. Spermatheca, ductus spermatheca.

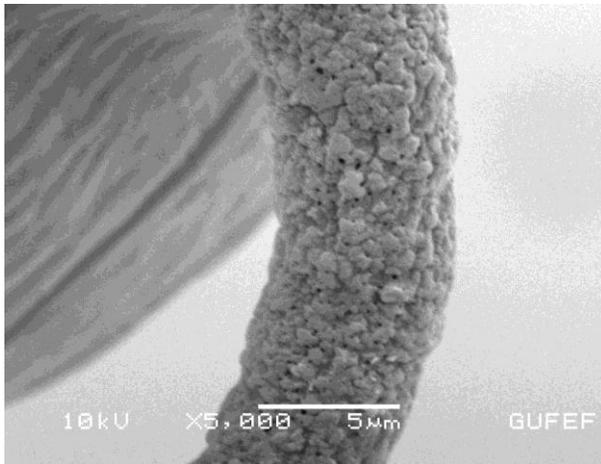


Figure 28. Spermatheca, pits on spermathecal gland.

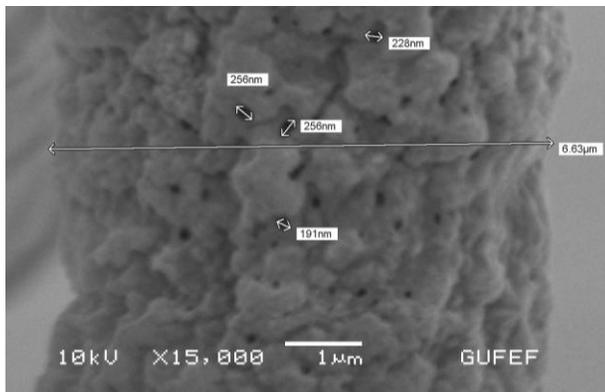


Figure 29. Spermatheca, pits on spermathecal gland.

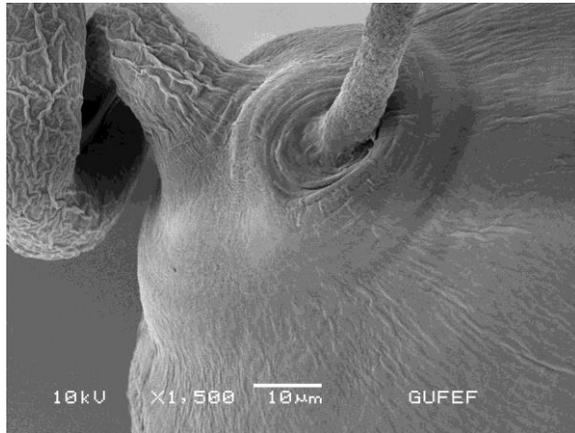


Figure 30. Spermatheca, reduced collum + ramus, spermathecal gland, ductus spermatheca.

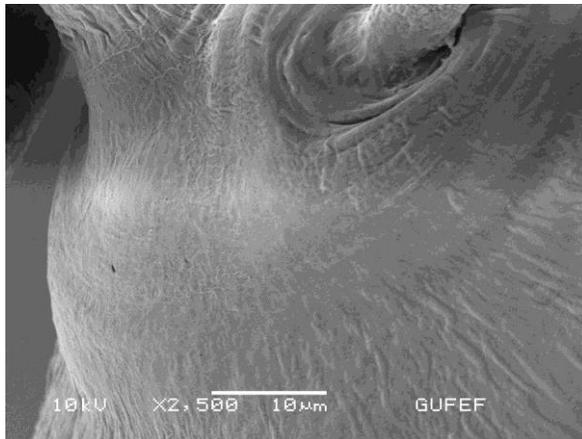


Figure 31. Spermatheca, pits on reduced collum + ramus.

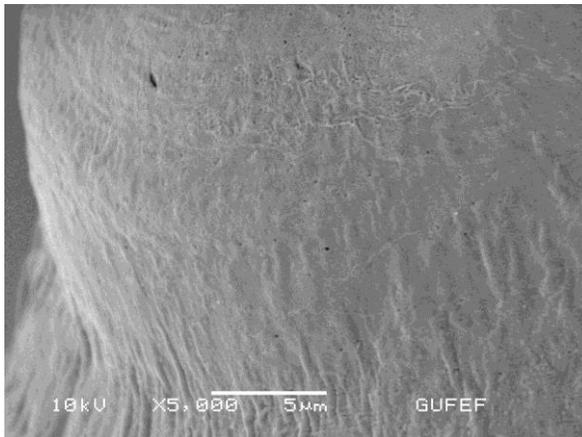


Figure 32. Spermatheca, pits on reduced collum.

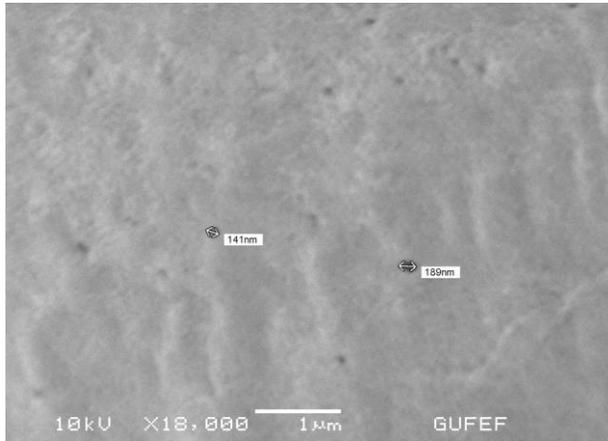


Figure 33. Spermatheca, pits on reduced collum.

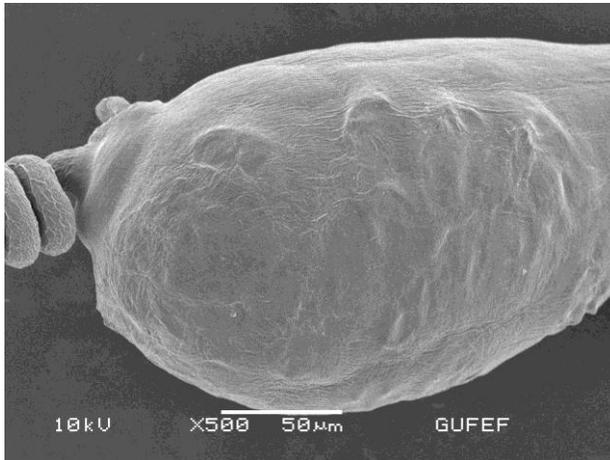


Figure 34. Spermatheca, nodulus.

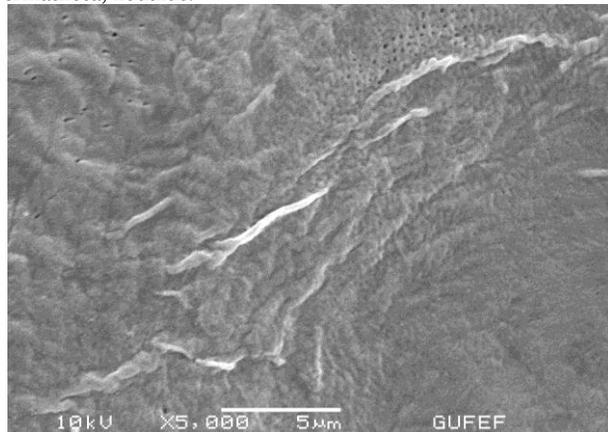


Figure 35. Spermatheca, pits on nodulus.

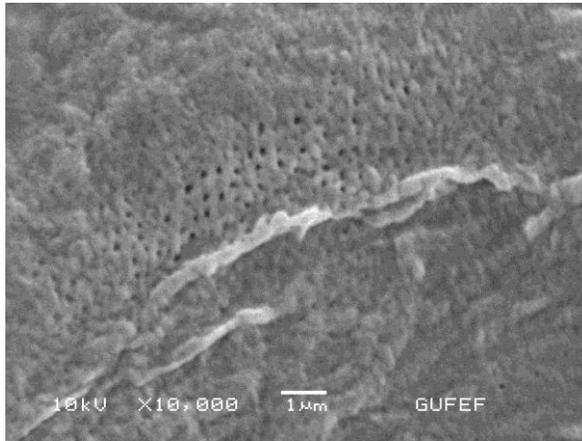


Figure 36. Spermatheca, pits on nodulus.

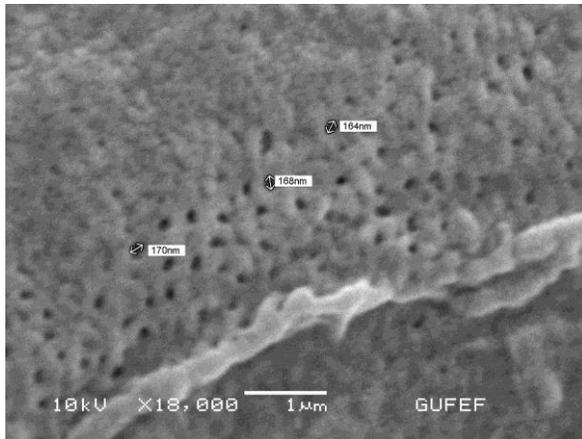


Figure 37. Spermatheca, pits on nodulus.

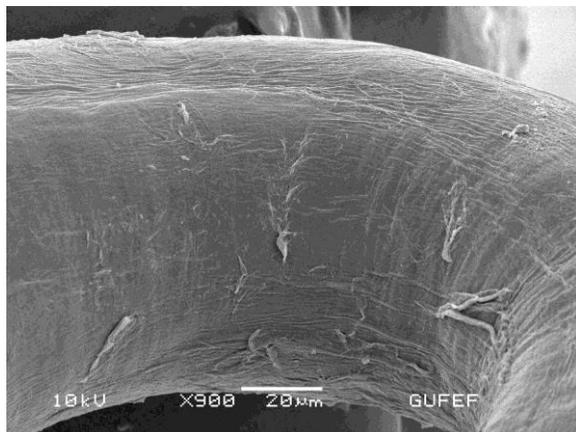


Figure 38. Spermatheca, cornu.

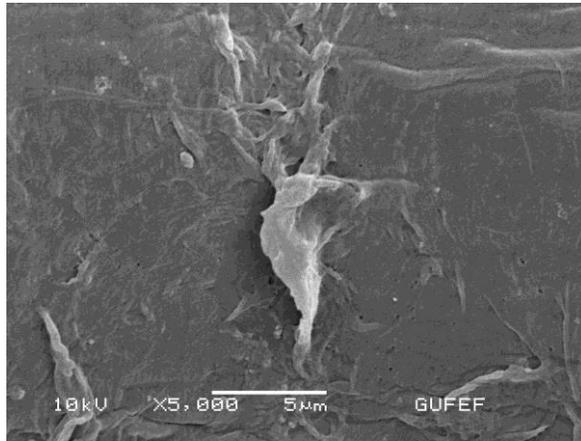


Figure 39. Spermatheca, pits on cornu.

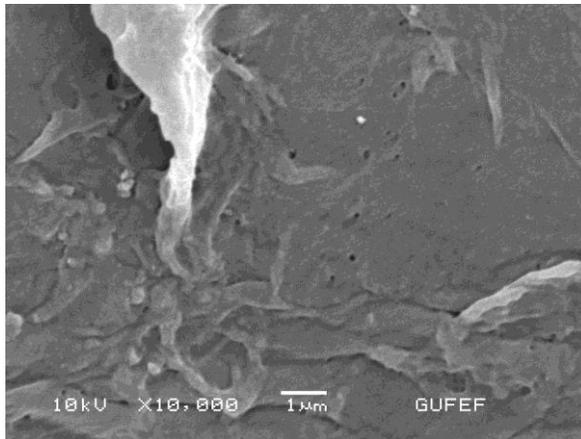


Figure 40. Spermatheca, pits on cornu.

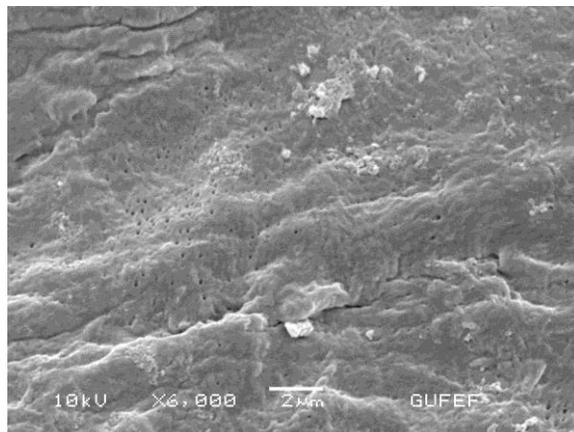


Figure 41. Spermatheca, pits on apical part of cornu.