Structure and distribution of antennal sensilla in the centipede Cryptops hortensis (Donovan, 1810) (Chilopoda, Scolopendromorpha)

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Abstract

Scanning electron microscopical investigation of the antennae of adult Cryptops hortensis (Donovan, 1810) shows the presence of 6 types of cuticular sensilla: 1. sensilla trichodea, 2. sensilla microtrichodea, 3. sensilla brachyconica, 4. sensilla basiconica, 5. club-shaped sensilla, and 6. hat-like sensilla. They are located on all antennal articles. The number of the different types of sensilla differs: More than 4000 sensilla trichodea per antenna, more than 100 sensilla microtrichodea at the base of different antennal articles, 50 to 100 sensilla basiconica at the distal edges of the antennal articles 6 to 16, and additionally, a few club-shaped and hat-like sensilla at the same articles are recorded. The hat-like sensilla of centipedes are new and not been reported before. The structure and distribution of the six types of antennal sensilla of C. hortensis are compared with the antennal sensilla of other centipedes. Possible functions of the sensilla in C. hortensis are discussed.

Keywords: antenna, cuticular sensilla, scanning electron microscopy, centipedes

1. Introduction

Cryptops hortensis, an epimorphic European centipede, lives mainly in warm and dry deciduous forests and compost heaps. This 20 to 30 mm long animal with 21 pairs of trunk legs is a synantropic representative of the Chilopoda. C. hortensis is an eyeless centipede that bears at the head a pair of antennae with 17 antennal articles.

Numerous studies on antennal sensilla in Chilopoda are carried out in Geophilus flavus (De Geer, 1778) [= Necrophloeophagus longicornis (Leach, 1815)] (Ernst 1976, 1979, 1981, 1983, 1996, 1997, 1999 2000), Lithobius forficatus (Linnaeus, 1758) (Keil 1975, 1976), and Craterostigmus tasmanianus (Pocock, 1902) (Ernst et al. 2006). No comparative investigation has been done in representatives of the Scutigeromorpha and Scolopendromorpha. Here we want to show the different types of the cuticular sensilla and their distribution on the antennae of C. hortensis studied by scanning electron microscopy.
2. Materials and methods

Specimens of Cryptops hortensis (Donovan, 1810) were collected in compost heaps near Cologne. Heads of 8 adult specimens were preserved in 70 % ethanol. After critical-point drying, they were mounted on Leitz-Taps (Plano), sputter-coated with a 25 nm gold film (BAL-TEC 005), and examined by scanning electron microscopy (SEM, LEO 1450 VP) in the Institute of Pathology, Friedrich Schiller-University, Jena. Dorsal side of the antennae in one specimen and the ventral side in the other were observed.

3. Results

Antennal structure

The antennae of adult specimen of C. hortensis consist of 15 to 17 articles or segments that are connected by thin and movable cuticular ‘membranes’ (Fig. 2). The antennal length varies between 1520 and 1910 mm (n = 8). The length of the antennal articles decreases from 141 to 178 µm in the 1st article to 94 to 104 µm in the 16th article. The length of the terminal article ranges from 162 to 174 µm (Fig. 3). Often, this article bears an area with a plain depression on its dorsal part. In this area, sensilla has never been observed as it is the case in Geophilus flavus (Ernst 1976, 2000). It is obvious that on the first antennal article only two types of sensilla exist (sensilla trichodea and sensilla microtrichodea), whereas on the terminal article three types of sensilla are observable (sensilla trichodea, sensilla basiconica, sensilla brachyconica).

Specimens with a reduced number of antennal articles (14 to 16) were also observed. Interestingly, a specimen with only 15 antennal articles on the right antenna and a single unsegmented antennal stump of 444 µm on the opposite side was observed (Fig. 4). It is unclear, if this anomaly was the result of a developmental failure or of an earlier lesion. Following types of antennal cuticular sensilla are distinguishable by SEM-techniques in C. hortensis (Fig. 1 a–g):

![Schematic drawings of the different types of the antennal sensilla of Cryptops hortensis.](image)

Fig. 1  Schematic drawings of the different types of the antennal sensilla of Cryptops hortensis. **a**: Sensillum trichodeum; **b**: Sensillum microtrichodeum; **c**: Terminal sensillum brachyconicum; **d**: Upper edge sensillum brachyconicum; **e**: Sensillum basiconicum; **f**: Club-shaped sensillum; **g**: Hat-like sensillum.
**Sensillum trichodeum (Fig. 1a)**

Sensilla trichodea are the most common type of sensilla. Their number increases from the basal antennal segment (approx. 60) up to the terminal segment (approx. 500). In one investigated antenna, the dorsal side of the antenna bears 2094 sensilla, whereas the ventral side bears 2005 – which accounts for more than 4000 sensilla trichodea per antenna. The distribution of sensilla trichodea on the different antennal articles is shown in Tab. 1.

Tab. 1 Distribution of sensilla trichodea on different antennal articles in two different specimens.

| article/side | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | 12. | 13. | 14. | 15. | 16. | 17. |
|-------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|    |
| dorsal side | 38 | 44 | 47 | 80 | 107| 106| 119| 128| 148| 152| 148| 148| 121| 133| 155| 154| 267|
| ventral side| 24 | 47 | 54 | 79 | 113| 124| 127| 137| 132| 126| 140| 133| 139| 130| 132| 137| 291|
| dorsal side |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  Σ 2094 sensilla trichodea |
| ventral side|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  Σ 2005 sensilla trichodea |

Two types of sensilla trichodea are distinguishable: Longish and hair-like sensilla (type 1) and short and compact sensilla (type 2):

**Type 1-sensilla** are frequently distributed on the lateral side of the antennal articles (Fig. 5). Their long shaft tapers to the end and bears a terminal pore (Ø approx. 600 nm). The surface of the shaft is keenly ripped. The antennal cuticle forms a collar-like cavity, in which the movable hair shaft is inserted (Fig. 6). In case of rupture, the shaft is pervaded by a small canal in which the dendritic outer segment draws up to the terminal pore.

**Type 2-sensilla** are short and compact. The tip of these sensilla is slightly curved. The shaft is more ripped than in type 1 and the diameter of the terminal pore is larger (Fig. 7). Type 2-sensilla are less common, they are distributed in the central area of the antennal articles (dimensions see Tab. 2).

Tab. 2 Dimensions of type 1- and type 2- sensilla trichodea.

<table>
<thead>
<tr>
<th>Sensilla trichodea</th>
<th>length (µm)</th>
<th>Ø base (µm)</th>
<th>Ø terminal pore (nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>type 1</td>
<td>17.4–87.9</td>
<td>1.3–3.8</td>
<td>275–1055</td>
</tr>
<tr>
<td>type 2</td>
<td>5.8–16.3</td>
<td>1.4–2.3</td>
<td>586–741</td>
</tr>
</tbody>
</table>

**Sensillum microtrichodeum (Fig. 1b)**

The short sensilla microtrichodea are arranged in three rows of 3 to 6 sensilla at the base of the basal antennal article (Figs 8, 9): an inner dorsal, a median dorsal, and an outer ventral row. Additionally, they are distributed on the antennal articles 2, 3, 5, 7, 9, 10, 12, 13, and on the unsegmented antennal stump (see above). Probably due to the fixation, some antennal articles are telescope-like retracted. Therefore, an exact counting of the sensilla was not always possible. However, approx. 100 sensilla microtrichodea per antenna were calculated.
Sensilla microtrichodea are miniaturised sensilla trichodea. They show a slender, hair-like form with slightly curved tips. Their base is inserted in a half moon-like cavity that restricts the movement of the sensillum in caudal direction. The sensillum will be deflected and thus activated when the antennal article is retracted. The surface of the shaft shows a slight striation. The sensilla are 6.45 to 11.7 µm in length, the basal diameter ranges from 1.3 to 1.7 µm, the diameter of the tip ranges from 4.47 to 6.31 nm. The diameter of the terminal pore is about 540 nm (Fig. 10).

Figs 2–7 Antennal sensilla of Cryptops hortensis (SEM). 2: Left antenna with 15 articles (dorsal view); 3: Terminal article of the left antennae equipped with numerous sensilla; 4: Left antennal stump (dorsal view); 5: Sensillum trichodeum of type 1, located at the lateral side of the fourth antennal article; 6: Sensillum trichodeum of type 1, moveable hair shaft inserted in a collar-like cavity; 7: Short sensillum trichodeum of type 2 with a terminal pore (arrow).
Antennal sensilla in *Cryptops hortensis* 8: Two laterally situated sensilla microtrichodea, inserted in a half moon-like cavity; 9: Two sensilla microtrichodea and a third deflected one (arrow) at the edge of an antennal article; 10: Tip of a sensillum microtrichodeum with a terminal pore; 11: Numerous sensilla brachyconica at a terminal antennal article (dorsal view); 12: A single sensillum brachyconicum (arrow) fixed to the cuticle of the terminal antennal article; 13: Sensilla brachyconica with terminal pores (arrow); 14: Single sensillum brachyconicum at the upper edge of an antennal article.

Figs 8–14 Antennal sensilla of *Cryptops hortensis* (SEM).
**Sensillum brachyconicum (Fig. 1c, d)**

There are two types of sensilla brachyconica (Keil 1975: Sinneskegel): terminal sensilla on the tip of the terminal article of the antenna (Fig. 1c) and upper-edge sensilla at the apical edge of the antennal articles (Fig. 1d).

**Terminal sensilla:** 8 to 11 terminal sensilla are situated at the end of the terminal antennal article (Fig. 11). In the case of the specimens with 14 antennal articles, the terminal article shows only 5 to 6 sensilla. The length of this type of sensillum vary from 7.5 to 13 µm, its shape is slender to slightly curved and tapers to the end (Fig. 12). Short below the tip, the diameter of the shaft is 342 to 488 nm, its basal diameter is 1.6 to 2.1 µm. A rounded terminal pore is developed (Fig. 13). The sensillum is fixed to the cuticle that considerably restricts the movement of the sensillum. The surface of the shaft is smooth to velvety. Sometimes its basal part is striated.

**Upper edge sensilla:** Single (Fig. 14) or paired sensilla of this type are situated at the apical edge of the antennal articles 2 to 16. Often they are in neighbourhood to the sensilla basiconica. These sensilla are centrally situated on the dorsal side of the antennal articles and marginally situated on the ventral side. 7 to 15 sensilla per antenna could be counted (dorsal 5 to 12, ventral 3 to 5). The upper edge sensilla brachyconica are small, and taper successively till the end. The length of their shaft is 4.4 to 6.8 µm. The diameter is 290 to 390 nm just below the tip, whereas the diameter of the base is between 1.6 to 2.1 µm. The surface of the shaft is smooth and velvety. The existence of a terminal pore is questionable. The sensillum is inserted in a wide and shallow cavity that allows movements of the shaft.

**Sensillum basiconicum (Fig. 1e)**

61 to 114 sensilla basiconica (dorsal 37 to 73, ventral 24 to 41) are distributed at the anterior edges of the antennal articles 6 to 15 (Fig. 15). In two groups, 3 to 5 sensilla are situated at the upper third of the terminal antennal article (Fig. 11). The unsegmented antennal stump (see above) shows 61 dorsally arranged sensilla basiconica at the margins of the median and upper third of the stump. It appears that a reduction of antennal articles results in a reduced number of sensilla basiconica. The conical sensilla basiconica are rounded at the tip. Their length is between 7.1 to 8.7 µm. Their maximal diameter is about 2.1 to 3.1 µm, and the basal diameter is 1.8 to 2.3 µm. The surface of the shaft shows numerous circular cuticular depressions (pores?) and a pore-free socket (Fig. 16). The presence of a terminal pore is likely (Fig. 17).

**Club-shaped sensillum (Fig. 1f)**

The club-shaped sensilla are rarely distributed on the antennal articles 6 to 11 and 15 to 16. Their total number is small and ranges between 2 to 4 per antenna. On their dorsal side, the sensilla are mainly distributed in the middle region of their upper edge of the antennal articles (Fig. 18), whereas ventrally they are very rare. On the unsegmented antennal stump (see above) they are distributed at the lateral margins (Fig. 19). Each sensillum has the appearance of a club, medially bulged and with an elongated tip. Its length is 7.9 to 11.3 µm. In the median region its diameter ranges from 1.8 to 2.7 µm and the tapered end ranges from 298 to 573 nm. Possibly a terminal pore exists (Fig. 18). The surface of the shaft is smooth to velvety. The base of the sensillum is inserted in a plain cavity.
Figs 15–21 Antennal sensilla of *Cryptops hortensis* (SEM). 15: Sensilla basiconica at the anterior edge of an antennal article; 16: Two sensilla basiconica; 17: Dorsal view of a single sensillum basiconicum, possibly equipped with a terminal pore (arrow); 18: Single club-shaped sensillum with terminal pore (arrow), located at the edge of the 6th antennal article; 19: Club-shaped sensillum at the edge of an antennal stump; 20: Hat-like sensillum at the distal border of the 13th antennal article; 21: Hat-like sensillum with a terminal pore (arrow).
Hat-like sensillum (Fig. 1g)

Hat-like sensilla are situated only on the dorsal side of the antennal articles 9 to 16. Their number differs between 2 to 6 per antenna. On the unsegmented antennal stump (see above) 7 sensilla of this type were counted. This type of sensillum appears solely or paired on the inner side of the upper edge of antennal articles. Each sensillum has the appearance of a pointed hat; its length is between 3.7 to 5.7 µm (Fig. 20). The socket of the broadened base is fixed in a complanate cavity. The shaft is smooth to velvety. The tip bears a terminal pore (Fig. 21). The basal diameter is between 1.7 to 2.25 µm; short below the tip, the diameter is 380 to 420 nm.

4. Discussion

The present study focussed on a survey of the distribution and the structure of different types of antennal sensilla in the centipede *C. hortensis*. Since fine structural and electrophysiological data are not available yet, these sensilla are classified according to their shape as sensilla trichodea, sensilla microtrichodea, sensilla basiconica, sensilla brachyconica, and as club-shaped and hat-like sensilla. Data on fine-structural organisation of similarly structured sensilla are only available for *Lithobius forficatus* (Keil 1975, 1976) and *Geophilus flavus* (Ernst 1976, 1979, 1981, 1983, 1996, 1997, 1999, 2000). They allow conclusions to their function as mechano- or chemoreceptors. Correspondences in topography and morphology of the antennal sensilla of *C. hortensis* to the above-mentioned sensilla allow a tentative assumption to their function.

Sensillum trichodeum

The most common sensillum in all hitherto investigated chilopods is the sensillum trichodeum. Their total number per antenna differs in the investigated species from 1100 to 1300 (*G. flavus*), 2000 (*L. forficatus*), 2200 (*C. tasmanianus*), and 4000 (*C. hortensis*). Their density increases distinctly from the basal to the terminal antennal articles. The maximum length of the sensilla trichodea ranges from 88 µm (*C. hortensis*), 150 µm (*L. forficatus*), 120 µm (*G. flavus*) to 390 µm in *C. tasmanianus*. The base of the antennal articles bears always the longest sensilla trichodea.

The antennal sensilla trichodea appear rather similar in all hitherto investigated centipedes. They always bear a terminal pore. The surface of the shaft is longitudinally ripped. The hair shaft is movably fixed at its base; therefore the sensillum can be shifted easily by contact. The two different types of sensilla trichodea (type 1 and type 2) found in *C. hortensis* are also common in other hitherto investigated chilopod species.

According to their fine-structural organisation, the sensilla trichodea bear two types of sensory cells in *G. flavus* (Ernst 1976, 2000) and *L. forficatus* (Keil 1976). Uniciliated sensory cells with longish dendritic outer segments that range up to the terminal pore in both species were investigated. They seem to be responsible for the detection of chemical messages. The dendritic outer segments of the biciliated sensory cells end at the base of the sensillum and possess a tubular body that is involved in the stimulus transformation by mechanical bending of the hair shaft (Thurm 1964, 1965, 1982, Füller & Ernst 1975, 1977). Therefore, a double function as chemo- and mechanoreceptor was assumed. Likewise a similar function as contact-chemoreceptor is attributed to the long sensilla trichodea in *C. hortensis*. Contact-chemoreceptors are also distributed on the four apical cones on the terminal antennal articles.

**Sensillum microtrichodeum**

Similar to the other representatives of the chilopod subtaxa, the short sensilla microtrichodea of *C. hortensis* are arranged in rows of 3–6 sensilla at the base of most of the antennal articles. Due to the telescope-like retraction of the antennal articles, it is difficult to detect the total number of these sensilla not only in *C. hortensis* but also in *Craterostigmus tasmanianus* (Ernst et al. 2006). *G. flavus* shows 80–114 (Ernst 1983, 1997, 2000) and *Lithobius forficatus* 240 sensilla microtrichodea per antenna (Keil 1975). The length of the sensilla ranges from 7–17 µm (*G. flavus*), 5–10 µm (*L. forficatus*) to 6.5–11.7 µm (*C. hortensis*). *C. tasmanianus* bears the shortest sensilla microtrichodea (4.9 µm).

In all hitherto investigated Chilopoda sensilla microtrichodea are hair-like with a slightly curved tip. A terminal pore is only present in *G. flavus*, *C. hortensis*, and *C. tasmanianus*, whereas in *L. forficatus* a terminal pore has not been detected. The surface of the shaft is more or less striated. The shaft is movably fixed.

The fine-structural organisation of this type of sensillum is only known in *L. forficatus* (Keil 1975) and *G. flavus* (Ernst 1983, 2000). The movable hair shaft of *G. flavus* houses two biciliate mechanoreceptive (proprioreceptive) and 5 to 7 uniciliate chemoreceptive sensory cells. In *G. flavus*, the dendritic outer segments of the chemoreceptive sensory cells has contact to the environment by means of a terminal pore; it is assumed that these sensilla function as contact-chemoreceptors. In *L. forficatus*, the sensilla microtrichodea are thought to function only as a position-hair for the antennal articles (Keil 1975: Stellungshaar). Due to the movable shaft with its terminal pore in *C. hortensis* these sensilla are thought to function also as contact-chemoreceptors. A similar function is attributed to the sensilla microtrichodea of *C. tasmanianus* (Ernst et al. 2006).

In Diplopoda, antennal proprioreceptors that are arranged in rows seem to be absent. The moveable sense hair of the trichobothrium of the Symphyla *Scutigerella immaculata* Newport with 16 biciliate sensory cells allow the stimulus perception from eight different directions (Haupt 1970). In Dipteran insects, the sensilla microtrichodea in the bristle field of the neck region function exclusively as proprioreceptors (Thurm 1964, Markl 1965).

**Sensillum basiconicum**

A comparison of sensilla basiconica in different chilopod subtaxa shows differences in number, locations, and length. In *C. tasmanianus* only a single sensillum basiconicum exists on the terminal antennal article (Ernst et al. 2006). In *L. forficatus* (Keil 1975) and *C. hortensis* 50 to 110 sensilla basiconica are distributed on the distal margins of numerous antennal articles. Additionally, in the upper third of the terminal article two lateral groups of sensilla basiconica exist. On the other side, in *G. flavus* 35 to 53 sensilla basiconica are localised in two lateral depressions of the distal half of the terminal article (Ernst 1979, 1999, 2000).
Differences concerning the length of sensilla basiconica exist: Whereas the small sensilla basiconica of *C. hortensis* only reach 7 to 9 µm in length, the terminal sensilla basiconica of *C. tasmanianus* reach a length of about 50 µm. The sensilla basiconica (Fuhrmann 1922: dünnwandige Sinneszapfen) of *L. forficatus* and *G. flavus* have a length of 10 to 20 µm.

Additionally, there are distinct differences concerning the structure of the surface of the shaft. In *G. flavus* the surface bears circular pores, whereas they are slit-shaped in *L. forficatus*. The shaft of *C. hortensis* bears numerous circular, that of *C. tasmanianus* numerous small cuticular depressions. The fine-structural study shows that in *G. flavus* (Ernst 1979) the pores do not extend through the cuticular wall and are not in contact to the lumen of the shaft. It would be of interest, whether the pores extend to the cuticular wall or not in the other species. In general, terminal pores are not proved in all hitherto investigated species. In *G. flavus*, thick and small dendritic outer segments are present, whereas in *L. forficatus* only a single type of dendritic outer segments is developed. It is therefore likely that the geophilid Chilopoda can detect two different odorous substances. This is also assumed for the basiconic sensilla in Diplopoda with its biciliate and uniciliate sensory cells (Nguyen-Jaquemin 1982, 1989, 1996). It is possible that the sensilla basiconica of *C. hortensis* also have an olfactory function.

Basiconic sensilla with olfactory function are developed in the diplopods *Polyxenus lagurus* (Linnaeens, 1758) and *Blaniulus liffer* (Brölemann, 1921) (Nguyen-Jaquemin 1982, 1989) and in different insects (Ernst, K.-D. 1969, Steinbrecht & Müller 1971, Keil & Steinbrecht 1984). In the tick *Amblyomma variegatum* and the Amblypygi *Admetus pumilio* the multiporous sensilla basiconica on the tarsus of the first leg pair have olfactory function (Tichy & Barth 1992). The cuticular pores on the shafts of the sensilla extend through the cuticle.

**Sensillum brachyconicum**

Sensilla brachyconica are cone-shaped antennal sensilla of different length, which are concentrated on the tips of the terminal articles as well as at the upper edges of several antennal articles. That is the case in *L. forficatus* (Keil 1975) as well as in *C. hortensis*. In *G. flavus*, sensilla brachyconica are only concentrated on the tip of each antennal terminal articles (Ernst 1981, 1999, 2000). In *C. tasmanianus*, sensilla brachyconica seem to be absent (Ernst et al. 2006).

A comparison of sensilla brachyconica in different chilopod subtaxa shows differences in number and length. In *G. flavus*, there are only 7 terminal sensilla brachyconica, while in *L. forficatus* 8 terminal and about 72 upper-edge sensilla brachyconica exist. In *C. hortensis* we counted 8-11 terminal and 7–15 upper-edge sensilla brachyconica.

There are also differences in the length of sensilla brachyconica in the different chilopodian species. Sensilla brachyconica in *G. flavus* range between 14–18 µm in length, in *C. hortensis* between 7–13 µm in length (upper-edge sensilla: 4.4–6.8 µm in length), and in *L. forficatus* approx. 10 µm in length (upper-edge sensilla). In contrast, the eight terminal sensilla brachyconica (Keil 1975: Sinneskegel) in *L. forficatus* are 50 µm long.

The structure of the shafts surfaces of sensilla brachyconica is different in chilopod species. In most cases the surface is smooth to velvety, but in *L. forficatus* the surface possibly shows little wall channels, whereas in *C. hortensis* a round terminal pore is present. The mobility of sensilla brachyconica is restricted in *G. flavus* and *L. forficatus*, due to their insertion within the cuticle.
Ultrastructural investigations of sensilla brachyconica are only existent in *G. flavus* and in *L. forficatus*. The sensilla brachyconica in *G. flavus* exhibit a single uniciliate and two biciliate sensory cells, and to this a bimodal function is assumed (Ernst 1981, 2000). In *L. forficatus*, this sensillum shows only 4 to 6 uniciliate cells (Keil 1975). The exposed position on the tips of the terminal article suggests a thermoreceptive function in *L. forficatus*; in *G. flavus* an additional hygroreceptive function is assumed. No-pore (np-sensilla) sensilla in insects were also presumed to have a similar function (Altner et al. 1983, Altner & Loftus 1985).

Similar functions seem to be plausible for the terminal sensilla brachyconica of *C. hortensis*. Due to their terminal pore, an additional chemoreceptive function is assumed. The absence of a multiporous surface makes an olfactory function very unlikely.

**Club-shaped sensillum**

The very rare, simple club-shaped sensilla are situated at the apical edges of a few antennal articles in *C. hortensis* (2 to 4 per antenna). A terminal pore might exist in these sensilla. In contrast, bottle-like sensilla in *C. tasmanianus* (1 to 4 per antenna) are divided into two parts: a long but broad proximal shaft and an inserted distal conical flagellum (Ernst et al. 2006).

The function of the club-shaped sensilla in *C. hortensis* and the bottle-like sensilla in *C. tasmanianus* is unknown. However, due to the presence of a terminal pore, a chemoreceptive function of the club-shaped sensilla seems to be possible.

**Hat-like sensillum**

The hat-like sensilla are a new type of antennal sensilla in Chilopoda. Among the upper-edge sensilla the hat-like sensillum of *C. hortensis* is the smallest one (up to 5.7 µm in length). The surface is smooth; movement (deflection) of the sensillum seems to be possible. A terminal pore points to a chemoreceptive function.

**Conclusions**

The distribution pattern of the antennal sensilla in *C. hortensis* is similar to that of *L. forficatus*. The hat-like sensilla of *C. hortensis* are a new type of antennal sensilla in Chilopoda. Conclusions of phylogenetic relationships of the different chilopodan subtaxa on the basis of distribution and morphology of antennal sensilla are hitherto not possible.

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