

Antennal sensilla of the primary larva of the false firefly beetle *Drilus mauritanicus* Lucas, 1849 (Coleoptera, Elateridae, Agrypninae, Drilini)

Les sensilles antennaires de la larve de Drilus mauritanicus Lucas, 1849
(Coleoptera, Elateridae, Agrypninae, Drilini)

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Abstract. Antenna of the primary larva and associated sensilla of a common malacophagous beetle in Morocco, *Drilus mauritanicus* Lucas, 1849 (Elateridae, Agrypninae, Drilini) are compared to other coleopteran larvae in order to discover whether these structures were influenced by malacophagy. The number of sensilla on the larval antenna of *D. mauritanicus* of the last instar larvae is 26 sensilla: 12 aporous sensilla chaetica C1, 3 uniporous sensilla chaetica C2, 1 long aporous sensillum chaeticum C3; 1 sensillum campaniformium; 1 sensillum styloconicum; 8 sensilla basiconica including 1 very large multiporous sensillum basiconicum B1 and 7 small sensilla basiconica B2-B8. The total number of sensilla is greater than that of most other species. The larval antenna is an important olfactory organ; which enables it to seek out its prey thanks to the large multiporous sensillum basiconicum B1, much more developed in *D. mauritanicus* than in the other coleopteran larvae, and also thanks to certain other sensilla basiconica. It is also a gustatory organ (sensilla chaetica type 2, sensilla basiconica B6) which is used during the bite of the prey and perhaps also during ingurgitation of the partly liquified flesh of the snail. The long terminal sensillum chaeticum C3 can be considered as a sensillum filiformium sensitive to air currents; it is replaced in other coleopteran larvae by 1 or several shorter gustatory sensilla.

Keywords: malacophagous, old primary larva, sensilla, olfaction, contact chemoreception, vibroreception.

Résumé. L'antenne de la larve primaire et les sensilles associées d'un coléoptère malacophage commun au Maroc, *Drilus mauritanicus* Lucas 1849 (Elateridae, Agrypninae, Drilini) ont été comparées aux autres larves de coléoptères afin de connaître si ces structures étaient influencées par la malacophagie. Le nombre de sensilles sur l'antenne larvaire de *D. mauritanicus* au dernier stade larvaire est 26 sensilles: 12 sensilles chétiformes sans pore C1, 3 sensilles chétiformes unipores C2, 1 longue sensille chétiforme sans pore C3; 1 sensille campaniforme; 1 sensille styloconique; 8 sensilles basiconiques dont 1 très grande sensille basiconique multipore B1 et 7 petites sensilles basiconiques B2-B8. Ce nombre total de sensilles est plus grand que celui de la plupart des autres espèces. L'antenne est un important organe olfactif permettant à la larve de rechercher sa proie grâce à la grande sensille basiconique multipore B1, plus développée chez *D. mauritanicus* que chez les autres larves de coléoptères, et aussi grâce à certaines autres sensilles basiconiques. C'est aussi un organe gustatif (sensilles chétiformes de type 2, sensilles basiconiques B6) utilisé au début de la morsure de la proie et peut-être aussi lors de l'ingurgitation des chairs en partie liquéfiées de l'escargot. La longue sensille chétiforme C3 peut être considérée comme une sensille filiforme sensible aux courants d'air; elle est remplacée chez d'autres larves de coléoptères par 1 ou plusieurs courtes sensilles gustatives.

Mots-clés: malacophage, larve primaire âgée, sensilla, olfaction, chimioréception de contact, vibroréception.

INTRODUCTION

The Coleoptera Drilids show one of the most extreme cases of sexual dimorphism in the shape and size in insects. The adult females are neotenic and larviform, completely lacking in wings and other adult characters, while the males are winged. Formerly classified in the Drilidae Blanchard, 1845 family, they are close to Elateridae and Lampyridae and are therefore now classified in the Elateridae family, the subfamily Agrypninae and the tribe Drilini (Kundrata & Bocak 2011). Two species of Drilini are cited in Morocco : *Drilus mauritanicus* Lucas, 1849 and *Malacogaster passerinii* Bassi, 1833; their larvae are specialized predators that hunt, bite and eat land snails (Lucas 1849, Cros 1926, 1930).

D. mauritanicus is a western Mediterranean species, which is present in Spain, Algeria and Morocco (Lucas 1849, Olivier 1910, Escalera 1914, Cros 1926, Kocher 1956, Bahillo de la Puebla *et al.* 2004). Only recently, *Drilus tangerianus* Escalera, 1914 alone was familiar in Morocco (Escalera 1914). Bahillo de la Puebla *et al.* (2004) have only just established the synonymy of this Moroccan species with

Drilus mauritanicus of which the original description is due to Lucas (1849), based on examples from Algeria.

As for the other Moroccan Drilini, *M. passerinii* (Cros 1930), the biological development of *D. mauritanicus* is characterised by hypermetamorphosis (Cros 1926, Fauchaux & Agnas 2008 and pers. obs.) : The first larvae are « primary larvae » very active, with a sclerotised and dark brown integument; they devour several snails, undergo several successive moultings and increase their size. When their growth ends, they remain in their final shell inside which they will continue their transformation before becoming an imago. Their moulting produces « secondary larvae » which do not eat. They differ from primary larvae by the possession of a smaller head, a generally lighter colour of the body and a different form of the terminal abdominal segments; this morphological type lasts only a few days. After subsequent moulting, the secondary larvae produce « tertiary larvae » (prepupa) which are white, soft, glabrous and possess tiny legs. The primary larvae alone are given to roaming in pursuit of prey (Cros 1926) and can be observed outside snail shells (Fig. 1).

The young instars of the primary larvae are elongate and more or less parallel-sided (Fig. 1b); the older instars reveal a progressive widening of the abdominal segments 2-7 (Fig. 1c); the last instar measures about 3 cm (Fig. 1d).

All the larval instars roll into a ball, like hedgehogs when they sense danger and remain absolutely motionless for several minutes (Fig. 1a). Only the primary larva at the end of their growth period will be described in the present note. The larvae are very active in their search for their snail prey and for that reason must have antennae equipped with sensilla enabling them to do so. The antennal morphology of *D. mauritanicus* will be compared to the species studied in the literature which possess other lifestyles and habits.



Figure 1. *Drilus mauritanicus*. Different larval instars (X 2). **a.** young instar rolled up; **b.** older instar with parallel edges; **c.** instars showing an enlargement of the abdominal segments 2-7; **d.** last instar showing its ventral face.

MATERIAL AND METHODS

The primary larvae of *D. mauritanicus* were captured by Mbarek Agnas at Oualidia (Atlantic coast of Morocco) on the garden walls of neighbouring houses in the douars, in april-may 2012. For SEM study, the heads of the last instar larvae were cleaned in acetone, dehydrated in pure alcohol and mounted both on the dorsal and the ventral face, on specimen holders.

After coating with gold and palladium, preparations were examined in a Jeol J.S.M. 6 400F SEM at 10 kV. Sensillum terminology follows Zacharuk (1980), Altner & Prillinger 1980), and Faucheux (1999).

RESULTS

General morphology

The antennae are of the same type in all the larvae of Coleoptera; they are formed of 3 or 4 segments (Jeannel 1949). The larval 3-segmented antenna of *D. mauritanicus* is inserted in an extensive and eversible membranous antacorium which connects it to the head capsule. It comprises a basal subcylindrical segment (antennomere I), a segment equipped with a lobe ("article lobigère" of Jeannel 1949) (antennomere II), and an apical segment (antennomere III) which is both tiny and elongated, internally situated on the apex of antennomere II and bearing a long seta (Figs. 2, 4 a-d). The dimensions of the antacorium and antennomeres AI-III in the last instar of the primary larva, as regards the length and basal diameter respectively, are the following: antacorium: 250 μ m, 140 μ m; AI: 280 μ m, 110 μ m; AII: 260 μ m, 90 μ m; AIII: 60 μ m, 35 μ m.

Antacorium reveals a characteristic design which it alone possesses; it reminds one of the facets of a compound eye in an adult insect and gives a granulous appearance to the segment (Fig. 4e). Antennomere I is smooth and has some scale-like structures towards the distal part of segment. The distal half part of antennomere II is covered with scales. The terminal antennomere is generally smooth but folded near the sensilla.

Antacorium has no sensilla. The following antennomeres possess sensilla situated in characteristic sites (Figs. 2, 3).

Sensilla of antennomere I

A sensillum chaeticum type 1 (C1), 160 μ m long, is present on the distal part of the 1st antennomere, on the ventral face (Fig. 2b). The dorsal face bears 3 distal sensilla chaetica C1, 140 μ m long (Figs. 2a, 4c). Sensilla C1 are very long and possess 6-10 longitudinal ridges (Figs. 5b, c), that are thorny and with a truncate tip. The thorns are few in number and evenly spaced (Fig. 5g). In fact the ridges, which culminate in sharp points evenly spaced over the full length of the hair, form the thorns. The diameter of the sensillum varies little between the base and the apex: 6.1 μ m at the base, 4.1-3.0 μ m towards the apex. The tips of the sensilla are variable: the ridges form either finger-like extensions (Fig. 5b), or else culminate before the end of the hair which presents a blunt aspect (Fig. 5c).

A *sensillum campaniformium* is located on the external margin in the basal part of the segment (Fig. 5h, i); it has the shape of a central oval cap perforated by an ecdysial pore, surrounded by a cuticular fold.

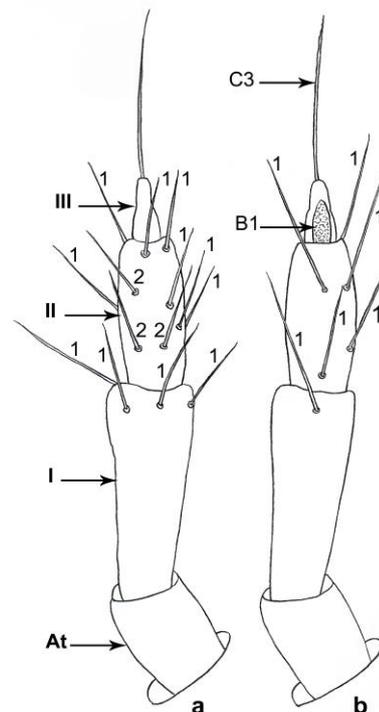


Figure 2. Diagrammatic representation of type, number and distribution of antennal sensilla chaetica of *Drilus* larvae; **a.** dorsal face; **b.** ventral face; I, II, III, antennomeres; 1, 2, sensilla chaetica of type 1 or 2; C3, sensillum chaeticum of type 3; B1, large multiporous sensillum basiconicum.

Sensilla of antennomere II

Sensilla chaetica are scattered on the 2nd antennomere: 4 ventral including 2 proximal of 90 μm and 2 distal of 170 μm ; 7 dorsal measuring 90 μm , 120 μm or 140 μm (Figs. 4c, 5a).

These sensilla can be divided into 8 sensilla of type 1 (C1) identical with sensilla of the 1st antennomere and 3 sensilla of type 2 (C2) (Figs. 2a, b). The sensilla chaetica C2 are of similar length to the C1 sensilla; they are likewise striated and thorny. But unlike the C1 sensilla, the sensilla C2 are slender with a diameter which decreases progressively from 7.2 μm (basal) to 1.5 μm (apical); the tip is perforated by a terminal pore (Figs. 5d, e).

The distal extremity of the antennomere II shows a joint membrane where is articulated the 3rd antennomere in an internal position and which bears in an external position a well developed lobe B1 and two short sensilla ST and B2 (Figs. 4c, 4d, 6a) and in an internal location, a small isolated sensillum B3 (Figs. 3, 6d). The lobe can be considered as a very large multiporous sensillum basiconicum B1 (Figs. 6a, 7b). This sensillum is cylindrical on the proximal half and ends in a point on its distal half; it is attached to the joint membrane by the intermediary of a stand (Fig. 6a). Between individuals, the length varies from 41 to 70 μm , and the basal diameter from 22 to 26 μm . The whole surface is perforated with pores whose density is 13-15 pores/ μm^2 (Fig. 6b). Sensillum B1 is located externally with respect to the 4th antennomere (Fig. 4d).

The two small sensilla (styloconicum ST and basiconicum B2) are situated on the ventral face of the antennomere in front of the large sensillum basiconicum, at the periphery of the segment (Fig. 6a). Sensillum styloconicum ST comprises a stylus (4.0 μm high, 3.5 μm basal diameter, 2.1 μm distal diameter) surmounted by a sensory cone with a shrunk tip (2.1 μm high, 1.4 μm basal diameter 1.8 μm) (Fig. 6e). Sensillum basiconicum B2 is a conical peg (7.5 μm long, 2.2 μm basal diameter) surrounded at the base by a circular dome (6.0 μm external diameter, 2.0 μm high) (Fig. 6c). The presence of terminal pore or wall pores in the two sensilla was not revealed with scanning electron micrographs. The sensillum styloconicum is positioned externally with respect to the sensillum basiconicum B2. Sensillum basiconicum B3 (7.5 μm long, 1.5 μm basal diameter) is a slender, pointed sensillum, isolated on the outer edge at the base of antennomere II (Figs. 3, 6d).

Sensilla of antennomere III

Six morphologically different sensilla are located at several levels of antennomere III, and apart from sensillum chaeticum C3, they are all in a ventral position (Figs. 3, 7b, 8a). Sensilla basiconica B4, B5, B6 and B7 are situated half way up the antennomere, sensillum basiconicum B8 is distal and sensillum chaeticum C3 is apical. Sensillum B4 (17.3-18.0 μm long, 4.0 μm basal diameter), located externally, is a sharp more or less curved sensillum (Figs. 7c, d).

Sensillum B5 (12.5-16.0 μm long, 5.3-7.5 μm basal diameter) is more thick-set than the latter. The wall pores of sensilla B4 and B5 were not observed with the scanning electron microscope. Sensillum B6 (8.0-10.0 μm long, 1.3 μm basal diameter) is a long cylindrical peg (Figs. 7d, e, f) ending in 5 finger-like projections (Fig. 7e). Partly hidden by sensillum B6, sensillum B7, situated internally contrary to the three previous sensilla, is a short cone-shaped sensillum (1.7 μm high, 1.4 basal diameter) inserted in a large cuticular fold (2.3 μm high, 4.8 μm external diameter) (Fig. 7f). Sensillum basiconicum B8 is isolated at the distal end of antennomere III. It has the shape of a thick cone (2.2 μm high, 1.1 μm basal diameter) ending abruptly in a point and surrounded at the base by a waving collar of 3.0 μm in diameter (Figs. 8a, b).

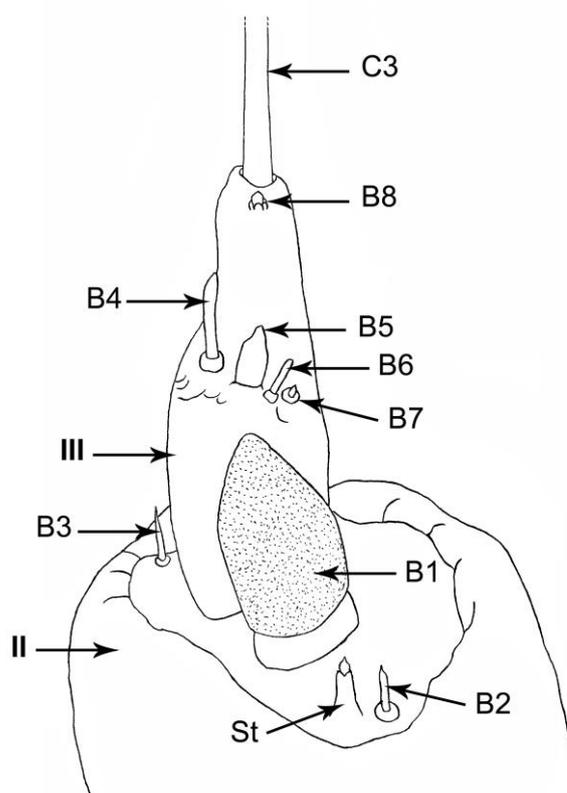


Figure 3. Diagrammatic representation of type, distribution of antennal sensilla of *Drilus* larvae on distal part of segment II and on segment III. B1-B8, sensilla basiconica types 1-8; C3, terminal sensillum chaeticum of type 3; St, sensillum styloconicum.

A very long sensillum chaeticum (C3) (300-320 μm long, 5.0 μm basal diameter) extends the antenna distally. Its wall is smooth and without terminal or wall pores (Fig. 7a). During the preparations for SEM, it is frequently bent back (Figs. 4c, 4d, 5f, 7a).

Observations of young instar larvae have shown that all the sensilla described in the aged larva were already present.

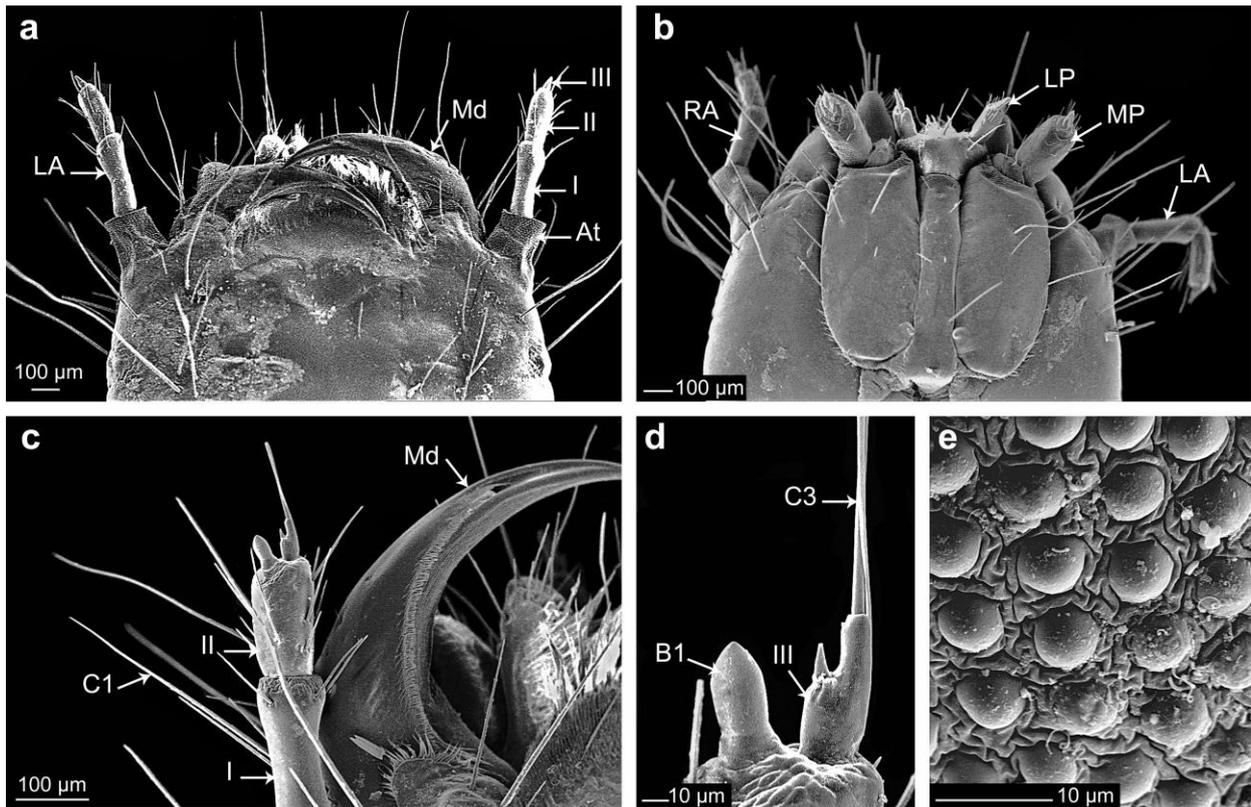


Figure 4. *Drilus mauritanicus*, antennal larva. **a.** dorsal face of head; **b.** ventral face of head; **c.** lateral view of left antenna; **d.** detail showing antennomere III and large sensillum basiconicum B1; **e.** microsculpture of antacorium. C1, sensillum chaeticum type 1; C3, sensillum chaeticum type 3 semi folded; LA, left antenna; LP, labial palp; Md, mandible; MP, maxillary palp; RA, right antenna; I, II, III, antennomères I-III.

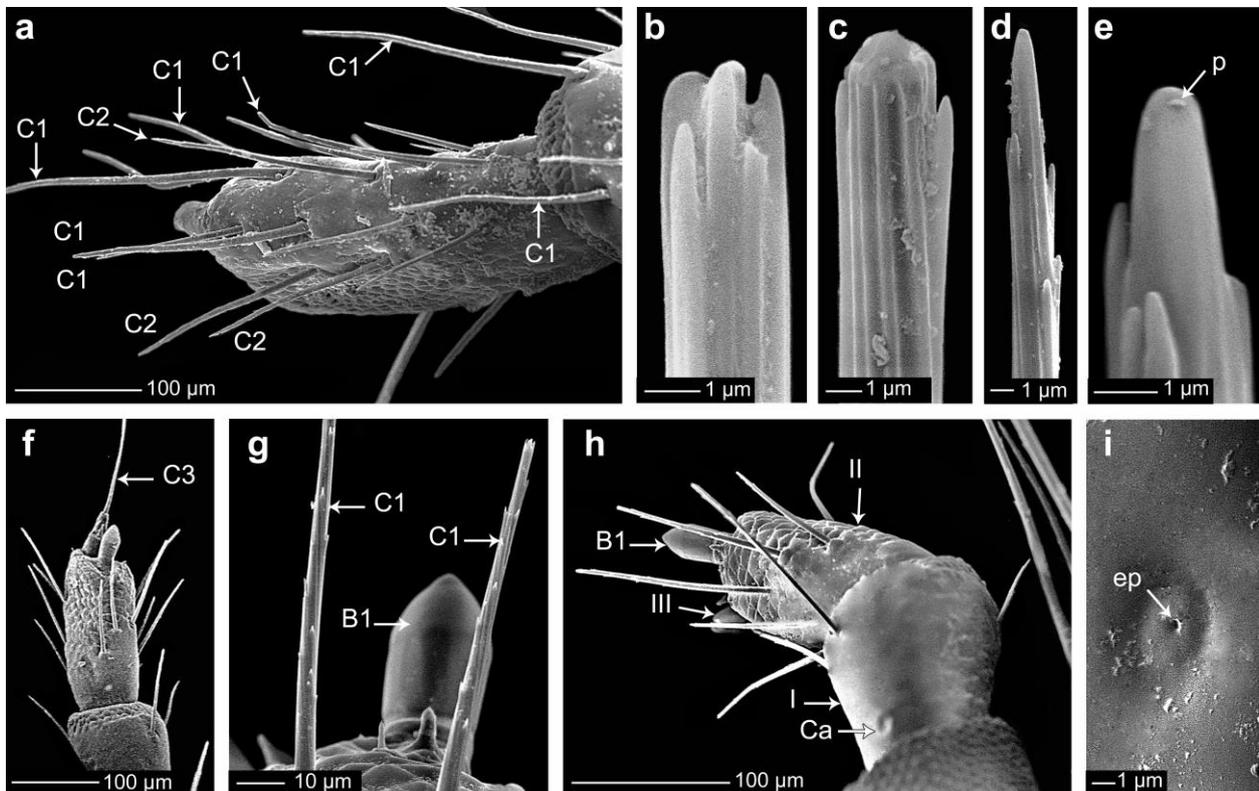


Figure 5. *Drilus mauritanicus*, antennal larva. **a.** location of sensilla chaetica C1 and C2 on the dorsal face of antennomere II; **b.** **c.** tip of sensilla chaetica C1; **d.** **e.** tip of sensilla chaetica C2 with terminal pore p; **f.** long terminal sensillum chaeticum C3; **g.** sensilla chaetica C1 of antennomere II; **h.** ventral face of right antenna showing a sensillum campaniformium Ca on antennomere I; antennomere III, not very visible, is seen from another angle; **i.** detail of sensillum campaniformium with ecdysial pore ep; B1, large sensillum basiconicum of antennomere III.

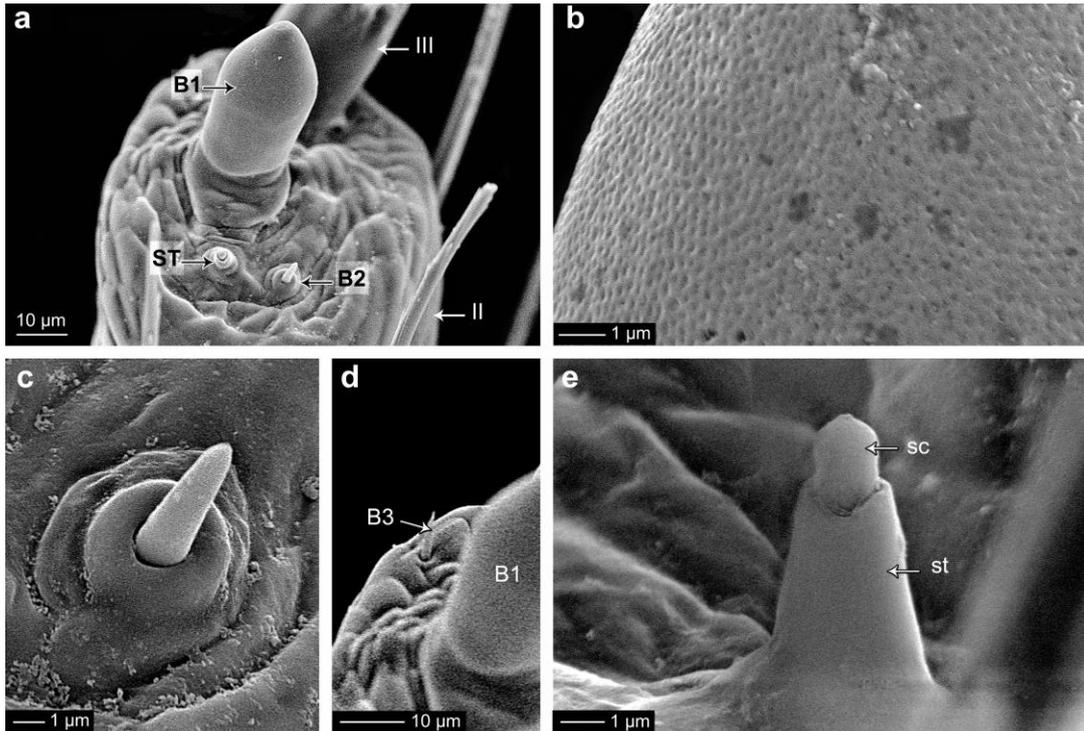


Figure 6. *Drilus mauritanicus*, antennal larva. **a**, distal part of antennomere II showing sensilla basiconica B1, B2, B3 and sensillum styloconicum ST; **b**, pores of sensillum B1; **c**, sensillum basiconicum B2; **d**, sensillum basiconicum B3; **e**, sensory cone sc and stylus st of sensillum styloconicum.

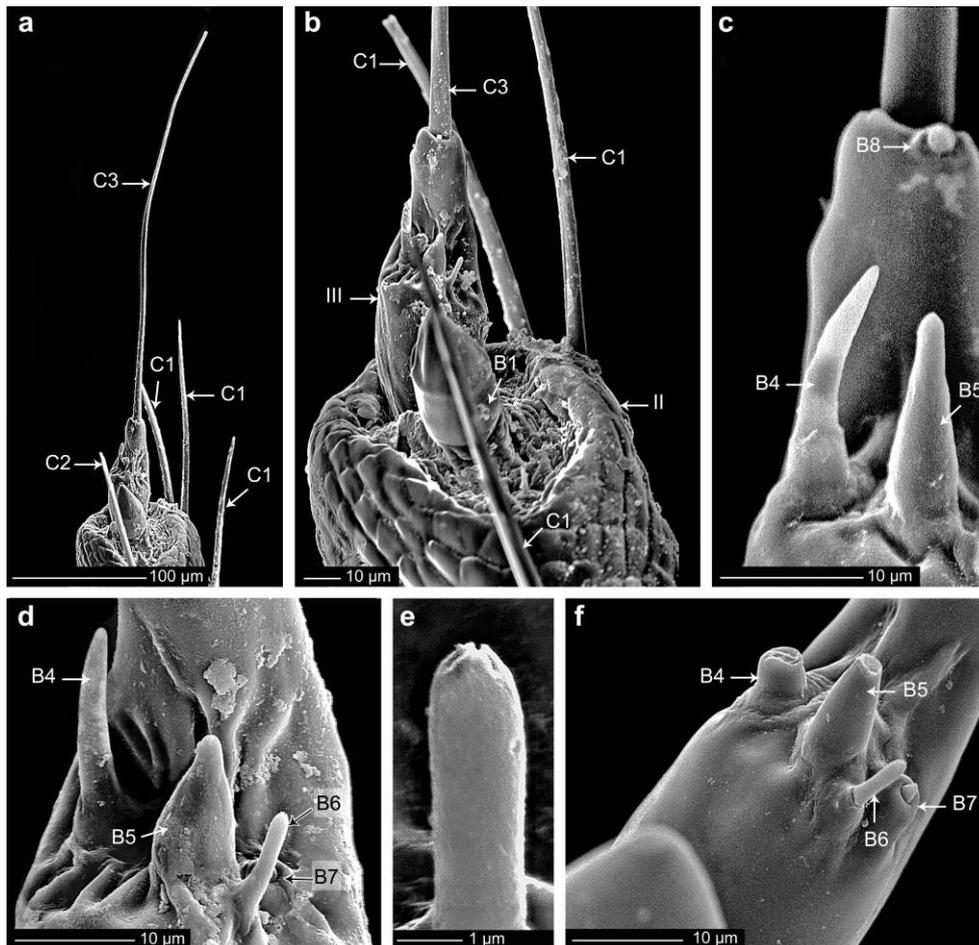


Figure 7. *Drilus mauritanicus*, antennal larva. **a**, ventral view of the distal part of antenna with sensilla chaetica C1, C2 and C3; **b**, detail of antennomere II and antennomere III; **c**, sensilla basiconica B4, B5 and B8 on antennomere III; **d**, sensilla basiconica B4, B5, B6 and B7 on antennomere III; **e**, tip of sensillum B6; **f**, another view of sensilla B4 – B7 with broken B4 and B5.

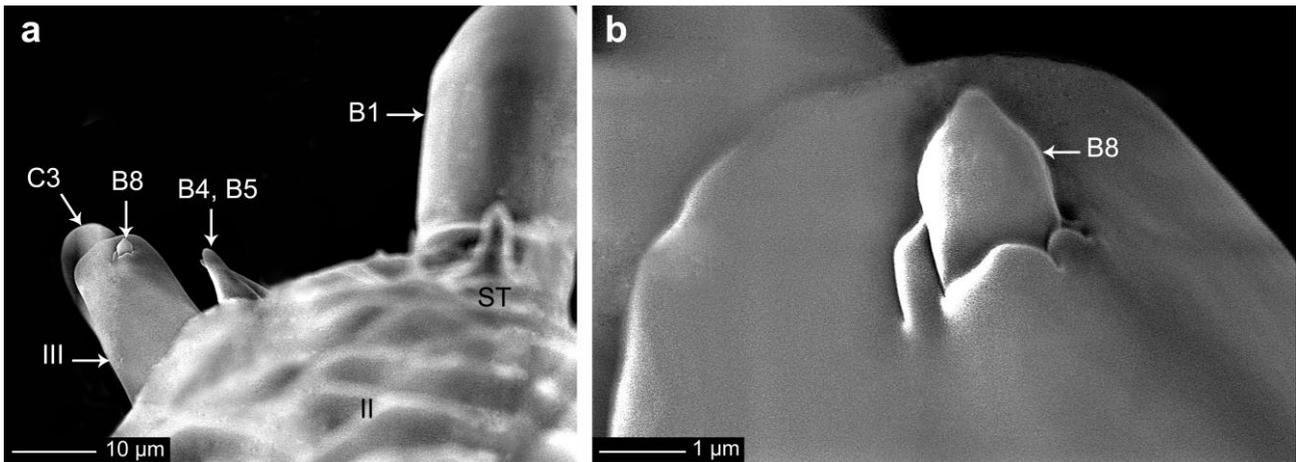


Figure 8. *Drilus mauritanicus*, antennal larva. **a**, another view of antennomeres II and III showing the location of sensillum basiconicum B8, sensillum C3 is folded and only partly visible; **b**, sensillum B8. B1, B4, B5, sensilla basiconica types 1, 4, 5; ST, sensillum styloconicum.

DISCUSSION

Certain authors use the terms of scape, pedicel and flagellum for the segments of the 3-segmented larval antennae (Corbière-Tichané 1973, Ryan & Behan 1973, Behan & Ryan 1978) whereas others call these segments I, II and III (Roppel *et al.* 1972, Bloom *et al.* 1982, Baker & Ellsbury 1989, Chan *et al.* 1988). To designate the three antennomeres of *D. mauritanicus*, we have chosen this second appellation because the first one suggests an analogy between the larval antennomeres and the scape, the pedicel and the flagellum of adult coleopterans, which never been demonstrated.

The functions of sensillum types can be deduced from their structure in scanning and transmission electron microscopy. According to Altner (1977), Altner *et al.* (1983) and Zacharuk (1980, 1985), the aporous sensilla chaetica with a flexible socket are contact mechanoreceptors (tactile sensilla), the aporous sensilla chaetica with an inflexible socket are thermo- and hygromoreceptors, the uniporous sensilla are contact chemoreceptors (gustative sensilla), and the multiporous sensilla are olfactory chemoreceptors.

The number of sensilla on the larval antenna of *D. mauritanicus* is constant in all the individuals and equal to 26 sensilla: 12 sensilla chaetica C1, 3 sensilla chaetica C2, 1 sensillum chaeticum C3; 1 sensillum campaniformium; 1 sensillum styloconicum; 8 sensilla basiconica including 1 very large sensillum basiconicum and 7 small sensilla basiconica. The number of sensilla is smaller in the larvae of *Tribolium spp.* (Behan & Ryan 1978) but it is not only the number but also the types of sensilla which differentiate the species. Thus, *Tribolium spp.* possesses a single hair-shaped sensillum, the “trichoid terminal sensillum”, and 9 sensilla campaniformia as against 16 hair-shaped sensilla chaetica C1, 2, 3 and a single sensillum campaniformium in *D. mauritanicus*. This numerical difference can be explained the different lifestyle in the two larvae. The presence of long sensilla, such as sensilla trichodea or chaetica, would be a handicap for the flour beetles *Tribolium* which are serious pests of stored cereal products whereas sensilla chaetica with a mechanoreceptive or gustative function, can prove to be useful for the predator larvae of *Drilus*.

In their feeding substrate, the flour, the larvae of *Tribolium spp.* undergo pressure from all sides, which justifies the presence of numerous sensilla campaniformia, with a proprioceptive function, spread out over all 3 antennomeres. The wandering larvae of *Drilus* which do not undergo this type of pressure possess only one sensillum campaniformium.

The sensilla chaetica C1 are aporous sensilla with a flexible socket present in large numbers in *D. mauritanicus*. They resemble “sensilles trichoïdes sT” with a mechanoreceptive function localized on antennomeres 1 and 2 of the three-segmented antenna of *Speophyes lucidulus* (Delarouzzée, 1860) (Corbière-Tichané 1973).

The sensilla chaetica C2 with a terminal pore of *D. mauritanicus* are identical to other “sensilles trichoïdes sT” with a gustative function of *S. lucidulus* (Corbière-Tichané 1973) and the terminal “trichoïd sensilla” of *Oryzaephilus surinamensis* (Linnaeus, 1758) (Roppel *et al.* 1972). Their location on the terminals of the larval antennae, which are employed in exploratory sweeping movements during locomotion, suggest that they have the generalized guidance function of ascertaining both the physical and chemical suitability of the environment.

Terminal sensillum chaeticum C3 is very long (300 µm) and folds back easily in the preparations for SEM, which highlights its flexibility; it can be considered as a sensillum filiformium. Since no pore was revealed, and given its lack of rigidity, and its presence at the tip of the antenna, we suppose that sensillum chaeticum C3 performs a function of vibromechanoreceptor or anemoreceptor sensitive to air currents. In other coleopterans, the terminal sensillum has another role. In *Tribolium spp.*, this sensillum, named “trichoid sensillum”, and smaller (53 µm), with a terminal pore and two dendrites in the sensillum lumen, has probably a gustative function (Behan & Ryan 1978). The three trichoid sensilla situated at the antennal tip of the larval sawtoothed grain beetle *O. surinamensis* also possess a contact chemoreceptive function (Roppel *et al.* 1972).

The large multiporous sensillum basiconicum (sensillum B1) is present on the larval antenna of most coleopterans (Jeannel 1949). Different names have been proposed for it:

“vésicule hyaline or article accessoire” (Jeannel 1949), “lobe membraneux” (Corbière 1969), “antennal sensory appendix” (Scott & Zacharuk 1971, Baker & Ellsbury 1989), “antennal sensory cone” (Zacharuk 1971), “cornicle sensillum” (Roppel *et al.* 1972), “plate organ” (Ryan & Behan 1973, Behan & Ryan 1978), “large sensillum basiconicum” (Chan *et al.* 1988). In most species, the large sensillum basiconicum is cone-shaped but in the tenebrionids *Tribolium confusum* Jacquelin du Val, 1863 and *Tribolium castaneum* (Herbst, 1797), they are plate organs (Behan & Ryan 1978). The dimensions of the sensory cone vary according to the families. The length and the basal diameter of the last larval instar are respectively as follows: 41-72 µm, 22-28 µm (*D. mauritanicus*, Elateridae); 20 µm, 12 µm (*O. surinamensis*, Silvanidae) (Roppel *et al.* 1972); 20-25 µm, 19-15 µm (*Hypera sp.*, Curculionidae) (Chan *et al.* 1988); 13 µm, 6 µm (*Languria mozardi* Latreille, 1807, Languriidae) (Baker & Ellsbury 1989). Of these species, *D. mauritanicus* is the only predator, the only one to possess the most highly developed large sensillum basiconicum.

In *Lampyris noctiluca* (Linnaeus, 1767) (Lampyridae), the sensillum B1 is hemispherical and measures 44 µm in diameter (pers. obs.). In another lampyrid, *Aspisma lineatum* (Gyllenhal, 1817), the “sensory appendix” measures about 30 µm in length (Viviani *et al.* 2012). These two latter species, which like *D. mauritanicus* prey on snails, also possess very large sensilla basiconica B1. The presence of very numerous wall pores in the sensillum B1 of *D. mauritanicus* suggests an olfactory function (Altner 1977, Altner & Prillinger 1980, Zacharuk 1980). This prominent sensillum is innervated by 13 pairs of bipolar neurons (Corbière 1969); it appears to represent the fusion of 12 individual sensilla into a compound chemoreceptor (Scott & Zacharuk 1971, Roppel *et al.* 1972).

According to the latter authors, the function of atmospheric chemoreception is suggested by the presence of channels in the thin cuticle communicating directly with the external environment. The high number of chemosensory neurons of this multiporous sensory organ suggests a possible ability of fine odour discrimination related to prey choice or host location (Giglio *et al.* 2008).

The short sensilla basiconica B1- B8 of *D. mauritanicus* are diverse in size and external morphology. They resemble the “short peg organs” described in *O. surinamensis*. Except for sensillum B6, the form and size of the other sensilla suggest neither an exclusive mechanoreceptive nor a chemoreceptive function because inspection at higher magnification reveals no pores in the cuticle. However, the wall pores are not always visible in SEM and an olfactory function is possible for some of these sensilla. Sensilla B4 and B5 occupy a distal position and are morphologically close to the two « sensilla basiconica » of *O. surinamensis* for which transmission electron microscopy has revealed the existence of wall pores and therefore the possibility of an olfactory function (Roppel *et al.* 1972). The tip of sensillum B6 ends in finger-like extensions which are in contact at their extremities. This specificity is often observed in the terminal-pore sensilla or uniporous sensilla (Altner & Prillinger 1980, Zacharuk 1985, Faucheux 1999). Therefore, a gustative function is suggested for sensillum B6. Some aporous sensilla with inflexible sockets may possess a

thermo- and hygro-receptive function (Altner & Prillinger 1980, Altner *et al.* 1983). Thus, sensilla B7 and B8 have morphological characteristics close to the “small styloconic sensillum” present on the terminal antennomere of *Tribolium ssp.* whose internal structure reveals a probable temperature receptor (Behan & Ryan 1978).

The “blunt-tipped pegs” and the “papillate sensilla” described in *Tenebrio molitor* Linnaeus, 1758 and *Zophobas rugipes* Kirsch, 1866 (Bloom *et al.* 1982, Farazmand & Chaika 2007) have been observed neither in *D. mauritanicus* nor in other species.

CONCLUSION

The larval antenna of *D. mauritanicus* is well provided in sensilla which perform various functions: mechanoreception, vibroreception, proprioception, olfaction, contact chemoreception, thermo-hygroreception. It is necessary to study it in order to better understand the sensory equipment of the adults. Indeed, the male antennae of *D. mauritanicus* and other Drilini have morphologically identical antennomeres (pers. obs.) but the female antennae show a sexual dimorphism and seem possess both adult and larval structures (Faucheux & Agnas 2011). The present study is liable to prove this hypothesis in the event of a subsequent study of female adults.

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