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# A new species of *Chalcogenia* from Israel, and notes on the systematic position of the genus (Coleoptera: Buprestidae: Anthaxiini)

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**Abstract.** A new species, *Chalcogenia halperini* sp. n. from Israel, is described, illustrated and compared with related species. Larva of *C. halperini* sp. n. is described in detail and compared with larvae of *Anthaxia* Eschscholtz, 1829; larval characteristics of Anthaxiini, Melanophilini and Kisanthobiini are given. Replacement of *Chalcogenia* Saunders, 1871 from Melanophilini to Anthaxiini is suggested on the base of both imaginal and larval characters and a key to African Anthaxiini is given.

**Taxonomy, larval morphology, Coleoptera, Buprestidae, *Chalcogenia halperini* sp. n., Palaearctic region**

## INTRODUCTION

The occurrence of *Chalcogenia theryi* Abeille, 1897 developing on *Acacia* trees was reported for Israel and Sinai (Bytinski-Salz 1954, Mateu 1975). It was believed this species occupied the most northern part of the geographical range of *Chalcogenia* Saunders, 1871, distributed exclusively in Africa.

During collecting trips to Israel in 1994 and 1996 the entomological expeditions of the Zoological Institute of St. Petersburg collected some specimens and numerous fragments of this species in Negev and Dead Sea Area. The comparison of these specimens with those from Obenberger's collection (NMPC) and type of *C. theryi* (MNHN) has shown that Israeli specimens belongs to a new species which differs clearly from *C. theryi* being closely related to some South-African species. Later on, the authors obtained additional material of this species from Mr. Josef Halperin (TAUI) and from some private collections. Mr. J. Halperin has also kindly supplied the authors with the larvae of this new species found inside the branches of *Acacia* trees in Negev.

The following abbreviations are used in the text: GMCC – collection of Gianluca Magnani, Cesena, Italy; GSCC – collection of Gianfranco Sama, Cesena, Italy; JHIC – collection of Josef Halperin, Nes Zyona, Israel; MNAC – collection of Manfred Niehuis, Albersweiler, Germany; MNHN – Muséum national d'Histoire naturelle, Paris, France; NMPC – National Museum, Prague, Czech Republic; RLWE – collection of Richard L. Westcott, Salem, USA; SPBC – collection of Stanislav Prepsl, Brno, Czech Republic; TAUI – Department of Zoology Tel-Aviv University, Israel; VKBC – collection of Vít Kubáň, Brno, Czech Republic; ZMAS – Zoological Institute, St. Petersburg, Russia.

## *Chalcogenia halperini* sp. n.
(Figs 1–24)

DESCRIPTION. Body large and robust, rather convex, distinctly cuneiform (Fig. 1); entire body metallic-bronze, tarsi, antennae and frons of male black with green-bronze lustre; underside

with small patches of white tomentum on proepisterns, pro-, meso- and metasternum and on abdominal sterna; pronotum and elytra asetose, frons with short but rather dense, white pubescence, vertex with nearly indistinct pubescence; ventral side and legs with moderately long and sparse, white pubescence, epimerons and laterosternites with very dense, white or cream-white pubescence.

Head rather large, frons flat (Fig. 1); vertex flat, 1.1–1.2 times as wide as width of eye; clypeus widely, triangularly incurved anteriorly, frontoclypeal suture completely missing; eyes very large and convex, slightly reniform but not projecting beyond outline of head; sculpture of head consisting of very small and dense, umbiliform punctures, space between them being smaller than the diameter of the punctures; antennae rather short, reaching mid-length of lateral pronotal margins; first antennal segment pear-shaped, 2.5 times as long as wide, second segment slightly longer than wide, enlarged apically; third segment sharply triangular, 1.5 times as long as wide; segments 4–10 enlarged, trapezoidal, wider than long, last segment regularly rhomboid; antennal sensory areas – see Figs 25–26.

Pronotum moderately and regularly convex, 1.6–1.8 times as wide as long with small and shallow, nearly triangular laterobasal depressions; anterior pronotal margin very slightly lobate medially, posterior margin bisinuous (Fig. 1); lateral pronotal margins somewhat angulately arched, nearly straight anteriorly and slightly incurved posteriorly; maximum pronotal width anteriorly of pronotal mid-length; pronotal sculpture consisting of fine and dense, simple punctures medially and dense, umbilicate punctures laterally (Fig. 1); puncturation of laterobasal depressions sometimes slightly prolonged forming indistinct, longitudinal wrinkles; lateral pronotal carinae incomplete, slightly S-shaped, not reaching anterior pronotal angles. Scutellum large, cordiform or slightly pentagonal, as wide as long, sharply pointed posteriorly.

Elytra cuneiform, rather convex, 2.1–2.2 times as long as wide at humeral part (Fig. 1); each elytron with four feeble, almost smooth, longitudinal carinae not reaching the very apex of elytra; humeral swellings small, basal, transverse elytral depressions well-developed reaching second elytral carina and divided by the prominent basis of the third carina; posterior third of elytral margins distinctly and sharply serrate, each elytron separately rounded apically; elytral epipleura narrow and shortened reaching only two thirds of elytral length; elytral sculpture consisting of very small and dense, umbilicate punctures which are transversely connected on lateral parts of elytra forming there short and fine, transverse wrinkles.

Prosternum lustrous and nearly asetose medially, prosternal process slightly convex, somewhat enlarged behind coxae, sharply pointed posteriorly, with very fine and sparse, simple puncturation. Abdominal sterna rather lustrous, sparsely and finely punctured with distinct medial, longitudinal groove which is reduced only to shallow, basal depression on the last two segments. Besides of this groove, all sterna with a pair of small, shallow and rounded depressions on each side; these depressions are usually covered with white tomentum and they are rather indistinct on anal sternum. Anal sternum sharply serrate laterally, apically with shallow, arched incurvation in male or deep, triangular notch and wide, smooth, medial carina in female. Legs relatively short, all trochanters of male with short but rather sharp spine. Metafemurs of male conspicuously swollen, pro- and mesotibiae slightly bent with inner serration and long, dense setae (Fig. 1); male metatibiae slightly bent outwards, their inner margin with sharp, robust tooth at the basal third and several smaller teeth between basal tooth and apex of tibia, also with long, inner bristles (Fig. 1). Tarsi somewhat enlarged, shorter than tibiae, tarsal segments 1–4 with well-developed adhesive pads. Claws very slender, long and regularly arched, only very slightly enlarged at their base.



Aedeagus (Figs 8, 9): rather long, flattened, parameres slightly angulate near their mid-length and sharply pointed apically; the median lobe of aedeagus simply and sharply pointed.

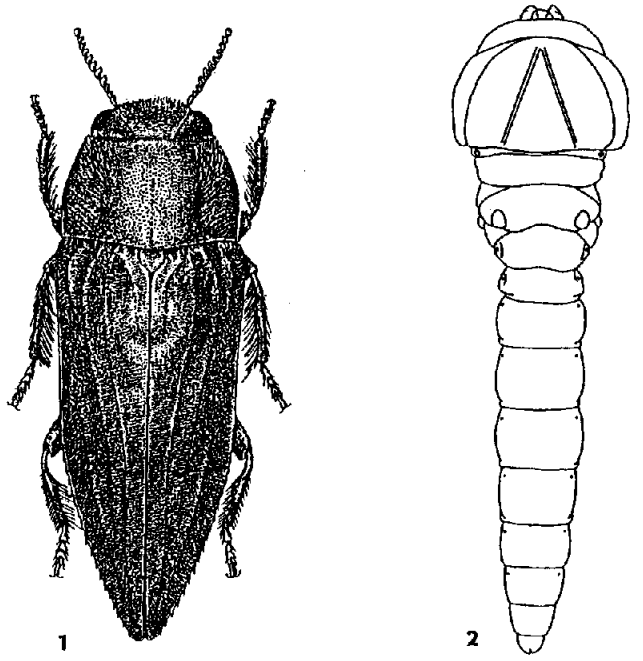
Ovipositor (Fig. 3): of tubular type, very long, approximately 5.3 times as long as enlarged part, with prominent median lobe between styli, bearing clusters of straight, short spines and basiconic sensillae at antero-lateral corners. Distal half of ovipositor covered with rather dense, straight and needle-like spines, distal margin of enlarged part with the line of basiconic sensillae. Hemisternites thin, slightly bent, with very long, narrow, strightly recurved branches, their apical sclerotization poorly developed.

LENGTH. 9.2–15.0 mm (holotype 10.0 mm); width: 3.5–5.5 mm (holotype 3.5 mm).

SEXUAL DIMORPHISM. Female differs from male by concolorous, bronze frons, narrower antennae, absence of spines on trochanters, not swollen metafemurs, simple, unmodified tibiae and by triangularly notched apex of anal sternum.

NAME DERIVATION. This new species is named after Mr. Josef Halperin, well-known Israeli specialist in xylophagous insects.

TYPE MATERIAL. Holotype (male): Israel, Southern Negev, loc. no. 5, N. Shelomo, 5 km W of Elat, 8.iv.1994, Volkovitsh & Dolgovskaya leg. Allotype (female): Israel, Southern Negev, Nahal Zihor, reared in August 1993 from branches of *Acacia gerrardii negevensis* collected in November 1992, J. Halperin leg. Paratypes: the same data as holotype (1 male). Israel, Southern Negev, loc. no. 6, Har Hizaiyyahu, 800 m, 12 km NW of Elat, 9.iv.1994, Volkovitsh & Dolgovskaya leg. (1 male). The same data as allotype (3 males, 2 females). Israel (Southern Negev), Timna res., reared ex *Acacia*, M. Niehuis leg.




Figs 1–2. 1 – *Chalcogenia halperini* sp. n., holotype, 10.0 mm; 2 – adult larva of *C. halperini* sp. n., 22.0 mm.

(1 male). Israel, Central Negev, Mizpe Ramon, ex larvae, 15.vii.–15.viii.1995, from *Acacia gerrardii negevensis*, G. Magnani leg. (5 males, 8 females). Israel, Central Negev, Mizpe Ramon, ex larvae 11.viii.1995 from *Acacia gerrardii negevensis*, G. Sama leg. (2 males, 2 females). Israel, Arava Valley, Moshaav Hazeva, wadi Shahak, between agricultural fields, –110 m, Sharkey malaise trap, 5.v.1995, M. E. Irwin, 30°46.33 N, 35°16.32 E (GPS) (1 female). Israel, Arava Valley, 4 km NE Hazeva Field School, Nahal Iddan, –400 ft., 28.iv.1996, M. E Irwin, 30° 47 38 N, 35°16 07 E (2 females). Israel, Hazeva, 15. viii.1959, J. Halperin (2 males). Israel Arava Valley, Iddan, side waddi bellow date orchard, –640 ft. malaise trap, 6.v.1996, M. E. Irwin, 30°49 05 N, 35°16 55 E (1 female). Israel, Arava Valley, Nahal Omer, ex larvae 5. viii.1995 from *Acacia raddiana*, G. Magnani leg. (1 male, 2 females). Israel, Arava Valley, Nahar Omer, ex larvae 8.ix. 1995 from *Acacia raddiana*, G. Sama leg. (1 male, 1 female). Israel, Arava Valley, Yotvata, ex larvae 1.vii.–20.viii. 1995 from *Acacia tortilis*, G. Magnani leg. (3 males, 1 female). Israel, Arava Valley, Yotvata, ex larva vi.1995 from *Acacia tortilis*, G. Sama leg. (1 female). Israel, Dead Sea Area, loc. no. 25, N. David, En Gedi env. 21.iv.1994, Volkovitsh & Dolgovskaya leg., from dead branches of *Acacia* sp. (1 dead specimen). Israel (Palestine), Ejn Hosb, 3.v. 19., Burasch leg. – *Chalcogenia theryi* Abeille, det. Dr. Obenberger (1 female). Israel (Palestine), Wadi Fukra, e. l., 10.v.19.., ex *Acacia spirocarpa*, leg. Bytinski-Salz (2 males, 1 female). Egypt, Sinai, Wadi Feirah, 9.iv.1973, *Acacia*, leg. Bytinski-Salz (1 female). Jordan, Wadi Ghuba, 9.v.1995, K. Denеš scn. leg. (2 males, 3 females). Jordan mer. occ., 20 m, 5 km S Aqaba, 29°24 N, 34°59 E, 3.iv. 1994, leg. S. Bečvář j. & s. (1 male, 1 female). No locality label, *Acacia spirocarpa* (1 male, 1 female). Holotype and allotype deposited in TAUI, paratypes in TAUI, ZMAS, NMPC, GMCC, MNAC, RLWE, SPBC, VKBC.

DISTRIBUTION. Israel (Southern Negev, Central Negev, Arava Valley, Dead Sea Area), Egypt (Sinai), Jordania.

BIONOMY. Larvae of this species develope under the bark and inside the wood of trunks and branches of various *Acacia* species: *A. gerrardii negevensis, A. raddiana, A. tortilis* and *A. spirocarpa.*

DIFFERENTIAL DIAGNOSIS. Within *Chalcogenia* we can distinguish two different groups: the most of species belong to the group which is characterized by slender, flattened body, smooth elytra without longitudinal carinae or with indistinct, slightly developed carinae and not enlarged or very slightly enlarged male femurs; species belonging to this group are often metallic-green or blue, or brightly cupreous and males have not any conspicuous pubescence on inner margin of tibiae or femurs. The second group includes only four species: *C. sulcipennis* (Gory, 1841), *C. femorata* Kerremans, 1908, *C. argodi* Kerremans, 1909 and *C. halperini* sp. n. This small group is characterized by rather convex, distinctly cuneiform body, well-developed and lustrous, longitudinal elytral keels, strongly enlarged male metafemurs and long, brush-like pubescence on inner margin of femurs or femurs and tibiae.

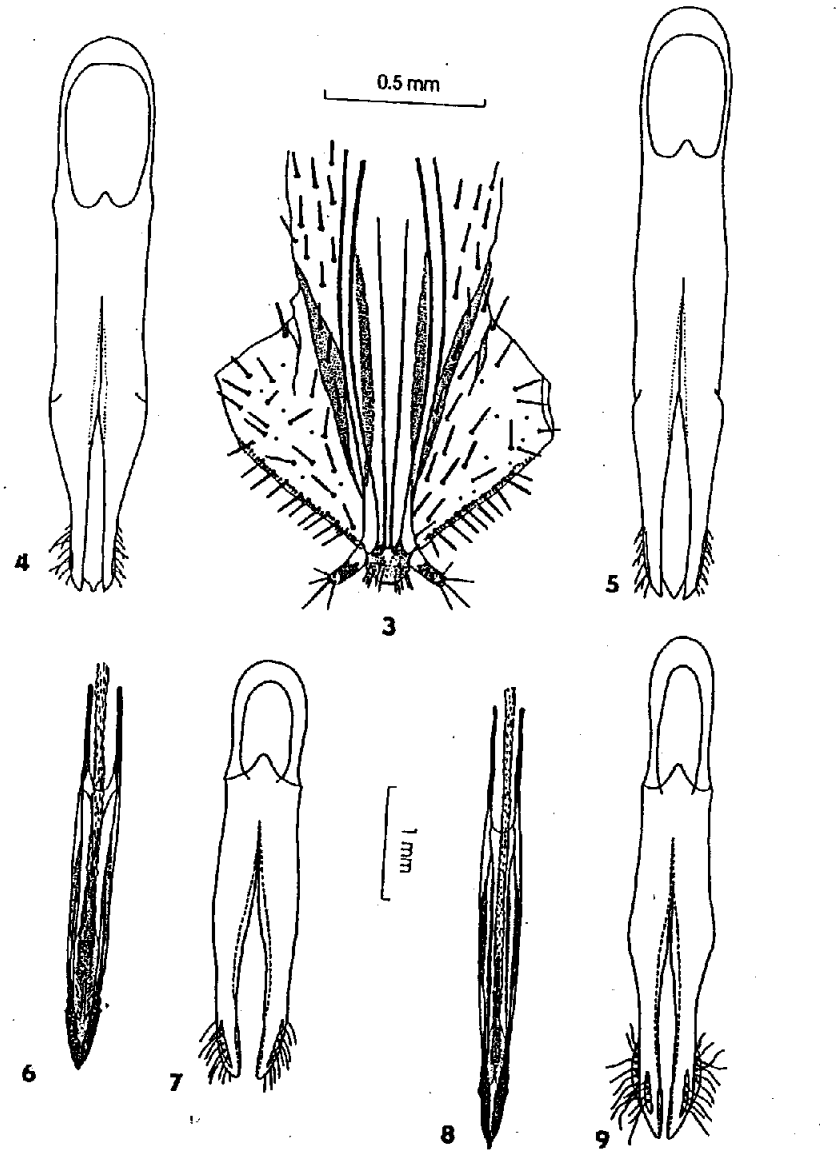
*C. halperini* sp. n. differs from *C. sulcipennis* (South Africa), *C. femorata* (Tanzania) and *C. argodi* (Somalia, Ethiopia) apart from its distribution by short and sharp spines on all trochanters of male, by the shape of metatibiae, form of aedeagus, long, brush-like pubescence of male femurs and tibiae (only femurs with long pubescence in males of *C. sulcipennis* and *C. argodi*) and slightly by sculpture of hind pronotal angles (large, deep punctures with central grains in *C. halperini* sp. n. and simple, somewhat transverse punctures in *C. sulcipennis* and *C. argodi*). *C. halperini* sp. n. also differs from both species mentioned above by its bronze colouration (black body with red-bronze pronotal angles in *C. argodi* and black body with bronze elytral interstices in *C. sulcipennis*) and by narrower and less elevated elytral keels.

## Description of larva

MATERIAL EXAMINED (4 larvae). Israel, Nahal Zihor, 12.x.1991, from branches of *Acacia gerrardii negevensis*, J. Halperin leg. (1 larva). Israel, Nahal Zihor, from branches of *Acacia gerrardii negevensis*, 15.viii.1992, J. Halperin leg. (3 larvae).

Length of the different instar larvae: 9–22 mm. Larva (Fig. 2) is of the usual buprestid type with strongly enlarged prothorax, corresponding to the 1st morpho-ecological type of *Acmaeoderella* Cobos, larva (Volkovitsh 1979).






Figs 3–9. 3 – ovipositor of *Chalcogenia halperini* sp. n.; 4 – aedeagus of *C. argodi* Kerremans.; 5 – the same, *C. sulcipennis* (Gory); 6 – *C. theryi* Abeille, medial lobe; 7 – the same, tegmen; 8 – *C. halperini* sp. n., median lobe; 9 – the same, tegmen.

HEAD AND MOUTHPARTS. Epistome (Fig. 10) 5.1–5.7 times as wide as long; anterior margin hardly arcuately bisinuous between the semiglobular mandibular condyles; posterior margin slightly bisinuous, nearly straight; lateroposterior corners blunt, weakly obtuse-angled, nearly rectangular and hardly projecting; lateral margins with deep antennal incissions. Epistome bearing 2 groups of 3 epistomal sensillae (Fig. 10, es) arranged linearly at the anterior third of epistomal length, divided by slightly sclerotized strip in the middle; each group consists of 2 short, trichoid sensillae medially and 1 campaniform sensilla laterally arising from the common basis. Clypeus (Fig. 11) narrow, membranous and glabrous, with anterior margin nearly straight.

Labrum (Fig. 11) trapezoid; anterior margin nearly straight between rounded antero-lateral corners, without lateral lobes, with straight sides, markedly converging posteriorly. Palantine sclerites well-developed, transverse and sclerotized with well-developed, strongly sclerotized lateral branches and poorly developed, short medial ones (Fig. 11, mb) (terminology according to Volkovitsh & Hawkeswood 1994). Each of medial branches bearing dorsally 3 medial sensillae of labrum (Fig. 11, msl): 1 short apical seta which hardly extends the anterior third of labrum and 2 campaniform sensillae situated below apical seta posteriorly the middle line of labrum on the same level; the distance between apical seta and both campaniform sensillae slightly more than that between them. Anterolateral sensillae (Fig. 11, alsl) include 2 sharp setae and 2 campaniform sensillae externally and 2 short setae near the anterolateral margin on each side internally. The position of anterolateral sensillae is as follows:

$$\frac{(1c, 2c, 3t) + 4t}{1t + 2t}$$

with external sensillae designations in the numerator and internal ones in denominator (1, 2, 3,... – the ordinal number of sensilla from the most medial to lateral ones; t – trichoid, c – campaniform sensillae; „( )" – with fused bases, „+" – with closed bases, „–" – with distant bases (Volkovitsh & Hawkeswood 1994). External surface of labrum glabrous; epipharynx laterally with indistinct microspinulae surrounding the pharynx.

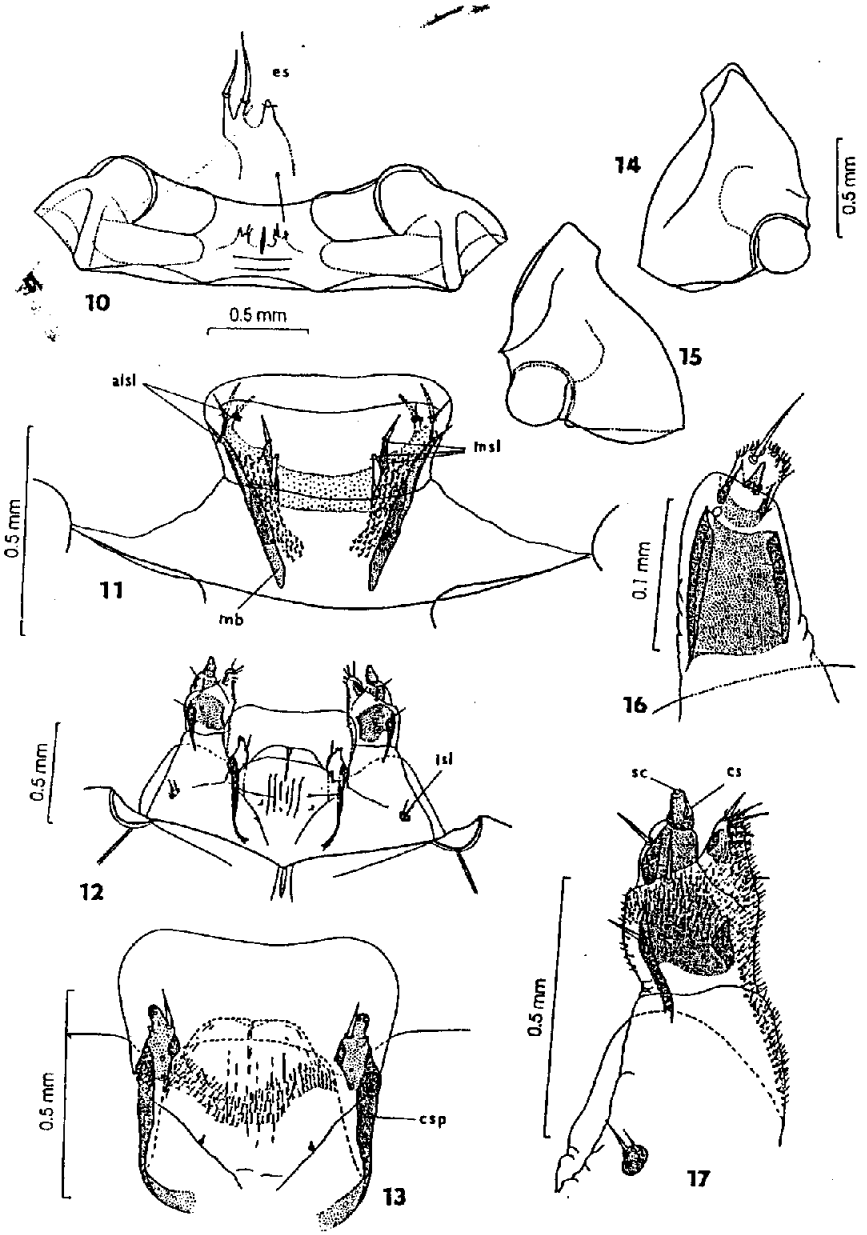
Antennae (Fig. 16): 2-segmented, situated in the deep lateral depression of epistome; articular membrane glabrous, forming a cover in which whole 1st and base of 2nd segments are sunk. First segment cylindrical, slightly narrowed towards the apex, 2 times as long as segment 2 and about 2 times as long as wide, strongly sclerotized; anterior margin glabrous with a campaniform sensilla externally at the middle and another one internally near the apex of internal margin. Second segment cylindrical, about 1.5 times as long as wide with normally developed inner sclerites, with fine microspinulae at the anterior margin and with short trichosensilla length of which is approximately equal to the length of the 2nd segment; apical cavity bearing sensory appendage and 2 hardly visible palmate sensillae at the basis of sensory appendage, the bottom of the cavity situated in the anterior half of 2nd segment.

Mandibles (Figs 14, 15): black, strongly sclerotized, broadened at the basis, triangular and slightly longer than wide. Cutting edge with dorsal and ventral ridges separated by deep incission, without apical tooth.

Hypostome. Slightly sclerotized except of lateral parts, bearing numerous short and indistinct trichoid and campaniform sensillae situated on the middle part of hypostome; these sensillae are missing in younger larva; pleurostome without any traces of ocelli.

Labiomaxillary complex (Figs 12, 13, 17). Maxillae (Fig. 17): maxillar cardo membranous, glabrous, with 2 short setae and 1 campaniform sensilla situated on a distinct, isolated, well-sclerotized sclerite (Fig. 12, isl) at the posterolateral corners near the cardo basis. Stipes with strongly sclerotized internal sclerite bearing one campaniform sensilla closer to external margin, one short, sharp seta at the external margin of internal sclerite and one short, sharp seta






Figs 10–17. Larva of *Chalcogenia halperini* sp. n. 10 – epistome (es – epistomal sensillae); 11 – labrum and clypeus (alsl – anterolateral sensillae of labrum, mb – median branch of palantinae sclerite, msl – median sensillae of labrum); 12 – labiomaxillary complex (isl – isolated sclerite of labrum); 13 – labium (csp – corner sclerite of prementum); 14 – right mandible, ventral view; 15 – the same, dorsal view; 16 – right antenna; 17 – left maxilla (cs – curved sensilla, sc – sensory cones).

near the anterior margin below the basis of maxillary palpus which does not extend the apex of 1st segment; anterior margin externally glabrous, external surface with microspinulae laterally; stipes internally with short dense microspinulae along external, internal and anterior margins, extending to the mala. Maxillary palpus two-segmented; basal segment strongly sclerotized, rounded, bearing a long, sharp seta which extends to the apex of segment 2 and a campaniform sensilla; anterior margin of basal segment glabrous; second segment thickened above the basis, about 1.5 times as long as maximum width, markedly sclerotized with one long, modified and curved sensilla (Fig. 17, cs) internally, one campaniform sensilla externally and about 8 small, conical sensillae (Fig. 17, sc) at the apex. Mala: moderately sclerotized with broad internal sclerite, elongate, slightly narrowed to apex, about 1.5 times as long as wide, externally with one campaniform sensilla at the middle near internal margin, one long, sharp seta at the apex and two closed setae at the anterolateral margin; mala internally with three short, thick, curved and sclerotized spinae at the anterior part and 1–2 non-sclerotized, straight setae along internal margin and with rather dense microspinulae.

Labium (Fig. 13): strongly transverse; prementum about twice as wide as long with markedly emarginate anterior margin, broadly rounded anterolateral corners and lateral sides feebly converging posteriorly; external surface of prementum quite glabrous; internal surface only with indistinct microspinulae along the lateral sides; each corner sclerite of prementum (Fig. 13, csp) bearing one short, sharp seta extending to about anterior third and 5 small, campaniform sensillae; postmentum with two indistinct campaniform sensillae.

Thorax (Figs 2, 24). Pronotal and prosternal plates poorly developed, glabrous, only with sparse, short bristles which are densest on prosternal plate and on the anterior and lateral parts of prothorax. Prothoracic grooves (Figs 18, 19) yellowish or colourless, hardly sclerotized; pronotal groove (Fig. 18) inverted V-shaped dividing into 2 nearly straight branches at apex, forming the sharp angle about $40^0$ grades; prosternal groove (Fig. 19) narrow, colourless, distinct only in its middle part. Mesothorax without distinct ambulatory pads on the both sides, glabrous. Metathorax with small, well-developed ambulatory pads both on dorsal and ventral sides which are connected by inner structures (Fig. 20) (see also Volkovitsh & Hawkeswood, 1987, Fig. 18); these structures are the main character of larvae of Anthaxiini. Thoracic segments glabrous, only with short bristles.

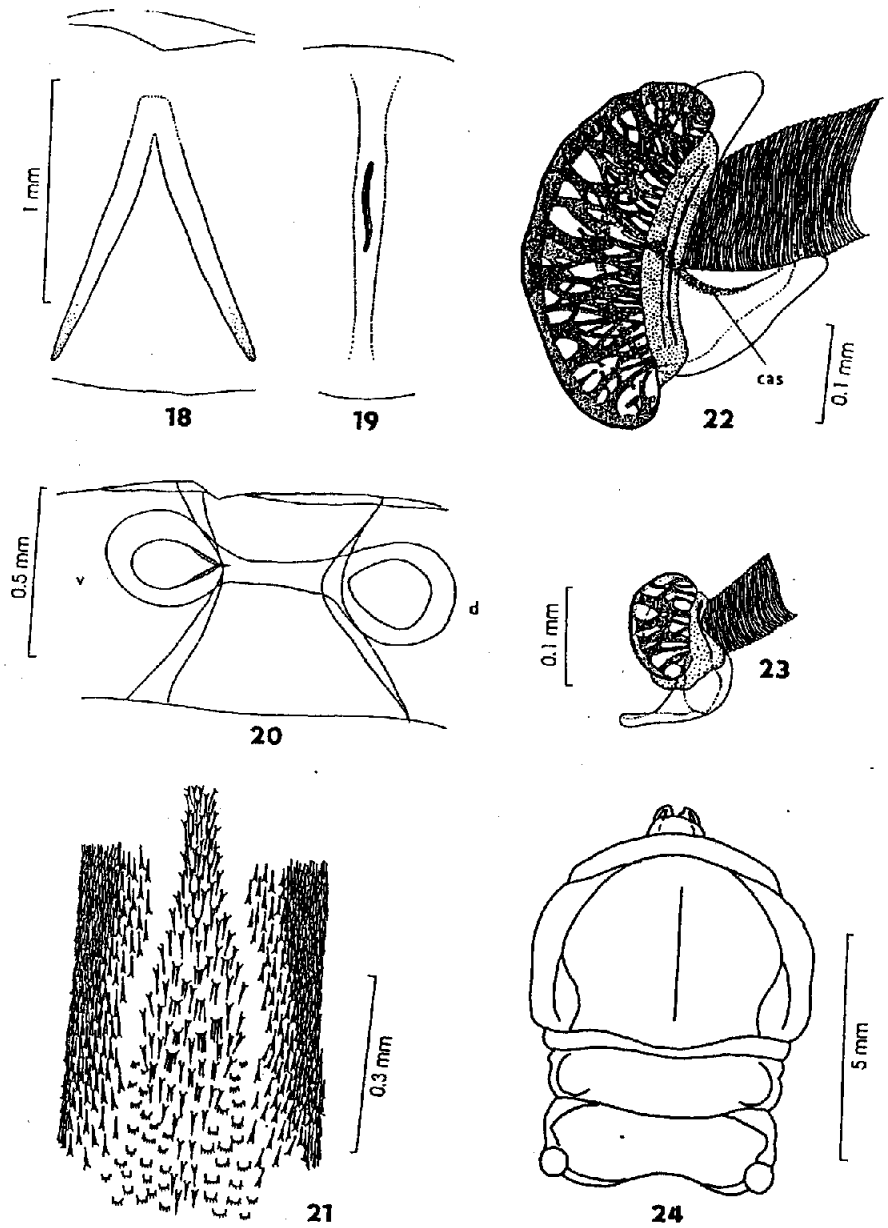
Abdomen (Fig. 2). Abdominal segments slightly transverse, flattened, with longitudinal, depressed zones laterally, glabrous. First segment wider than 2–10 segments, without ambulatory pads. Segments 2–9 also without ambulatory pads, irregularly covered with sparse, short bristles which are denser on their lateral margins.

Spiracles (Figs 22, 23). Thoracic spiracles (Fig. 22) reniform, about 3 times as long as wide with very dense branching inner trabeculae; the closing apparatus of spiracles (Fig. 22, cas) not sclerotized. Abdominal spiracles (Fig. 23) variable in size, reniform, oval or irregular in shape, about 1.5 times as long as wide; they differ from thoracic ones only in the shape and size.

Proventriculus (Fig. 21). The morphology of the inner fields and their armature are typical for Anthaxiini; the armature includes microspinulae and microsetae, forming a complicate pattern which is rather similar to that of *Anthaxia* (*Cratomerus* Solier, 1833) (Soldatova 1970, fig. 3; 1973, fig. 1; Bílý 1975, figs 52, 54, 55).

Larvae of *Chalcogenia* are very similar to larvae of Anthaxiini in all respects. We have failed to find the reliable larval characters which would separate the genera *Chalcogenia* and *Anthaxia* sensu lato. Some differences are as follows:






Figs 18–24. Larva of *Chalcogenia halperini* sp. n. 18 – pronotal groove; 19 – prosternal groove; 20 – ambulatory pads of metathorax (d – dorsal, v – ventral); 21 – medial band of dorsal surface of proventriculus; 22 – mesothoracic spiracle (cas – closing apparatus); 23 – 1st abdominal spiracle; 24 – prothorax of adult larva, ventral view.

*Chalcogenia*

Epistome bearing 3 epistomal sensillae arising from the common base in each group: 2 short trichoid ones medially and 1 campaniform sensilla laterally (Fig. 10).

The bottom of apical cavity of the second segment of maxillary palpus situated in the anterior half of the 2nd segment; 2nd segment with normally developed inner sclerites, it does not form the tube, its anterior margin microspinuled.

Internal surface of stipes and mala covered with dense microspinulae.

*Anthaxia*

Epistome bearing 2–4 epistomal sensillae in each group: 1–2 short trichoid (or campaniform) medially and 1–2 campaniform sensillae laterally (only lateral sensillae if they are 2) arise from the common base.

The bottom of apical cavity of the second segment of maxillary palpus situated at the bottom of 2nd or in the middle of 1st segment (Volkovitsh & Hawkeswood 1994, fig. 18); 2nd segment with rudiments of inner sclerites at the base or without them forming the tube, its anterior margin glabrous.

Internal surface of stipes and mala covered with sparse microspinulae or nearly glabrous.

The differences between larvae of Anthaxiini, Kisanthobiini and Melanophilini are shown in the Table 1. There is obvious that larvae of *Chalcogenia* have nothing in common with those of Kisanthobiini and Melanophilini.

## DISCUSSION

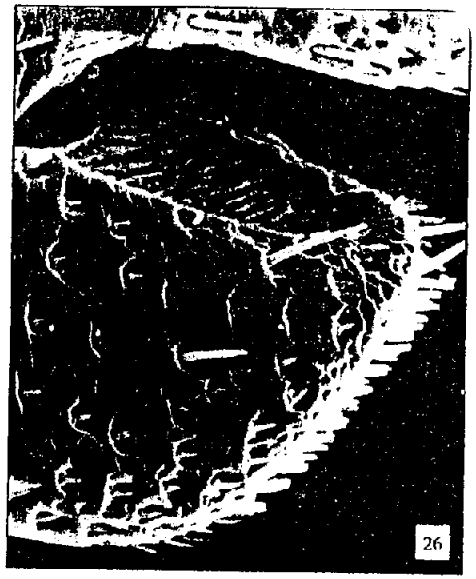
The generic name *Chalcogenia* was suggested for the first time by Saunders (1871) for two species: *Evagora sulcipennis* Gory, 1841 and *Anthaxia contempta* Mannerheim, 1837. Since this name was not accompanied with any descriptions subsequent authors attributed the authorship to Thomson (1879), who gave the generic description and designated *Anthaxia cuprea* Gory & Laporte, 1839 (= *A. contempta* Mannh.) as the type species. According to the Article 12b (5) (ICZN 1985) the authorship of generic name *Chalcogenia* should be attributed to Saunders (1871).

Kerremans (1903) placed *Chalcogenia* to the group Anthaxites of the tribe Buprestini; Théry (1928) and Obenberger (1930) shared this opinion. Latter on, this genus was placed to Melanophilini (Bellamy 1985, Holynski 1993). The comparative study of antennal and larval morphology as well as many external characters and male genital structure have demonstrated undoubtely that *Chalcogenia* belongs to Anthaxiini.

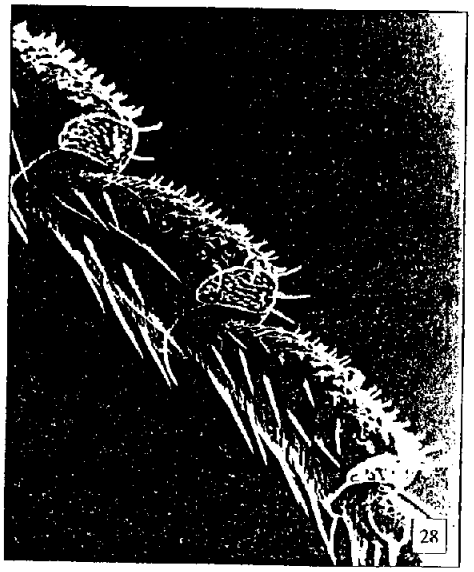
The antennal structures are shown on Figs 25–32. The principal character of Anthaxiini is the disposition of sensory pit at the middle of apical surface of antenomeres (Figs 25–30). Melanophilini are characterized by apical cavities (Figs 31, 32) which are completely or nearly completely closed. Very interesting pattern of antennal structure was found in African *Brachanthaxia* (Fig. 30) which looks like that of some Australian genera traditionally attributed to Anthaxiini or Melanophilini: it has apical sensory pit covered from above with a lobe which is an extending lobe of the inner margin of the pit itself (the analogous sensory organs of Australian genera originated as a result of the invagination of sensory pits). It is obvious that the antennal structure of *Chalcogenia* (Figs 18–19) is the same as in Anthaxiini (Figs 27–32), being more similar to *Anthaxia iliensis* Obenberger, 1914.

The larval structures of *Chalcogenia* are the same as in *Anthaxia*. We have failed to find any reliable characters which could be regarded as generic besides some unreliable differences in the number of epistomal sensillae and the disposition of the bottom of apical cavity of maxillar








Figs 25–28. Antennal structures. 25 – *Chalcogenia contempta* (Klug), 6–11 segments, internal view, ×130; 26 – the same, 7th segment, ×600; 27 – *Anthaxia illiensis* Obenberger, 6th segment, internal view, ×400; 28 – *A. vittula* Kiesenwetter., 7–8th segments, internal view, ×350.





Figs 29–32. Antennal structures. 29 – *Brachelytrium transvaalense* Obenberger, 8–11th segments, internal view, ×250; 30 – *Brachanthaxia gemmata* Gory & Laporte, 6–11th segments, internal view, ×350; 31 – *Phaenops guttulata* (Gebler), 10th segment, internal view, ×450; 32 – *Melanophila picta* (Fabricius), 11th segment, internal view, ×450.



Table 1. Comparison of the main taxonomic characters between the larvae of Kisanthobiini (*Kisanthobia*), Anthaxiini (*Anthaxia, Cratomerus, Chalcogenia*) and Melanophilini (*Melanophila, Phaenops*) (*)

| Character | Kisanthobiini | Anthaxiini | Melanophilini |
|---|---|---|---|
| Antena (**) | Situated in lateral incission between epistome and hypostome (pleurostome); articular membrane glabrous, not forming a cover around 1st segment; with dense microsetae on the anterior margins of segments 1 and 2; bottom of apical cavity extending to about the basis of segment 2 | Situated in lateral depression of epistome; articular membrane glabrous, forming a cover, in which whole 1st and basis of 2nd segments are sunk; without microspinulae or microsetae on the anterior margins of segments 1 or both 1 and 2; bottom of apical cavity may extend to the middle of segment 1 (Fig.16; see also Volkovitsh & Hawkeswood 1994, Fig. 18) | Situated in lateral incission between epistome and hypostome (pleurostome); articular membrane covered with microspinulae, not forming a cover around 1st segment; with very dense microsetae on the anterior margins of segments 1 and 2; bottom of apical cavity extending to about basis of segment 2 |
| Labrum | Externally with dense microsetae along the entire anterior margin; epipharynx with narrow strips of microspinulae (Alekseev & Soldatova 1968, Fig.3) | Externally glabrous; epipharynx with sparse, indistinct microspinulae or glabrous (Bílý 1975, Figs 33-40) | Externally with very dense microsetae along the entire anterior margin; the most of epipharynx with the same microsetae |
| Labrum: anterolateral sensillae | (1t,2c)-3t-4t<br>(1t,2t,3t) | (1c,2c,3t)+4t<br>1t+2t | (1t,2c)+3t-4t<br>(1t,2t) |
| Mandibles | With 2 ridges of blunt teeth arising in pairs on common bases | With 2 ridges without teeth or with hardly developed teeth (Bílý 1975, Figs 25-32) | With 2 sharp teeth at apex |
| Labium: prementum | With microsetae externally; with hardly visible microspinulae along lateral margin internally (Alekseev & Soldatova 1968, Fig.3) | Externally and internally glabrous (Bílý 1975, Figs 41–48) | With microsetae externally; with dense microsetae covering the most of surface internally |
| Prothoracic plates | Glabrous, except of small zones of microspinulae on the anterior and posterior margins (Alekseev & Soldatova 1968, Fig. 2) | Glabrous | Centrally densely, regularly covered with strongly, evenly sclerotized, scalelike asperities, surrounded by microteeth (Volkovitsh & Hawkeswood 1994, Fig. 17) |
| Metathorax | Withouth distinct ambulatory pads (Alekseev & Soldatova 1968, Fig.2) | With well-defined ambulatory pads on both dorsal and ventral surfaces, connected by inner structures (Volkovitsh & Hawkeswood 1987, Fig. 18) | Without distinct ambulatory pads (Alekseev & Soldatova 1968, Fig. 2) |
| Body surface | Mainly glabrous, with sparse setae and narrow zones of poorly developed microspinulae and tubercles | Mainly glabrous with very sparse setae and indistinct zones of microspinulae | Almost totally covered with microteeth, with setae laterally |

(continuation on the next page)

| | | | |
|---|---|---|---|
| Proventricular fields of microteeth (***) | With developed, dense microteeth situated by groups or one by one on the tops of poorly sclerotized tubercles | With developed, dense microteeth situated by groups or one by one on the tops of sclerotized tubercles (Soldatova 1973, Figs 1-3; Bílý 1975, Figs 49-56) | With poorly sclerotized, sparse microteeth situated one by one or, rarely, by groups on the tops of unsclerotized tubercles (Soldatova 1969, Fig. 1) |

(*) See also Alekseev & Soldatova 1968, Soldatova 1969, 1973, Bílý 1975, Volkovitsh & Hawkeswood 1987, 1993, 1994.
(**) See for comments in Volkovitsh & Hawkeswood 1994, p. 24, footnote 6.
(***) See for comments in Volkovotsh & Hawkeswood 1994, p. 25, footnote 7.

palpi. The differences between Anthaxiini, Melanophilini and Kisanthobiini are shown in the Table 1. It is obvious that *Chalcogenia* has nothing in common with both latter tribes. Some larval characters of *Chalcogenia* were also compared with Australian genera *Neocuris* Fairmaire, 1877 (Volkovitsh & Hawkeswood 1987), *Anilara* Thomson, 1879 (Volkovitsh & Hawkeswood 1993) and *Melobasis* Laporte & Gory, 1837 (Volkovitsh & Hawkeswood 1994); it was concluded that these taxa are not closely related to Anthaxiini or Melanophilini and that *Chalcogenia*, due to its larval characters, should be included to Anthaxiini.

## Key to the African genera of Anthaxiini

1(4) Body short and stout, less than twice as long as wide; pronotal sculpture homogenous, consisting of regular, polygonal cells all over the whole pronotum; depressions at posterior pronotal corners very fine or missing: anal sternum 4 times as wide as long, its lateral margins slightly concave; prosternum convex; South Africa.

2(3) Elytra more convex completely covering pygidium, each elytron with 4 longitudinal, slightly elevate carinae; elytral epipleura not reaching elytral apex; pronotal sides convex, lateral pronotal margin double in posterior half; antennal sensory pits open; dark blue -green species. ..... *Brachanthaxia* Théry, 1930

3(2) Elytra less convex, flattened, slightly uneven and shortened, not covering pygidium; elytral epipleura well-developed reaching elytral apex; pronotal sides straight or slightly incurved before posterior angles, lateral pronotal margin simple; antennal sensory pits nearly closed (Fig. 29); dark bronze species. ..... *Brachelytrium* Obenberger, 1923

4(1) Body slender, 2.5–3.5 times as long as wide; pronotal sculpture consisting of simple punctures on disc and rounded cells at posterior corners or the sculpture is more complicate: polygonal or rounded cells which are indistinct at anterior pronotal margin, transverse wrinkles combined with polygonal cells, fine concentric or longitudinal wrinkles or combination of cells, transverse wrinkles or concentric wrinkles; depressions at posterior pronotal corners well-developed; anal sternum about twice as wide as long, its lateral margins straight or convex; prosternum flat or very slightly convex; whole African continent.

5(6) Pronotal sculpture consisting of simple, fine punctures on disc and rougher, often umbilicate, punctures at posterior corners which can rarely form short and fine, longitudinal wrinkles; all abdominal sterna grooved medially; elytral epipleura flat or convex, shortened, reaching usually only hind third of elytra; large species (9–16 mm); whole African continent, Israel, Jordan. ..... *Chalcogenia* Saunders, 1871

6(5) Pronotal sculpture never consisting of fine, simple punctures on disc being always more complicate: in the simplest case it consists of polygonal and rounded cells (with or without central grains) which are indistinct or missing near anterior pronotal margin but usually the pronotal sculpture consists of the combination of polygonal cells, transverse (rarely longitudinal) wrinkles or fine concentric lines; abdomen without medial groove, all sterna convex; elytral epipleura well-developed, usually groove-like, reaching or nearly reaching elytral apex; usually smaller species (3–12 mm); worldwide distribution (except of Australian region). ..... *Anthaxia* Eschscholtz, 1829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