Genus	Vol. 12 (4): 563-575	Wrocław, 28 XII 2001

A description of the larva of *Agathidium kumaonicum* Angelini et De Marzo, 1985 (*Coleoptera*: *Leiodidae*)

Aleksandra Kilian
Zoological Institute, University of Wrocław, Sienkiewicza 21, 50-335 Wrocław, Poland,
e-mail: alkagath@biol.uni.wroc.pl

Abstract. The larva of *Agathidium kumaonicum* Angelini et De Marzo, 1985 is described. This is the first agathiid larva described and illustrated from the Orient. Its characters seem to be unique among the family *Leiodidae*: absence of urogomphi, reduced antennae, labrum partly fused with clypeus.

Key words: entomology, morphology, larva, *Coleoptera*, *Leiodidae*, *Agathidium kumaonicum*, Oriental region.

INTRODUCTION

This is the first description of larva of the tribe *Agathidiini* from the Oriental region. At presently, 135 species of the tribe are known from Nepal, including 129 members of the genus *Agathidium*. The larva described represents *Agathidium kumaonicum* Angelini et De Marzo, 1985, of the subgenus *Neoceble* and the group *nigripenne*. The species is widespread in Nepal and India (Kumaon, Kashmir, Himachal Pradesh) (Angelini & De Marzo 1985, 1986, 1990, 1994) and associated with *Myxomycetes* in the forests of northwestern India (Angelini & Stephenson 1990).

Acknowlegdements

I would like to express my sincere thanks to Prof. Alfred Newton Jr. for the loan of the material for this study.

MATERIAL AND METHODS

The description is based on a single specimen borrowed from the collection of Prof. A. NEWTON (Field Museum of Natural History, Chicago). The head of the larva had been separated from the rest of the body, and both the head and the body were mounted in „Permount" medium. All drawings were made without additional preparing because of fragility of the larva. For this reason the head is in dorsal position, and the thorax and abdomen are in lateral view. The larva was examined and measured at magnification up to 600x using Phase Contrast microscope "Nikon" and "Eco-Vision"(400x).

The chaetotaxy system, abbreviations, designations and measurements follow KILIAN (1998), based on papers by ASHE and WATROUS (1984) and WHEELER (1990). In some cases I give more than one term to describe one structure. I do not attempt to discuss the terminology but I would like to underline the terminological disparity between various authors describing the morphology of beetle larvae. For example, CORBIÈRE (1967) classified a few types of sensilla under the term "stylus" ("styles sensoriels"): pigmented and translucent, with or without socket and with various types of innervation

Another problem is caused by campaniform sensilla. When pores on tergites are a kind of campaniform sensilla or "pores sensoriales" as defined by CORBIČRE (1967), I assume that campaniform sensilla protruding above the surface represent type D of ZACHARUK (1962) but are also similar to the plate organs (sensilla placodea) described by SNODGRASS (1926).

The chaetotaxy of sensilla is not homologized with that presented in other descriptions of leiodid larvae; such an attempt would be premature when the description is based on one specimen, one larval stage and when there are no data on the function and innervation of these sensilla.

Based on the previous descriptions of agathidiid larvae, the specimen represents the second or the third larval stage.

Agathidium kumaonicum ANGELINI et DE MARZO, 1985

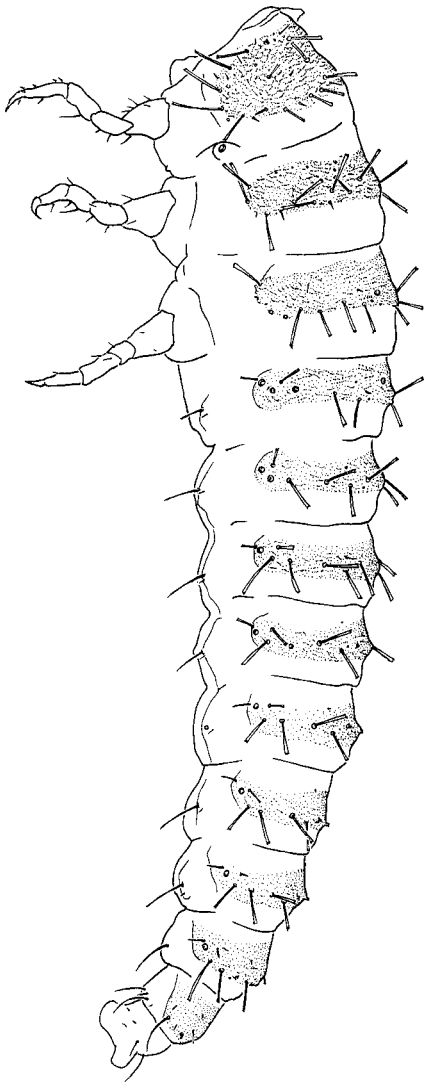
DIAGNOSIS

Two stemmata. Antennae reduced, with two segments. Primary setae of tergites and partially of head very characteristic: with corrugated sculpture of walls, blunt-ended, irregularly star-shaped, called „expanded setae" by NEWTON (1991). Microsculpture present only on basal part of head. Epicranial stem absent. Clypeus produced. Labrum partly fused with clypeus. Mandibles slightly asymmetrical, apically bidentate with smooth internal edge, mola toothed regularly on ventral side and wrinkled dorsally. Apex of maxilla divided into fimbriate galea and lacinia with 5 spine-like setae. Dorsal integument of tergites with granulated microsculpture, the densest and arranged into honeycomb-structure on pronotum,

sparse and arranged into rows on the rest of dorsal segments. Abdominal tergite IX with large, expanded setae. Urogomphi absent.

DESCRIPTION OF LARVA

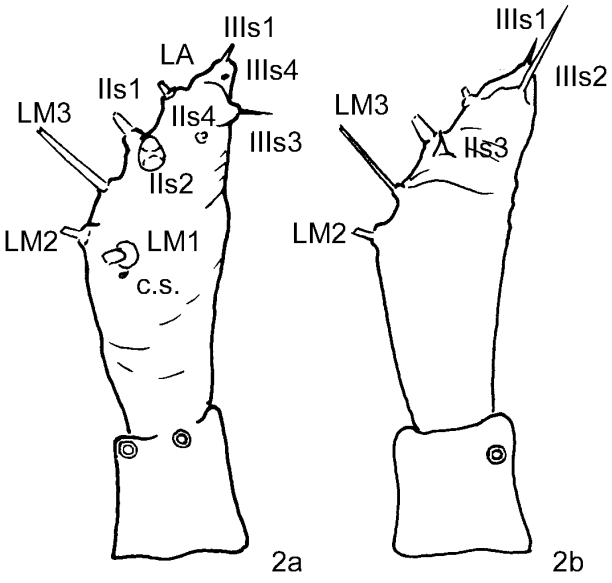
Body (fig. 1). Cylindrical, elongated, weakly sclerotized; length: 2.98 mm; integument with granulated microsculpture, no urogomphi.



1. *Agathidium kumaonicum,* lateral view of thorax and abdomen

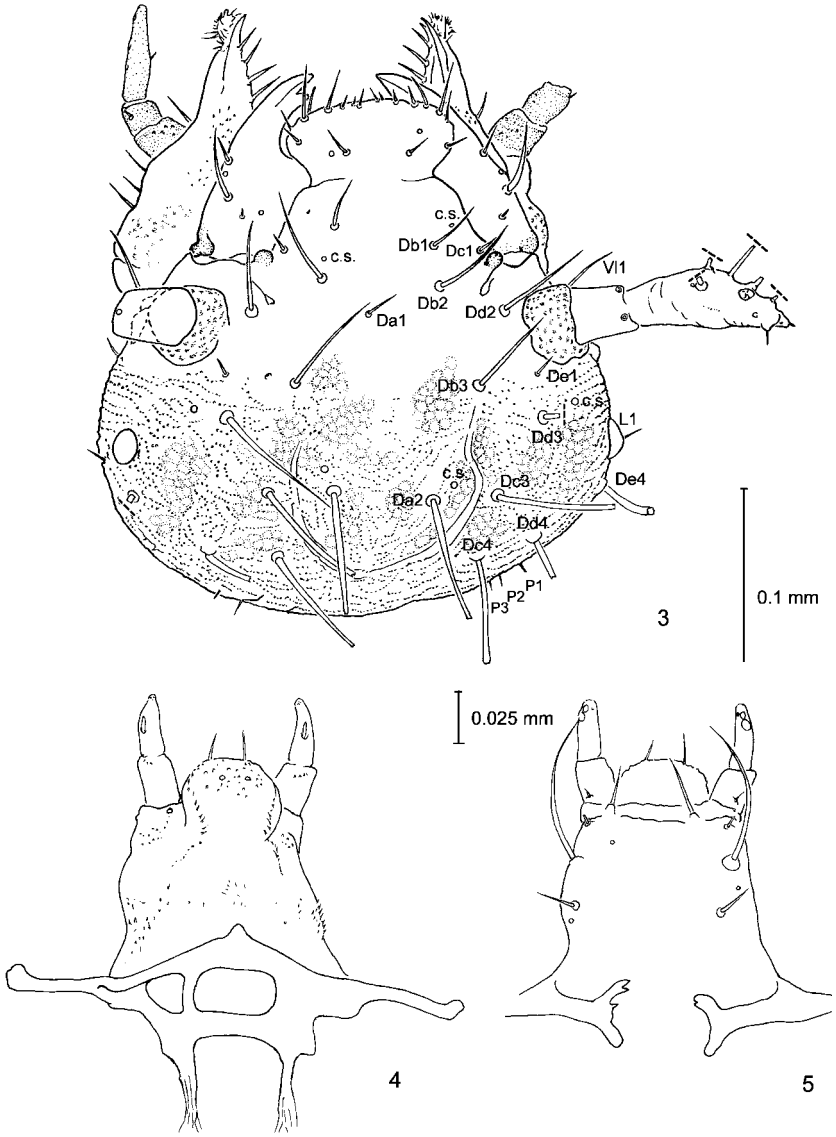
Head (fig. 3). Width: 0.42 mm; length: 0.42 mm. Chaetotaxy: row Da with setae: Da1, Da2; row Db with setae: Db1, Db2, Db3, single Db*a; row Dc with setae: Dc1, Dc3, Dc4; row Dd with setae: Dd2, Dd3, Dd4; row De with setae: De1, De2; lateral setae: L1, L2, Vl1; 3 posterior small setae (P1-P3); campaniform sensilla: 1 near Da2, 1 near Dd3, 1 near Db1, 1 near Db2 (asymmetrical); setae: Da2, Dc3, Dc4, Dd3, Dd4, De2 expanded, with corrugated walls; setae in anterior part of head (Dd3 and above it) with pointed ends. Clypeus produced. Labrum partly fused with clypeus. Epicranial suture distinct in posterior part of cranium, u-shaped, without epicranial stem. Two pairs of stemmata. Granulated microsculpture on distal half of head.

Antenna (figs 2a,b, 3, 12, 13). Number of antennomeres reduced to 2; first article as long as broad, asetose, with 2 campaniform sensilla dorsally and 1 campaniform sensillum latero-ventrally; second segment 3 times longer than the first one, with: 3 setae (broken tips) latero-medially (LM1-LM3), 1 seta latero-apically (LA), 2 campaniform sensilla (?), 3 thin-walled sensilla (called "solenidia" by ASHE and WATROUS, 1984): 1 of them truncated rather than digitiform (IIS1), the other semicircular rather than digitiform (IIS2) called "antennal sensory appendix" by ZACHARUK (1962), or "sensory appendage", "large solenidium" by ASHE and WATROUS (1984), or "digitiform organ", "digitiform solenidium" by WHEELER (1990). Near these sensilla 1 pigmented, spiniform sensillum („style sensoriel" of CORBIÈRE, 1967). Above them 1 small sensillum (IIS4) dorso-medially resembling campaniform sensilla but protruding above the surface of cuticula (like type D campaniform sensillum on plate 2A in ZACHARUK, 1962).

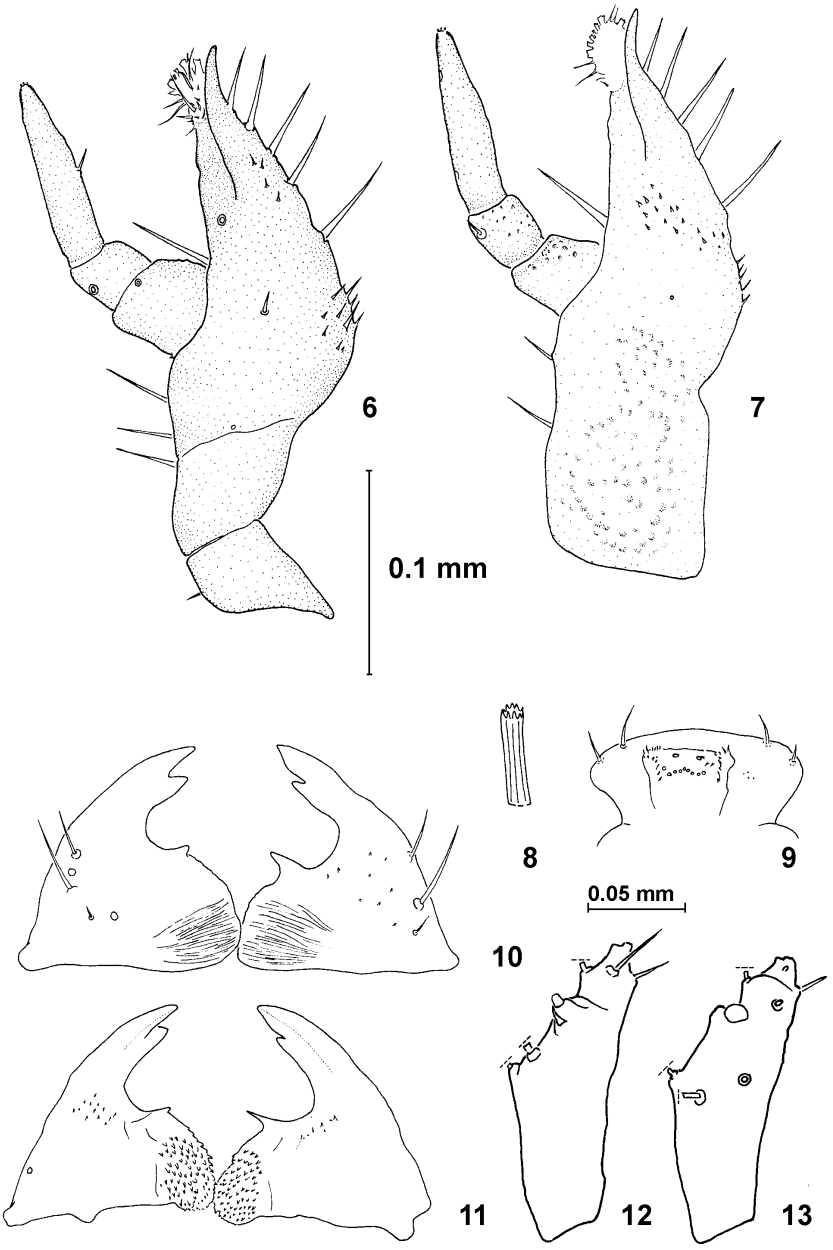


2. *Agathidium kumaonicum*, right antenna: a - dorsal view, b - ventral view

Apical part of the second antennomere (which seems to correspond to the third segment in other leiodid larvae) with: 1 seta (LA, broken? or other sensilla), 3 styli or solenidia (ASHE and WATROUS, 1984): latero-dorsally (IIIS3); 1 medio-ventrally (IIIS2); 1 pointed at the apex (IIIS1) and 1 very small (visible as spot in fig 2a) sensillum below IIIS1 (IIIS4).



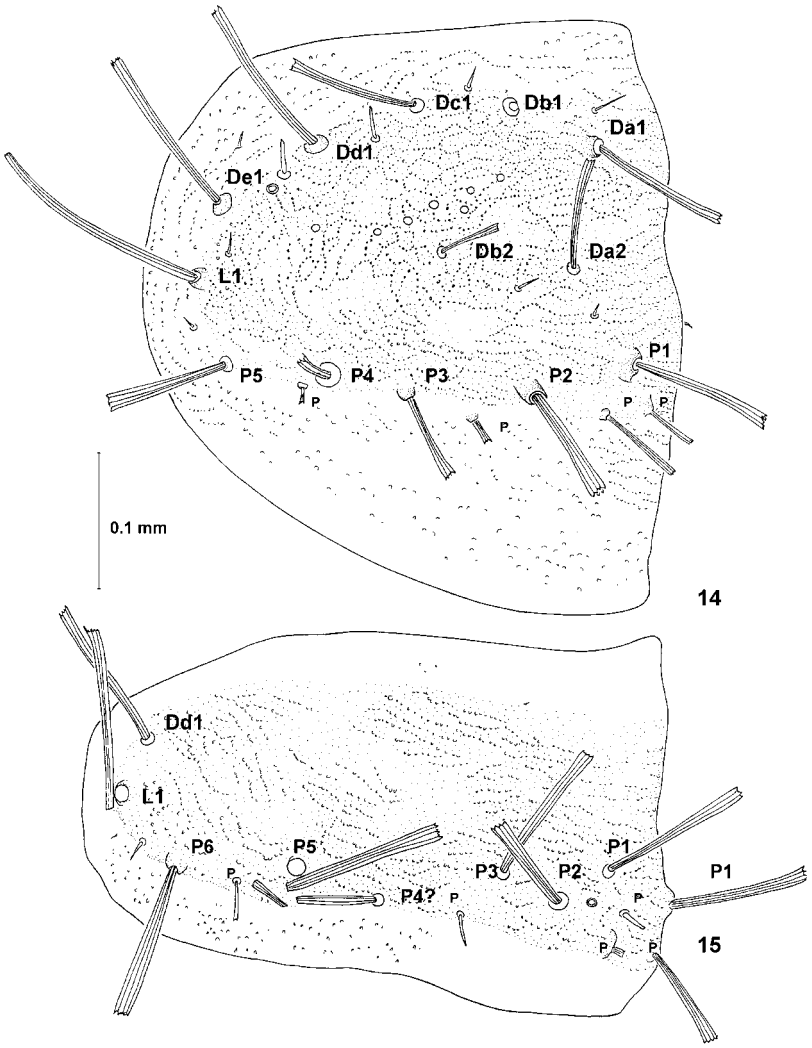
3-5. *Agathidium kumaonicum*: 3 - head, dorsal view; 4 - labium, dorsal side; 5 - labium, ventral side



6-13. *Agathidium kumaonicum*: 6 - maxilla, ventral side; 7 - maxilla, dorsal side; 8 - apex of setae; 9 - labrum, ventral side; 10 - left and right mandibles, dorsal side; 11 - left and right mandibles, ventral side; 12, 13 - apical segment of left antenna: 12 - ventral side; 13 - dorsal side

Mouthparts:

Labrum (figs 3, 9). Transverse, rounded marginally, constricted at base, partially fused with clypeus, without emargination. Chaetotaxy as follows: dorsal surface with a pair of setae in its mid part and 1 pair of setae laterally, 1 pair of campaniform sensilla; 5 pairs of setae on margin of labrum; ventral part of labrum: 2 pairs of setae on margin. Epipharynx: lobes with rows of microtrichiae;

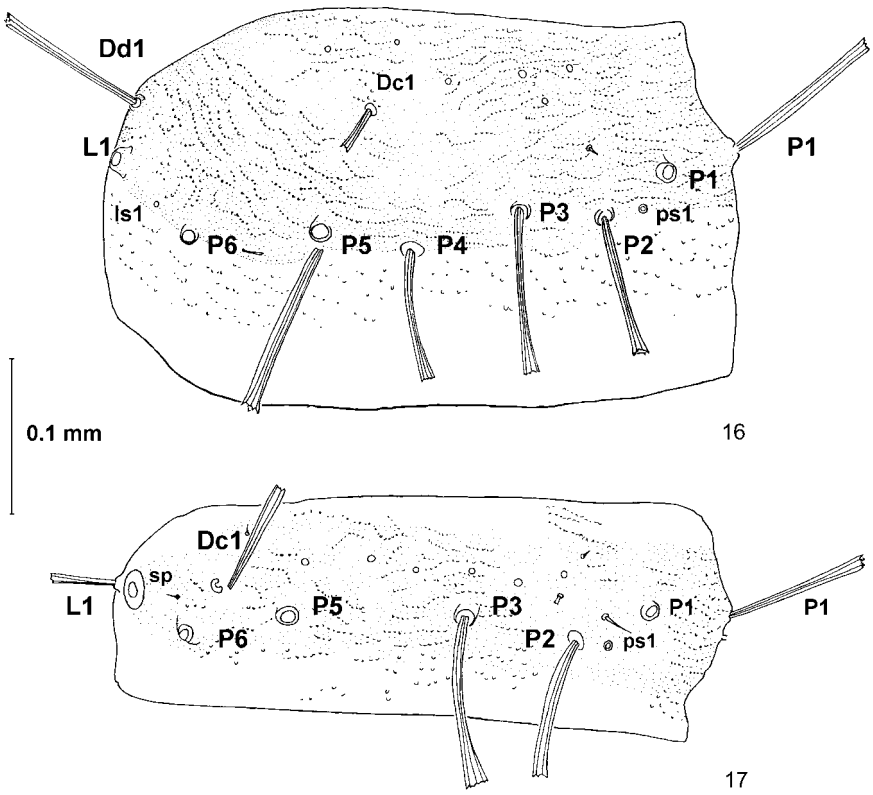


14-15. *Agathidium kumaonicum*: 14 - pronotum, lateral view; 15 - mesonotum, lateral view

transverse row of 9 small sensilla ("cone campaniform sensilla" of ZACHARUK, 1962 or „pores sensoriels" of CORBIÈRE, 1967); a pair of campaniform sensilla above.

Mandibles (figs 10, 11). Asymmetrical, apically bidentate, internal edge smooth, right prostheca pointed and longer than left, left prostheca blunt and smaller than right. Mola: ventral side with regular teeth, dorsal side with nearly parallel wrinkles, 3 setae, 3 campaniform sensilla on left mandible: 2 dorsally, 1 ventrally.

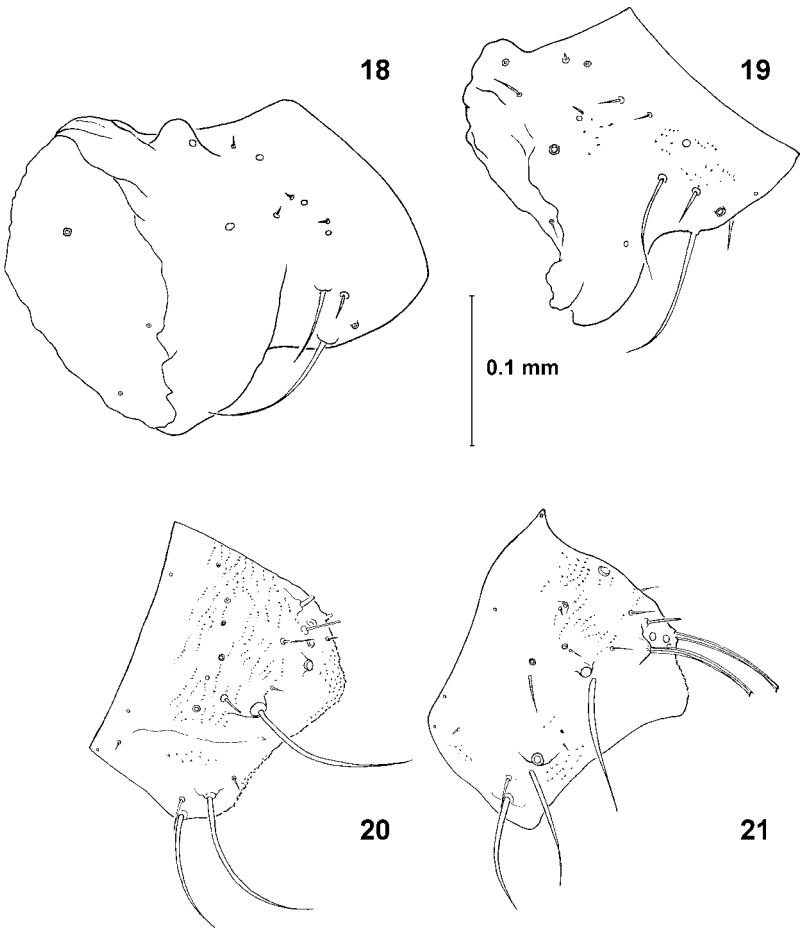
Maxilla (figs 6, 7). Galea with fimbriate apex and 1 campaniform sensillum at base. Lanceolate lacinia: ctenidium with 5 long, slender spine-like setae (no sockets contrary to most agathiid larvae, only one unidentified species from the Bieszczady Mountains has similarly fixed spines: KILIAN, 1998: 205); a group of small spines below. Stipes not distinctly separated from mala, with 5 setae laterally, 1 seta dorsally and 1 small campaniform sensillum. Cardo simple with 1



16-17. *Agathidium kumaonicum*: 16 - metanotum, lateral view; 17 - abdominal segment I, lateral view

seta. Maxillary palp: segment I: 1 small seta at base, 1 campaniform sensillum, asperities on dorsal side; segment II: 1 seta, 1 campaniform sensillum; asperities on dorsal side; segment III: 2 pores (campaniform sensilla ?) in lateral position; 1 peg-like seta/sensillum called "organe digitiforme" by CORBIÈRE (1967) and "digitiform peg" by CROWSON (1981); 1 seta; group of small peg-like sensilla on the membrane at the tip of maxillary palp ("bouquet sensoriel" of CORBIÈRE, 1967).

Labium (figs 4, 5). Labial palp: segment I: 1 small seta ventrally; segment II: 3 sensilla subapically on ventral side; peg sensilla (see segment I of maxillary palp) on dorsal side; "bouquet sensoriel" at apex; ligula semicircular with: 2 setae apically, serrate lobes ventrally, a pair of campaniform sensilla in the middle;



18-21. *Agathidium kumaonicum*: 18,19 - anal membrane, lateral view; 20,21 - abdominal segment IX, lateral view

dorsal side of labium with 4 pairs of setae of various size and 2 pairs of campaniform sensilla; hyphopharyngeal sclerome subquadrate, with complete posterior and anterior bridges.

Leg (figs 24-27).

Coxa. Irregularly shaped, chaetoaxy as in figures, minute pores indicated with arrow.

Trochanter tubular.

Femur. Short, lenght shorter than double width.

Tibia. Longer and thinner than femur.

Tarsungulus. Pointed, long, with two setae.

Pronotum (fig. 14). Transverse. Chaetotaxy: all large setae and some of short setae with corrugated sculpture and star-shaped tips (expanded); row Da with 2 setae: Da1, Da2; row Db: setae Db1 and Db2; row Dc: seta Dc1; row Dd: seta Dd1; row De: seta De1; row L: seta L1; posterior transverse row: P1-P5, between and slightly below row P: smaller but also expanded setae (between P1/P2, P2/P3, P3/P5); 1 campaniform sensillum between Dd1/De1; 7 pores grouped in the mid part of tergum; 6 short setae blunt or pointed between: Da1/Db1, Db1/Dc1, Dc1/Dd1, Dd1/De1, De1/L1, L1/P5; 2 short pointed setae below Da2, Db2; tergit with granulation arranged into more or less regular honeycomb-like figures.

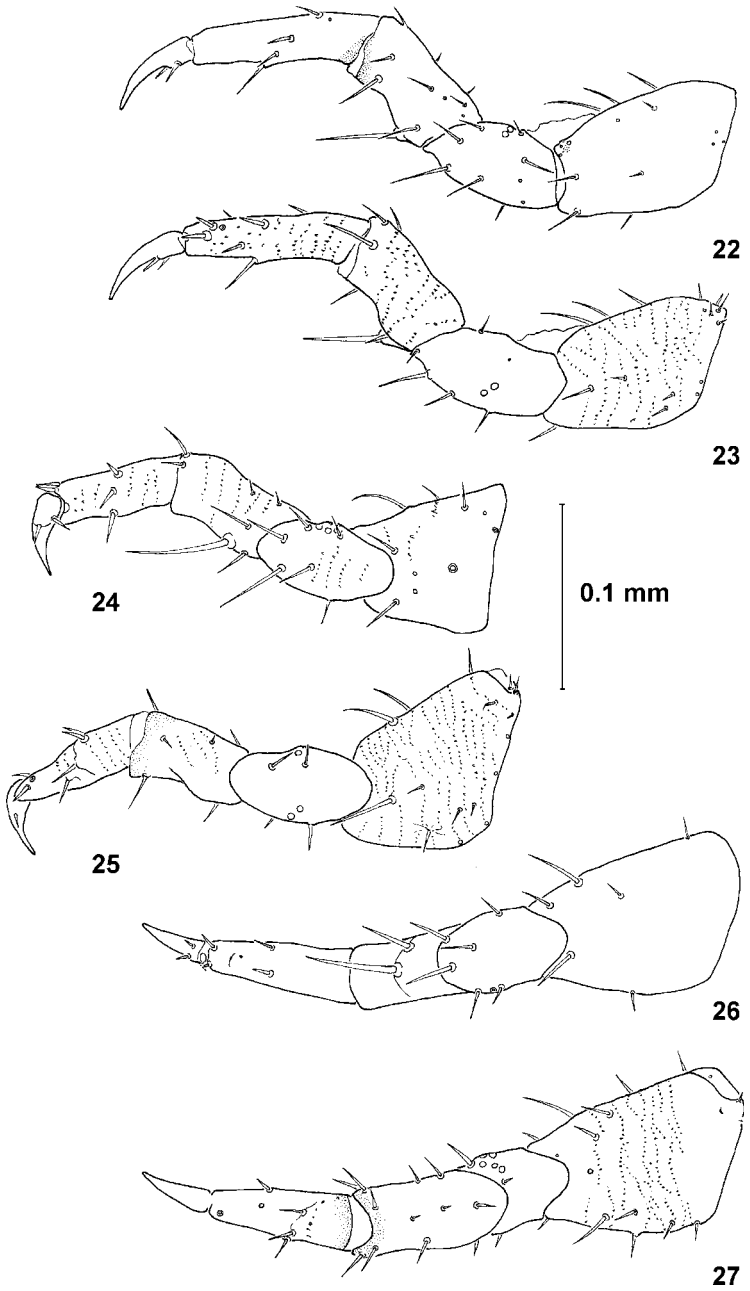
Mesonotum (fig. 15). Transverse. Chaetotaxy: primary, large setae expanded with corrugated sculpture: posterior row of setae: P1-P6; lateral seta L1; single seta Dd1; between and slightly below posterior row of setae: 2 minute setae pointed; 2 minute setae blunt-ended; 1 campaniform sensillum between P2/P3 (ps1); 2 setae with corrugated sculpture; granulation arranged into short rows; pores absent.

Metanotum (fig. 16). Transverse: chaetotaxy: primary, large setae with corrugated sculpture and star-shaped tips: posterior row: P1-P6, 1 additional P; Dc1; Dd1; L1; 1 minute, pointed seta; 1 campaniform sensillum between P2/P3; group of 6 pores; granulation arranged into short rows.

Abdominal segment I (fig. 17). Transverse. Chaetotaxy: primary, large setae with corrugated sculpture and star-shaped tips: posterior row: P1-P6; lateral seta L1; Dc1; 4 minute setae pointed; 1 minute seta blunt ended; group of 6 pores; 1 campaniform sensillum between P2/P3; microsculpture like on others tergites.

Abdominal segment IX (figs 20, 21). Urogomphi absent; numerous setae of various type and size (minute and large, pointed and expanded, smooth and corrugated). It is unknown if tergum is divided or undivided.

Anal membrane (figs 18,19). Dorsal view: 3 pairs of setae, a pair of protruding campaniform sensilla (type D? of ZACHARUK, 1962); ventral view: 4-5 pairs of minute setae and a few pores and campaniform sensilla.



22-27. *Agathidium kumaonicum*: 22,23 - left proleg: 22 - posterior view; 23 - anterior view; 24,25 - left second leg: 24 - postero-ventral view; 25 - antero-dorsal view; 26,27 - left hind leg: 26 - ventral view; 27 - dorsal view

MATERIAL

"Associated with *Agathidium kumaonicum* ANGELINI & DE MARZO, 1985; India: Him. Prad., Narkanda, 2700 m 29 August 1987, leg. S.L. STEPHENSON, Lot No. 04446 ex *Cribraria* sp.".

REMARKS

The morphology of the larva of *Ag. kumaonicum* differs very much from other members of the tribe *Agathidiini*. The lack of urogomphi, reduction of the third antennomere, produced clypeus, labrum only partly fused with clypeus - make the diagnosis of this species unique in this tribe and even in the whole family *Leiodidae* as far as their preimaginal stages are described in details (ANGELINI & DE MARZO 1984, WHEELER 1990, NEWTON in STEHR 1991, ROZIČKA 1996, RATAJCZAK 1995, 1996, KILIAN 1998). Up to now, the lack of urogomphi was one of the diagnostic characters of larvae of the family *Leiodidae*. However, I observed the absence of urogomphi not only in larvae of *Ag. kumaonicum* but also in larvae of *Liodopria serricornis* (GYLLENHAL), whose prepupal stage I described (KILIAN 1998), with urogomphi characteristic of pupae. The redescription will be published soon.

Anyway, the combination of characters like the one described for *Ag. kumaonicum* does not occur in any other beetle family. The detailed chaetotaxy and other diagnostic characters of the larva described here are very similiar to those described for larvae of *Agathidiini*.

The above features raise two questions: the phylogenetic significance of these characters in the family *Leiodidae,* and how common are these characters in agathidiid larvae in the Oriental region (where the number of species is the highest). I hope this paper will encourage coleopterologists to study preimaginal stages of Asian *Leiodidae*.

REFERENCES

ANGELINI, F., DE MARZO, L., 1984. Morfologia della larva matura e della pupa in *Agathidium varians* BECK (*Coleoptera*, *Leiodidae*, *Anisotomini*). Entomologica, Bari, **19**: 51-60.

—, 1985. Reports of *Agathidium* from Central Nepal and North India: expeditions 1979 and 1981 of Geneva Natural History Museum (*Coleoptera*, *Leiodidae*). Rev. suisse Zool., **92** (1): 33-76.

—, 1986. Expeditions 1982, 1983 and 1984 of Geneva Natural History Museum in Nepal. *Anisotomini* (*Coleoptera*, *Leiodidae*). Rev. suisse Zool., **93** (4): 827-873.

—, 1994. Catalogue of the *Agathidiini* of Nepal with Descriptions of new Species (*Coleoptera*: *Leiodidae*). Stuttgarter Beitr. Naturk. Ser. A. Nr. 505, 53 pp.

ANGELINI, F., STEPHENSON, S., L., 1990. *Agathidium* collected in Northwestern India with description of *Agathidium shimlense* N. sp. Boll. Soc. ent. ital., **122** (2): 119-122.

ASHE, J., S., WATROUS, L., E., 1984. Larval chaetotaxy of *Aleocharinae* (*Staphylinidae*) based on a description of *Atheta coriaria* KRAATZ. Col. Bull., **38** (2): 165-179.

CORBIÈRE, G., 1967. Anatomie sensorielle des appendices céphaliques de la larve du *Speophyes lucidulus* (DELAR.) (Coléoptère cavernicole de la sous-famille des *Bathysciinae*). Ann. Spéléol. **22**: 417-431.

CROWSON, R., A.,1981. Biology of the *Coleoptera*. Academic Press. A Subsidiary of Harcourt Brace Jovanovich, Publishers. London, New York, Toronto, Sydney, San Francisco. 802 pp.

KILIAN, A., 1998. Morphology and phylogeny of the larval stages of the tribe *Agathidiini* (*Coleoptera*: *Leiodidae*: *Leiodinae*). Ann. Zoologici, **48**: 125-220.

NEWTON, A., F., Jr., 1991. *Leiodidae*. Round Fungus Beetles, Small Carrion Beetles and Allies, pp. 327-329. *In* F.,W., STEHR (ed.). 1991. Immature Insects. Michigan State University. Kendall/ Hunt Pub. Co., Dubuque, Iowa.

RATAJCZAK, A., 1995. Redescription of the third larval instar of *Anisotoma humeralis* (F.) (*Coleoptera*: *Leiodidae*). Genus, **6**: 277-288.

—, 1996. Description of the third larval stage of *Anisotoma orbicularis* (HERBST) and redescription of the third larval stage of *A. castanea* (HERBST) (*Coleoptera*: *Leiodidae*). Genus, **7**: 351-378.

ROZIČKA, J., 1996. Description of the third instar larvae of *Anisotoma axillaris* and *A. glabra* (*Coleoptera*: *Leiodidae*), with a key to larvae of European *Anisotoma* species. Acta Soc. Zool. Bohem., **60**: 455-468.

SNODGRASS, R.,E., 1926. The morphology of insect sense organs and the sensory nervous system. Smithson. Misc. Coll., vol. **77**, no 8, 80 pp.

STEHR, F.W. (ed). 1991. Immature Insects. Michigan State University. Kendall/Hunt Pub. Co., Dubuque, Iowa.

WHEELER, Q., D., 1990. Morphology and ontogeny of postembryonic larval *Agathidium* and *Anisotoma* (*Coleoptera*: *Leiodidae*). Am. Mus. Nov., no. 2986, 46 pp., 105 figs, 3 tabb.

ZACHARUK, R., Y., 1962. Sense organs of the head of larvae of some *Elateridae* (*Coleoptera*): their distribution, structure and innervation. J. Morphol., **111**: 1-33.