

**New *Agathidium* Panzer, 1797 species (Coleoptera: Leiodidae: Leiodinae)
from China without or with reduced eyes**

Zdeněk ŠVEC

Kamenická 4, 170 00 Praha 7, Czech Republic
e-mail: zd.svec@volny.cz

Taxonomy, descriptions, key, Leiodidae, Leiodinae, Agathidiini, *Agathidium*, China

Abstract. *Agathidium* (*Agathidium*) *cavum*, *A. (A.) cryptophthalmum*, *A. (A.) minoculum*, *A. (A.) daublebskyorum*, *A. (Macroceble) caecum* and *A. (M.) fernandoangelinii* spp. nov. from China are described, distinguished from similar species and figured. The key to the identification of new and similar species is presented.

INTRODUCTION

The genus *Agathidium* Panzer, 1797 is the most numerous genus within the tribe Agathidiini Westwood, 1838 with currently more than 800 described species. Although several important recent works dealing with the systematic position using basic morphological characters (Angelini 1993, 1995, 2004, 2010), presenting phylogenetic species concept (Wheeler & Miller, 2005) or cladistic analyses (Wheeler 1990, Kilian 1988, Angelini & Peck 2000, Park, Leschen & Ahn 2013) have been published, *Agathidium* is still a taxonomically difficult genus. Its generic position and the position, validity and justness of the existing subgenera and species groups are still far from settled. Being aware of these difficulties and taking into account some practical advantages of the simple morphological approach I follow Angelini's concept of the genus (1993, 1995, 2004, 2010) in the present work.

The paper deals with those Chinese *Agathidium* species which share the same characters:

1. lack of membranous wings,
2. lack of eyes or eyes strongly reduced,
3. specific rhombic shape of the head,
4. long temples (at least 0,5 times of the eye length with few exceptions),
5. roundly angulate temple angles in dorsal view,
6. supraocular carina merges into postero-lateral marginal crest,
7. small size of body: 1.5-2.5 mm,
8. yellow-red or reddish-brown dorsum,
9. unicolorous light antennae,
10. metasternum usually shortened even in the species belonging to *Agathidium* s. str.

The shape of body of these species is in a range from short oval to very oblong oval. Dorsal punctures bear short light coloured recumbent setae predominantly directed forward on head, backward or obliquely backward on pronotum and irregularly or backward on elytra. Mainly those species lacking eyes have a few very sparse long erect setae on their dorsum.

Up to now, 25 species of the subgenus *Agathidium* s.str., which occur in Pakistan, India, Nepal and China and seven species of the subgenus *Macroceble* Angelini, 1993 from Malaysia, India and China, having the above mentioned morphological characters have been known. Nine species of *Agathidium* s.str. and three *Macroceble* occur in China. Among all the Asian species only one - *Agathidium (Macroceble) anophthalmicum* Angelini & De Marzo, 1984 from India (Darjeeling), is known to lack eyes completely the remaining species possess reduced eyes.

Altogether twelve *Agathidium* species having the combination of the characters mentioned above are known to occur in China. In the present paper, six species of *Agathidium* having the characters mentioned above are described as new to science. Two of them are totally lacking eyes.

MATERIAL AND METHODS

Thanks to the courtesy of Aleš Smetana (Ottawa, Canada), Michael Schülke (Berlin, Germany) and Olaf Jäger (Dresden, Germany) the author was provided with very interesting material, recently collected in China, containing species lacking eyes or having eyes strongly reduced.

Unless otherwise stated, the descriptions of the new species are based on the holotypes only. The description of the variability is based on the paratype specimens.

The measurements of total body length were taken from all the specimens examined. Specific measurements of the individual body parts were taken from the holotypes only. They were measured to the first decimal place.

Abbreviations of body parts and measurements:

AII-AXI	Antennomeres II-XI.
AIII/AII	The ratio of the length of the antennomeres III:II.
MTLM	Metasternal length measured at midline from the top of anterior metasternal process and top of posterior metasternal process.
MTLC	Metasternal length measured at the shortest distance (between mid- and hind-coxae).
MTW	Metasternal width measured between outermost postero-lateral points.
MTW/MTLM or MTLC	- Ratio between relevant measurements.
L	Length.
W	Width.
L/W or W/L	- Ratio between measurements

Collection abbreviations:

MSBC	Michael Schülke, Berlin, private collection, Germany;
SMTD	Staatliches Museum für Tierkunde, Dresden, Germany;
ZSPC	Zdeněk Švec, Prague, private collection, Czech Republic.

The material examined was compared with the type and other material deposited in the author's collection and the collection of Jonathan Cooter (Oxford, England). The material mentioned in this paper is deposited in the collections of MSBC, SMTD and in ZSPC.

In this paper, the term lateral angle of elytra is used instead of ‘humeral angle’ (Angelini, 2004), ‘humeral “angle” ’ (Wheeler & Miller, 2005) or ‘humerus’ (Park, Leschen & Ahn 2013) because it is obvious, in the past, this term was used by different authors without necessarily the same precise meaning. Furthermore, the character being referred to (lateral angle) is frequently located far from humeral part of elytron, sometimes even close to mid-length of elytron. The terms supraocular carina (e.g. Angelini & Peck 2000) is used in this work although some of the species described below lack eyes. For the carina occurring in some species of *Agathidium* just beneath eyes and well visible in lateral view the term ‘subocular carina’ is used in this paper even if eyes are lacking. In those species lacking eyes or ommatidia, the “temple” is defined as being the lateral area of the head from the point of fusion of the supra- and sub-ocular carinae to the mid-point in the curvature of the posterior-lateral angle of the head. The ratio of eye length to temple length is best observed in oblique lateral view. The term ‘base of the spermatheca’ refers to the adjacent portion of the basal part of spermatheca where the duct inserts.

Dissected male and female genitalia were mounted in gum Arabic or in Euparal on the same plate or on a transparent plate added to the same pin as the relevant specimen. Each holotype or paratype is indicated by a red label bearing the status of the specimen (holotypus or paratypus, respectively) name of the species, the name of the author, year 2013 and attached to the same pin as the relevant specimen. The male genitalia have been figured in dorsal and lateral view. The shape of the operculum is indicated in dorsally figured median lobe by a dotted line.

DESCRIPTIONS

Agathidiini Westwood, 1838

Genus *Agathidium* Panzer, 1797

The key to the identification of the Chinese *Agathidium* sharing the characters 1-10 mentioned above in the Introduction.

Generally the species are variable in details and simultaneously uniform in the general appearance. Therefore dissection and the examination of the genitalia is necessary for correct identification.

- | | | |
|------|--|-----------------------------------|
| 1 | Femoral lines lacking, metasternum shortened, lateral angle of elytra feebly developed unobtrusive (subg. <i>Macroceble</i>)..... | 2 |
| - | Femoral lines developed, metasternum well developed or shortened (subg. <i>Agathidium</i>)..... | 6 |
| 2(1) | Species lacking eyes. Tarsal formula 4-4-4 in male, | 3 |
| - | Eyes strongly reduced but visible in dorsal view. Tarsal formula 5-5-4 in male. | 4 |
| 3(2) | Average size larger (1.8-2.2 mm). Median lobe of aedeagus constricted before tip (Fig. 20). Spermatheca U-shaped, stout (Fig. 22). China (Yunnan)..... | <i>A. (Macr.) caecum</i> sp. nov. |

- Body on average smaller (1.4-2.0 mm). Median lobe of aedeagus evenly narrowed apically (Fig. 26). Spermatheca U-shaped, slim (Fig. 28). China (Yunnan). *A. (Macr.) fernandoangelinii* sp. nov.
- 4(2) Median lobe very broadly rounded on apex (Fig. 27 in Angelini 2002). Antennal segment III distinctly longer than segment II (AIII/AII=1.4). Length 2.1 mm. China (Hubei). *A. (Macr.) nanum* Angelini, 2002
- Median lobe of aedeagus apically emarginate or conical with rounded tip (Figs 42, 43 in Angelini & Cooter 2003). Antennal segment III approximately as long as segment II. 5
- 5(4) Median lobe apically emarginate (Fig. 43 in Angelini & Cooter 2003). Spermatheca J-shaped with stout basal part. Longitudinal carina on mesosternum weakly developed. Length 2.2-2.3 mm. China (Hubei).
..... *A. (Macr.) penultimum* Angelini et Cooter, 2003
- Median lobe conical with rounded tip (Fig. 42 in Angelini & Cooter 2003). Mesosternal carina sharp. Length 1.5-1.7 mm. China (Jianxi, Fujian). *A. (M.) dongnanense* Angelini et Cooter, 2003
- 6(1) Sutural striae not developed on elytra. 7
- Sutural striae developed. Entire dorsum distinctly microreticulate. Median lobe deeply emarginate on apex (Figs 41, 42 in Angelini & Švec 2000). Length 3.4 mm. China (Gansu).
..... *A. (A.) janatai* Angelini et Švec, 2000
- 7(6) Eyes developed, but reduced, not visible in dorsal view. 8
- Eyes reduced but visible in dorsal view. Temples long, well developed. 11
- 8(7) Dorsum without microreticulation. 9
- Dorsum at least in part distinctly microreticulate. 10
- 9(8) Maximum width of head close behind posterior margin of eyes, temples broadly rounded, ratio of eye : temple length 2.7:1 (see from oblique lateral view). Antennomeres VI-X broader than long. Median lobe regularly narrowed to almost pointed tip (Fig. 8). China (Yunnan). 2.0 mm.
..... *A. (A.) cryptophthalmum* sp. nov.
- Maximum width of head at roundly angulate temples just behind posterior margin of eyes (position of eyes ascertained from lateral view). Antennomeres IV-X broader than long. Median lobe very broadly rounded apically (Fig. 18). China (Yunnan). Length 2.1 mm. *A. (A.) daublebskyorum* sp. nov.
- 10(8) Clypeus shallowly emarginate. Elytra microreticulate, punctured. Median lobe evenly curved to very shortly rounded apex (Fig. 11). Spermatheca U-shaped with swollen basal part (Fig. 13). Length 1.6-1.8 mm. China (Yunnan). *A. (A.) minoculum* sp. nov.
- Clypeus deeply emarginate. Elytra microreticulate, without puncturation. Aedeagus with nipple on apex, parameres swollen distally (Fig. 14 in Angelini & Cooter 1999). Length 1.6 mm. China (Zhejiang).
..... *A. (A.) nitidulum* Angelini et Cooter, 1999
- 11(7) Average size smaller (up to 2.5 mm). AIII/AII=0.9-1.3. 12
- Size larger (2.9-3.0 mm). AIII/AII=1.9. Elytra superficially microreticulate, not punctured. Head and pronotum smooth but punctured. Head with short temples (at most as long as one-third length of eyes). Aedeagus with nipple apically (Fig. 28 in Angelini 2002). China (Yunnan). *A. (A.) michaeli* Angelini, 2002
- 12(11) Median lobe not emarginate apically. 13
- Median lobe very deeply emarginate apically ending in two gradually widened rami (Fig. 2). Elytra microreticulate. Spermatheca with bulbous basal part (Fig. 4). Length 1.8-2.0. China (Zhejiang).
..... *A. (A.) cavum* sp. nov.
- 13(12) Median lobe broadly triangular at apex (Figs 37, 38 in Angelini & De Marzo 1998; Fig. 17 in Angelini & Cooter 1999). Spermatheca J-shaped (Fig. 39 in Angelini & De Marzo 1998; Fig. 18 in Angelini & Cooter 1999). 14
- Median lobe ending in nipple or small bump or broadly rounded apically or evenly narrowed to shortly rounded tip (Fig. 23 in Angelini & Cooter 2003; Figs 29, 32, 35, 43 in Angelini & Cooter 1999). Spermatheca U-shaped (Figs 30, 33, 36, 44 Angelini & Cooter 1999). 15
- 14(13) AIII longer than AII (AIII/AII=1.3). Aedeagus with slim parameres, operculum protruding a little at apex of median lobe in dorsal view; spermatheca with swollen basal part (Figs 37, 38, 39 in Angelini & De Marzo 1998). Tarsal formula 5-5-4 in male; 4-4-4 in female. Length 2.2-2.3 mm. China (Hubei).
..... *A. (A.) celatum* Angelini et De Marzo, 1998
- AIII as long as AII. Aedeagus with parameres swollen apically, operculum not visible in dorsal view; spermatheca with swollen basal part constricted and bent at base (Figs 16-18 in Angelini & Cooter 1999). Tarsal formula 5-5-4 in male, 5-4-4 in female. Length 2.1-2.4 mm. China (Jiangsu).
..... *A. (A.) zijinense* Angelini et Cooter, 1999

- 15(13) Parameres slim or unobtrusively widened apically. Median lobe broadly rounded on apex or evenly narrowed to very shortly rounded tip. Spermatheca U-shaped; if J-shaped spermatheca straight at base. 16
 - Parameres distinctly swollen apically; median lobe ending in distinct nipple. Spermatheca curved at base (Figs 28, 29, 30 in Angelini & Cooter 1999). Smooth except of vague traces of microreticulation on elytral apex and very fine and sparse punctures. AIII/AII=0.9. Length 1.5-2.0 mm. China (Zhejiang).
 *A. (A.) tianmuoides* Angelini et Cooter, 1999
- 16(15) Median lobe broadly rounded on apex; spermatheca J-shaped. 17
 - Median lobe conically narrowed to apex ending in very small and unobtrusive nipple; spermatheca U-shaped. 18
- 17(16) Average size smaller (1.8-1.9 mm). Parameres unobtrusively thicker on apex; distal part of J-shaped spermatheca terminates approximately at level of mid-length of basal part (Figs 34-36 in Angelini & Cooter 1999). China (Zhejiang). *A. (A.) paratianmuense* Angelini et Cooter, 1999
 - Size larger (2.5 mm). Parameres slim all along their length (Fig. 23 in Angelini & Cooter 2003).
 *A. (A.) jiuchongense* Angelini et Cooter, 2003
- 18(16) Average size smaller (1.5-1.9 mm). Operculum oval with deep emargination apically; basal part of spermatheca slimmer than distal part (Figs 42-44 in Angelini & Cooter 1999). China (Zhejiang).
 *A. (A.) tianmuense* Angelini et Cooter, 1999
 - Average size larger (1.8-2.1 mm). Operculum rectangular with very shallow emargination apically; basal and distal parts of spermatheca similar in their strength; base of spermatheca strongly curved inward. China (Zhejiang). *A. (A.) pseudotianmuense* Angelini et Cooter, 1999

Subgenus *Agathidium* Panzer, 1797

Agathidium (Agathidium) cavum sp. nov.

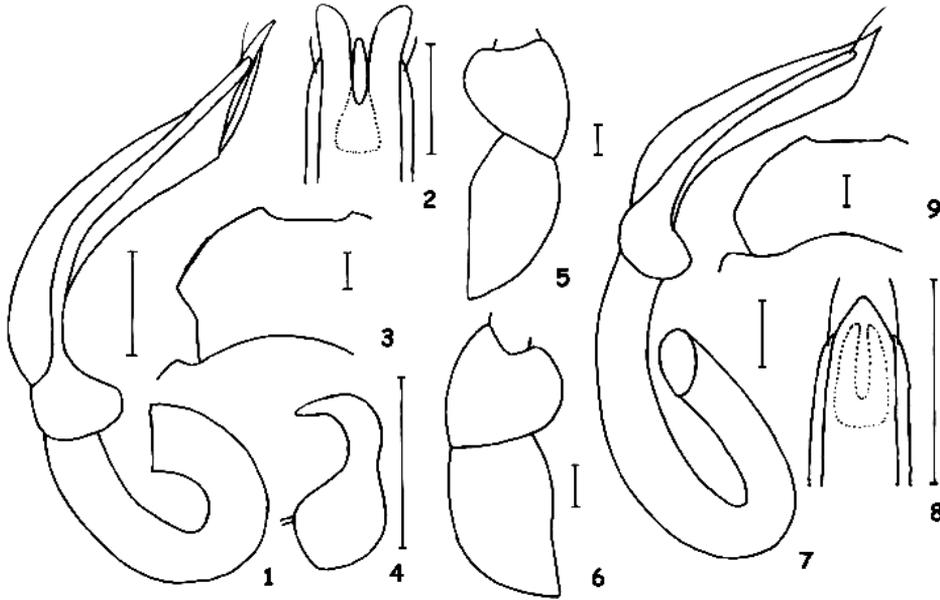
(Figs 1-5, 29)

Type material. Holotype (♂): "CHINA: Zhejiang [CH07-36], West/ Tianmu Shan N.R., way to peak of/ immortals, 30°20'34"N 119°25'51" E/ 1100-1200 m, prim. mixed forest, litter/ moss sifted, 15.vi.2007, M. Schülke", (MSBC). Paratypes: (2 ♀♀), the same locality data, (MSBC, ZSPC).

Description. Length of body 1.8-2.1 mm, in holotype 2.0 mm. Length of body parts in holotype: head 0.4 mm, pronotum 0.7 mm, elytra 0.9 mm, antenna 0.6 mm. Maximum width of body parts in holotype: head 0.8 mm, pronotum 1.0 mm, elytra 1.0 mm.

Oval (Fig. 29). Dorsum and legs light reddish-brown. Antennomeres yellow-reddish. Ventral surface reddish-brown. Dorsum punctured, microreticulate on elytra; sutural striae absent; femoral lines developed (species group *laevigatum* sensu Angelini 1993).

Head. Maximum width of head far from posterior margins of eyes, temples distinctly angulate, well developed, ratio of eye length : temple length = 2:1. Eyes visible in dorsal (Fig. 3) and ventral views as thin darker line along supra- or subocular carina. Eyes very narrow in lateral view. Ratio of length : maximum width of eyes = 12.0 in dorsal view. Supraocular carina a little raised anteriorly before clypeus vaguely resembling *Agathidium madurensis* species group sensu Angelini (1993). Supra- and subocular carina meet a little way behind posterior margin of eye. Clypeus feebly emarginate, clypeal line lacking. Antennomere III longer than II (AIII/AII = 1.3). Antennomere III longer than antennomeres IV and V together. Antennomeres IV and V as wide as long, antennomeres VI-X broader than long, antennomere XI 1.3 times longer than broad; 1.3 times as long as antennomere X. Antennomere X as wide as XI. Surface of head smooth, lacking microsculpture but with very sparsely arranged extremely small and fine punctures separated more than 10 times their own diameters



Figs 1-9. Figs 1, 7: aedeagus lateral; Figs 2, 8: apex of aedeagus dorsal; Figs 3, 9: head dorsal schematically; Figs 5, 6: pronotum with elytra lateral; Fig. 4: spermatheca. 1-5- *Agathidium (Agathidium) cavum* sp. nov.; 6-9- *A. (A.) cryptophthalmum* sp. nov. Scale = 0.1 mm in Figs 1-4, 7-9; 0.2 mm in Figs 5, 6.

Pronotum. Shape in dorsal view as in Fig. 29. Sides broadly arcuate in lateral view (Fig. 5). Puncturation similar as on head.

Elytra. Shape as in Figs 5, 29. Regularly distinctly microreticulate. Puncturation similar to that of head and pronotum. Sutural stria absent. Lateral angle located close to basal quarter of elytra.

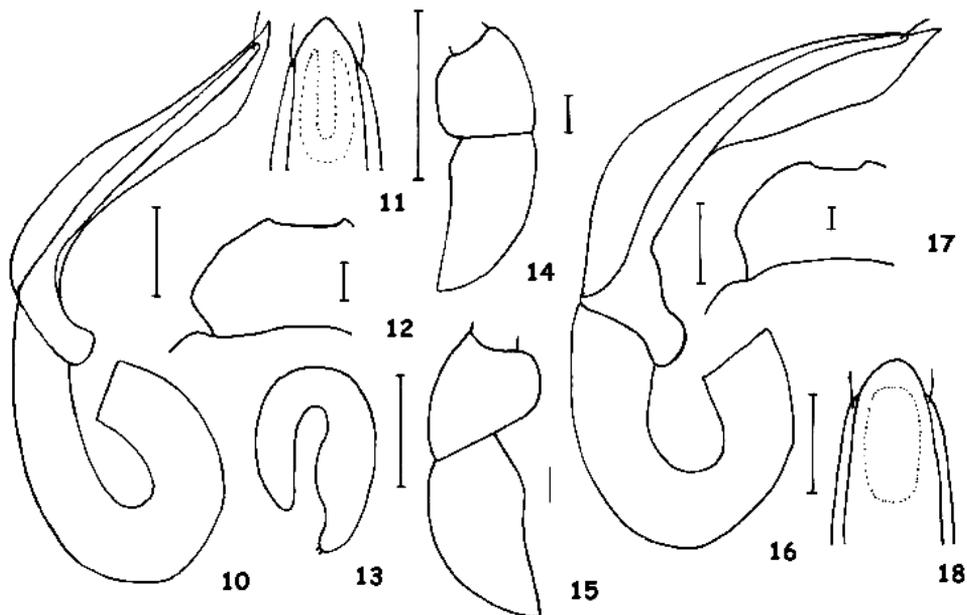
Legs. Anterior and mid-tarsomeres I and II distinctly dilated in male. Tarsi slender in female. Tibia widened, mid-tibia 3.5 times as wide apically as basally in the male holotype; two times in female paratypes. Lateral margin of hind tibiae straight, medial margin widened up to mid-length, then almost straight. Hind tibiae 2.3 times as wide apically as basally in the male holotype; two times in female paratypes. Hind femora with large tooth at distal fifth of their caudal margin. Femora simple without obtrusive characters in female paratypes. Tarsal formula: 5-5-4 in male; 5-4-4 in female.

Mesosternum. Posterior part subconcave. Anterior part raised with longitudinal carina. Lateral lines absent.

Metasternum. Femoral lines complete well distant from mid-coxal holes. Metasternum moderately developed - MTW/MTLM = 5.1; MTW/MTLC = 6.6. Membranous wings absent.

Genitalia. Aedeagus as in Figs 1, 2. Median lobe strongly excavate. Operculum long cone-shaped with tightly rounded tip protruding in the emargination of median lobe. Spermatheca as in Fig. 4.

Variation. AIII/AII varies between 1.2-1.3 in the type series. The microreticulation on elytra of one of the female paratypes feebly developed.



Figs 10-18. Figs 10, 16: aedeagus lateral; Figs 11, 18: apex of aedeagus dorsal; Figs 12, 17: head dorsal schematically; Figs 14, 15: pronotum with elytra lateral; Fig. 13: spermatheca. 10-14- *Agathidium (Agathidium) minoculum* sp. nov.; 15-18- *A. (A.) daublebskyorum* sp. nov. Scale = 0.1 mm in Figs 10-13, 16-18; 0.2 mm in Figs 14, 15.

Differential diagnosis. *Agathidium (A.) cavum* sp. nov. is similar to *A. (A.) celatum* Angelini et De Marzo, 1998 from China in the size and colour of its body and antennae, presence of microsculpture on elytra, absence of sutural striae, the shape of head having the eyes strongly reduced, visible as narrow strip in dorsal view, lack of membranous wings and by AIII/AII. It differs by the shape of the median lobe of the aedeagus that is deeply emarginate in the new species while the same is shortly triangular in *A. celatum*. Basal part of spermatheca is almost spherical in the new species, while in *A. celatum*, it is oblong oval.

Name derivation. The name of the new species refers to the excavate apex of the median lobe of aedeagus (from Latin *cavus*=hollowed out).

***Agathidium (Agathidium) cryptophthalmum* sp. nov.**

(Figs 6-9, 30)

Type material. Holotype (♂): "CHINA: N-Yunnan Nujiang Lisu/ Aut. Pr. Gongshan Co. Gaoligong/ Shan, valley at 3000-3050 m/ 27°47.90'N 98°30.19'E/ 21.vi.2005, A.Smetana [C169]", (ZSPC).

Description. Length of body 2.0 mm. Length of body parts: head 0.4 mm, pronotum 0.7 mm, elytra 0.9 mm, antenna 0.6 mm. Maximum width of body parts: head 0.9 mm, pronotum 1.2 mm, elytra 1.2 mm.

Short oval (Fig. 30). Dorsum, antennae and legs light reddish-brown, chest-nut. Ventral

surface yellow-brown. Dorsum not microreticulate, punctured; sutural striae absent; femoral lines developed (species group *dentatum* sensu Angelini, 1993, see Discussion).

Head. Maximum width of head close behind posterior margin of eyes, temples broadly rounded, developed, ratio of eye length : temple length 2.7 : 1. Eyes not visible in dorsal view (Fig. 9), indicated only by darker part of supraocular carina just above eyes. Supra- and subocular carina meet at posterior margin of eye. Eyes narrow in lateral view. In ventral view eyes detectable as very narrow strip formed by one row of ommatidia. Supraocular carina equally high all along its length. L/W of eyes = 2.7 in lateral view. Clypeus feebly emarginate, clypeal line absent. Antennomere III distinctly longer than II (AIII/AII = 1.6). Antennomere III longer than antennomeres IV and V together. Antennomeres IV and V longer than broad, antennomeres VI-X broader than long. Antennomere X 1.3 times broader than XI. Antennomere XI 1.4 times as long as wide, 2.2 as long as antennomere X. Surface of head smooth, lacking microsculpture but very sparsely punctured with very small and fine punctures separated approximately by about 6-10 times their own diameters.

Pronotum. Shape as in Fig. 30 in dorsal view, sides broadly arcuate in lateral view (Fig. 6). Pronotum smooth, without microsculpture, punctured. Puncturation similar as on head, a little denser, punctures irregularly distributed, spaced by about 3-10 times or more their own diameter.

Elytra. Shape as in Figs 6, 30. Lateral angle broad unobtrusive located at basal fourth of elytra. Without microsculpture, punctured. Puncturation similar to that of head and pronotum. Sutural stria absent. Several longer erect yellow setae along lateral margin of elytra.

Legs. Anterior tarsomeres I and II distinctly dilated in male. Tibia widened; mid-tibia with straight lateral margin, its medial margin distinctly convex. More than twice as wide apically (2.2 times) and in mid-length (2.4 times) as on base. Hind tibiae straight, almost two times (1.8 times) as wide apically as basally, two times as wide in distal third of tibial length as on base. Hind femora concave in basal third of posterior margin forming there blunt unobtrusive angle. Tarsal formula: 5-5-4 in male; female unknown.

Mesosternum. Posterior part subconcave. Anterior part roof raised without longitudinal carina. Lateral lines absent.

Metasternum. Femoral lines almost complete, a little shortened. Well distant from mid-coxal holes. Metasternum shortened, mid- and posterior coxae approximate. MTW/MTLM = 6.8; MTW/MTLC = 17. Large fovea furnished with erect setae in middle of metasternum. Diameter of fovea larger than distance between mid- and hind coxae. Membranous wings absent.

Genitalia. Aedeagus as in Figs 7, 8. Median lobe regularly narrowed to almost pointed tip.

Differential diagnosis. *Agathidium (A.) cryptophthalmum* sp. nov. is similar to *A. (A.) pusillum* Angelini et De Marzo, 1981 from India and Nepal and to *A. (A.) daublebskyorum* sp. nov. in the colour, body shape, absence of dorsal microsculpture, absence of sutural striae, shape of head, short temples, lack of membranous wings, widened tibia and to *A. pusillum* also by the shape of aedeagus. The new species differs from *A. pusillum* mostly by the eyes not visible in dorsal view and by the tarsal formula of males (4-4-4 in *A. pusillum*). *A. cryptophthalmum* differs from *A. daublebskyorum* by broadly rounded temples and by abruptly rounded apex of the median lobe.

Name derivation. The name of the new species refers to eyes not visible in dorsal view (from Greek *kryptos* = hidden, *ophthalmos* = eye).

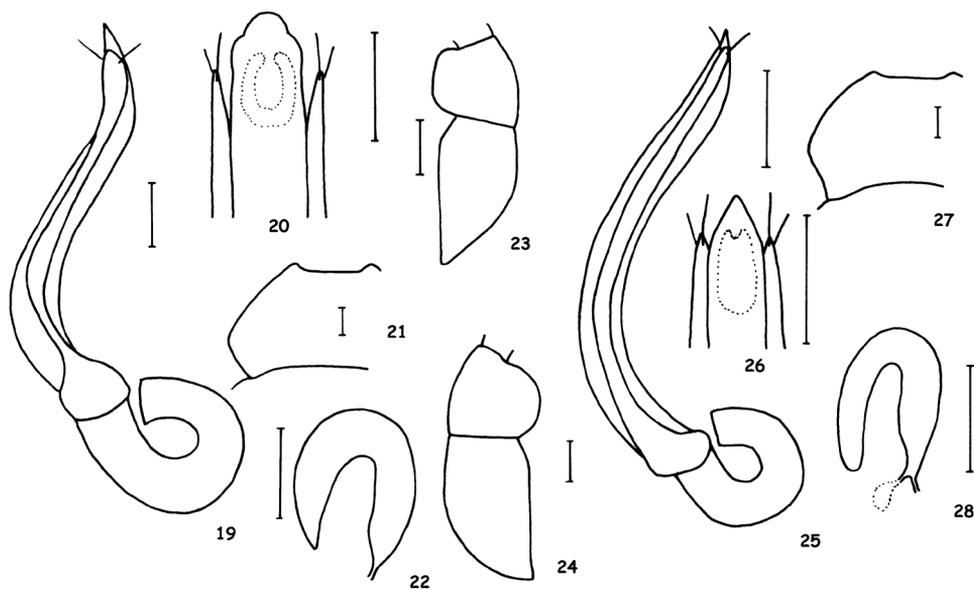
***Agathidium (Agathidium) minoculum* sp.nov.**
(Figs 10-14, 31)

Type material. Holotype (♂): "CHINA: N-Yunnan Diqing Tibet / Aut.Pr. Deqin Co Meili Xue Shan / E side 14 km W Deqin / 28°27.47'N 98°46.35'E, 2580 m / 11.vi.2005, A. Smetana [C158]", (ZSPC). Paratypes: (1 ♂, 1 ♀), the same locality data; (1 ♂), "CHINA: N-Yunnan Nujiang Lisu/ Aut. Pr. Gongshan Co. Gaoligong/ Shan, valley at 3000-3050m/ 27°47.90'N 98°30.19'E/ 21.vi.2005 A. Smetana [C169]", (ZSPC); (1 ♀), "CHINA: N-Yunnan [CH03-13B] / Zhongdian Co., 36 km ESE Zhongdian / overgrown rock hillside with old mixed / forest, bamboo, dead wood, mushrooms / 27°40.9' N, 100°01.5' E, 3500-3550 m/ 24.viii.2003, leg. M. Schülke", (MSBC).

Description. Length of body 1.6-1.9 mm, in holotype 1.7 mm. Length of body parts in holotype: head 0.3 mm, pronotum 0.6 mm, elytra 0.8 mm, antenna 0.5 mm. Maximum width of body parts in holotype: head 0.7 mm, pronotum 0.9 mm, elytra 0.9 mm.

Oblong oval (Fig. 31). Dorsum, antennae and legs reddish. Ventral surface yellow-brown. Dorsum microreticulate, punctured; sutural striae absent, femoral lines developed (species group *laevigatum* sensu Angelini, 1993).

Head. Shape as in Fig. 12. Maximum width of head far behind posterior margin of eyes, temples developed, roundly angulate, longer than eyes in lateral view; ratio of eye length : temple length 0.7:1 in lateral view. Eyes not visible in dorsal view, indicated only by darker



Figs 19-28. Figs 19, 25: aedeagus lateral; Figs 20, 26: apex of aedeagus dorsal; Figs 21, 27: head dorsal schematically; Figs 23, 24: pronotum with elytra lateral; Figs 22, 28: spermatheca. 19-23- *Agathidium (Macroceble) caecum* sp. nov.; 24-28- *A. (Macr.) fernandoangelinii* sp. nov. Scale = 0.1 mm in Figs 19-22, 25-28; 0.2 mm in Figs 23, 24.

part of supraocular carina just above eyes. Eyes very small and consisting of several facets only visible laterally. In ventral view eyes detectable as very short and narrow strip formed by one row of facets. Subocular carina meets supraocular carina just behind caudal margin of eyes. Supraocular carina equally high all along its length. Clypeus very feebly emarginate, clypeal line absent. Antennomere III distinctly longer than II ($A_{III}/A_{II} = 1.5$). Antennomere III longer than antennomeres IV and V together. Antennomeres IV and V as long as broad, antennomeres VI-X broader than long. Antennomere X as wide as XI. Antennomere XI a little longer than wide, twice as long as antennomere X. Surface of head with weak but detectable traces of microsculpture; sparsely punctured with very small and fine punctures separated approximately by about 6-8 times their own diameter.

Pronotum. Shape as in Fig. 31 in dorsal view. Anterior and posterior pronotal angles broadly rounded but detectable in lateral view (Fig. 14). With weak but detectable traces of microsculpture; punctured. Puncturation similar to that of head, punctures, spaced by about 3-6 times their own diameter. Several larger punctures before base.

Elytra. Shape as in Figs 14, 31. Lateral angle distinct, located just behind basal quarter of elytral length. With distinct microreticulation, punctured. Punctures a little larger than on pronotum tending to become seriate in some places, separated by about 8-10 or more times their own diameter. Several yellow erect setae along lateral margin. Sutural stria absent.

Legs. Tarsomere I on anterior and mid-tarsi a little dilated in male. Tibia widened; mid-tibia gradually widened apically, straight on medial and lateral margin. Twice as wide apically as on base. Hind tibiae straight, two times as wide apically as basally. Tibiae slimmer, straight in females. Hind femora straight on their posterior margin in male and female. Tarsal formula: 5-5-4 in male; 4-4-4 in female.

Mesosternum. Posterior part subconcave. Anterior part raised without longitudinal carina. On summit of the anterior part of mesosternum several longitudinal scratches. Lateral lines absent.

Metasternum. Femoral lines complete. Well distant from mid-coxal holes. Metasternum shortened. $MTW/MTLM = 6.4$; $MTW/MTLC = 12$. Large transverse fovea furnished with erect setae in middle of metasternum. Membranous wings absent.

Genitalia. Aedeagus as in Figs 10, 11. Median lobe regularly narrowed to tip. Operculum U-shaped. Spermatheca U-shaped with swollen basal part (Fig. 13).

Variation. A_{III}/A_{II} varies between 1.3-1.6 in the type series. The paratype from Zhongdian is larger than the others (1.9 mm), its $A_{III}/A_{II} = 1.3$, head missing microreticulation; its basal part of spermatheca is a little slimmer in comparison with spermatheca in the paratypes from Diqing Tibet.

Differential diagnosis. *Agathidium (A.) minoculum* sp. nov. is similar to *A. nitidulum* Angelini et Cooter, 1999 from China in the colour of the dorsum, size of body, non visible eyes in dorsal view, microreticulate elytra, lack of sutural striae and widened tibia. It differs by feebly emarginate clypeus, compared to deeply emarginate one in *A. nitidulum*, by punctured elytra and shape of the median lobe of the aedeagus.

Name derivation. The name of the new species refers to very small eyes (composed from Latin words minimum and oculum = eye)



Figs 29-34. Holotypes, dorsal. 29- *Agathidium* (*A.*) *cavum* sp. nov.; 30- *A.* (*A.*) *cryptophthalmum* sp. nov.; 31- *Agathidium* (*A.*) *minoculum* sp. nov.; 32- *A.* (*A.*) *daublebskyorum* sp. nov.; 33- *Agathidium* (*Macroceble*) *caecum* sp. nov.; 34- *A.* (*Macr.*) *fernandoangelinii* sp. nov.

***Agathidium* (*Agathidium*) *daublebskyorum* sp. nov.**

(Figs 15-18, 32)

Type material. Holotype (♂): "CHINA: Yunnan, Pu'er Pref./ Ailao Shan, 37 km NW Jingdong/ 24°45'12"N, 100°41'24.5' E, 2350 m/ devastated forest remnant, litter &/ dead wood sifted, 13.ix.2009/ leg. M. Schülke [CH09-48]", (ZSPC).

Description. Length of body 2.1 mm. Length of body parts: head 0.4 mm, pronotum 0.8 mm, elytra 0.9 mm, antenna 0.6 mm. Maximum width of body parts: head 0.8 mm, pronotum 1.1 mm, elytra 1.1 mm.

Oval (Fig. 32). Dorsum, antennae and legs light reddish-brown. Ventral surface yellow-brown. Dorsum not microsculptured, punctured; sutural striae absent, femoral lines developed (species group *dentatum* sensu Angelini, 1993).

Head. Shape as in Fig. 17. Maximum width of head at roundly angulate temples just behind posterior margin of eyes viewed laterally. Eyes not visible in both dorsal and ventral views, indicated only by darker part of supraocular carina. Eyes narrow laterally visible ($L/W=4.2$). Supraocular carina equally high all along its length meeting subocular carina just behind posterior margin of eyes. Clypeus very feebly emarginate, laterally on each side with two long seta. Clypeal line absent. Antennae broad. Antennomere III distinctly longer than II ($A_{III}/A_{II} = 1.8$) and than IV+V together. Antennomeres IV-X broader than long. Antennomere X as wide as XI. Antennomere XI as long as wide, 1.9 as long as antennomere X. Surface of head without microsculpture; sparsely punctured with small and fine punctures separated approximately by about 6-7 times their own diameters.

Pronotum. Shape as in Figs 15, 32. Sides broadly arcuate, anterior and posterior angles vaguely developed. Without microsculpture; punctured. Puncturation a little finer than on head; punctures spaced by about 6-8 times their own diameter.

Elytra. Shape as in Figs 15, 32. Lateral angle shallow, located shortly behind basal quarter of elytra. Without microsculpture, punctured. Punctures a little larger than on pronotum, separated by about 4-6 times their own diameter. A few yellow erect setae along lateral margin. Sutural stria absent.

Legs. Anterior tarsomere I-III and tarsomere I-II of mid-tarsi slightly dilated. Tibia widened; mid-tibia at their lateral margin straight, at medial margin convex. In mid-length 2.3 times as wide as on base, 2.2 times wider apically than on base. Hind tibiae straight laterally, convex medially, 2.1 times as wide in distal fifth, twice as wide apically as basally. Hind femora with distinct tooth on distal fourth of posterior margin with tip curved proximally. Tarsal formula: 5-5-4 in male; female unknown.

Mesosternum. Posterior part subconcave. Anterior part raised with longitudinal carina. Lateral lines absent.

Metasternum. Femoral lines long but incomplete. Well distant from mid-coxal holes. Metasternum shortened. $MTW/MTLM = 6.2$; $MTW/MTLC = 8.9$. Membranous wings absent.

Genitalia. Aedeagus as in Figs 16, 18. Median lobe very broadly rounded distally. Operculum oblong oval.

Differential diagnosis. *Agathidium (A.) daublebskyorum* sp. nov. is similar to *Agathidium (A.) cryptophthalmum* sp. nov. from China and *A. (A.) pusillum* Angelini et De Marzo, 1981 from India and Nepal in the colour, absence of dorsal microsculpture, absence of sutural striae, shape of head, short temples, lack of membranous wings and widened tibia. New species differs from *A. pusillum* mostly by the eyes not visible in dorsal view and tarsal formula of males (4-4-4 in *A. pusillum*). *A. daublebskyorum* differs from *A. cryptophthalmum* by angulate, abruptly rounded temples and by broadly rounded apex of the median lobe.

Name derivation. The new species is named in honour of my wife's family Daublebsky von Sterneck.

Subgenus *Macroceble* Angelini, 1993

***Agathidium (Macroceble) caecum* sp. nov.**

(Figs 19-23, 33)

Type material. Holotype (♂): "China: Yunnan, Dali Bai Aut. Pref./ Zhemo Shan, 7 km NW Xiaguan./ 25°32.33' N, 100°10.11' E, 2870-2970/ m, scrub with bamboo, oaks/ Rhododendr., litter sifted, 18.ix./ 2009, leg. M. Schülke [CH09-60]", (MSBC). Paratypes (5 ♂♂, 2 ♀♀): the same locality data, (MSBC, ZSPC).

Description. Length of body 1.8-2.2 mm, 2.0 mm in holotype. Length of body parts in holotype: head 0.4 mm, pronotum 0.6 mm, elytra 1.0 mm, antenna 0.6 mm. Maximum width of body parts: head 0.8 mm, pronotum 1.0 mm, elytra 1.0 mm.

Oblong oval (Fig. 33). Dorsum, antennae and legs yellow-red. Ventral surface yellow-brown. Dorsum microsculptured, punctured. Sutural striae and femoral lines absent (subgenus *Macroceble* Angelini, 1993; see the paragraph discussion).

Head. Shape as in Fig. 21. Maximum width of head at temple angles. Temples distinctly angulate, sharply rounded. Eyes not detectable either from dorsal, lateral or from ventral view. Space between supraocular and subocular carinae concave. Supraocular carina equally high all along its length. Along supraocular carina are a few long erect setae. Supra- and subocular carinae meet at temple angle. Clypeus very feebly emarginate. Clypeal line absent. Antennomere III longer than II ($A_{III}/A_{II} = 1.3$) a little shorter than IV+V together ($A_{III}/A_{IV+V} = 0.9$). Antennomeres IV as long as wide, antennomeres V-X wider than long. Antennomere X wider than XI ($A_X/A_{XI} = 1.1$). Antennomere XI as wide as long and 1.8 times longer than antennomere X. Surface of head without microsculpture; very sparsely punctured with small fine punctures separated approximately more than 5-10 times their own diameters. Two large punctures on frons.

Pronotum. Shape as in Figs 23, 33. Pronotum with broadly rounded but distinctly developed anterior and posterior angles laterally seen. Without any microsculpture; punctured. Puncturation similar to that of head.

Elytra. Shape as in Figs 23, 33. Strongly narrowed caudally approximately from basal fifth in dorsal view. Round lateral angle shallow but distinct, located approximately at basal fifth. With feebly developed micro-reticulation, punctured. Punctures similar to those on head and on pronotum but more sparsely arranged. Sutural stria absent. A few long erect setae near lateral margins.

Legs. Anterior tarsomere and mid-tarsomere I distinctly dilated in male. Tibia widened; mid- and hind tibia straight on both lateral and medial margins; widest apically, 3.0 times as wide on apex as on base.

Hind femora emarginate in both proximal and distal half of posterior margin forming unobtrusive angle in mid-length. Female femora without specific characters. Tarsal formula: 4-4-4 in male; 4-4-4 in female.

Mesosternum. Posterior part subconcave. Anterior part raised with unobtrusive blunt longitudinal carina. Lateral lines absent.

Metasternum. Short, mid- and posterior coxae approximate. $MTW / MTLM = 10.0$; $MTW / MTLC = 20.0$ Femoral lines missing. With large fovea centrally (approximately as large as space between mid- and hind coxae) equipped with bush of setae. Membranous wings absent.

Genitalia. Aedeagus as in Figs 19, 20. Median lobe initially widened apically, then emarginate before very broadly rounded tip. Operculum U-shaped with rami approximate to each other apically. Spermatheca as in Fig. 22.

Variation. AIII/AII varies between 1.1-1.5 in the type series. The entire dorsum in one male paratype with feeble microreticulation. Also the density of head puncturation varies - in one paratype the punctures are separated by about 4-6 times their own diameter.

Differential diagnosis. *Agathidium (Macroceble) caecum* sp. nov. is similar to *Agathidium (Macroceble) fernandoangelinii* sp. nov. from China and to *A. (Macroceble) anophthalmicum* Angelini et De Marzo, 1984 from India having no eyes. It differs by a larger size of its body and by the shape of the distal part of median lobe that is first widened apically, then emarginate before very broadly rounded tip while the same is simply narrowed to tip in *A. fernandoangelinii* and in *A. anophthalmicum*. The shape of the spermatheca in *A. caecum* sp. nov. is similar to *A. fernandoangelinii* while by possessing a bulbous basal part is quite different to that in *A. anophthalmicum*. From *A. anophthalmicum* it differs also by the shallowly emarginate clypeus.

Name derivation. The name of the new species draws attention to the lack of eyes (lat. caecum = blind) in this species.

Agathidium (Macroceble) fernandoangelinii sp. nov.

(Figs 24-28, 34)

Type material. Holotype (♂): "CHINA: N. Yunnan Dali Bai/ Nat. Aut. Pref. Diancang/ Shan 3 km W Dali 25°41.1' N/ 100°06.8' E 2750 m/ 1.ix.03 A. Smetana [C144]". Paratypes (1 ♀): the same locality data (ZSPC); (3 ♂♂, 3 ♀♀): "CHINA: Yunnan, Dali Bai Aut. Pref./ Jizu Shan, summit plateau, 37 km NE/ Dali, 25°58.30' N 100°21.36' E/ 3150 m, mixed forest, sifted from litter/ moss & mushrooms, 5.ix.2009/ leg. M. Schülke (CH09-28)", (MSBC, ZSPC); (1 ♂): "CHINA: Yunnan [CH07-08]/ Dali Bai Auton. Pref., Diancang/ Shan, 43 km NW Dali, 3078 m./ 25°59.35' N, 99°52.06' E, W/ pass, Rhodod., oaks, bamboo/ sifted, 29.v.2009, leg. A. Pütz.", (SMTD).

Description. Length of body 1.4-2.0 mm, 1.6 mm in holotype. Length of body parts in holotype: head 0.4 mm, pronotum 0.5 mm, elytra 0.7 mm, antenna 0.5 mm. Maximum width of body parts: head 0.6 mm, pronotum 0.8 mm, elytra 0.8 mm.

Oblong oval (Fig. 34). Dorsum, antennae and legs yellow-red. Ventral surface yellow-brown. Dorsum microsculptured, punctured. With some long erect setae on pronotum and elytra. Sutural striae and femoral lines absent (subgenus *Macroceble* sensu Angelini, 1993; see the Discussion).

Head. Shape as in Fig. 27. Maximum width of head at temple angles. Temples distinctly angulate, sharply rounded, long. Eyes not detectable either from dorsal, lateral or from ventral view. Space between supraocular and subocular carinae concave; both carinae merge far before temporal angle. Supraocular carina equally high along its entire length. Clypeus

very feebly emarginate. Clypeal line absent. Antennomere III longer than II ($A_{III}:A_{II} = 1.3$) a little shorter than IV+V together ($A_{III}/A_{IV+V} = 0.9$). Antennomeres IV and V as long as wide, antennomeres VI-XI wider than long. Antennomere X as wide as XI. Antennomere XI 1.6 times longer than antennomere X. Surface of head with feeble microreticulation; sparsely punctured with small and fine punctures separated approximately by about 3-5 times their own diameters. Rare smaller punctures interposed. Along supraocular carina few long erect setae at temporal angle.

Pronotum. Shape as in Figs 24, 34. Margins of pronotum broadly rounded laterally seen. With microsculpture similar to that on head; punctured. Puncturation similar to that on head, punctures stronger. A few larger punctures with erect seta present at disc of pronotum.

Elytra. Shape as in Figs 24, 34. Strongly narrowed caudally approximately from basal fifth in dorsal view. Round lateral angle shallow but distinct, located approximately at basal fifth. With micro-reticulation more distinctly developed than on head, punctured. Punctures stronger than on head and on pronotum, punctures separated by about 6-8 times their own diameter. Recumbent setae moderately long. Sutural stria absent. A few long erect setae present near lateral margins, along suture and also on disc of elytra.

Legs. Anterior tarsomere and mid-tarsomere I distinctly dilated in male. Tibia widened; mid- and hind tibia straight on both lateral and medial margins; widest apically, 2.5 times as wide on apex as on base (2.0 times in females).

Hind femora emarginate in proximal two-thirds and in distal one-third of posterior margin forming unobtrusive angle between emarginations. Femora without specific characters in female. Tarsal formula: 4-4-4 in male; 4-4-4 in female.

Mesosternum. Posterior part subconcave. Anterior part risen, with trace of longitudinal carina. Lateral lines absent.

Metasternum. Short, mid- and posterior coxae approximate. $MTW/MTLM = 7$; $MTW/MTLC = 20$. Femoral lines absent. With shallow foveal depression furnished with brush of setae. Membranous wings absent.

Genitalia. Aedeagus as in Figs 25, 26. Median lobe strongly narrowed apically. Operculum oval with deep emargination distally. Spermatheca as in Fig. 28.

Variation. A_{III}/A_{II} varies between 1.1-1.3 in the type series. Also the presence or strength of dorsal microreticulation and density of the dorsal puncturation vary. In the paratypes from Jizu Shan microreticulation is generally less evident or missing on the head or even also on the pronotum. The puncturation on lateral sides of pronotum is markedly denser (punctures separated by 3-4 times their diameter) than on the disc of pronotum. One of the female paratypes from Jizu Shan is more densely setose-punctured than the others making the dorsum seem to be hairy. In the paratypes from Jizu Shan and in the female paratypes from Diancang Shan the temporal angles are broadly rounded. The body of the paratypes from Jizu Shan is in average larger (1.6-2.0 mm) than that in the specimens from Diancang Shan (1.4-1.9 mm). The main difference between the specimens from Diancang Shan and Jizu Shan can be detected in the shape of the distal part of the aedeagus. The distal part of the aedeagus in the specimens from Diancang Shan is abruptly conically narrowed to almost pointed tip in dorsal view, parameres are longer, while the median lobe is gradually narrowed

to a more rounded tip; the parameres are a little shorter in the specimens from Jizu Shan. In lateral view the aedeagi in the specimens from Jizu Shan are more flexed distally.

Differential diagnosis. *Agathidium (Macroceble) fernandoangelinii* sp.nov. is similar to *Agathidium (Macr.) caecum* sp. nov. from China and to *A. (Macr.) anophthalmicum* Angelini et De Marzo, 1984 from India in lacking eyes. From *A. caecum* it differs by smaller size of body and by the shape of the distal part of median lobe that is simply narrowed to the apex while the median lobe is first widened apically, then emarginate before very broadly rounded tip in *A. caecum*. From *A. anophthalmicum* it differs also by the shallowly emarginate clypeus. Spermatheca in *A. fernandoangelinii* and *A. caecum* sp. nov. is similar while the shape of spermatheca with bulbous basal part is quite different in *A. anophthalmicum*.

Name derivation. The new species is dedicated to my friend and well known specialist in Leioididae Fernando Angelini (Francavilla Fontana, Italy).

DISCUSSION

The external morphological characters of the species newly described in this paper confirm the difficulties with the classification within the genus *Agathidium*.

Although the metasternum of *Agathidium (A.) cryptophthalmum* sp. nov. is distinctly shortened, its mid- and meta-coxae are approaching each other and the head is widened in a manner quite similar to the species of the subgenus *Macroceble*, developed femoral lines indicate the species belonging to the subgenus *Agathidium* s. str. Therefore the species is tentatively assigned to the subgenus *Agathidium*, *A. denticulatum* species group sensu Angelini (1993).

Difficulties also occurred when studying the classification of *Agathidium caecum* sp. nov. and *A. fernandoangelinii* sp. nov. By the general appearance, especially elongate shape of body and not very much shortened metasternum in both species remind some species of the subgenus *Agathidium* (e.g. *A. cryptophthalmum* sp. nov.). All the same the metasternum in both species is somewhat shortened, meso- and metaxoxae are more approximate and, most significantly, the femoral lines are absent. I consulted the classification of *A. fernandoangelinii* sp. nov. with the author of the subgenus *Macroceble*, Fernando Angelini. His opinion (which concurs with my own) is that the species belong to the subgenus *Macroceble*.

The type series of *A. fernandoangelinii* originated from two different sites separated by mountains, valleys and a lake. The shape of aedeagus in the specimens from both sites is generally the same but the differences in the shape of the median lobe and in the length of parameres cannot be omitted without a remark. In my present state of knowledge, determined by limited amount of material and by the morphological attitude to the differentiation of the species, I am not able to decide for certain if the differences between the material from Diancang Shan and Jizu Shan that I assigned to the same species *A. fernandoangelinii* are within the variation or if they are significant sufficiently to separate the specimens as two different taxa. Believing that the geographical isolation of individual populations of the same species can cause the distinct differences the material listed in the description of *A. fernandoangelinii* is considered, for now, to represent the same species as a similar degree of variation is known to occur in some wingless taxa (Švec, 2012).

ACKNOWLEDGEMENTS. My sincere thanks are due to all my friends and colleagues who provided me with the interesting material that enabled me to do the present work. I also want to thank to my friends, well known specialists in Leiodidae, Jonathan Cooter who helped me with his comments and corrections to the work and who allowed me the access to the species preserved in his collection and Fernando Angelini who helped me with his advice.

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Received: 2.12.2013

Accepted: 20.12.2013

