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## THE GENUS *BOLBELASMUS* BOUCOMONT IN ASIA, WITH NOTES ON SPECIES OCCURRING IN OTHER REGIONS (COLEOPTERA: GEOTRUPIDAE)

by

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With 19 text-figures and one plate

### ABSTRACT

The genus *Bolbelasmus* Boucomont is diagnosed. The Oriental and Palaeartic species are keyed. A checklist of the world species and subspecies is given. Two new species are described: *Bolbelasmus meridionalis* (Indonesia, China, Thailand, Vietnam) and *B. nativus* (Taiwan). The other Asian species are discussed and their distribution is recorded. A subspecific differentiation is suggested for the North African *B. bocchus* (Erichson).

Although this paper mainly deals with the four East Asian species of *Bolbelasmus* Boucomont, I have added notes regarding species occurring elsewhere. Only pertinent references are given, as little of importance has been added to our knowledge of the Old World forms after Boucomont (1912). Cartwright (1953) and Howden (1964, 1974) dealt with the New World species.

I have diagnosed the genus, described two new species, and inserted them in a key to the Palaeartic and Oriental species. All the known species are listed, and records concerning those of Asia are given. Some serious taxonomic problems remain (specified below), the solutions to which cannot be given without studying more material. This seems not to be available.

Little can be said about phylogeny, as the character states cannot, in my opinion, be interpreted phylogenetically. The dispersal between the present New and Old World land masses seems to have occurred in the North Pacific, the amphi-Pacific group formerly named *Kolbeus* being indicative of this.

**Bolbelasmus** Boucomont

*Bolbelasmus* Boucomont, 1911: 335 (diagnosis, 3 spp. included), 338 (in key).

*Kolbeus* Boucomont, 1911: 335 (diagnosis, 2 spp. included), 338 (in key); Paulian, 1945: 40 (in key), 41 (diagnosis).

Generic diagnosis. — Frons with more or less conical erect protrusion (♂) or with transverse ridge (♀). Clypeal border arcuate, with perimarginal ridge; genal angles tuberculate or not. Antennal club normally convex, segment 1 with large, well-defined, smooth, glabrous area on its inner surface; outer surface of club segment 3 without grooves. Pronotum of ♂ with paramedian and lateral (maximally four) protrusions; paramedian protrusions may be connected by transverse crest. Eye-canthus and temporal lobe separated. Middle coxae (sub)contiguous. Parameres moderately sclerotized, more or less lobiform, without notable accessory elements (figs. 6-9). Seven striae between elytral suture and humeral umbone; stria 1 contiguous with scutellum (figs. 2-5). Anterior paramedian costae of prosternum obsolete, its postgular surface simply convex, occasionally with some longitudinal carinulae. Colour dorsally uniformly black, brown or yellow.

Dorsal outline of mandibles, apart from usual lobes, symmetrically arcuate. Labrum without ridge or with indistinct transverse ridge. Vertex sharply separated from tempora, posterior surface concavely acclivous to pronotum. Shape of eye-canthus and dorsally visible area of eye variable. Pronotal apex marginate; base variably marginate, or completely immarginate. Pronotal apex fringed with narrow velum. Scutellum short (l/w ratio 1-2), deltoid or ogival (2-5, 13, 15). Elytral base immarginate; epipleuron gradually narrowing to apicosutural angle. Elytral striae variably impressed; interstria 1 slightly to strongly convex, others at most slightly, equally convex. Postprosternum protuberant, in some cases dentate. Metasternal plate rhomboid in outline. Fore tibia with 6-10 external denticles, their size decreasing proximad; terminal spur slender, long, acuminate. Middle and hind tibiae with one or two variably shaped anteapical fossorial elevations. Sexual dimorphism strong, most evident in cephalic and pronotal protrusions. Robust, globular, small to medium-sized forms (length 5-16 mm).

Type-species. — Of *Bolbelasmus*: *Bolboceras gallicum* Mulsant, subsequently designated by Cartwright (1953: 97). Of *Kolbeus*: *Bolboceras coreanus* Kolbe, subsequently designated by Lucas (1920: 356).

Although there is some reality in the distinction of *Bolbelasmus* and *Kolbeus*, I agree with the view originally expressed by Cartwright (1953: 97), and later confirmed by Howden (1964: 39), that the differences (e.g. in shape of scutellum and pronotal margin; see key, couplet 1) do not warrant a generic separation.

**Affinities.** — The closest known relative of *Bolbelasmus* is *Bolbotrypes* Olsoufieff, a monotypic genus endemic in the Far East. This group differs mainly by the presence of two well-defined grooves on the outer side of the terminal antennal lamella, by the first stria extending to the elytral base instead of the side of the scutellum, and by having a characteristic transverse frontal lamella. Virtually all the other characters of *Bolbotrypes* are very similar to those of *Bolbelasmus*. There is no other genus to which this generic pair is directly related.

**Infrageneric dissimilarities.** — Characters used for the delimitation of species include:

**Head:** (1) position of frontal elevation; (2) development of frontal elevation, especially in males, and (3) shape of its apex; (4) shape of eye-canthus.

**Thorax:** (5) dorsal outline of pronotum, and (6) shape of anterolateral angle; (7) spacing and (8) shape of pronotal protrusions; (9) development of a ridge on pronotal base; (10) shape and (11) punctuation of scutellum.

**Elytra:** (12) punctuation (especially size of punctures) and (13) degree of impression of elytral striae; (14) degree of convexity of juxtasutural interstria.

**Genitalia:** (15) shape of parameres.

**Legs:** (16) shape of fossorial crests on middle and hind tibiae.

**Other characters:** (17) dorsal colour; (18) punctuation of various parts; (19) total body size.

As many species are known from a very limited number of specimens, further study of the variation of these characters and the distribution of their states over the species-group taxa listed below, is required. With the

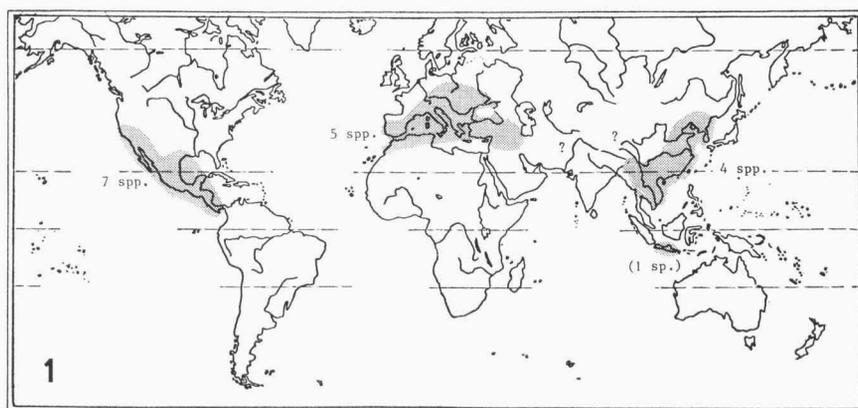


Fig. 1. Approximate known range of *Bolbelasmus*, with indication of number of species per disjunct area (species of Java also occurs in continental Asia).

scanty material at hand I refrain from a thorough analysis. The key given below is tentative, especially for the two Near East species.

Distribution and composition. — Approximate known distribution of the genus and number of species per disjunct area are given in fig. 1: Oriental (3 spp.), Palaearctic (8 spp.), Nearctic (5 spp.), and Neotropical Region (2 spp.) — total 16 species. I would not be surprised if the gap between the West Palaearctic and Far East area would be filled in the near future. The absence of records from Sumatra, Borneo and the Malay Peninsula may be real in view of the absence or rarity of primeval open forest (the West Palaearctic species seem to prefer this type of habitat).

Bionomics. — Nothing pertinent seems to be known about the Asian species, except that they are attracted to light. The European *B. gallicus* and *unicorne* are found burrowing to various hypogeic fungi, including truffles, in open oak and pine forests on various soils. They are crepuscular and/or nocturnal, and stridulate vigorously. Essentially, this is all we know about the habits of *Bolbelasmus*. Fabre (e.g. 1900: 38off.) has given vivid descriptions of his observations on the habits of *Bolbelasmus gallicus*.

#### KEY TO OLD WORLD SPECIES OF *Bolbelasmus*

##### Males

(with more or less conical frontal protrusion)

1. Pronotal base at least medially marginate. Scutellum usually short (l/w ratio < 1.2; fig. 5) . . . . . 4
- Pronotal base immarginate. Scutellum elongate (l/w ratio  $\geq$  1.2), basally more or less parallel-sided (figs. 2-4) . . . . . 2
2. Juxtasutural interstria of elytra raised, strongly convex. Anterolateral angle of pronotum rectangular (fig. 11) . . . . . 3
- Juxtasutural interstria of elytra not raised over its entire length. Anterolateral angle of pronotum slightly acute (fig. 11). Parameres with rounded apex (fig. 8). Frontal horn between eye-canths, base elongate, contiguous with clypeofrontal suture. Length 9-13.5 mm . . . . . *coreanus*
3. Parameres with rounded apex (fig. 7). Frontal horn between eyes. Pronotum laterally very densely, more or less contiguously punctate (number of punctures beneath lateral foveole 15 or more, separated by less than their diameter). Length 10 mm . . . . . *nativus*
- Parameres with angulate apex (fig. 6). Frontal horn between eye-canths. Pronotum laterally abundantly but not contiguously punctate (number of punctures beneath lateral foveole less than 15, separated by more than their diameter). Length 7-9.5 mm . . . . . *meridionalis*
4. Ridge on basal margin of pronotum broadly interrupted laterally.

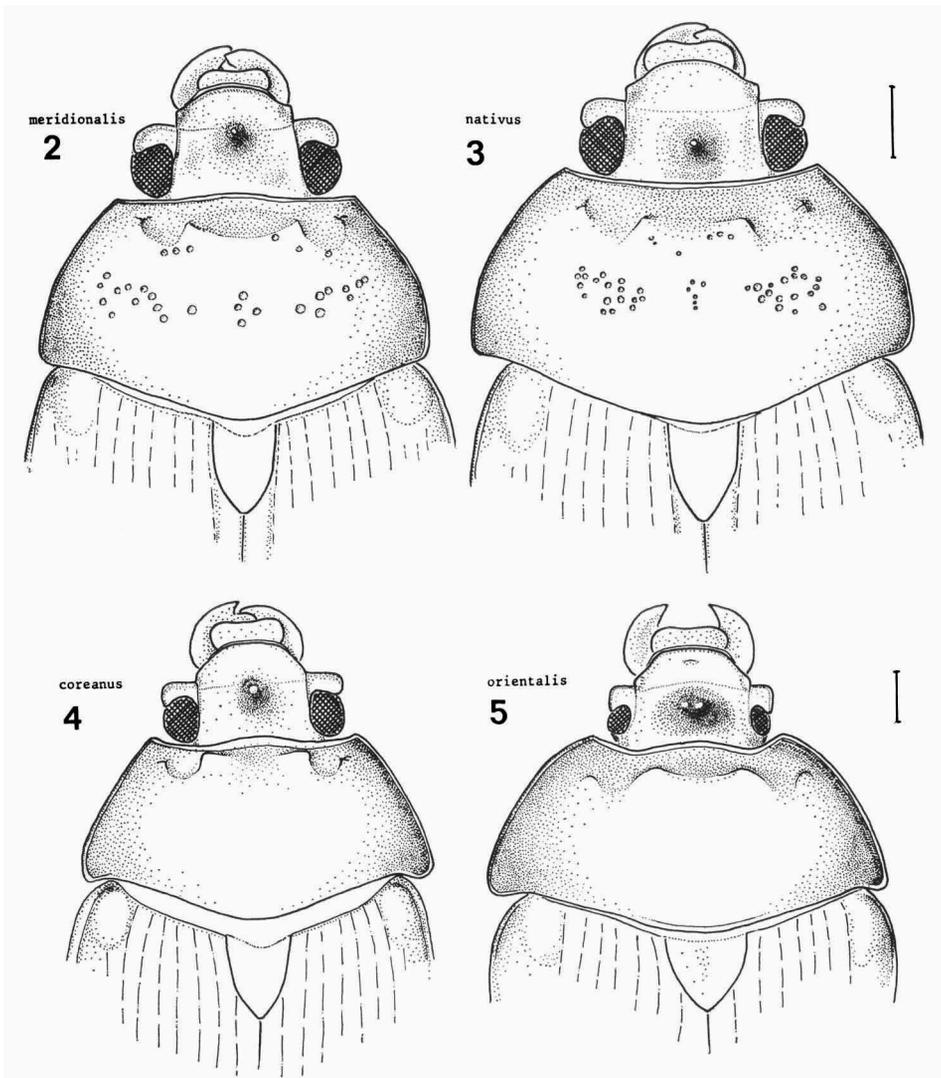
- Usually reddish brown . . . . . 6
- Ridge on basal margin of pronotum complete. Usually black . . . . . 5
5. Scutellum densely punctate. Frontal horn basally not dilated. Length 10-15 mm . . . . . *gallicus*
- Scutellum smooth or nearly so. Basal part of frontal horn strongly dilated (figs. 16, 18). Length 10-16 mm . . . . . *bocchus* (2 subspecies)
6. Frontal tubercle with bifid apex (at least in larger males; fig. 10) Length 12-12.5 mm . . . . . *orientalis*
- Frontal tubercle with simple apex . . . . . 7
7. Eye-canthus rounded. Punctures of elytral striae not superficial . . . . . 8
- Eye-canthus angulate anterolaterally (fig. 12). Punctures of elytral striae small, superficial, scarcely affecting interstriae (fig. 13). Lateral impressions and tubercles of pronotum poorly pronounced. Frontal horn slender. Length 10-12 mm . . . . . *tauricus*
8. Frontal horn robust (base one-third of interocular width). Distance between anterolateral angles of pronotum less than or equal to distance between lateral tubercles. Eye-canthi wide. Large species, length 12-15 mm . . . . . *unicornis*
- Frontal horn slender (base one-fourth of interocular width or less). Distance between anterolateral angles of pronotum exceeding distance between lateral tubercles. Eye-canthi narrow. Small species, length 10.5 mm . . . . . *nireus*

#### Females

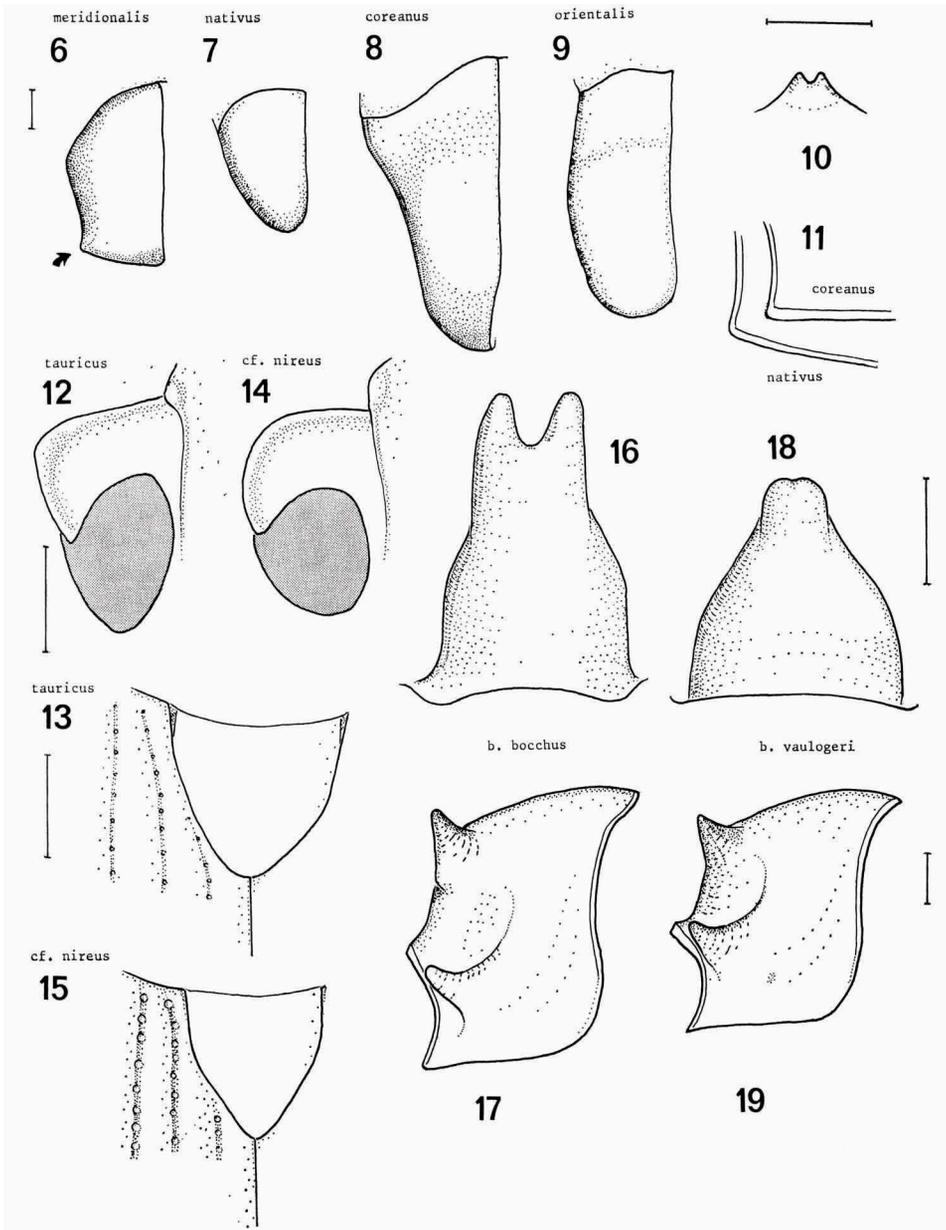
(with transverse frontal protrusion)

1. Pronotal base at least medially marginate. Scutellum usually short (l/w ratio  $< 1.2$ ) . . . . . 4
- Pronotal base immarginate. Scutellum elongate (l/w ratio  $\geq 1.2$ ), basally more or less parallel-sided . . . . . 2
2. Juxtaputural interstria of elytra raised, strongly convex. Anterolateral angle of pronotum rectangular (fig. 11). Eye-canthi different . . . . . 3
- Juxtaputural interstriae of elytra not raised over its entire length. Anterolateral angle of pronotum slightly acute (fig. 11). Eye-canthi widely arcuate in front. Length 9.5-11.5 mm . . . . . *coreanus*
3. Eye-canthi narrowly tapering. Pronotum laterally abundantly but not very densely punctate. Length 6.5-8 mm . . . . . *meridionalis*
- Eye-canthi widely tapering. Pronotum laterally very densely, more or less evenly punctate. Length 9 mm . . . . . *nativus*
4. Ridge on basal margin of pronotum broadly interrupted laterally. Usually reddish brown . . . . . 6

- Ridge on basal margin of pronotum complete. Usually black . . . . . 5
- 5. Scutellum densely punctate. Medial elevation of frontal ridge truncate.  
Length 10-15 mm . . . . . *gallicus*
- Scutellum smooth or nearly so. Medial elevation of frontal ridge  
bituberculate. Length 12-16 mm . . . . . *bocchus*
- 6. Eye-canths wide. Penultimate fossorial elevation of hind leg with



Figs. 2-5. Dorsal contours of fore body of *Bolbelasmus* species (males). 2, *meridionalis*, holotype; 3, *nativus*, holotype; 4, *coreanus*, Su-Tchuen; 5, *orientalis*, holotype. Scale lines = 1 mm; 2, 3: same scale; 4, 5: same scale.



Figs. 6-19. Details of *Bolbelasmus*. 6-9, left paramere, full-face view of: 6, *meridionalis*, holotype; 7, *nativus*, holotype; 8, *coreanus*, Su-Tchuen; 9, *orientalis*, holotype. 10, frontal tubercle of *orientalis* (frontal view). 11, left anterolateral angle of pronotum, *nativus* and *coreanus*. 12, 13, left eye-canthus and scutellar region (dorsal view) of *tauricus*, holotype; 14, 15, ditto, of *cf. nireus*, ♂ Antalya. 16, 17, frontal horn (frontal view) and left side contours of pronotum of *bocchus bocchus*, ♂ Mascara; 18, 19, ditto, of *bocchus vaulogeri*, ♂ Sousse, Scale line with fig. 6 = 0.1 mm, with 12 = 0.5 mm, others = 1 mm; same elements same scale.

- feebly bisinuate crest. Large species, length 12-15 mm . . . *unicornis*  
 — Eye-canths narrow. Penultimate fossorial elevation of hind leg with  
 perfectly arcuate crest. Small species, length 9.5-10 mm . . . *nireus*

CHECKLIST OF *Bolbelasmus* SPECIES AND SUBSPECIES <sup>1)</sup>

- arcuatus* Bates, 1887: 111 (*Bolboceras*; lectotype in London). ♂♀. —? California; Mexico to Panama (type-loc. Chontales in Nicaragua).
- bajaensis* Howden, 1964: 44 (holotype in San Francisco). ♂. — Mexico (type-loc. Scammons Lagoon).
- bocchus bocchus* Erichson, 1841: 170 (*Bolboceras*; type in Berlin); synon. *Bolboceras fissicornis* Mulsant. ♂♀. — Algeria!, Morocco!, Portugal, Spain.
- \**b. vaulogeri* Abeille, 1898: 254 (*Bolboceras*, as sp.; syntypes in Paris). ♂♀. — Tunisia! (type-loc. Bizerte).
- coreanus* Kolbe, 1886: 188 (*Bolboceras*; holotype ♀ in Berlin!); synon. *Bolboceras conicifrons* Fairmaire. ♂♀. — China, Corea (type-loc. Seoul), India.
- gallicus* Mulsant, 1842: 350 (*Bolboceras*; syntypes in Lyon); synon. *Bolboceras conjunctus* Mulsant, *Bolboceras provincialis* Mulsant. ♂♀. — France, Italy, Portugal, Spain.
- hornii* Rivers, 1886: 61 (*Bradycinetus*; syntypes in Eberswalde?). ♂♀. — California (type-locs. Sonora, Sacramento Co.), Mexico.
- meridionalis* Krikken, present paper (holotype in London). ♂♀. — Indonesia, Thailand, China, Vietnam.
- minor* Linell, 1895: 723 (*Bradycinetus*; holotype in Washington). ♂♀. — Texas (type-loc. San Diego).
- monticolus* Howden, 1974: 568 (holotype in Howden coll.). ♂♀. — El Salvador (type-loc. Boqueron); incorrect declension of *monticola*.
- nativus* Krikken, present paper (holotype in Brussels). ♂♀. — Taiwan (type-loc. Heito).
- \**nireus* Reitter, 1895: 81 (*Bolbocerus*; holotype in Paris!). ♀; ?♂. — Syria (type-loc. Akbes), Irak.
- orientalis* Petrovitz, 1968: 185 (holotype in Geneva!). ♂ only! — Pacific USSR (type-loc. Vladivostock).
- rotundipennis* Howden, 1964: 43 (holotype in Ottawa). ♂♀. — Mexico (type-loc. Jacala).

<sup>1)</sup> An asterisk preceding a species-group name indicates that the status of the taxon concerned needs revision. The term type (instead of syntypes) is applied if the original description does not contain information on the number of specimens on which it was based. — An exclamation mark denotes any confirmation.

\**tauricus* Petrovitz, 1973: 338 (holotype in Geneva!). ♂ (not ♀). — Turkey (type-loc. Namrun).

*unicornis* Schrank, 1789: 61 (*Scarabaeus Unicornu*; type presumably destroyed); synonym. *Scarabaeus aeneus* Panzer, *Scarabaeus quadridens* Panzer. ♂♀. — Austria, France, Germany, Hungaria, Italy, Greece, Poland, Rumania, Tchechoslovakia, West USSR, Yugoslavia!

*variabilis* Howden, 1964: 41 (holotype in Ottawa). ♂♀. — Mexico (type-loc. Guadajajara), U.S.A.

#### DESCRIPTIONS, RECORDS, OTHER NOTES

##### **Bolbelasmus meridionalis** sp. nov. (figs. 2, 6, 20)

Description (holotype, male). — Approximate length 9, width 6, height 4.5 mm. Reddish brown, shiny; tips, ridges, margins, sutures more or less infuscated; pilosity yellowish. Habitus, fig. 20.

Labrum slightly emarginate in front, sides widely rounded, surface rugulate-punctate. Cephalic contours, fig. 2. Clypeus transversely elliptic-trapeziform; surface coarsely, shallowly, contiguously punctate; margin raised, genal angles nearly tuberculate. Clypeofrontal suture distinct, straight; frons immediately behind suture with high coniform tubercle; frons abundantly punctate, punctures moderately deep, well defined, isodiametric. Vertex sparsely punctate. Eye-canthus arcuate, with reflexed anterior margin, surface of canthus irregularly, contiguously punctate; separated from frons by frontolateral ridge extending to hind border of eye; eyes with very convex superior side.

Pronotal contours, fig. 2. Pronotum medially bituberculate, protrusions connected by concave arcuate ridge; anterior declivity steep, vaguely shagreened; midline not impressed, base not marginate; lateral tubercle separated from median protrusion by concavity. Pronotal punctation double; primary punctures on disc sparse (with some concentrations), well defined, deep, isodiametric; primary punctation laterally dense, marginal punctures smaller and more shallow; secondary punctation ( $\times 25$ ) very fine and generally sparse. Scutellum (fig. 2) small, ogival, with a few indistinct primary and many secondary punctures.

General surface of elytra evenly strongly convex; juxtasutural stria fine, impunctate ( $\times 25$ ). Discal striae shallowly, vaguely impressed, heavily punctate; punctures deep, well defined, isodiametric, separated by 2-3 times their diameter; distal punctures large, sharply defined; peripunctural impressions indistinct and only slightly affecting interstriae. Elytral interstria 1 very strongly convex, raised, others slightly convex; punctures on interstriae extremely fine ( $\times 50$ ), sparse.

Fore tibia with (6) + 4 external denticles, their size increasing distad, 1-6 sharply acuminate; terminal spur large, acuminate, reaching tarsal segment 3. Femora all without notable details. Middle and hind tibiae with spinose fossorial elevations, increasingly developed distad, number in right middle tibia (2) + 2, in right hind tibia (2) + 3, their crest arcuate; number of fossorial spines along crest of antepical elevation on right middle tibia 14, their length gradually increasing to superior side. Terminal spurs of hind tibia subequal in length, reaching tarsal segment 3, their tip rounded.

Parameres (fig. 6) with angulate apex.

Some measurements in mm. Longitudinal distance from tip of frontal tubercle to clypeal apex 0.55; cephalic maximum length (exclusive of labrum and mandibles) 1.65, maximum width (over eyes) 3.00. Pronotal median length 3.10, maximum width 5.70. Maximum scutellar length 1.25, maximum width 1.00. Median length of elytra to base of scutellum 4.4, maximum width combined 6.9.

Sexual dimorphism and variation. — Females differ mainly by the frontal and pronotal protrusions. Frons with feeble ridge, length ca. half interocular distance, medially feebly tuberculate. Pronotal disc anteriorly limited by feebly bisinuate transverse ridge.

There are slight differences between the specimens from Java and those from continental Asia, primarily in size and coloration. Specimens from Java seem to have more strongly punctate elytral striae, but this may be due to their lighter brown colour and the more strongly infuscated peripunctural impressions. Further material is needed to assess the relationships between Javanese and continental populations.

Length 7-9.5 (♂), 6.5-8 mm (♀).

Identification. — In addition to the characters mentioned in the key, *Bolbelasmus meridionalis* can be identified from the following features. Frontal horn of male coniform, with simple apex. Eye-canthus arcuate in front. Transition from pronotal disc to anterior declivity abrupt. Scutellum sparsely, minutely punctate ( $\times 50$ ). Elytral striae strongly punctate, impression of striae slight. Middle and hind tibiae with two (sub)arcuate fossorial crests. Colour brown.

Material examined. — 8 males, 6 females.

Holotype, a well-developed ♂ from "Java / Horsfield / 60-15" (London), mentioned by Boucomont (1911: 38; see notes under *coreanus*). Paratypes as follows.

Indonesia: Java: Ardjoeno<sup>1</sup>), 1891, Scheepmaker (1 ♀, Amsterdam); Getassan, 1100 m, Van Doesburg Jr. (1 ♀, Amsterdam); Ng. Leboe (Rembang distr.), 2.xii.1926,

<sup>1</sup>) Spelling on label usually retained to enable easy recognition of type-material. Several localities mentioned in this paper could not be located.

Verbeck, at light (1 ♀, Amsterdam); West Java, Piepers (1 ♂, Leiden). — Thailand: Ampur Muang (Chiangmai region), 1962, Scanlon, light trap (1 ♂, Washington); Metah Valley, Hedley (2 ♂, London). — Vietnam: Tuyen-Quan, (Phu-An-Binh region), iv-vi.1901, Weis (1 ♀, Paris). Cochinchine, 1872, Harmand (1 ♀, Paris; mentioned by Boucomont & Gillet, 1921: 71, sub *coreanus*). — China: Taiwan: Heito, v-vi.1931, Miwa (1 ♂, 1 ♀, Brussels), identified as *coreanus* by Gillet; South Kiangsi: Sunwu, 13.vii.1936, Gressitt (1 ♂, Howden coll.).

***Bolbelasmus nativus* sp. nov.** (figs. 3, 7, 11, 21)

Description (holotype, male). — Approximate length 10, width 7, height 4.5 mm. Reddish brown, shiny; tips, ridges, margins, sutures more or less infuscated; pilosity yellowish. Habitus, fig. 21.

Labrum slightly emarginate in front, sides widely rounded, surface rugulate-punctate. Cephalic contours, fig. 3 Clypeus transversely elliptic-trapeziform, margin raised, genal angles tuberculate; surface coarsely, contiguously punctate. Clypeofrontal suture distinct, straight; frons with high coniform tubercle between eyes; frons abundantly punctate, punctures shallow, well defined, isodiametric. Vertex sparsely punctate. Eye-canthus arcuate, surface irregularly, contiguously punctate; separated from frons by fronto-lateral ridge extending to hind border of eye; eyes with very convex superior side.

Pronotal contours, fig. 3. Pronotum feebly quadrituberculate, paramedian pair separated from sublateral by shallow impression; anterior declivity steep; midline not impressed, base not marginate. Pronotal punctation double ( $\times 50$ ); primary punctures on disc sparse (with some concentrations), well defined, deep, isodiametric; lateral punctation contiguous. Scutellum (fig. 3) small, ogival; primary punctation fine, secondary punctation almost invisible ( $\times 50$ ), both abundant.

General surface of elytra evenly strongly convex; juxtasutural stria fine, impunctate. Discal striae of elytra distinctly impressed, abundantly punctate; punctures moderately deep, moderately defined, isodiametric, separated by 1-2 times their diameter; peripunctural impressions vague, slightly affecting interstriae. Elytral interstria 1 rather convex, raised, especially halfway sutural length, others slightly convex; punctation on interstriae sparse, double, both size classes scarcely distinct ( $\times 50$ ).

Fore tibia with (3) + 4 external denticles, their size increasing distad; terminal spur large, acuminate, reaching tarsal segment 3. Femora all without notable details. Middle and hind tibiae with spinose fossorial elevations, increasingly developed distad; number in right middle tibia (2) + 2, in right hind tibia (2) + 2, their crest subarcuate; number of fossorial spines along crest of antepical elevation on right middle tibia 15, their length gradually

increasing to superior side. Terminal spurs of hind tibia subequal in length, reaching tarsal segment 3, their tip rounded.

Parameres (fig. 7) with simply rounded apex.

Some measurements in mm. Longitudinal distance from tip of frontal tubercle to clypeal apex 1.25; cephalic maximum length (exclusive of labrum and mandibles) 2.00, maximum width (over eyes) 3.15. Pronotal median length 3.50, maximum width 6.50. Maximum scutellar length 1.20, maximum width 1.00. Median length of elytra to base of scutellum 4.5, max. width combined 6.5.

Sexual dimorphism. — There is one female which may belong to the same species. It shows the usual sexual dimorphism; the median tubercle of the frontal ridge is feebly bifid. The pronotum is densely covered with primary punctures; the numerous secondary punctures are easily distinguishable ( $\times 25$ ). Length 9 mm.

Identification. — In addition to the characters mentioned in the key, *Bolbelasmus nativus* can be identified from the following features. Frontal horn of male coniform, with simple apex. Eye-canthi arcuate in front. Scutellum sparsely, minutely punctate ( $\times 50$ ). Punctures of elytral striae strong, striae shallowly impressed. Fossorial crests on middle and hind tibiae feebly bilobate. Colour brown. Ridge on frons of supposed female with feebly bifid median tubercle.

Material examined. — Holotype male from Taiwan: Heito, v-vi.1931, Miwa (Brussels, from Gillet collection, identified as *coreanus*). The female just mentioned (excluded from type-series) is from S. Taiwan: Kagi, 26.viii.1907, Sauter (Berlin).

#### ***Bolbelasmus coreanus*** (Kolbe) (figs. 4, 8, 11, 22)

Notes. — This is a widespread, somewhat variable species; I have, however, been unable to distinguish Corean specimens from those of southern localities by constant characters. I have illustrated the largest male (long ca. 13.5 mm) in fig. 22. This specimen has deep lateral cavities on the anterior side of its pronotum, and strongly developed subconical paramedian tubercles, which project laterad; the frontal horn of this male is extremely long and slender. There are other differences, but, with this single male at hand, I can only regard all these as falling within the variation of *coreanus*. Apart from size, the parameres of the large male are similar to the others I have extracted.

With Boucomont (1911: 38) I consider *Bolboceras conicifrons* Fairmaire (1896: 82) a junior synonym. As for the other specimens mentioned by Boucomont (l.c.) as identical to *coreanus*, I disagree (though I have not recovered them all); a male from Java (Horsfield) he mentioned even

became the holotype of *Bolbelasmus meridionalis*. Some of the records given by Boucomont & Gillet (1921: 71) and Paulian (1945: 42) may be based on *meridionalis* or *nativus*; Paulian's fig. 26 (l.c.: 41) seems based on *coreanus*. Miwa (1930: 164, 176) possibly based his records partly or entirely on information supplied by Gillet (see also material examined under *meridionalis* and *nativus*).

Identification. — In addition to the characters mentioned in the key, *Bolbelasmus coreanus* can be identified from the following features. Frontal horn of male coniform, with simple apex. Eye-canths arcuate in front. Scutellum sparsely, minutely punctate ( $\times 50$ ). Punctures of elytral striae strongly, striae shallowly impressed. Fossorial crests on middle and hind tibiae bilobate. Colour brown.

Material examined. — 17 males, 19 females.

China: Hangtcheou (Chekiang), 1925, Pichon (1 ♀, Paris); Shi Men Kan (Kwei Chow), vii.1934 (1 ♂, Washington); Pe Yen Tsing (Yunnan) (1 ♂, Paris); Su-Tchuen (Siao Lou), 1897 (1 ♂, Paris); Su-Tchuen, 1903 (1 ♀, Paris); Yen-Ping, vi.1930 (1 ♂, discussed above, Ottawa); prov. Anhui, Anders (1 ♀, Stockholm); prov. Yunnan (1 ♀, Brussels). Taiwan: Kosempo, x.1911, Sauter (1 ♀, Eberswalde); Koshun, vii.1908, Sauter (1 ♂, Brussels). China (1 ♀, Berlin). — Korea: Chemulpo (2 ♂, 3 ♀, Berlin); Mai-Lou-Yong, 1911 (1 ♀, Leiden); Mirinai (1 ♂, Paris); Seoul, viii.1883, Gottsche (1 ♀ holotype, Berlin); ditto, viii.1900, Scarlett (1 ♀, London); ditto, 1913 (5 ♂, 2 ♀, Paris); Tong du Chon, v-vii.1970, Sanda (1 ♂, Howden coll.); Korea (1 ♂, 1 ♀, Dresden); ditto, 1892 (1 ♂, Dresden); Korea (1 ♀, Paris). — India: Pashok (Darjeeling distr.), 28.[?].1915, Baptista (1 ♂, Bombay); Khasi Hills (1 ♀, Dresden). — Thailand: Trang: Khaophapha Khaochang, 200 m, 3-5.i.1964 (1 ♀, Honolulu).

### ***Bolbelasmus orientalis*** Petrovitz (figs. 5, 9, 23)

Notes. — In accordance with the sexual dimorphism mentioned in the generic diagnosis, the "female allotype" of this species on dissection turned out to be a small male. The female sex is still unknown. This species is closely allied with the West Palaearctic *B. unicornis*.

Identification. — *Bolbelasmus orientalis* has no direct affinity to the three preceding species, having evenly curved scutellar sides and a marginate pronotal base. The bifid frontal horn is small compared to that of the West Palaearctic *B. bocchus*. Clypeal callosity distinct. Dorsally visible area of eye relatively small. Colour light brown.

Material examined. — Two males (holotype and "allotype") from Petrovitz collection, now in Geneva, collected at "Wladiwostok".

### ***Bolbelasmus tauricus*** Petrovitz (figs. 12, 13)

Notes. — This species was sexed incorrectly (female, Petrovitz, 1973: 338), although one of the specimens was earlier recorded as male of *nireus* (Petrovitz, 1963: 239). The three types of *tauricus* are here assumed to be

males; their genitalic region, however, had been so severely damaged that only fragments could be found. Presumably Petrovitz missed the phalli in searching because they were small and poorly sclerotized.

The paratype from 60 km N of Antalya differs from the holotype in some characters, i.a. in shape of eye-canthus, and in development of punctures in elytral striae (figs. 14, 15). This specimen is tentatively considered a male of *nireus*.

Material examined. — Holotype from Turkey: Namrun, 8.vi.1968, Wewalka; paratype from Namrun, Petrovitz-Ressl (both in Geneva).

### **Bolbelasmus nireus** (Reitter) (figs. 14, 15)

Note. — I can only add to the notes in the key and under *tauricus* that the diagnostic information presented in this paper is most tentative.

Material examined. — Female holotype from Akbes (Syria) (Paris: Boucomont coll.); a second female from Assur (Geneva: Petrovitz coll.); and, tentatively assigned to *nireus*, a paratype of *tauricus* from Turkey: 60 km N of Antalya, 25.v.1968 (Geneva: Petrovitz coll.) — used for key to males, couplet 8.

### **Bolbelasmus bocchus** (Erichson) (figs. 16-19)

Notes. — Although *B. bocchus* falls outside the scope of this paper, my suggestion of a subspecific differentiation in the above checklist has to be clarified. After having seen specimens from various North African localities I conclude that the males from Tunisia differ from those collected in western localities (Algeria, Morocco) in the shape of the frontal horn, and in the shape and direction of the pronotal paramedian tubercles. I regard these differences as subspecific, and apply the name *vaulogeri* Abeille; more material should confirm this new status. The two subspecies can be characterized as follows (only applicable to larger males; see figs. 16-19):

1. Profile of anterior declivity of pronotum collinear with profile of paramedian tubercle, which is erect and has its base angulate anteriorly. Frontal horn with long, strongly bifid tip. — Algeria, Morocco *b. bocchus*
- Profile of anterior declivity of pronotum interrupted by obliquely placed paramedian tubercle, base of declivity more depressed; paramedian tubercle basally not angulate. Frontal horn with tip short, usually feebly bifid, in frontal view giving a strongly dilated impression. — Tunisia *b. vaulogeri*

Material examined. — 18 males, 12 females.

Subsp. *bocchus*. Algeria: Mascara, Cros (1 ♂, 3 ♀, Leiden); ditto, iv-v.1913, Le Comte (6 ♂, 2 ♀, Paris, Leiden); Algeria (1 ♀, Leiden). — Morocco: Melilla: Ixmoart, xi.1948 (1 ♂, Kuyten coll.).

Subsp. *vaulogeri*. Tunisia: Bizerte, v.1965 (1 ♂, Leiden); Hammamet, 200 m,

4.iv.1975, Kuijten (4 ♂, 4 ♀, Kuijten coll.); Maktar, 22.iv.1973, Hielkema (3 ♂, 1 ♀, Leiden, Hielkema coll.); Sousse, iv.1973, Hielkema (2 ♂, 1 ♀, Leiden, Kuyten coll.).

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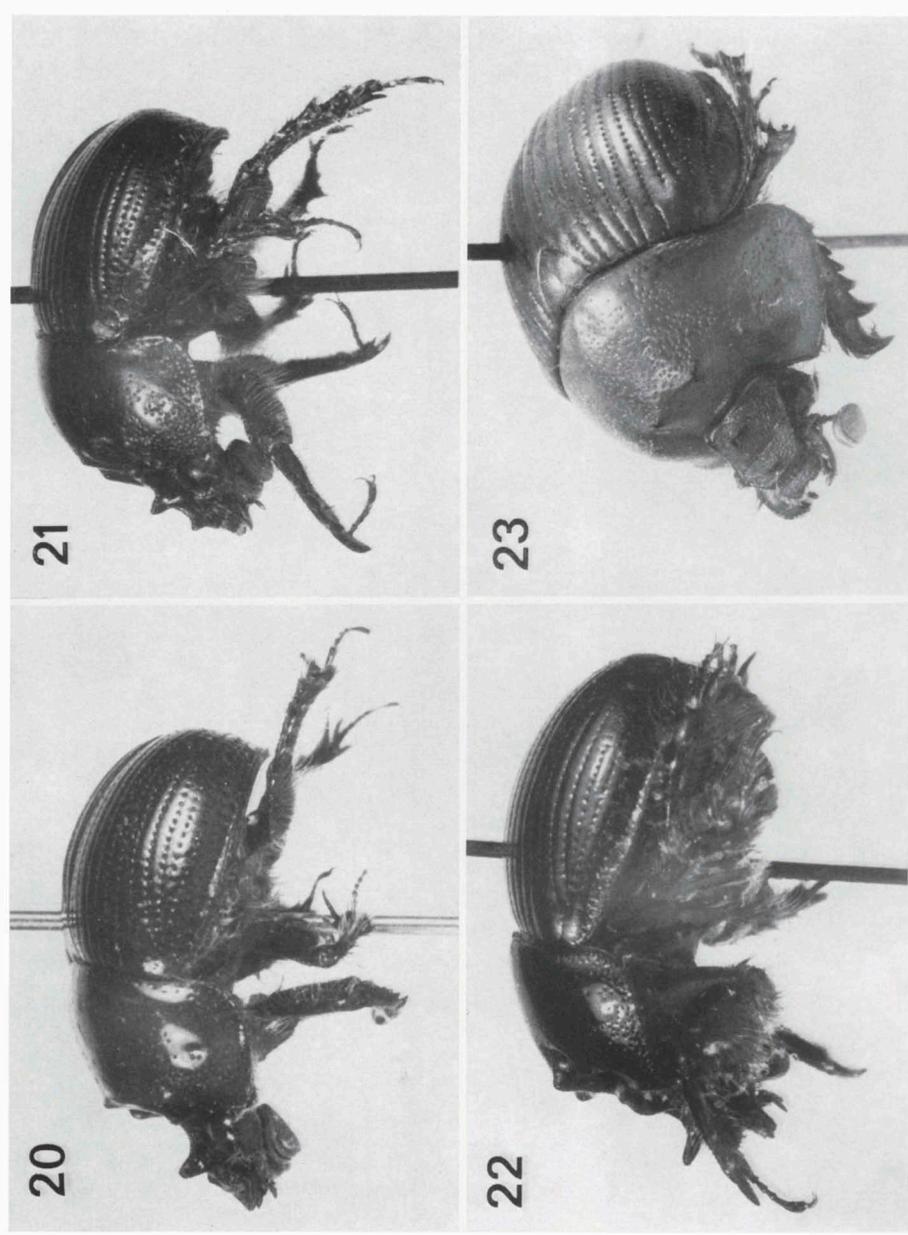
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*Bolbelasmus* species, males. 20, *meridionalis*, holotype; 21, *naticus*, holotype;  
22, *coreanus*, Yen-Ping; 23, *orientalis*, holotype.